NEW ZEALAND Plants and Gardens

Vol. I. No. I.
December 1955

The Official Publication of the Royal New Zealand Institute of Horticulture (Inc.)

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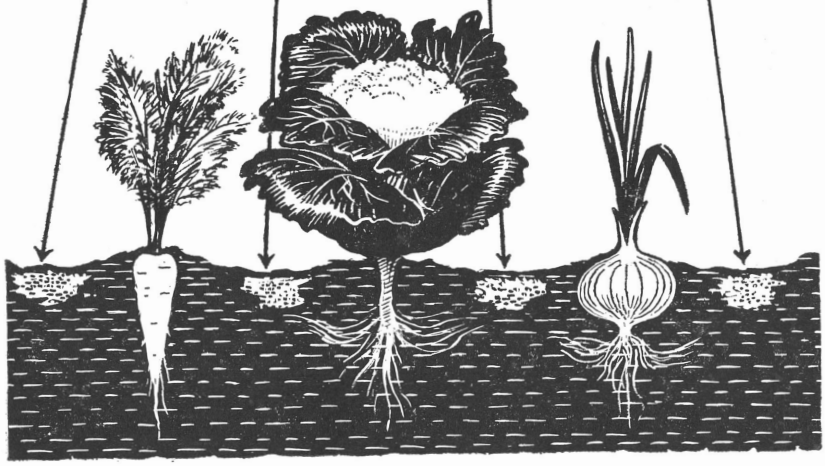

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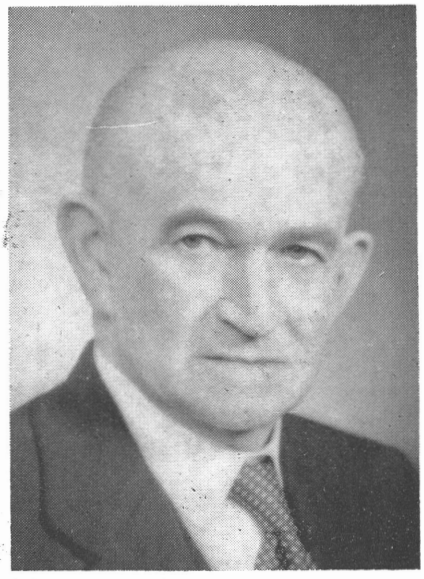
December, 1955.

New Zealand Plants and Gardens

Official Publication of The Royal New Zealand Institute of Horticulture (Inc.)

From the President . . .

THE reappearance of a Journal published by the Royal New Zealand Institute of Horticulture (Incorporated) will do much towards increasing interest in flowers, shrubs, trees, plants and gardens. This in itself is assisting in furthering the objects of the Institute.



Leaders in horticulture in this Dominion have long felt the necessity for a publication on similar lines to that produced by the Royal Horticultural Society (England) for its members. This quarterly issued to our members is designed to fulfil that want.

The New Zealand Institute, which his Worship the Mayor of Wellington, Mr. R. L. Macalister, A.H.R.I.H. (N.Z.), has aptly termed "The Parliament of Horticulture," is increasing in strength every year. Its membership of over 2000, representing 18 different centres of the Dominion, includes horticultural leaders, specialists, home gardeners, organisations, societies and students.

The educational service rendered by the Examining Board of the Institute is also increasing. Horticulturists are now offered opportunities for self-improvement by undertaking studies prescribed by the Examining Board, and gazetted by Her Majesty's New Zealand Government.

Examination courses now listed include:—

N.D.H., N.Z.—National Diploma Horticulture (N.Z.).

N.D.F.C., N.Z.—National Diploma Fruit Culture (N.Z.).

C.V.C., N.Z.—Certificate in Vegetable Culture (N.Z.).

C.S.G., N.Z.—Certificate in School Gardening (N.Z.).

S.C., N.Z.—Seedsmen's Certificate (N.Z.).

The publication of this Journal is a further step forward by the Institute, which is gradually and surely consolidating its position in the Dominion.

May I conclude this foreword by extending Seasonal Greetings to all our members throughout this Dominion, wishing all a Merry Christmas and a bright and prosperous New Year.

JOHN HOUSTON,
Dominion President.

Editorial . . .

FOR several years there has been a desire for this Institute to publish its own Journal. This has now come to fruition. The birth of a publication such as this is not attained without considerable difficulties, not the least being that of finance.

Now that these obstacles have been overcome it is necessary that the publication should be made to fulfil a useful purpose in the Institute. There can be no justification for a publication which exists merely to gratify our vanity. There are many conflicting points of view on the purpose which this Journal should fulfil, and it is obvious that it will be impossible to give full satisfaction to them all.

This Journal must reflect the policy of the Institute as a whole, which has been clearly defined as that of fostering horticulture in all its aspects. This has been borne in mind in formulating Editorial policy. With the relatively limited resources at our disposal we cannot hope to adequately cover all the possible aspects presented to us. It has been suggested that the most useful function which we can perform is that of collecting and publishing material not covered elsewhere, either in the publications of the Government Departments or in commercial journals.

There is a wealth of horticultural knowledge in New Zealand which has never been committed to paper, and it is hoped that this knowledge, the result of long years of practical experience, and also from the study of up-to-date research both here and overseas will be made available, not only to our members, but also to posterity, through these columns.

The Journal can only progress on co-operation, and it is to be hoped that members will be interested in contributing from their own experience so that their knowledge will be available for the benefit of others.

In This Issue . . .

Cover Picture

The cover picture shows Her Majesty the Queen planting a tree in the grounds of Government House. The spade Her Majesty used was later presented to the Chairman of the Wellington Branch of the R.N.I.Z.I.H., Mr. J. C. Stirling, N.D.H.N.Z., F.R.I.H.N.Z.

Correspondence and articles for publication should be addressed to The Editor, c/o. The Royal New Zealand Institute of Horticulture (Inc.), P.O. Box 1368, Wellington. Small advertisements and enquiries re trade advertisements should be addressed to Industrial Publications, P.O. Box 6402, Te Aro, Wellington.

Controlled Irrigation

By M. RICHARDS, B.Sc. (Hort.), N.D.H., N.D.H. (N.Z.).

IRRIGATION of plants with water is one of the oldest horticultural practices. The ancient Egyptians and the Romans were both aware of its benefits and in countries with warm dry climates the practice has continued. In more recent times we have come to appreciate the importance of water in plant growth, and great strides have been made along the pathway to better use of water in irrigation.

If we take a critical view of irrigation practice over the first 50 years of this century it is surprising how little we knew of how to use irrigation in plant growth. Most people were aware of the fact that if water was applied during a dry summer, increased growth resulted. Beyond this we had no guide. As a result of research work in Great Britain and the United States this picture has been completely changed, and irrigation has now been placed among those factors which can be accurately controlled.

The two great problems of irrigation can be plainly stated as: When should water be applied, and how much water should be applied. To understand how scientists have arrived at the answers to these problems it is necessary to go back to the question of what happens to the water which is available.

Although the plant uses vast quantities of water in its growing season, very little is actually retained in the body of the plant. Most of the water taken up from the soil is given off from the plant to the atmosphere as water vapour. This process is known as transpiration, a term which we must use several times. Obiously then this process of transpiration must be important in irrigation, since it accounts for over 90 per cent. of the water required.

Transpiration only occurs because water is evaporated from inside the leaves of the plant. In the plant's leaves, small openings occur through which air passes from outside to inside the leaf, so that the leaves may extract the oxygen and carbon dioxide necessary for growth. During this process the air comes into contact with the moist cell walls inside the leaf, and evaporates water. The amount of water evaporated depends on several factors, sunlight, temperature and wind, just as the drying of a path or line full of washing depends on the same factors. Since we know the drying capacity of these factors it has been possible to calculate how much water will be evaporated or transpired under a given set of climatic conditions. Whether or not this amount of water will, in fact, be removed from the plant depends on whether or not it is present to be evaporated. We can liken this to a wet sheet on a line. It is possible to caulculate how much water is being evaporated so long as the sheet is wet, but as it dries out the amount evaporated will be less than the calculation shows. Therefore it has been found useful to call the calculated figure the potential transpiration.

Several valuable facts have been found about the potential transpiration. One is that if the evaporation covers the soil, the potential transpiration is approximately the same for any given area, irrespective of the crop. This concept has not been popular in some circles, since it is contrary to established ideas, but it has been shown to be correct within reasonable limits. Another valuable fact is that for plant growth to proceed at its maximum rate, sufficient water must be available for transpiration to proceed at its potential rate for the climatic conditions which are occurring at the time.

Since we can calculate the amount of water which the plants will take from the soil we have gone a long way towards answering our first question: When should water be given to the plants? The rest of the answer is tied up with two things, how much water is in the soil, and how much can the plants get before transpiration starts to fall below the maximum. To start to understand this side of the question, we must understand what happens when water falls on the soil as rain or irrigation water.

As water reaches the soil it first wets a shallow layer until that shallow layer can hold no more water. Further water percolates down through the soil, fully wetting succcessive shallow layers. If sufficient water is applied the soil becomes wetted to capacity throughout its depth. Any further water will be removed as drainage. This process takes time, and after very heavy applications of water the surface layers may be super-saturated but after 24 hours a state is reached where every soil particle has a relatively thick film of water, with some air spaces through the soil. This state is conveniently called "field capacity."

If we start with soil at field capacity and measure or calculate the water loss by transpiration, we know how much water has been lost from field capacity. Since a soil cannot be wetted beyond field capacity, it is a convenient measure for water loss. Thus we can say that the water loss over a period is equivalent to, say, 1 inch of rainfall. This water loss, below field capacity is termed the soil moisture deficit.

At the end of the winter we can safely assume that the soil is at field capacity. By measuring

or calculating water loss, and subtracting any rainfall we arrive at the soil moisture deficit, and when this reaches a predetermined figure for that crop, we apply irrigation in an amount equivalent to the deficit. This brings the soil back to field capacity.

The only question which remains is the question of determining the soil moisture deficit at which irrigation is necessary if growth is to continue unchecked. This will depend on the crop, since some crops can extract water from the soil with greater ease than others, and also the deep rooted crops such as fruit trees explore a greater bulk of soil with their roots so have more water aavilable. Heavy clay soils will hold more moisture than light sandy soils, and so will have more moisture available for the plant. It has been found in England that most perennial crops such as grass, strawberries, potatoes and lettuce start to suffer from water shortage when the deficit is equal to 1 inch of rainfall. A recent report from East Malling indicates that apples may suffer at deficits of about 1½ inches. The important point is that at this stage there is no visible sign of water shortage, in other words, growth slows down long before the grower suspects that there is any check.

The question of how much water should be applied at any time poses a problem which applies to all watering. We have already said that when water falls on the soil it wets the surface layer to "field capacity," and then as more water is applied the state of "field capacity" is reached in successively deeper layers. For really satisfactory watering, therefore, one must apply sufficient water to wet the soil to field capacity as deeply as the roots will penetrate. The amount required to do this will be equal to the amount of moisture which has been lost by transpiration, the soil moisture deficit.

With many crops which terminate their growth in summer and merely ripen over autumn, it may not be desirable to keep the soil at field capacity over the entire period. For this reason a gradual deficit may be allowed to build up over the latter part of the season. For example, in January the amount of water applied may be half an inch less than that lost if this is repeated in February, March and April; the accumulated deficit would be two inches. This would be replaced by rain over winter.

The period at which this planned deficit should begin will depend largely on the crop being irrigated. As soon as maximum growth is no longer necessary the deficit may commence to build up.

The efficiency of using calculated transpiration as a basis of irrigation control may be illustrated by reference to two overseas experiments. The first concerned sugar beet, a crop very susceptible to water shortage. Three series of plots were laid down, two series being controlled by growers with long practical experience in the use of irrigation. Each visited the plots at regular intervals, and irrigation water was applied as directed. The third series was controlled by Dr. Penman, from Rothamstead, over 100 miles away. Dr. Penman never visited the plots, but directed irrigation by calculating the water loss. The plots irrigated in this way gave significantly greater yields, both in weight of beet and weight of sugar extracted. The other experiment was conducted on grass. Every farmer knows that if water is applied to grass during a dry season extra growth will result. British farmers were amazed to find that increased grass could be grown by irrigation at times during a wet season when no one would normally have used irrigation. The answer was, of course, that during isolated spells of fine weather, the moisture deficit rose to a figure high enough to check growth.

This method is being used in commercial horticulture in Great Britain, largely as a result of close collaboration between soil scientists and the Meteorological Office. The calculations involved are too difficult for the average grower to attempt, but simplified systems have been introduced. Meteorologists have found a way to forecast with good accuracy, the water loss for the year, ignoring rainfall. This forecast is supplied to growers, showing the forecasted loss for that area on a week to week basis. The grower measures rainfall on his property, and by subtracting this from the forecasted deficit, can arrive at the soil moisture deficit at the time. Each two weeks a correction figure for the forecast is broadcast, to take care of variations between the forecast and the actual weather conditions. By adding or subtracting this figure from the forecast, the growers can keep accurate account of the soil moisture deficit and irrigate accordingly.

Other uses have been found for the calculations. By reference to calculations over the last 30 years it has been possible to define how many years in 10 it would be desirable to apply irrigation in any given area. This is a great help to growers in deciding whether or not an irrigation plant is a good investment. It is also of assistance in national planning of the water resources of a country.

It is hoped that similar forecasts will be available in New Zealand in the next few years. Some work will then be necessary on deciding on the permissible soil moisture deficit on our various soil types. This, however, is less of a problem than formerly, and is well within the province of existing knowledge. Unfortunately this method is not practicable for glass house work since each glasshouse has its own separate climate. Other methods have been devised for this, but they are a subject best referred to at another time.

Announcement of Awards

The following announcement of awards issued under the authority of the Royal New Zealand Institute of Horticulture Act, 1953, is now released by the Dominion President:—

"This Institute is authorised under an enactment entitled The Royal New Zealand Institute of Horticulture Act 1953 to grant a Certificate or Diploma to any person who fulfils the undermentioned qualifications:—

(1) Is not less than 40 years of age;

(2) Has practised horticulture or any branch therof for not less than 20 years;

(3) Who is in the opinion of the Examining Board is qualified to receive the Certificate or Diploma.

Consideration has been given to persons qualifying and the Examining Board on the recommendation of the Dominion Council of the Institute wishes the announcement made that the persons named below have been granted Certificates and Diplomas as scheduled.

The Institute proposes through its 18 branches within New Zealand to arrange appropriate functions for the presentation of these meritorious awards."

(Signed) JOHN HOUSTON.
President.

LIST OF SEEDSMEN APPROVED FOR ISSUE OF THE SEEDSMEN'S CERTIFICATE S.C. (N.Z.) WITHOUT EXAMINATION

Name: Address:

1. Agnew, W. E., 72a Victoria Avenue, Wanganui.
2. Arnold, A. G., 43 Arawa Street, New Lynn, Auckland.
3. Barnes, O. H., 3 Customs Street W., Auckland, C.1.
4. Barwick, W. R., N.Z. Farmers' Co-op., Private Bag, Christchurch.
5. Brough, A. E., P.O. Box 300, Nelson.
6. Chudley, A. E., P.O. Box 93, Wellington.
7. Cooper, F. E., P.O. Box 93, Wellington.
8. Craig, A. M., P.O. Box 1, Nelson.
9. Deacon, R., P.O. Box 298, Dunedin.
10. Dean, J. H., 266 George Street, Dunedin.
11. Esau, H. L., Queen Street, Masterton.
12. Gardiner, I. R., P.O. Box 75, Gore.
13. Garlick, F. B., P.O. Box 93, Wellington.
14. Gaston, V. G., 169 Oxford Street, South Dunedin.
15. Gilbert, W. J., 10 Brougham Street, New Plymouth.
17. Hopkins, C. G., Dilworth Buildings, Customs Street East, Auckland.
18. Hornibrook, E. J., 241 Hastings Street, Napier.
19. Howden, G., 755 Colombo Street, Christchurch.
20. Irvine, S. M., 42 Seddon Road, Otahuhu, Auckland.
21. Jeffery, B. M., P.O. Box 34, Roxurgbh.
22. Johnston, W. R., B ox 102, Whangarei.
23. King, L. C. R., 18 Boon's Road, Christchurch.
24. Knight, A., 939 Three Kings Road, Mt. Eden, Auckland.
25. Lennie, R. J., 104 Cashel Street, Christchurch, C.1.
26. Lyons, R. D., 8 Ballin Street, Ellerslie.
27. Mallard, K. A., P.O. Box 93, Wellington.
28. Marks, G. F., 219 Queen Street, Onehunga.
29. Martin, T. De B., P.O. Box 79, Gisborne.
30. Mercer, H. F., c/o F. Cooper, Ltd., Dixon Street, Wellington.
31. Merritt, K. R., P.O. Box 190, Napier.
32. Miller, L. A., P.O. Box 195, Hastings.
33. Newrick, I. H., 101 Murdoch Road, Hastings.
34. Nimmo, R. J., P.O. Box 298, Dunedin.
35. Parnell, H. K., 172a Victoria Avenue, Wanganui.
36. Priest, C. N., P.O. Box 1109, Auckland.
37. Redgrave, A. F., P.O. Box 195, Hastings.
38. Rothville, E. F., P.O. Box 11,09, Auckland.
39. Russell, G. M., c/o F. Cooper, Ltd., Dixon Street, Wellington.
40. Sired, L. F., 29 Maida Vale Road, Wellington, C.4.
41. Storey, A. H., P.O. Box 1109, Auckland.
42. Teague, B. H. N., 122 Marine Parade, Wairoa, H.B.
43. Chin Ting, Mr. G., c/o Te Aro Seeds, Ltd., 58 Courtenay Place, Wellington.
44. Trevarthen, F. R., c/o Arthur Yates & Co., Ltd., Albert Street, Auckland.
45. Walker, R. H., P.O. Box 651, Dunedin.
46. Wallis, H. C., P.O. Box 626, Dunedin.
47. Weaver, P. C., c/o A. Simmonds & Co., Ltd., Heretaunga Street, Hastings.
48. Wemyss, F. M., P.O. Box 910, Christchurch.
49. Yates, N. W., C.P.O. Box 1109, Auckland, C.1.
50. Yeoman, E. W., P.O. Box 298, Dunedin.

