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Republic of Lebanon
Office of the Minister of State for Administrative Reform
Center for Public Sector Projects and Studies
(C.P.S.P.S.)

THE PLACE OF EUCALYPTUS IN REAFFORESTATION IN LEBANON
A REPORT FOR THE GOVERNMENT

by
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S U M M A R Y

1. Although most of Lebanon has highly calcareous soil in much of the area which limits choice to some extent the climate is suitable for growing several species of Eucalyptus.
2. Because of the intensive agriculture there is however very little land available which is suitable for Eucalyptus planting.
3. The principal benefits from Eucalyptus are in short rotations and high yields under such rotations but these can be achieved only if soil is available which can be prepared mechanically and which can be completely clean-cultivated for the first two years.
4. To evaluate fully the potential with Eucalyptus a series of arboreta should be established in different regions using proper cultural methods.
5. The following sites are suggested for small arboreta using the species indicated.
 - a. Bekaa near Baalbek E. dalrympleana, E. rubida, E. viminalis, E. ovata, E. leucoxyton, E. sideroxyton, E. albens,
 - b. Nabatiye E. camaldulensis, E. leucoxyton, E. sideroxyton, E. maidenii, E. gomphocephala, E. occidentalis, E. albens, E. melliodora.
 - c. Bayada Tyr species as for Nabatiye
 - d. Tyr-sandy area south of town E. camaldulensis, E. occidentalis, E. gomphocephala, E. platypus, E. lehmanni.
 - e. Tyr nursery with and without irrigation in a paired plot
E. grandis, E. citriodora, E. gomphocephala, E. camaldulensis, E. cladocalyx, E. occidentalis.
6. The position should be reviewed in five years time, especially in relation to other agricultural and forest crops.
7. A working trial with a village plantation for firewood and rough construction timber should be made in association with a suitable small community.

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THE PLACE OF EUCALYPTUS IN REAFFORESTATION IN LEBANON

It has been found during the last several decades that various species of Eucalyptus are of particular value for use in reafforestation work in the warm temperate latitudes of the Mediterranean. Eucalyptus is of particular value where a yield of general utility timber is needed in a short time for firewood, charcoal and rough construction. It has also filled a demand for timber on a rather large scale for the industrial process of semichemical pulp manufacture where again its capacity for quick growth and high yields on a short rotation has been of particular value. There are several places too where by carrying on trees for a longer rotation sawlogs are produced and the timber is used for construction and furniture in the traditional way.

Eucalyptus has certain requirements for satisfactory growth apart from the broadly limiting climatic and soil requirements. The sites on which it is to be planted must have soil (or loose substrate) of reasonable depth and secondly, prior to establishment, most sites (unless they are, for example, deep loose sand) must be deeply ripped with heavy machinery, and during the first two years the surface must be thoroughly surface-cultivated so that there is no growth of other plants whatsoever. Unless these requirements are met the principal benefits in growing Eucalyptus—short rotations and rather high increments are lost. It is against this background particularly that the prospects for successful Eucalyptus planting must be gauged.

CLIMATIC AND SOIL REQUIREMENTS

Lebanon has a climate in which the strictly winter rainfall is high in comparison with many other localities around the Mediterranean and except possibly for the drier parts of Bekaa towards Hermel there is rainfall adequate for some species of Eucalyptus. The temperature too is in the main mild enough for correctly chosen species but it becomes too cold in the higher mountains and in much of Bekaa the occasional very cold winter spells are near the limit for successful growth of species which will withstand the summer draught there.

The soil is, with very few exceptions, highly calcareous and although the "active lime" content is not always at the same intense level which is often found it is sufficiently prominent again to limit the group of species of Eucalyptus which can succeed in this edaphic environment to a rather small number for any given climatic zone.

