PROGRESS REPORT ON RESEARCH: MARCH 1933.

1. Nursery Experimental Work.

The following is a summary of the principal results obtained in 1932.

The trial of various methods of covering small seeds was continued in both England and Scotland, European larch, Sitka spruce, birch and alder being the species investigated. In European larch the use of sand resulted in an improvement of 12 per cent. and 30 per cent. in germination as compared with nursery soil. In Sitka spruce the benefit of using sand was considerably greater, the germination was increased by 60 per cent. in one experiment and more than doubled in a second. The maximum yield with sand covering, based on a count made towards the end of June was 107,000 seedlings per pound.

Well-decayed Douglas fir humus gave slightly better results than nursery soil but not nearly so good as sand. In Kennington Nursery, where these experiments with Sitka spruce were carried out, the weather after sowing was cold and wet and attempts to reduce caking by covering the soil in some of the plots with A. sphagnum moss, and B. Douglas fir twigs, were not successful. The secondary covering impaired germination in all cases. Previous work on the same lines has shown that in dry weather the sphagnum covering may be beneficial, but in normal or wet springs the method cannot be recommended.

The great sensitiveness of seed of birch and alder to type of covering was well brought out by experiments at Altonside. In earlier trials it was found that with a cover of well-washed sand a much higher germination resulted than with nursery soil. In the new experiments sand was

used as a control, and parallel plots were covered with coarse grit, an appreciably coarser material; in both species the germination in the grit-covered beds was double that of the sand controls.

The beneficial effect of watering seed of birch and alder was again clearly demonstrated in Kennington nursery; water was applied until germination was general. The yield was increased over ten fold in birch and five fold in alder in the plots which received water. The weather conditions were fairly dry.

Some preliminary tests on the stratification of seed had given promising results in 1931 at Kennington and the method was followed up last year by tests with Norway spruce, Douglas fir, birch and alder. Peat and sand respectively were used for stratification and part of the seed was kept stratified throughout the winter and part stored in air tight jars until January when it was stratified; there were also controls of seed sown dry in autumn as well as in the spring.

The results are curious, stratification in peat was fatal to Douglas fir and not beneficial to Norway spruce but gave the best results with both birch and alder. On the other hand Douglas fir seed stored in jars until January and then stratified in sand until the spring gave a germination of 74 per cent. as compared with 39 per cent. obtained by the normal sowing of unstratified seed stored in jars and sown in the spring.

Improvement in yield of Sitka spruce was obtained in Inchnacardoch Nursery by pregermination, a considerable bulk of seed being used. The seed was kept moist for 20 days and turned at frequent intervals while control seed was soaked in running water for 6 days. Both lots were sown on May 18th; the pregerminated seed gave 30 per cent. more plants than the control.

Experiments on weed control were carried out in four nurseries using sulphuric acid 1 in 80 and 1 in 160 watered on immediately after sowing, 1 per cent. Copper sulphate applied 7 days after sowing, and a blow lamp. All the above treatments were not given in all the four nurseries. The species used were Sitka spruce and, in one nursery only, also Scots pine.

The acid and copper sulphate treatments had little apparent effect on the germination except at Kennington where the acid treated plots had more than twice as many seedlings as the control. The blow lamp treatment gave quite normal germination figures in three of the nurseries but in the fourth, where it was applied to Scots pine as well as Sitka spruce, it proved disastrous, destroying all the pine and the majority of the Sitka seedlings. Apparently late sowing at a time when conditions were favourable for rapid germination was responsible for this result.

As regards effect on the weed growth the acid and copper sulphate solutions halved the amount of the first weeding and substantially reduced the second weeding; the blow lamp was not on the whole so effective, except in the one nursery where the tree seedlings also were killed.

Attempts to improve the growth of one year seedlings of larch, Sitka spruce and other species by the use of manures and raised boxed-in seed beds have not led to any positive result. At the end of the growing season larch was the only species to benefit from heavy applications of broad leaf humus. Artificial manures increased weed growth to an alarming extent and heavy losses from weeding resulted.