LIST OF ORCHARDISTS APPROVED FOR ISSUE OF THE N.D.F.C. (N.Z.) WITHOUT EXAMINATION

Name. Address.

1. Archer, T. F. A., Mahana R.D., Upper Moutere.
2. Arnott, H. S., 155 Astley Avenue, New Lynn, Auckland.
3. Bailey, F. L., 49 Arawa Street, New Lynn, Auckland.
4. Baker, C. J. H., R.D. 2, Hastings.
5. Biggar, W. J., Appleby Research Orchards, Private Bag, Nelson.
6. Bonthron, O., Bethlehem, Tauranga.
7. Borck, W. L., c/o State Advances Corporation, Napier.
8. Brown, I. M. L., P.O. Box 118, Nelson.
9. Brown, C. H., 306 Queen Street East, Hastings.
10. Brash, J. W., 9 Taupata Street, Stoke, Nelson.
11. Bryan, H. S., Levers Road, R.D. 4, Otumoetai, Tauranga.
12. Clift, H. B., St. Andrews Road, Havelock North.
13. Colebrook, R., P.O. Box 28, Henderson.
14. Conway, T., P.O. Box 118, Hastings.
15. Cranwell, J. F., "Delta Orchards," Rata St., Henderson.
16. Davies, N. C., 20 Holton Street, Papanui, Christchurch.
17. Dicker, L. B., Mapua, Nelson.
18. Falconer, R. G., P.O. Box 69, Tauranga.
19. Freeman, E. J., 233 Stylx Mill Road, Stylx, Christchurch, N.W.4.
20. Frew, S., Department of Agriculture, Private Bag, Christchurch.
21. Galletly, J. D., 92 Wainui Street, Christchurch.
22. Gatenby, C., R.D. 2, Upper Moutere, Nelson.
23. Grainger, A. R., Horticulture Division, P.O. Box 2298, Wellington.
24. Hawkins, J. E., Fruit Research Orchard, Earnscleugh, R.D., Alexandra.
25. Hiam, N. J., c/o Department of Agriculture, Private Bag, Auckland.
26. Hopkins, G. P., Department of Agriculture,
27. Horrocks, F. N., P.O. Box 449, Hastings
28. Hume, J. E., 38 Union Street, Palmerston North.
29. Inglis, J. J., No. 4 R.D., Albany.
30. Kenning, H. A., Appleby Road, Richmond, Nelson.
31. Lemmon, E. T., "Poraite Homestead," P.O. Box 197, Napier.
32. Lowe, F., P.O. Box 90, Havelock North.
33. McMiken, W. J., Sunnyside Orchard, Silverdale Road, No. 4 R.D., Hamilton.
34. Nicholas, J. L., Department of Agriculture, P.O. Box 118, Nelson.
35. Paynter, J. H., St. Georges Road, Hastings.
36. Prew, H. A., P.O. Box 125, Tauranga.
37. Renouf, L. R., 9 Lukewa Road, Gisborne.
38. Robbins, R. E., Research Orchard, Goddard's Lane, Havelock North.
39. Saxton, L., 304 Hardy Street, Nelson.
40. Simpson, R. H., Golden Bay Nursery, Uruwhenua, Takaka, via Nelson.
41. Stagg, K., Department of Agriculture, Private Bag, Palmerston North.
42. Sunde, P., Shaw Road, Oratia, Auckland.
43. Taylor, E. R., 730 Ngaio Street, Hastings.
44. Taylor, H. S., P.O. Box 125, Tauranga.
45. Viney, R., 4 Abbott Street, Gisborne.
46. Ward, W., Department of Agriculture, P.O. Box 118, Nelson.
47. Watt, J. H., Department of Agriculture, P.O. Box 2298, Wellington.
48. Watts, H. G. L., P.O. Box 58, Cromwell.
49. Wilkinson, V. H., 10 Achilles Avenue, New Lynn.
50. Winn, O., Research Orchard, South Road, Henderson, Auckland.

Horticultural Institute Circuit Meeting at Mangatoki

In its series of circuit metings the South Taranaki District Council of the Royal New Zealand Institute of Horticulture visited Mangatoki last week when Mr. K. Downes, New Plymouth, dealt with aspects of begonia culture and discussed the culture and breeding of gerberas.

Mr. F. Chambers (Opunake) displayed coloured slides of liliums and spoke on the peculiarities and culture of the varieties illustrated. Mr. P. Linnell (Hawera) showed an interesting range of cacti from seedlings to more mature flowering specimens.

Mr. T. H. Reader (Hawera), who presided over the meeting, spoke on building and stocking garden pools, with charcoal sketches.

A sales table did good business. Supper was served. Nearly 90 members and friends attended the meeting and appreciative thanks were expressed to all who contributed to an interesting and successful meeting.

The Native Orchids of the Waikato

By M. C. GUDEX, M.A., M.Sc., N.D.H., A.H.R.I.H. (N.Z.).

The Waikato is rich in orchids, both in species and in individuals. However, their numbers are being reduced steadily by the clearing of bush and manuka heaths, and by the drainage of swamps. A new factor is aerial top-dressing, which will increase the growth of grass in the rough country favoured by orchids.

A convenient grouping of orchids is:
(a) Epiphytic; (b) Terrestrial

THE EPIPHYTIC

Though many of the forest trees are being felled, there are often enough of the rejects to provide homes for the various perching orchids. Indeed, several kinds of introduced trees, such as pine, privet, oak, cherry and willow have been colonised by them.

The species are:

1. Dendrobium cunninghamii Ldl., with white flowers marked with pink, over half an inch in diameter, in bloom from December to February. This species can be identified easily because of its shrubby habit and its wiry, rounded, jointed stems. It is fairly common on trees growing in the foothills and mountains, but distinctly rare in the lowlands of the Waikato.

2. Earina mucronata Ldl. The specific name "mucronata" was given because its grassy leaves end in very sharp points. This plant is as common in the lowlands as on the hills. One of its favourite stations is the cabbage-tree (Cordyline australis), for the rough bark of this tree gives a firm foothold to orchids and to ferns such as Asplenium flaccidum and Microsorium diversifolium.

This species is now taken to include Earina aestivalis, for the latter appears to be merely a variety of it with stiff, rather short and broad leaves. The cream-coloured flowers of mucronata are sweet-scented, and are borne in October and November.

3. Earina autumnalis Hook.f. The leaves of this species are much broader and thicker than those of E. mucronata, are deeply grooved, and are not sharp-pointed. This species is rather rare in the lowlands of the Waikato, but is common on the hills. The white flowers with yellow centres, borne from March to June, are so sweet-scented as to have received the specific name suaveolens, now changed to autumnalis on the ground of priority. Occasionally the pendent stems are over five feet long.

4. Bulbophyllum pygmaeum Ldl. This plant has little fleshy leaves, round pseudo-bulbs about $\frac{3}{8}$ in. in diameter, and a network of roots. It occurs at different heights on trees, but owing to its smallness it is found most often on felled trees. There is another species (B. tuberculatum Col.) with larger leaves, but Mr. E. D. Hatch in litt. says this is exceedingly rare, and the Waikato plants supposed in recent years to be B. tuberculatum have invariably been identified as B. pygmaeum. Flowers November to February.

5. Sarcochilus adversus Hook.f. This is a dwarf species with long, thin roots and thick, fleshy leaves borne in obscure pairs (hence the specific name adversus). Its little greenish flowers appear in October and November, and later every spray may bear several seed-capsules about one inch long, shaped like a banana.

I have found this species growing on 32 species of trees and shrubs (including five exotics) in the Waikato, and on an additional three in the Raglan district. (Trans. Royal Society of New Zealand Vol. 82 p. 611-612.)

THE TERRESTRIAL

1. Pterostylis banksii R. Br. ex A. Cunn.

This reaches a height of nearly two feet, and has solitary, green, hooded flowers more than $2\frac{1}{2}$ inches long, including the "tails" of the lateral sepals. This species is to be seen at its best at the end of October in manuka heaths, on the banks of streams, and on the fringes of the bush.

2. Pterostylis trullifolia (Hoof.f.) gracilis Cheesem.

This is one of the daintiest orchids, and, surprisingly, one of the hardiest, a favourite station being a well-drained bank at the base of a tree or large shrub. In such a place there may be over fifty plants growing in a square foot. The flowers are greenish, solitary, and borne on slender stems up to six inches high. Young plants not flowering have leaves grouped in a rosette, but mature speciments have two leaves on the stalk.

3. Pterostylis trullifolia (Hook.f.) alobula Hh.
This seems to be a rare plant in the Waikato.

4. Pterostylis foliata Hook.f., found on Mt. Pirongia, but a rare plant. The lower leaves, 2 to 5 in number, are short and almost form a rosette. The stem is stout, 3 to 18 inches high. Flower solitary, in bloom in December and January.

5. Pterostylis graminea Hook.f., a species resembling P. banksii but smaller having a green hood, without filiform "tails." The leaves are grass-like. This species is rare in the Waikato, but is found in some of the swamps growing side by side with the sundew Drosera binata. It flowers in October and November.

6. Orthoceras strictum R.Br. This also seems rare in the Waikato. It has stiff stems from 9 to 24 inches high, bearing 3-12 flowers of a greenish purple colour in December and January.

It is found on clay banks with a light covering of grass—the favourite station of Microtis unifolia and several species of Thelymitra.

7. Thelymitra longifolia J.R. et G. Forst.

This very common species has leaves longer than the flower stems, which reach a height of 15 inches. The flowers are borne in a raceme, white, pink or blue, in November and December, and when fully opened have a starry shape.

8. Thelymitra pauciflora R.Br. This is a tall, slender species, with a leaf much shorter than the flower stem, from 1/10th to 1/5th inch wide.

The flowers, of a pale blue, are borne in October and November.

9. Thelymitra pulchella Hook.f. This has a slender stem reaching a height of 18 inches. The flowers, up to 1 inch in diameter, are of a lovely purple colour, but are rarely seen open. It seems to be rare in the Waikato.

10. Microtis unifolia. (Forst.f.) Reichb.f. This is the hardiest and commonest of all our orchids, being found on grassy banks, in swamps, and in manuka heaths. It is even found on the grassy sides of some streets in Hamilton. The stems vary in height from 3 to 24 inches. Though the flowers are very small, they are often very numerous. The tuberous root has won for this plant the name "Maori Onion."

11. Acianthus fornicatus (R.Br.) sinclairii Hook.f. Hh.

This very dainty little orchid is found commonly in fairly open manuka heath. It bears several greenish or brown flowers on a thread-like stem about six inches high. A distinctive feature is its heart-shaped leaf borne two or three inches up the stem.

12. Caladenia carnea R.Br. var.minor (Hook.f.) Hatch comb. nov.—a very rare orchid in the Waikato. It seems to prefer open manuka heaths. The pink solitary flowers are borne in October and November. There is one true leaf, long, narrow and hairy, rising from near the base of the thin, hairy stem.

13. Chiloglottis cornuta Hook.f. This beautiful orchid is found in rather damp parts of the open bush or manuka heath, rooted either in the ground or in rotting logs and stumps. The stem is from 2 to 5 inches high and the two leaves are 1 to 3 inches long, up to 1 inch wide, and usually flat. The flower, half an inch in diameter, is green, spotted with purple.

14. Corybas macranthus (Hook.f.) Reich.f.

In many places the forest floor is covered with this species, but only a small percentage of the plants bloom in one season. The fleshy solitary leaf has a petiole ½ to 3 inches long, and a blade up to 2 inches in diameter. The flower is one inch long, of a purple colour, and the lateral sepals have filiform "tails," hence its common name of "Spider Orchid." It is in bloom from October to December.

15. Corybas macranthus (Hook.f.) Reich.b.f. var. longipetalus Hh.

16. Corybas trilobus (Hook.f.) Reichb.f. This is fairly common in the more open parts of the bush and in manuka heaths. It may be recognised by the sharp point on the middle one of the three lobes on the leaf. It blooms from July to September.

17. Corybas oblongus (Hook.f.) Reichb.f., a rare species in the Waikato, found in the same kind of stations as the other species of Corybas. The leaves have an oblong shape. The flowers are borne from September to November.

18. Gastrodia cunninghamii Hook.f. This species is very rare in the Waikato, probably because farm stock have trampled it, and wild pigs have eaten its tuberous roots. The brownish-white flowers are rather distantly spaced on stiff erect stems that reach a height of nearly 30 inches. It blooms in December and January.

ACKNOWLEDGEMENT

I wish to thank Mr. E. D. Hatch, of Laingholm, Auckland, for his help in identifying my specimens of orchids. He says in litteris the following additional species have been recorded in the Waikato:

Pterostylis barbata Ldl. near Rangiriri.
Pterostylis montana Hh. var. montana, at Ngaruawahia and near Rangiriri.
Thelymitra venosa R.Br. var. venosa, at Rukuhia.
Thelymitra carnea R.Br. var. imberbis (Hook.f.) Rupp. and Hh., at Tauhei and Morrinsville.
Prasophyllum nudum Hook.f., at Waitomo, Arapuni and Mairoa.
Corybas carsei (Cheesem.) Hh. at Tauhei and Morrinsville.

14th International Horticultural Congress

This congress, which was attended by leading horticulturists from all countries of the world, was held in Schevingen, in Holland, in August, 1955. New Zealand was officially represented by Mr. J. D. Atkinson, M.Ag.Sc., of the Fruit Research Station, D.S.I.R., and Mr. K. C. Hockey, N.D.H., N.Z., head of the Horticulture Department at Massey College.

In addition, the Royal New Zealand Institute of Horticulture was represented by Mr. J. A. Hunter, N.D.H., N.Z., of Plant Diseases Division, D.S.I.R. It is hoped to publish some details of the Congress, and the representatives' impressions of horticulture overseas, in future issues.

Gardens for Flat Dwellers

Large blocks of flats have been developed on the hollow square system, with a communal park-like garden formed in the centre. From the purely aesthetic viewpoint these communal gardens have much to commend them, partly because the gardens can be developed as on a unified plan suited to the site. In addition the flat dwellers usually develop extensive window gardens, both as exterior window boxes and as shelf gardens inside the windows. The cultivation of these interior gardens has been brought to a high level of efficiency, particularly with pot plants. Thus, in terms of ornamental horticulture, such flat dwellers are by no means divorced from gardens. Admittedly, no vegetable gardens can be cultivated under this system, but an increased pressure for food production can only mean some sacrifices if an increasing population is to be housed at the same time.

It is generally agreed that urban sprawl must be checked if our fertile lands are not to be obliterated by houses and shops. However, the population has a right to expect to be housed, and two possible alternatives suggest themselves, to build upon the poorest soil types and to build tall blocks of flats. Eventually, of course, the poor lands must be exhausted, leaving only the choice of building upwards.

Organisations interested in horticulture view this prospect with mixed feelings, since the prospect of blocks of flats must at first sight mean divorcing the inhabitants from their gardens. However, this prospect is not as unhappy as it may first appear; it may merely mean that we must exchange our traditional gardens for another form of gardening.

In the Netherlands urban sprawl was halted many years ago, for land was too valuable to the country's economy for it to be built over. So valuable is the soil that it is not unusual for the fertile soil to be removed before building is erected. Yet no one who has had the good fortune to visit that country would accuse the Dutch of being divorced from horticulture.

Problems in Seed Germination

By M. RICHARDS, B.Sc. (Hort.), N.D.H., N.D.H. (N.Z.).

IN terms of numbers, many more plants are propagated from seeds than by any other method. The number of seeds sown each year must be astronomical. Any attempt to calculate the number would need the assistance of an electronic brain. Yet the number of these seeds which germinate and grow into plants is only a small proportion of the numbers sown. Each seed is a potential plant, so that nearly 100 per cent. should germinate. When this does not occur it is usual to blame the seed. In some cases this may be correct, but generally the reasons for the failure will lie in the methods used.

