7 Research

Silviculture

In 1949 and 1950 there had been major developments in the direction and organisation of forest research, under the newly trained and appointed forest ecologist. These centred on learning much more about the ecology of the natural forests and the most effective and economic methods of regenerating them after harvesting; on studying the growth and management of the recently started the softwood plantations; on formalising research procedure and records in conformance with the Indian Silvicultural Research Code; and on close liaison with the advisory staff at EAFFRO.

This programme proceeded satisfactorily in 1951 and close liaison was maintained with specialists of EAAFRO. Visits by the Silviculturist and the Horticulturist resulted in valuable modifications to nursery and planting techniques. The Department adopted the Indian Silvicultural Research Code as a basis for research procedure and progress was made in introducing standard forms for all current research work. A beginning was made in the compilation of data for a publication on 'The Silviculture of East African Trees' and on the introduction of exotics into the country. The former did not materialise within the period of this history but the latter by Dale was published in 1953.

Natural High Forest

As a result of a study by the Forest Ecologist of girth/frequency figures of all species in typical forest plots in South Mengo, he concluded in 1951 that silvicultural improvement operations should centre on the tending of existing young stems rather than the inducement of further seedling regeneration. The next step would be experimental to test various methods of pre-exploitation work with the object of securing maximum survival and growth of economic species. To this end, the 760 acre (307 ha) Mpanga Forest was selected as a research forest and excised from the productive area of the South Mengo working plan. A further series of plots were laid out in Mpanga to investigate the relative effects of four different types of understorey and shrub removal. Work was also begun on weed-tree poisoning.

Work on pre-exploitation treatment of high forest was continued and extended at

Mpanga in 1952/53 and a new permanent research area was opened at Nyakafunjo (Bunyoro). It was hoped that these two plus another to be opened at Sebutole (Toro) would provide sufficient check for the time being on the extensive regeneration work it was hoped to initiate in all high forest exploitation areas.

The work of the Ecologist on arboricides produced results of the greatest value and significance which were summarised in a paper produced in 1954 that there was sufficient evidence that diesel-borne Finopal was an effective arboricide on weed trees of tropical forest. Death of trees followed in from one to eighteen months after spraying of a 4% solution on the bole.

The experiments on understorey felling, ground weed slashing, understorey weed poisoning and ground weeding continued in 1955 but as these long-term experiments proceeded, it became apparent that assessment methods would need revision. The main deduction possible so far was that heavy fellings resulted in regeneration of the order of 150 established saplings of desirable species per acre in three years (three times more than in untreated plots) and that these would survive if given weed-slashing treatment.

An experiment was begun at Mpanga to assess the felling damage during a normal timber exploitation operation. On an area of about 140 acres (56 ha), 154 timber trees were felled by a milling company. All felling gaps were measured and their area calculated; the average devastation including tractor paths amounting to 0.13 acre per tree. All plots were assessed for regeneration and 30 were laid out to study the effects of various types of canopy and understorey weeding.

Increment work in natural forest disclosed extraordinarily high variability in individuals of the same species, on the same site and of apparently comparable silvicultural status. As this would affect the whole question of potential productivity of the forests, the study was considered to be of major importance. Research work on natural forests underwent a major change of emphasis as a result of the Ecologist's work on the management of natural tropical high forest. The principal conclusions reached in 1957 were:

(a) any polycyclic system of management with fellings collapsing into immature growing stock was unlikely to achieve an annual acre increment of over 20 cu ft (0.57 m^3) and would probably attain considerably less;

(b) under a monocyclic system it was unlikely that final crops of more than 20 stems per acre (50 stems per ha) at eighty years of age or perhaps 40 stems per acre (100 stems per ha) at 40 to 50 years could be achieved;

(c) even with growth rates averaging 2 ft (0.61 m) girth in ten years mean annual increments of the final crop were unlikely to exceed 60 ft^3/acre (4.2m^3/ha). Over wide areas the annual acre out-turn of 6 ft (1.8 m) to 8 ft (2.4 m) girth trees were likely to average no more than 30 ft^3/acre (2.1 m^3/ha) to 40 ft^3/acre (2.8 m^3/ha).

