

Plantations formed chiefly on sand-drift along the sea-side on the Estate of Culbin

No - Within the last 28 years a considerable extent of plantation has also been formed on the sands of Culbin. These sands occupy several thousand acres of the north-west corner of the county of Moray, NB, and are composed of small hills of sand, ranging from 20 to 140 feet high, the surface of which is ever changing by the influence of the wind. Along this district in rough dry weather the atmosphere is thickened with sand-drift, and from the prevailing westerly winds its course is generally eastward; but the ordinary driftings are intercepted by the river Findhorn, and the sand is carried out to sea and forms a bar, where the in-shore tidal current, running to the westward carries it in that direction, again to be thrown on shore and blown eastward; thus to some extent it forms an endless circuit. Along the southern extremities of these sand-hills, at the distance of several miles from the sea, are beaches of rolled boulders from twelve to twenty feet above the tide-mark. Similar beaches exist in many parts along the south side of the Moray Firth, and these, with the accumulation of sand are supposed to be due to the effects of the extraordinary inundations of the German Ocean in the thirteenth century recorded by Buchanan and Fordoun. But although large mountains of sand are said to have been formed at this time along the sea-shore, called the hills of Maviston, yet it must have been long after this period before they spread out on the cultivated land to anything like their present extent. In the beginning of the fifteenth century the estate of Culbin was in the possession of the Kinnaird family, and their descendants continued to prosper on it for many generations. After the middle of the seventeenth century the estate is known to have consisted of sixteen very regular and compact farms, so famous for their fertility that the district had acquired the distinguished appellation of "the Granary of Moray". The rental of the estate at that time was as follows:- Money rent, £2720 Scots (more than equal to sterling money now), 640 bolls of wheat, 640 bolls of bear, 640 bolls of oats, and 640 bolls of oatmeal. Such a rental now would be worth about £7000 sterling per annum. Besides, the family had valuable fishings in the Findhorn, which then ran westward through the estate, but its course, having been drifted up, was turned into its present channel during the general calamity. Towards the close of the seventeenth century the then proprietor applied to Parliament to be exempted from the payment of cess, because his estate, which twenty years before was one of the most considerable in Moray, with an area of about 5000 acres, was nearly all covered with sand, and the mansion-house and orchard destroyed. Since that period the property passed by purchase through several families. The next rental, taken in 1733, after the estate was almost entirely blown up with sand, shows the yearly value in money and victual to be only £494. 4s. 4d. Scots. But small as that amount comparatively is, it has also been extinguished, and for many years the district with its broad and fertile fields, formerly designated "the Granary of Moray", has become altogether an arid waste of shifting sand, bearing only the wavy ripple of the wind. Singularly enough, these possessions have disappeared as completely as their occupants, and their names are heard of only when the search of the antiquary discovers them among the musty papers of a bygone age, or deciphers them on the mossy tombstones of the old churchyard, while he seeks for their locality in vain.

No. The south-east portion of this desert comprehends almost the entire property of Binsness, which measures 558 acres, and has of late diminished in value almost yearly, by the inroad of sand-drift. It stood in the cess-books of the county in 1667 at £390 17s 2d Scots of yearly rent. It possesses no plantations whatever. Its arable fields have been abandoned to desolation, and the whole extent was sold in 1865 for the small sum of £660.

Kincorth Plantations - R Grant, Esq, of Kincorth, was the first to reclaim part of the sands in this quarter by plantation, and all the sandy space on his property

is now completely covered with thriving wood. In a report to the Highland and Agricultural Society of Scotland, published in 1847, he says:-

"In the most advanced part of the plantation, which is now eight years old, the plants average a height of at least six feet, so that a man walking among them can scarcely be seen; and the author may truly report, that the average growth of one year on the Scots firs was a foot, and on the larches nearly eighteen inches; while all the younger parts of the plantation promise well to attain the same size at the same age. Whether or not trees may ever become valuable as timber, on such an arid soil, is a problem which can only be solved in future years (for he is not aware of there being any such existing under similar circumstances in this country). but he is sanguine that they will attain a size to be very useful for palings and other country purposes. But it was not in the expectation of profit that he was induced to plant, but entirely in the hope of obtaining shelter and ornament, and of giving an improved appearance to a very dreary prospect. In this object the author has every reason to believe, from present appearances, that in due time he shall succeed; and it would gratify him much if, stimulated by the knowledge of his success, any other proprietor of similar dreary and sandy tracts, which are so frequent along the coasts of Scotland, should be induced to plant them".

