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Edited under the authority of the Executive Council of the Institute.

EXAMINATIONS.

Examinations for the following are conducted by the Institute:—

1. Junior Certificate in Horticulture.
2. Senior Certificate in Horticulture.
3. Diploma in Horticulture.
4. Second-class Certificate in Fruit-culture.
5. National Certificate in Fruit-culture.

EXAMINATION PAPERS.

Sets of examination papers used at the last four examinations in horticulture are obtainable on application for sixpence per examination set.

Address all correspondence to:

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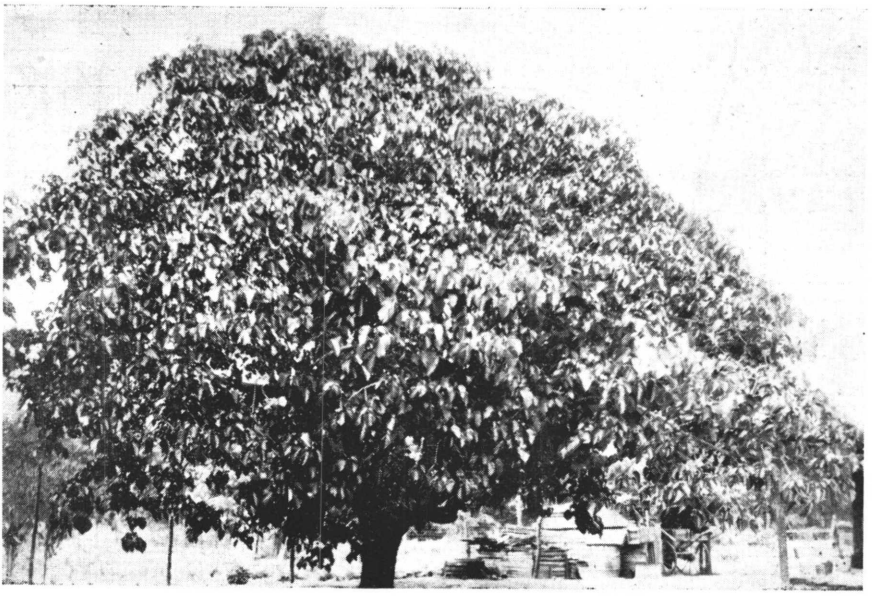
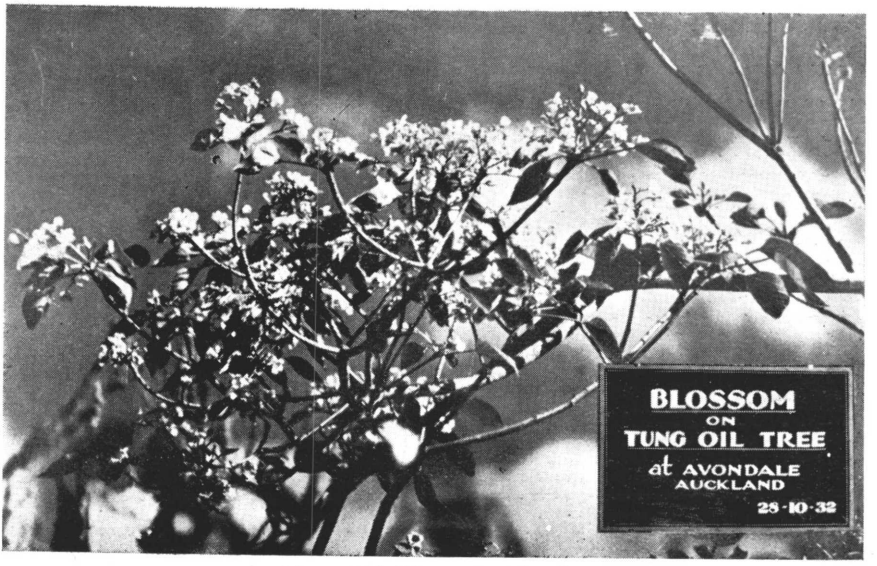


20 year old Tung Tree, Florida.



Tung Oil Plant, Auckland.

Plantation of year old Tung Trees, Kaikohe.

Journal of the New Zealand Institute of Horticulture

VOL. 3 WELLINGTON, MARCH, 1933 No. 4

THE CULTIVATION OF THE TUNG TREE IN NEW ZEALAND.

BY G.F.