PAST INTRODUCTIONS OF EUCALYPTUS

In spite of the lack of plantations, Eucalyptus is a common sight along the coast of Lebanon. The large majority of the trees is *E.camaldulensis* with here and there hybrids of this species mainly with *E.rudis* and here and there with *E.botryoides*. Both of these hybrid combinations no doubt occurred before the seed reached Lebanon and the morphological diversity which results is well demonstrated in the plantation and line planting in the Agricultural and Forest Nursery at Tyr.

There are several old (30 years or more) trees of various species in and around Beirut itself where the following were seen:

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| <i>E. citriodora</i> | well grown in a private house in Chiah about 75' tall and 24" D.B.H. Also in Museum Square. |
| <i>E. paniculata</i> | of moderate thrift only at Badaro. |
| <i>E. sideroxylon</i> | in a street in Beirut, well grown and healthy. |
| <i>E. botryoides</i> | along the roadside near Amcheet, near Byblos. |
| <i>E. globulus</i> | in a private garden, well grown, in Bhamdoun |

In the grounds of the college at Jamhour, and all less than 11 years of age the following species were seen:

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| <i>E. gomphocephala</i> | fair growth. |
| <i>E. leucoxylon</i> | " " |
| <i>E. occidentalis</i> | good near tennis court. |
| <i>E. sideroxylon</i> | quite good but not very fast growth. |
| <i>E. astringens</i> | two good trees near tennis court. |
| <i>E. salmonophloia</i> | rather poor. |
| <i>E. cladocalyx</i> | fair (35' and 10" D.B.H. in 10 years) but with a tendency to chlorosis. |
| <i>E. wandoo</i> | moderate only. |
| <i>E. rudis</i> | poor |

The rainfall here is about 700 mm and the elevation about 300 m.

At Tannayel in the courtyard of a farm with some degree of protection six trees, 24 years old were seen together with one *E.camaldulensis* which had been repeatedly damaged by frost.

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Two trees were *E.ovata* about 70' tall and more than 18" diameter. These were damaged by frost in the winter of 1962-63 and the leading shoots were dead for about 20'

Three other trees were *E.rubida* with rather less growth-up to about 50'

One tree may have been *E.dalrympleana* which was about the same size as the *rubida*. Neither of the last two species showed any sign of frost damage.

Otherwise throughout Lebanon single trees and roadside plantings of *E.camaldulensis* are often seen. They exhibit frost damage at elevations above about 1000 m and in Bekaa and frequently many of the individuals especially the older ones show moderate to severe chlorosis.

FUTURE INTRODUCTION AND PLANTING

Areas included within the Plan Vert such as those near Berkayl or Bayada near Tyr or Nabatiye are not promising for the establishment of Eucalyptus which should be limited in such localities to very small trials with a few selected species. These sites are rather steep and rocky being in a late stage of soil degradation with a considerable amount of *Poterium* always present. Eucalyptus species such as *E.gomphocephala*, *E.sideroxyton*, *E.leucoxyton* and *E.occidentalis* will grow on such areas but only if considerable effort is put into site preparation in the formation of contour banks or terraces together with subsequent cultivation. These operations are not always feasible on the more rocky sites but where they are they are costly. If applied they will give reasonable growth but the amount of growth increase over that of the local conifers which can be planted alternatively without such elaborate establishment technique is scarcely likely to justify the very heavy expense involved in preparation.

While it is important to warn against optimism in the growth to be expected from Eucalyptus on the lands mainly available in Lebanon at lower elevations on which Eucalyptus could conceivably be planted, it is nevertheless desirable to have an actual experimental demonstration of the growth potential of the most suitable species on such sites and it is recommended that some small trials be established in locations such as Bayada and Nabatiye to evaluate this more precisely.

On deep sands such as the area just south of Tyr several species can be expected to grow well and of these *E.camaldulensis* may well be the fastest. here, however, strict attention must be given to protection from wind from the south-west which everywhere in Lebanon shows itself to be a very potent factor of the environment. In establishing shelter on the seaward side on such sites several local species such as *Tamarix* are of great value as well as *Acacia cyanophylla* and these might be supplemented by Eucalyptus *platypus* and *E.Lebmanni* with advantage. Such soil conditions are however very limited in Lebanon and are apparently not sufficiently extensive to make if planted a significant contribution to timber production.

