

THE LON MOR : 1925-1945

Between those upper regions of hilltop and mountain, which by reason of sheer altitude must remain beyond the aspirations of the forester and the eminently plantable lower reaches he may acquire or merely covet, there lies a derelict peat-clad hinterland which in North and West Scotland alone runs into many thousands of square miles. Selective grazing by sheep or deer and, in this region of high rainfall, the tragic practice of muirburn, have hastened the process of regression into utter wastelands.

Exactly twenty years ago a research officer¹ of the Forestry Commission seeking a site for a station to be devoted to experimental plantings on that wasteland, found what he wanted at Lon Mor. If anything, the area was worse than typical - which was all to the good. In that year, 1925, a minimum of initial drainage was done and the first experiments were laid down. Lon Mor is simply the Gaelic for Big Waste; it lies on a wide shelf of acid moine schist about a mile North-west of the valley between Port Augustus and Invergarry in central Inverness-shire. Besides a series of flats or basins, where the peat may be as much as 12 feet deep, both peat clad rock ridges and tough-peat covered moraines are included. Scirpus, cross-leaved heath and scanty, sickly heather covered everything, excepting a narrow margin by one of the sluggish natural drainage channels where molinia flourished, and there was much sphagnum and surface water at first. It is recorded that when the 'find' was reported to the District Forest Officer, that worthy, with a characteristic grimace, forthwith pledged himself to carry everything that could be grown in ten years down from Lon Mor to Fort Augustus on his back in one load.

Following soon after investigations which had revealed the completely superficial nature of the root system adopted by spruces on wet types of peat², it was decided from the beginning that, facilities for shallow rooting must be provided at Lon Mor. In consequence a new inverted thin, or shallow, turf was employed: through this turf the plant was notched and its roots spread on the surface of the bog. The designer was from the first convinced that turfs of like depth (about 5 inches) must eventually be produced by a plough of sorts, and it is well to remember that everything prepared by manual labour twenty years ago imitated in some degree the plough work envisaged for later on. As a matter of fact a very crude form, of plough was designed and tried about 1926, but it immediately became obvious that the lack of suitable tractive power was the stumbling block in the way of further progress.

It is interesting to find that even in 1925 the evidence against direct planting into the surface of the peat was so fully appreciated that no direct planting was put in until 1927, when the need for a small demonstration plot of direct notching - as a sort of datum line - had become obvious. It is even, more interesting to note that the originator of this system of shallow turf planting was so convinced of the need for facilitating immediate surface rooting that he did not employ the comparatively well known high (or Belgian) turf system at all. Actually three years were to elapse before any proper Belgian turfing was introduced at Lon Mor, but for several years thereafter the tendency was to

¹ M. L. Anderson

² H. M. Steven

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depart from the shallow turf in favour of the Belgian type. There were two reasons for the departure:- peat is more easily cut "below the tough rooty layer (i.e. at 10" than at 5"), and by 1928 the possibility of securing tackle to provide turfs mechanically, was at best remote.

Belgian turfs were in favour from 1928 until 1935 when they gave place to thin, vertical slices of turf. There were several reasons for this. Firstly, a draining-and-turfing-in-advance experiment had shown that heavy Belgian turfs tended sooner or later to sink into the surface of the bog and become amalgamated with, and sodden like it. Secondly, direct evidence was secured in other experiments to the effect that a group of shallow turf's - doubtless by providing an increased area of suitable rooting medium - gave better results than either a single shallow or a 'single-Belgian turf; and thirdly, the new vertical slice turf left a deeper and therefore "better drainage channel than the original, horizontal-shallow-turf system did. There was still no immediate, hope of turning out the required turfs by mechanical means, but the new method was making the best use yet of manual labour and the ordinary draining tools. The point to observe is that we were back again to shallow turf within ten years. More recent work (none of it at Lon Mor) has shown how markedly better is the start of tree plants where complete shallow turfing had been done, and this present winter may with reason be remembered in the annals of moorland afforestation as the date of the first successful complete shallow ploughing of difficult peat land. The tools were a Caterpillar tractor and a Massey-Harris Prairie Buster plough, the place Minard Forest in Argyll.