Tung tree cultivation and development in New Zealand has advanced sufficiently to attract the attention, interest, and favourable comment of overseas trade journals.

A recent issue of "The Chemical Age (Annual Empire Number)" in an article entitled "Tung Oil from Empire Sources. A Possible Industry for New Zealand," features the activities of the various companies engaged in expanding this new primary industry in the sub-tropical Northland of New Zealand, where nurseries situated at Keri Keri, Lake Ohia, Parenga, Te Aria, Dargaville, etc., are raising trees from seed imported from Florida.

Tung oil production within the Empire is considered of sufficient importance to induce The Imperial Institute to appoint a special sub-committee to collect data thereon and report solely upon Tung oil activities throughout the world.

Kew Gardens, from the section devoted to Tung tree cultivation, supplies valuable information and advice from the horticultural side, while the director of the Imperial Institute has all enquiries answered in connection with the uses, marketing and handling of the oil, when harvested.

In the following account the author has freely availed himself of the information given in a publication by H. A. Gardace, entitled "Question and Answers on Tung Oil Production in America," issued by the "American Paint and Varnish Manufacturers' Association, who were the first to successfully demonstrate that extended groves of the Tung tree are practicable outside of its native habitat—China, where it is said to have flourished for over 5,000 years.

Tung oil is a product of a tree of the *Aleurites* species, which is indigenous to China, principally in the West Yangtse Kiang Valley. The oil is found in its natural state in the cells of the seeds, is practically

colourless and neutral in reaction, and when removed by cold pressing it is of a light amber colour. Due to the crude methods of handling the oil in China, the best imported Chinese tung oil is of a darker colour and may contain up to 7 per cent. of free acid.

APPEARANCE.

The tung tree *Alcurites fordii* and *A. montana* are very ornamental in character and rapid growers, producing fruit under favourable circumstances in and after the third year.

At Kaikohe, a yearling tung tree transplanted from the nurseries at Keri Keri flowered and produced tiny nuts in the spring of 1932. This is exceptional and goes to prove that soil and climatic conditions, in certain parts of New Zealand, are favourable to the propagation of this valuable exotic tree—just as the Peach, Plum and Cherry have established themselves here, with excellent results.

In China the tung tree generally grows to a height of 20 to 25 feet, with trunk about 10 inches in diameter, showing a canopy spread of about 25 feet.

Tung trees are deciduous. The leaves are large, dark green in colour, and more or less heart shaped. The flowers, produced before the leaves, are white with pink centres and yellow stamens on the male blossoms. Each cluster is made up of one or more female flowers surrounded by male flowers, there usually being but one female flower to the cluster. Some years ago in America certain trees were noticed which had two or three female flowers to each cluster. Selected seeds of this type, known as "multiple cluster" seeds, appear to transmit this characteristic and may be expected to crop more heavily than the ordinary tree.

It is this "multiple cluster" type of seed that is sown in New Zealand, seed selected from nominated trees, growing in Florida, known to be "multiple cluster."

Nourishment and heredity will doubtless play important roles in developing trees of the greatest yielding variety.

The blossoms are very sensitive to early spring frosts. The established *A fordii* (the type planted here in New Zealand) is hardy enough to resist occasional frost, but the young tree is not likely to be successful in areas subject to extended periods of frost.

Care is necessary when transplanting from the nursery not to injure the tap-root.

The successful transplanting of nearly 80,000 trees, last July and August in the Maungakahia Valley, near Kaikohe, by the New Zealand Tung Oil Corporation represents a very important advance in development work. The misses were under one per cent. This effort is certain to command the attention of all those interested in

consolidating this new industry, which seems destined to revolutionise the farming pursuits of those situated in the climatically favoured Northland. Already over 20,000 trees from the Keri Keri nursery are planted out on privately owned land, ranging from Helensville to Kaeo.

TYPE OF SOIL REQUIRED.

Tung oil has been tried on almost every type of soil, and has been found to grow on practically any soil which is slightly acid with plenty of moisture, but still well drained, provided no excessive amount of phosphate or lime is present. Apparently the ideal is a sandy soil or sandy loam which is underlaid with clay three to eight feet down. Tung trees in Florida have grown on land that ranges from almost white sand to a heavy clay loam. The growth, however, is in proportion to the richness of the soil. The better the soil, the more vigorous the growth and the smaller the amount of fertilizer that will be necessary. *Alkaline earth appears to be fatal to the growth of the tree.*

Poor drainage is more detrimental to tung oil trees than any other condition. A high water table keeps the soil cold and retards growth. Too high a rainfall is, therefore, a disadvantage. Between 30 to 70 inches uniformly spread over the months not required for ripening off the nuts, which fall from the trees when ripe, seems satisfactory. Drainage ditches are often necessary on flat land.