In the light of these conclusions, research was therefore directed primarily to a very limited stocking of 'leading desirables' in each crop, it being realised that the land was unlikely to carry healthy final crops of over 100 to 120 sq ft per acre (23–28 m^3/ha) and that adequate growth rate could only be achieved by allowing full crown freedom, at least in the pole stages

of the crop. It was further confirmed, as Malaya had pointed out eight-years previously, that increment cannot be calculated from repeated inventory of tropical high forest crops unless trees are individually identifiable throughout their measurement history.

In all treatments to date, all forms of canopy opening. no matter what their subtle distinctions, promoted seedlings, saplings and small poles while none had any effect on timber-sized trees, however much these appeared to need liberation. After only five years' complete crown liberation, adolescent high forest trees in Uganda had made no useful response to opening such as had been reported from Ghana. If these conclusions were to be substantiated by further work, the logical sequence would be to concentrate tending operations only on the younger crops, i.e. in practice mostly on the regeneration resulting from harvesting and conversion to the uniform system. Therefore the success with field scale arboricide treatments led to more attention being paid to attempts to measure the results of pre-exploitation operations to induce more and better regeneration.

The Silvicultural Section's Annual Report for 1959/60 ran to 16,000 words and the report period was stated to be the most fruitful yet in terms of results achieved, a claim which would be difficult to refute.

The trends in growth rates already established were maintained throughout 1962/63 and confidence was established that the target of a MAI of 1.2 in (3 cm) gbh over a rotation of 60 years, i.e. to produce a 6 ft (1.8m) girth tree in 60 years was achievable. In fact, it was believed confidently that a rate of growth considerably greater than this was possible.

Research plots established in older plantations in Mengo and Bunyoro showed how much their development depended on the degree of clearing before planting. Those planted without deliberate opening, although in lightly exploited forest, stagnated but at least they survived. Experiments were begun to measure their acceleration after arboricidal opening.

New plots were planted with *Maesopsis* after total clear felling.

The Research Plan

An important and stimulating advance was the production in 1953 of a Territorial Silvicultural Research Plan (SRP) which was prepared in an experimental form by the Forest Ecologist and approved in September. The main objectives of the plan were:

(a) to indicate the main problems obstructing silviculture efficiency and to assign priorities to them;

(b) to ensure the sound design, execution, recording and assessment of research plots and to perpetuate the results.

The plan covered a wider field than silviculture in the strict sense and included botanical and ecological studies, the study of pests and diseases of the living plant, etc. The most important principle of the plan was the full and proper recording of all research plots. Progress was made but many plots still remained in 1954 to be properly written up and recorded. Of an estimated 350 plots, 150 were fully recorded but further progress had to await the appointment of an

additional officer to the Silvicultural Division. With his arrival towards the end of 1955, great progress was made in 1956 with the full recording of research plots, a further 145 being written up to give a total of 322 plots at the end of the year.

The 1953 Plan was entirely revised in 1958 by division into a number of separately defined research projects arranged on the Oxford Decimal Classification and ordered according to nine priority headings based on the Government's forest policy. It proved to be most useful and, unlike the original, was in daily use by research staff. A major amendment to the Plan was the addition of a policy statement for an outline of the methods to be used in following up successes amongst the species trials with provenance studies and tree breeding. This was first circulated around the Department as a Technical Note and was later incorporated in the SRP after its approval at a Regional Officers Conference in June 1963.

The second revision of the Plan was completed in June 1963. It included prescriptions for the improvement of control of silvicultural research and continued the work of codifying research practices with the eventual aim of producing standard methods for all the experiments in common use. There were 533 research plots on the register at the end of July 1963, of which 330 were active.

