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Wrenbrug On Grasses

THE NATURAL GRASSES

Their Uses For Temporary And Permanent Pasture
Their Uses In Connection With Clovers And Other
Leguminous Plants

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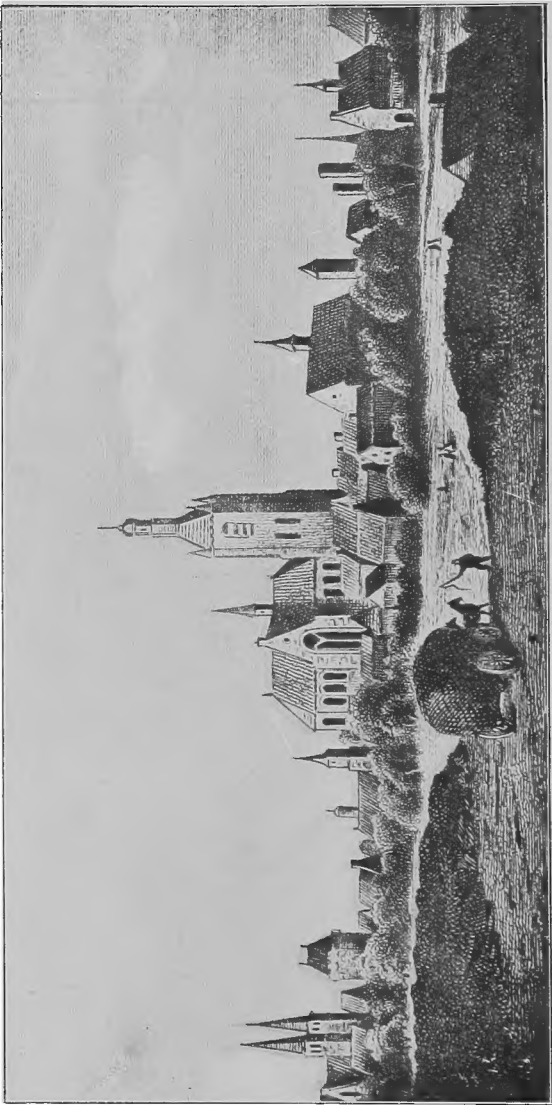


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ARNHEM IN THE MIDDLE-AGES.

MONEY IN GRASSES.



THE EXPERIENCE OF OTHER NATIONS FROM
WHICH THE FARMER, AND ESPECIALLY THE AMERICAN
FARMER MAY PROFIT.



WITH A SHORT ACCOUNT OF THE CITY
OF ARNHEM THE CENTRE OF THE GRASS-SEED
INDUSTRY IN EUROPE.

BY

JOSEPH THEODORE BARENBRUG



PUBLISHED BY:
BARENBRUG, BURGERS & Co.,
Grass-seed specialists,
ARNHEM (HOLLAND).

Lying in the sunshine among the buttercups and the dandelions of May, scarcely higher in intelligence than the minute tenants of that mimic wilderness, our earliest recollections are of grass; and when the fitful fever is ended, and the foolish wrangle of the market and forum is closed, grass heals over the scar which our descent into the bosom of the earth has made, and the carpet of the infant becomes the blanket of the dead. Grass is the forgiveness of nature—her constant benediction. Fields trampled with battle, saturated with blood, torn with the ruts of cannon, grow green again with grass, and carnage is forgotten. Streets abandoned by traffic become grass-grown like rural lanes and are obliterated. Forests decay, harvests perish, flowers vanish, but grass is immortal. Beleagued by the sullen hosts of winter, it withdraws into the impregnable fortress of its subterranean vitality, and emerges upon the first solicitation of spring. Sown by the winds, by the wandering birds, propagated by the subtle horticulture of the elements which are its ministers and servants, it softens the rude outline of the world. Its tenacious fibers hold the earth in its place, and prevent its soluble components from washing into the wasting sea. It invades the solitude of deserts, climbs the inaccessible slopes and forbidding pinnacles of mountains, modifies climates and determines the history, character and destiny of nations. Unobtrusive and patient, it has immortal vigor and aggression. Banished from the thoroughfares and the field, it abides its time to return, and when vigilance is relaxed, or the dynasty has perished, it silently resumes the throne from which it has been expelled, but which it never abdicates. It bears no blazonry of bloom to charm the senses with fragrance or splendor, but its homely hue is more enchanting than the lily or the rose. It yields no fruit in earth or air, and yet should its harvest fail for a single year, famine would depopulate the world.

(From a copy-righted article by the late Senator J^{no} James Ingalls, of Kansas, by special permission of Mrs Ingalls.)

Introductory to American edition.

(By George C. Watson, of Philadelphia, Pennsylvania; resident American agent of the company, and for 37 years actively engaged in the grass-seed trade in Europe and America.)

While the American people have learned much on agricultural subjects in the past two hundred years they have by no means kept pace with the world's progress in some lines, and this is the case conspicuously in their ignorance of the uses of the higher types of *Natural Grasses*. Intensive culture in the older countries of Europe, notably in the Netherlands, Great-Britain, France and Germany, has given a closer knowledge of the higher types of the cultivated grasses and clovers, enabling the farmers to draw larger returns from the soil with a smaller expenditure of expense and energy. This does not imply that the American is any less intelligent than his European confrère; but only that the matter has not been brought forcibly to his attention.

Before coming to America at the age of twenty-two, the writer of these lines had been brought up at the plough-tail, and subsequently served an apprenticeship of nine years in the seed-business, five of which were devoted almost exclusively to grasses, enabling him to have an exceptionally good grasp of that line with its sources of supply in all parts of the world, supplemented by careful study of the leading authorities, test-work on the sample-grounds, and diligent following up of the experimental stationwork then lately established by the government. After a residence of twenty-three years in America, and an active participation in the grass-seed business during all of that period, he is more than ever of the opinion that the European farmer is ahead of the American in his appreciation of the values of the various species and types of *Natural-Grasses* and their allies.

With a sincere desire to remedy this defect in American practice, negotiations were opened with Joseph Theodore Barenbrug—of Barenbrug, Burgers & Co., Arnhem, the recognized European specialists in this line—to write a treatise on the subject. After much persuasion this labor was finally undertaken, and the following pages are the result.

This treatise is not to be taken in the deeply scientific light of the *Hortus Gramineus Hoburnensis*—the foundation of our subse-

quent knowledge—nor even in the same class as that of the later investigations of Lawson, Flint, Faunce de Laune, and many other scientific authorities. It is rather a sizing-up of the world's practical experience brought down to date, sifted, winnowed and freed of all extraneous matter, and put into such short and compact shape as can be readily assimilated in a short time by the farmer and seedsman—the always busy! It is a thoughtful resumé of the subject; the ripe fruit of the brain of a practical seedsman and farmer; trained by many years of experience and study, verified by travel and observation in foreign countries, and an intimate knowledge of the subject in every direction. It is full of “meat”, and worthy of the most respectful attention.

What Vilmorin's book stands for in the vegetable-world, Barenbrug's treatise on the grasses although of smaller bulk takes equal rank as to quality and importance. The men of to-day may be no better physically, mentally, morally, than the higher types of the ancient civilizations; but they have one great advantage: they can stand on the mountain-tops and look back on the achievements of their forefathers, adding the result of past experience to their own and thereby doing their little share for the advancement of the human race and helping: “to rise on stepping-stones of their dead-selves to higher things.”

Some naive and quaint expressions in the treatise caused by the author having written same in a foreign language while doing his thinking in his own, might easily have been reduced to English and American crispness; but such trimming and polishing would undoubtedly have spoiled the piquance and native simplicity and sincerity of the text which, in its original form, appeals to the reader with more force than if amended.

As already stated the writer of this introductory, while wishing to be within the bounds of good taste, can honestly aver that he is no novice in this particular field. Yet he has found much in the treatise in thought and practice, that is new even to him, and he has therefore all the more confidence in commending the work not only to the novice, but in many cases to the most advanced farmer and seedsman. And it is surely voicing a general sentiment to exclaim:—“hats off to Joseph Theodore Barenbrug!” for he has certainly put the agricultural interests and the world generally under a debt of gratitude for a *good work, well done.*

GEORGE COOPER WATSON.

PHILADELPHIA, Pa, U. S. A. February 1908.

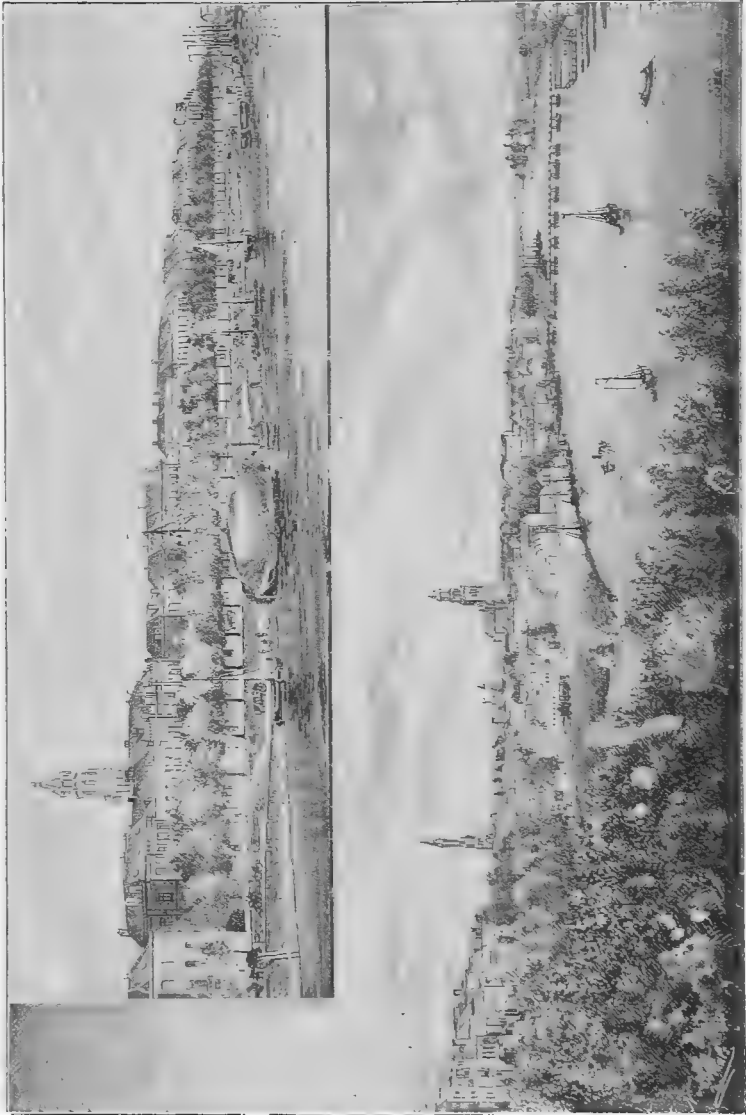
Arnhem And Its Connection With The Natural Grass-Seed Export Trade.

Of the cities in Holland which for scenery, public hygienic arrangements, cleanliness and welfare are most noted, Arnhem ranks decidedly amongst the foremost.

A foreigner, who might be inclined, as most foreigners are, to picture to his mind Arnhem as a Dutch city, cut up by a great many canals, spanned by numerous bridges and with a great number of mills in the distance will, on paying a visit to this city, be greatly struck by the fact, that his imagination of a Dutch city has, at any rate in this instance, led him astray and to find himself face to face with quite a modern city of about the same style and stamp as those of the greater part of the West-European continent; a city, therefore, of which it may be truly said, that it has nothing about it, that can be called characteristically Dutch.

Quite different from what it is in the provinces of North- and South-Holland, Zealand and Utrecht, all of which are situated *below* the level of the North- or German Sea, and which for irrigation and drainage purposes are in various directions cut up by canals which not only serve as waterways for home-navigation, but likewise are the means to carry off to the sea the superfluous waters pumped out of the agricultural, arable lands by means of the manyfold steam- and wind-mills built broadcast throughout these provinces, Arnhem and the greater portion of the province of Gueldre, of which it is the capital is situated *above* the Amsterdam- or sea-level, which fact causes it to lack all that, which is characteristic to most of the *Dutch* cities, towns and villages as these are generally seen on pictures, exhibited in show-windows of art- and picture-dealers in countries outside Holland.

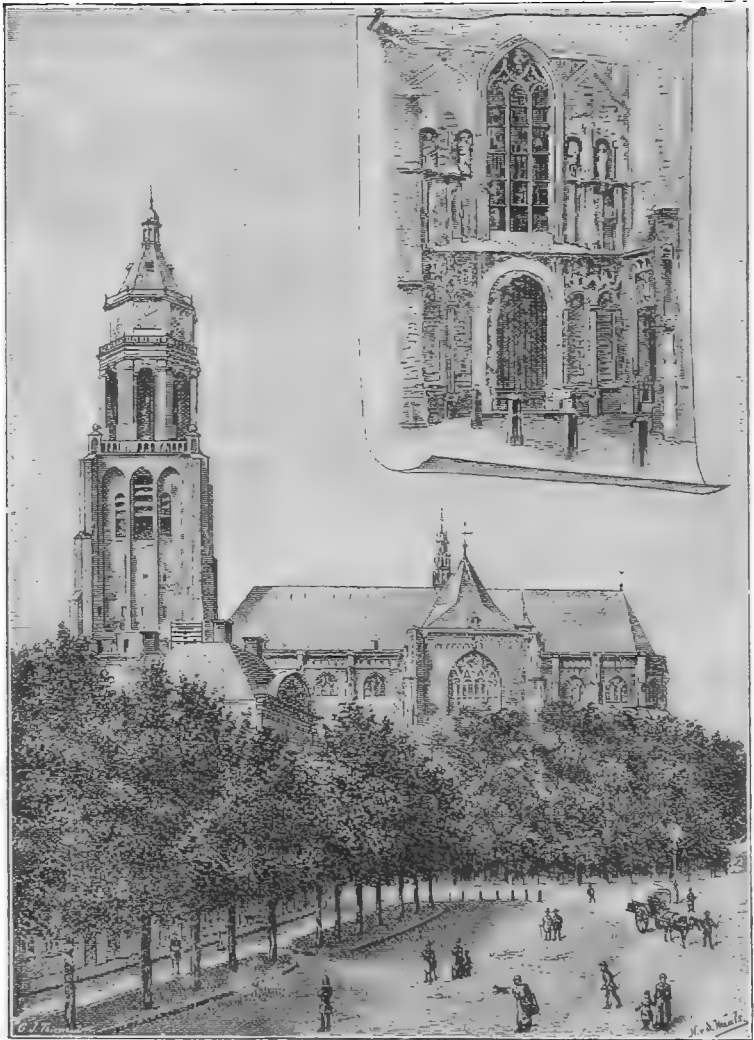
Arnhem, a city of about 62.000 inhabitants may be best described as a luxury town; a place of comfort, to which a great



VIEW OF MODERN ARNHEM. THE RIVER RHINE AND QUAYS.

number of the wealthier classes have during the last fifty years resorted, to spend an easy and agreeable life. Especially in the years from 1870 to 1890, Arnheim has been the place of attraction "par excellence" for such people, amongst whom were counted a great number of "East-Indian Guests", i. e. Dutch people who had made their fortunes in the Dutch East Indies on the sugar-, tobacco-, coffee- and other plantations, and of which plantations they were the proprietors still. Needless to say, the magnificent environs; the numerous estates a little outside the city which, with rare exceptions, are all open to visitors; its situation in one of the highest parts of Holland, with extensive fir- and other woods, which make it one of the healthiest spots in Holland, greatly account for this influx and increase of population since the middle of the last century. For, since 1848 when its population numbered about 17,000, Arnheim increased its inhabitants according to the last census to over 62,000. And this is not due to the fact, that some new industry has been started somewhere about Arnheim, which naturally would have attracted a good many outsiders, directly or indirectly interested in such an industry; but it is to be considered as a regular and sound increase both by births and influx. Arnheim (*Aernheim = Eagles' Home*), situated on the north bank of the Rhine, was first spoken of in history in the 11th century as a mere borough founded by Count Gerard II. In 1233 it was raised to the rank of a town with town-rights by Otto III (*with the horsefoot*), Count of Gueldre and Zutphen, after which rise, its position as well as that of its inhabitants soon altered for the better. As customary in those times, Arnheim had been fortified by means of walls, ponds and forts, as may be seen from a bird's eye-view of it taken early in the 17th century, at which time everything in that respect was looked upon as being complete. It had its 4 gates: *Velperpoort* (*Velp = neighbouring village*); *St. Jan's poort* (*St. John's gate*), *Sabel's poort* (*Savel = Sand gate*) and *Rijnpoort* (*River Rhine gate*), all of which were built in the town's walls of fortification.

It was during the latter half of last century, that Arnheim underwent quite a metamorphosis, when all the walls, ponds and gates, which encircled it and made it a fortified city, were pulled down and done away with. This done, there was sufficient room for its extension and embellishment. The place where in former times were found both walls and ponds, and which the one after



GREAT CHURCH (REFORMED DUTCH) WITH NORTH ENTRANCE AND MARKET-PLACE.

the other were pulled down and drained, produced a splendid opportunity to lay out the town with large magnificent squares and avenues, on both sides of which beautiful mansions have been erected.

In ancient public buildings or monuments Arnhem is rather poor. As such St. Walburgis Church (*Roman Catholic*) takes, as the most ancient of all, the first place. It was built end of the 14th century in the *gothic* style; has known its ups and downs during hard times of the reformation and other, until in the year 1807 it was restored to the R. C. community, since when it has during various periods been greatly restored, embellished and improved, with one interval, however, when about the middle of last century, one of its two spires, which form the frontispice, came down and destroyed in its fall part of the nave. Since then re-built and splendidly re-furnished, it ranks now amongst the finest buildings of public-worship, both inside and out.

St. Eusebius Church (*Reformed Dutch*) the highest and largest of churches in the town, likewise *gothic*, originally devoted to the patron-saint of the city, and built about the middle of the 15th century, was formerly a *Roman Catholic* place of worship. Possession of it was taken by the *Protestant* body at the *Reformation*. Its spire measures 96 Metres = about 105 Yards. This beautiful piece of architecture suffered much from all the ravages of the time etc., especially once through a fire in the year 1633, when great damage was done to the structure, impaired still by the less artful restoration of it. It is only since some 15 years, that earnest steps have been taken and that works are in process, to bring the building back to its pure and magnificent style.

The Townhall (*Devil's House*) originally built as a private mansion by Maarten van Rossem, a field-marshal and wealthy citizen of Arnhem about the end of the 15th century. It was erected in the *early-Dutch Renaissance*-style. History has it, that Maarten van Rossem to show his riches, desired to cover and have laid in the steps, that lead to the main-entrance with "Rijksdaalders", a Dutch silver coin of the value of a dollar. Of course, the authorities could not allow him such extravagance, for fear of inciting to theft people, imbued with less honest inclinations. To show his spite and anger over this refusal, Maarten van Rossem had several ugly-looking images, devils with horse-feet, hewn out in the stone walls of the building, which after his death was turned into a townhall. In the course of time



ST. WALBURG-STREET WITH NEW EXTENSION OF TOWNHALL BUILDINGS.

the structure had by less artful hands been greatly spoiled from an architectural point of view. It is only since the last decade, that the building has been restored and brought into proper form and style again, and enlarged to accommodate the larger staff of officials required nowadays for the largely extended city.