PREPARATION OF LAND.

For old land, the ideal way is to plough the land broadcast early in the spring to a depth of six inches or more. Then harrow so as to have a smooth surface and at the same time making a good seed bed. A month later a good legume, such as velvet beans, lupins or soya bean, should be planted as a cover crop.

In the late fall, the cover crop should be ploughed under and the land prepared for the planting of the tung oil seeds.

NURSERY PLANTING.

The months late in the dormant season are the best months to plant the seed. They may be planted about four inches deep and from 8 to 12 inches apart in the nursery row. Rows should not be less than three feet apart to permit ample cultivation. Variation in the time required for germination always happens. Forcing frames have been successfully used in New Zealand and the time materially reduced. Thirty to ninety days gives the range. The forcing frames bring about uniformity, although the expense is greater.

Spot planting, 60 to the acre, can be resorted to, which entails planting at 25 feet distances each way for a permanent plantation. Probably on grassland, spot planting may be advantageous, provided a strong seedling makes its appearance. On fallow land the weeds are apt to gain ascendency, adding greatly to the cost of cultivation.

The tung tree does not usually yield nuts in commercial quantities until the fifth year, increasing in volume up to the tenth year, and under tree plantation culture the yield increases, according to experience in Florida, up to the 20th year. The plantation life of the tree is held to be 25 to 30 years. Intensive cultivation including budding from high yielding trees, is apparently the secret of success. Returns per acre are estimated at from £25 to £30 from the 10th year.

FERTILISING.

Experience under varying conditions, such as will be obtainable from the farmers planting upon their own land, will largely determine the mode to be practised under New Zealand conditions. In Florida, two applications of fertilizer are given each year, the first soon after the trees are transplanted. At this time one-half pound to one pound per tree is given. A second application of one to two pounds per tree is given about mid-summer. Increasing quantities of fertilizer are given each year in proportion to the amount of nuts produced. It is claimed that eight to ten year-old trees require 10 to 12lbs. of fertilizer per year. A formula analyzing about 5 per cent. ammonia, 7 per cent. phosphoric acid, and 2 per cent. potash is generally recommended for young trees. Farmyard manure is desirable, if available, but guano is superior to other fertilizers. The residue from expressing the oil from the nuts can also be used as a fertilizer. At the transplanting stage, a spadeful of farmyard manure can be mixed with the earth when planting.

The high yields now obtaining in Florida appear to be due to the method of green fertilization employed. Allied to budding and scientific fertilization, tung trees yield many times higher than they have yet done in China. Tung trees are self pollenizing and bear annually from the fifth year upwards. Pests are unknown in Florida. Cattle will not eat the leaves.

In viscosity, tung oil ranks next to castor oil. Basing water at .00, linseed oil is .04, tung oil .20—five times as thick.

USES AND POSSIBLE DEMAND.

Tung oil is of great value in the manufacture of paint, varnish, linoleum, waterproof, and insulating materials. The General Electric Company, New York, uses nearly 1,500,000 pounds of tung oil annually, for insulation purposes. Its heat, rust and acid resisting properties are being demonstrated beyond refutation in many parts of the world. The demand will increase beyond the means of supply for the next two decades. Europe is crying out for tung oil. The market is immense. The United States imported in 1930, 56,000 tons from China. This would need 4,000,000 trees to replace, if China increased her home consumption to the extent of ceasing to export. China now consumes 40,000 tons annually, and it is claimed that she can not greatly enlarge her production in the regions where the tung tree grows. Food is the first consideration and the tung trees are grown on barren

hillsides up to an altitude of 2,000ft., on poor soil where ploughing and fertilizing are often impracticable.

The United States imports linseed oil to the value of $60,000,000 annually. To supplant that import by home grown and produced tung oil would need 20,000,000 trees. The United States produces another $60,000,000 worth of linseed oil, grown on 3,000,000 acres of land.

Great Britain consumes 125,000 tons of linseed oil per annum, which she extracts from over 300,000 tons of linseed imported largely from foreign countries.