Having followed the trend in the development of turf-planting it may be well to turn now to tree species as with experience, they came into or fell from favour in the course of the twenty years. Only two species, Sitka Spruce and Norway Spruce, were planted as indicators in the earliest experiments. Even when dressed with phosphate, Norway never made much growth and it was usually omitted in later trials. Sitka with phosphate made a good start and despite the check which invariably follows exhaustion of the manure, its use as the main indicator species has been continued - latterly in mixture with pine where the check is less marked. White spruce has been a failure, but Omorika has done better than any other spruce and only the difficulty in securing that species in quantity has prevented its more general use.

Scots pine although planted on spare turfs in 1925 did not get a fair trial because of dreadful damage by blackgame which persisted until about 1930; then the pests practically disappeared. This pine was not given the advantage of any initial applications of phosphate in the earliest years. It was therefore round about 1928 by which time some pine had been top dressed and were looking well despite continual blackgame pruning that the pine began to make a good impression. Naturally the blackgame damage prevented shoot measurements of pine showing up well in assessments, but their root development had been unchecked. Pinus contorta, first planted in 1926 was, despite the blackgame plague, quick in asserting its value as a pioneer species on almost shocking types of peat. While it has never developed any characteristics which render it less desirable - unless perhaps its susceptibility to roe-deer damage - Contorta pine is now much more closely challenged

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by Scots pine* It is obvious, however, that the American tree with its short branches is inherently better suited as a nurse for spruce than our own pine. There are undesirable types of *Pinus contorta* but we had neither the clumsy, heavily branched coastal variety nor the thin, miserably branched interior one at Lon Mor. Mountain pine, also planted in 1926, with its painfully slow rate of establishment has only in the last few years made any real claim to usefulness, but it does eventually cover the ground better than the other two. One of the unexpected results at Lon Mor is the way in which Weymouth pine has continued to grow if only in a delicate way on wretched peat and in full exposure.

Four larches - Hybrid, Japanese, European and Dahurica have all been planted. The former is best, the latter died out and the European is most unhappy. Phosphate dressings are really essential if vigorous growth is to be established and maintained, - perhaps more so than with any other species. The larches were first planted in 1927 and did so unexpectedly well that Japanese larch has generally been used as an indicator species along with Sitka spruce and *Pinus contorta* ever since. Two points about this Japanese and Hybrid larches call for remarks: they seem to require close spacing if they are to make steady growth and they may need a second dressing of phosphate. In the one (1926) experiment in which they have been given a fair trial, Douglas fir might be classed among the unexpected if limited successes and so might *Nobilis* and Balsam silver firs. One is somehow less surprised find to Hemlock doing quite well or indeed to know that it and *Omorica* spruce are the two most successful species in the unslagged section on a very poor type of peat. Among conifers that failed were *Thuja*, Lawson's Cypress and *Cryptomeria japonica*. Practically every common hardwood failed including birch and rowan but excluding Grey Alder - although even it fell off quickly in growth after about five years. The experiments in which the majority of these species were compared are of a simple type which might well be employed in standard pilot plots for pre-testing new or unusual types of ground. There is little reason why the layout should not be standardised to contain a fixed number of lines each of a different species, and in all plots stocks of identical origin should appear. The results would not only provide data to show how the various species reacted to the sites but would make it possible to assess the sites themselves with a valuable degree of precision. As distinct from comparative species trials no race or provenance studies were established at Lon Mor except with Scots pine and to a much more limited extent with *Pinus contorta*. The subject is one which cannot be expected to provide much information for some years.