Amongst the *modern* structures which, from an architectural point of view, are worth mentioning, may be stated the General Post-Office and St. Elizabeth's Hospital (*R. C.*), the latter commanding a nice view of the Rhine and country south of this river called "Betuwe" (*bet-uwe = best old soil*).

And amongst the various estates in the environs of the city, open free to the public and which are fully worth a visit, we might cite "Sonsbeek" (property of the city of Arnhem now), "Rozendaal" (*daal = vale*), "Mariëndaal", "Oorsprong", "Westerbouwing". "Hemelschen Berg", "Duno", "Doorwerth", "Biljoen".

At a distance of about 8 miles in the north-eastern direction, passing through the village de Steeg, we enter on the magnificent "Middachter Allée", a splendid avenue with beautiful beech-trees on both sides of the road, unique throughout Holland and in summer a great place of attraction for foreigners and those fellow-countrymen, residing in the low-lying, flat and watery parts of Holland, devoid of woods or any such tall trees and a similar dry and healthy atmosphere.

On Industry And Business Matters.

Would any-one wonder at such a town as described above to become a place of attraction and resort for those, who in business have born the heat of the day, either in Holland-itself or in its colonies in the tropics? And would any-one wonder furthermore, that in the absence in the direct neighborhood of any raw materials or mines, a city of this description does not lend itself to any industry of a certain importance?

For what does it mean to a city of over 62.000 inhabitants, if it can point in that respect to a ship-building yard where a little over a couple of hundred hands are employed; or to a tobacco-factory, although with magnificent connections and a fairly large



TOWNHALL BUILDINGS (DEVIL'S HOUSE).

turn-over, where some 40 people are engaged; or, finally, to a weaving-factory (tapes, cord, etc.) with some 250 hands at work?

How, then, is it, that the Natural Grass-seed business has made roots, and deep roots indeed, in this city so devoid of any commercial enterprise?

The reply can be a short-one, viz the fact of its being so well, so centrally situated for that particular trade!

For, whereas the place has north of it in its direct vicinity a lighter, sandy soil with various woods, yielding the varieties that are being either grown on these lighter soils or collected in those woods, such as *Festuca duriuscula*, *ovina* and *ovina angustifolia* (*Hard-, Sheep's and Fine-leaved Sheep's Fescue*), *Aira flexuosa* (*Wavy Mountain Hair-grass*), *Poa nemoralis* (*Wood Meadow-grass*) etc., it has south, west and east of it the more fertile, heavy clay soil, which for centuries has been permanent pasture-land, where most of the more valuable meadow-grasses have from times immemorial been collected or, as has been the case for the last three or four decades, have been more systematically grown as crops. Amongst these grasses we mention in the first place varieties like *Agrostis stolonifera* (*Creeping Bent-grass*), *Alopecurus pratensis* (*Meadow Foxtail-grass*), *Anthoxanthum odoratum* (*Sweet-scented Vernal-grass, true*), *Avena flavescens* (*Yellow Oat-grass, true*), *Avena elatior* (*Tall Oat-grass*), *Cynosurus cristatus* (*Crested Dogstail-grass*), *Dactylis glomerata* (*Cocksfoot or Orchard-grass*), *Festuca elatior* and *pratensis* (*Tall Meadow and ordinary Meadow-Fescue*) and *Poa pratensis* and *trivialis* (*Smooth- and Rough-stalked Meadow-grass*) the former generally known in America as *Kentucky Blue-grass*.

Nor is this all in the way of advantages Arnhem has over various competitors. But the fact that the River Rhine with its tributary the River Waal, both of which farther westward have again connection with the several canals that cut up the more distant parts of Holland, run like serpentines through these two sorts of districts, gives magnificent and cheap accommodation for the conveyance of the various grasses from the different and most remote points, not only for the partly dressed stuff, but also for the original seed-material in its green state, which for the reason that it requires a more intense drying and thrashing, is all conveyed to Arnhem to undergo those more thorough operations.



ARNHEM. - RIVER RHINE HARBOUR.

It is impossible to give an historical account of the origin of the Natural Grass-seed trade in Holland; or to establish in what time that trade was started. The fact being, that up till some forty or fifty years ago no concentrated trade was being done in Holland-itself.

This only can be stated as a fact, that for several generations and long before a more systematic growing of Natural Grass-seeds was either started or even thought of, it was the habit of the poorer classes, to go out in summer and collect wherever such was permitted, either in meadows or in woods or fields, and in accordance with the successive terms at which the various kinds do come to maturity, the different grass-seeds, the agricultural or other value of which was either known or intimated to them through the various agents whose hands these seeds had to pass through before they reached the foreign wholesale-dealer and cleaner.

And as practically all the agents who were at the time the buyers, first-hand, of these grasses in their rough or partly dressed state, had their social seats as well as their warehouses in Germany, just a little beyond the Dutch border, very little was either seen, known or heard by the collectors of either the dressing and use of the seeds or of the countries whither they were sold and shipped when cleaned.

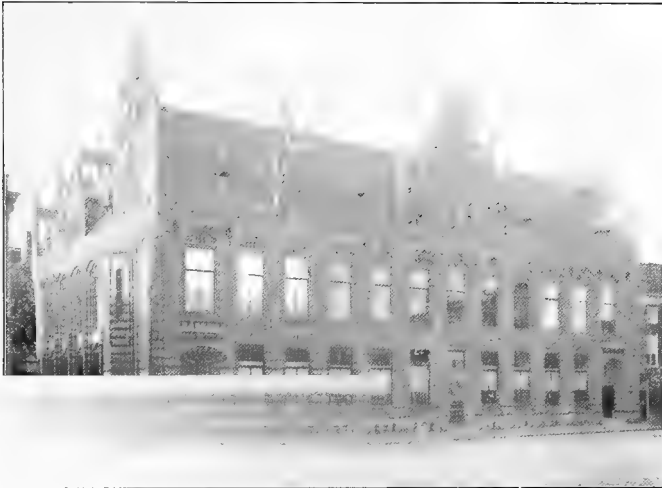
There is still an other reason why, whilst this seed-collecting had been going on for years and years, never in Holland-itself a firm sprang up sooner to establish a sound export-trade; combine the produce of the districts and put up warehouses with a satisfactory plant of machinery: the fact, namely, that the use of the Natural Grass-seeds, though these were fairly well known and appreciated by a few of the enlightened seedsmen and farmers, was far from being a universal-one then. The majority of both the trade and farmers followed carefully the steps of their predecessors and the system then prevailing, which prescribed for laying down pasture-land, either permanent or for 2, 3 years' lay, the use of Ryegrasses and Clovers. It was not until men like Peter Lawson and others who stood in the foremost ranks where it served to instruct farmers as well as the seed-trade, had pointed to the far greater value of the Natural Grasses for the purpose of laying down permanent pasture, as compared with the system then universally followed, namely the use Ryegrasses and Clovers, that these Natural Grasses by their persistent endeavors, got more and



ARCHWAY. ST. ELIZABETH'S HOSPITAL.

more introduced to and known by the average seedsman and farmer.

Well, then, if we mention here as a fact, that it was not until the fifties or sixties of last century, that the ideas of the trade and farming underwent this metamorphosis and that it is only from that time that the Natural Grasses got gradually introduced to and found appreciation by the trade at large, it must be clear to anybody, that very little trade had been done in these grasses before then; and that there had consequently been very little



ARNHEM. — GENERAL POST-OFFICE.

inducement for any-one in Holland, interested in the seed-business, to take earnestly in hand a branch of that trade, which up till then was far from being a lively or a remunerative-one; at least for those not understanding that branch.

Here, like in every other branch of commerce we have the three stadia to go through: the first, that of an article being scarcely known; the second, that of the public's attention being drawn by some-one or several as the case may be, to the value and merits of that particular article; and finally the third, that of it being tested and, the results being satisfactory, its finding a regular and increasing sale with a gradually extending production dependent thereon.

It was mainly due to the clear foresight of Mr. Arnold Burgers, oldest member of the present firm of Barenbrug, Burgers & Co., of Arnhem, who till then had been acting for one of the foreign houses as one of the several agents in Holland, to buy the rough material from the various collectors, and who, some forty years ago, took the initiative to concentrate the whole, or nearly the whole of the production of Holland into one hand; put up warehouses and mechanical installations for the thrashing and cleaning of the rough material and find a direct sale to the several seed-



ARNHEM. — DAM AND ST. WALBURGIS' CHURCH.

firms scattered all over the world, that the Natural Grass-seed export-trade was established in Holland-itself, and that, by doing so, this trade was placed on a sounder basis, namely that of bringing the consumer nearer to the producer and having the seat of business established in the centre of production, with a saving of expenses dependent on this more rational method of business.

That this was not so easy a task to be performed need scarcely be said. Circumstances, however, helped a great deal to lighten the work. First of all this, that the demand was only then beginning to become a more lively-one year after year, so that the production,



ARNHEM. — ESTATE SONSBECK THE CITY'S PROPERTY.



MR. ARNOLD BURGERS.



MR. BERNARD BURGERS.



MR. JOSEPH THEODORE BARENBRUG.

and everything in connection therewith, could keep pace with the increasing demand; that warehouse-room and machinery could be improved upon and gradually enlarged. Secondly, that the demands put in regard to the qualities of the various seeds were not so stringent then as they are nowadays, but extended themselves in time and in accordance with the deeper and sounder knowledge that was being acquired by practice.

Needless also to say, that Mr. Arnold Burgers found great assistance since some 25 to 30 years in the co-operation of his son, Mr. Bernard Burgers and of the author of this book, Mr. Joseph Theodore Barenbrug, two other junior members of the firm of Barenbrug, Burgers & Co., who, whilst the originator planned and traced out the course to be followed, were, each in his way, the men to carry out those plans and improve on them, wherever practice indicated improvements to be possible, or showed, that in one way or other for practical reasons, the original way adopted was less adviseable to be followed, had to be deviated from, and that it was necessary to march in an other direction.

The various factors, however, once having been set in working-order, and the individuals having been put in the right places, the trade made regular and even rapid progress. And it may be stated without any exaggeration in the least, that now the Natural Grass-seed trade in Holland, with Arnhem as its centre, is at-present one of the most important in the world.

And that this export-trade is an exceedingly lively-one, will be clear to anybody, if we mention here as a fact, that it is practically expanded all over the civilized world now, Europe, as being the cradle taking, of course, the foremost place.

It was in Great Britain since the middle of last century, that both the trade and farmers, first of all, got gradually fully alive to the importance of the Natural Grasses for the purpose of laying down permanent pasture. And it may be said without any exaggeration, that all over the British Islands, the Natural Grasses are now being used for permanent pasture-land, and that in the number of importing countries it stands foremost.

Next to this country it was France, Belgium, Germany (we don't speak here of the *exporting*-firms, but of the seed-dealers and farmers for the consumption at home) Austria, Denmark, etc., which got gradually alive to the importance and the indispensibleness of them.

Finally, there is the United States and Canada which followed and especially in recent years made great strides in that direction.

Up till some 20 or 25 years ago, there were but a few isolated firms there, knowing the Natural Grasses and their use sufficiently



CASTLE "BILJOEN".

well, and importing them regularly every year. But it is from then on, that the number of firms, to whom the knowledge of the Natural Grasses and their use penetrated, gradually and rather progressively widened, and that the use of them and along therewith, the imports rapidly increased. And it may be truly said now, that amongst the more practical and up-to-date seedsmen of the United States and Canada, there is actually not one sufficiently important firm left, which is not fully aware of the importance of the Natural Grasses, and of the necessity to have them added to the agricultural department of the business with, what is nowadays where producer and consumer are being closely brought together, a

necessity, a *direct* import of them from the centre of production, without the intermedium of the several middle-men or importing wholesale-dealers.

The Use And Value Of The Natural Grasses In General, And Of Each Variety In Particular.

In this chapter we mean to deal on the use and value of the Natural Grasses, and as we are writing for both those who are more or less acquainted therewith and those who are not, it can't fail that on more than one occasion, we shall repeat to certain of our readers points familiar to them and dealt on more exten-



CASTLE "BIJJOEN". — THE POND.

sively in works written by authors who had set it their task to deal on same more minutely, but which points we consider essential for the majority of readers, who sofar have had neither the opportunity nor the inclination to study such copious, deep-going

works which, as a rule, are at the same time of a tiring nature.

But as it is our intention to consider the various grasses and furthermore some of the leguminous plants more from a practical point of view, we venture that even such readers as alluded to above will find some useful knowledge in these lines either new to them or lost sight of in the study of the more theoretical side of the matter.

And then, in regard to the value of the various species of Natural Grasses, we must say, that it is the general opinion now of the most competent and experienced men, that these merits which cannot be estimated too highly, have been but too long neglected, seeing what benefits are to be derived from their use for various purposes, of which that of laying down permanent pasture-land, for alternate grazing and hay-making purposes, is decidedly the most important-one.

If in former times the Ryegrasses (*perennial* and *Italian*) and Clovers were chiefly the ingredients for laying down pasture- and grazing-lands, we would say, that these answered the purpose fairly well, if the farmer had in view a pasture or meadow for say 2 or 3 years' lay, as such a mixture would produce the maximum of good fodder in a minimum of time. But even to reach that aim we know a little better now. We know at least this, that for that purpose we can use to great advantage in connection with the Ryegrasses and Clovers, certain Natural Grasses, the nutritive value of which surpasses that of the Ryegrasses and which, though more slowly than these, do as yet develop fastly enough to render good service in pastures and meadows of so short a duration.

For, although everybody knows, that it is the Ryegrasses, "*par excellence*", which come to the front in a very short time once they have been sown, and yield a good crop of hay the first year, yet practice and experiments during the last few decades have taught likewise, that amongst the Natural Grasses also, there are a few species which, though they don't produce the first year so large a quantity of hay as the Ryegrasses do, display the second year all their luxury and the full abundance of quantity. Nor is this all. For, amongst the Natural Grasses, there are even a few which, though developping not quite so luxuriously as the Ryegrasses, yet just like these do actually produce also a fairly good crop the first year and, therefore, though it would be unwise to sow them alone, may be used with great advantage in connection with the Ryegrasses and Clovers and help these to increase not

only the yield, but to improve also the value of the hay, giving same likewise all the advantages which mixed hay has over the crop of only one variety.



MIDDACHTER AVENUE.

Amongst these quickly developping Natural Grasses we cite *Avena elatior* (*Tall Oatgrass*) as the most important and quickest-one.

But the main thing is, and the greatest advantages to be derived from the Natural Grasses are the use of them for *permanent* pasture-land and meadows.

It is here the place to draw likewise the attention of the reader to the use of certain varieties of Natural Grasses for another useful, though not quite so important a purpose as the laying-down of pasture-lands. We mean that of making *fine* lawns, recreation-grounds, bowling-greens, etc. And this will be clear to everybody, who so far has been in the habit of using Ryegrasses only, be it that he took to the *short-seeded perennial* or *paceys*, in order to get a finer-leaved grass than that of the ordinary perennial, if we tell him, that there is one characteristic attached to the Ryegrasses which, apart from the fact, that they are prone to disappear after a couple of years or to leave at least bare spots, if a severe winter with alternate wet and sharp-frosty weather has to be gone through, makes it unadvisable to sow them alone: this characteristic, namely, that the Ryegrasses grow in rather elevated tufts, in opposition to certain of the Natural Grasses which spread in a creeping, a more even turf making way; and that they have the bad habit of shooting forth part of their roots above or at least quite near the surface of the soil. The result of this is, that unless a lawn has been sown very thickly indeed; unless these tufts join one another closely, with practically no space between, the turf won't be an even-one, but will show near each tuft a smaller or larger bare spot; something of a "sinking", which is being made worse by the fact, that the lower part of the stem of the Perennial Ryegrass is of a rather reddish shade, which is being seen the sooner in such a case where the turf is not a thick-one.

Now, this is surely neither good nor recommendable for a *fine* lawn; and it is to provide for this deficiency, that some of the Natural Grasses which produce a fine, narrow and deep-green leaf and which do not possess to such an extent that tuft forming habit, should be used to fill up those gaps and smoothen away the unevenness of the tuft forming Ryegrasses. It is, moreover, these Natural Grasses which, if and wherever the Ryegrasses are wearing out, should by their sub-terrestrial propagation cover again the bare spots left by the Ryegrasses.

The main object in using a mixture of *short-seeded* or *paceys* Perennial Ryegrass and fine-leaved Natural Grasses can therefore be described in brief as this, that the Ryegrass has to promote the quick creation of a green turf, whereas it is the Natural Grasses which have to do the completing work of the first year, i. e. to make the lawn a *fine* and *even-one* for the following years

by taking the place of the Ryegrass where this is worn out.

What we have said here of the usefulness of certain Natural Grasses, which are non-tuft forming varieties, but spread themselves by their capacity of shooting forth subterraneously their roots, thus creating merely for beauty's sake that even turf, applies, though for an other reason, with the same vigour to their use for pasture-lands and meadows.



CASTLE "ROSENDAEL".

For, if the great aim to be reached for the former is to have a fine, even plot of grass, that in view for the latter is to derive the greatest possible production of the very best quality of nutritive grasses. And whilst the nutritive value of nearly all the Natural Grasses surpasses that of the Ryegrasses, sometimes even very much indeed, they tend at the same time to cover the soil far more thickly than the latter are capable of doing. Now, it need scarcely be said here, that the more thickly the land is covered by grass-plants of whatever variety these are, the greater will be the quantity of either grass or hay yielded.

Every little spot of the land should produce its share of the crop; not the smallest portion should lie waste. That is the great aim a farmer and dairyman should have constantly before him. And as it is the seedsman to whom the farmer looks as a rule for his advice and counsel, it is he, therefore, who cannot be too careful in composing his grass-seed mixtures.

Now, the main thing a seedsman should have in view when doing so, is first to look for those grasses which answer the purpose best. If for pastures, to use those varieties which with the greatest possible production give a quality of hay of the greatest nutritive value. If for lawns, to make his choice amongst those varieties which with a deep-green shade produce the finest possible leaves. The next thing, which applies to both purposes is to see such varieties put in, which fill up one another in their deficiency, where it concerns to see every little space of the soil covered.

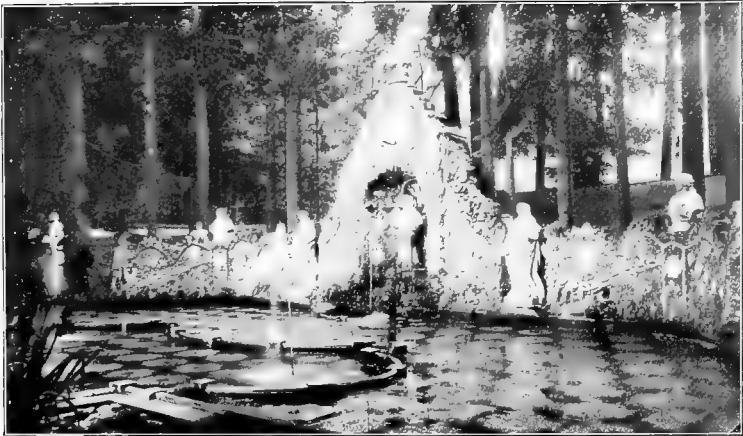
As explained above, it is the capacity of certain grasses, and we state as a fact, that they form by far the majority amongst them, good and inferior kinds, to grow in "*tufts*" which capacity often prevents a meadow or lawn from being so thickly covered as it both could and should be. It is on the other hand the minority of the various grasses, which propagate by their roots creeping in all directions and shooting forth new plants.