The linoleum industry in the United Kingdom alone uses 50,000 tons of linseed oil annually. 4,000,000 trees would need to be at the full producing stage to supply that amount. "The Chemical Age" recently stated that tung oil would give a quicker and cheaper manufacture than linseed for linoleum manufacture.

A recent discovery, made at the Boston Laboratory of Research, that tung oil could be used in the manufacture of artificial silk, would, if utilized to that effect, absorb the whole of the world's present supply.

The "bogie" of over-production does not exist in this new industry. A waiting market exists, in contradistinction to our old and tried primary exports, which have felt the full force of foreign competition.

In the Empire Marketing Board's Memorandum—"The Production of Tung Oil in the Empire"—the following sentence appears:—"As far as can be seen, there will always be a demand for tung oil, as it is a raw material, which is essential in some industries. It should always command a price higher than that of linseed oil."

Tung oil is a hydro-carbon, or basic compound. Chemists state their inability to make a synthethic product.

What are the future potentialities for this new industry in the Northland of New Zealand? The industry is now past the experimental stage. There is every indication that, selecting the proper conditions and using scientific cultivation similar to that used in Florida, the success attending Florida's venture can be duplicated here in New Zealand. It is well worth the effort. Present times render imperative the search for fresh avenues and sources of wealth.

With such bodies as the Empire Marketing Board, the Society of British Oil and Colour Chemists, scientists such as Dr. Sir A. W. Hill, K.C.M.G., F.R.S., Director of Kew Gardens, Dr. L. A. Jordan, Dr. Sc., F.I.C., of the British Paint, Colour and Varnish Chemists' Association, Dr. Gardner, Technical Director and General Manager of the American Tung Oil Corporation, and A. R. Penfold, Esq., F.A.C.I., F.C.S., Director of Technological Museum, Sydney, and many others of note, at the back of this industry urging its growth and necessity, the factors for success appear undeniable. Nearer home the wholehearted support of the Department of Scientific Research and Industries, aided by the Cawthron Institute, and Massey College, must ensure a successful solution and an affirmative answer to the Imperial question—"Can Tung Oil be Produced in the Empire?"

G.F.

GRASSLAND RESEARCH AND ITS SIGNIFICANCE TO HORTICULTURE.

By A. H. Cockayne,
Assistant-Director of Agriculture, Wellington.

The Banks Lecture for 1933.

In this address I propose to deal by means of a series of illustrations with the development of New Zealand grasslands, how they arose, to what stage they have reached, and to indicate the foundations that have been laid on which can be built an art of New Zealand grassland farming that is so based on scientific research and scientific direction that the progress, good as it has been in the past, will be insignificant in comparison with what the future has in store. In dealing with my subject I wish particularly to bring forward the fact that the grassland management of the farmer is essentially concerned with major horticultural principles and, when viewed from these aspects, progress will become definite and rapid both with regard to research and the applications that follow.

When Sir Joseph Banks, to whom this annual lecture of the Institute of Horticulture is dedicated, landed in Poverty Bay in 1787, grassland, in the ordinary acceptation of the farmer, was non-existent in New Zealand. True, there were wide areas of tussock lands, particularly in the South Island, but they were not in their primitive conditions applicable for the grazing of animals. Little could Sir Joseph Banks have thought at that time that immense areas of forests, fern and scrub-covered lands would be replaced by the grasses and clovers of his own land; and certainly he could not have thought that on the very ground he landed on there would be developed a ryegrass, Poverty Bay Rye, of significance not only to New Zealand, but to the whole Empire. Initially the majority of artificial grassland was produced in New Zealand without the aid of the plough. The axe and match prepared the seed bed and European grasses and clovers were sown on the ashes of forest fern and scrub lands. Depending on the type of country and the management that could be adopted, these pastures either remained essentially with what they had been sown with or underwent many changes ending either in stable grassland, or were stumped and ploughed and re-seeded down in grass, or unfortunately, in many cases, reverted to the original growth when the factors, that enable grassland to be maintained, could not be exerted sufficiently to avoid Nature taking the upper hand. I want here to specially emphasise that Nature does not want the land to be clothed with grass. She has quite other ideas and unless man puts into play factors that make for permanence of grass conditions, Nature, in New Zealand at any rate, would get her own way, and fern leading to scrub, leading to forest would again dominate.