Most gardeners have good results in sowing vegetable seeds. These are sown in drills outdoors and will generally germinate without further attention. This leads people to believe that all seeds should germinate satisfactorily under similar conditions, and consequently they do not realise that failures are not due to poor seeds. The plants which we have come to use as vegetables all have seeds which germinate readily. Those which did not were quickly discarded since man could not afford to rely on plants which might not grow in some years.

Many flower seeds will, of course, germinate under practically any conditions, as for example, Calendulas, and if we were content to use only such plants for garden decoration we should have very few troubles. However, we are not content with these plants and ambition leads us to attempt to grow plants which come from widely scattered regions of the earth. Now these plants have only been able to develop and grow in these areas because their seeds are especially adapted to germinate under the climatic and other conditions which apply in such areas. If we are to germinate these seeds successfully, we must provide as near as possible the conditions for which the seeds are adapted.

The prime problem in seed germination is the medium on which the seed is sown. This medium must provide several conditions, an equitable supply of moisture, adequate aeration and an open texture so that roots may develop and leaves may push up to the surface to carry out their function of providing nutrients to the plant. Besides this, the medium must contain an adequate supply of soil nutrients so that the young plant may grow unchecked. Few soils can provide all these conditions, and so mixtures, or seed composts, are used. Among the most satisfactory composts are those developed by the John Innes Institute, consisting of 2 parts of loam, 1 part of peat or leaf mould, and 1 part of sand. To this is added 1½ ounces of superphosphate and ¾ oz. of lime per bushel of mixture. The peat is used to increase the water holding capacity, and the sand to help keep the mixture in a friable condition. Such mixtures should be used in boxes or pots which can then be kept in suitable conditions for germination.

The second problem is the right sowing techniques. The surface of the medium should be level before sowing, as this is important in providing an even water supply to parts of the soil. A good plan is to nearly fill the box or pot with the compost, firm and level, then stand the box in a shallow dish of water until the surface shows dark patches on the surface, indicating that the soil is thoroughly moist. Leave to drain for an hour, then the seed may be sown.

The seed must be evenly distributed over the surface and not too thickly. Each seedling should have an equal chance for development. The seed should then be covered with a very shallow layer of sieved compost. This must be only deep enough to cover the seed, its purpose being to keep the seed moist. The container must be protected from the direct rays of the sun, since the sun will cause the surface to dry out, and then will cause the soil layer to become overheated. Temperatures of over 100 degrees Fahrenheit have been measured at the surface of dry soil exposed to the sun. A good way to prevent this is to cover the box with a sheet of paper and a sheet of glass. The paper provides the shade, and the glass prevents the surface soil from drying out. The glass should be lifted and turned over twice a day to remove condensation. Paper on its own is nearly as satisfactory and does not require such close attention.

All covering must, of course, be removed as soon as germination starts. If the box is covered in this way no further watering should be necessary before germination occurs, but if the compost shows signs of drying, the container may once again be steeped in a shallow dish of water. Overhead watering causes caking down of the surface, and interferes with aeration of the soil.

This is the basic technique of seed sowing, and if followed should cope with the first elementary problems encountered in germination. There are other alternative methods used, and one or two may be worthy of mention. Perhaps the most important today is the use of sphagnum as a germination medium. This has become very popular for handling very fine seeds, mainly

because of the difficulty of covering such seeds; if they are covered too deeply the leaves do not emerge to the surface; if they are not sufficiently covered they may easily dry out. A normal seed compost is prepared, using less than usual of the compost in preparing the container. Over the surface of the container place a layer of finely shredded sphagnum about one-quarter of an inch thick. This may be moistened with a syringe and the seed then sown on the surface. No covering is necessary as the fine seed is dispersed into the crevices of the moss, which in turn hold copious quantities of moisture without becoming waterlogged. Under these conditions the seed germinates freely. As the roots develop they penetrate the compost and derive nutrients from it, while the leaves do not have to push their way to the surface. Practically all seeds can be germinated in this way. Even normal seeds such as tomato do well under these conditions. As an alternative such substances as vermiculite may be used in place of he sphagnum, the main requirement of the material used being an open texture, good water retention without becoming waterlogged and freedom from harmful substances.

Even under these conditions some seeds do not germinate as expected. This is especially true of tree seeds, and some perennial plants. There are a variety of reasons for this, and an explanation of these may help to prevent failures.

The most common cause of slowness to germinate is a hard seed coat, which does not allow water to enter the seed. Many Australian shrubs and trees show this condition, which is believed to have arisen as a protective measure against bush fires. The first broke down the seed coats as the bush was desroyed, and the seeds, which has hitherto remained dormant, germinated after the next rains had provided the necessary moisture. In this way the bush was perpetuated over the ages.

Various treatments have been used to break down these hard seed coats. Many of the larger seeds are placed into hot water, and left until the water has cooled. Direct heating on a hot iron plate is often advocated, and also immersing the seeds for a minute or two in strong sulphuric acid. Where only a few seeds are to be treated, chipping the seed coat with a knife or file, or rubbing the seeds on sandpaper will be quite effective. An Australian propagator has told me that he makes a small fire of "woodwool" on top of the soil after sowing this type of seed.

One of the critical factors in some seeds is germination temperatures, and if the temperature is either too high or too low germination may not occur. Two examples may illustrate this. Delphiniums normally ripen seed in late summer or autumn, and the seed normally germinates almost immediately it falls to the ground. Because the seed of Delphinium is short lived, it is especially adapted to germinate at the low temperatures encountered in autumn. However, we often wish to sow this seed at other times of the year when temperatures are high. Under these conditions the seed does not germinate and we blame the seed. If a box of Delphinium seed is sown in mid-summer it should be kept in a cool shady place until germination has occurred.

At the other end of the scale is Salvia splendens which germinates only at high temperatures. This plant ripens its seeds in late autumn, but it is necessary for its survival that the seed should not germinate until there is no danger of the seedlings being killed by frost. The need for high soil temperatures is a guarantee that seedlings do not appear until summer time. Thus we can learn a great deal about the temperature requirements of our seeds by studying the native habitat of the plants.

Three and shrub seeds often have more complicated temperature requirements. Many of these trees grow in areas where long cold winters are experienced, where the seeds which ripen in autumn must survive cold wet conditions before they can germinate in Spring. Such seeds have been so well adapted to these conditions that they will not germinate until they have experienced cold moist conditions for some time. The seeds of many of our deciduous trees and shrubs come into this category, including most fruit trees. These seeds are often said to require "after-ripening." Overseas, in countries with very cold winter climates, special treatments are used for such seeds. These usually consist of mixing the seed with moist sand or peat and storing in a cool cellar until spring, when the complete mixture is sown outdoors. This process is referred to as stratification. When seeds requiring this treatment are received from overseas during summer time, this treatment can be applied by using a refrigerator to give the low temperatures. Forty degrees Fahrenheit for six weeks is usually satisfactory as a cold treatment, the seeds then being sown in a warm glasshouse. Under New Zealand conditions these treatments are unnecessary for home produced seeds. They may either be sown in beds outdoors, or in boxes which are kept in cold frames. If the seed is sown as it ripens in autumn, it will germinate freely in spring.

Some Lilium seed shows an interesting variation on this. L. auratum and L. speciosum seed sown in autumn will produce small bulbs in the first summer, but do not produce any leaves until the following spring. If the seed is sown in a warm glasshouse or mixed with sand and stored in a warm cupboard, it will form the small bulbs in about six weeks. The containers of seedling bulbs are then exposed to cool conditions, about 40 degrees Fahrenheit, for a

further six weeks, after which the leaves will grow. One grower mixes the seed with moist sand in jars and stores them in a hot water cupboard until the bulbils are formed, then transfers the jars to a refrigerator. In spring the contents are sown in beds outdoors, and the foliage of the bulbils appears in the same summer. These bulbs will flower in the second and third year, at least twelve months less than that required for seeds treated in the conventional manner.

Some tree and shrub seed has the most difficult organisation of all, a combination of hard seed coats and the need for a cold moist treatment. The hard seed coat must be broken down before the cold moist period can be effective, and under normal conditions these seed require two years to germinate, one summer in which the seed coat breaks down, followed by a cold winter period. This period can be reduced by using one of the treatments to destroy the seed coat as soon as the seed is ripe, followed by cold moist conditions over winter. The seed should then germinate in spring. The trees which normally carry berries in the winter, such as Cotoneaster, usually show evidence of this.

Some people will no doubt be surprised that so far there has been no mention of disease as a problem. There is a good reason for this. before we commence to rely on disease control measures, we must first know how to raise seedlings in the absence of any pathogens. Disease control is a subject large enough to warrant a separate article, and it is hoped to publish this in the future. The prime disease problem will, of course, be "damping off." The best control for this is to use sterilised soil and good cultural methods. Seed sown on sphagnum moss is almost immune from soil-borne "damping off" since the pathogens do not multiply readily on this medium. The various seed dressings available on the market can be used where it is suspected that disease is being carried on the seed coat.

The Royal Horticultural Society

The Royal Horticultural Society is one of the senior horticultural societies of the world, and as such enjoys a world-wide reputation. The membership passed 45,000 several years ago. and the great number of members is a major factor in the influence of the society.

The headquarters are located in London, at the society's offices in Vincent Square and at the new hall in Greycoat Street.

The society's gardens at Wisley, in Surrey, are the admiration of all who have had the opportunity of visiting them. These gardens cover acres, and in addition to the gardens proper, the laboratories and students' hostels offer unique opportunities for training.

The society's activities include regular lectures and fortnightly shows in London, and regular demonstrations at the society's gardens. It is a tribute to the horticulturists of the country that each fortnightly show is an exhibition fully worthy of the society. The greatest of the shows is, of course, the Chelsea Show, held in May each year. This incomparable display attracts visitors from all over the world.

New Zealand horticulturists may become Fellows of the R.H.S. under the Overseas Fellowship Scheme. The subscription for overseas Fellows is one guinea per year. The benefits include the receipt of a copy of each issue of the society's monthly journal; the receipt, on application, of a share of such surplus seeds as may be available for distribution from the society's gardens; and on visiting the United Kingdom, tickets of admission to the society's shows, including Chelsea, to the society's gardens and to lectures and demonstrations held by the society. During such visits Overseas Fellows may also make use of the facilities available at the society's offices, including the Lindley Library.

Application must be made on the prescribed form, which is obtainable from:

The Secretary,
Royal Horticultural Society,
Vincent Square,
London, S.W.2.,
England.

Lemon Culture in New Zealand

For many years lemon trees (Citrus limonia Osbeck) have been grown in various parts of New Zealand, but only during the last 40 years has planting been carried out on a commercial scale. Lemons can be produced profitably in the Dominion, and already their culture has developed into a useful industry. The production of lemons on an economic scale is confined mainly to restricted areas at Keri Keri, Auckland, Tauranga, Gisborne, and Hastings. There were were 76,041 lemon trees in registered orchards throughout the Dominion on March 31, 1947, distributed in the various districts as follows:—

Keri Keri	11,232
Auckland	34,642
Tauranga	31,835
Hamilton	1,021
Gisborne	3.072
New Plymouth	374
Hastings	2,336
Wanganui	414
Palmerston North	526
Masterton	9
Wellington	21
Motueka	470
Mapua	677
Nelson	997
Blenheim	388
Christchurch	25
Alexandra	2

These figures do not include the lemon trees grown in gardens throughout the country for private use.

It is unlikely that New Zealand will be able to develop an export trade in lemons, as the world's markets are already supplied by countries more favourably situated. The local market is capable of absorbing lemons in the months of January to April, but the trees at present planted are capable of supplying this trade for other months of the year. In the circumstances, the further planting of lemon trees on anything like an extensive scale is a matter that should be approached with caution. The replacement of old trees should receive attention during the next few years as trees become available.

Varieties

The main varieties grown in the Dominion for commercial purposes are the Lisbon and Eureka. Other varieties which are grown to a limited extent are the Villa Franca, Sweet Rind (a strain of Eureka), Genoa, and Meyer.

Lisbon.—Fruit of good quality, medium size, oblong, of good even shape, and firm with a thin, smooth, pale-yellow rind, and with comparatively few seeds. This variety is a good cropper and produces much of its fruit in the interior of the tree. Two crops are borne each year, the winter crop being the main one. It has large thorns, which cause injury to the fruits coming into contact with them and make pruning and picking operations more difficult.

Eureka.—Fruit of good quality, medium to large in size, oblong, of good even shape, and firm with fairly thick, wrinkled, pale-yellow rind, and with comparatively few seeds. The tree is a moderate and consistent cropper and is thornless. It comes into bearing earlier than Lisbon. Fruit is mainly borne near the tips of the branches and on young trees is inclined to be coarse.

Villa Franca.—Fruit of good quality, medium in size, oblong, slightly pointed at blossom end, of good, even shape, and firm with a thin, pale-yellow rind, and nearly seedless. The fruit from the young trees is inclined to be rough. The tree is a heavy summer bearer, a vigorous grower, and is practically thornless. The branches have shorter joints than other varieties, and on this account this variety is better suited to somewhat exposed situations. The tree is of a spreading and somewhat drooping habit.

Eureka (Sweet Rind).—Similar in appearance and quality to Eureka, but produces fewer seeds, yields a greater quantity of summer fruits, and produces a smoother type of fruit than Eureka. It comes into bearing early.

Genoa.—Fruit of good quality, medium in size, oblong, of good shape, smooth, and attractive in appearance. The tree is a heavy summer cropper and bears heavily while very young. It has a drooping style of growth, with fine laterals and foliage, and is hornless. It is not so vigorous as some varieties, but this probably can be overcome by an annual moderate thinning of the young fruits until the trees are six years from planting.

Meyer.—A sweet orange-lemon hybrid Early fruiting, hardy and heavy cropping. Fruit smooth, thin skinned, juicy, good texture, medium size, oval in shape, and of a deep golden yellow colour. Becoming increasingly popular in domestic and comercial orchards. One main crop is borne, which reaches maturity towards the end of the month of May.

Stocks

Since the commercial varieties of lemons grown on their own roots are susceptible to disease they usually are worked on to more resistant stocks.

It is very important that the stock should suit the conditions of the locality where the trees are to be planted. Many trees have died, while others have produced light and inferior crops, through the use of an unsuitable stock. The stocks which are in most general use are the rough lemon known in Australia and New Zealand as "Citronelle," a horticultural variety of the lemon Citrus Limonia, and the sweet orange (Citrus sinensis).

Other stocks which are in use to a limited extent are sour orange (Citrus aurantium), and trifoliate orange (Poncirus trifoliata).

The rough-lemon, of which there are a number of strains, has been used extensively in a wide range of soils in all citrus-growing countries, but has the disadvantage of being sensitive to cold and susceptible to collar-rot, bark-blotch, gummosis, and citrus verrucosis in the heavier and wet soils. It is deep-rooting and has a well-developed root system, which encourages the trees worked on it, particularly those planted in light, sandy soils, to grow vigorously. In the early years of bearing the fruits produced are frequently poor in quality on account of the rapid growth of the trees, but after the advent of heavy bearing, fruit of good quality is produced

The sweet and sour orange stocks are more resistant to diseases than the rough-lemon stock. On the orange, the trees do not come into bearing as early as they do on the rough-lemon, but remain productive for a longer period. Experience in other countries has demonstrated that the sweet-orange stock is suitable for light, deep, and well drained soils and has a comparatively shallow-rooting system. It produces well-shaped trees. In this country stocks of this orange are usually raised from selected pips of the Cook Islands sweet orange.

The sour, or Seville, stock is hardy and well furnished with deep-rooting roots and is adapted to most situations, but thrives particularly well on heavy soils.

The trifoliate orange is not recommended for commercial orchards, but may with advantage be used in domestic gardens where large trees are not desirable. It is a very hardy slow-growing stock with a dwarfing effect upon the scion. It develops a good deep-rooting system and is suited to localities with a rich heavy loam containing a fair amount of moisture. It is entirely unsuited to light sandy soils.

Not a great deal is known of the performance of the Pomelo stock, but it is recorded that it is susceptible to collar-rot and gummosis in the heavier soils. It is also recorded that from a small and crooked tap-root a strong lateral root-system develops at a somewhat deeper level than the roots of the sweet orange

Further experimental work remains to be done before definite recom-

mendations can be made as to the stocks on which lemon varieties should be worked in this Dominion.

Raising Stocks and Trees

The practice in raising seedlings for stocks is to save fruits from selected trees which exhibit a strong healthy growth. The seed is removed from the fruits, and the largest are selected and are stratified in sand until the time for planting arrives. The period best suited for planting the seeds is from the later part of September to the end of October. The seeds are set out in well-prepared soil in rows 9 in. apart and 2 in. to 3 in. apart in the row. The seeds are set in drills 2 in. deep and covered to the depth of 1 in. Until the seedlings are well established the soil is kept moist and well cultivated.

The seed-bed is protected from the winds and the hot sun by covering it with scrim or other suitabie material The soil should not be allowed to become baked.