These plantations, now (1865) from twenty to twenty-eight years of age, range from twenty-five to forty-five feet in height, and are very vigorous. They yield valuable thinnings, and although they stand on pure sand-drift, give promise of producing heavy timber at a period not far distant.

Observing that these plantations were treated in the most skilful manner, I applied to Mr Grant for information regarding their pecuniary return, and he has kindly favoured me with the following statement:-

"Forres House, 25th February 1965 - In answer to your letter of inquiry respecting my plantation adjoining the sand-hills of Kincorth, I write to say that, although I have not kept any precise notes of the entire management, you may reply on the accuracy of the following details. The extent of the plantation is about seventy acres, but having been planted during successive years, some parts of it are more advanced, and have been oftener thinned than others. I have constantly adhered to the rule of not cutting any trees in it except in thinning with the object of improving the plantation. The greater part of it was thinned twice without yielding any pecuniary return, and at an expense of from £15 to £20, each time, say in all of £35. From these thinnings, however, I had garden and some field upright fences made, which lasted substantially for four years. During the last six years I have had all the ordinary flake-palings I required for the farm made from trees in the older part of the wood, - I should say at the least to the value of £10 or £12 annually. In addition to this, I find from my book that within the same period (six years) I have received for props £235 9s 6d, and have expended for thinning, etc etc £69 16s 4d". Although the cost of the formation of this plantation cannot be exactly ascertained, yet it is quite clear, from the cost of other plantations adjoining (which will be immediately shown), that the returns already realised are sufficient to pay all outlay, and interest at a high rate, up to the present time; even supposing the outlay in its formation to have been three or four times the usual rate, which some small spots that were covered with grassy surface, together with the fences, may have occasioned.

The present money value of the oldest part of this plantation is not less than £30 an acre; and although other parts are as yet of less value, on the whole, during the next twenty or thirty years, the thinnings will pay the current rate of interest on that amount, with every prospect of the timber in the plantation increasing very much in value per acre during the period. This is a moderate estimate of the value of the plantation, yet it is clear that it will in future

yield a revenue equal at least to that of ordinary arable land; and beyond this the proprietor has fully realised the primary object of its formation, namely, ornament, shelter, and a sure protection against sand-drift.

The success of the Kincorth plantations while they were only a few years old induced the proprietor of Moy, who owns several thousand acres of the adjoining sands of Culbin, to form plantations thereon.

Plantations on Culbin belonging to Moy Estate - In the beginning of winter 1840 I planted on these sands 199 imperial acres with Scotch fir and larch, at the following cost per acre:-

|                                                               |    |    |   |           |
|---------------------------------------------------------------|----|----|---|-----------|
| 1800 one-year transplanted native Highland pine               | £0 | 3  | 8 |           |
| 100 two-year seedling, do                                     | 0  | 1  | 3 |           |
| 800 two year do larch                                         | 0  | 2  | 0 |           |
| Carriage from Forres nurseries                                | 0  | 0  | 3 |           |
| Planting                                                      | 0  | 3  | 2 |           |
| 199 acres, at                                                 | £0 | 10 | 4 | £102 16 4 |
| Building fences and planting about 25 acres by the proprietor |    |    |   | 97 14 9   |

In January and February 1842, I added to the above plantation seventy-four acres, but allowed only 3200 plants per acre, thus:-

|                                                              |    |   |    |           |
|--------------------------------------------------------------|----|---|----|-----------|
| 2200 two-year seedling and transplanted native Highland pine | £0 | 3 | 3  |           |
| 1000 two-year old larches,                                   | 0  | 2 | 6  |           |
| Carriage from Forres nurseries                               | 0  | 0 | 2  |           |
| Planting                                                     | 0  | 2 | 10 |           |
| 74 acres, at                                                 | £0 | 8 | 9  | 32 7 6    |
| Making in all 298 acres, amounting to                        |    |   |    | £232 18 7 |

It will be observed that the expense of these plantations is usually small. This arises from several circumstances. The ground being soft, with little or no surface herbage, rendered it suitable for small plants which were planted by the hand-iron, by people in the vicinity much practised in the work, and who could plant an acre daily on such ground without difficulty. The plantations were also made at a time when the price of nursery plants was under the usual rate. The expense of fencing these plantations was also very small: only a part of the south and western boundary required protection, and that is enclosed by a turf wall five feet high. The east end is fenced by the Kincorth plantations; the north is bounded by a vast extent of pure undulated sands, with a surface destitute of vegetation, and bearing only the wavy ripple of the wind, except where a clump of bent grass here and there arises. No cattle or sheep frequent this quarter, and a fence is unnecessary. The north sides of these plantations stand nearest to the sea, and are formed on knolls of pure sand-drift. These knolls are situated from one to two miles from the south edge of the Moray Firth, at a part where the sea is from twenty to twenty-five miles in breadth. Their altitude varies from twelve to thirty feet above the tide-mark.