However, at the present time we have in New Zealand nearly 18 million acres of sown grassland, of which 13 or 14 million acres were originally forest, scrub, and fern, the rest being derived from swamp and tussock. On this area are produced each year over 80 million tons of grass, which in turn is elaborated into 300,000 tons of meat; 120,000 tons of butter; 100,000 tons of cheese and over 100,000 tons of wool, say, 600,000 tons of food and clothing, or some 30 or 40lbs. of saleable material per acre.

It has to be admitted that the products derived from grassland represent very wasteful elaboration, or, in other words, livestock are very inefficient machines to convert raw materials into human necessities. For instance, even with the most efficient, the cow, 4 tons of nutritive dry matter are required to elaborate 300lbs. of butterfat and one feels that sooner or later the food and clothing of the world, represented by animal products, will be derived in a more direct way than at the present time but, until that time comes about, grassland will have to play its part and play it in the most efficient way that science can direct, and so far as New Zealand is concerned the present small figure of 40lbs. per acre stands in need of enlargement. One reason why the average figure is small is that the grass crop is the most variable one the farmer has, varying in herbage production from not much more than 2cwt. per year to over 20 tons per year; or, to put it another way, from a carrying capacity of a fifth of a sheep to over a cow to the acre. When one thinks that the average production in saleable material has only reached an average of 40lbs. the possibilities ahead of grassland development are apparent, particularly in the light of modern knowledge not yet, by any means, fully put into application.

In the earlier days the laying down of land into grass was viewed only as the initial development, it being considered that, as time went on, we would become more and more an arable farming country where the plough would dominate the position and that the be all and end all of endeavour would not be the production of permanent grass.

However, the development of the freezing industry and its capability in the direction of livestock product export and the standardisation of our main farming lines into lamb and butterfat has determined, up to the present, our main agricultural policy, making us more and more a land of grass farming rather than one where arable farming is predominant.

I have just mentioned that lamb and butterfat are our main lines. Both these represent milk and, for the production of milk grass, must be young and nutritious. Hence the problem of New Zealand grassland farming may be said to be production of grassland that will produce milk indefinitely; or, in other words, the production of grassland that must be permanently young and have permanently the vigour of youth. This does not at all conform to Nature's view. Permanently juvenile pasture in Nature is an impossibility and to her represents a phase leading to old age. In farmers' terminology, young grass

represents wet stock country and old grass represents dry stock country. As milk is the essential, whether it be from the cow or from the ewe in our grassland policy, the production of permanent young grass represents the *Mecca* to which we must turn.

It is just here that one realises the significance of horticultural principles as applied to grassland farming. It is said that a visitor to one of the English Universities, struck with the green velvety appearance of the lawns, asked how they were managed. The answer was, "We mow them and roll them for hundreds and hundreds of years." The answer, however, was only a half one and to it should have been added, "We put half inch of soil topdressing each year and water them whenever necessary." This really gives us the answer to the problem of permanent young grass—prune, feed, cultivate and water. Let us see how these factors, the essential ones spelling longevity of youth in grassland, work out and how research has aided us in the translation of these horticultural practices to grassland farming.

Pruning is essentially for the production of fresh growth and so it should be with grass—burning; the use of cattle on sheep country; mowing either for topping grass, ensilage production or hay, rotational grazing and the fencing carried out to regulate grazing, are all connected with pruning and all connected with fresh young grass development. The relationship of all these factors has and is being studied in New Zealand. The problem of under-pruning and over-pruning are all vital ones in modern grassland management. I shall only quote one to illustrate how science coming into play can have its practical application. The pruning carried out may have to be of such a character that undue advantage is given to some particular plant with harmful results to the pasture. Ragwort is a case in point, pruning grassland with dairy cows leads to great increase in ragwort and over large areas. Until a couple of seasons ago the only practical method to adopt, when this took place, was to restrict dairying and use sheep. Research, however, with a material known as Sodium Chlorate has proved that ragwort can be efficiently destroyed with this material, using either water or a dry material like ground limestone as a conveyor. This year the farmers in ragwort districts have used over 600 tons of Sodium Chlorate and many thousands of acres have been cleared of the weed, but unfortunately there are lots of thousands of acres more. I just use this as an illustration of how pruning may have sidelines bringing in scientific effort.