The seedsman should therefore carefully see, that a good proportion of varieties is being put in of the "*creeping*"-grasses. And finally, and this again concerns the meadows and pasture-lands alone, a wise and experienced judgement should guide him, where it refers to putting into the mixtures a sufficient proportion of both upper- (high-growing) and bottom- (short-growing) grasses. We scarcely think, that the advantages of the latter advice require any elucidiation to our readers.

It is the place here to come back to a point referred to already in this book, which is of great interest to the seedsman composing his mixtures, and which may save him a good deal of money, without at the same time reducing much the value of his mixtures, at least of such of the average or cheaper kind: we mean the place where we dwelt on the methods by which the grass-seeds are harvested; the original way: by collection in fields and meadows and the more modern way: that of growing the various grass-seeds on purpose and separately as a crop.

It must be clear to anybody, that the modern system, though being a far more costly-one, carries with it the acquisition of fully-

matured, heavy seed, almost entirely pure in its variety. There is the buying of the purest possible stock-seed; the careful labouring of the land to make it clean from obnoxious weeds, thus giving a good opportunity to the seed sown to develop most freely, not being kept down by overruling weeds and other stronger varieties; and furthermore the constant labour on the land in cultivation to keep same clean. All this tends to secure the purest, heaviest seed-crop. But at the same time it tends likewise, in connection with the risk of having either a short, or practically no crop at-all



ROSENDAEL. — BEDRIEGERTJES ("THE DECEIVERS").

(for grass-seed growing [is an exceedingly risky-one in regard to yield), to make the cost-price oft times a very high-one.

On the other hand, there is the old system of seed-collecting, which is still being carried on largely. And we need hardly say, that here there can scarcely be a question of getting seed in quite as pure a state as is the case with the produce of the modern system; for with the old system we have before us a field covered with all sorts of grasses, all of which are to be cut in succession as they come to maturity. Now, however carefully this collection is being done, the number of pounds a seed-collector brings together daily and by which his earnings of that day are being fixed, tends to hasten him to bring together the number of

pounds which he has set before himself as his task, much to the detriment of the quality of his produce from a purity point of view. This is worse even there, where it concerns varieties of about equal heights or of those which come to maturity almost simultaneously as for instance *Dactylis glomerata* (*Cocksfoot* or *Orchard-grass*) and *Festuca pratensis* (*Meadow Fescue*), which citations could be easily increased by several others.

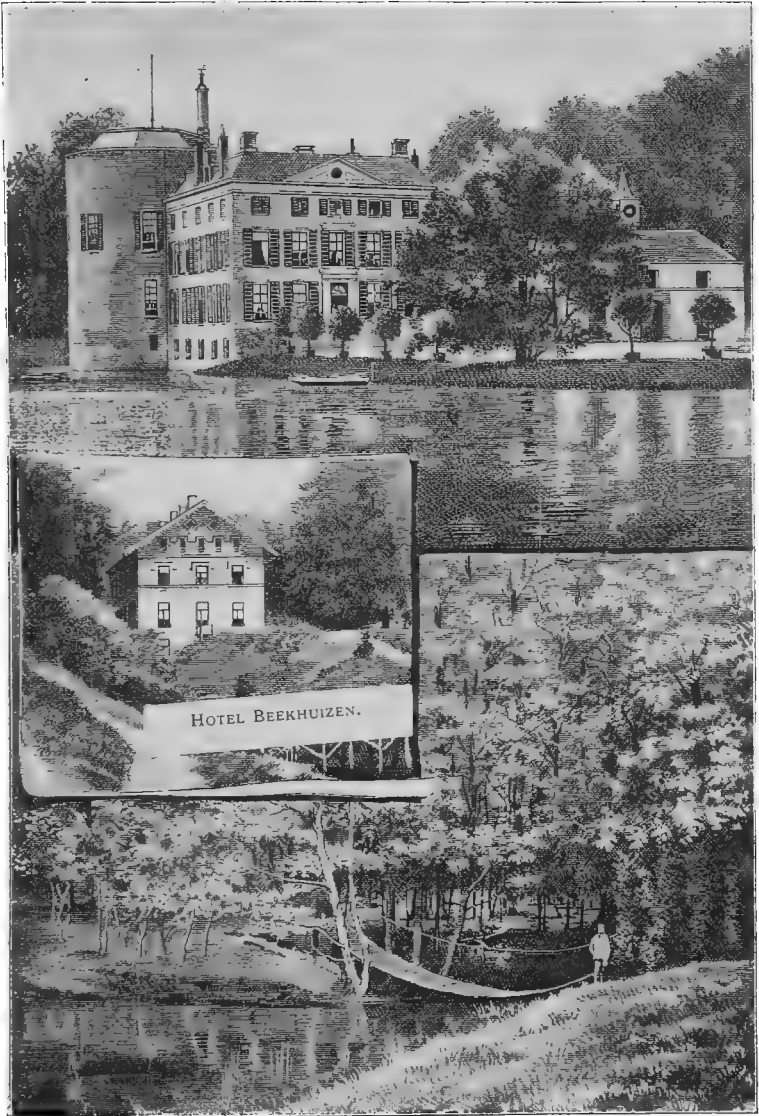
In regard to the germinative capacities of both the collected seeds and those grown as a crop, experience has taught most decisively, that whilst for certain varieties the percentages found for seeds of the old system are in no way inferior to those obtained from the produce of the modern system, there are a few other species which, in that respect, speak decidedly in favour of the seed purposely grown as a crop. This is mainly due to the fact, that crops of separate varieties grown for seed-saving are treated all over the fields more equally; that the plants ripen more simultaneously; and, finally, that if a farmer thinks the crop not sufficiently ripe and believes it to be in his interest to let it stand over a few days longer, he can do so and defer the cutting of the field as long as he likes.

On the other hand in regard to the seeds saved by collection, it is a fact, that if a seed-collector is not just then engaged in collecting a variety which is fully matured for reason he is through with his work on that kind, he is prone to commence with the following-one though it would have been far better if that following variety had been left uncut a few days yet.

Of course the cleaning-up of these collected seeds; the winnowing out of same of the light material, will do a great deal to provide for this deficiency; in several cases even carry up the germinative-powers to the same high standard as that of the seeds grown as a crop.

And as regards the exact purity in the sense of absence of obnoxious weeds, though the produce of the modern system is originally more free from same, the cleaning both by machinery and hand-sifting, is capable of carrying same for the one as well as for the other up to an equally high standard.

And, finally, as regards the capacity of each to maintain their force and permanency in the newly sown meadows and pasture-lands, the ideas which originally placed both produces on a par, have at least in a couple of cases been departed from in favour of the wildly-growing, collected seeds, since in recent years varieties like *Avena elatior* (*Tall Oatgrass*) and *Festuca pratensis*



1. CASTLE ROSENDAEL.

2. HOTEL BEEKHUIZEN.

3. CHAIN-BRIDGE ROSENDAEL.

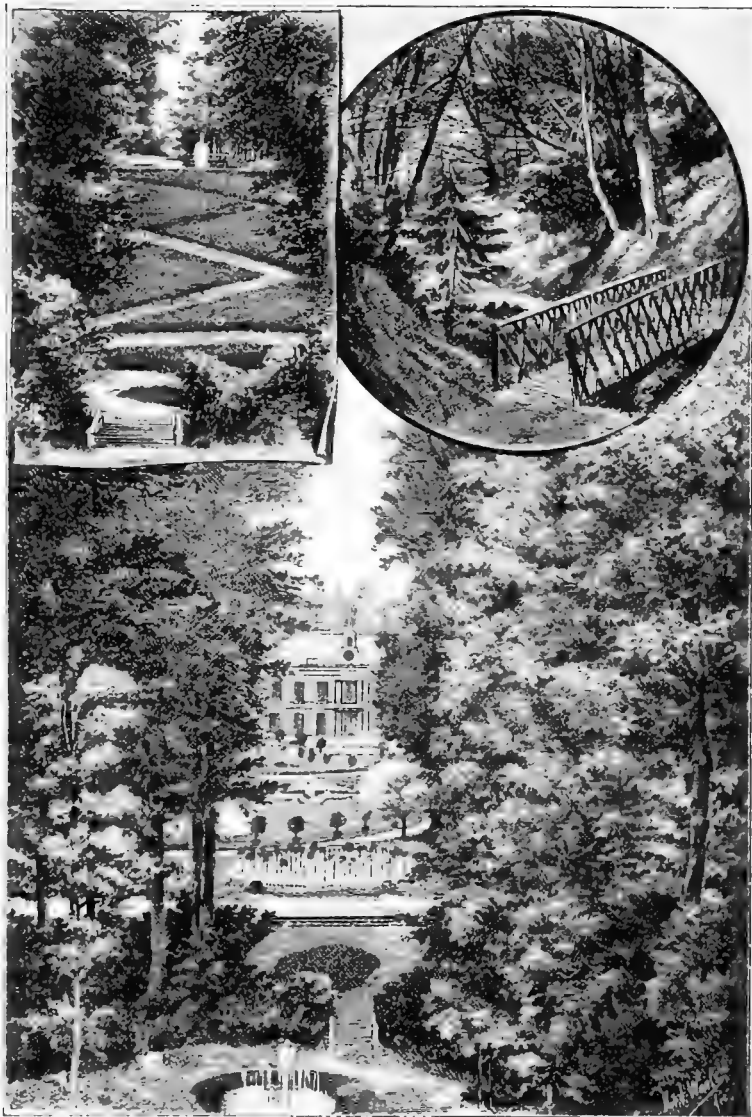
(*Meadow Fescue*), experience has proved, that the latter not only do produce a greater quantity of grass, but also are by far stronger in maintaining their presence in the field, not being so easily crowded out by other varieties or damaged by severe winter-weather.

The main thing that can be said against the collected produce is this, that certain varieties do often contain a greater or smaller proportion of species, though equally valuable, of an other denomination and in certain cases of lighter or immature seeds.

As regards the former we would say, that as long as the foreign seeds are good varieties, there is nothing against their presence in the bulk. It is simply the business of the seedsman here to take this *involuntary* admixture into account when composing his mixtures. And so far as the lighter seeds are concerned, it is our opinion, that the quantity of grass-seed sown per acre by the average farmer, is as a rule quite large enough to allow for a certain percentage of lighter, or immature seeds in the bulk not to produce plants, without doing any harm to the thickness of the turf.

If, therefore, there are certain advantages attached to the seeds grown as a crop, advantages especially of "quality", there is on the other hand much to be said in favour of the collected seeds, the main thing of which is, that they can be procured at a far cheaper price, the cost of production being much lower. Here no landrent to be paid for the purpose of the seed-saving; here no buying of dear genuine, pure stock-seed; here no intense and costly labour for making the land in proper condition and keeping the field clean when in spring the grasses are about to develop; here, finally, no risk of seeing all this output in money and labour done in vain by a failure, wholly or in part, of the crop. But here a seed-crop will be saved, if at the time of harvest, it is proved that in fact there is a seed-crop present on the field. If not, whatever is actually on the land in question can be used for hay-making or grazing purposes.

All this will make it clear to the reader, that and why collected seeds can very often be sold at a price half or even less than that quoted for the other. And where it is a fact, that in certain regions farmers are very little inclined to pay a good, satisfactory price for agricultural seeds, especially in the case where it concerns to create "grass-land only", these cheaper qualities come in most handy to the seedsman to compose that mixture which the farmer wants to order at the price he is inclined to pay.



OOSTERBEEK. — CASTLE MARIËNDAAL.

It may be here the place to disperse a wrong conception held by certain seedsmen with insufficient knowledge of the case, or misguided by others who may know a good deal more of grass-seeds, but who seem, notwithstanding, to have acquired a wrong conception of it, and who, no doubt quite involuntarily taking their opinion for a truth, base their reasoning thereon, piling up arguments against what is according to their views a bad thing to be wiped out, and who make others think like they do. We mean the so-called adulteration of grass-seeds.

It is far from us to pretend, that there is no room for adulteration of seeds to the advantage of the seedsman, desirous to derive unrighteous profits from his trade. But where the seed-trade in general is a trade of confidence in the first place, it is his own interests which will guide every sensible seedsman who has at heart his concern and means to maintain the position he takes up in the trade, not to do willfully anything that may be detrimental to his repute and to the confidence placed in him by his customers.

This said, it is not difficult to us to make clear to the reader, that in most of the cases where, at first sight, one might feel inclined to think of adulteration, we have simply to do with the result of *natural* causes, at least in such cases where *collected* seeds are the object of the denunciation.

If the reader remembers what we said before of the hasty manner in which the majority of the collectors bring their seeds together, to get in a minimum of time the maximum of weight; if he knows, furthermore, that various kinds of plants of the same height are standing next to one another, and if he finally knows, that the difference in time they come to maturity is for a few varieties that of a few days only, he will readily understand, that collected seeds of such varieties are bound to turn out, when thrashed and cleaned, as more or less mixed lots, according to the greater or lesser care and time a collector has bestowed on bringing together his produce.

Such will be even more clear to the reader when we tell him, that in the case of *Dactylis glomerata* (*Orchard-grass*) and *Festuca pratensis* (*Meadow Fescue*), the maturity of which falls but a few days later (in certain years of excessive heat and drought even simultaneously for both kinds), it is a system in certain of the growing-districts to cut these two varieties together, and as the weight of the *Orchard-seed* is far lighter and the plants

more numerous than those of the *Meadow Fescue*, the result is, that in such a produce the former's seeds are by far in the majority, which naturally leads both collector and wholesale-dealer, to sell such seed under the name of *Orchard-grass*.



!THE GHOST. WARNSBORN.

To speak or even think here of adulteration is (to deal with it gently) a misuse of words. This weighs the more, if we express as our opinion, that we scarcely know to which of these two varieties we should give the preference in regard to their agricultural value

in a meadow. It is true, that Orchard-grass gives a greater bulk; but it is equally true, that Meadow Fescue is a far softer and tenderer plant, less coarse and hard than the former and therefore preferred by the cattle. And as regards the market-value of both varieties, it must be stated that, though Orchard-grass sells as a rule dearer than Meadow Fescue, we have known the time more than once, that the reverse happened to be the case and that Meadow Fescue was selling a good deal, 50 0/10 even, dearer than Orchard-grass.

Under such circumstances there would even be no sense in committing willful adulteration!

Here is another instance. Take *Festuca ovina angustifolia* (*Fine-leaved Fescue*). Experience has taught that, if three or four years seed has been collected from one and the same tract of land, the plants and the seeds likewise acquire quite a different character, deviating greatly from the original, true variety and taking more or less the aspect of the *ordinary Festuca ovina* (*Sheep's Fescue*), not quite so large-seeded, however, and giving more the idea of a "cross" between the one and the other. This seed is regularly being sold as the *fine-leaved* variety, as it actually emanates from that variety's fields, and it would, consequently be likewise a wrong conception of the case to speak here of adulteration.

Poa nemoralis (*Wood Meadow-grass*), an other instance, is even as a *fancy* quality never to be got entirely pure and free from *Poa pratensis* (*Smooth-stalked Meadow- or Kentucky Bluegrass*), of which variety it contains always a larger or smaller percentage according to the grade under which it is being classified. And the grains present in a sample are, therefore, never being deducted from the exact percentage of purity when a sample of *nemoralis* is being analysed.

One more example. Take *Avena elatior* (*Tall Oat-grass*). This seed, likewise, is seldom even as a *fancy* grade got purer than say 85 to 90 0/10 on an average. It is always found to contain a certain percentage of *Dactylis glomerata* (*Orchard-grass*), *Festuca pratensis* (*Meadow Fescue*) and some other kinds, mainly *Bromus*-varieties. If such a *fancy* quality is being analysed, it is generally understood that, if say 90 0/10 is given as its purity, these 90 0/10 are composed of "good seeds" of *different* denomination, of which the *Tall Oat-grass* forms, of course, the bulk, whereas some 10 0/10 or more, very often as high as 15 to

20⁰/₀ are composed of *Dactylis glomerata* (*Orchard-grass*), *Festuca pratensis* (*Meadow-Fescue*), *Avena flavescens* (*Yellow Oat-grass*), *Lolium perenne* and *Italicum* (*Perennial* and *Italian Ryegrass*), besides a couple of species of the *Bromus*-varieties, etc.

If this is true of the *superior* grades of this variety, it goes without saying, that the lower, cheaper grades contain even a far larger proportion of these other varieties, and though amongst the more experienced grass-seed dealers these grades go under the



OOSTERBEEK. ESTATE HEMELSCHÉ BERG ("CELESTIAL MOUNT").

name of "*Fenasse*", yet they are being handled likewise under that of *Tall Oat-grass*. It is not at-all an exception to meet samples, containing say 50⁰/₀ "good" seeds, of which there are 23 of the true variety only.

Nobody, knowing the grass-seed trade thoroughly, would think here for a moment shouting of "adulteration", if a sample like the one described here were being sold as "*Tall Oat-grass*". Such lots are the *natural* outcome of the collector's work, and where

the varieties which with the Tall Oat-grass compose the percentage of "*good*" seeds, are indeed kinds of as great or even greater a value than the Tall Oat-grass-itself, there is indeed nothing against such lots of seed being sold under the name of that variety which in appearance is by far the predominant-one, as has been the habit from the very existance of the grass-seed trade.

Therefore, to speak here as well as in the precedent cases of "adulteration", which could easily be increased by many other instances of equal force is, to deal with it gently, a misuse of words!

The Agricultural Value Of The Leading Natural Grasses And How To Use Same In Mixtures.

In dealing on the agricultural value of the various Natural Grasses and their use in mixtures for permanent pastures and lawns, we must say, that they should be divided in varieties of the greatest possible value, which should always be used in a fair quantity in mixtures, larger or smaller according to their greater or lesser value and soil, climate, etc., they are destined for and in those of less agricultural value, the use of which may be adviseable under certain circumstances and conditions only.

We mean to review furthermore certain other agricultural plants, *non-gramineæ*, which, for laying down permanent pastures and other fields, form oft times the necessary complements of grass-seed mixtures.

To deal therefore in the first place and alphabetically on the Natural Grasses, we have to speak first of:

Agrostis stolonifera (*Fiorin or Creeping Bent-grass*). The principal of the *Agrostis*-varieties. This is a bottom-grass growing from 20 to 25, in certain favorable soils even as high as 30 inches; it is one of the fewer non-tuft forming varieties, shooting forth in a creeping way its roots not only subterraneously, but also, though in a smaller degree on the surface of the soil. This habit makes this variety especially valuable in mixtures, where seeds of the tuft-forming kind form the majority, as is practically always the case; it fills up then the bare spots which are being naturally created by the latter, thus making an even, thickly covered turf. Though it prefers a moist, even marshy soil, yet it is found likewise in dry, even in sandy soils, but does not thrive there quite so well. Therefore, although it prefers moisture, it can at the same time stand the drought very well indeed. It is a very good feeding-grass with abundant fine-leaved foliage, well-liked by all sorts of stock and suitable not only for grazing, but also for

hay-making purposes as, in the latter case, it gives a good deal of bottom-forage, increasing consequently greatly the bulk. It being, moreover, one of the later varieties, it has the advantage of producing a fresh, young grass at the time when the early varieties have ceased to thrive so well as they did in the earlier period of their vegetation. Though, on account of its fine-seeded grain in not too great a proportion, it should never be left out of a mixture for permanent pasture.