By the autumn, if the plants make reasonable growth, they reach a height of from 8 in. to 12 in. In the following spring the strong plants are set out in nursery rows 3 ft. apart and from 12 in. to 15 in. apart in the rows The weaker plants may be allowed to remain another year in the seedling-beds, but it is better practice to destroy them. Diseased plants should be discarded.

In the year following the transplanting, when the sap is flowing freely, which is usually from November to March, budding is done in the same manner as on other classes of trees. The buds should, however, be inserted at a point 8 in. to 12 in. above the soil-level so as to lessen the possibility of the wood of the scion becoming contaminated with bark-blotch, etc.

Citrus stocks should not be budded until the wood has reached suitable dimensions whether this be two or three years from the time the pip is sown. A lead-pencil is often referred to for illustrating the size of stock wood desirable, but a stock of this size cannot be relied upon to produce the growth required. Orange stocks which have attained a diameter of from ½ in. to ¾ in, and rough-lemon stocks of ½ in. will be found to give more general satisfaction than those of smaller diameter.

The budwood should be selected from trees which are thrifty, heavy regular bearers, and producing fruit of approved type. On account of the bud-variations which occur on individual trees the fruit on the branches from the which the budwood is taken should be carefully examined to ensure that it has the desired characteristics. The buds near the tip and near the base of the bud stick should not be sued. The budwood should be at least ¼ in. in diameter (about pencil thickness), rounded, and dark green in coldour, with plump, well-developed buds.

When the buds are about to break in the following spring the stock should be cut back to within 8 in. above the bud. The wood left above the bud is used for tying the young growth to, as this is better practice than tying it to stakes. In the following spring, after the danger from frost injury is over, the wood above the bud should be carefully removed with a sloping cut and a protective wound-covering applied.

The budded trees should remain in the nursery row for eighteen months to two years before being planted out in their permanent positions. Detailed information in reference to budding is given in Bulletin No. 81, "The Budding of Pip and Stone Fruit-trees", issued by the N.Z. Depadtment of Agriculture.

Selecting Young Trees

In the establishment of a productive orchard success is largely dependent on the quality of the young trees.

Only thrifty well-rooted trees with well-coloured healthy bark should be selected. Weakly trees and those that have the lowest main branch less than 2 ft. from the ground-level should be rejected. Orders should be placed early with a reliable nurseryman, and no attempt made to obtain cheap lines. Maiden trees—one year from the bud—should have one clean, straight stem from the point wheer budded. Two-year-old trees should have at least three strong thrifty branches. Trees that have been summer-pinched in the nursery to cause them to branch, and have developed only weakly growth, should be avoided.

Trees should be unpacked as soon as possible after their receipt from the nursery, and heel-ed in. Heeling-in is done by opening up a shallow trench in which the trees are placed in a sloping position and at right angles to the line of the trench. Although the trees may be laid closely together they should be placed singly so that the soil comes in contact with all the roots. Then the roots should be covered with soil, which should be trodden moderately firm, and then more soil should be thrown on so as to leave a loose surface. The trees remain heeled in until required for planting. Before heeling-in, all roots bruised in the process of lifting from the nursery should be cut back to above the injury, since any damaged roots left to die back are likely to seriously interfere with the formation of new roots.

Climate and Soil

Among the essentials for the cultivation of citrus fruits are a comparatively warm climate, absence of extreme winter conditions and damaging frosts, a fair rainfall without long periods of droughts, and good friable soil with a subsoil that will allow of deep rooting and perfect drainage. Lemons are grown on many types of soil, but that recommended is a deep sandy or clay loam over a porous subsoil. Since the trees are evergreen they are never dormant, so that the soil in winter should be well drained and warm to permit of continuous root-growth. On most stocks lemon trees are inclined to be shallow-rooting, and therefore the sub-soil should be loose and either naturally well drained or capable of being thoroughly drained by artificial means. Shallow soils, heavy clay soils, swampy soils, or soils that have a hard pan or an impervious clay sub-soil are unsuitable for citrus-culture.

As lemon trees are liable to injury by severe frosts areas in which they occur should be avoided. The best positions for orchards are the northerly slopes of low hills with easy grades or level land not locked in by hills. Areas exposed to cold winds or where fog lies heavily should not be selected. The annual rainfall in the citrus areas of the Dominion, when evenly distributed over the year, is usually sufficient to meet the needs of the trees.

Preparation of Land

No planting should be done until the whole area is properly prepared. It is a mistake to plant trees with the intention of making the necessary improvements afterwards, since in very few instances is it possible to do this thoroughly. Where there is scrub growing on the land it should be grubbed and burned. It is inadvisable to plough woody matter into the soil, as this material is liable to become a host for fungous diseases. If there is a sward of grass the first ploughing should be shallow—e.g., skim-ploughing. The furrows should be broken down with discs and left for a few weeks. The land should be deeply crossploughed when the turf is dead, but if twitchy grass plants are present they should be grubbed and harrowed out before ploughing. The soil should be thoroughly worked and brought to a fine tilth. It is a good plan to devote two whole seasons to the preparation of the soil prior to planting. A crop of potatoes followed by lupins in the first season, followed by further working and cover crop in the following season, leaves the soil in suitable condition to receive the trees. Superphosphate 44-46 per cent. at the rate of 3 cwt. per acre, carbonate of lime 3 cwt. per acre, and sulphate of potash 1½ swt. per acre should be sown with each cover-crop. The cultivation necessary for the potatoes breaks up the soil and suppresses weed-growth, while the lupins supply a good body of humus. Where practicable, the ploughing-in of the cover-crop should be delayed until fibre has developed in the plants, which would be at the commencement of the flowering-period.

Drainage

Good drainage is essential to successful citrus-culture and must therefore be considered together with the preparation of the land. Such troubles as collarrot, bark-blotch, etc., are frequently caused by insufficient drainage. A drainage scheme should

be capable of carrying away the water quickly when heavy rains are experienced. Drains are laid between rows of trees where practicable to allow of lifting should cleaning out the pipes become necessary. The soil must be free from surplus water in the winter as well as in the summer. The water-level should be as low as possible. Good drainage greatly assists in the improvement of the fertility of the soil. Land which cannot be readily drained should not be selected for citrus planting, and where trees are planted on soil which cannot be readily drained it may be advisable to put the land to some other use.

Shelter

It is essential that the orchard should be adequately sheltered from all winds. Good, permanent shelter-belts around the boundary should be established at least two years before planting the orchard so that the lemon trees may receive early protec- Cupressus lawsioniana, Cupressus bention. The shelter may consist of either thamii, or Cupressus macrocarpa. Pinus muricata, Pinus insignis, Eucalyptus amygdalina, Bambusa vulgaris, Acmena floribunda, Hakea saligna, Cryptomeria janonica, Berberis vulgaris, and Acacia decurrens var. Mollis are alternative shelter trees planted by some orchardists.

Planting

For heavy or moderately heavy soils that are liable to remain cold and sodden during the winter months spring planting is preferable to autumn planting, since the soil is in better condition after lying fallow during the winter. Further, as the trees are set out in soil which is becoming warmer, the roots soon establish themselves. Autumn planting is suited to most well-drained soils provided the land is well worked prior to planting.

The trees should be planted on the square system, as this facilitates cul- class lands should be planted from 22 tivation. Trees to be set out on better- ft. to 25 ft. apart. The former requires 90 trees per acre and the latter 69 trees per acre. It is not advisable, however, to plant trees closer than 25 ft., as a less distance does not allow for the land between the trees to be effectively worked or cover-crops grown when the trees reach full stature. On less fertile soils they may be planted 20 ft. apart. At this distance 108 trees per acre are required.

For the purposes of economical working, as well as general appearance, it is important that the trees be planted in lies, so that from whatever point they are viewed the rows look perfectly straight. Full details in connection with the laying-out of an orchard may be obtained from the Horticulture Division, Department of Agriculture, Wellington.

The sites for the trees having been marked with pegs, the holes should be dug and the soil removed and scattered broadcast. Before planting it is advisable to mix lime, superphosphate, and bone-dust together—three of lime, two of superphosphate, and one of bone-dust—and to place six handfuls of the mixture into each hole and work it well into the soil. If not attended to when heeling in the roots of the young trees should be examined and damaged parts cut off.

In the process of transplanting there is always some loss of roots. The tops should be lightened to balance this loss, as it is difficult to re-establish a tree with a head heavy in proportion to the roots. This may be effected by removing superfluous branches—three to four main branches being sufficient to make the foundation of a tree—or by shortening growths as the case may require, or by both removing and shortening shoots. When a young tree is furnished with spreading roots it is well to bake a mound in the centre of the hole, on which to place the tree with the roots pointing down the sides of the mound. The soil for filling in is obtained by digging the surrounding soil forward. The advantage of this method is threefold: It breaks down the walls of the hole, does away with a possible pot-hole for water and ensures that nothing but top soil will come in contact with the roots. If the soil is of a heavy nature the filling-in should be done with a digging fork. It is advisable to tread the soil firmly over the roots but to leave the surface soil loose. During the planting operations the roots should be be left exposed to wind or allowed to become dry. To neglect this precaution may cause a loss of trees.

Pruning

In the study of the methods adopted for the pruning of lemon trees it is found that a great many trees are not pruned sufficiently. While over-pruning is not recommeded, the pruning should be sufficient to maintain a fairly openheaded tree furnished with a good supply of thrifty fruiting laterals. Except for the winter and early spring months, pruning may be carried out at any season of the year. The most suitable period, particularly if heavy cutting has to be resorted to, is in the spring at the commencement of tree-growth, when the wound-gum is present in sufficient quantity to protect the tissues against the entrance of disease through the wounds.

Pruning in the Nursery

The pruning of the tree should begin with the one year rod from the bud. The height at which the one-year tree should be cut will depend upon the height that it is desired to make the head. For convenience in working the orchard the tendency now is to prune the rod back to a height of about 3 ft. from the ground. It is, however, advisable to cut a little higher for the following reasons: Firstly, it is impossible to be sure of keeping the top shoot. Top shoots are frequently strong in growth, and until well on in the season their hold on the main stem is not too secure. In windy places they are liable to be blown off, which may be disastrous to the development of a well-balanced tree if other suitable branches are not available. Secondly, some trees send up the first shoots too near to the perpendicular. If the young tree is headed a little higher than the top branch is required, the upper shoots tend to spread, and so the desired angle to form a broad base are other branches to select from in to the trees is obtained. Further, there case any are blown off.

During the first year after the heading-back of the rod, the shoots which develop should not be touched as the tree needs as much foliage as possible with which to develop a good root-system, strong branches, and to protect the trunk from the sun.

In the second year the branches to form the framework should be selected. Each tree should have from three to four main branches, the distance between the lowest and highest being from 10 is. to 12 in. The lowest branch should be at least 2 ft. from the ground. The branches should be arranged spirally on the trunk and not opposite each other, because when leaders are in whorls they are liable under stress to break away from the trunk. Those branches which are not required should be removed carefully.

Pruning at Time of Planting

Young trees received from the nursery in most instances are branched trees two years from the bud with the head already formed. When the young trees are planted shoots not required should be removed in order to restore the balance between the top and the root. Normally the selected branches do not need shortening, but where they have made very strong growth it may be desirable to head them back.

The trunks should be protected from sun-scald either by white-washing or by wrapping newspaper or other suitable material around them.

Pruning of Nonbearing Trees

During the first three years after planting very litle pruning is necessary—merely sufficient to keep the trees upright, to develop a shapely open, balanced head, and to remove superflous shoots. Branches which are growing strongly to the detriment of others may require heading-in to increase the strength of weaker branches and to induce lateral growth. The trees should have as many leaders as will fully furnish the tree without crowding.

There are a number of methods adopted by growers to develop the framework of the trees. One method which gives a tree of the desired symmetrical form and openness of of head is to select three or four leaders, which should be inclined at about 45 deg. angle. This should be

done at the end of the second or the third year after planting, when the trees are well established and strong growth has been made. Of the vertical growths which arise from the leaders two strong well spaced vertical shoots should be selected. Other vertical shoots should be either kept in subjection or removed, and the leader shortened back to the outside selected vertical growth. Two years later, when the selected shoots have made strong growth, each should be cut back to two suitably placed strong lateral shoots, thus doubling the number of leaders. From the vertical shoots which arise from these laterals one shoot each should be chosen, and two years later, when these selected shoots have made strong growth, each shold be shortened back to a strong lateral growth. The treatment of the past two years should be repeated until the trees reach a height of 10 ft. In most situations the trees should not be allowed to exceed 10 ft. to 12 ft. in height, as such a height allows of much of the fruit being gathered from the ground and of pruning and spraying being more readily carried out. This system of training provides shapely trees, each having from 12 to 16 leaders which should carry heavy crops without undue bending. The centre of the trees should not be allowed to become filled with vigorous shoots.

Young lemon trees should receive attention two or three times a year for the purpose of cutting back branches that are outgrowing the remainder of the tree and to remove suckers, especially should they arise from the trunks of the young trees.

Pruning of Bearing Trees

To maintain a maximum supply of fruiting wood the stronger subsidiary lateral growths should be pinched back to cause them to send out fruiting wood nearer to their base and close the main branches. Trees with an open centre carry fruit both on the inside as well as on the outside of the trees. The lower growth should be kept well above the ground-level and all straggling shoots and branches cut back to preserve as nearly as possible an even contour in the whole tree. All brush (unthrifty lateral growth), watershoots, and dead and dying wood appearing in the tree should be pruned out entirely. If the wood is young and vigorous the fruit will develop better, and much of it will mature in the summer. Growth that has been injured by frost should be cut back to sound tissue. A fairly open head in the tree fosters fruiting laterals and facilitates effective spraying. When a tree is allowed to grow with little or no attention it may produce a fair crop for a time, but much of the fruit will be on the ends of branches where it is liable to sway with the wind and become rubbed and bruised. Branches may be also broken by the weight of fruit, thus reducing the productiveness of the tree. To keep the mature tree shapely and fruitful it is desirable that it should receive attention at least once a year. Neglected trees are difficult to spray and often become infected with fungous diseases and infested with insect pests to an other wise avoidable degree.

The Lisbon, being an extremely thorny variety, requires more thorough and regular pruning than the other varieties, if fruit is to be obtained free from thorn injury. The inside of the tree must also be made accessible to the picker so that without undue difficulty he may avoid thorn scratches. Thorns on the main limbs should be reduced by pruning at the time of picking.

The Eureka lemon requires more shortening back of the laterals and reduction in tree heights, as its habit of growth is that of a tip-bearer. The lemons set at the end of long lateral growth are blown by every wind, thus resulting in rind abrasions and injury.

The Genoa, Villa Franca and Meyer develop more symmetrical - shaped trees. The Meyer is somewhat similar to the sweet orange in its habit of growth—closer headed. In the main the trees require only a thinning out of the shoots, which tend to become dense where annual pruning is neglected.

Tools and Wound-Covering.—Sharp secateurs to enable smooth cuts to be made are essential as are also a sharp saw, and a knife to smooth off the tissues ruptured by the use of the saw. A protective wound-covering should be applied to all wounds over half an inch in diameter.

Gather and Destroy Prunings.—These should be gathered and burnt without undue delay, to get rid of prunings that are diseased, to maintain the general tidiness, and to improve the hygienic conditions pertaining to the orchard.

Cultivation

The depth to which the soil may be cultivated is governed by type of soil and depth of rooting of the trees. As there is a tendency for young lemon-trees to develop roots near the surface the ploughing during the first few years should be relatively deep near the trees. The space around the trees not reached by the plough should be hand-dug, and any roots met with near the surface severed close to the trunk by a clean cut. As the trees increase in size the ploughing should be restricted to the area outside the spread of the trees, and the ground beneath the trees can then only be surface-cultivated. When this stage of the tree development is reached the trees will have a well-established root system in the middle and lower strata of soil. The importance of a good depth of well-cultivated soil cannot be too strongly emphasised, because unless this is provided the roots cannot long remain sufficiently active to maintain growth and produce continuously heavy crops of fruit suitable for commercial purposes.

The amount and character of cultivation, however, given to an orchard must be governed to a large extent by the nature of the soil and the climate. Usually it is best to plough to a depth of from 6 in. to 8 in. in the autumn and cross-plough in the spring. During the summer months the surface should be kept loose with a cultivator, ploughing at that time being inadvisable, as it tends to dry out the soil.

In the autumn the first furrows may be turned up against or towards the trees and an open furrow left in the middle of each "land" between the trees. In the spring the order is reversed, and thus the soil is brought back to its original position. The spring ploughing should be done as early as practicable, either in August or early September, and should cover all weeds and trash lying on the ground. The soil should then be worked down to a fine tilth, which should be maintained throughout the summer. The ground under the trees should be dug over to a depth of from 5 in. to 6 in. at least three times a year. In working soil where the main mass of feeding roots have been allowed to become established close to the surface the depth of cultivation should not be so deep as to cause a serious loss of roots.

