Brief Report on Visit to Forests of Portugal, 8th - 15th October, 1950.

Notes by D. W. R. Stewart.

Object of Visit -

1. To make contact with the seed firm of Patricio Ferreira Patricio, and enquire into the origin of our 'Leiria strain' seed of P. pinaster.

2. To see something of the forests of 'Leiria strain' P. pinaster in their natural habitats, and seek information on their establishment, maintenance, growth, production and utilisation.

Preliminary Remarks.

1. As it is not desired to duplicate the report of Mr. Cromer, on his 1947 visit, much of the information furnished by him will be omitted from this report, except where it is desired to add to it, or comment on it.

2. Further information is available from Mr. D.A.N. Cromer's translation of the Portuguese publication entitled "About the Forest Service", and he will no doubt supply a copy on request if you have not yet received one. This gives a good general picture of the activities of the Portuguese Forest Service, the part forestry plays in the economic life of the nation, and the objectives of the "30 year Plan".

3. The present Director-General is Snr. Filipe Jorge Mendes Frazao, who speaks French but not English.

The two men who accompanied me on the tour were both from the laboratory of Forest Biology. They were the Chief of the Laboratory, Snr. Jose da Cunha Monteiro, who speaks French and German well, and a little English; and Snr. Azevedo e Silva (Entomologist) who speaks French and English well, and had just returned from a 7 weeks tour in the United States under the Marshall Aid Plan.

Organisation of the Forest Service.

In addition to the four Field Service Divisions (see Cromer's report) there are four Divisions based on Lisbon Head Office, as under :-

1. First Technical Division - Covers Administrative Management and Exploitation of National Forests and Forest Lands.

2. Second Technical Division - Covers a wide range :-

   Afforestation of Mountains & Dunes.
   Watershed Management - Torrent, flood, and erosion control.
   Forest regime.
   Protection of Private Forest Property - especially cork oak groves.
   Topo Surveys
   Engineering
   Wild Life and Game
   Technical Assistance
   Fish-breeding Units.

3. Third Technical Division - Covers research activities :-

Cadastral Surveys
Forest Management (and Management Accounting).
Fire Control.
Research - e.g. Phytopathology, Chestnut diseases, Soil chemistry.
Technical Assistance
Ecology.
Pine Tree Experiment Station.
Wood technology.
Cellulose and Wood Pulp.
Laboratory of Forest Biology - (Entomology, seed testing, Botany, Mycology, etc.)
Naval Stores Laboratory.

4. Division of Fiscal and Administrative Services

Accounting.
Staff.

Seed Supplies.

A. Pinaster seed from the private firm of Patricio Ferreira Patricio.

The business is apparently run by father and son who do not speak English, but the son's wife understands English, speaks a little, and is able to translate correspondence. They are local (Leiria) seed merchants who also sell a lot of seed to the Portuguese Forest Service.

The seed is collected only from private forests in the Leiria region, (they are not permitted to collect it from State Forests) from standing trees by climbing them, and by using long iron hooks to pull off the cones. There is, of course, no attempt at selection of trees, except that cone gatherers are attracted to the trees with the heavier crops of cones. The only forests of very poor form are those forming the long narrow strip of 'protection' forest close to the coast, and as these are mostly state owned, no seed comes from them to Patricio F. P.

Collection is made from November to April. An export permit is necessary before the seed can be exported. This may take as long as three months to get and may be delayed until Forest Service requirements are met. The seed is the same as supplied to the Service. It is desirable to order in good time. The 1950 order was recently filled.

B. The Forest Service buys its seed from a number of suppliers, both small and large. Sample seed in sealed packets is supplied by producers to the Service, one packet being preserved intact, in case of dispute, and the other analysed in the Laboratory of Forest Biology, for purity and germination capacity. The actual price paid per unit weight for this seed, vafies with its quality, and germination per cent. The seller abides by the result of the analysis but if he disputes it, he may call for analysis of the second sealed packet to confirm or refute the previous results. Germination tests are carried out on damp shallow sand trays in a room kept at 55°C.

As seed extracted at high temperatures in kilns, may have its germination capacity impaired, the Service insists that all seed bought must still carry the wings (as evidence that it has not been subjected to high adverse kiln temperatures). The figure for 'cultural value' for each sample takes into account * 'purity' as well as germination per cent.