The plants on both plantations advanced vigorously, and, with the exception of a few small spots here and there covered with sand, or where it was drifted away soon after the plants were inserted, no vacancies existed. On lifting and examining some of the plants of both sorts, from the pure sand, it was found that they had furnished themselves with tap-roots, which strike underneath the plants to a great depth; but the greater portion of the roots run horizontally at a depth of about four inches under the surface of the sand and extended over an almost incredible space. Many of the plants six years planted were possessed of roots upwards

of twenty feet in length, which ramified into numerous lateral fibres. Where the surface had remained undisturbed, there was a remarkable uniformity in the depth of the fibres, both in flat and in steep situations. Nature adapts the plants for emergencies, and no instance was observable of their having perished from drought, or having been removed by wind after having grown a few years; some of them stood where sand to a depth of more than a foot had been drifted from underneath them, and continued to thrive with a great portion of their roots laid bare. In other cases the Scotch firs grew when drifted up with sand, and had only the growth of a year or two above the surface. In this position the shoots of Scotch fir do not strike root, but where the larch became sunk in drift its shoots readily rooted at a depth of four inches under the surface. many stools were to be found resembling handfulls of larch plants inserted into one spot, showing that the soil was well adapted for the growth of cuttings.

Plants of every kind of Coniferae grown from seed deserve a preference to those propagated by any other method; but the readiness with which the lateral branches of the larch take root, when sunk in sand of this quality, suggests a very speedy and effectual method of increasing some of the more valuable Coniferae, the seeds of which cannot be obtained.

When the cover of trees begins to prevent the movement of the sand, the vegetation first observed on the surface was Hypochaeris radicata, Polytrichum commune, Agrostis vulgaris, Agrostis alba, Ammophila arundinacea and Calluna vulgaris. The first-mentioned plant strikes its root to a great depth, grows freely, seeds abundantly, is a perennial, and likely to be valuable in fixing sand. As to the relative fitness of the two kinds of trees for the situation at first, there was some difficulty in deciding which was the more suitable. The native fir affords the best shelter; it stands in greath health, and has much the advantage in appearance; its deep green contrasts beautifully with the whiteness of the sand, which gives the foliage of the native plant something of the lustre of a Himalayan. The larch, from the shedding of its leaves, which soon decay, forms a dark stratum of vegetable matter on the surface of the sand, which consolidates it and promotes vegetation, particularly the growth of the grasses, much sooner than the exuviae of the Scotch fir; but both have their advantages, and in order to furnish a choice of kinds in the operation of thinning, a mixture to be recommended, although there is now no doubt that the Scotch fir is the more reliable tree, and will ultimately, in most cases, yield the most valuable crop of timber. Within the boundary of these plantations are several beaches of rolled boulders of primitive and transition rocks. Although the surface of these is stationary, and the soil intermixed amongst the stones, they are almost destitute of any vegetation except moss; on these beaches the larches do not grow, and the firs assume a yellowish green, and are much more dwarfish than those in the pure sand. This probably arises from the stones admitting the drought of summer to a greater extent than the pure sand does.

Along the south side of the ground, under these plantations, where the surface is a sandy-peat, the cover is a short grassy heath; on such parts the plants grew freely, and are generally taller than on the pure sand. In other parts along the outskirts of these sandy regions, although not comprehended in the plantations here referred to, there is a considerable extent of flat land under a close, rank, grassy sward; the ground is a pure sand, with a slight mixture of decomposed vegetable matter on the surface. This description of ground is, of all others, the most difficult to get successfully planted; for, when plants are notched into such, they uniformly die of drought during the first summer. The matted herbage intercepts the ordinary showers, and keeps the ground destitute of moisture at the depth of a few inches. When a surface turf is pared off before the plant is inserted it has a better chance, and when the ground is pitted or trenched it is still more for its advantage. The preparation of the ground should be made several months before the planting, and the planting should be done in early Autumn, or in moist weather in March or April. In places of this description, the risk of sand-drift on a trenched surface, where it is not convenient to thatch it with brushwood sometimes prevents the destruction by trenching, of any surface vegetation which

may already exist.