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The position in Bekaa is interesting since the climatic conditions there appear to be near the limit for Eucalyptus. There are other deeper soils which can be handled mechanically and it is quite possible that if a species suitable for the site can be found that the production of some industrial timber there might ultimately be found more profitable than wheat growing on the poorer sites. Again a trial on a few hectares with a small group of selected species is well worth while to evaluate the prospects. In such a trial *E. rubida* and *E. Dalrympleana* should be included.

There is one other possibility worth consideration. Along the coast there is clearly a narrow zone of particularly mild climate in which at present bananas are being grown to a considerable extent up to an elevation of about 100 m. Although it has never been tried adequately, it is possible that *E. grandis* would thrive in suitable situations in this zone and that it would be a useful tree for the small private owner to plant. It would have to be used on very restricted areas mostly as line planting along the small streams but its good form and fast growth as well as the general utility of the timber offer attractions here.

There is also scope for more variety in planting for ornament and shelter and a small trial in the Nursery at Tyr both with and without channel irrigation would be justified. In this *E. grandis* and *E. citriodora* should be included.

FINAL COMMENT

Forestry in Lebanon can be aided a little by the use of more Eucalyptus but the main issues for improvement are clear. As with so many areas in similar latitudes grazing and particularly goat grazing is still causing degrade to the forest remnants. Elimination of such grazing such as has been achieved in the northern districts of Tunisia in a spectacular way would be of great benefit to Lebanon and is perhaps the most important single method for forest improvement.

In the long term too, planting of Cypress and Pine on the steeper and more rocky sites will transform much of the countryside into and more productive land from reports available it is apparent that Cedar and Fir forest can be rejuvenated, again mainly by the control of grazing.

In time, the importance of various agricultural crops may change to the extent that timber-growing for industrial use may become even more profitable than some forms of existing agriculture as has indeed happened in North Italy. Basic information in relation to this possibility is needed.

There is little doubt too as the result of recent research that poplar growing in Bekaa could be considerably improved even at present in the existing economic and land use pattern and there is the possibility that it could replace as well a small proportion of the existing crops.

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There also seems to be a paradox in the belief that more firewood and rough construction timber is not needed in Lebanon. It is obvious, of course, in the bigger cities like Beirut itself, that fuels alternative to wood are widely in use and are increasing in consumption. The Kerosene carts can be seen all day long, and no doubt electricity and Butagaz are also widely used. Nevertheless there are many small villages in Lebanon, often at considerable elevations, where the weather is cold for half the year in which fuel for heating and cooking must be at a premium. It is reported that the firewood consumption in Lebanon is increasing but at a rate less than that of the population increase. This implies that the less well-to-do segments of the community still depend very much on wood for these things and will continue to do so for a long time in the future.

If this conclusion is correct there is a very important place for Eucalyptus planting in association with villages using some of the land which is at present used for rough grazing. In many localities such land could reasonably be converted to Eucalyptus plantation by the use of mechanical equipment and yields of firewood and timber for rough construction obtained in a short time. An area where this seems feasible is in the vicinity of Insar Dmoul where the sites are much more suitable for Eucalyptus planting than the steeper and more rocky areas such as Nabatiye. Species like *E. leucoxydon*, *E. albens*, *E. gomphocephala*, *E. melliodora* and *E. camaldulensis* could be expected to grow here, and the most useful amongst them could be selected after an initial trial. In such circumstances the support of the local community for such an undertaking would be essential. It may be that the locality mentioned is not the ideal place but there must be suitable alternatives with similar soil and topographic conditions.

The possible value of such planting in the present stage of development of Lebanon is so great—in my opinion—that a good working trial to assess the value of such local planting should be made.

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