Probably the most important generalisation that has come out of grassland research in New Zealand is in connection with feeding the pasture to secure perpetual youth and that is in connection with the "Surface-feeding theory." The generalisation is that on any type of soil, provided rainfall is evenly distributed, the development of a surface layer of two or three inches, packed with available plant food, is all that is necessary for the permanent maintenance of wet stock grassland, permanently young grassland. The theory rests on the fact that grasses and the clovers depend mainly for their nourishment on new roots that

are developed and that new roots by most milk-producing grasses and clovers arise near the surface of the ground and not in the deeper layers. The practical application of this generalisation can be seen on the 2½ million acres that are now annually top-dressed and which were largely store stock country involving the use of over 300,000 tons of phosphate and 100,000 tons of lime, a figure that must rise by leaps and bounds with the more general realisation of the surface feeding theory and the longevity of youth in grassland. High milk production, be it by the cow or the ewe, is possible on any class of soil, rich or poor, provided the surface is blanketed with really adequate quantities of phosphate, nitrogen, potash and lime. The "surface-feeding theory" turns the old adage of "use the grass best fitted for the soil conditions" *into* "transform with a film of fertility the surface soil layer and thus make the habitat suitable for the best kind of grass and clover." Surely this is very akin to horticultural practice. The blanketing of soil by artificial fertilisers to the point necessary for longevity of youth may be too expensive to adopt but there are millions of acres awaiting the process, the pumice lands, the gum lands, the Pakihis, so far as undeveloped country is concerned, and dry stock permanent grassland and rotational grassland in the case of developed land. When all is said and done, the process is the equivalent of the half inch of top-dressing to our University lawn, but at a far lesser cost and far more efficiently.

A great deal of research is being carried out, particularly by the Plant Research Station at Marton, on the most efficient and economical methods for the development of surface fertility and from that work is rapidly being standardised grassland fertiliser practice in general. There are certain features in connection with the biological condition of the surface layer that however required investigation in connection with fertilising.

And now for our other two factors, cultivation and watering. The horticultural practice of breaking up root-bound clumps of plants has its replica in the deep harrowing of pastures, admittedly a valued factor in lengthening the youthfulness of grass. Exact scientific work in this connection is just being undertaken in New Zealand, but, unlike the factors of pruning and feeding, exact knowledge is meagre and its application is based more on empirical than scientific knowledge.

And now comes the watering factor. This in grassland, except in arid regions, has not as yet been properly studied but its significance should not be overlooked, and it is high time that research along this horticultural practice should be carried out. The full efficiency of pruning, feeding and cultivation are all connected with watering in some shape or form and and modified irrigation, even in humid climates, must sooner or later be incorporated into the act of grassland farming. I have now dealt with four cardinal factors but there is still another, perhaps of greater significance, than any of these. This factor is the variation in strain that exists in all our regular grasses and clovers.

It is obvious that strains of grasses and clovers on which the factors of pruning, feeding, cultivation and watering can exert their greatest effect are what are wanted. Now what is required in our permanently youthful milk-producing pasture? The components must have persistence. They must be high leaf producers for leaves are more nutritious than stems; they must recover rapidly after pruning. Provided the components are of this type the efficiency of pruning, feeding, cultivation and watering is enhanced. Just as strain building is essential in the garden so it is with regard to grassland and in New Zealand we are well along the road to success. Special strains of permanently leafy ryegrass, cocksfoot and white clover are being rapidly developed at the Plant Research Station at Palmerston North and, perhaps more important than their mere production, is the fact that the system of crop certification adopted by the Government is rapidly translating them into the grassland practice of the country. For instance, this year over 22,000 acres of perennial ryegrass is being certified by the Government. With special strains of clovers and grasses and the adoption of management factors, based on scientific research, there is no reason why our 40lbs. of saleable products per acre from grasslands should not be doubled within a few years and then again redoubled.

In certain aspects in grassland farming; New Zealand is by no means the most backward of countries. She leads all others in the production of grass ensilage and its recognition as a pruning factor leading to stability of milk-producing pasture. She leads all others in the topdressing of grassland with superphosphate. She leads all others in the use of Sodium Chlorate in grassland weed destruction. She leads all others in her desire to establish permanently young milk producing pastures and, by no means least, she leads all others in the acreage of Government Certified Pedigree grass-seed. She stands almost last in the list with regard to the amount of hay saved and the amount of supplementary crops grown per 100 acres of sown grassland, and she stands quite near the bottom in the amount of the people's money that she spends on grassland research. What she has spent to date is already returning manifold. There are grassland problems in plenty awaiting investigation and their solution looks to be good business and ample provision for their solution looks to be justified, but I want again to emphasise that grassland farming is essentially horticultural in its outlook and future grassland research should tend to have a more horticultural bias than it has had in the past. Pedigree strain building problems, feeding problems, cultivation problems and watering problems are all horticultural ones. True it is that the term "grassland farming," first used by me some 25 years ago to dignify a type of soil utilisation then rather despised, has come into its own and raised the plane of the art. It would not be amiss if the term were altered to "grassland gardening."