Enumerations

The results of the 1950/52 work in South Mengo were summarised in a paper published in the Empire Forestry Review (June 1952) entitled 'Experiments in low percentage enumerations of tropical high forest'. The most important new conclusions reached were:

(a) sampling errors depend too intimately on population density and distribution to allow prediction of the necessary sampling intensity in a new area before the work starts;

(b) transects need to be fully demarcated and recording units should not be longer than two chains (40m) – as this work is performed by subordinate staff, it is essential to have a method whereby efficient and rapid checking can be done by a responsible officer in the absence of the original enumerator;

(c) considerable care is needed in the categorization of species for enumeration and in the definition of size classes.

Research was also started on intensive enumerations in the Mpanga experimental forest. The forest was enumerated in tenth acre (0.04 ha) plots, about 30 of the more important species being recorded.

Botanical

In 1952 about 300 specimens were laid into the Entebbe Herbarium and 338 distributed to Kew, Oxford and the East African Herbarium. The secondment of an officer of the Department to the Ruwenzori Expedition resulted in a great accretion of montane material

which had not been dealt with by the end of the year. Routine botanical collection continued particularly in the course of enumerations in Kalinzu and Budongo forests.

The publication of I.R. Dale's revision of Dr Eggeling's *Indigenous Trees of Uganda* was a landmark in the Department's history and this officer was also engaged during the year on the preparation of a proposed book on the 'Introduced Trees of Uganda'. It was published in 1953.

A full-time Herbarium Assistant and Librarian was available throughout 1953 with highly beneficial results both to the herbarium and the library. The herbarium contained about 8,800 sheets in 2,600 species but several hundred sheets from Ruwenzori had still to be determined by the British Museum. Some 300 permanent specimens were determined by the Forest Ecologist and many more by Kew and the East African Herbarium.

The herbarium was maintained and extended between 1954 and 1956 – 300 duplicates were distributed to other herbaria. In 1957, the herbarium reached 10,000 sheets in about 3,000 species. District herbaria were maintained at most district headquarters. (This herbarium was eventually handed over to Makerere University to be merged with the one there in 2002.)

A notable discovery in 1956 by the Research Ranger in Budongo was of several large individuals of the West African tree, *Discoglypremna caloneura*, hitherto unrecorded from East Africa. They were only a few yards from a road which had been in constant use since 1943. A considerable achievement was the collection of five trees of *Albizia grandibracteata*, *A. zygia* and *A. gummifera* in apparently 'pure' form for timber tests. Until recently it had proved impossible to distinguish large trees of the first two without leaves – it could now be done on bark alone.

Entomology and Mycology

After completion of training at the Forest School and instruction under the Forest Entomologist, EAAFRO, two Rangers were posted in 1952 as Insect Rangers. They were trained primarily in the routine of collecting information under 'Survey of Forest Insects in East Africa'. One was posted to Opit (Acholi) to make a special study of mvule gall. General collecting by the Insect Rangers made steady progress from 1952 to 1956. A Forest Entomologist was recruited soon after the end of 1956. This initiated a new section of departmental research. The insect collection at Nakawa numbered 455 named species. Two years later it had reached 529 named species, of which 88% were Coleoptera and 40% Cerambycidae alone.

In 1956 *Armillaria mellea* was found on *Pinus radiata* and *Widdringtonia* spp., the latter being apparently highly susceptible. As part of a survey, a plot of eight different pines was established in a heavily infected area to compare susceptibility. The most serious fungal disease was musizi (*Maesopsis eminii*) canker which was first reported from Mwere arboretum (Bugoma) and subsequently was found at Wangu, north of Bombo in West Bugwe and at Mubende. Few trees appeared to have been killed and in the worst affected plantation, Wangu, most of the trees recovered. The exact identity of the causal fungus was uncertain, perhaps a *Fusarium* sp.

Although the reference collection of forest insects increased by only one hundred species in 1956 to a total of 1,404, it received more attention than the previous year in view of the impending preparation of the Departmental Annotated List and EAAFRO's backlog of several thousand unidentified specimens.

