

FIXATION OF DUNES WITH MARRAM, ETC.

The oldest plan for fixing the soil of dunes consists in planting marram on them, and it is still the means generally resorted to.

This kind of grass, which grows on almost all dunes, develops itself best in those places where the wind brings plenty of sand. That comes about from its forming stems at the joints, where new stalks and roots can be produced. In time, thus extending itself under the influence of the dust from the sand, the plant succeeds in taking possession of a considerable area.

Where the marram increases abundantly supplies are obtained to serve in the fixation of the dunes. The plants are cut in the middle with a small spade at about 4 in. beneath the surface of the soil, but naturally care is taken to have plants in sufficient number. The cut plants are tied in bundles and carried to the place where it is proposed to fix the dune.

The works decided on for this fixation are begun by rounding off the edges of the holes made by the wind, and if necessary the projecting parts of the dunes, because it is there that the wind has the most effect. Narrow holes are then made with the spade in the sand, in which are placed at regular intervals bunches of marram, which are pressed down with care. If one does not lay out with marram, straw is sometimes substituted for it. (Note: Generally marram and straw are used, as a rule planting only marram where it is found in abundance at hand and where the highest seas cannot reach it.)

The bunches of marram are spaced on the slopes at about 12 in. by 12 in., and in the more level places about 20 in. by 20 in. Provided one does not use too old plants (for example, plants not more than two years old), and that the stems have joints, the marram will put forth roots and spread. If that has not taken place it will be necessary to maintain the ordinary repair—to fix the dune afresh—and that generally at the end of three years, because then the stems of the marram are rotten. Where, however, the soil of the dunes is better there will have grown during this time, besides the marram, other plants which will help to fix the dune.

Where sufficient heather grows in the hollows (*pannes*) it is cut and used for the fixation of the dune. The heather is spread in thin layers on the ground and weighted down in the middle with shovelfuls of sand. This is more expensive than the use of the marram. In return, this kind of covering turns out to be more effective in the very dry parts where the marram does not take, and the maintenance of it is not onerous.

The results of the methods described here are relatively of little durability, and necessitate considerable expense in maintenance and renewal. Afforestation, on the contrary, is capable of fixing the dunes in a permanent manner.

AFFORESTATION OF THE DUNES.

The experiments in afforestation not only of the dunes belonging to private persons but also those of the State date from a long way back. Well known is the trial made by the State in 1865 and the two following years on the dunes of Schoorl. There were then used the following species of trees: *Pinus Laricio* var. *austriaca*, *P. montana*, *P. silvestris*, *P. maritima*, and *Picea excelsa*. Unfortunately the planters had no experience; many of the young plantations perished from want of care, and the results obtained with the others were only partly successful. This attempt has at least not only shown particularly that the three first species named above can give excellent results, and that *Pinus silvestris* succeeds very well in sheltered places, but that *Picea excelsa* and above all *Pinus maritima* are unfitted for this use.

New trials have been made since the year 1893 on the dunes in the neighbourhood of Schoorl. At first, following the example of Denmark and Jutland, they planted chiefly *Picea alba*. This species, however, has been found unsuited for the afforesting of the Dutch dunes. They have therefore had recourse particularly to the species used at the trials of 1865 and 1867. The young plants are raised in nurseries situated near or on the dunes. They endeavour to obtain young spruces from two to three years old, not too big, but with fibrous and long roots very important conditions, seeing the dryness of the dunes.

As a rule, preparation of the soil can be dispensed with in situations where the sand is mostly dust, the soil being there generally sufficiently mellow and containing enough moisture.