Photo of some of the Delegates who attended the opening of the National Conference on Horticulture, January 24th, 1933, the co-operating bodies being N.Z. Institute of Horticulture (Inc.), N.Z. Horticultural Trades' Association (Inc.), Horticultural Seedsmen's Association of N.Z. (Inc.), N.Z. Association of Directors of Parks and Reserves.
First Row:—E. Walker (H.B.); J .S. Dallenger (Lower Hutt); Geo. A. Green (Secretary N.Z.H.T.A.); A. McMillan (Lower Hutt); J. S. Hadfield (Flock House); ————; ————; W. S. Mason (Wellington); H. Bennett (Dunedin); M. Matheson (Dunedin); V. C. Davies (N.P.); T. Waugh, Jnr. (Lower Hutt).
Second Row:—J. C. Nicoll (Wellington); J. A. Campbell (Director Horticulture Division); W. Nash (M.P. Hutt); Hon. C. H. McMillan (Minister of Agriculture, who opened the Conference); Mrs. Knox Gilmer (President Wellington Horticultural Society); F. J. Nathan (President Institute of Horticulture); Councillor Meadowcroft (who gave the Civic Welcome); J. N. McLeod (President H.T.A.); A. H. Cockayne (Director Fields Division); T. Waugh (Chairman Management Committee H.T.A.); Miss Gray; A. W. Buxton (Christchurch).
Other leading members in the group were E. Hale (Masterton), W. C. Kemp (Masterton), N. R. W. Thomas and N. Yates (Auckland), A. T. Attwood, A. W. Just, W. H. Walker (Hawkes Bay), Cliff Gibbons (Christchurch), and a number of lady members.

SUMMARY OF PROCEEDINGS OF TENTH ANNUAL CONFERENCE.

Held in the Dominion Farmers' Institute Hall, Wellington, on Wednesday, 25th January, 1933, at 2 p.m.

Reports.—The following reports were received and adopted:—

1. Executive (with Statement of Accounts)—See Journal of October, 1932.
2. Examining Board—see Journal of October, 1932.

Election of Officers, etc.—

President: F. J. Nathan, Esq., Palmerston North.

Vice-Presidents: Messrs. D. A. Hay (Auckland), Frank E. Smith (Hawke's Bay), P. Black (Manawatu), J. G. MacKenzie (Wellington), Dr. T. H. Easterfield (Nelson), T. D. Lennie (Christchurch), Hon. Sir T. K. Sidey and D. Tannock (Otago), and Jas. A. McPherson (Southland).

Executive Committee: Mrs. Knox Gilmer, Professor H. B. Kirk, Messrs. J. A. Campbell, T. Waugh, H. Baillie, R. B. Hammond, W. R. B. Oliver, F. S. Pope, W. C. Hyde, W. T. Goodwin, W. S. Mason, G. A. Green, B. C. Aston, T. C. Brash, A. H. Cockayne, and Herbert J. Poole.

Auditor: Mr. J. L. Arcus.

Honorary Fellow: Professor H. B. Kirk.

Honorary (Overseas) Members: Hon. H. D. McLaren (President of the Royal Horticultural Society) and Mr. J. F. Bailey (Adelaide Botanic Gardens).

REMITS ADOPTED.

1. (a) *National Societies*: "That the formation of 'National Societies' (by the Institute) be determined only by the annual conference of the Institute or the Executive Council, but, in the latter case, only after submission to the District Councils."

   (b) "That no District Council shall take action towards the formation of a 'National Society' which will in any way commit the Institute as a whole in the matter."

   (c) "That the Institute take steps to assist in the formation of a National Rose Society."

2. (a) *Membership*: "That the yearly subscription to the Institute shall be deemed to include both the member and his wife."

   (b) "That there shall be Junior Membership of the Institute under age eighteen with a yearly subscription of two shillings and six pence."