Research on termite attack in eucalyptus plantations and treatment with various chemical compounds continued. With the exception of one plot at Moroto, termite control research was centred at Walulumbu where it would receive more attention from the Section. The value of potted plants in reducing the losses (hitherto attributed mainly to termites) suffered by young eucalyptus plantations was clearly shown by Department research plots and by some independent research by the Agricultural Department.

In 1962 a new plot was opened in Budongo as part of a joint project with the EAAFRO Forest Entomologist to study the fluctuations in Ambrosia beetle populations in high forest and their reactions to the intensive tree-poisoning carried out under TSI operations.

Contact was maintained with the entomologist working on the *Milicia* (*Chlorophora*) Gall Fly (*Phytolyma*) in West Africa and on his recommendation some seed of C. *regia* was obtained for trial in Uganda. Although closely related to M. (C.) *excelsa* and apparently producing an identical timber, M. (C.) *regia* appeared to be much less liable to *Phytolyma* galling. This appeared to be borne out by the results – after only one year, from the research plot at Mpanga which showed that the gall fly did not attack the exotic *Milicia* (*Chlorophora*) *regia* and consequently, it might grow twice as fast as the indigenous species.

The insect reference collection expanded considerably in 1963/64 with over 350 new species.

Artificial Regeneration

Arboreta and trial plots were extended in most districts during 1953. Species trials consisted of two categories – the arboretum and the trial plot, the former being confined to groups of not more than 25 trees and including all possible species. The trial plot was normally a chain sq (20 m) and was used only for species of distinct known possibilities. Arboreta were maintained and extended at all silvicultural centres and a large number of new species, largely of *Eucalyptus* and *Pinus* species, introduced in 1955. In all, 124 species were represented in trial plots in 1956. Accelerated work in the discovery of suitable species for plantations in the semi-arid north was badly needed. At the end of 1957, the number of species in trial plots and arboreta was 131, the majority being exotics. There was little sign that the well-tried favourites such as C. *lusitanica*, *P. patula*, *E. saligna*, were likely to be outdone in their respective spheres. The number of trial plots planted in 1963 dropped markedly and fewer unreplicated extensions were planned for the following year.

Hardwood Timber Plantations

A series of trials using closer spacing of indigenous hardwoods was started in 1952 at Budongo, Opit and Kitambwa, covering 29 acres (12 ha). The species used were Mvule, *Khaya* spp., *Maesopsis eminii* and the introduced tree *Gmelina arborea*.

During 1955 there was no extension of work on the silviculture of mvule but all existing experiments were maintained. Dr E.W. Jones of the Imperial Forestry Institute, Oxford spent three weeks in Uganda as part of a study tour right across Africa with a view to a preliminary assessment of the major problems affecting the silviculture of mvule. No new work was undertaken on mvule in 1956 but all plots were kept under observation, a depressing but necessary duty. After from six to 17 years' observation, it was concluded in 1958 that neither *Milicia* (*Chlorophora*), *Khaya*, *Phyllanthus*, *Maesopsis* nor *Gmelina* derived any benefit from being planted under a canopy, however incomplete, of indigenous woodland. *Milicia*, at least, could not be raised to timber size in close plantation either in Lango, Acholi or Busoga but it showed every sign of being an ideal species for wide-spaced culture as might be achieved by a peasant planting scheme with fixed agriculture.

The early growth of *Maesopsis* in Acholi was most promising but it was too soon to judge whether it could be grown on to timber size. Later (1958) it continued to do well. At all major *Eucalyptus* plantations plots were set aside to grow on to timber as this genus was considered to have a potential place in the future timber picture. An experimental thinning of the Kityerera teak plantations was carried out.