Over 40% good seed is considered very fair
Over 50% " " " " very good
Over 60% " " " " excellent quality.

Most samples are 40% or better, but some run lower than 30%.

The forest service also collects large quantities of seed from its own forests. As was done in France (Landes), the cones are piled on a large concrete floor about 30 yards by 40 yards surrounded by a low 18" wall. They are spread out gradually, as warm summer weather advances, to a depth of 2 cones, by women workers, who beat the cones together as they dry to dislodge the seeds and then throw the open cones to a heap outside the wall. Workers gather the cones in either private or State forest (mostly the latter) and are paid for them at approx. 9d. sterling per 100 cones. Average yield is 1 lb. of seed per 62 cones, so that the worker receives about 6d. per lb. of seed. One such site inspected had obtained 7,238 lbs. of seed from 449,050 cones. The empty cones are sold per 1000 for fuel.

* N.B. Analysis for 'purity' determines the percentage by weight of extraneous matter such as dirt, scales, pieces of leaf and twig etc.

Part played by Forests in Portugal's National Economy.

In 1932, Portugal is listed 10th in countries for tree cover in proportion to total area with 26.2% under forest. This area has since increased. Much of it is comparatively open, and forest of low height growth such as cork oak.

Average annual value of exports over 5 years 1937/41 = £5,120,000 being 25% of total exports.
Average annual value of imports over 5 years 1937/41 = £820,000 being 3% of total imports.
∴ Annual value of net balance of exports = £4,300,000 of timber and forest produce. (Total area of P. pinaster forest - state and private = 3,250,000 acres).

State Forest Area in 1938 was 296,000 acres being approximately 4% of the nation's forests - 96% were privately owned.

Total forest area = 7,400,000 acres.

It is not known what percentage of this wealth comes from forests of maritime pine, but they occupy a large area both on the coastal plain and in the hills and mountains of the interior up to 2,500 ft. altitude, where they are able to grow on poor soils, - often on rock from which all soil is long since eroded. They provide considerable quantities of pit-props for export in addition to sawn timber and turpentine.

In 1938 a 30 year plan was approved for afforestation by the State of a further 880,000 acres. Except for some 22,800 acres of coastal sand-dune, all this afforestation area is eroded mountain country. P. pinaster will play an important part in the whole scheme. In the first 11 years of the 'Plan', 1939/49 afforestation work totalled

On sand dunes - 22,590 acres.
Mountain country 103,150 "

This is no mean achievement.

Sand dune pinaster forests on the strip between Nazare and Aveir (80 miles) is said to be about 125,000 acres.

Afforestation of sand dunes.

The pine seeds are sown in furrows about 3 ft. apart, together with seeds of shrubs, and grasses, such as Marram grass; artemisia crithnifolium; tamarix gallica; mesembryanthenium; spartium junceum; Ulex; arbutus unedo; acacia longifolia; and Myrica faya. Before sowing, heaps of brush and branches are provided at intervals along the line and used to cover the seeded strip to reduce the intense heat and shelter the young seedlings. Branches with persistent leaves are required - Pine branches are not suitable as they shed their needles. Ulex is one of the best. Others are Spartium, Calluna, Erica and Corema album. The shrub species after germination, protect the young pine in early years.

Seed quantities used are 25 lbs. to 35 lbs. per acre. If a supplementary sowing is necessary, 9 to 13 lbs. per ac. used.

Soils - P. pinaster is used on a wide range of soils and does well on the poor rocky granites with very little soil (e.g. on the mountain of Busaco). It does not thrive on calcareous soils, however, and small failed areas on calcareous soil have been resown with P. halepensis, which succeeds thereon.

Tending - (a) Pruning is not practised in State Forests. Drastic pruning may be seen in many private forests where the limbs are removed for fuel, both household and for bakers' ovens. In extreme cases the trees are pruned to within 5 or 6 whorls of the top leaving a spindly stand of 'feather dusters'. Such pruning will not produce clean timber either, as branch stubs are left from 3" to 6" long.

(b) Thinning - See notes given by D. Cromer on thinning and spacing. As the stands are grown primarily for good timber, this cautious thinning practice contrasts with Landes practice in France where the object is large healthy crowns to produce maximum resin yield. Here, the trees are not tapped until 20 to 30 dms. diam., i.e. just shortly before felling. (Cromer states 3 years before felling). In private forests, quite small trees may be tapped, and at much earlier ages than in State Forest.