Having followed up the history of turfing and of choice of species as they were developed at Lon Mor let us run over now some minor projects into which the 52 registered experiments and upwards of 30 preliminary trials carried out thereat, can be classified - leaving to the last the big field covered by manurial tests. The very first year saw an experiment laid down to investigate the effect of shelter and one or two designed to discover the best age of plant. Shelter was discovered to be of secondary importance to the presence of phosphate. A curious incident concerning the sheltered plants comes to mind: every alternate plant was in the lee of a small shelter of fresh pine boarding; but although the nearest pine wood was several miles away the sheltered plants were almost at once attacked by weevils although the unsheltered ones not a couple of feet away, were scarcely touched. Two year, one

year Spruce transplants had the lowest losses and made the best initial growth in the age and type trials. Somewhat allied to these age of plant tests are the direct sowings which have been singularly successful when carried out in the presence of phosphate; so much so that when ploughing becomes the standard practice on peat, sowings may yet displace planting. To avoid complicating the story when outlining the development of turf-planting, reference to the method of plant insertion was intentionally omitted. At first the inverted single shallow turfs were either holed by a circular spade (Belgian spade) which removed a plug more or less intact and reaching right through the turf, or were notched by an ordinary spade from outside to centre. By the former method the plant was set in the hole and the plug replaced tightly, in the latter the plant was slipped into the notch until it stood vertically at the centre of the turf with its roots spread below the turf and on top of the original ground surface. Because it was adequate, and cheaper, the so called Side Notch method was continued at Lon Mor and indeed has been widely used elsewhere. The round plug method was dropped so far as shallow turfs were concerned although it was still used in any standard Belgian turfing.

Spacing between plants has not been a specific study at Lon Mor. The earliest experiments were planted at extraordinarily close spacings and were criticised later because these were so much removed from every day practice; but they were essentially short-term tests concerned only with the comparative behaviour of the plants in the first few years as a result of the differential treatments. The criticism has been repeated for it is difficult to convince practical foresters that it is desirable sometimes to depart from the strictly normal in order to limit the area of an experiment and thus reduce inherent site variation which might otherwise outweigh the effect of any treatment under test. Bearing on plant spacing, the group system introduced in 1928 was something definitely original. It combined two ideas; (1) locally close planting-with all its recognised advantages (with - on such poor ground - the possibility of adding a greater concentration of phosphate to the square yard); (2) no increase in the number of plants required per acre. The groups contained 13 trees each; only one or two in the centre - and these were usually Sitka Spruce - were intended as timber producers, the rest were there simply to assist the one or two final crop trees to that end. The essential fact about the group system is that it was designed when thinnings in North Scotland were unsaleable and likely to remain so. It attempted to employ the, in all probability, unsaleable trees to the best silvicultural advantage.

From the-beginning Lon Mor has played a very prominent part in the researches into the effects of manurial dressings upon conifers on poor quality sites. Indeed of the 80 and more trials there laid down, nearly 50 have had some connection with this subject. Basic slag or phosphate in some other form has entered into most of these experiments, for, as early as 1928 the futility of attempting to grow trees on such conditions without phosphate had been amply demonstrated. A 1928 experiment introduced two new forms, both proprietary, Semsol, later believed to be half superphosphates and half ground mineral phosphate, and Ephoa, simply an Egyptian mineral phosphate. Experiments continued to be laid down to find, how plants reacted to phosphates of all sorts, in all sorts of doses and combinations thereof right up to the war. A very recent assessment of many preliminary trials points to ground mineral being the best of these phosphates, and of it one and a half ounces per plant seems to be sufficient as an Initial dressing. Besides/

Besides a phosphate (Basic slag) both a magnesium salt (Epsom salts) and a potassic manure (Kainit) were tested in the first year's experiment and others have since been tried. Magnesium sulphate did produce, a slightly beneficial effect but no other source of magnesium did so. Potash (sulphate) also showed positive reactions "but nothing comparable with those obtained with phosphates. The effects of magnesium and more so of potash were much enhanced when these were applied to trees which had also received phosphate. This fact led to quite a series of experiments being put down with a view to arriving at a really suitable complete manure. Dr. A.B. Stewart of the Macaulay Institute co-operated in this work. It will be some time before the results of these complete fertilizers can be assessed, but the signs are that they will not be so vitally much better than phosphate alone can produce, to be worth while. As a nitrogenous fertilizer Sulphate of ammonia proved fatal in most cases at Lon Mor. In the latest complete manures Dr. Stewart introduced, as the source of nitrogen, a hoof and horn manure as it was much slower acting: to supply slow acting potash both Granite dust and Basalt dust have been used in the mixtures. No tests of compost have been carried out at Lon Mor although active peat, from stands where the tree species concerned was growing vigorously, was tried about fifteen years ago, with no apparent result. Some trials of Dr. Rayner's composts have been laid down in an adjoining area¹ which is really an extension to Lon Mor.