The annual growth of both kinds of tree in these woods in the purest sand was upwards of fourteen inches long, and contrasts favourably with that of plants in apparently better soil. more solid but overspread with a matted surface of the natural grasses; thus illustrating the advantage of planting on a loose open soil, with a clean surface, whether poor or rich. When such plantations reach from ten to twelve feet in height they are fit to yield a large supply of thinnings, which are well adapted for reclaiming the sands and limiting the encroachment of sand-drift. These thinnings of brushwood are valuable for the purpose of being spread over the newly planted sands in the roughest exposures; overlapping or spreading the brushwood in an imbricated position, causes it to stick to the surface, and thus it affords shade and shelter to the young plants in situations where they would otherwise perish.

The plantation on the Culbin sands belonging to the Laird of Moy are now twenty-two and twenty-four years old, and form a very compact wood of nearly 300 acres affording great shelter in their vicinity, and forming a striking contrast to the barren hills in their neighbourhood. The trees continue to advance most vigorously. The tallest larches are about forty feet high, and the best Scotch firs about twenty eight feet high; generally the wood stands from twenty to thirty feet high. Roads have been opened up through the plantations, and thinning has been practised, first to a small extent in 1855 and 1856, which yielded little or no return; but from a statement furnished by the factor in charge of the property, prop-wood yielding a return of £482, 8s 6d was sold in 1864, and a further sale of £400 was expected before the necessary thinning was effected. I have not ascertained the cost of the operations of thinning, road-making etc but it is clear that the return already received for the prop-wood thinnings is more than sufficient to pay the original formation of the forest, with interest and all expenses up to the present time. From its present healthy state, 1865, the forest cannot be valued at less than £22 per acre, or altogether, £6556. Frequent thinnings will be required from time to time, at intervals of only a few years, as it is easy to see that the vigour of the trees has a tendency to draw them up too tall in proportion to their girth. Allowing trees to become drawn up through want of thinning is the ruin of many of the woods of our country, and should always be guarded against, particularly since it unfits the timber for railway sleepers, so constantly in demand, and so profitable. Of late years a few hundred acres have been planted in addition to those already described, but these have failed to some extent, from the ravages of rabbits, which overrun the place.

The market for pit-props has of late become somewhat depressed in this country, in consequence of their abundance and cheapness on the Continent, particularly near Bordeaux, where they are produced on sandy regions similar to that I have attempted to describe, and to which I shall now refer.

#### Modes of growing plantations on sands along the French coast.

The greatest triumph of arboricultural skill in reclaiming sand-drift was recorded by a Commission appointed by the French Government to report on the pinaster forests formed by M Bremon-tier, of the Administration of Forests. In 1789 M Bremon-tier commenced his operations at the Gulf of Gascony, where the downs offered nothing to the eye but a monotonous repitition of white wavy mountains, destitute of vegetation, and agitated by the wind. In 1811 the Commission reported that 12,500 acres of downs had been covered with thriving plantations by means of sowing the seeds. The process is as remarkable for its simplicity as for its success. It consisted in sowing two pounds of the seeds of the pinaster, mixed with four to five pounds of broom-seed per acre, and immediately covering with branches of pine or other trees, with the leaves on, commencing at the side next the sea, or that from which the wind generally prevailed, and sowing in narrow zones in a direction at right angles to that of the course of the wind; the first sown zone being

protected by a line of hurdles, this zone protecting the second, the second the third, and so on. After sowing, the ground was immediately thatched with branches, overlapped, to protect the seed, with a hurdle fence erected to intercept the progress of the sand. In a word, wherever seeds were sown the surface of the sand was thatched. A thatching of rushes, reeds, or sea-weed was also used and was quite as effectual as the branches. In six weeks or two months the broom-seeds are said to have produced plants six inches high, which attained three or four times that height during the first season. The pinaster plants do not rise above three or four inches the first season, and it is generally seven or eight years before they overtop the broom, which often in these downs attains to the height of twelve or fifteen feet. At the age of ten or twelve years the pines have in a great measure suffocated the broom; they are then thinned, the branches cut off being used for the purpose of thatching downs not yet recovered, and the trunks and roots cut into pieces and burned to make tar and charcoal. These plantations, and others in the sands of Bordeaux, and between that city and Bayonne, constitute the principal riches of the inhabitants, whose chief means of gaining a livelihood arises from the preparation of resin and tar from these pinaster forests. The pinaster consists of numerous varieties, all of which grow remarkably well in sand or in dry, poor soil, and endure the influence of the sea better than most trees. In wet or fertile soil it is less hardy than in sand; in the former its shoots become more succulent, less matured, and are thus unable to resist the severity of the winter in Scotland away from the influence of the sea.