The large-scale grading experiment was continued in the coated nurseries; and the results of the P.31 lining out have been received. Losses in all species and nurseries were high, the second and third grade seedlings especially showing up badly.

The experiments for the current season deal with the following problems

1. Spraying of larch against Meria laricis.

2. Weed control by application of sulphuric acid and other chemicals.

3. Technique of using the blow lamp for controlling weeds in seed beds.

4. Stratification of seed: Douglas fir, Corsican pine, Sitka spruce, Alder, Birch.

5. Pregermination. Sitka spruce and European larch.

6. Effect of dense bedding out upon quality of plants. Scots pine, Sitka spruce.

7. Manurial treatment of ash in seed beds and on lining out.

8. Seed of 3 different origins of European larch to be sown in 4 nurseries, the object being to study relative development of larch in different nurseries.

9. Grading of pines and larches (continued)

. Plantation Work. P.33.

(1) Peat Soils

Semi field scale experiments were carried out at Inchnacardoch and Achnashellach on difficult types of slope peat using Japanese larch as the principal species but putting Pinus contorta on the drier knolls and Sitka spruce on any moderately good ground. The relative effect of basic slag and other phosphatic manures will be studied. Japanese and Hybrid larches are being tried at Borgie, Benmore and Bennan. Further experiments on the lifting of checked spruce have been made. The root development of turf planted and manured spruces is under investigation.

Depth of planting spruce on turfs is being studied at Kielder, also use of seedlings compared with transplants.

At Clocaenog Forest experiments were carried out on the effect of heather burning, trial of Japanese larch, Sitka spruce and Pinus contorta with different phosphatic manures, method of planting and intensity of drainage.

(2) Upland Calluna Soils.

At Allerston a further series of plots has been laid out to compare the use of seedlings of various species with transplants, on ploughed ground, and also the effect of phosphatic manures. The comparative effect of basic slag and Semsol on Sitka spruce and Japanese larch is to be determined. Other problems under investigation are the correct position of the plant on ground ploughed in ridges and the direct sowing of Corsican pine.

Work at Harwooddale has continued on much the same lines as in the previous year, different species, methods of planting, and the use of manures are being tried out.

Mixtures of pines or Japanese larch with Sitka spruce are being planted on an exposed ridge in Clashindarroch and a control to the P.31 ploughing experiment has been laid down.

(3) Wareham Heath.

The majority of last year's experiments with direct sowing of pines and the use of seedlings and transplants are being repeated. A test of the relative value of basic slag and Semsol is also being made.

(4) Chalk Soils.

An experiment has been started to determine the advisability of leaving the ground for several months to weather after ploughing and before planting. The effect of root and shoot pruning on the establishment of beech and grey alder is being studied. Various forage crops (Lucern, Sainfoin and Forage Burnet) are to be sown as a possible means of protecting newly planted beech seedlings.

(5) Breckland Soils (Thetford).

A further series of plots of Scots pine has been underplanted with Beech. The area has been fenced against deer.

(6) Loam and Clay Soils (Hardwoods).

Experiments on the density of direct sowing of oak and also on the optimum season for sowing oak have been continued in Division 7. A grading experiment with 1 x 0 oak seedlings has been carried out.

Stump planting of alder and oak has been tried on heavy clay at Drayton in Northants, and in the same forest two further series of plots of different species have been established, one series on grassland and one on old woodland.

Experiments on the raising of poplar have been continued in four nurseries in England.

(7) Provenance of Seed.

Plants of known seed origin of the following species have been planted.

Scots pine at Thetford, Inchnacardoch.

Mountain pine at Clashindarroch, Braemore.

Norway spruce at Braemore.

Sitka spruce at Lianachan.

European larch at Clashindarroch, Braemore and Drummond Hill.

Ash at Braemore.

(8) Beating-up.

An investigation has been started to determine the development of plants used for beating-up gaps in young plantations, and the relation between the height, branch spread etc. of the established trees and the size of the gap necessary for the useful survival of the introduced plant.