Utilisation

The experimental workshop buildings at Nakawa were completed in 1951 except for the seasoning shed. A 3-ton gantry was also erected to unload logs and feed the bandmill. Additional equipment was obtained in 1953 for the experimental workshops at Nakawa. It included a bandsaw lap grinding machine, electric muffle furnace and fly press with dies for blanking saw-teeth. This enabled a start to be made with the workshops although the seasoning sheds had still to be built. The initiation during 1954 of a programme for large scale trials of indigenous species for railway sleepers was a development of probably the greatest potential significance in regard to forest utilisation. The trials were arranged with the EAR&H and embraced the testing in the track of 500 sleepers from each of some ten species at Gilgil in Kenya. It would, of course, be several years before results became available; an assessment in the mid-1960s showed that the *Erythrophloeum* had performed best.

In 1951 strength testing of *Chrysophyllum albidum* and *Albizia zygia* was carried out at the FPRL as well as general tests on mubura (*Parinari excelsa*), a timber with a high silica content which has an abnormal blunting effect on saws and cutters. In 1952 root stocks of tree heaths from Ruwenzori were sent to Dunhills in London for pipe-making trials.

In 1955, a Forest Products Utilisation Research Plan for the period 1955–59 was prepared and approved. It was complementary to the Silvicultural Research Plan approved in 1953 and was drawn up in consultation with the FPRL in the UK. General tests and special tests continued in 1955 on various timbers. Special peeling trials for veneer and plywood were carried out at the FPRL on *Piptadeniastrum*, *Newtonia*, *Mitragyna* and *Aningeria*.

In 1956 general tests were completed at the Utilisation Section Workshops on the timber of *Aningeria altissima*. It was considered to be suitable as a general purpose joinery timber. Trials were completed at the FPRL in England on *Bosquiea phoberos* and *Chrysophyllum albidum*

as plywood timbers. Results were disappointing, the latter being considered unsuitable for any but the lowest grades of plywood while the former, although technically suitable, was considered to be unsuitable for British mills. Other special tests in progress included sea defence trials of Parinari excelsa (mubura) in collaboration with the Timber Development Association in the UK, and in 1960 these showed that after $5\frac{1}{4}$ years of exposure, the annual rate of wear was slightly lower than that of greenheart installed nearby. From the report, it appeared that mubura was as good as greenheart for this purpose and should be considerably cheaper.

The main emphasis in 1957 continued to be on research into the properties and uses of local timbers but towards the end of the year, a programme of milling recovery studies was also begun. Local timber testing was aimed primarily at obtaining immediately useable information and to screen species as a preliminary to more exhaustive testing. For this purpose only relatively elementary pilot testing of the basic properties was done locally. More exhaustive comprehensive tests or special tests for advanced methods of manufacture such as peeling or pulping trials were undertaken by overseas laboratories by arrangement.

The resignation of the Logging and Milling Engineer at the end of 1958 on the expiry of his contract resulted in the mill recovery studies having to be put into abeyance for the time being.

In 1960, sleepers of five species, *Parinari excelsa*, *Holoptelea grandis*, *Celtis sp*, *Erythrophleum guineense* and *Mildbraediodendron excelsum* were handed over to the Railway for preservative treatment and installation in the tracks. Collection of *Piptadeniastrum africanum* sleepers continued. Because of the lack of a Utilisation Officer, research was limited to timber testing as well as peeling trials of *Eucalyptus saligna/grandis*. The *Eucalyptus* was given the normal processing at the Sikh Sawmills & Ginners' plywood plant and a number of test sheets made up. The plywood was of good appearance and no special problems were encountered in manufacture.

Research on *Eucalyptus* crops for transmission poles and timber was raised to third priority because they represented a lot of capital investment and still required an annual recurrent expenditure almost equal to that of the high forest or the softwood plantations. In addition recent suggestions for setting up a paper pulp mill and a continued if unpredictable demand for transmission poles stimulated interest in their growth characteristics.

After tests on fast-grown 13-year-old *Pinus patula* from Kenya, it was considered that mature *P. patula* grown in Uganda could reasonably be expected to be of adequate strength for general building purposes.