There is a ready sale for all thinnings both locally and for the export pit-prop trade.

Harvesting and Utilisation

In the Forest of Leiria, extraction of the final crop was by light narrow-gauge railway, with a loco fired on wood fuel and carrying a spark arrester. The present tendency is to build good roads and extract the logs by motor transport. Extraction to loading sites is done by bullocks, mule or donkey, and bullocks may also be seen drawing logs along the roads. The 1938 'Plan' provides for 1500 miles of new forest road, of which some hundreds of miles are in the coastal dune forests. All branchwood is removed as fuel, and carried out by donkeys, bullocks, and women, the latter taking large bundles of the small faggots. Even large quantities of needle litter are removed, apparently for spreading over fields as fertiliser, and for bedding down animals.

Many sawmills may be seen converting the timber, which is used for practically all purposes:- Buildings, joinery, floors, panelling, ceilings, furniture, etc. The heartwood is selected for high-quality interior work to avoid the unsightly

blue stain which so readily appears on the sapwood. The pinaster interior of district offices was quite pleasing.

I was informed that one pulpwood plant was using P. pinaster both for chemical and mechanical pulp.

Yields - Very little was obtained in the way of growth figures. - The M.A.I. in Leiria forest was given as 4 $m.^3$ per ha. an. i.e. 56 cu.ft. per ac. an. The maximum in fast grown forests is stated to be 6 $m.^3$ ha. an. i.e. 84 cu.ft. per ac. an. Some figures taken from a recent assessment of a forest south of Marinha Grande, give an indication of possible yields in this region, and are listed below:

Age of Stand	Vol.per. ha.	Vol. per. ac.	M.A.I. per ac.
50	120 m/c	1680	33.6 c.ft. per ac.
50	140	1960	39.2
50	150	2100	42.0
50	165	2310	46.2
39	127	1778	45.6
39	96	1344	34.4
39	152	2128	54.6
17	123	1722	101.3
16	108	1512	94.5
14 to 16	91	1274	85.0
14 to 16	70	980	65.3
51	183	2562	50.2

Yield tables were not available for me at the time. (Volume tables for the forests of Leiria and Urso are attached.)

Resin Tapping According to information given to Mr. D. Cromer, this is carried out during the last 3 years before felling, i.e. a heavy 'tapping to death', and this presumably applied to both thinnings and the final crop. I was informed that tapping is not done until the trees are 20 cms. diam. or more. In State Forest, it is not the practice to apply light tapping to final crop trees, as is done in France.

Subdivision and Organisation for Fire Control

With a long, hot dry summer, there is a considerable fire hazard, and conditions appear closely parallel with our own on the coastal sands of the S.W. of W.A.

The standard layout of compartments is a rectangular pattern with the long axis north and south (i.e. parallel to the coast) giving compartments 400 metres x 800 metres (i.e. ¼ mile x ½ mile) having an area of 80 acres. These may be further subdivided by sand track extraction routes. (The compt. boundaries are cleared fire-lines only 11 yards wide East-West and 5½ yards wide North South. The Divisional Forest Officer (Snr. Aralo Pinto) considers these too narrow. (Twice the width would be better for fire-lines.) Maintenance is carried out by hand labour; clearing of scrub growth with spade and hoe every 10 years, to expose the sand on the fire-line strip.

Detection of smokes. The coastal belt is covered by a series of lookout towers on the higher points enabling smokes to be located by cross-bearings. The cabin is equipped with telescope pivoted over a protractor circle, a telephone, but no plan. It is manned by two men on alternate 4 hour shifts.

Fire fighting is done by hand tools, beating and raking trails. There is always plenty of labour available from work people living in and close to the forest, who realise that fire suppression is in their own interest, as they draw their living, or many advantages from the forest. It is rarely that a fire reaches any appreciable size before being attacked and suppressed. I was advised that 30 acres was the greatest area lost for many years.

Once canopy is formed, utilisation is so intense that all dead branchwood is removed for fuel. Furthermore, the removal of large quantities of needle litter by farmers still further reduces the amount of inflammable debris on the forest floor, thus tending to reduce the fire hazard to a minimum. The most vulnerable areas are the young stands up to 20 years of age.