The effect of cultivation upon the soil organisms (bacteria, fungi, and protozoa) is often overlooked. It is to these countless silent workers that a rich soil mainly owes it fertility. Thorough aeration, obtained only by cultivation and good drainage, is necessary for the micro-organisms to thrive and carry on their important work of soil improvement.

Cover Crops

For the successful growing of lemons it is essential to have a soil with a high humus-content. Besides assisting with the elaboration of plant-foods, especially nitrogen, organic matter increases the capacity of the soil to retain the moisture and improves the aeration of the soil. The humus-content should be built up by green manuring before planting the and deep ploughing is possible. To orchard, and while the trees are young maintain the trees in thrifty condition after they have come into bearing cover-cropping should be continued.

Legumes are most suitable for cover crops, since they grow rapidly and are rich in nitrogenous matter. Those recommended are horse-beans, lupins, vetches, and field peas used either alone or in combination with oats, barley, etc. A mixture of equal quantities of superphosphate and carbonate of lime often may be broadcast profitably with cover crops at the rate of 6 cwt. per acre.

In some districts weed-growth may be sufficient to maintain an adequate humus-content of the soil. During the early summer weeds, on account of their demand upon soil moisture, should be should be suppressed, but when early autumn rains are experienced they may be allowed to grow. When the herbage of weeds is allowed to grow it would be good practice to augment it with a legume broadcast early in February to come up in advance of the weeds.

Before ploughing a green crop under it is good practice to cut it into pieces with the discs, as this ensures a more even distribution of the organic matter. A green crop should not be ploughed in while the soil is in a dry state, unless it be in the late autumn with winter rains soon to follow. A fair amount of soil moisture is necessary to ensure the decay, as when moisture is in scant supply the crop decays very slowly. Green manuring should not be carried out during the later part of the spring or summer, since the bulk of the material may remain undecomposed thus keeping the soil open with a consequent loss of valuable moisture.

It is recognised that a green crop ploughed into the soil may have at first a temporary impoverishing effect, reducing for a time the available nitrogen. It is therefore necessary that green crops should be turned in at a time when trees are requiring a minimum amount of nitrogen, this being about midwinter. Soil-moisture is usually abundant at this time, and decompositions should be well advanced before the trees reach full activity.

For the first four or five years vegetable crops may be grown between the rows of trees. It usually is advisable to manure for these crops, and they should not be planted so close to the trees as to interfere with the young roots. If these matters are attended to intercropping is beneficial, as the cultivation necessary for the crops improves the condition of the soil. Potatoes, kumaras, tomatoes, and peas, beans, and other leguminous crops are suitable.

Fertilisers

To obtain profitable crops and maintain satisfactory growth citrus trees require ample supplies of plant-foods. Although the turning-in of cover crops and frequent cultivation do much to enrich the soil the addition of artificial manures is also necessary. Manuring, however, should not be overdone. Experiments have shown that nitrogen and, to less extent, phosphates and potash increase yield and improve the quality and hardiness of the new growth. Best results are obtained with fertilisers where there is an ample supply of decaying organic matter and moisture in the soil.

Nitrogen encourages growth. Fertilisers which contain nitrogen are sulphate of ammonia (20 per cent. nitrogen), nitrate of soda (15.5 per cent. nitrogen), blood and bone (4 per cent. to 8 per cent. nitrogen). dried blood (10 per cent. to 12 per cent. nitrogen), bonedust (3 per cent. nitrogen), and farmyard, sheep and fowl manure. Nitrate of soda should not be used regularly upon clay soils. Blood and bone, which also contains phosphate, is used extensively by citrus growers. It takes usually at least four times as much blood and bone as sulphate of ammonia to supply a given quantity of nitrogen. Sulphate of ammonia is generally the cheapest per unit of nitrogen, but as its regular use increases soil acidity and annual application of 1½ lb. carbonate of lime for each 1 lb. sulphate of ammonia is necessary, applied about one month prior to the spring application of nitrogen.

Phosphates promote root-growth, better setting of fruit, and earlier maturity of crops. Phosphates are normally supplied as superphosphates, basic phosphates, basic slag, blood and bone, and as bonedust, but the particular form used depends on local conditions and cost.

Potash is stated to improve flavour and the colour and smoothness of the skin, It is abundant in the majority of New Zealand soils, and in most localities only small dressings are necessary. Wood ashes that have not been weakened by rain are also a source of potash as well as of phosphates and should not be wasted. Where plenty of such ashes are available no other potash will be needed; about 500 lb. per acre is an adequate dressing for full-bearing trees.

Other manures which may be used are blood and bone, well-matured fish manure, and meatmeal. Lime improves the physical condition of heavy soils, and is also useful in correcting soil acidity.

If possible, organic matter, such as cover crops, farmyard, sheep, fowl and well conditioned fish manure, etc. should be turned in annually.

The fertilisers recommended for young non-bearing trees, distributed over the area occupied by the roots, are:—For the first year after planting sulphate of ammonia and superphosphate, ½ lb. each, and muriate of potash, ¼ lb. per tree, followed by an annual increase of ½ lb. of the two former and ¼ lb. of the latter per tree until the trees come into bearing. In addition, carbonate of lime should be applied at the rate of 1½ lb. for every 1 lb. of sulphate of ammonia used.

The quantities given in the following table are to be used as a basis for manuring bearing trees from 4 years to 12 years from planting.

Nitrate of soda may be substituted for sulphate of ammonia if desired. For older trees the dressings, in most situations, should be increased.

Diseases and Insect Pests

Fungous diseases and insect pests are more readily controlled when the trees are given good care. A tree crowded with growth provides a suitable harbour for pests and renders treatment very difficult. Important factors in the control of diseases and insects pests are proper attention to drainage, improvement of the soil, pruning, and the maintenance of clean surroundings, including the gathering and the destroying of decaying fruit before the spores are ready for dissemination.

Renovating Trees

Trees may become unthrifty from a variety of causes, such as a heavy infestation of insect pests or the presence of fungous diseases, want of systematic pruning, bearing continuously heavy crops of fruit, or old age. So long as the roots and trunk are sound it is possible to restore trees of poor production to a thrifty condition. Such trees may have a good deal of dead wood, may have run up in a straggling manner, or have lost branches through breaking down. These trees should be treated by cutting back the broken, dead, and diseased branches to healthy tissue an removing superfuous growth. The heading-back of the main branches should be done in the early part of October and should not be too severe the first year, but only partially done so as to avoid removing too much foliage before new growth develops.

The tree during the spring and early summer should be then sprayed two to three times with a summer-oil at a 2½-per-cent. dilution. In the winter following the appearance of the new shoots upon the lower parts of the tree the renovating may be continued. The hard cutting of the tree back to the main leaders should be done about October. Branches removed should be cut back to the branch or trunk from which they issue, so as to leave no "snags". Large wounds should be painted over with either Stockholm tar or a thick mixture of whitelead and oil. The trunks and limbs exposed to the sun by pruning should be protected from sunscald by applying a coat of whitewash. The soil around these trees should be cultivated deeply towards the end of April, before the late autumn or winter rains set in. The cultivation should become deeper with increasing distance from the trunk. Any available well-rotted manure or orchard and garden refuse should be worked into the soil around the trees. Should a good rain not be experienced within a fortnight the subsoiled trees should be given a good watering. The trees will soon push out number of new shoots. These should be thinned to the number required to furnish the tree with new branches and be afterwards subjected to the same shortening as described in a previous paragraph under the heading of pruning. Trees that are dying because of roots lost from disease or from unsuitable soil conditions obviously cannot be resuscitated, and should be destroyed.

Top-Working Trees

Trees that are in a healthy condition can be reworked with other varieties by budding. Grafting of citrus trees is somewhat uncertain. The buds should be worked into young wood, which is obtained by heading back the trees to a suitable point on the main limbs at the beginning of October. The new growth should be thinned out during the summer, leaving sufficient selected shoots which, when worked, will refurnish the trees with new branches. If the wood has attained sufficient size the buds may be inserted during the following March; if not, the budding will have to be deferred until the following November.

In the former case the buds remain dormant till spring. When growth starts the branches should be headed down to within 8 in. of the buds. It is not advisable to head close to the buds, as the sap in the wood left above affords nourishment to them and serves as a support to which the resultant shoots may be tied to prevent them from being blown off. The stump above the bud should not be allowed to make any growth and should be cut off as soon as the shoots are strong enough to support themselves. Shoots arising from the limbs and any remaining branches should not be removed immediately, but kept in subjection by thinning and heading back for two seasons, until the branches arising from the budwood are well established.

Harvesting

The care and skill required for picking, curing, and marketing lemons is as great as that needed in establishing and maintaining the orchard itself, and the results obtained at the harvesting stage necessarily mean success or failure of the whole venture. That lemons can be grown successfully in the warmer parts of the Dominion has been amply demonstrated, but this is not in itself sufficient to ensure the establishment of a successful lemon industry. There is demanded in addition a much more complete knowledge and practice of the art of curing than at present obtains in New Zealand to enable the grower to carry his fruit with a minimum of loss ocer such periods as the exigencies of the market may demand.

Picking

Careful handling during picking and carting to the packing-shed is essential to prevent injury to the skin of the lemons. It is necessary for the pickers to wear gloves to prevent scratching of the skin with their finger nails. The lemons should be removed from the laterals with sharp clippers with rounded nose. The stalk should be cut back to a mature bud about an inch and a half from the fruit and then double clipped to remove the stalk and to ensure that it is trimmed level with the button, for unless this precaution is taken the protruding spikes are liable to damage fruits with which they come in contact.

The fruits should not be dropped, but laid in a padded tin or in a picking-bag, which should be so made as to open at the bottom. When sufficiently full the lemons must be carefully transferred to the orchard box, which should not be filled to within more than 1 in. of the top. To roll the fruit roughly into the boxes causes bruising and stem punctures and an ultimate heavy loss, for storage rots usually gain an entrance to the fruit only through injury to the skin.

The orchard boxes should be smooth inside, have no protruding nails, and should be closely boarded on the bottom to prevent the entrv of stubble, etc., which may cause injury to the fruit. The boxes should be disinfected prior to each picking in a solution of formalin (40 per cent.), 1 part to too parts water.

In orchards where ladder-work is necessary pickers should avoid resting taining lemons, and, when descending, their weight on the picking-bag conthe fruit should not be allowed to bump against the ladder. Several days should be allowed to elapse after rain before picking is proceeded with. Fallen fruits should not be placed into the orchard box with the picked fruit, but kept separate. After picking, the fruit should not be left exposed to the sun.

Lemons should be picked when they reach the size desired by the trade, which is approximately 2¼ in. to 2½ in. in diameter. To obtain the finest grade and long keeping they should be picked when they are green or silver-green in colour. Fruit ripened on the tree is usually oversize and coarse, is not amenable to the curing, and is usually disposed of to the factory for the preparation of peel and juice. In order to harvest the lemons in proper condition a picking should be made at least every four weeks, and in some situations once in three weeks is necessary. Growers who do not pick as often as this have in consequence a higher percentage of oversized and yellow lemons than is desired where all the fruit is required for curing.

In loading the wagon care should be taken to see that the fruit has remained below the level of the boxes so that it will not be crushed by the boxes placed on top. The boxes should not be bumped down nor stacked any higher than a person can conveniently reach, which is about six feet high.

Preparation for Marketing

Based on a number of years experience first by the Tauranga Citrus Growers' Association and more recently by the Internal Marketing Division the treatment of lemons following their delivery at the citrus processing and packing depots has been modified from time to time with the object of minimising fruit losses caused by green mould (Penicillium expansum) and of providing to the trade and consumers sound fruit of good quality.

After delivery at a processing and packing depot the fresh lemons direct from the orchards are usually stacked in separate lots according to growers' marks for from three to seven days, depending upon rate of delivery of the fruit, before undergoing any further handling. This tends to reduce the possibility of skin injury during the subsequent mechanical handlings which the fruit has to undergo in its preparation for the market.

The principal depots are equipped with modern washing, drying, grading and sizing machinery, together with gas colouring and curing rooms, which greatly facilitate the handling of the lemon crop.

The orchard boxes are emptied on to a sloping fruit table, and after removal of any decayed fruits the lemons roll gently into a soaking tank containing water at 100 to 110 degrees Fahrenheit, where they remain from two to three minutes. On emerging from the tank they are carried along and brought in contact with revolving spiral cleaning brushes, over which they pass beneath a con-

Annual Dressing of Fertilisers for Bearing Trees from 4 to 12 Years from Planting

Fertiliser	Period of Application: Spring (August-September).	Period of Application: Late Summer (January-February)
Sulphate of ammonia	2 lb. to 5 lb. per tree	—
Lime (carbonate)	1½ lb. to each 1 lb. of sulphate of ammonia applied. Apply at least one month prior to dressing of sulphate of ammonia and work into soil. (Above treatments to be applied within spread of trees.)	3 cwt. per acre combined with superphosphate mentioned below.
Superphosphate	3 lb. per tree, applied within spread of tree prior to deepest working.	3 cwt. per acre broadcast at time of sowing cover crop.
Potash (sulphate or muriate)	1½ lb. per tree combined with phosphate.	—

stant shower of water. From the brushes the lemons cross a succession of metal squeegee rollers, which remove most of the moisture from the surface of the fruit before it passes into a bath of disinfectant solution of similar temperature to the water in the soaking tank. They remain in the solution for from one to two minutes, and are then elevated on to a further set of metal rollers where the surplus solution is removed before the fruit passes into the drying chamber. While being carried slowly through the drying chamber the lemons are subjected for three minutes to a drying air current of 100 to 110 deg. F. They emerge dry and ready for preliminary grading and sizing.

Preliminary Grading and Sizing

From the drier the lemons travel by endless belt to roller sorting tables where by-products fruits and rejects are removed and placed in measure boxes, while marketable grade lemons pass on to be separated into "coloured" and "green" classes before reaching the sizing mechanism. The "coloured" and "green" lemons are delivered to separate sets of bins.

The sizing machine operates on the weight principle, carrying lemons to a series of bins into which they are delivered suitably sized as follows:—

Commercial Grade ....
2⅛in. to 2⅝in. (138 to 198 counts).

Preferred Commercial Grade ....
1⅞in. to 2in. (216 to 270 counts).
2⅛in. (113 to 125 counts).

First Grade Peel .... Larger than 2⅛in.. (100 count and larger).

From the respective bins they are transferred by employees to open-slatted measure boxes, into which are placed grade slips indicating the grade of fruit, grower's name and date graded, thus enabling the line to be traced through its subsequent stages until it is packed.

The measure boxes are filled to a marked level, which gives one bushel (not packed) of lemons. A tally of the number of measure boxes of each marketable and by-products grade is then made and recorded in the books of the depot to the credit of the grower concerned.

Colouring

As the majority of lemons are picked green from the tree, colouring is practised to hasten the development of a bright natural lemon colour in the fruits. The colour may be developed by either sweating or by gas treatment. Sweating may be carried out by storing the fruit in well constructed rooms, which should be kept dark. A temperature of 70 deg. F. and a relative humidity of from 80 to 95 pe rcent. should be maintained as nearly as possible for a period on the average of approximately seven to 10 days. Under these conditions the period depends on the degree of colour in the fruit when picked. At a lower temperature the colour will not develop so quickly, while insufficient relative humidity will cause the skin of the fruit to harden and shrivel. To maintain the correct relative humidity and temperature moisture and artificial heat are necessary.

The gas method of colouring lemons is now used extensively, the gas employed being either thylene or coal gas.

The rooms should be airtight and fitted with ventilators to enable thorough ventilation to be carried out quickly and with air ducts through which air, heated if desired, may be injected into the room to maintain or raise the temperature, to change the air, or to provide circulation according to requirements.

The "green" lemons are placed in measure cases which are constructed of narrow battens with a space between each batten to allow air circulation, and are stacked in tiers in the colouring and curing rooms. Four such air spaces are left between the tiers and 18 in. passageways between the rows of tiers with 12 in. of air space between the ceiling and the top boxes. No dunnage is used.

When the room is filled with lemons and closed tightly, ethylene gas 1 to 30,000 parts of air, or coal gas at 1 to 1,000 is introduced. The release of the gas into the room is so regulated that it will reach the required concentration in about 30 minutes. During the colouring the temperature within the room is maintained at 70 deg. F. and the relative humidity at approximately 90 per cent.

After at least six hours the door and ventilators are opened up and the air changed by forced draught. The room is then left for a short period with moderate ventilation, until it is again filled with gas at the concentration as stated above. Gassing and ventilation are repeated for five or seven days according to the degree of green colour (light to medium) of the lemons when the colouring treatment was commenced. Dark green lemons, however, require a longer period to develop the desired colour. During this time the colour of the lemons will have changed to a light yellow shade. Following the gas treatment,, the lemons remain in the rooms for a further two to three weeks to complete their curing.

Curing

Lemon-curing is a term used to indicate a treatment of mild dehydration to which lemons are submitted to improve the quality of the fruit and to extend the period for which it may be kept in sound condition. The treatment causes the skin to become thinner and tougher. The rind of a properly cured lemon should be smooth and soft.