It is furthermore a very useful grass for fine lawns and pleasure-grounds, on account of its short growth, deep-green and fine-leaved foliage, so that it is highly recommendable for that purpose and is always being used in a fair proportion in lawn-mixtures. In *America* this is considered one of the most valuable of all the lawn grasses—its stoloniferous roots forming a close turf and its fine texture and deep-green colour being greatly appreciated. It seems to bear constant walking over in the most remarkable way and is therefore indispensable for golf-course, croquet- and cricket-field mixtures, as well as general lawn formulas.

Agrostis canina (*Rhode-Island Bent-grass*). Except that this variety is of a more tuft-forming habit, much of the foregoing may be said of it, although it is by a long way not so productive of either fertile stems or foliage; our experience is, that though it does not require quite so good a soil and may just as well be sown on a lighter ditto, it cannot equal either in quantity or in quality the *Agrostis stolonifera*, which is a softer, tenderer plant, whereas the *Agrostis canina* tends to go hard and strawy and, therefore, when it has reached that stage is not so well-liked by the cattle.

It is, however, a useful grass for lawns. Many seedsmen use it just as freely for that purpose as the *Agrostis stolonifera*.

The common name: *Rhode Island Bent* indicates *American* origin, although the variety is really a native of *Europe*. In *America* it is nowadays very difficult to find *true canina*, the *vulgaris* or ordinary *Red-top* being generally mistaken for it. Experienced seedsmen, therefore, prefer to import their *Rhode-Island Bent* direct from *Europe* where stocks are more dependable, or to use and recommend where circumstances permit the superior variety *stolonifera*. *Agrostis canina* is decidedly the inferior of the two for lawn-purposes, in this respect, that its foliage is by a long way of not so deep-green a shade as that of the first-described species,

which, therefore, gives a far nicer aspect to the lawn and makes this latter more recommendable for that purpose.

Aira caespitosa (*Tufted Hair-grass*). A tall meadow-grass, growing from 40 to 50 inches, forming wide tufts and found on marshy, boggy soils. It is of no agricultural value and must, therefore, be considered more like a *weed-grass*, as it has the bad habit of spreading in soils described above very rashly indeed, pushing away and taking the place of the more valuable varieties, which are not such vigorous growers. It should, therefore, never be used in pasture-mixtures.

It is being used as a component in *cheap* lawn-mixtures to which not too great exigencies are being put. However, even there, it should not be used. The fact, that it is too high-growing a variety with far from narrow leaves, makes it less suitable for that purpose. Only the fact of its being a *cheap* grass, could therefore be an argument for its use. But even this cannot be called a sound argument, since there are other varieties answering the purpose better which are not dearer.

Aira flexuosa (*Wavy Mountain Hair-grass*). Another variety of no agricultural value, occurring in woods, especially fir-woods, and producing plants of from 20 to 25 inches in height. It is of a tuft-forming character, not rich in foliage, but as its blades are rather narrow, it comes in handy for cheap lawn-mixtures. It should, however, not be used in too large a proportion and by preference under trees only. The stems tend to go yellowish very soon after they have reached their full height, and the grass should therefore be kept short to see the green shade maintained.

Alopecurus pratensis (*Meadow Foxtail-grass*). One of the most valuable varieties for permanent pasture. It is an even tuft-forming upper-grass, growing from 35 to 45 inches, of great nutritive value and well-liked by all sorts of stock. It requires a moist soil, by preference heavy clay; is seen most of all on the slopes of ditches and prefers such tracts of land, bordering on rivers, which, during winter-time overflow their banks, inundate the neighboring fields and leave there their fertile deposits.

It is one of the earliest varieties, producing abundant foliage, and as it develops very quickly indeed, it produces a good quantity of grass at a time when the majority of the other grasses are

only just giving a sign of vegetation, therefore at a time when practically nothing in the pasture-lands is there as yet for the cattle to graze on. Apart from the fact, that all sorts of stock are very fond of it, it is also for that reason one of the most useful and valuable varieties and should, therefore, be used in a fair proportion in mixtures for permanent pasture, where the soil is fit for it.

It does not thrive so well on lighter soils, though we have witnessed several such lands, where the plants once being there, maintained their presence very well indeed. We ascribe this mainly to the combined causes of a moist atmosphere with frequent rain-falls, the system of strongly manuring the pasture and of only using it for grazing, not for hay-making purposes. Treated that way, such lands receive sufficient assistance, to enable the *Foxtail-plants* to thrive on them and maintain their presence there.

Amphiphila arundinacea (*Sea-reed grass*). A tuft-forming grass growing from 40 to 50 inches, with a rather hard stem and a great many broad bottom-leaves. Scarcely of any agricultural or nutritive value, it is found on sandy sea-shores and dunes only. It is being used for sowing sandy regions and sandy hills near the sea-side and similar tracts of land, with no other purpose than to bind the soil together to prevent same from sliding away, its chief characteristic being that of making exceptionally deep roots, very often as deep as 4 yards, thus being a good means for binding such loose soils together and giving some firmness to them.

Anthoxanthum odoratum (*Sweet-scented Vernal, true perennial variety*). The most early grass in the pasture-lands. It grows from 20 to 25 inches in rather even tufts, and as it has the habit even there where it predominates to make a thickly-covered turf, shooting forth an abundance of stems, it gives a fair quantity of bottom to the hay, if the field is destined for the purpose of hay-making.

It is indispensable in meadows for grazing purposes, as at the moment when first the cattle are brought on the fields early in spring when, generally speaking, there is a shortness of grass, the later varieties not yet having started to develop, this variety is there and provides the first young fodder for the cattle. It thrives both on heavy and lighter, even on sandy soils and, if the latter be well-manured, even luxuriantly there.

As the name indicates, it is noted for its nice smell which, if the variety is in bloom and occurs in the field in a somewhat large proportion, is scented to a considerable distance. It is also this variety, which more than any other gives that nice smell to the newly made hay, if the hay-crop has been saved in good condition. It produces a fair quantity of foliage, the blades, given the shortness of the stems, being rather broad-shaped.

As for the agricultural value, the opinions on it are more or less divided. It is given out that, though its nutritive value cannot be doubted, it is not much cared for by the cattle on account of its somewhat bitter taste. Our own experience of several years, however, tells us quite a different tale. If we say, that the hay mowed from fields, composed of practically nothing but *Sweet-Vernal*, after the seeds have been saved from same, therefore at a time when the plants have become rather hard indeed and when the best part of the nutritive value is out of them, is taken up by the cattle with no sign of dislike, it stands to reason, that there can be no question of aversion, if the cattle can graze on it when the grass is in its most suitable feeding-state, i. e. either before or during the flowering-time and in connection with other grasses; or, when speaking of the hay, if such has been mown in good time and also in connection with other grasses, which as a rule form the bulk in the fields.

In our opinion, therefore, it should *not* be left out of the mixtures for permanent pastures; but a fair, not too large a proportion, should always be put in.

***Anthoxanthum odoratum, Puëlli* (*Sweet-Vernal, Puëlli*).**

Though the seed of this plant has a striking resemblance to that of the *true Sweet-Vernal*, yet they are two entirely distinct species. The *Puëlli* is of not the least agricultural value. It is an annual, short-growing and poorly-leaved plant; it occurs as a weed-grass only in rye-fields on sandy soils. It is never being grown as a crop, but the seed together with the chaff and foreign matter, is being sifted out of the rye-crops. It should not be used in mixtures for permanent pasture, but might find at best a use for cheap lawn-mixtures and then only along with *perennial* varieties, as it is bound to disappear, if (as is generally the case with lawns) it is regularly being mown and has consequently no opportunity of sowing itself again by the ripened seeds falling off on the soil.

Avena elatior (*Tall Oat-grass*). A valuable grass, growing from 40 to 50 inches high with abundant broad leaves, liked by all sorts of stock when the plants are young. It grows on both heavy and lighter not, however, on marshy soil; it is a middle-early grass and a quick grower. If sown early in spring, it produces very often spikes the same year and is therefore strongly to be recommended for such pastures that are destined for a short lay only. As, however, after a few years it loses its force and is being crowded out by some of the other, stronger varieties, a small proportion only should be put in mixtures for *permanent* pasture. In the southern latitudes in Europe as well as in America it is, however, used much for grazing and hay and is considered there one of the most valuable of all the Natural Grasses. The fact, that it likes a warm, dry climate is doubtless the reason why it seems to be better in its place there than in the northern latitudes.

Like several of the tall-growing grasses, it has a tendency of going rather hard and strawy towards maturity. As soon as this stage is reached, it is no longer cared for, but left alone by the cattle and has lost a great deal of its nutritive value. If, therefore, it is to serve for hay-making, a farmer should cut his fields, where this variety happens to be predominant, when the plants are in bloom. He won't lose much in bulk by doing so, but he will preserve at any rate the nutritive value of it.

Avena flavescens (*Yellow Oat-grass, true*). A very valuable bottom-grass of great nutritive value, growing in even tufts, 20 to 25 inches high, useful both for grazing and mowing-purposes and very much liked by all sorts of stock. It grows, with exception of the extreme wet and sandy districts, on all sorts of soil, is a middle-timed under-grass, and as it produces an abundance of both stems and foliage, it is one of those bottom-grasses, which largely increase the bulk and value of the hay.

If sown in the most suitable sorts of soil, it thrives and spreads very freely indeed, so that a small proportion only is required in a mixture for permanent pasture.

Bromus arvensis (*Field Bromegrass*). A tuft-forming, 25 to 35 inches high growing mid-season upper-grass, producing a fair quantity of fodder both, for grazing and hay-making purposes of, however, like all the *Bromus*-varieties, no great nutritive value and not so well-liked by cattle; horses only do not so much object to

It thrives both on heavy and poorer soils and has, also like all the family, the bad habit of forming great clusters of roots moving in every direction and producing there new shoots everywhere, thus easily pushing away all other varieties. As long as the varieties, thus subdued and wiped out, are of inferior agricultural and nutritive value, it won't do much harm. However, where it destroys the better, far more valuable varieties, it might be a point of consideration, whether at-all it should be put in mixtures for permanent pasture.

Our advice would be to use it only in such mixtures that are destined to create permanent pasture on lighter, poorer soils, where the other better grasses stand a poor chance only to thrive.

Bromus erectus or **pratensis** (*Meadow Bromegrass*). A tall 35 to 40 inches high growing grass, forming even tufts, and producing an average quantity of foliage and stems of no great nutritive value. It thrives on light soils, especially on those poor in chalk, where other grasses would not do. It tends to go rather hard if, in the case of hay-making, it is not being cut in due time, i. e. either before or when the plants are flowering early in June.

On account of its rather limited value, it should be used on lighter, sandy soils only with the aim of getting the largest possible yield of an average fodder there where nothing better can be obtained.

As practically all sorts of stock are not fond of it, this seed should not be used in mixtures destined for good soils, as there it would, on account of its tendency to spread and crowd out everything else, soon push away the far better, more valuable grasses.

Bromus inermis (*Awnless Bromegrass* or *Hungarian Fodder*) A tall 30 to 40 inches high growing and subterraneously creeping grass. It flowers about middle of June and produces an abundance of stalks and foliage. The former, however, tend to go hard very soon indeed and the plants are, therefore, not so well-liked by cattle. It is horses only, that care for it and eat it eagerly. If destined for hay-making, it should be cut before flowering-time as, otherwise, it goes too hard.

It does not require a heavy, good soil, but thrives there where the better, more valuable varieties would not do well. The nutritive value is rather under average and, though we consider it the best of the *Bromus*-varieties, it belongs therefore to the second

grade grasses only. It should consequently be used only in mixtures for poorer land and not be put in there where the purpose in view is, to create permanent pasture-land on good, heavy soil. Seedsmen and farmers should even be warned from putting this variety in such mixtures as, owing to its capacity of strongly shooting forth its roots in all directions and to long distances, it has the bad tendency of pushing away every variety, good or bad, but most of all the good-ones, which come in its way, so that where it is itself a strong variety of, however, inferior value, it would soon reduce the field which, without it, would surely show a magnificent and valuable pasture-land.

Bromus mollis (*Soft Brome- or Goose-grass*). A partly tuft-forming and partly creeping grass, growing from 25 to 40 inches high with a rather woolen-like stem and similar broad leaves, yielding a large bulk of either grass or hay. It is a grass of very little value, which should only be sown in very poor soils where the better, more valuable varieties won't thrive, just to get at least something from that land.

It should *never* be put in mixtures destined for laying down permanent pasture on good soil, as it would work there as a mere weed. It thrives very rapidly indeed and pushes easily away every good variety that comes in its way, so that it reduces in a very short time the value of an originally good field, once it gets a footing there.

The cattle won't touch it as long as they can find only a small bit of an other, better grass. Similar to *Bromus pratensis* and *inermis*, it is horses only that do not so much object to it, although these also do look for better and leave it alone, if they can find something suiting their tastes better.

Bromus Schraderi (*Prairie-grass*). A tall-growing, broad-leaved grass, rather hard, making deep roots and not a useful species for permanent pasture. As the name indicates already, it is a *prairie-grass* and finds its use, therefore, mainly in rather rough-lying districts of not exactly arable land, to make the best of it and have at least something there in the shape of green fodder, where for various reasons one could not think of laying down a regular permanent pasture. Though of no great merit, it has at any rate a certain nutritive value and is a fairly good grazing fodder for horses; but it is rather too hard for cattle. Sown in rougher districts

it has, moreover, the advantage of giving same a less barren, more homely aspect.

Cynosurus cristatus (*Crested Dogtail*). One of the most useful under-grasses for permanent pasture, not so much on account of a great productivity, but especially for its exceptionally great nutritive value. It is a tuft-forming grass growing 20 to 25 inches high with rather narrow blades; it prefers a heavy moist soil, and though the cattle only eat the stems when young and leave the fullgrown-ones which tend to go wiry untouched, they graze off the blades with eagerness.

It is one of the later varieties, and if it has its right weather, it may be seen profusely in all the better meadows of Holland and other *European* countries, which meadows derive their greater value in the first place from the multitudinous presence of its plants. It does not like the lighter soils so well, but is even seen there in abundance in wet seasons with heavy rainfalls and alternate sunshine. It should therefore be used without fail in every mixture for permanent pasture on heavy and middling, but not too light or dry a soil, as it materially improves the crops, both for haymaking and grazing purposes.

But not only for pastures is it a useful grass, it is likewise the most splendid plant for *fine lawns* and *pleasure-grounds*, so much so even, that wherever a seedsman can get his customers to pay for it the price which the article usually commands, there would be nothing against its being used either entirely or in majority in a mixture for that purpose. Its deep-green, very narrow blades and its dwarf growth render it the most appropriate grass for lawns.

American authorities while endorsing these views of *Cynosurus cristatus* go further in recommending it for hilly situations as its roots penetrate deeply and the plant, therefore, stands severe droughts very well. Another great advantage in *American* practice is the colour which is the same as that of *Poa pratensis*, the latter grass being used in *America* where the *British* would use *Lolium perenne* and in similar important proportion as the admixture to *Cynosurus cristatus*, which latter is rarely, if ever, used entirely alone there, but mostly in mixtures with other grasses for lawns and permanent pastures.

Dactylis glomerata (*Rough Cocksfoot or Orchard-grass*). A

tall 35 to 45 inches high growing, large tufts and deep roots forming grass with an abundance of rather broad leaves and of great agricultural and nutritive value. Of the 5 most valuable upper-grasses for permanent pasture, viz *Alopecurus pratensis* (*Meadow Foxtail*), *Avena elatior* (*Tall Oat-grass*), *Festuca elatior* (*Tall Fescue*), *Festuca pratensis* (*Meadow Fescue*) and *Dactylis glomerata* (*Orchard-grass*), the latter is considered by the majority of the experienced seedsmen and farmers to deserve the first place, so that in composing their mixtures, it carries the greatest proportion of these upper-grasses in such mixtures.

It certainly deserves a foremost place there on account not only of its great productivity and great agricultural and nutritive value, but also for this reason, that of the 5 varieties named above, it is the one which better than any of them thrives well in nearly all sorts of climates and soils. In that respect it leaves far behind it every-one of them. Place it in a heavy-clay, or in a light-sandy; in a moist or in a dry soil, or even on the slopes of railway- or other embankments, it will thrive in either of them. It dislikes marshy tracts of land only. Yet, we think, it should be treated a bit circumspectly!

As said before, it is a grass of great nutritive value and of great productiveness, but its stalk has a tendency of going rather hard at maturity. For that reason, meadows which contain a large proportion of it should be stocked well, if they serve for grazing-purposes; or they should be mown early, not later than when the plants are flowering, if destined for hay-making. In the first case, the greater number of stock will keep the grass short and be compelled to eat the stalks when these are young and tender, thus preventing same from shooting forth too robustly and going hard; and in the second place the early cutting, although producing less in quantity, will have the effect of turning into hay the grass, which till then has all the softness and tenderness that can reasonably be desired. Moreover, although the bulk may be somewhat less then, the greater nutritive value the hay contains when mown early, will easily make up for the smaller quantity. It is this habit of rather rough-growing and becoming too hard, which keeps many farmers and seedsmen from composing their mixtures of it in too great a proportion, and makes them feel more for *Festuca pratensis* (*Meadow Fescue*) and *Festuca elatior* (*Tall Fescue*), which varieties are not so much subject to that habit. This is, of course, a question of personal appreciation. But this

drawback, which such farmers and seedsmen dwell on so much, can be greatly reduced or taken away by following the hints given above.

It is also a useful grass for 2 or 3 years' lay in connection with *Ryegrasses*, *Timothy* and *Clovers*. Except a very few spikes, which may occasionally be seen, it does not produce many stalks the first year. But it does give at any rate a fair quantity of foliage. It is the *Ryegrasses*, *Timothy* and *Clovers* which predominate then. The second year, however, it gets its full force, and the plants may then be seen in profusion in the field, where the *Ryegrasses* have been greatly reduced and the *Clovers* are likewise fewer then.

For such a short duration it, however, causes this inconvenience to the farmer who, after the second or third year desires to plough the field up again, that it will cost him a good deal of labour to turn the same into good condition again, the plants having by then made very strong, deep-going clusters of roots, which require some intense labour to be cut to pieces and destroyed.

This grass is a great favorite in the *United States* both for hay and pasture. It has been found quite hardy and does well everywhere. It flowers with *Red clover* and is generally used in that conjunction. As said before, much care is necessary to cut just before maturity to get the best of the sweetness of the plant either dry or cured. It has been found to stand constant cropping better than any other of the recognized pasture-grasses. Farmers and seedsmen have to thank Henderson and Crozier to a great extent for enlightening them on the merits of this grass during the past twenty years.

It is entirely unsuited for lawns, however, on account of its broad leaves and its coarse, tufty habit.

***Festuca duriuscula* (Hard Fescue).** A sub-variety of *Festuca ovina* (*Sheep's Fescue*) and a 20 to 25 inches high growing, small even tuft-forming grass with narrow blades and still finer bottom-leaves of a deep-green colour. It is being chiefly used as a lawn-grass and forms, on account of its cheapness, as a rule, the bulk in mixtures for that purpose. It thrives on both middling and lighter soils and is, as will be clear from the foregoing, a very useful grass for lawns, especially on such soils where the more valuable varieties, like *Cynosurus cristatus* (*Creded Dogtail*) would do well only with a satisfactory rainfall, a thing of which one is seldom sure.

In fact, we know of lawns on such sorts of soil, which consist almost entirely of Hard Fescue and have been lying for several years, that rank even now amongst the finest we ever saw. This does not imply, of course, that the plant would do so well on every such soil and under every condition and that it would be advisable to sow this variety by itself or nearly so. But there is nothing against its being used very freely in lawn-mixtures destined for lighter or sandy soils.