Round about 1930 when news of the stimulating effect which basic slag was exhibiting at Lon Mor and elsewhere had reached the forests, and orders for tons of the stuff were causing concern in high places, Savile Row issued the famous dictum; "An ounce of patience is worth a ton of slag". On the face of it this was amply justified then, but now the ratios rather call for revision, if not for inversion. Naturally quite a number of the early "experiments are now rendered futile by the results supplied by later ones. For instance it was soon obvious that phosphate was essential to conifer growth on the poor peat types, so that tests on various subjects laid down before the days of phosphate have had to be repeated with it. Many of the early results of Lon Mor experiments are taken for granted now - indeed some were accepted even before they had been subjected to proper test. Naturally enough in forestry as elsewhere the research side came in for much criticism and banter from the starts H.l.d. - the research standard (file) head - was considered fair game. "Hid" the foresters called it. In the North-west the Branch has been given some other and more picturesque titles in what might be termed pigeon-Gaelic, that tongue having to be bolstered up to render it fully effective.

Further symptoms of the interest which Lon Mor and other experimental reserves were arousing among the practical men came in a mild rash of Divisional experiments in forests tip and down the country. These, from being very simple in the early years, became more and more involved as time went on - what with controls and replications - until foresters and officers realised that it was one thing to plan an experiment but quite another to keep track of what had been done. Indeed it is doubtful if what was done is ever as important as knowing exactly what was done. One outstanding day in the history of Lon Mor occurred in 1935 when the late Assistant Commissioner and the Divisional Officer for the North spent, a day there. By that year there was much to see and the Divisional Officer was at the top of his form. At one point when confronted by evidence that, advance draining and turfing was detrimental he remarked "Well, it's there all right, but I am blessed if I believe it!" But before the day was over he was apparently impressed by the

¹ P.22 Inchnacardoch care/

care taken in laying out, numbering, tallying and recording, for he vowed to cease henceforth from making private or Divisional experiments and to leave the job to the branch with its facilities for recording and, to him perhaps more important, for interpreting its own written records! For years it has been the practice to ask visitors for suggestions as to new trials which might be laid down, and it has been quite remarkable how often it has been possible to say that their suggestions had already been tried.

Instead of a miasma, enthusiasm seems all along to have arisen from the boggy surface of Lon Mor and to have stimulated, all who were connected therewith. The thrill experienced when, about 1927, the then technical Commissioner made his first visit must have touched visitor and visitor alike, judging by the expansion of the work on the poorest peat types which followed, both within Lon Mor and beyond.

In all fields of research it would be depressing to find pet hypotheses disproved as they repeatedly are, but for the fact that there are always new ones to try, and because knowledge increases as much from negative as from positive results. It has been thrilling to realise how much less impossible it was becoming each year to afforest more difficult types of moorland. It is heartening to note that the long threatened bogey - sudden termination of growth - has not yet appeared. And so at Lon Mor and in its extension areas we go forward with enthusiasm undiminished; with hope and confidence increased. We are on the eve of tackling the worst the Lon Mor can provide in the way of peat (and that is saying a good deal) by tractor and plough, and considerable success is assured. There will be many old tests to repeat under these new conditions. We have passed through a period when there seemed little hope of securing the necessary mechanical equipment to deal with basin peats, and that led to a partial emigration from Lon Mor and to concentration upon thinner slope-peats on which ploughing might be more feasible; but now wide track Caterpillars and better ploughs have made possible the mechanisation envisaged when Lon Mor was first selected. Still tougher peat knolls and ever more intractable bogs will therefore come within the foresters power to afforest. There is a fascination in coaxing useful plantations to arise "in the wide desert where no life is found". On then "tomorrow to fresh woods - the wilderness and the solitary place shall be glad for them."

(Intd.) J.A.B.M.

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