It is essentiai during the curing process to maintain a plentiful supply of fresh air about the lemons. The humidity of the room should not be allowed to fall to low, otherwise the skin of the fruit is apt to shrivel. Humidity is not usually difficult to control in the New Zealand climate, as there is sufficient transpiration from the fruits to supply he necessary moisture, provided ventilation is not overdone. The relative humidity is determined by means of a hygrodeik, and a reading of 90 to 95 per cent. is suitable.

A cool, even temperature between 40 and 65 deg. F. tends to reduce the liability of green and blue mould infection in lemons and enables them to be kept longer than those held at other temperatures. If occasion arises, the curing process may be hastened by increasing the temperature, but this should not exceed 75 deg. F. The curing-room should be darkened and draughts avoided.

As mould is usually much more prevalent between August and November, the fruit in the curing-room during these months should be examined at least once a fortnight and mould-infected fruits removed. During the remainder of the year examinations should be made at intervals of at least once in every three weeks.

Coloured lemons which require no treatment in the colouring rooms are stacked on the depot floor, with adequate ventilation spaces between through which a moderate circulation of air is maintained by use of portable fans for a period of 10 to 15 days.

Following the foregoing treatments both the "coloured" and previously "green" lemons of the marketable rind. If not sweated in this way, the grades are put through the processing machinery a second time. As in the first instance, any fruits which may have decayed during the curing period are removed, and the lemons are then washed, sterilised and dried before reaching the sorting tables for final check grading. They are mechanically sized into bins, nd from there are packed into the standard lemon packages, only lemons of similar sizes being placed in each container. The packages are then lidded and branded and consigned to the respective markets throughout the Dominion.

Grading

The modification of the grading standards for lemons has been adopted whereby size and quality rather than appearance and quality are the principal determining factors for classification of marketabel fruit. The simplicity of the new grade specifications has been of material advantage in the packing depot, and at the same time has been acceptable to both producers and consumers of lemons under existing conditions.

By-Products

In all citrus areas there is a proportion of the fruit which is below the quality required by the markets, such

as over-large, coarse, and tree-ripened lemons. This class of fruit usually can be disposed of for the making of lemon peel and lemon-juice. The manufacture of other by-products, such as lemon-oil, pectin, citric acid, and citrate of lime, etc., has not yet been developed in the Dominion.

Following initial washing and grading, naturally coloured "peel" fruit should be processed as soon as possible and green "peel" fruit artificially coloured, but not cured, before processing. After being cut longitudinally into halves by machine the lemons are reamed to remove juice and packed tightly into open barrels. The barrells are then lidded, filled with a saturated solution of cold brine, and left overnight. They are then topped up weekly with brine to replace that lost by evaporation and absorption into the peel, and are held for approximately three months, by which time the skins have become soft, pliable, and somewhat translucent in appearance. Before shipment the now pliable peel is packed much more tightly into barrels which are then filled with brine and despatched to merchants, who purchase the peel in this condition and complete the processing themselves.

"Juice" fruits are cut into halves and reamed to extract the juice. The reamed pulp is put through a juice strainer which removes pips and rag, after which the juice goes into clean casks and is preservatised by addition of sulphur dioxide. The juice is then ready for delivery to merchants who complete processing to suit their various requirements.

Shed Hygiene

It is recommended that:—

(1) The members of the staff handling the lemons should use suitable gloves or have their finger nails closely cut to avoid injuring the skins of the fruits.

(2) The measure boxes should be sprayed with formalin solution (400 per cent.) at a dilution of 1-100 after they have been emptied of each grower's line of lemons for which they have been used. When necessary, these boxes should be thoroughly washed in formalin solution.

(3) The curing rooms, grading and sizing machinery, and other equipment should be periodically sprayed with formalin solution.

(4) The mould-affected lemons should be so handled as to prevent the spores from being disseminated into the atmosphere of the room.

(5) Mould-infected fruits should be collected in suitable receptacles taking every possible care to see that the mould spores are not disseminated throughout the building. Lidded metal drums, if available, are recommended for holding decayed and mould-infected fruits awaiting disposal. These containers should be stored outside the depot and the contents removed and disposed of at regular intervals.

General Recommendations

Lemons below grade, diseased or infected with scales should be discarded into suitable containers in the orchard.

(1) Lemons should be picked at light green to medium green stage when they have reached a size of 2¼ in. Light yellow lemons are suitable for marketing, but should be picked before the colour becomes deeper, even if not up to 2¼ in. Dark green lemons or "nigger-heads" are undesirable, owing to the difficulty in curing them. Some dark green lemons may require to be left to develop to peel size before harvesting. "Peel" fruit should not be harvested until of light yellow colour, but should not be allowed to reach a deep yellow stage approaching tree-ripeness. Yellow lemons approaching the tree-ripe stage are unsuitable, but may be used for juice purposes.

(2) The pickers should wear gloves in order to prevent finger nail injury to the fruit.

(3) Lemons should be clipped without injury to the "button", but with no projecting stub of stem. Two cuts may be necessary to secure this condition.

(4) Picking should be done by means of a specially designed sharp clipper with rounded nose.

(5) Lemon boxes should be sterilised with formalin solution (40 per cent.) 1-100 before being used for picking.

(6) The fruit should be picked and handled very carefully. Boxes should not have projecting nails or rough surfaces, and field boxes should not be filled to a level which will cause lemons to be injured by upper boxes in a stack "riding" on fruit in lower cases.

(7) To secure maximum percentages of marketable grades, picking should be regularly carried out every three to five weeks and all lemons of suitable condition picked at each harvesting.

Curing for Small Growers

Lemons carefully handled and gathered from the tree at the right stage of maturity may be successfully cured or conditioned, and then stored for several months without deterioration. By suitable treatment their keeping and edible qualities and appearance are improved.

In the process of curing, lemons are submitted to a mild dehydration treatment, which causes the skin to become thinner and tougher. When properly cured the rind of the lemon should be smooth and soft, and the colour of the fruit changed from green to yellow.

To obtain the best results from curing, the lemons should be carefully cut from the tree, preferably with sharp clippers with rounded nose, when they have reached approximately 2½ in. in diameter, but are still green or silver-green in colour. The stalk should be cut just beyond a mature bud, and about 1½ in. from the fruit, then double-clipped level with the button, for unless this is done the protruding stem is liable to damage fruits with which it comes in contact. Every care should be taken to avoid scratching the lemons with the fingernails or other means and damaging the rind by bruising. Injured parts readily decay.

After picking, the fruit should be placed in trays or shallow boxes in a shaded, airy position and allowed to remain for several days to permit the excess moisture to exude from the lemons will tend to become unduly damp in storage and thus be more liable to infection by mouds.

The dipping of lemons in water heated to 110° F., containing borax at the rate of 4 lb. to 5 gallons, for a period of four minutes, before placing them in storage, is practised and recommended to reduce the danger of the fruit becoming affected with blue or green moulds.

The fruit should then be put in a box with one-piece sides or in trays, covered with a piece of canvas or other suitable materials to prevent excessive wilt of the fruit, and stored in a darkened room in which the relative humidity and temperature should not be allowed to fall too low. A relative humidity of about 75 per cent. and a temperature of between 40° and 65° F. are suitable. If the atmosphere of the storeroom is considered to be too dry, the humidity can be increased by sprinkling water on the floor. According to the temperature maintained the curing process should be completed in from six to ten weeks. If it is desired to speed up the colouring, a higher temperature and humidity may be maintained about the fruit by covering the boxes entirely with canvas or sacks when it is placed in the store; or the temperature may be increased by the use of a paraffin or other heater. The fruit should be inspected periodically, and all lemons which show signs of decay carefully removed from the box and burnt.

Another method of curing the fruit is to store the lemons in clean, slightly damp sand or sawdust in one-piece-sided boxes lined with paper. Sawdust from pines or from Cupressus macrocarpa should not be used, because of the possibility of its tainting the fruit. A layer of the material about 2 in. deep is first laid down, and then a single layer of lemons is placed on this so that no two fruits are touching. The lemons are then covered with at least 1 in. of the material, and then another layer of fruit and so on, until the box is full.

Briefly, the recommendations are:—

1. Carefully clip the fruit from the trees when it has reached 2¼ in.

to 2½ in: in diameter and while green or silver-green in appearance—green lemons keep longer than those ripened on the tree.

2. Handle the fruit carefully to avoid causing injury to the skin of the fruit.

3. Place fruit in shaded, airy situation for four days to sweat.

4. Then dip fruit for period of four minutes in borax solution (4lb. borax to each 5 gallons water) heated to 110° F. and allow fruit to dry.

5. Place fruit—
   (a) In a close-sided box or box lined with paper or in trays and cover with canvas; or
   (b) Between successive layers of slightly damp sawdust.

6. Examine fruit fortnightly for pose of removing mould-infected fruits, which should be burnt.

7. Maintain as far as practicable a temperature of between 45° and 65° F., and a relative humidity of approximately 75 per cent.

8. Curing process will take from six to ten weeks, according to the conditions under which the lemons have been produced.

9. The storeroom should be darkened, kept well ventilated, and draughts should be avoided.

(Bulletin No. 96 issued by the New Zealand Department of Agriculture and reprinted from articles by W. K. Dallas in "The New Zealand Journal of Agriculture," April, May, June, July, 1944.)

PRECAUTIONS WITH H.E.T.P. AND T.E.P.P.

Particular care should be taken when the organic phosphorous insecticides H.E.T.P. (hexaethyl tetraphosphate) and T.E.P.P. (tetraethyl pyrophosphate) are being used. Gardeners should not eat, drink, or smoke when handling them and they should wash their hands thoroughly after spraying. The chief danger is from the concentrated material and every precaution should be taken to prevent it from coming in contact with the skin. If any is spilt on the hands, it should be washed off immediately. Empty containers should be disposed of by burying.

Floral Festival Publicity

The Floral Festival to be held at New Plymouth next March will be advertised by the Tourist and Publicity Department throughout New Zealand and overseas. The department has branches throughout New Zealand and in Australia, Britain and the United States. The festival will be opened by the Minister in Charge of Tourist and Health Resorts, Mr. E. H. Halstead. A meeting of the committee of Floral Festivals (Taranaki Inc.) was told this at Stratford by the New Plymouth public relations officer, Mr. W. E. Barrett, this week. All the halls in the Taranaki winter show buildings, covering about 20,000 square feet, will be used for the festival.

Advice to Home Gardeners

WITH the rapid increase in house building in New Zealand over the last decade, it is inevitable that there will be many people seeking advice on gardening. It does not seem to be generally appreciated that there is a wealth of information on horticulture which is available to the public of this country. In fact, there are relatively few countries in the world in which the public is so well served, both by the quantity and the quality of the advice available, much of it free.

There is a wide range of books available on all matters pertaining to horticulture. These are sometimes relatively expensive, and the acquisition of a good horticultural library can make gardening a costly hobby. Practically all the books available can, however, be obtained through the Country Library Service. Applications should be made through the nearest public library or direct through the Country Library Service. It is hoped to publish a suggested list of books in our next issue.

There are, in addition, some inexpensive books available, written by New Zealand horticulturists, which should answer the first problems of the tyro gardener. In addition, the New Zealand Journal of Agriculture includes each month worth-while articles on horticulture, including vegetable and flower gardens. Other commercial journals, such as the New Zealand Gardener, publish articles on horticultural matters.

The Department of Agriculture, through its Horticulture Division, also publishes bulletins dealing with various aspects of horticulture. These bulletins are compiled by officers of the Department and give authoritative advice on the culture of various plants and crops. In addition, special advisory leaflets are compiled for each district, each dealing with special problems of that district. It will be appreciated that there is a wide variation in climate and soils in New Zealand, giving rise to special problems. For example, a crop which may be planted outside in August in Auckland may not be safely planted until October in Southland. This makes it practically impossible to give a blanket coverage of advice for New Zealand.

The publications of the Department of Agriculture can be obtained from any of the offices of the Department, located in the main towns of the country. It sometimes happens that some of the publications may at times be unobtainable, but this is usually a temporary matter.

Some Department of Agriculture bulletins are:

FRUITS:

310 The Home Orchard
357 Peach and Nectarine Culture
358 Apricot Culture
281 Budding Pip and Stone Fruit Trees
285 Grafting of Fruit Treees
96 Lemon Culture
241 Culture of New Zealand Grapefruit, Orange and Mandarin
303 The Propagation of Citrus Trees
135 Passion Fruit Culture
306 Tree Tomato Culture
349 Chinese Goooseberries
258 Raspberry Culture
282 Currant Culture
321 Strawberry Culture in New Zealand
297 Gooseberry Culture

VEGETABLES:

342 The Home Vegetable Garden (Cost, 4/- post free. This covers all aspects of the home vegetable garden and should be on every gardener's boookshelf.)
340 Soil Fertility in the Home Garden
314 Disinfection of Glasshouse Soil
370 Growing Tomatoes in Glasshouses

MISCELLANEOUS:

309 Establishment and Maintenance of a Lawn
359 Establishing and Maintaining a Rose Garden

Apprenticeship and Military Training

From a number of cases recently noticed by the Labour Department it appears that some employers are not aware of the provisions of the Military Training Act, 1949, in respect of apprentices. There are three main points to be noted:

(1) The time an apprentice spends on military training is reckoned as part of his apprenticeship. He does NOT have to make up the time. (Section 66 (1).)

(2) Wages are not payable during periods of military training. But, since the time spent on military training counts as part of the term of apprenticeship, any wage rise that is due comes on the same date as if the apprentice had not been in camp. (Section 66 (2).)

(3) For the purposes of ANNUAL HOLIDAYS an employer is not obliged to count time spent on whole-time military service. (Section 64.)

Official Announcement of the 33rd Annual Meeting

NOTICE is hereby given that the 33rd Annual meeting of the Dominion Council of the Royal New Zealand Institute of Horticulture (Incorporated) will be held in the Victoria Concert Chamber, Town Hall, Invercargill, on Tuesday, 31st January, 1956, beginning at 9.30 a.m.

J. H. McIVOR,
Dominion Secretary.

1956 CONFERENCE ARRANGEMENTS

At a recent meeting of the Royal New Zealand Institute of Horticulture correspondence from the Southland District Council was tabled covering the 1956 Conference.

Arrangements approved were that the Conference be held in the Victoria Concert Chamber, Town Hall, Invercargill, on Tuesday, 31st January, 1956, commencing at 9.30 a.m. A suggestion that arrangements be concluded for talks on the International Horticultural Congress, at which New Zealand was represented by Mr. Hunter, of Auckland, and Mr. Hockey, of Palmerston North, was approved, and an invitation was extended to the abovenamed gentlemen to address the Annual Conference.

The Banks Lecture will also take place on January 31st in the Victoria Concert Chamber, commencing at 8 p.m., and if the Annual Meeting concludes on the Tuesday a tour of the City will take place on the Wednesday morning and the Horticultural Exhibition will be attended in the afternoon. It was agreed that Wednesday evening be left free and that tentative arrangements be put in train for a trip to Stewart Island on the Thursday.

Digging — Terms and Techniques

EVERY horticulturist worthy of the name has at least a passing acquaintance with digging. It is undoubtedly true that the modern young horticulturist is more familiar with the mechanical cultivator than with the more mundane spade, but there are many occasions in horticulture where the spade remains as a brutal necessity. Many techniques of digging have been evolved over the years, and each has acquired its characteristic name, but, as is so often the case, the names have been confused, until they are no longer descriptive.

R. F. Martyn, Principal of the Pershore Farm Institute carried out an investigation into the techniques of digging and their terminology and his report to the Horticultural Education Association on this subject throws interesting light on this subject.

Gardeners of the eighteenth and nineteenth century were firm believers in deep cultivation and the wisdom of their policy is to be seen in many of the mellow soils of the old English private gardens. They had two main objects in view One was to create a layer of fertile soil at least three feet deep, through which the roots of the plants might ramify without hindrance. The other reason was even more important. In the process of establishing and maintaining the deep fertile layer, the soil was frequently inverted, so that the lower strata was brought to the surface. Thus a layer of soil in which a crop had been grown would be buried for some years before being brought to the surface once more. Thus the gardener was able to practise a form of rotation in depth as well as rotation of crops across the surface. These old gardeners regarded crop rotation very seriously, although they referred to it as "resting the soil." Modern knowledge has confirmed the value of the practice in reducing the incidence of soil-borne pests and diseases.

It may be worthy of note that this method of rotation of crops is still in use in some places today. In the bulb fields near Lisse, in Holland, soils have been specially developed for their purpose, and their area is limited. Because of the specialised nature of the crops, normal surface crop rotation is impracticable and soil inversion, several feet deep, is a common practice, a section of the holding being so treated each year.

Such soil inversion must be done by opening out a trench to the required depth, then digging in the top soil, followed by piling the lower strata of the soil on top. Almost inevitably, this system of digging acquired the name of "trenching." Today the term is often applied to several different methods of digging, but the name should be reserved for a form of cultivation in which the "sub-soil" is brought to the surface, and the "top soil" buried.

