

Staff who gave us such a good look round their department this afternoon. Our thanks also to the domestic staff here for the excellent way in which they have looked after us. Finally, our thanks to Arthur Carter, now our President but who, as Vice-President, had the responsibility for arranging such an excellent programme.

**NOTES ON THE PROPAGATION OF SOME ORNAMENTALS
AT THE NURSERIES OF THE CAPITAL CITY
DEVELOPMENT CORPORATION, LILONGWE, MALAWI**

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Lilongwe, Malawi

Stocking of the nurseries commenced in January, 1970, and it is hoped that the following notes on our experience to date may be of interest to others starting from scratch under tropical or sub-tropical conditions.

Climate. Lilongwe is situated 14° south of the equator, at an altitude of 3,500 ft. Annual rainfall is about 33 in., almost all of which falls between late November and early April. Mean relative humidity during January-February is approximately 85%, falling steadily during the dry season to 52% in October.

Mean temperature throughout the day rises to 74° F. in November and falls to 59° F. in July. Occasional frosts are experienced during June-August. Mean surface wind speed is approximately 4 mph in January and February, increasing steadily during the dry season to reach over 7 mph in October. Climatic data is shown in Table 1.

Leaf fall of most trees begins in June and much vegetation is defoliated by August. Many shade trees and shelter belts are, therefore, ineffective from June to November, although some recommence growth in September—long before the rains arrive.

All of the above factors influence the nursery propagation routine.

Experience to date has shown that the most productive methods of propagation under these conditions are by hardwood cuttings and by seed.

Hardwood Cuttings. Suitable material becomes available after leaf fall but hardwood cutting propagation can also be carried out at other times, in which case material should be defoliated. Material inserted in August when temperatures begin to rise will make adequate growth by the November-February planting season. Hardwood material is convenient to use during the August-November period of low humidity, minimum cloud amount and rising temperatures and air movement.

Table 1. Temperature, humidity, wind levels, and cloud cover at Lilongwe, Malawi.

Monthly Means	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Mean daily temp., ° F	70	69	69	68	64	60	59	62	68	73	74	72
Mean daily humidity, %	84	85	80	76	71	68	61	58	54	52	60	76
Daily humidity at 1400 hrs, %	67	68	61	54	46	43	37	36	35	33	42	60
Mean surface wind, mph	4.2	3.8	4.2	4.6	5.0	5.4	5.6	5.9	6.5	7.1	7.2	6.4
Cloud amounts, octas	6.4	6.5	5.9	4.0	3.3	3.1	2.8	2.0	1.5	2.1	4.3	5.8
Mean maximum ° F	80	80	80	80	78	75	75	78	82	86	86	82
Mean minimum ° F	63	63	62	57	50	45	43	46	52	58	62	64

Selection and preparation of material. Most subjects are made into cuttings 8-12 in. in length. In some cases age or thickness of material is not critical, and cuttings up to 3 in diameter of *Bougainvillea*, *Datura*, *Buddleia*, *Hibiscus*, *Nerium*, *Poinsettia* and *Lagerstroemia* root readily. Material over $\frac{3}{4}$ in diameter is sawn to length by hand. Smaller material is cut with secateurs. No rooting compounds are used but a stone dust dip containing 10% Captan has been used with advantage.

Facilities. Propagation frames are constructed of brick covered with 500-gauge opaque polythene sheeting on 4 ft. x 3 ft. timber lights. Drainage is provided by a layer of broken bricks topped by $\frac{1}{2}$ in granite chippings. The rooting medium is $\frac{1}{4}$ — $\frac{1}{16}$ in crushed granite from the local quarry. Pots (black polythene containers) are manufactured locally to specification.

Insertion and management. Although, at first, care was taken to insert material directly into the propagating medium in spaced rows, experience and necessity have led to close packing, rather as in a rooting bin. Most material produces roots freely in these conditions, but breakage of roots and other losses due to handling in dry conditions have led to the practice of direct insertion into polythene pots for some subjects, e.g. *Bougainvillea* and *Lagerstroemia*.

Some of the hardier species—*Datura*, *Nerium* and *Poinsettia*—are potted directly into 3 in black polythene containers and placed in a shade house (50%) until established.

Experience has shown that hardwood material in the propagation frames has not required shading and new growth produced within the frames is not damaged by the high temperatures achieved during the middle of the day.