A proposal for the establishment of a central utilisation research centre for East Africa with the assistance of UNO was still not decided at the end of 1964. As a result, revision of the Utilisation Research Plan was delayed and no new long-term projects were started. It was thought that if routine timber testing were to be carried out by a central laboratory it would enable the Utilisation Section to devote more time to the improvement of methods of extracting, sawing and handling of timber. R.A. Plumptre was appointed Utilisation Officer in 1963 and timber strength testing continued during the 1960s as did tests on shrinkage and movement.

Conversion studies were carried out on *Eucalyptus saligna* logs from six different sites. Seasoning was undoubtedly the most difficult problem and was critical in the utilisation of this timber in Uganda. Properly seasoned, *E saligna* is an easy timber to work and is very decorative but it will not stand the normal seasoning treatment given by most mills to other Uganda timbers. However it would respond to reconditioning in a special steam chamber built for the purpose alongside the conventional kiln. A trial plot of *E. saligna* at Mbale was maintained with a view to timber production and was thinned accordingly.

The agricultural revolution involved considerable fencing on and around farms. Normally the life of fence posts of either *Eucalyptus* or of commonly available bush species is only one year or two at the most and therefore there is a great potential demand for cheap and efficiently preserved posts. The Section carried out a range of preservation tests using sap displacement by copper-chrome-arsenic salts. The trials were very promising and the method and results were given a very wide circulation.

In 1965, the first revision of the Utilisation Research Plan and the first Entomological and Pathological Research Plan were approved and published. The plans together with that for Silvicultural Research laid down priorities and procedures for research and list all projects and trials.

Timber testing of natural high forest species was nearing completion in 1964/65. Plans were made for full scale testing of the more important plantation species.

A small pressure impregnation plant was installed and trials started to determine the resistance to impregnation of NHF species. A prototype solar dryer was built in 1965

A 70hp four-wheel drive articulated logging tractor was obtained as a gift from the Canadian Government. A log turner, also from the Canadian Government, was installed. The British Government supplied conveyors and a new 8-inch Stenner bandsaw and carriage, plus conveyors for the whole mill and a sawdust extraction system..

For the first time it was possible, due to the availability of staff, to carry out detailed sawmill studies.

Increment/Establishment Plots

Plots of various exotic species were maintained or extended in 1951. Increment plots of native species including mahogany, mvule etc were maintained. Remeasurements were made of *Podocarpus* trees planted by L.C. Chalk in Masaka in 1922/23. Height growths ranged from 10 ft to 40 ft (3–12 m) with gbh up to 2 ft 6 in (0.75m).

Increment and establishment plots were maintained or extended in 1952 – a number of new species, coniferous and broad-leaved were introduced. Rotation and spacing plots of *E. saligna* were felled (4 years) at Kampala – girth varied directly with the spacing but yield was in inverse proportion.

Soil Investigations

Soil investigations were made at West Bugwe, Kigezi and Kyehara in 1951 and fertiliser trials were begun in the Lango/Acholi nurseries.

In nursery fertiliser trials at Opit there were indications that NPK had a beneficial effect on mvule transplants.

A series of fertiliser experiments in eucalyptus, pine and cypress nurseries showed a universal benefit from the use of NPK, ranging from 10% to 200% improvement in height of seedlings according to locality. At Kitubulu, mvule showed no response either to fertiliser or trace elements.

Work on *Maesopsis* seed started in 1956 began to show results in the nurseries but direct sowings in the field continued to disappoint.

Arboricides

Assessment was continued on the efficiency of contact arboricides, the indication being that 2,4-D was almost as lethal as 2,4,5-T though taking longer to act.

Work was started in Karamoja on the use of arboricides for killing out scrub growth with a view to pasture improvement. Experiments near Moroto proved that most bush species could be killed by a basal spray of ½% 2,4,5-T in diesel oil and that crown sprays were uneconomic and were only partially effective.