Festuca elatior (*Tall Fescue*). A tall 35 to 45 inches high growing large tuft-forming grass, producing an abundance of broad leaves and a plant of great agricultural and nutritive value. It thrives on rich, especially on such heavy clay soils that border on rivers which during winter-time leave their fertile deposits on such lands. It produces there exceptionally big crops of splendid fodder, relished by all sorts of stock. There are many such meadows in Holland where the *Tall Fescue* forms by far the majority of the grass-plants present, and they are none the less valuable for it; for, experience has taught, that there we have one of the heaviest fattest sorts of cattle and the best dairy cows that give, together with the largest quantity, the best finest-flavored milk, richest in cream.

Also for hay-making it is one of the most valuable grasses, both for bulk and nutritive value. It should, however, be borne in mind, that like every tall-growing grass, it tends to go hard towards maturity, and that it should therefore be cut in due time to preserve its softness and tenderness. It resembles much the *Dactylis glomerata* (*Orchard-grass*) in that respect, except that it grows a bit taller, and goes a little less hard than that variety. If, however, the Orchard-grass is being mown in due time, it cannot fail, that the *Tall Fescue* has its right time also, as it comes to maturity about a week later even.

It is, therefore, to be considered one of the very best grasses which should be used in a fair proportion in pasture mixtures for good heavy and moist, though not marshy soils.

Festuca heterophylla (*Various-leaved Fescue*). An even tuft-forming, 25 to 30 inches high growing under-grass with very narrow blades and even finer brush-like bottom-leaves. It thrives on lighter soils, especially in a wild state; prefers the open spots in woods and the outskirts of these and likes the warmer regions.

It remains both, as regards yield and nutritive value, below average and is therefore from an agricultural point of view a grass of secondary importance only, which may profitably be used in pasture-mixtures destined for light warm soils, especially there where the better, heavy soil requiring under-grasses either would not thrive or stand a poor chance only.

It is on the other hand a very good grass for lawns, for which its fine, brush-like bottom-leaves make it exceedingly fit. For that purpose it is even superior to the *Festuca duriuscula* (*Hard Fescue*), but comes as a rule a good deal dearer than that variety.

Festuca ovina (*Sheep's Fescue*). A 20 to 25 inches high growing, even tuft-forming grass with both very few small bottom- and stalk-foilage. It grows on both middling and light sandy soils, though the latter are its places "par excellence". It is middle-timed as far as maturity is concerned, and is both in regard to yield and nutritive value, a secondary grass only. As the name indicates, it is *the* grass for sheep-pastures, that is to say, on light sandy soils there, where the better, more valuable grasses have either little or no chance to thrive. The reason why it is both named and considered the "*Sheep's*" grass is based on the fact, that in such regions as are either for lightness of soil or lack of sufficient rainfall, or for both, not so well adapted for permanent pasture and unsuitable for cattle to graze on, this grass will do very well indeed when sown in connection with *Anthyllis Vulneraria* (*Kidney Vetch*), to send sheep on which, as is generally known, can feed sufficiently and fatten even there, where cattle would almost be starving.

It should be borne in mind, that more than any other short-growing grass, *Sheep's Fescue* tends to go hard and strawy very soon and that, if a field of *Sheep's Fescue* alone, or of *Sheep's Fescue* and *Kidney Vetch* combined, were destined for hay-making, it should be mown either before or at least not later than when the plants are in bloom.

A certain percentage of *Sheep's Fescue* is very often being put also in mixtures for permanent pasture on good heavy soil. There is, however, very little sense in doing so, as there are several other more valuable and heavier yielding varieties that can be used to far greater advantage on such soil. We ascribe the use of it in such mixtures more to the desire of the composer

to reduce the cost-price of same, the *Sheep's Fescue* being, as a rule, one of the cheapest varieties of the Natural Grasses.

Festuca ovina angustifolia* or *tenuifolia (*Fine-leaved Sheep's Fescue*). A short 15 to 20 inches high growing, small tuft-forming grass with very few stem-leaves but a larger number of brush-like bottom-foliage. It is found especially in fir-woods and alongside the roads bordering on such woods; furthermore, on tracts of land, formerly fir-woods, the trees of which have come down a short while before and the soil of which has been ploughed up. It has no agricultural value, except that the sheep, which happen to pass through such woods or along such roads, are inclined to graze on it whilst moving onward.

It is, however, being used in a fair proportion as a lawn-grass in mixtures for fine lawns. In such a case, owing to the fact, that it is far cheaper, as a rule, than *Crested Dogstail* it is very often used in equal proportions, sometimes even, especially in years when the latter is high in price and the soil to be sown is a lighter sandy-one, in a greater proportion than the *Crested Dogstail*. Its fine, deep-green and hair-like leaves make it well-adapted for that purpose.

Festuca pratensis (*Meadow Fescue*). One of the best upper-grasses for permanent pasture. It grows in even tufts of from 35 to 40 inches, matures second part of July and yields an abundance of fodder of great nutritive value, much liked by all sorts of stock. It likes both heavy and middling well-manured, though not marshy soils. It does not thrive so well on lighter situations. It answers both purposes, that of grazing and that of haymaking very well indeed and is the equal of *Orchard-grass* with which it forms the bulk in mixtures destined for permanent pasture, the inferior of which it is only in regard to yield, but the superior of which, in our opinion, it is in regard to quality of both grass and hay. Its superiority, in our opinion at least, is mainly this, that it is by a long way not so coarse a grass and that it keeps its softness and tenderness of plant far better than *Orchard-grass*; that the cattle continue grazing on it much longer than on the last named variety. It develops somewhat more slowly in the field, and if a pasture of say 2 years' lay only were to be laid down, it would not be so well in its place there, as it would only just have reached its full force, when the time would have arrived for its

being ploughed under again. It will do better in permanent pasture or in a temporary pasture of no shorter duration than say 3 years, by which time it will have acquired its full development. But it is surely needless to say, that for permanent pasture it answers the purpose best of all.

It is here the place to draw the attention of both seedsman and farmer to the fact, that it makes an enormous difference of which origin the *Meadow Fescue-seed* is he uses for his mixtures. *American* seed may be a clean heavy seed of high growth, yet as regards produce it is by far the inferior of the *European (Rhenish)*-grown seed. Not only that the former does not produce so great a quantity of hay as the latter (in many cases not one half of it), but both stalks and leaves, produced by *American*-grown seed, have the bad tendency to go rusty and hard very soon. In that state the plants are seldom touched by the cattle. Both seedsman and farmer should therefore see, they get *Rhenish*-grown seed, if it is possible to procure same, even if they cannot get so high a purity and growth as the *American*-grown seed usually possesses, and even if they have to pay a good deal more for it.

Festuca rubra (*Red- or Creeping Fescue*). A partly creeping partly tuft-forming, about 25 to 30 inches high growing bottom-grass with narrow and not too many blades, useful for both grazing- and hay-making purposes; it does not give a big crop of either grass or hay, but has this advantage that, wherever once settled down, it remains there easily, as it does not put great demands to either soil, manure or circumstances of the weather. It thrives on all sorts of soil, even on dry sandy bottoms and forms a rather thickly-covered turf, leaving very little room for weeds to come through. It does, however, not belong to the varieties of the greatest agricultural and nutritive value and remains in that respect under average. But it is at any rate very useful from this point of view, that it gives a good deal of bottom and that it covers thickly the place where it occurs, filling up splendidly the little spots left bare by the large tuft-forming varieties. It is, moreover, one of the earliest grasses, so that it comes to the front at a time, when the young fodder is most looked for. It should be used in a small proportion in mixtures for permanent pastures on heavy soils, which proportion might be increased to double its quantity on lighter dittos.

It is also being used in mixtures for fine lawns; its deep-green,

very narrow blades making it a very useful grass for that purpose ; and as it is usually being quoted at a reasonable price, it comes in very handy for that purpose. It is also valuable for shady places in lawns and has been found to do well under the shade of pine-trees. The Agricultural Department at Washington recommends it especially in the latter connection.

Holcus lanatus (*Woolen Soft-grass*). A big tuft-forming 25 to 30 inches high growing grass with rather broad and abundant foliage. Though the bulk be a voluminous-one, there is, however, very little weight in it. Both as grass and hay there is little agricultural value in this variety, which is not at-all liked by cattle. This, it is assumed, is not only due to its being so little nutritious, but also to the fact, that both stalk and blades being rather hairy, which gives to the plant an appearance and feeling of a velvet-like nature, does not suit so well the taste of the cattle, so that wherever it occurs in meadows, where other valuable grasses are found in sufficient quantity, its large tufts may be seen, both stalks and abundance of foliage, untouched by the cattle.

It may in good meadows on heavy soils even be considered a "weed"-grass. For not only is it being rejected there by all sorts of stock, but owing to its bad habit of spreading exceptionally fast in all directions, it pushes away in a very short time every other good grass which comes in its way, so that once it has set foot in such a meadow, it will soon have superseded all the other good grasses and form the majority of plants in that meadow, much to the detriment of its agricultural value.

It is for that reason, that the better class of both seedsmen and farmers never put the variety in their mixtures and that they go so far as to reject even samples of other varieties, if they find such samples to contain a few odd grains of *Holcus lanatus* harvested with same and not taken out, as they won't suffer this plant to come into their grounds.

Holcus lanatus may be used for pastures only, either permanent or temporary, on light-sandy or marshy soils, where scarcely any of the more valuable varieties will thrive.

It is also much objected to in lawns on account of its broad, pale-colored leaves and its high-tuft-forming habit, both of which characteristics make a lawn look far from nice.

Phalaris arundinacea (*Reed Canary-grass*). A tall as high

as 80 inches growing water-grass, thriving in brooks, ditches, ponds and marshy tracts of land. A permanent pasture might easily do without it, and yet its presence in the ditches surrounding a pasture gives some aspect of completeness to it. Moreover, it is a grass of good nutritive value. When mown and cut to short pieces, it is in its green state when mixed with say oats a magnificent fodder for horses which eat it with eagerness.

Phleum pratense (*Timothy* or *Cat's-tail*). One of the most universally known and cultivated grasses, growing from 25 to 40 inches and found on nearly all sorts of soil. It is more than any other a magnificent grass in cold moist soils, where other grasses that require a warmer ditto would either not, or at any rate, only poorly thrive. It is, moreover, on account of the cheapness of its seed, a splendid grass for poor regions where farmers cannot or are not inclined to have a great outlay of money to create a permanent pasture composed of the dearer, more valuable grasses, which perhaps might even not succeed on their lands to make good their costs.

It grows in even tufts and produces a fair quantity of both stalks and foliage of average nutritive value.

We would, however, recommend it to be used especially as fodder in its green state, as it tends to go hard, even if cut before it is in bloom. More than of any other of the tall-growing grasses, this is a drawback of Timothy if it goes for hay-making.

It is for that reason, that we would not advise it to be used in permanent pasture mixtures. It is better in its place there, where it is being used in connection with clovers. *Timothy*, namely, being a rather late variety will, of course, be young and tender yet, when the first cut of the clovers is being taken, and it does not push again so quickly as to be liable to become hard at the second cut.

As, furthermore, it is a quickly developing plant and, if sown in spring, produces spikes already that same year, it answers the purpose of sowing in connection with clovers very well indeed.

It might be sown also separately and in this case, where a farmer has a better view of it than if sown in connection with other grasses or clovers, he will sooner come to mowing it early, if he discerns, that his field is shooting up too rashly and too high, and if he knows, that such is detrimental to the quality of the hay.

And in case it might, against his intentions, have advanced too far already before he perceives such, he might use it yet as fodder for his horses, which do not object so much to that sort of hay as cattle do.

Poa annua (*Annual Meadow-grass*). A very short, fine tuft-forming 5 to 10 inches high growing grass, springing up wild on tracts of land which are a while out of cultivation. It might be a useful grass for lawns if it were a perennial and had not the bad habit of turning yellow already a short while after it has made its appearance. There is, therefore, no practical use for it, and the seed of it is scarcely ever handled.

Poa aquatica (*Water Meadow-grass*). A tall 80 inches high growing water-grass, thriving exactly and in the same places as *Phalaris arundinacea*, and all we said about the habits and merits of the latter, applies to this variety likewise.

Poa or **Festuca fluitans** (*Floating Fescue* or *Fowl Meadow-grass*). A grass serving for much the same purpose as the precedent variety, except that it reaches a size of from 40 to 60 inches only, and that instead of having its stems turned upwards as all other grasses, it has same, through its weakness, heaviness and long size of seed-head bent and floating on the surface of the water in the ditches at the immediate side of which only this plant will thrive. It is not at-all strange to see such ditches covered all over with both stalks and foliage of this plant.

It has a good agricultural value and is eagerly eaten by both horses and cattle. But it stands to reason that, on account of the way it grows, it contains a great percentage of water, reducing the nutritive value of a certain quantity of hay in the same proportion when saved.

Poa nemoralis (*Wood Meadow-grass*). A tuft-forming 15 to 20 inches high growing grass of a deep-green colour and with thin stalks and fine narrow blades. It grows in woods only and by preference under beech-trees, as it likes the shadowy places. It is of no agricultural value, except that it helps to nourish the game (hares and deer). Its great merits are those of serving as a magnificent lawn-grass in shadowy places and under high-growing trees rich in foliage, the fact being, that it is the only grass which

can stand the heavy drops that after a severe shower fall from such trees. These big drops have quite weight and force enough to kill every other variety of grass by laying bare the roots, thus taking away from the plants the chance of living and thriving. Hence the bare spots under trees, witnessed in nine cases out of ten where *Poa nemoralis* does not occur, and which give an aspect far from nice to the lawn. It is this variety only, which in the struggle with these heavy drops has proved to be the stronger of the two, and, if we repeat here what we said already, that it has with this good characteristic at the same time a nice deep-green shade and an exceptionally fine leaf and stalk, nobody will wonder at being told, that there is a strong and increasing demand for the seed of so valuable and for the creation of fine lawns so indispensable a grass.

Poa pratensis (*Smooth-stalked Meadow- or Kentucky Blue-grass*). A valuable under-grass for permanent pasture. It is a creeping 25 to 30 inches high growing grass with a tender stalk and producing a fair quantity of foliage of good agricultural and average nutritive value. It is both good for grazing and hay-making purposes, though for the latter with the alternate aim of grazing the field, after mowing, off by cattle it does not answer that purpose so well, the fact being, that after that cut has been taken, it does not grow up quickly again that same season. It gives, therefore, almost its entire yield at mowing-time, and as it is one of the earlier grasses, its thriving capacity is practically over early in July. However, it gives a fair quantity of bottom-grass at the first cut, and as a grazing-grass it is well-liked by all sorts of stock. It grows on fairly good and lighter warm soils and can stand drought very well indeed. It does not thrive so well on heavy, moist soils; only in very dry summers it may be seen in profusion there, if once it has its root-system there and the other, in average years with alternate sunshine and rain predominating varieties have no opportunity to show their usual luxury.

It should, therefore, be used in a fair proportion in mixtures for permanent pasture on average and lighter soils. But it is not advisable to use it for pastures destined for 2 or 3 years' lay, as it takes a few years before it is sufficiently developed.

It is also being used as a lawn-grass on lighter soils, for which its creeping, spreading and thickly covered turf-forming capacity makes it well adapted. And as it has a fine leaf, there is nothing

to be said against the use of it for that purpose, the less so, as it is as a rule not too dear a seed.

Poa trivialis (*Rough-stalked Meadow-grass*). Decidedly one of the very best bottom-grasses in a meadow. It grows in rather even tufts 25 to 35 inches high with narrow leaves and a tender stalk. Though it does not produce a large bulk, it is none the less valuable for it, as its great nutritive value makes easily up for what it yields less in bulk than might be expected of it.

There is no doubt about it, that more than any other variety it is well-liked by all sorts of stock; that it is most suitable for dairy purposes, and that more than any other variety its presence in the pasture, even in a limited quantity, tends to increase the quantity and enrich the quality of the milk. In meadows forming part of a dairy-farm, it is therefore a grass, the merits of which cannot be too highly estimated.

It requires a heavy or average kind of soil, does not thrive on lighter or sandy loams, except where these have been strongly manured and in seasons with heavy rainfalls.

Also as bottom in hay it keeps up its good qualities very well indeed and is in that state being fondly eaten by all sorts of stock, especially by dairy cows.

We cannot, therefore, recommend highly enough the use of this valuable grass in mixtures for permanent pasture on suitable soils. On rich heavy soils it is by far the superior of its cousin *Poa pratensis*, and the higher price it usually commands should make no seedsman or farmer ever shrink back from using it liberally in their permanent pasture mixtures.

Lolium perenne, Lolium perenne, Pacey's and Lolium Italicum (*Large- and Short-seeded Perennial and Italian Ryegrasses*). We consider these varieties, their use and value, both agricultural and nutritive sufficiently known by the average seedsman and farmer so as not to require to be spoken of here lengthily in so far as their characteristics and merits are concerned. We wish, however, to repeat here what we said already, that both *Perennial* and *Italian Ryegrasses* have hitherto been used too much for purposes they are not fit for, i. e. for permanent pasture.

They may be used for a green-field of say one or two years' lay, but they should not be looked upon as being the grasses for *permanent* pasture. For one year's lay they answer the purpose

fully as they thrive very quickly and, if sown early in spring, can easily be mown twice that same year; and if cut in due time, they do produce a good fodder indeed.

If we were to make a choice between the two, both in regard to produce and quality of either grass or hay, we would not hesitate for a moment to give the preference to the *Italian Ryegrass*, except in such a case, where the farmer is sure to let the field stand over a second year. In that case we would let our choice fall on the *Perennial Ryegrass*, as the former is not so strong as to do the second year so well as the latter.

But for one year's lay only, we would decidedly prefer the *Italian Ryegrass*, as we consider it less hard and wiry, and as we got larger yields of it than of the other variety.

The *Short-seeded Perennial*, we think, every seedsman knows well enough, finds its use for lawns only as the cheaper admixture in compositions for that purpose and to promote an early green turf. But if there is no great hurry with a lawn, and if the seedsman's customer is inclined to pay a satisfactory price for it, we would advise him to abstain from it as much as possible for this reason, that the bottom-part of the stalks are rather reddish-colored. Now, it is scarcely necessary to say, that lawns should be kept short, if at-all they are to deserve the name of lawn. And it will certainly be clear to anybody, that in such a case it is exactly that reddish-colored part near the surface, which catches the eye and spoils the look of the lawn, for which it is a condition, that it should command a deep-green view.

We might also point to the fact, that it is not one of the finest-leaved varieties, which fact also makes it a less desirable grass for lawns, at least for *fine* lawns.

How To Lay Down Permanent Pastures.