3. Research Work at Aberdeen.

Dr Fraser has been studying the soils under the temporary sample plots of Scots pine in north east Scotland with a view to establishing a relation between soil characters and rate of tree growth. No very definite results have been obtained as yet.

Dr Laing has found marked differences in mycorrhiza development of different races of Pinus Laricio as two year seedlings. The much more fibrous root system of Austrian pine as compared with Corsican pine from Corsica or the Pyrenees is apparently due to the fact that in the latter the fungus arrests the growth of the lateral roots, while in Austrian pine the lateral roots are relatively little checked.

4. Mycorrhiza Research.

A small nursery has been prepared at Wareham on typical heath soil and experiments with inoculation and humus composts will be carried out in April. Pot culture work is also in progress in the glass house at Bedford College.

5. Research on Vole Disease.

A grant of £50 has been made to Dr C.E. Elton of the Bureau of Animal Population Oxford University for an investigation on the disease which is apparently responsible for bringing vole epidemics to an end. The disease is believed to be of the virus type and a bacteriologist is co-operating with Dr Elton in this work. It is hoped that it may be possible to isolate the virus and infect voles in the early stages of an outbreak. The grant will be expended partly in travelling to Argyllshire where the material is to be collected and partly in the upkeep of live voles in the laboratory.

6. Sample Plot Work.

During the 6 months October 1932 to March 1933 7 new sample plots were established and 13 plots remeasured. The Abies grandis plots at Novar are remarkable for their heavy volume production; these 32 year old plots have been thinned four times, 4000 cubic feet have been cut

out of the heavily thinned plot and 1700 cubic feet out of the lightly thinned one. The standing volume is 5400 cu.ft. in the former and 9300 cu.ft. in the latter.

A set of replicated sample plots of Japanese larch was established at Largie, there were two treatments light (B grade) and heavy (D grade) with three replications of each treatment. Two of the sub plots are rather markedly inferior in growth to the other four.

The remeasurement of the ash plot at Haggerston shows this stand to have made very little progress in the last five years. At the present age of 46 years the volume is only 1000 cubic feet per acre and the current mean annual increment only 50 cubic feet per acre.

The programme for the next few months includes the establishment of new sample plots of Japanese larch at Hafod Fawr and Llandinam and of Corsican pine in Sherwood Forest, also the remeasurement of oak plots in the Forest of Dean.

7. Mycology and Entomology.

Mr Day's investigations on frost damage under controlled conditions are being continued.

A full account of the work on Meria laricis is now in preparation for issue as a Bulletin. Further experiments on methods of spraying will be carried out in four nurseries this year.

Other work includes the following:

Ink Disease on Spanish Chestnut

Poplar Canker.

Melampsoridium betulinum causing leaf-cast on birch in nurseries.

Damping-off of seedlings

The writing up of fungal diseases affecting tree willows

On the entomological side it is hoped by the end of this year to bring up to the stage of publication the work on the

pine shoot moth and also on the oak leaf caterpillars in the Forest of Dean. This will clear the ground for a new major investigation dealing with the pine bark beetles. Myelophilus piniperda in particular. In this work we are going to have the active collaboration of Dr W.R. Thompson, F.R.S., Director of the Farnham House Laboratory, Bucks. It is proposed that Dr Chrystal and Mr Brown shall study the biology of the pine beetle, effect of climatic conditions etc., and also the extent of the damage caused, especially in relation to the efficiency and cost of control measures. Dr Thompson's staff will concentrate on the relations between the beetle and its parasites and predators. Work will be centred in the New Forest.

8. Timber Investigations.

At a recent meeting with the Director and staff of the Forest Products Research Laboratory the following matters were discussed

Uses of Poles. Manchester Ship Canal Co., Ministry of Transport, and Dry-Dock Companies to be approached.

Utilisation of Thinnings. A sample lot of conifer thinnings to be sent to the Laboratory to test for turnery use.

Portable Creosoting Tank. Suggested that the men who are to work the tanks should have a week's instruction at the Laboratory.

Pruning. A project for the detailed examination on the effect of pruning upon quality of timber to be drafted.

Survey. A quantitative survey of wood-using industries was desirable.