Regeneration of stands is, as in France, by clear-felling, and natural regeneration, supplemented by broadcast seed. It was noted, however, that a very light stocking of 'standards' (perhaps 1 to 3 per ha.) is retained to provide a reserve of large trees for special government requirements. These were always very good specimens. The rotation is 80 years (see Cromer's notes).

General Observations.

Pests - None of serious consequence. The processionary moth (a defoliating caterpillar) is present as in the Landes, and does a certain amount of damage, but is not serious.

Unthrifty Plantations - 'Sick Areas'

It was surprising to note comparatively large areas of very unhealthy growth on certain sand dunes afforested in recent decades. They appeared very similar to some of our 'Phosphate-deficient' areas where the pines exist for years but do not grow. They are yellow, stunted, short needles, and very unhealthy. (It is hoped that photographs when developed, will illustrate the condition). Some examples seen were :-

a) Forest of Urso - Age 24 yrs. - 7 kms from coast; yellow pines 3' to 7' high on pure sand. - Beyond, in a slight depression the pines were healthier, green, and 20' to 30' high.

b) Age 21 to 23 years - height 18" to 5' - yellow colour. A very few odd healthy trees scattered singly or in small groups throughout.

c) Age 17 years - height 1' to 3' - A large area of dune, sown in lines - poor and yellow.

d) Age 10 years - height 6" to 3' - poor and yellow - Occasional trees in depressions are normal green, healthy, and 6' to 8' high.

The Service is keenly interested in the W.A. work on pine nutrition, and has commenced phosphate trials in an endeavour to effect an improvement. Local officers informed me that it is not unusual to get very poor results with the first sowing, but that with a re-seeding in the second rotation the results are much better. They would be pleased to receive a copy of Bulletin 50 when it is reprinted.

Use of Eucalypts and Wattles

On moister sites, (e.g. in proximity to swamps which are being drained and afforested,) and on a range of soils, including bare rocky mountain soils, phenomenal results have been achieved with Euc. globulus. e.g. (a) One swamp drained in 1910 yielded 266 tons of firewood per acre when felled for war time fuel at the age of 31 years. Coppice shoots on these stumps are now 8" to 12" diam., and from 40 ft. to 70 ft. high in 9 years. - ((b) A plot 33 years old was seen with inside trees approx. 72" G.B.H. and edge trees up to 108" G.B.H., with heights of 120 ft. and more.

Acacia melanoxylon has also done very well both alone and as an understorey below the E. globulus, with trees 12" to 15" diameter at 33 years, and 60 ft. high.

As mentioned by D. Cromer, the Service is anxious to procure eucalypt seeds for trial, in view of their very large projects for afforestation of mountain country, and dry soil types. They would be very pleased to receive any seeds, particularly of some of our more promising dry-country species.

Staff - Recruitment and Training.

Professional Officers ("sylvicultural Engineers") are trained at the "Instituto Superior de Agronomia" at Lisbon, doing a four year course plus one years field work leading to the degree 'Engenheiro Sylvicultor'. If successful they may then be appointed 'Forest Engineers' - 3rd class, rising later through 2nd class to First Class. The course is commenced at 17 years of age.

A subordinate grade of Forest "Regentes", does a four year course of training from 13 to 14 years to 17 or 18 years at one of the three "Agricultural Schools" of Evora, Lantarem, or Coimbra. After some field training they begin as 3rd class 'Regentes', and work up through 2nd to 1st class. Forest guards are recruited from the army and must pass an examination before being appointed in the 3rd class. Promotion may follow to Forest Guard 2nd and 1st class and then further to 'Master of Forest Guards' 2nd and 1st class.

Each of the four major divisions under a 'Forest Engineer' may contain from 4 to 8 districts or 'administrations' which may be controlled either by a Forest Engineer or a Forest 'Regente'.

References in Literature.

1. I managed to purchase a copy of Snr. Aralo Pinto's "Pine Forests of the King" covering in detail the Leiria Pine Forests. It is well illustrated, but will require a translator. It is probably the only comprehensive work on P. pinaster in Portugal, but is concerned particularly with the species over a limited range in the Leiria region.

D.W.R. Stewart
9/12/50.