If after all we have said in the foregoing part about the values and merits of the various grasses, we are to make a brief resumption of, and classify same as grasses of the greatest value and importance, the use of which is to be highly recommended for laying down permanent pastures with the intent of deriving the very best results from a field; and of those of secondary import-

ance and value only, the use of which may be advisable there and in such cases where the purpose in view cannot reasonably be expected to be reached with the more valuable varieties for various reasons of soil, climate, etc.; and, finally, of those destined for lawns and pleasure-grounds, we would make this classification as follows:

I. Very best grasses for permanent pasture on heavy and good average soils:

- Agrostis stolonifera* (*Creeping Bent-grass*).
- " *canina* (*Rhode-Island Bent-grass*).
- Alopecurus pratensis* (*Meadow Foxtail-grass*).
- Avena elatior* (*Tall Oat-grass*).
- " *flavescens* (*Yellow Oat-grass, true*).
- Anthoxanthum odoratum* (*Sweet-scented Vernal, true*).
- Cynosurus cristatus* (*Crested Dogstail-grass*).
- Dactylis glomerata* (*Cocksfoot or Orchard-grass*).
- Festuca elatior* (*Tall Meadow Fescue*).
- " *heterophylla* (*Various-leaved Fescue*).
- " *ovina* (*Sheep's Fescue*).
- " *pratensis* (*Meadow Fescue*).
- " *rubra* (*Red or Creeping Fescue*).
- Phleum pratense* (*Timothy or Cat's-tail-grass*).
- Poa pratensis* (*Smooth-stalked Meadow- or Kentucky Blue-grass*).
- " *trivialis* (*Rough-stalked Meadow-grass*).

II. Varieties of secondary importance, i. e. grasses of rather little agricultural value, and grasses of sufficient such value, but which are useful only for certain limited purposes:

- Aira caespitosa* (*Tufted Hair-grass*).
- Ammophylla arundinacea* (*Sea-Reed*).
- Bromus arvensis* (*Field Brome-grass*).
- " *erectus* or *pratensis* (*Meadow Brome-grass*).
- " *inermis* (*Awnless Brome-grass*).
- " *mollis* (*Soft Brome-grass*).
- Holcus lanatus* (*Woolen Soft-grass*).
- Lolium Italicum* (*Italian Ryegrass*).
- " *perenne* (*Perennial Ryegrass*).
- Phalaris arundinacea* (*Reed Canary-grass*).

- Poa aquatica* (*Water Meadow-grass*).
 „ *fluitans* (*Fowl Meadow-grass*).

III. Grasses for fine lawns and pleasure-grounds:

- Agrostis stolonifera* (*Creeping Bent-grass*).
Anthoxantum odoratum (*Sweet-scented Vernal, true*) *For early growth*.
Cynosurus cristatus (*Crested Dogtail-grass*).
Festuca duriuscula (*Hard Fescue*).
 „ *heterophylla* (*Various-leaved Fescue*).
 „ *ovina angustifolia* (*Fine-leaved Fescue*).
 „ *rubra* (*Red or Creeping Fescue*).
Poa nemoralis (*Wood Meadow-grass*). *For under trees*.
 „ *pratensis* (*Smooth-stalk Meadow-grass*).
Lolium perenne, *Paceys* (*Perennial Ryegrass, Paceys*).
For quick effect.

IV. Grasses for lawns and pleasure-grounds of secondary value to be used for cheaper compositions as an admixture to those varieties mentioned sub III:

- Agrostis canina* (*Rhode-Island Bent-grass*).
Aira flexuosa (*Wavy Mountain Hair-grass*).
Anthoxanthum odoratum, *Puëlli* (*Sweet-Vernal, Puëlli*).

How to compose a mixture, i. e. in what proportions is not only a question of both soil and climate, but also one of personal appreciation, and to give a firm prescription for it is a difficult task. However, from the foregoing, where we dealt on the value and merits of each variety, we gave some useful hints in that direction as to the importance and the greater or smaller proportion in which they should be used in mixtures either for pasture or lawn and for various soils.

An other question is *how* to sow them to derive the greatest possible benefits and best results. And then we would say, that if for pasture, the land should be well, intensely labored, so as to make it as free as possible from weeds and fine and mouldy.

Next as regards the grass-seed mixture, it is adviseable to mix the seeds thoroughly, so that each variety occurs in every part of the mixture in equal proportion.

If a mixture of grasses and clovers is to be sown it is, moreover, to be recommended to make *two* mixtures of it: one of the grasses and another of the clovers and have them sown separately. In this case *Timothy* (if at-all it is to occur in the mixture) might be mixed with the clovers.

Making only *one* mixture of grasses and clovers combined, would result in the heavier clover-seeds sinking to the bottom of the sack, causing same to be sown too thickly in one place and not sufficiently in another.

Then, as for sowing-time, spring (end of March or beginning of April) is decidedly the best time. Sowing in autumn (August or September) may under certain circumstances and conditions of soil, climate and weather yield good results, the chance of success is by a long way not so good as when sowing takes place in spring. As a rule the weather in spring is, on account of its more numerous and heavier rainfalls than in August or September more favorable to the germination of the seeds and the development of the young plants, and the latter will be far more advanced and stronger to stand better the severity of early frosts when winter comes on, than if sown in autumn.

Next, it is highly recommendable to sow the grass-seed mixture not by itself, but along with another crop: Oats, Barley Summer- and Winter-Rye etc., such in accordance with the season when the sowing takes place.

Our own experience has taught us, that a crop of oats suits the purpose best; the oats should, however, not be sown too thickly, but only just thick enough, not to cause the young grass-plants to suffer or even die away for lack of either light, air or feeding, which might easily happen, if the oats have gone up too luxuriantly.

Not only that by following this method the farmer will have the first year a paying crop, but he will, furthermore, find a great assistance in this crop to keep the weeds down, which in the absence of an oats-crop, and in view of the fact that nearly all grasses are rather slow in germinating and developing, will spring up rapidly and cover the soil in a very short time, even preventing the grasses from doing their work.

It is the quickly developing plants of the first crop like oats, etc. which, though they cannot take away that evil entirely, will nevertheless reduce it to a minimum.

On Some Other Useful Agricultural Plants Other Than Grasses, But Often Sown In Connection With These.

We mean to deal in this chapter on such agricultural plants which have some affinity in purpose with the grasses and which are being either separately grown and given as fodder to the cattle, or cultivated in connection with grasses and served as a mixed fodder.

We consider most of the varieties we are to review, together with their respective agricultural and nutritive values sufficiently known to the average seedsman and farmer. It is, therefore, more our intention, to give some useful hints as to their use in connection with grasses, as it cannot fail, that a deeper knowledge of that connection, based in the first place on practice, may assist them to make a good choice amongst them, where it concerns to make a mixture of the one and the other.

And then it is, of course, of great avail to know, which varieties of agricultural plants and natural grasses go together well from this treble point of view: 1) Similarity of growth, sowing-time and time of maturity; 2) Affinity in regard to nutritive value and of the soil they require; 3) Duration of each of them so as to coincide together.

There is f. i.

Achillea millefolium (*Yarrow*) which, when young, is a splendid fodder, the merits of which are being recognised more and more by those who have made experiments with it for a successive number of years. It grows on nearly all sorts of soil, except on too wet and marshy lands. It is, however, the lighter sandy and dry clay-soils where it thrives best of all. Though it requires moist weather when it starts to develop, it stands after that a lasting drought fairly well and is not subject to suffer from severe winter-weather. It develops rather early, flowers end of July when it commences to become somewhat hard and is being left alone by the cattle, except that they eat off as yet the fine not too numerous foliage. Apart from the fact that it is of very good nutritive value, there is something in it acting as a purifier and working as a kind of medicine in the cattle's stomachs and as an appetizer. In view of this as well as of the fact, that it is a good fodder when young, it is a good thing to use it in a very small proportion, say of not greater than 1 or 2% in mixtures for per-

manent pastures. It is not advisable to use more, firstly as it is a very fine-grained seed producing numerous plants, and secondly because, if in suitable, especially lighter drier soils, it tends to spread fairly fast its subterraneously creeping roots, moving in every direction and shooting forth upwards several new stalks, covering very soon a larger portion of the meadow than might be considered advisable.

If in the field in a good proportion and if this field should be destined for hay-making, the farmer should see it mown rather early to prevent the stalks from becoming too hard. It may, however, be stated here, that there is no great fear for that, the Yarrow being a plant flowering an exceedingly long time and maturing rather late indeed, so that in most cases a farmer will, even without this hint before him, have mown his field before the time when this plant is about to loose its tenderness.

Anthyllis vulneraria (*Kidney Vetch*). A good fodder for poor sandy soils there where either Red- or White Clover won't do. It is since the last century only, that greater attention has been paid to this variety, and though no experienced farmer would use it on good soil where the better varieties of clover do thrive, it is an excellent plant for the poorer regions. As it is a *biennial* the plant will die out after a couple of years, except in such cases where it ripens and drops some of its seeds. Though like every plant it is grateful for a certain quantity of manure, yet it does not require much that way; for as it makes rather deep roots, it extracts the necessary nutrition from the depths. It can stand both a long period of drought and cold sharp winters very well indeed. It is a middle-timed plant, supplying a good nutritive fodder between the first and second cut of Red- and Alfalfa Clover. It gives, as a rule, one cut only after which it thrives again, but not to such an extent as to allow a second cut to be taken. Only if mown quite early, the plants will shoot forth sufficiently high again for such a purpose. But it is more advisable to mow it somewhat later and have one cut only taken, and have whatever springs up again grazed off by either sheep or cattle, or let it grow up and have it ploughed under as green manure, if the field is to lie no longer as such. It is an excellent thing for the latter purpose, as more than any other plant the Kidney Vetch leaves a large quantity of roots, etc in the soil which, when rotted, are a splendid manure.

It may be used both as green fodder and as hay and is well-liked by all sorts of stock, horses excepted, which don't seem so fond of it. If destined for hay-making, it is advisable to handle the green produce somewhat gently to avoid the loss of foliage which, as the leaves are the longest size of all sorts of clover, would mean the loss of a great portion of the very best part of the hay.

The best time and way to sow is early in spring and in connection with either summer-rye or oats. The quantity of clover present on the field after the rye or oats are off, is not exactly a large-one, and our experience has taught us, that it is not advisable to have this mown off, even, if it has had time to develop further, as the next year's yield is sure to suffer from doing so and to give far less in bulk.

Better than having a field of Kidney Vetch *single*, is to sow a mixture of it with grasses, in which case varieties like *Festuca ovina* (*Sheep's Fescue*), *Phleum pratense* (*Timothy*) and *Avena elatior* (*Tall Oat-grass*) are the best suited for the purpose.

Hedysarum onobrychis and **bifera** (*Sainfoin double* and *single*). One of those agricultural plants which, whilst putting the lowest demands to either kind of soil or manure, gives in exchange the very best results, both in regard to yield and quality of produce.

It does not put a great demand to the soil. In fact, it grows on the lightest soils holding a certain percentage of lime only, thriving the better the greater that percentage is.

However, once the plants have got a sound footing in such lighter soils, there is no fear they won't thrive well. In fact, *Sainfoin* produces then and there a splendid crop of very good fodder, and as it makes exceptionally deep roots, there is amongst the clovers no variety which stands a lasting drought so well as this plant. All sorts of stock like it both in the green state and as hay. As hay it has this advantage over the various clovers, that it is soon dry during the process of hay-making and does, therefore, not loose so easily its manifold leaves; and where, as is the case with all sorts of clovers, 100 Lbs of foliage do possess as great a nutritive value as 200 Lbs of the remainder of the plant, very often even more than that, it stands to reason, that it keeps up its value in hay better than any other sort of clover, especially if these are not being carefully handled during the process of hay-making.

As green fodder it can, however, not render such great services as in the shape of hay. Not that it is not valuable enough in that

state: it is a very good fodder then also, especially for horses which like it very much indeed. But it cannot render there such good services for the reason, that it flowers too short a time, about a week only, and becomes hard after this, so that a farmer can cut it for green fodder during about a week only, from doing which he is kept back very often if, in a busy time, his attention is being attracted by some other, more important work, which ought to be done.

Though the duration of a field of Sainfoin is considered to be 3, 4 or 5 years; yet, if well-manured and helped that way, it may under certain circumstances and conditions of both soil and climate, easily reach 8 or 10 years. And here it must be stated, that the *Hedysarum bifera* (single Sainfoin), though producing less in quantity the first couple of years and though it does not flower again the same season, whereas the *Hedysarum onobrychis* (double Sainfoin) does, and consequently produces less in bulk after the first cut is off than the latter, it is stronger in its capacity of maintaining itself than the *double* variety.

There is one thing more that requires attention in regard to the cutting, viz this, that it is not advisable to mow the field during a lasting wet period, the fact being, that with that sort of weather the stubbles on the field tend to fill themselves easily with water. In that state the plants are very much liable to rot away and along with them the roots, thus causing larger or smaller bare spots to present themselves.

As will be clear from the foregoing, it is the *double* Sainfoin only which after the first cut has been taken, produces anything like a second ditto. But the first cut of *both* varieties yields a fair bulk.

If grasses are to be sown along with Sainfoin we would, as answering the purpose best, recommend *Perennial* and *Italian Ryegrasses*, *Avena elatior* (*Tall Oat-grass*), *Dactylis glomerata* (*Orchard-grass*) and *Timothy*.

Lotus corniculatus (*Coarse-grained Bird's-foot Trefoil*). An excellent fodder for nearly all sorts of soil, except the very moistest and driest sand soils. Not only is it useful from a nutritive point of view, but also from the fact, that of all the clovers it is the one which lasts the longest. It is no exception to find it back in fields 20 or 30 years after it has been sown, especially in good soils which are being regularly and well-manured. It does not produce that quantity which either Red- or Lucerne clover

will yield, but it can nevertheless be mown easily twice; on good heavy well-manured land even three times, thus yielding after all a fairly large bulk. It is a splendid fodder both in the green state and as hay, and as it dries up rather rashly after it has been mown, it is soon ready for the latter purpose. Great care must, however, be bestowed on preparing the hay, as the plants easily drop their leaves if handled roughly. All sorts of stock like it very much indeed. It may be sown as a separate crop and then, doing so, in spring with either Oats or Summer-rye. The plants will then be there in a fair quantity already after the fore-crop will be off; some of them will even flower that same autumn. But it will bring in its first crop the next year; or, under certain less favorable circumstances and conditions of both soil and climate, the third year only.

It is a strong hardy plant, resisting easily the coldest winters and the most unfavorable circumstances of the weather.

Whereas it may be grown as a separate crop, yet it is of greater value if sown with either Red-, Lucerne- or Sand Lucerne-clover as a mixed clover-field; or along with grasses either as a temporary or a permanent pasture.

If for a *temporary* pasture, the best grasses for the purpose are *Perennial* and *Italian Ryegrasses*, *Avena elatior* (*Tall Oat-grass*), *Dactylis glomerata* (*Orchard-grass*), *Festuca pratensis* (*Meadow Fescue*), *Phleum pratense* (*Timothy*), to which, if for moist soils, *Festuca elatior* (*Tall Fescue*) may be added with great advantage.

If for *permanent* pasture, varieties like *Anthoxanthum odoratum* (*Sweet-scented Vernal, true*), *Avena flavescens* (*Yellow Oat-grass, true*), *Cynosurus cristatus* (*Crested Dogstail*), *Festuca ovina* (*Sheep's Fescue*), *Poa pratensis* and *trivialis* (*Smooth- and Rough-stalked Meadow-grass*) should again be joined to the former varieties of grasses.

Lotus villosis (*Small-grained Bird's-foot Trefoil*). Nearly all that has been said of the former species applies to this variety. It is just as hardy a plant and valuable a fodder growing in much the same way, except that it requires a moist marshy soil. There it thrives well and brings in a fair quantity of fodder. Both stalk and leaves are somewhat more robust and larger, though the latter are less numerous, but somewhat thicker than those of the *Lotus corniculatus*, and the plant is in all its parts somewhat soft and woolly to the touch. It comes in a little later than

its cousin, and whereas the latter sometimes gives 3 cuts, *Lotus villosis* never yields more than 2, so that in regard to productivity, it is the inferior of the two. Cattle are very fond of it; more so than horses or sheep.

Spring is the best sowing-time, and though it may be sown by itself and as a separate crop, yet it is to be recommended to do so with Oats or Summer-rye as a fore-crop, as it is not until the second year it comes to its full development when it gives a sufficient crop of its own. As, moreover, it has the habit of extending its roots in a creeping way and in every direction and turns up its stalks at short distances, it stands to reason, that it spreads easily and tends to increase the bulk soon after it starts to thrive.

Like the *coarse-grained* variety, however, *Lotus villosis* finds its greatest use in connection with grasses for either temporary or permanent pastures. In this case, attention should be paid to the fact that, whereas *Lotus villosis* requires a soil widely different from *L. corniculatus*, viz a marshy moist soil instead of a lighter or heavier drier ditto, the accompanying grasses should be such varieties as equally prefer a moist soil. Next to the Ryegrasses, *Perennial* and *Italian*, we would therefore recommend in a fair proportion *Alopecurus pratensis* (*Meadow Foxtail*), *Festuca elatior* (*Tall Fescue*), and next *Avena flavescens* (*Yellow Oat-grass, true*), *Anthoxanthum odoratum* (*Sweet-scented Vernal, true*), *Cynosurus cristatus* (*Crested Dogstail*), *Festuca pratensis* (*Meadow Fescue*) and *Poa trivialis* (*Rough-stalked Meadow-grass*).

Lupinus luteus (*Yellow Lupin*). This plant as well as the blue-flowering variety has practically no other purpose except that of either saving a seed-crop of it or, when the plants commence to flower in June or July, having the field ploughed under as green manure to serve for some autumn-sowing. In that case it is a very good precedent to such an autumn-sowing of a field destined for creating a pasture-land. It is, however, a plant for the lightier sandy soils, where it thrives very well indeed and where it produces an exceedingly large yield both for seed-saving and manuring. It is sometimes, but very rarely, used as a green fodder for horses, never for cattle, as these do not like it on account of its bitter taste. Even horses are far from fond of it. Sown in spring the Lupins shoot forth very rapidly and cover the field soon rather

thickly with high-going, broadly-extending plants making a good display so far as quantity is concerned. If destined for manuring, the seed is as a rule sown somewhat later than for saving a seed-crop.

The difference between the *Yellow* and the *Blue* Lupins is mainly this that, whereas the blue-flowering species grows somewhat taller, the yellow-flowering variety usually covers the field more thickly, producing a more broadly-extending plant of not quite so high a growth.

It is mainly the *Yellow* Lupins that are being used and preferred on account of the larger quantity of green produce they yield and the larger amount of manure dependent thereon that will consequently be ploughed under. They should not be sown on better heavy land; first, as they would not answer the purpose so well there; and next as there are several other more valuable and suitable agricultural plants for such soils.

The Lupins are neither sown in connection with grasses or clovers, nor with oats as a foregoing crop, but always form a crop for themselves.

Medicago lupulina (*Yellow Trefoil*). A good fodder on middling soils. Though it thrives well on heavy land, yet it has its place especially on lighter sandy soils, where more valuable plants would not bring in that bulk which might reasonably be expected of them if sown on rich land. It is of fairly good nutritive value, but as it is only an annual or biennial plant and does not bring in a large bulk, it is not a variety that can be considered as one to be used for a purpose involving a lengthy lay, or in such cases where expectations for a large yield are being entertained.

On the other hand it is being very much used on account of the cheapness of its seed and where a short lay is intended. It will then bring in a sufficient yield and, when ploughed under, bring into the soil some very good green manure for the next crop.

As *Yellow Trefoil* tends to grow in a creeping more than in an erect way, there is a certain advantage in sowing it with either some other kind of clover, *Red* or *Lucerne* on heavy, *Sand Lucerne*, *White-* and *Alsike* clover on lighter soils, or with grasses for either temporary or permanent pasture.

Growing side by side with either of these, it won't lie down so easily, but be kept erect and increase and improve its yield and quality.