To do this with immature or virgin soils would often be disastrous, since sub-soil is generally an unsuitable habitat for plants and seeds. These old gardeners were not fools, and realised that their trenching technique could not be applied to such soils until the sub-soil had been improved. They introduced another technique to improve the soil until it was ready for inversion. In this technique a trench is opened out one spit deep. The sub-soil in this trench is then dug over in situ, incorporating organic matter

to improve the fertility. This is then covered with the next row of top soil and the process repeated. After two years of such treatment, these two spits could then be inverted, and during the process the third spit could be dug over and manured.

This process was regarded as a false form of trenching, and consequently they applied to it the name bastard trenching. Current usage has made this an unfortunate term, and it has been replaced by the more acceptable double digging. Thus double digging and bastard trenching should be regarded as synonymous for a method of cultivation in which the soil is not inverted, and in which the sub-soil is cultivated in situ.

It is apparent that many variations can be evolved, for example, where trenching two spits deep and cultivating the third spit in situ. Such unlikely digging systems should be described as such, if they must be mentioned today. Trenching is not likely to be practised again in New Zealand, but double digging may well find favour in home gardens established on unkindly soils. It is perhaps significant that the Royal Horticultural Society, doyen of garden tradition, has dismissed trenching from the syllabus of its practical examinations, and has defined clearly what is meant by double digging.

Horticultural Apprenticeship

(Notes of a talk by the Commissioner of Apprenticeship, Mr. H. C. McQueen, to the Wellington District Council on September 20, 1955.)

Apprenticeship in horticulture and gardening is governed by an order of the Court of Arbitration made in 1948. There had been an early order (1926) for Canterbury, and one for Wellington was made in 1941. The present order is for the whole of New Zealand.

A New Zealand Apprenticeship Committee is responsible for the general administration of apprenticeship. Its members are: Messrs. V. C. Davies, E. Hutt, L. F. Sired, W. H. Little, J. Shankland, W. Windle, G. V. Wild, and H. C. McQueen. Three of these represent employers and three workers, and Mr. Wild represents the Director of Education.

Local administration is in the hands of three local committees, for Canterbury, Hawke's Bay, and Wellington. These committees are constituted on the same pattern as the New Zealand Committee. Outside the jurisdiction of the three local committees the District Commissioners of Apprenticeship in Auckland, Hamilton, New Plymouth, Palmerston North, and Dunedin perform the functions of local committees.

There are 62 apprentices in New Zealand, 15 of whom began their contracts in the last year. Their minimum wages are prescribed as percentages of the rate for nurserymen, the scale being: 23, 29, 35, 41, 47, 53, 59, 56, 71, 77. At the present time the starting wage is about £2/14/- a week, and there are rises of about 14/- every six months. The term of apprenticeship is five years, but holders of School Certificates have a reduction of six months allowed.

An apprenticeship contract binds the apprentice to serve his employer and learn his trade; at the same time it binds the employer to employ the apprentice and teach him the trade. Provision is made for time an apprentice spends at an approved institution (Massey or Lincoln) to count as part of his contract term.

All apprentices are required to undertake a course of study with the Education Department's Technical Correspondence School. Those who are preparing for the Diploma follow the course of study prescribed, but the others have a simpler and more practical course of study. The New Zealand Apprenticeship Committee has made arrangements for the conducting of short courses at Massey and Lincoln for senior apprentices, but a slight administrative difficulty has prevented the actual running of any course so far.

Each apprentice is required by the apprenticeship order to "'keep a diary of the work he has done, with notes of other items of horticultural interest." The local Committee has the right to inspect the diary from time to time.

(Notes of a talk to the Wellington District Council by Mr. A. M. W. Greig, Director of the Horticulture Division of the Department of Agriculture.)

Tonight I will only deal with two aspects:

i. The qualifications and prospects of a fruitgrower.
ii. The training and work of a horticultural advisory officer in the New Zealand Public Service.

Let's start off by seeing how these occupations are alike and how they differ.

First of all—like work in all phases of horticulture—the person contemplating fruitgrowing or advisory work must have a genuine interest in biology, in nature or in living things. He must want to do something useful and creative, and feel impelled to make New Zealand more fruitful and more beautiful than he finds it. Now already I've started to talk about him and not about her—for although there are openings for girls and women in horticulture—and what better

training for the future home-builder than a training in home gardening—yet it is true that both fruitgrowing and advisory work is restricted almost entirely to men, although during the past five years the Public Service has appointed two or three women as Horticultural Instructors or advisory officersto home gardeners and to countrywomen through the Farm Schools organised and run in country districts by the Department of Agriculture.

But fruitgrowing is largely a man's job and it's harder work than many people imagine. Girls are invaluable as packers in the shed and as assistants in picking the fruit. I think even in New Zealand today too many think fruitgrowing is easier work than it is and too many, after years in an office, decide to buy a citrus orchard to retire to. Most would be very much better off physically and financially if they were content with half an acre or at the most one acre in orchard and home garden.

Talking about finance, let's get the situation clear. In neither job as grower or adviser will the individual make money—in fact, if his interest is largely influenced by the financial rewards he should be discouraged from taking up either of these two occupations. If he is unlikely to inherit capital he would be wiser to be an advisory officer for adequate capital is essential for the fruitgrower. Not just the capital required to buy the land or build the house but enough capital to secure enough of the essential equipment and to bring the trees into almost full bearing. Too many in the past have had insufficient capital. They have felt that if they struggled on till the trees commenced to bear fruit things should improve—but they were wrong —the most expensive years on an orchard are not the first five but the second five, or when the trees are from 6 to 10 years planted—they require full-time attention but they do not give the owner a full-time income. Otherwise the young man needs extra capital to see him over this period and after that he still needs one year's income in reserve for emergencies or crop failures through drought or flood, cyclonic wind, hail or frost—for believe it or not—fruitgrowing is still a gamble and if your son has been brought up to eschew gambling as one of the deadly sins —then don't let him go in for fruitgrowing— it is still an occupation with more hazards than most.

The fruitgrower needs very good health. Even though social security may provide benefits and hospital expenses it doesn't maintain the orchard and unless the orchard is maintained there will be no worth-while crop. Having grown the crop —he must be fortunate and have no unforeseen hailstorm, cyclone or unseasonal or exceptional frost before harvesting and finally, however he markets his fruit, he needs an adequate financial return.

These two jobs differ again, in another fundamental factor. The fruitgrower is, and may be successful as an individualist—an advisory officer must be able to get on with others and can only be successful through co-operation and by working through others.

Both jobs are full of interest and varied—from season to season or from year to year. Both are to a large extent out of door jobs—the fruitgrower should be the more efficient craftsman; the advisory officer the more competent scientist.

What would I advise a boy or young man to do if he was quite definite that he wanted to go in for either of these two jobs?

1. I'd like to see him very early in his post-primary schoool course—so as to be sure he takes the right units.

The advisory officer's course is the Professional B course—English, French, Maths., and General Science with emphasis on Chemistry and Physics. He must obtain University Entrance so as to attend university and qualify with the degree in horticulture now available at both of the Agricultural Colleges—Massey and Lincoln. I would advise him to take on all types of horticultural jobs during his school vacations. I would advise him to take a year in Upper Fifth for Higher School Certificate and then go straight to University and obtain his Agricultural Intermediate exam. (Chemistry, Physics, Zoology or Botany) as soon as possible and then I'd advise him to have at least one year, possibly two, working full time on an orchard, a market garden or in a nursery before attending Massey or Lincoln. If he does so he is much more likely to have combined adequate practice with his science and he'll be a much better advisory officer. But it's quite a long course—

University Entrance at 16 years.

Higher School Certificate at 17 years.

Intermediate Exam at 18 years.

Two years on the land in horticulture to 20 years.

Three years at Massey or Lincoln for B.Ag.Sc. (Hort.) to 23 years.

Turning now to the lad **who wants to be a fruitgrower,** I'd get him to check on his prospects of acquiring or inheriting capital by the time he's 25 and then—

School Certificate at 15 or 16 years.

Subjects should include much the same as for the advisory officer's course but French could be omitted and Maths. taken only to the Fourth Form, substituting Agriculture and Carpentry, etc.

Then two years full time on an orchard.

Then two years at Massey or Lincoln, taking the course for the Diploma in Horticulture which should be completed before the young man turns 21 years.

Finally, I must draw your attention to the assistance now offered on a competitive basis to young men intending to become Horticultural Instructors.

Each year, about this time, the Public Service offers two to three weeks' time horticultural cadetships for courses on the lines I have outlined. Prospective candidates are interviewed by a selection committee of three, of whom one is the Director, Horticulture Division. Those selected, before taking up the cadetship, are required to sign a bond undertaking to work diligently throughout the course and on completion to remain in the Public Service for at least five years after graduation. The bond is equal to the cost of training—£900—and is guaranteed by the boy's parent or some other reputable citizen. On qualification cadets are posted to the Professional Division of the Public Service at £665 per annum rising by annual increments of about £35 to £40 up to £915 whilst on field duties as Horticultural Instructors. If anyone in the audience has a son between 16 and 19, who has University Entrance or is sitting this year and is interested in these horticultural cadetships I'll supply further information to the enquirer personally. The first graduates under this scheme are due to complete at Massey College at the end of this year, two others are part way through the course—this is what we are doing to make sure the Horticulture Division's advisory officers of the future are fully qualified in both the art and the science of Horticulture.

Our Native Plants

Leptospermum scoparium or manuka is the commonest plant in New Zealand. Sometimes it is a small tree, then it has red bark hanging in strips; in the mountains it turns into a prostrate mat-shrub. The thin branches are spreading or in upright bundles, the branchlets covered with silky hairs.

The aromatic leaves, half an inch long, are also thin and stiff, stalkless, sharp pointed and smooth edged. The lovely single flowers, half an inch across, are stalkless in the axils of the leaves or tips of branches. The sepals form a cup with fixed white lobes which soon fall off. The five petals are separate from each other and attached to the rim of the cup. The very numerous stamens form a ring inside the petals. The ovary at the bottom of the cup rises as it ripens and shows its red cap while the petals are still there.

As the seed-box gets older it becomes hard, brown and woody and finally, often after some years, splits open to show the slender orange-red seeds.

Manuka grows abundantly all over both islands. It forms thickets that protect forest seedlings which in time may become true forest or provides shelter for orchids and many other small plants. There is nowhere it cannot grow, from bog to dry heath, from sand dunes to mountain tops.

According to some people manuka is a worthless weed as sheep won't eat it and if they shelter in the thickets the persistent hard, woody seed capsules tear the wool off the sheep's backs. Its loveliness and scent do not appeal to them.

Plants an inch high can flower and set seed; the younger the plant the more graceful it is and the more abundant its flowers.

The red wood is used for fences and firewood, the branches for sand-breaks and windbreaks, and formerly the leaves were, occasionally, used for tea. Manuka is very hardy and grows from a young plant or seed which germinates quickly. It flowers in spring and autumn, and the seeds are ripe in May.

Dendrobium Cunninghamii—the common dendrobe—are tree-dwelling orchids, though found occasionally on rocks. The stems, much-branched, round, polished, thin and wiry, hang downwards from the tree; if growing on rocks, the stems are short, thick and erect.

There are many leaves arranged alternately, 1½ inches to 2 inches long, light green, stiff and and pointed. The flower-stalks usually bear one or three large, handsome flowers, from three-quarters of an inch to an inch wide, either white or pink.

The orchid is found from North Otago to Stewart Island in the bush from sea-level to 2000 feet. It is the most beautiful orchid in New Zealand.

The seeds, being very small and light, are carried about by the wind, and one perhaps may lodge in a fork or roughness on a tree where a few rotten leaves are ready to form a seed bed. Under suitable conditions the seeds, developing roots, do not bury themselves in the soil but clinging to the tree trunk absorb, by means of an upper layer of spongy tissue, any particles of water that may drop upon them.

To grow this hardy orchid, transfer a piece of the bark upon which the orchid is living to a damp, shady spot in the garden. It flowers in the summer.

District Council Notes

Secretaries are requested to forward notes on District Council activities to P.O. Box 2760, Wellington, for inclusion in these pages.

DISTRICT COUNCIL NOTES

At the annual meeting of the Auckland District Council held recently the following officers were elected:—

President: Mr. H. A. L. Turner, F.R.I.H.N.Z.

Immediate Past President: Mr. J. A. McPherson, N.D.H.N.Z., A.H.R.I.N.Z.

Chairman of Executive: Mr. F. Jollie, F.R.I.H.N.Z.

Secretary: Mr. Carl R. McDermott, F.R.H.S.

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Dominion Vice-president: Mr. W. H. Rice, O.B.E., A.H.R.I.H.N.Z.

Mr. Bertram George Bennett was presented with his Certificate of Fellowship by the Immediate Past President, Mr. J. A. MacPherson.

On behalf of the Auckland District Council and the Dominion Institute and the members of the Examining Board, Mr. J. A. MacPherson expressed the pleasure felt in presenting Mr. Aubrey Ernest James Smith with the National Diploma of Horticulture (N.D.H.N.Z.).

At the conclusion of the annual meeting, Mr. J. A. MacPherson gave a wonderful address on the Popular Saintpaulias, which was fully acclaimed by spontaneous sustained applause.

MANAWATU

A most successful meeting was held on October 12 when a lecture was given by Mr. Bryce, of Levin, on the flora of New Zealand. His lecture was illustrated with magnificent colour slides. Mr. Bryce showed a deep knowledge of our native flora, gained by years of patient study with the Levin branch of the New Zealand Plant Society. A large audience was stimulated to a new interest in New Zealand's native plants.

NORTH TARANAKI

At a meeting on September 24 Dr. Yeates gave an illustrated address on rhododendrons. The meeting was well attended and there was considerable interest in the subject among members.

On Saturday, October 8, a visit was made to the gardens of Mr. M. G. Maxwell, at Rhotu, and of Mrs. J. A. Stevenson at Pihama. A visit to Wanganui was planned for October 22 and 23.

These trips are always well attended and provide much of interest and valuable information for members.

SOUTH TARANAKI

Visit by Rose Enthusiasts to View Wanganui Gardens

A party of 38 members of the South Taranaki District Council of the Royal New Zealand Institute of Horticulture visited Wanganui on Saturday by bus and private cars. The weather was perfect, and the trip proved of outstanding interest. While the primary object of the visit was to view rose gardens, considerable variety was introduced.

At the property of Mr. A. Whitehead, bulb specialist, members were interested in the automatic labour-saving devices which are used there. These included an automatic digger and an automatic planter. With these Mr. Whitehead is able to plant and later to dig up a straight row 100 yards in length in six minutes.

At the Winter Gardens by Victoria Lake some interesting specimens were viewed. The party had morning tea in the grounds.

The roses in the gardens of Mrs. Frank Burnet, Oakland Avenue, and Mrs. D. M. Murchie, Wicksteed Street, were at their best. There was a great variety of good roses in each garden, and members were busy with their notebooks.

After lunch at the Jessie Hope Gibbons Garden Circle rooms in Bell Street, the visitors were joined by Mr. P. Cox, the president of the Wanganui District Council, and Mrs. Cox. The day's programme was arranged by Mr. Cox.

Riverside Drive

A drive along the riverside for some four miles brought the party to the extensive grounds of Mrs. P. Hussey. Here interest centred round an extensive collection of exotic trees planted by Mrs. Hussey's father 65 years ago. Some of these are quite unusual in New Zealand, and many, including a highly scented camphor tree, have grown to a great height. The Aramoho Park was inspected, an a stop was made for afternoon tea there. The garden of Mr. and Mrs. Pearce, Upper Aramoho, proved very attractive. The final visit of the day was to Mr. Cox's own trim garden, Harrison Street. Specimens of the new standard miniature roses were a novelty. Members were interested in a large collection of cacti, and also in Mr. Cox's work in making pumice containers for them.

The thanks of the visitors to their various hosts, and to Mr. Cox, were expressed by Mr. John Houston, the president.

When leaving Wanganui, a short stop was made at the "Look Out," from which a good view of the city is obtained.

TRIBUTES TO BOROUGH AND COUNTY CO-OPERATION IN ARBOR DAY CEREMONY

Although only 25 people turned up for a recent official Arbor Day ceremony on Tawhiti Road, the practical interest of these few and of many others who had helped in various ways with the project but could not be present was valued when some three-quarters of an acre of county reserve land was planted in trees and shrubs as part of a long-term scheme of the year-to-year beautification of the several approaches to Hawera.

"This is a particularly pleasing occasion not only because of the planting but because of the tangible evidence we have here of the co-operation of the Hawera county and the Hawera borough," said one of the speakers, Mr. John Houston, Dominion president of the Royal New Zealand Institute of Horticulture. If these two bodies could become more closely associated it would be all to the good. Co-operation was a good thing, and in this Arbor Day observance representatives of town and county had found it possible to meet on common ground.

It was given to Mr. R. Syme to relate how the planting had emanated from a series of talks at a well-attended public meeting, when the idea of planting the approaches to the town, not necessarily all in one year, gathered weight. With Messrs. J. H. Buttress, D. W. Robinson and R. W. Barry, Mr. Syme had gone as a member of a deputation from the association to both the Hawera county and borough councils.