Material propagated as above includes the following species:

<i>Acalypha hamiltoniana</i>	<i>E. leucacephala</i>
<i>A. wilkesiana</i> cvs.	<i>E. pulcherrima</i>
<i>Allamanda cathartica</i>	<i>Ficus</i> spp.
<i>Alstonia scholaris</i>	<i>Heterocentron roseum</i>
<i>Bougainvillea</i> cvs.	<i>Hibiscus x archeri</i>
<i>Buddleia asiatica</i>	<i>H. mutabilis</i>
<i>B. madagascariensis</i>	<i>H. rosa-sinensis</i>
<i>Cestrum nocturnum</i>	<i>H. schizopetalus</i>
<i>C. purpureum</i>	<i>H. syriacus</i>
<i>Clytostoma binatum</i>	<i>Holmskioldia sanguinea</i>
<i>Codiaeum variegatum</i> 'Pictum'	<i>Hypoestes aristata</i>
<i>Cuphea micropetala</i>	<i>Iochroma tubulosa</i>
<i>Datura arborea</i>	<i>Jacobinia</i> spp.
<i>D. chlorantha</i>	<i>Lagerstroemia indica</i>
<i>D. suaveolens</i>	<i>Malvaviscus arboreus</i>
<i>Euphorbia fulgens</i>	

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Megaskepasma erythrochlamys
Morus nigra
Moschosma riparium
Nerium oleander
Odontonema nitidum
Punica granatum
Pyrostegia venusta

Russelia juncea
Sanchezia nobilis
Solandra grandiflora
Solanum rantonnettii
S. wendlandii
Strobilanthus isophyllus
Vitex agnus-castus

Seed. A number of subjects are raised by the Government Forestry Department by direct sowing into 2 in black polythene tubes filled with forest soil and placed in blocks 3 ft. to 4 ft. wide under shade. This method has been adopted for the production of ornamentals with the following modifications: perforated bags, instead of tubes, were found to be more satisfactory, necessitating less frequent moving to break any roots developing in the standing ground.

Some species with hard seed coats are germinated in polythene bags after initial chipping or hot water treatment. In this way a periodic selection of seeds which actually "popped" are sown directly into the pots giving uniform batches of plants for handling, e.g. *Delonix regia* (*Poinciana regia*), *Schizolobium excelsum* and *Cassia* spp.

Capping of soil is a problem and this has been resolved by topping the direct sown seed with granite chippings (1 / 4 in-1 / 16 in). This also serves to indicate where sowing stopped on the previous day.

In order to avoid drying out and to reduce soil compaction in the containers the blocks of containers are covered after sowing with coarse hessian which is left in place until germination is well advanced. The hessian protects the soil structure, holds the seed down during initial germination, raises the temperature of the compost when the sun shines, ensures a more even distribution of water from the overhead hand-irrigation and reduces the amount and frequency of irrigation required.

On germination, the hessian is raised on a bamboo framework about 18 ins. above the containers to protect the seedlings from desiccation and from occasional frost at night.

Certain species which germinated with the seed leaves still enclosed in the testa after emergence suffered from drying out and hardening of the testa on exposure to the air and had to be helped out by hand—a laborious, delicate and often fatal operation. These included *Schizolobium excelsum* and *Bixa orellana*. In future these will be germinated in cold frames where the atmospheric humidity is more easily controlled.

Species sown directly into pots as above include the following:

<i>Acacia</i> spp.	<i>Ipomea arborescens</i>
<i>Azelia quanzensis</i>	<i>Jacaranda acutifolia</i> (<i>J. ovalifolia</i>)
<i>Albizia</i> spp.	<i>Jatropha multifida</i>
<i>Aleurites moluccana</i>	<i>Khaya nyassica</i>
<i>Allamanda neriifolia</i>	<i>Melia azedarach</i>
<i>Bauhinia purpurea</i>	<i>Moringa oleifera</i>
<i>B. monandra</i>	<i>Deloniz regia</i> (syn <i>Ponciana regia</i>)
<i>Bixa orellana</i>	<i>Rauwoflia caffra</i>
<i>Caesalpinia pulcherrima</i>	<i>Ricinus communis</i>
<i>Cassia</i> spp.	<i>Schizolobium excelsum</i>
<i>Eriobotrya japonica</i>	<i>Solanum seaforthianum</i>
<i>Erythrina</i> spp.	<i>Theveha peruviana</i>
<i>Gmelina arborea</i>	(syn. <i>T. nereifolia</i>)

Numerous other species with seeds too small to be handled individually are sown in boxes of forest soil—surprisingly free from weed seeds—and covered with an appropriate depth of granite chippings (3/4 in-1/16 in) to facilitate watering and prevent capping. Seed sowing commences in August to provide material of planting size by December.