Trefoil can stand winter-frosts very well indeed and won't easily suffer or die away from such a cause. It likes a warm

moist climate, but stands, nevertheless, a lasting drought fairly well. As said before, it grows both on heavy and lighter soils, even in marshy situations if not of the coldest kind. It does not make deep roots, but extracts its nutrition from the surface which, though it is not necessary that this be of the best, yet requires to be sufficiently manured to get a satisfactory crop.

Sown in connection with grasses either for a short lay or for permanent pasture, it is a very good plant indeed. For the latter purpose, the *Trefoil* will disappear after a couple of years when the pasture will be sufficiently covered by the grasses.

If for *short* lay, it is the Ryegrasses, *perennial* and *Italian*, *Avena elatior* (*Tall Oat-grass*), *Dactylis glomerata* (*Orchard-grass*), *Phleum pratense* (*Timothy*) that should be used. If for *permanent* pasture, *Alopecurus pratensis* (*Meadow Foxtail*), *Anthoxanthum odoratum* (*Sweet-scented Vernal, true*), *Cynosurus cristatus* (*Crested Dogstail*), *Festuca elatior* and *pratensis* (*Tall and Meadow Fescue*), *Poa pratensis* and *trivialis* (*Smooth- and Rough-stalked Meadow-grass*) that should be added to the former grasses.

The nutritive value of *Trefoil* surpasses that of any other medium kind of clover, though, on the other hand it can be used only for a short lay.

Medicago media (*Sand Lucerne*). A good fodder for lighter sandy soils. In regard to nutritive value in no way the inferior of the *Medicago sativa* (*Ordinary Lucerne* or *Alfalfa*). It is its inferior only in regard to yield; for it can scarcely be cut twice the same season, whereas the *ordinary Lucerne* may be mown three or four times. Neither is it so early as the *ordinary Lucerne* which thrives and brings in a fair quantity very early in spring, whereas the *Sand-Lucerne* gives its first cut second part of June only, the second cut being, moreover, but a small-one. Though not growing quite so high, it spreads out more broadly and makes consequently a more thickly covered field than the *ordinary Lucerne*.

It has this advantage over its cousin, that it is stronger in maintaining itself a lengthier time and is also less liable to either suffer or die away through severe winters and sharp spring-frosts.

If no practical farmer would sow it where the *ordinary Lucerne* has its right place and thrives well, i. e. on heavy rich soil, the *Sand-Lucerne* is highly recommendable on lighter, not marshy soils; on sand even, where the *ordinary Lucerne* would not thrive,

but die away soon; and he will use it there with great advantage and success.

It is more useful for hay-making than the ordinary Lucerne as it is far sooner dried and looses therefore less in weight and in its best part: the foliage.

Sand-Lucerne may be sown either by itself, or in connection with grasses. In both cases the best way is to have it sown in spring with either oats or summer-rye as the first year's crop. After the oats or summer-rye are off, there will be that same season very little Sand-Lucerne on the field, not sufficient at any rate to allow of its being grazed off or of getting anything in the shape of a crop worth mentioning.

If grasses are to be sown along with the Sand-Lucerne, it is *Avena elatior* (*Tall Oat-grass*), *Dactylis glomerata* (*Orchard-grass*), the Rye-grasses, *perennial* and *Italian*, *Festuca ovina* (*Sheep's Fescue*), *Festuca pratensis* (*Meadow Fescue*) and *Phleum pratense* (*Timothy*) that should be used for that purpose.

Medicago sativa (*Lucerne* or *Alfalfa*). If Red clover is the most universal, widespread and important of all clovers, it may be said without any exaggeration, that *Lucerne* or *Alfalfa* comes next to it from an agricultural point of view. It is in no way inferior to the Red clover in regard to nutritive value for which it ranks amongst the foremost. It is the *inferior* of Red clover only in yield at each mowing, but as it shoots forth after cutting very rapidly again, it can easily be mown 3 or 4 times in a favorable season and make good by its manifold mowings what it gives less at each cutting.

Though cattle, if they have the choice of it, prefer Red clover to Lucerne, it is on the other hand horses that give the preference to Lucerne. But all of them eat it with eagerness. For *dairy*-cattle, however, it is advisable, not to feed them on Lucerne *alone*, but to give them some other fodder besides, as the feeding of Lucerne „pure and simple” has a less favorable effect on both the quality and flavour of the butter.

Lucerne has, furthermore, in its favour over Red clover its longer duration. For, although it does not last as a rule so long as is supposed to be the case: a duration of seven years, yet, on suitable soil it shows a fairly covered field easily 5 or 6 years.

Lucerne requires a good heavy but not too moist a soil and

thrives best on land holding a fair percentage of lime. It does not require much in the shape of stable-manure which, if overdone, is even detrimental to its growth; but it is grateful for a manuring with potash and phosphoric-acid.

As it makes exceptionally deep roots, sometimes as deep as 6 to 15 feet, it extracts both its nutrition and moisture from long distances. It does not require, therefore, the surface of the land to be of the best as long as it finds a good fertile soil below. And it is for the same reason that, whilst it does not like too much moisture, it can stand a lasting drought very well indeed. The plants won't wither soon during a dry period; they may not show signs of thriving then, but they won't die off, and whenever there is a change of weather with some rainfall, the plants will start up again at-once and display themselves luxuriantly.

Lucerne is better adapted for fodder in its green state than as hay, as it drops more than any other variety its leaves during the process of hay-making, thus causing the loss of the very best part of the plant.

Now it makes a great difference what stock-seed is being used. First of all, there is an enormous difference between the produce of *American*- and *European*-grown seed, so much so even, that throughout our own country—Holland—it is being considered quite a falsification if *American*-grown seed is sold for *European*-grown, or if mixtures of the two are handled as genuine *European*-grown seed. There is simply no comparing the one plant with the other. Not only that the *American* plant's duration does not surpass 2 or 3 years at best, so that it does not answer the purpose of having a longer lay than a field of Red-clover, and that consequently it is by far the inferior of the 5 or 6 years lying plant of *European* origin. But the plant-itself is a rather poor-one compared to that of *European* descent! Even the first cut does not yield more than half the quantity yielded by the latter, whereas the second cut is even less in that respect. Crops produced by *American* seed in *America*-itself may be better, they are worth practically nothing in *Europe*.

Amongst the *European*-grown seeds of Lucerne, viz: *Provence*, *Middle*- and *North of France*, *Italian*, *Hungarian* and *Russian*, we consider the *Provence* and *Italian* seeds to be the best; next we would prefer the *North*- and *Middle of France* and *Hungarian* seeds, whilst the *Russian* seed is in our opinion, in no way superior to the *American*.

Where all these seeds are being offered at almost equal prices, or with a slight difference only, we would advise every seedsman and farmer to procure the best seed he can get as intimated above.

As a rule Lucerne is grown with or without a fore-crop as a separate field, which is usually sufficiently covered by these plants alone, not to require any admixture. Yet it may just as well and to advantage be sown in connection with grasses. In this case we would advise, if for *short* lay, Ryegrasses, *perennial* and *Italian*, *Dactylis glomerata* (*Orchard-grass*), *Avena elatior* (*Tall Oat-grass*) and *Timothy*; if for *permanent* pasture, *Alopecurus pratensis* (*Meadow Foxtail*), *Festuca elatior* (*Tall Fescue*), *Festuca pratensis* (*Meadow Fescue*), *Cynosurus cristatus* (*Crested Dogstail*), *Anthoxanthum odoratum* (*Sweet-scented Vernal, true*), *Avena flavescens* (*Yellow Oat-grass, true*) and *Poa pratensis* and *trivialis* (*Smooth- and Rough-stalked Meadow-grass*) might furthermore be added to the previously mentioned varieties.

The five varieties named first might likewise be applied in cases where after 2 or 3 years' lay a field of Lucerne should for reasons not known show too many bare spots to have same eliminated.

Ornithopus sativus (*Serradella*). The main object of this plant is decidedly that of serving as a green manure to be ploughed under. It thrives on lighter sandy soils, and though it does not shoot up high, it covers the field very thickly indeed. If sown by itself without an upper crop the first cut might be used as green fodder which, though it is no plant of great nutritive value, is eaten with no objection by either cattle or horses. Or that first cut might be dried to hay which is a fairly good fodder too. After that and when the plants have grown up sufficiently again the field might be ploughed under.

If sown in an *Oats- or Summer-rye* crop, the field might be grazed after the Oats or Rye are off, or ploughed under after a while.

It is not a plant destined for a good heavy class of soil, where several others would decidedly do better and yield greater benefits.

Serradella is never sown with grasses; its only connection with these being that of serving as a green manure precedent to the laying down of a pasture-land.

Spargula arvensis and **maxima** (*Ordinary and Giant-Spurry*). Two capital things as green fodder, especially for dairy cattle at a time when young green fodder is becoming somewhat scarce,

namely between the first and second cuts of the various clovers and when the freshness of the first young grass is a bit worn off. In most cases where a farmer has sufficient pasture-land for his stock, he will divide same in several enclosures, in order to have these not only grazed off clearly by his stock placed thereon; but also to send them on another fresh enclosure which had not yet been stocked. Doing so, the flock will find from time to time entirely fresh young fodder, and the section grazed off will have time and rest to be recovered with new grass and be fresh and nice again when it is to be re-stocked.

Now, in such cases where a farmer has no superfluous pasture-land giving him an opportunity of sending his stock from one enclosure to another and is desirous of giving his pasture a certain rest, spurry comes in very handy indeed for dairy cattle in regions consisting of lighter soils, where *Red-* and *Lucerne* clovers won't do; the more so as it is a fodder of great nutritive value and very much liked by all sorts of cattle which eat it with eagerness in its green state. Especially for dairy cattle it is a magnificent thing, as it is not only conducive to a large increase of the quantity, but in a larger degree even to the improvement of the milk, which is greatly enriched by it and obtains thereby a very fine taste.

The butter also made of *spurry*-cream is noted for its nice flavour, and certain farmers in Holland make it a specialty to feed at the right time their cattle on spurry only and sell their butter as spurry-butter, thus fetching a higher price for their produce for the time being.

Sown in spring it makes its appearance very soon indeed and gives, as said before, its yield between the first and second cuts of clover.

We would scarcely know which of the two varieties: *Spergularia arvensis* (*Ordinary Spurry*) or *Spergularia maxima* (*Giant-Spurry*) to recommend as the better of the two. It is true that the *Giant-Spurry* produces a far larger crop; but the greater nutritive value of the *Ordinary Spurry* fully weighs out its deficiency in bulk. And it is furthermore generally admitted, that the cattle themselves do like the ordinary variety better than the taller-growing species.

Spurry has no other connection with grasses except that it serves as fodder in their place during periods where for reasons explained above, the cattle cannot well feed on grasses. They are never sown together.

Trifolium hybridum (*Alsike Clover*). A splendid plant and a useful fodder, inferior to *Red-clover* only in this respect, that it does not yield so large a bulk and that, if served separately, it is on account of its somewhat bitter taste not eaten by cattle with that greed as is the case with Red clover. It is superior to Red clover in this respect, that it lasts 3 or 4 years or longer even; that it does not put such a stringent demand to the kind or quality of the soil; that, whereas Red clover does neither thrive on superfluous wet nor dry soils and is rather sensitive for alternate wet and frosty weather as well as for keen night frosts in early spring, *Alsike* stands all that far better; can be grown again with a rather short interval even on the same tract of land that was in cultivation with it before, a thing which Red clover tiring out sooner would not easily stand, and will do even in a wet marshy soil, where the other would soon die away. Owing to its habit of growing in a rather creeping way before turning up its stalks, it has a tendency of lying down on the earth, especially there where it has a heavy well-manured soil when and where it grows up somewhat luxuriantly and the bulk becomes a heavy-one. Result of this may be, that in such a state it is liable to rot on the field if the farmer cannot get it mown and saved for hay in time. It is therefore advisable to sow *Alsike* in connection with something else; we would even say that such is, in our opinion, the right way only as it does away with the two drawbacks alluded to, viz: that of the plants creeping too much along the surface by being kept erect through the medium of the accompanying varieties; and that of diminishing the bitter taste of the *Alsike* to which cattle do more or less object.

Under such circumstances it is in the first place the *grasses* that are being thought of as an admixture; and the question a seedsman and a farmer has to put before him is: which varieties come in most useful to be sown with *Alsike*.

If for a *short* duration only, say of 3 or 4 years, we would recommend the Ryegrasses, *perennial* and *Italian*, *Avena elatior* (*Tall Oat-grass*), *Dactylis glomerata* (*Orchard-grass*) *Festuca pratensis* (*Meadow Fescue*) and *Timothy*.

If for turning such a field into a *permanent* pasture later-on, *Alopecurus pratensis* (*Meadow Foxtail*), *Anthoxanthum odoratum* (*Sweet-scented Vernal, true*), *Avena flavescens* (*Yellow Oat-grass, true*), *Cynosurus cristatus* (*Crested Dogstail*), *Festuca elatior* (*Tall Fescue*), *Festuca rubra* (*Red Fescue*),

and *Poa pratensis* and *trivialis* (*Smooth- and Rough-stalked Meadow-grass*) might be joined to the above named varieties.

As regards the yields of various origins of the seeds of Alsike, we never found a great difference whether the stock-seed used were *United States-, Canadian- or European-grown*. In that respect we would therefore look in the first place for the purest possible and biggest grain, and our choice would fall *first on Canadian; next on United States'*; and *finally on European-grown seed*. There are, as a rule, every year several lots of *European* seed which excell in quality those exported by *Canada*. Yet, where many of them do contain *Cuscuta (Dodder)*, we consider it safer to buy either *Canadian* or *States'* seed, which never contain this obnoxious weed.

Trifolium incarnatum (*Crimson clover*). Once, some 30 years ago, extensively used in Holland as well as the neighboring districts just beyond the border. It has gradually lost ground there and very few fields grown with this plant are noticed now, the value of which is a good-one from a nutritive point of view, but the purpose of which is rather limited. Sown in August on a middling or lighter kind of soil, seldom used on heavy good rich land, it springs up very soon indeed and makes good-sized plants the same autumn; and though it gives one cut only in spring, it has this advantage, that it is one of the earliest kinds of fodder then; that it can be cut quite a fortnight earlier than Red clover and comes in, therefore, very handy indeed at a time when young green fodder is very much wanted, especially in a spring which through lasting cold weather is somewhat backward with the general vegetation. As all stock like it, there is also for that reason nothing against sowing it for feeding every variety of them.

The field having been cut, all that has been left there of the plants may be ploughed under, thus giving a fair quantity of green manure to the soil for some autumn sowing.

Crimson-clover being a plant of a short duration only, it is seldom used in connection with grasses, but nearly always sown as a separate crop. If at-all grasses are to be used along with it, it is the *Ryegrasses*, *perennial* and *Italian* that answer the purpose best and are to be recommended.

Trifolium pratense (*Red clover*). Decidedly the most important of all feeding plants and so universally known and expanded, that it would almost sound temerarious, if one were to pretend that he was going to tell something new on it.

Now we surely don't mean to do this. And yet there are many things and facts known to one class of agricultural people, unknown to another; whereas this latter class may know other things and facts unknown to the former. If, therefore, we write here a few lines on this article, giving facts based for the greater part on our own experience, the intent is mainly this, that every-one of our readers may gather from them that which is new to him and use it to his advantage.

And then, we think, it does not require any explanation as to how Red-clover should be sown in regard to time, or how and when it should be cut. Only this we wish to say in regard to the latter and repeat here what has been said on several occasions and in different ways by others, that if destined for hay-making, a farmer can't be too careful during the process of hay-making in handling gently his Red-clover in order to avoid as much as possible the loss of the plants' foliage, i. e. of the very best nutritive part of the plant.

But we mean to point out in the first place what seed should be used, and next what connection the article has with the various *Natural Grasses*, the main object of this treatise.

Now our experience has taught us, that next to getting the cleanest possible seed, free from obnoxious weeds, amongst which *Cuscuta (Dodder)* in its different varieties is the worst of all, there is one thing more that speaks a great word and to which, in our opinion, far too little attention is being paid. We mean the *origin* of the seed that is being used. For here comes in the question of both yield and quality of the produce and hardness of the plants to maintain themselves in the fields under both favorable and unfavorable circumstances of soil and climate.

Our experience has taught us, that the seeds grown in the northern and more temperately situated districts of Europe are far superior to those of the southern regions; not only for the fact that they do contain a smaller percentage of weeds and of their being as a rule free from *Dodder*, but also owing to their far greater yields at the various successive cuts; the quality of their produce and their maintenance in the field where they are by a long way not so liable to dying away during severe winters and keen spring-weather as the produce of southerly-grown seed.

And, if in this place and in this respect we have to deal on both *United States'* and *Canadian* seed, we must pronounce as our opinion based on our own experience acquired during several

years, that we do not exactly think favorably on them. At any rate no more favorably on them than on the *South-European* grown seeds!

The *American* and *Canadian* seeds may do well in their *own* countries and yield good crops of good quality there, they cannot by a long way replace the seeds grown in our *northern-* and *central-European* districts.

Our objection to these two origins are:

1^{stly.} that they produce a plant far shorter and thinner and yield as a result thereof a smaller bulk than what we are used to of North-European seed.

2^{ndly.} that the second cut of these two origins gives in our region at least very little bulk indeed.

3^{rdly.} that their plants come very badly through winter; leave at any rate with severe winter-weather large bare spots in the fields, whilst the plants that actually come through are as a rule of a poor weak character, so that for a two years' lay, as is usually the case with us, the American and Canadian seeds scarcely answer the purpose in view. And

4^{thly.} the fact that the plants, produce of these two origins are covered all over from bottom to top, stalk and leaves, with rather prominent hairs to which both cattle and horses, but especially cattle have a great dislike. It is surmised that, though the first Red clover introduced in America during the 17th. century was of European origin, therefore originally free from it, the plant has acquired in the course of time that hairy character as some kind of degeneration, due perhaps to the hotter and drier atmosphere prevailing on the American continent, and which might have been avoided if, instead of regularly using their own: American farmers had from time to time imported *new genuine European* stock-seed.

The fact that the American crops of Red clover have been almost an entire failure in the years 1905 and 1906, compelling the American seedsmen and farmers to look for stock-seed elsewhere, and causing the trade in America to import large quantities from Europe, has given the American farmer an unexpected opportunity to make a comparison between the crops yielded by *European* and *American* stock-seed.

So far we have heard nothing about the results obtained. But we venture to say that, if the European seed has under the altered conditions of soil and climate had a good start in its early devel-

opment, a marked difference very much in favour of the *European* seed will have been noted.

Still, as said before, there is even amongst the various *European* origins an enormous difference.

One of the very best kinds of stock-seed is decidedly the so-called *Lowland Dutch*. It is noted for its beautiful, tall-growing tender plant and its exceptionally large yield. Unlike most of the high going plants it keeps its tenderness very well indeed without showing a sign of turning hard. It is a big-grain and has as a rule (not always, however!) a palish colour with a few seeds in tending towards a brownish shade as though they had suffered from rain, a characteristic which must be mainly attributed to the moist atmosphere of this country.

It is, therefore, not a seed which for colour takes the eye; but its great merits for quantity and quality of yield are doubted by nobody this side of the Atlantic.

And the fact that before the time arrived when in other sections of Europe the cultivation on a large scale of Red clover-seed was started, it was the *Lowland Dutch Red* that was being looked for and bought everywhere, gives ample proof of how since centuries that seed was kept in high esteem.