"I do not think I need say anything further but ask you to look at this piece of ground. You will then appreciate that our deputation met with the greatest of sympathy.

AREA FENCED BY COUNTY

"The county has fenced the area and the borough has prepared the ground and procured the trees and shrubs towards the cost of which a number of organisations and a number of individuals have made contributions."

Mr. Syme said he doubted whether anyone looking at the area would think there was a plan in the planting, which looked "all higgledy-piggeldy." The area had been laid out in four eccentric semi-circles, all concentrating upon smaller areas in the centre. When growth was established the planning that had gone into the planting would become apparent in flowers and foliage that would provide a scene of beauty for most of the year.

Referring to the pohutukawas being thinned out on South Road, Mr. Syme said that several years ago some far-sighted person, and one who had persisted in spite of many setbacks due to frost, had planted what had grown to be a fine belt of trees. It was a striking tribute to today's appreciation of the value of trees that now that a good many of them were being removed for the sake of new houses instead of burning them as would have happened a few years ago; the county council was taking special pains in removing them and giving them a chance of growing again elsewhere.

FUTURE MAINTENANCE

Mr. Syme referred to the various places in which the trees were being replanted, and said he was particularly pleased to see the reluctance to destroy trees unnecessarily. He spoke of his appreciation, too, of the wholehearted co-operation of the borough and the county councils in an event he hoped would be made an annual one, and of the generous offer of Messrs. Walker Brothers to maintain the Tawhiti Road plantation.

Mr. P. J. Clement, chairman of the county council, said the planting had put the council's plans forward by about three years. The council had not hesitated to do this when approached by the deputation, and now that the two councils had a joint committee to carry Arbor Day on from year to year he wished it all the success it deserved. Removal of the South Road trees by the county council had been at the demand of the Housing Division and the council, on the assurance given that the trees would grow again, had taken special care in their removal to different parts of the county.

FIRST ORGANISED ARBOR DAY

This was the first occasion Hawera had had a properly organised Arbor Day, said the Mayor (Mr. F. W. Finer), congratulating the Progressive Association on promoting the idea and the councils of both county and borough on accepting it so sympatetically. His policy in borough council affairs had been to delegate responsibility, and he complimented the chairman of the borough parks and reserves committee, Mr. J. A. Blyth, as a member of the joint committee, and Messrs. Syme and Barry, on the success of their undertaking. It had been a creditable effort. They had been given a free hand in the buying, and members of the public and organisations that had contributed funds to ensure orderly buying and orderly planting of exactly what was required for the mass effects aimed at were thanked. The Mayor hoped today's planting would be the forerunner of many others in and around Hawera.

Chairman of the Progressive Association at the time it went into recess and an advocate of the beautification of Hawera, Mr. D. McCormick congratulated the committee on having secured such a large measure of effective co-operation in the task to which it had set its hand. He hoped the younger generation would come to see in the area planted the value of trees.

The first tree was planted by Mrs. E. M. Hamilton, senior vice-president of the Hawera Horticultural Society, after which those present shared in the planting of approximately 120 trees.

118 ATTEND HORTICULTURAL INSTITUTE MEETING IN MANAIA.

Manaia and district provided an audience of 118 garden lovers at a circuit meeting of the South Taranaki District Council of the Royal New Zealand Institute of Horticulture last night.

Mr. J. A. Blyth (Hawera) spoke on selecting, growing and bedding annuals for summer display. Mrs. C. D. Pope (Normanby) gave a demonstration of decoration work, assisted by Mrs. A. R. Stevenson (Normanby). Mrs. C. F. Marsh (Tokaora) showed coloured pictures of her recent visit to Fiji, Tonga and Samoa, and also of Pukeiti Rhododendron Reserve, and New Plymouth parks and gardens. Mr. T. H. Reader (Hawera) spoke on garden pools, their building and stocking.

A feature of the evening was the decorative floral arrangements prepared by local members. Arrangements in bowls and troughs set around the hall were real works of art. A well-stocked sales table did brisk business.

The thanks of all present to those responsible for a very pleasant and successful meeting were expressed by the president, Mr. John Houston (Hawera).

Supper was served.

Book Reviews

ASIATIC MAGNOLITS IN CULTIVATION, by G. H. Johnstone.

(Published by the Royal Horticultural Society.)

The appearance of a new monograph is usually welcomed by horticulturists since such publications may be regarded as the last word in authoritative definition of their subject. This volume is no exception to the rule. The author writes from long experience of the genus; he has a fine collection of these plants in his own garden, and has had access to the other great collections in Britain. Careful checking of living and herbarium specimens has led to the clearing up of many synonyms.

The book is clearly laid out, and superbly illustrated with colour plates and line drawings. Besides the taxonomic descriptions, there are useful sections of the book devoted to the propagation and cultivation of these plants. New Zealand nurserymen will not agree with some of the propagation methods described. They are none the less valuable in that they remind us that there are many ways of killing the proverbial cat.

It is unfortunate that rising costs of such publications puts this book in the price range at which most gardeners will quail. Those especially interested in these plants will no doubt consider the price (80/-) justified. We lesser mortals will endeavour to borrow a copy from our library.

SCIENTIFIC HORTICULTURE XI.

(Published by the Horticultural Education Association.)

The Journal of the Horticultural Education Association has been keenly sought after in Great Britain since its inception in 1930. Although annual publication has not been possible since the war, the contents have not been lessened in value on this account. The latest issue is no exception. Although it is inevitable in such a publication that some of the contributions will be of interest only in the country of origin, the majority of the articles have a wide ap-

plication. Writers of the calibre of Dr. E. W. Russell on the subject of "Maintenance of Productivity of Horticultural Soils" and W. J. C. Lawrence on "Glasshouse Design" promise interesting reading. Of 24 articles five are devoted to cherry culture, four to glasshouses, two to insect pests, three to virus diseases, and four to vegetable culture. There is an interesting glossary of terms used in relation to pruning of fruit trees, which gives rise to thoughts of the desirability of a clear definition of such terms.

The Association is to be congratulated on the high standard achieved in their publications which deserve a wide reading public in this country. Copies are obtainable at 17/6 from Gibbs & Sons, Orange Street, Canterbury.

Annual Report of the East Malling Research Station 1954

The annual reports of Research Stations are not everyone's diet, since the writings of research workers do not always appear to be closely allied to horticultural practice. The serious student may, however, find himself in the position of a Gilbertian character, "if you winnow all the folly you may find a grain or two of truth among the chaff."

This volume contains many valuable articles, with special appeal to some sections of the horticultural industry. Nurserymen may find use for the descriptive keys for the Malling series of root-stocks, and from reports on experiments with root cuttings in which new light is thrown on to the problem of handling these cuttings. Students of pathology will find interesting reading in articles on "Problems arising from the use of insecticides" and "The search for better fungicides."

All students of horticulture should benefit from reading the Amos Memorial Lecture by Professor Bennet Clarke, even if only because the learned Professor demonstrates how little we really know about things which we so often explain with a glib tongue.

Few horticulturists may feel need to purchase these Annual Reports, but those with access to library copies may find them interesting reading. Professional horticulturists should regard this as a "must."

The Naming of Plants is Not so Baffling

Many people find the scientific names of plants difficult to understand or remember, but it is not such a problem once the basic principles are explained.

Taking New Zealand native plants as examples, a translation of the names and a short description of their discoverers may make it easier to remember their scientific titles.

Every plant has two names. The first is the genus or parent name, and is a subdivision of the family or clan. Family names end in "ae" always, and usually in "aceae," because the family name is used as an adjective agreeing with plantae (plants) which is understood.

Many genera can be included under the same family name, all more or less akin to one another, and often found scattered all over the world.

Family titles are frequently far-fetched. For instance, one is "Apocynaceae," which means "the family of . . . from the dog" (i.e. "keep from the dog") because one of the genera is harmful to dogs.

Many refer to medicinal qualities, or are known by the name of a person cured. Koromiko belongs to the "Scrophulariaceae" as a plant of that family cures scrofula. "Gentianaceae" receives its name from the genus of Gentiana, because King Gentius was healed by it.

A flower's second or more specific name often describes in Latin its outstanding characteristics or the name of the first discoverer who registered his find. It sometimes happens that two people in separate places find the same plant about the same time, and both send in a named description and specimen to the proper authorities, generally a director of a museum. The first parcel received, even if the last one sent in, retains the title it arrived with if that title has not been used before or, if the original finder does not name it, the botanist studying the plant may do so.

If the discoverer is so honoured as to have a genus called after him, the name of the genus will begin with a capital letter and end generally in "a," as "Haastia" or "Forstera."

Proper names used as specific names also begin with a big letter and often end in "us," "um," "a," or "ii." The last is the sign of the genitive or possessive case of "ius," used in Latin to turn a noun into an adjective, so the surname now becomes "Haastii" or "Forsteri" (only one "i" is used if a short syllable is in front).

Banks and Solander were the botanists of Captain Cook's first voyage to New Zealand. They landed near the future Gisborne on October 8, 1769, and gathered a few plants on the shore line. The Maoris did not give them time to get any more. Later they landed further north more successfully, but could only collect coastal specimens, as they had no opportunity of going inland.

The name of Banks was given to a few plants, such as "Freycinetia Banksii"—the climbing screw-pine—and Dr. Solander's to about one of every family he found.

If a flower is, therefore, called either Banksii or Solandri, you know it is coastal, probably from Auckland Province or Queen Charlotte's Sound.

On Cook's second voyage, Dr. Forster and his son were the official botanists. They were

not enthusiastic, and only a few things bear their name; a genus of Forstera—a pretty little pink spotted flower—and an Olearia Forsteri are among them.

The next keen plant hunter arrived in 1823, Dr. Cunningham, the head of the Sydney Botanical Gardens. He, and later his brother, explored the top of the North Island and found many new species, several of which are "Cunninghamii." Only those flowers that grow throughout New Zealand will bear their names in the South Island.

Dr. Haast had already arrived in New Zealand from Austria and made Dr. Sinclair's acquaintance in Nelson. When he was appointed Geological Surveyor for Canterbury in 1860 he invited Dr. Sinclair to join him. Gold had been discovered in Westland and Dr. Haast had the task of finding a short and easy way across the Southern Alps. Naturally this led him into the high country and he and Dr. Sinclair found many new plants. Haastia, a vegetable sheep genus, was named in his honour and most of the Canterbury alpines seem to be Haastii or Sinclairii.

In 1861 they were exploring the Upper Rangitata River when they found Ranunculus Lyalii in flower and knew at last it was a buttercup.

The Rev. W. Colenso, a missionary to the Maoris from 1834 to 1899, spent all his spare moments looking for plants. There is a genus, "Colensoa," a sort of lobelia, called after him, and dozens of species have Colensoi as their second name. He was the first European to climb a mountain in New Zealand and find the alpine flora.

In 1845 he, with a party of Maoris, crossed the Ruahine range.. When they came to the edge of the bush and forced their way through the belt of sub-alpine scrub and suddenly found before them thousands of utterly unknown flowers, he was so excited he stripped off his clothes, including his shirt and tall hat, to carry specimens in, got them safely down to camp,

In 1840 the ships "Erebus" and "Terror" arrived in Dusky Sound to prepare for, and later refit after, their exploration of the Antarctic. Dr. Lyall was the surgeon-botanist of the "Terror" and he put in the months spent in New Zealand plant-hunting in the Sounds and Southland, both then and when he returned again 10 years after on another vessel, the "Acheron."

Just before he left for the last time he came across the leaves of the Mount Cook lily. No one had even found such a type of plant before and many were the suggestions as to what its flower could possibly be. No one thought of a buttercup.

Any other plants with Lyalii as a name will be found growing down by the Sounds, even if they are elsewhere too.

In 1841 Dr. Lyall in the "Terror" went to the Bay of Islands, where he met Mr. Colenso and and a new enthusiast, Dr. Sinclair. The South Island and Wellington Province were now becoming settled and after some time Dr. Sinclair made Nelson his headquarters and spent all his time at his favourite occupation of plant-hunting.

Dr. Sinclair was drowned crossing that river soon afterwards, and Dr. Haast had to continue his work alone.

In 1840 a French immigrant ship "L'Aube" arrived at Akaroa with Dr. Raoul in charge of the new settlers. He stayed there for three years and studied the botany of Banks Peninsula. The genus Raoulia (including the other vegetable sheep) was named in his honour and a few specific names remember him. One plant he discovered, "Pittosporum obcordatum" was not found again until a few years ago and then in the Auckland district. He must have chanced upon the only one in the peninsula.

(From "Our New Zealand Trees and Flowers," by E. C. Richards.)

Obituary

MR. R. P. WARD

Reuben Percy Ward was born in Leicestershire in 1875 and came to New Zealand in 1894. For some years he was engaged in farming at Cambridge, and later entered the building trade. Throughout his life he was keenly interested in horticulture, especially in trees, shrubs and ferns. A successful propagator, he gave freely of plants to a wide circle of friends with gardening interests, and a gift of ferns formed the nucleus of the Auckland Domain fernery.

Besides his horticultural interests Mr. Ward found time for community services, including two terms on New Lynn Town Board.

His death at his home in New Lynn on August 18 is a loss to the Institute and to horticulture throughout New Zealand.

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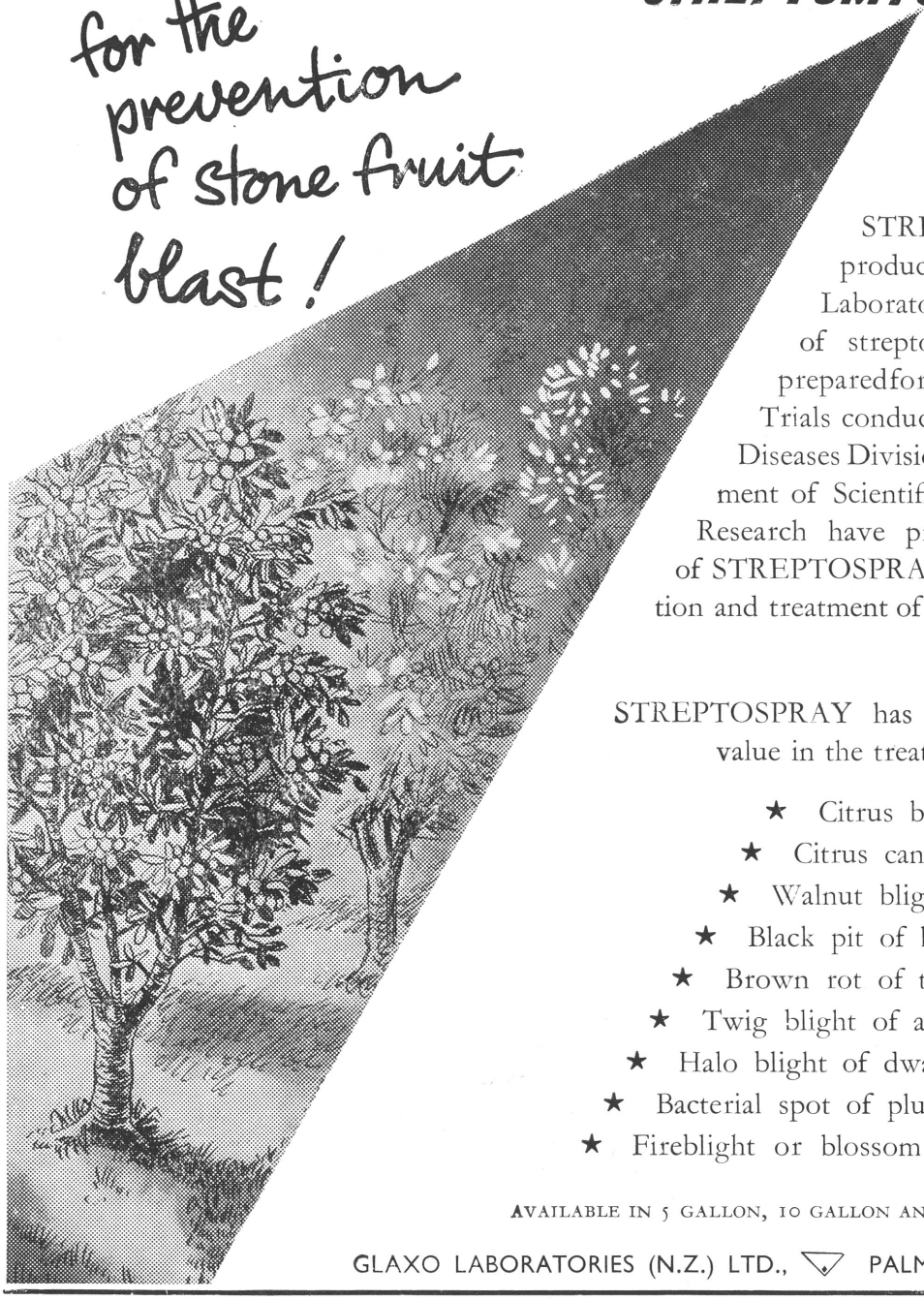

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