Electric Fencing

Three experimental fences were erected in natural forest and maintained with a great variety of batteries, insulators and wire but maintenance costs reached the appallingly high figure of £5 per mile (1.61 km) due to the frequency of short circuits from cob-webs, falling branches, climbers and luxuriant vegetation and the frequency in some areas of breaks caused by animals. Buffalo were generally defeated, elephant rarely. The study was wound up in 1960 for the above reasons.

In the only area where elephant were excluded successfully, the effect on sapling regeneration was phenomenal. Five years of persistent lopping gave way to some of the most rapid growth ever seen in Ugandan natural forest.

Microclimate

The construction in 1958 of a 120 ft (37 m) steel tower in the Mpanga forest by the EA Virus Research Institute to study mosquitoes allowed the Department to accumulate data on wind, humidity and temperature at all layers of the forest. It was soon evident that saturation deficit was very considerably lowered by understorey conditions. An attempt was made later to move the tower or erect another one at a more suitable location.

An unexpected bonus came via the light traps on the tower which were a notable source of other interesting species of insects.

Volume Tables and Analysis of Data.

New mahogany volume tables for Budongo were compiled in 1956 taking full account of buttress and crown rejects. This required no change in yield control prescription for the forest.

Considerable progress was also made with the production of volume tables for the high forest species with the assistance of the computer service of the Commonwealth Forestry Institute. In all, 20 two-dimensional tables (i.e. based on girth at 10 ft (3 m) and timber height) and 19 tables based on girth at 10 ft (3 m) only were produced.

J.N.R. Jeffers, Statistician with the UK Forestry Commission, spent one month in East Africa, including ten days in Uganda, visiting research plots and examining details of individual plots as well as general principles of their control, design, execution and analysis. The purpose of the visit, which was sponsored by the Department of Technical Co-operation, London, was to advise on the application of statistical methods to forest research with particular emphasis on modern methods of recording experimental data so that they could be subjected to mathematical analysis by means of electronic digital computers. His valuable report was accepted and the implementations of its recommendations resulted in improved planning of research and, what was badly needed, speedy analysis of the data.

Yield Tables

Work on compiling East African yield tables for the main conifers was started during 1956 with co-ordination by EAAFRO. Quality classes for *Cupressus lusitanica* were tentatively defined and sample plot work started early in 1957. According to the first draft of a yield table produced the following year, Uganda crops were of high quality, lying mostly in QI with some QII. By East African standards there were no QIII crops. Seven- to ten-year-old crops on better sites at Mafuga and Lendu showed mean annual increments from 245 to 325 cu ft/acre (17 to 23 m^3/ha).

Some astonishing volume increments were found in softwoods and *Eucalyptus* in 1959/60. In the latter, MAI ranges from 250 ft3/acre (17.5 m^3/ha) on poor soils in the east to over 800 ft^3/acre (56 m^3/ha) in Toro. In the case of conifers, MAI ranges from 150 to 350 ft^3/acre (10.5 to 24.5 m^3/ha), the best performance being Cupressus on forest sites at from 5,000–6,000 feet altitude (1,500–1,800 m) in altitude.

Diagnostic Sampling

This technique of diagnosis adapted from Landon's 'LS' method of Malaya was tested on field scale by research staff in 1958. This resulted in some simplification of the method described in Paper 34 (Imperial Forestry Institute) as set out in departmental standing orders for tropical high forest treatment.

Seed Supplies

Thanks to the contacts made by the Silviculturist during the FAO study tour of Latin America and the attention which the tour focussed on these countries, the supply of seed of many of the Latin American conifers improved although it still remained inadequate. The most welcome acquisition was 35 lbs (15 kg) of *Pinus caribaea* var. *hondurensis* obtained through the Department of Technical Co-operation, London.

Seed Orchards and Tree Breeding

In 1962/63 the *Ecologist* reported 'Talk, talk, talk and paperwork was all there was to report'. Grafting for practice was started in the Entebbe nursery.