This may be a guidance to American seedsmen who, after the experience that is now being made with European-grown, imported seed and who, after making a comparison between the produce thereof and that of their own home-grown seed used before, and finding themselves likewise some marked difference in favour of the former should henceforth have an intention to import European-grown Red clover-seed, to know *which* of the European origins ranks amongst the foremost.

The connection between Red clover and the Natural Grasses is easily seen, and the knowledge of where they can help one another to derive the best possible results and the greatest possible yields of good nutritive fodder, is acquired very soon indeed.

The fact that Red clover fields serve as a rule for a two years' lay indicates at-once those varieties of grasses to be used in connection with this seed if a mixed field of both Red clover and grasses is to be created; or in case too large bare spots present themselves in a newly sown Red clover-field, in order to see such grasses rather quickly developed and derive the desired for benefits of the land within the shortest possible space of time.

Next to the *Rye grasses*, *Italian* and *perennial* which of all

the grasses are the first to thrive, it is *Dactylis glomerata* (*Orchard-grass*), *Avena elatior* (*Tall Oat-grass*) and *Phleum pratense* (*Timothy*) that are to be used as producing a crop soonest of all. We would not recommend any further varieties for that purpose and such a short lay, as these are quite sufficient to give both bulk and quality, and as they are the only-ones that are sure to develop in time. Using any other Natural Grasses for so short a duration would simply mean a waste, as they would bring in their share only at the moment when the field in question had finished to serve the aim it had been laid down for.

If, however, the purpose in view is to have a Red-clover field go over into permanent pasture, the following varieties should likewise be added, viz: *Agrostis stolonifera* (*Creeping Bent-grass*), *Alopecurus pratensis* (*Meadow Foxtail*), *Anthoxanthum odoratum* (*Sweet-scented Vernal, true*), *Avena flavescens* (*Yellow Oat-grass, true*), *Cynosurus cristatus* (*Crested Dogstail*), *Festuca elatior, pratensis* and *rubra* (*Tall-, Meadow- and Red Fescue*) and *Poa pratensis* and *trivialis* (*Smooth- and Rough-stalked Meadow-grass*).

There is one more purpose the Red clover is being used for in Holland, largely even in the very best agricultural districts and which, though it may seem a pity to many a farmer to have a field of it used for that purpose, pays our farmers very well indeed. We mean the use of Red clover as a *green manure*. It is a common way in one of the best provinces of Holland to sow amongst wheat-, barley- or other crops Red clover seed; let the Red clover shoot up after the "fore" crop is off, as high as it will go up that same summer and autumn and then plough the land up and have it resown with some other winter crop. Or to have the land ploughed up the next spring and put on some summer crop. Or again to have the first cut taken that same spring and have the land turned up after the plants have gone up fairly high again, to serve for some autumn sowing. This is a system which has been going on there for years and years, and though some other plants are being used for the same purpose, it is the Red clover which is mainly being used for it.

In that case, it is the biggest plant producing seed that is being looked for, and such farmers will then take the so-called *Rozen-daal-Red*, a *sub-variety* of the *Lowland Dutch*.

Needless to say, that it is the heaviest richest soils only where this course is being followed.

Trifolium pratense perenne (*Cowgrass* or *Perennial Red clover*). On account of its longer duration: 4, 5 years or longer even, and of its great agricultural and nutritive value, a splendid plant. It does not grow up high and is for that reason unfit for the same purpose the *ordinary* Red clover is being used for, which apart from the aim of having a good fodder (in which respect the *perennial* Red clover is in no way inferior to it!) is to get *bulk* as well. To reach, therefore, the latter aim it cannot be recommended, on account of the shortness of its plant and the smaller quantity it consequently yields.

Its great value, therefore, comes in there where it is being used as an admixture to the permanent grasses. There it can be used with great advantage, though not in too great a proportion, as otherwise it tends to cover the land too thickly and prevents the grasses from coming through.

All sorts of stock are exceedingly fond of it and eat it with eagerness.

Trifolium repens (*White clover*). Except for seed-saving this is not a variety to be sown separately, the main purpose being to use it in a small proportion as an admixture to the Natural Grasses for permanent pasture-land. Its dwarf growth does not make it so well adapted for a separate clover-field, as it would not bring in that bulk which the other clovers and Lucerne yield. We would not say anything against its nutritive value, which is in no way inferior to the other varieties, except that both cattle and horses often leave the flowers, which have a more or less bitter taste, alone. But they do eat with eagerness its *foliage*. It prefers a heavy soil, but may be seen just as well and in great abundance on lighter ditto, provided this be a well-manured tract of land.

As said before, its right place is in a permanent pasture, where it fills up many a bare spot with a useful feeding plant and gives, if for grazing purposes, a good change for the cattle, be it that it does not bring in bulk.

Yet one of the White clover's characteristics, namely its tendency to spread, should make a farmer be somewhat cautious in using it too freely in a grass-seed mixture. For, with quality it is at the same time *bulk* he demands of his land. And now, if certain circumstances and conditions of soil and weather work together, it often happens, that the White clover-plants develop too luxuriantly, creeping subteraneously in various directions and covering

in a very short time a rather big spot with a thick turf, preventing the grasses, the *main* thing in the meadow to come through. There is no exaggeration in our assertion if we say, that the presence of a single plant is, soil and weather permitting, capable of covering in one season a plot of land a couple of square yards in size.

The only remedy here would be to have the pasture thoroughly manured with stable-manure or have it grazed off for a few successive years. Doing so, the grasses will find more assistance than the clovers to make headway and to overrule in the long run the latter.

As for the *stock*-seed to be used, here like in every such case we would say, that next to the cleanliness of a sample, it is the size of the seed which should decide, as producing the biggest plant. Amongst the *European*-grown origins, it is the seeds grown either in *Holland* or in *Great-Britain* which are considered the largest grain and which, moreover, may be taken as *free from dodder* deserving, therefore, to be classified first.

Vicia sativa (*Spring Vetch*). If on one hand the *Winter Vetch* or *Tare* is found in *Holland* only as a rare exception, there is on the other hand a good deal of attention paid here to the *spring Vetch*. It may be that the greater portion of the soil here, being heavy rich land, is not so well suited for the one, but excellent for the other which accounts for that. It may be also that the excellent quality of the *Holland*-grown *spring Vetch*, which is far superior to its foreign opponents, enables the farmer here to obtain results which pay him well, whereas his colleagues on the lighter soil have never been so well off with the winter variety or have taken more to growing other agricultural plants that have some similarity in purpose with the *Winter Vetch*.

Now to deal first on the *spring Vetch*, this is decidedly a magnificent plant, useful for many a purpose. Sow it in spring as a separate crop, it will shoot up very rashly indeed and give an excellent fodder after the first and before the second cut of *Red clover* and *Alfalfa*. Or, if not cut at that time, let it stand over till it bears fruit and ripens, have it then mown and give it then, plant and seed to the cattle, it will again be a magnificent fodder. Or, have the seed thrashed out, feed te cattle on the hay and have the seed sold, or feed the latter unground to horses, or ground and in connection with other meal to cattle, it is an excellent fodder again. Let the plant after this shoot up again

as far as that goes, and have the field ploughed up, and there will be a splendid green manure to have some winter-crop sown on.

Next: sow it in spring in connection with Oats or Summer-rye. In the first case there is when ripe, a splendid fodder of mixed oats and vetches for horses; in the second case when ripe, there is good material to have mixed cattle-meal ground of the grain. And in both cases, there is the straw to be likewise used as fodder in a chopped state. Furthermore, there is in the unripened state of that mixture of plants also a very good green fodder for both cattle and horses.

And as for the quality of the fodder, it is a very good fodder indeed. In the green state, though it is not eaten with that eagerness by both horses and cattle as is the case with Red clover and Lucerne, yet both do like it well enough, and it is most surely of great nutritive value. The same applies to the Vetches in the shape of grain for horses and of meal for cattle.

In regard to the meal as fodder for cattle, it is a splendid thing even and is for dairy-cows very conducive to an increase of milk, tending to enrich greatly the cream. The somewhat bitter taste of the Vetch-meal does not seem to be much of an objection on the part of the cattle. If at-all there should be any sign in that respect, the addition of a certain percentage of say rye-meal will soon alter this.

Finally, there is the use of spring Vetches for green manure on heavy rich soil. And for that purpose there is of recent years in Holland a large increase in the use and cultivation of them, the fact being that *spring* Vetches do lend themselves very well indeed for sowing throughout spring, summer and early part of autumn; that they thrive very rapidly, and that they produce consequently a splendid green manure for the next crop, be it that either a summer or autumn sowing is to follow.

And here it may be the place to draw special attention to the Holland (*Gueldre*)-grown *spring* Vetches. It is true, that they are being sold at a higher price than those of other origin usually command, but they are fully worth the higher price.

Take the seed. It is a far bigger grain and, if sown for seed-saving, yields a far larger quantity, so that the additional money laid out for stock-seed, easily comes back in the shape of the larger yield; far more than that even.

Take the plant destined to be ploughed under for green manure. Here, again, the larger bulk of green material to be ploughed

under is adequate to a larger amount of money put into the soil in the shape of manure for the next crop. And it is a fact beyond the slightest doubt, that these Vetches do not only produce a far larger bulk, but that, what is a great thing also, they thrive and shoot forth far more rapidly than any other *spring* Vetches. This is a thing of great importance in a case where f. i. they are to precede some autumn-sowing, after one summer-crop or other has been saved on that particular tract of land. In case such a summer crop through reason of a late season or unfavorable weather during harvest has been brought in rather late, the lapse of time between that harvest and the autumn-sowing will be the shorter for it, and a quick-thriving, high-growing Vetch will soon make good the disadvantage of the season.

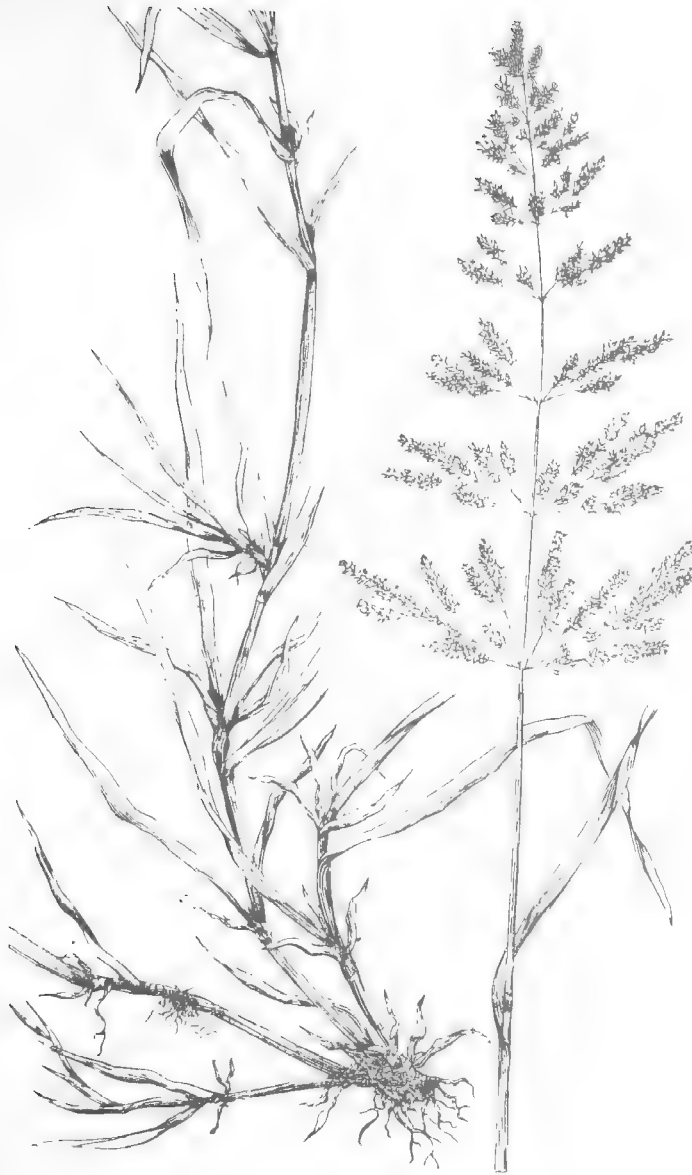
The Spring Vetches have no connection with the grasses, except this that as green fodder they help in times, where there is a shortness of grass in the pastures, to provide for a change and a complement to the cattle's and horses' feeding; and that as green manure they are an excellent foregoing crop to the laying down of permanent pasture-land.

Vicia villosa (*Sand- or Hairy Vetch or Winter-tare*). In connection with winter-rye a useful plant on lighter soil, both as fodder in the green state, or when ripened and chopped or thrashed out as corn for horses, or finally in the latter state ground to meal for cattle; and as green manure to be ploughed under in about the same manner as the *spring* Vetch.

Whatever the *spring* Vetch may be for the heavier richer soil, the *Sand*-Vetch will do for the lighter sandy ditto. Sown in autumn with winter-rye and destined for green fodder, it comes in rather early in spring and is therefore a most welcome feeding-stuff, especially if the grass in the meadows is on account of lasting winter-weather somewhat late and not plentiful.

In Holland with its majority of rich heavy soil, there is very little done in the way of *Sand* Vetches. But in countries like Germany with its lighter soil, France, Great-Britain and Ireland, as well as in the United States with their partly middling soils, great attention is being paid to the growing of the *Sand* or *Hairy* Vetch for both feeding- and manuring purposes.

SOME OF THE LEADING
VARIETIES OF
NATURAL GRASSES.



Agrostis stolonifera.

(rass.)



Alopecurus pratensis.
(Meadow Foxtail-grass.)



Anthoxanthum odoratum.

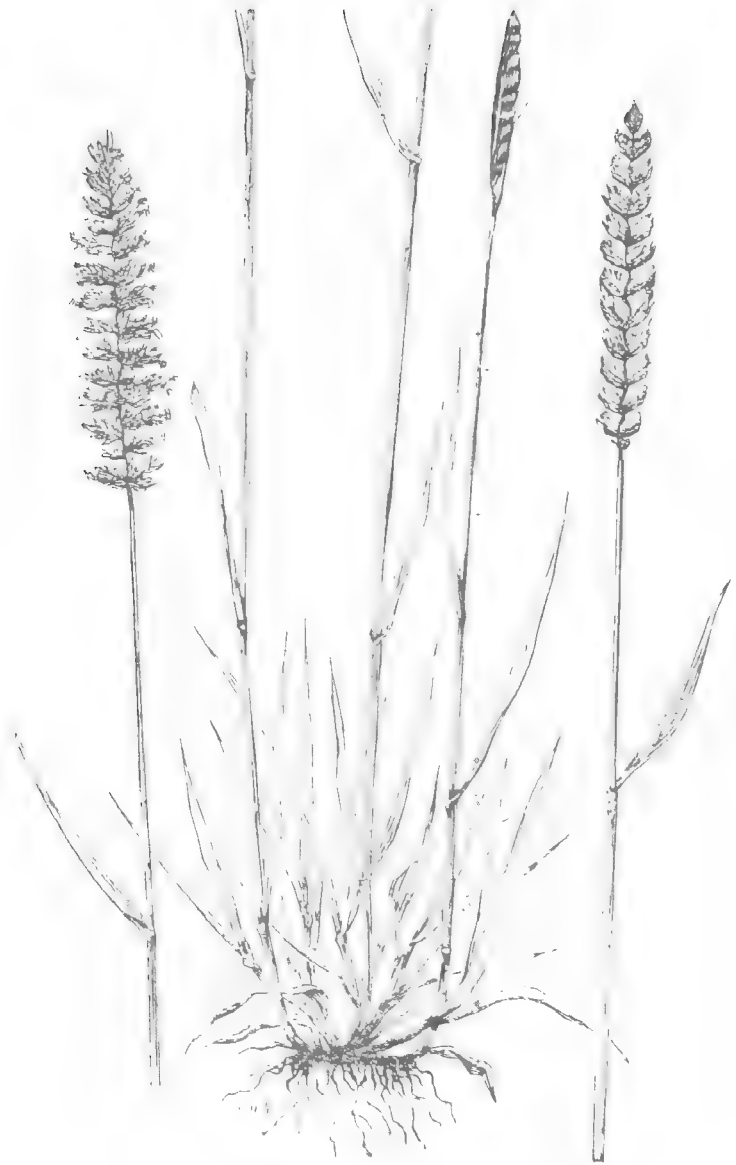
(S., true)





Avena flavescens.

(YOSSE, f. e.)



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(Cres



Dactylis glomerata.

Bot. Beech. — D. Hook. Grasses.

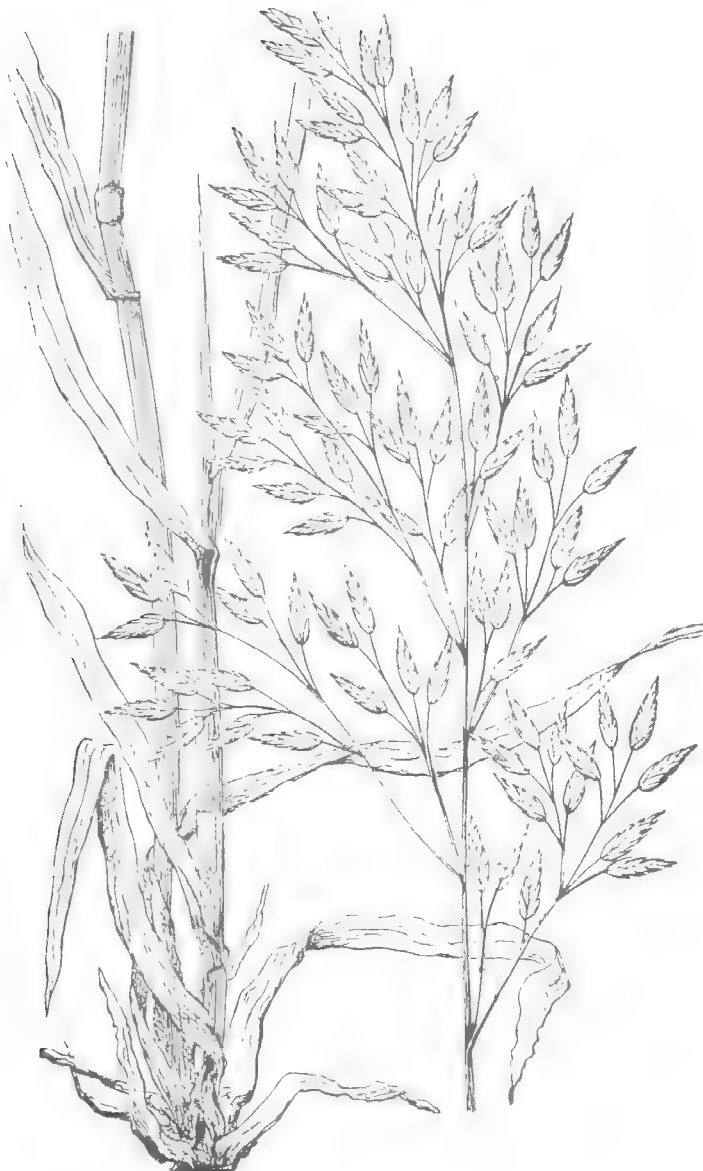




Festuca ovina.



Festuca ovina L. (Sheep Fescue)
 (Fine-leaved Fescue)



Festuca pratensis.
(Meadow Fescue)



(Red)



Poa nemoralis.

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Poa pratensis

(Smooth-stalked)



Poa trivialis.
(*Rough-stalked Meadow-grass.*)

