

It is with a view of restoring these forests that at present much skill and labour, as well as large amounts of money, are being spent in getting up new forests.

For the successful cultivation of the Scotch fir in the Lüss forests, the moorpan, so prevalent in these plains, had frequently to be broken through.

Cultivation on land with a sub-soil of moorpan.

Near Niebeck alone there are about 1,000 acres brought thus under cultivation, and nearly all within the last three years.

This area was generally broken up in strips eight feet wide, leaving between strips of six feet in width untouched.

This was done partly by ploughing, where necessary, to a depth of two feet; and in places where even this was not sufficient to break through the moorpan, it was done with the spade by men trenching the soil.

The average cost of thus preparing the soil for these plantations has been 18s. 3d. per acre, which would be very high if it was not considered that by so doing the soil was redeemed for cultivation.

The material for planting consisted of one-year-old seedlings of Scotch fir, and occasionally a two-year-old seedling of spruce, which are raised in the ordinary way by sowing in furrows.

The planting is done with a wedge spade, which is constructed in one piece out of beechwood, shod with iron, and 3ft. 4in. long from the handle to the edge.

The blade alone is 11½in. high, half as broad, and 2in. thick at the top. (Fig. 1).

With this spade one man proceeds along the prepared strip or bed, making holes at distances 3ft. x 5ft. by simply treading the spade into the soil, and he is followed by two women, who plant by holding the young seedling firmly with their left hand against one side of the hole, whilst with their foot they press the soil from the opposite side towards the plant.

The average cost of such planting has been about 5s. 8d. per acre.

Where sowing was adopted instead of planting, the ploughed or trenched strips were first levelled with a harrow, and after this the seed sown at an average cost of 1s. 4d. per acre, 3lbs. of Scotch fir and 1lb. of spruce seed being used for sowing one acre, the cost of which is not included.

The filling up of vacancies afterwards came to 1s. 6d. per acre, and the average of the total expenditure of getting up these plantations was £1 5s. 6d. per acre.

These forests are of greater value by being situated alongside of the Hanover and Harburg line of rail, as the thinnings and so forth are readily disposed of; but by this they are also placed in great danger from fire during hot and dry summers, since the sparks flying from the engine often light the accumulated fir leaves, dry heather, and other smaller plants. To guard against this danger, so called "safety strips" of other kinds, not conifers, are planted along the line of rail, as, for instance, birch, coppice wood of oak, &c.

Protection of forests against fire.

Something similar might be carried out in India, with a better chance of keeping out fires than there is at present, and at reasonable cost.

I had frequent opportunities of witnessing the damage done to the Scotch fir forests by insects, and the means adopted to prevent or diminish it where possible.

Danger to forests from insects.

Whilst the young trees suffered most from the larvæ of may-bug (*Melolontha vulgaris*), and a little beetle (*Curculio [hylobius] pini*), the old trees were frequently destroyed by beetles (*Bostrichus*) attacking the bark, which necessitates occasionally the cutting down of whole forests, since wind and storms, admitted through the open spaces caused by the attack of the beetles, would soon overthrow the rest of them. Caterpillars also frequently damage the young Scotch fir by eating the leaves, thus making the plants sickly, and rendering them more liable to attacks from other insects.

The Scotch fir requires more light and air than any other, and does not thrive at all in the shade of other forest trees. For the same reason natural reproduction is very difficult, and only practicable under very favourable circumstances, and not attempted here, where it is grown in regulated forests with complete clearances, and re-stocked by sowing or planting.

General management of Scotch fir forests.

As a tree affording some shade to other kinds which require it, the Scotch fir is well suited.

If sown or planted very close, early attention to thinning out is also necessary, as plants early stunted never fully recover their strength.

The soil not being rich, the trees are not allowed to grow older than 60 to 80 years, this being the age at which the comparative yield of wood is the best.

For the production of large timber, the soil is not good enough, and therefore this is, as a rule, not attempted.

The holding over of a few selected trees, to grow as many years again with the succeeding generations, is not advisable in these forests either, as the storms and winds are too violent.

Fellings of the Scotch fir, as of all other kinds, are proceeded with from east or north-east to west or south-west, to secure the shelter of the old forest, which remains standing.

As before mentioned, spruce is planted in small numbers with the Scotch fir; and even where the soil is not good enough for it to grow up into large trees with the Scotch fir, it becomes beneficial to the latter by the cover it affords to the soil, through its denser foliage, thus facilitating decomposition of the soil, and keeping it moister and cooler than the Scotch fir alone would be able to do.

The making of charcoal in the forests is kept up to some extent, not that much revenue is derived from it, but it covers the expense of getting the stumps out of the ground and the branches collected, whereby danger from insects is removed, as this old wood is their chief breeding place, besides the loosening and clearing of the soil afforded by the digging up of the former.

Manufacture of charcoal.

I took this opportunity of getting instruction in charcoal burning, in which economy is sadly wanted in India, especially in the tea districts.

At the Nienburg forests, to the north-west of Hanover, which also consist chiefly of Scotch fir, I received instructions in the cultivation and management of forests in low situations.

Nienburg Scotch fir forests.

As the Lüneburg forests are remarkable for their dryness and the general want of moisture and water, so are these particularly instructive on account of their low, swampy character.

Drainage is the only way by which such ground can be made fit for forest growth, and has often to precede by several years the planting, since the ditches cannot be made sufficiently deep at once, as they would soon be filled up again by the falling in of the sides.

Cultivation and drainage of swampy forests.