3. *Educational*: *Garden Trainees*: "That all garden trainees employed by Local Authorities should be impressed through their employers with the importance of attendance at classes in horticulture at technical colleges and other such institutions with the

ultimate view of qualifying for the Institute's Diploma of Horticulture."

4. *School Gardening*: "That the Minister of Education and other educational authorities be urged (a) to have name labels, not already attended to, placed on all trees, plants, etc., in school gardens and (b) that articles on elementary botany, with illustrations, be published in the School Journal (c) that representations be made to the proper authorities for the inclusion of botany."

5. (a) *Forest Preservation*: "That the Counties Association be thanked for their assistance and that the Government be again requested to make provision for the right to exempt bush land from rates in terms of the resolution of the 1932 Conference."

   (b) "That the Government be asked to pass an amendment to the National Parks Reserves and Domains Act defining a National Park and to prohibit the importation of exotic plants and animals likely to endanger plant and bird life."

6. "That in the opinion of the Institute, the State Forest Service should continue as a separate entity under the direction of a trained forester."

7. *Road Beautification*: "That the attention of the Main Highways Board be drawn to the desirability of more attention being given to road beautification and to tree planting along the highways and to the suppression of noxious weeds; also to the possibility of indicating dangerous cross roads."

8. *Plants Patent*: "In view of the urgent need for the provision of adequate protection for the discoverers of new varieties of plants this Conference strongly urges upon the Government the need for the setting up of a Nomenclature Board with statutory powers to prohibit the sale of a plant under a name other than that adopted for it by the Board. It is further suggested that an amendment to the New Zealand Institute of Horticulture Act, 1927, be passed to this effect.

9. (a) *New Introductions*: "That the Government be asked to enforce the 'Introduction of Plants Act, 1927,' and that a register of all new horticultural introductions be prepared with a view to supplying information as to their subsequent development."

   (b) "That before further liberations of opossums and other imported animals or birds are permitted the Government be requested to have the necessity for such action closely investigated."

10. *Seed Industry*: "As this Dominion is admirably adapted for the raising of practically all kinds of seeds, the Executive be strongly recommended to favourably consider full investigation of the advisability of fostering seed-growing as such industry, if properly established, should develop into an important trade and would provide congenial, useful and remunerative occupation for many individuals now on relief work."

11. *Exchange of Plants, etc.*: "That the matter of exchange of plants, seeds, etc., between members, public gardens, etc., be further considered."
12. *Nomenclature*: "That the opinion and, if favourable, the assistance of the Royal Horticultural Society, be obtained with a view to a modification of the rules of the International Botanical Congress to prevent needless changes in the botanical names of plants."
13. *Arbor Day*: "That the Institute undertake the responsibility for the general observance of Arbor Day by promoting ceremonies and lecturettes and by co-operating with local bodies and that this remit be referred to the Executive."

OTHER BUSINESS.

Waitangi Estate: On the recommendation of the Auckland District Council the Conference placed on record its sincerest appreciation of the magnificent gift and lead given by their Excellencies Lord and Lady Bledisloe in purchasing the Waitangi Estate for the nation.

Educational: On the recommendation of the Auckland District Council the Conference decided to place on record and to convey its appreciation of the action of the Headmaster of the Mount Albert Grammar School and of the Auckland Grammar School Board of Governors in endorsing the Headmaster's report in favour of the adoption of the Agricultural Course as proposed by the Institute and that the Education Department and the Senate of the University of New Zealand be again urged to make provision in their syllabi for the teaching of the proposed new General Science subject.

DAFFODIL NOTES.

The following is an extract from a recent letter from the Secretary of the Royal Horticultural Society:—

DAFFODIL YEAR BOOK.

I have no doubt that all Daffodil lovers in New Zealand will be delighted to learn that this Society has decided to revive its Daffodil Year-book. It is proposed that the first issue should appear in the summer of 1933, and it is hoped that it will include contributions from New Zealand Daffodil Growers.

I am sending this letter to you in duplicate so that you may transmit a copy of it to the National Daffodil Society.

DAFFODIL REGISTRATION.

Mr. T. Waugh, already the Institute's representative on the Certification Committee of the New Zealand Daffodil Society, has since been appointed representative also on the Society's Executive and Mr. Herbert J. Poole, Secretary of the Society has been appointed its representative on the Executive of the Institute.

NATIONAL CONFERENCE ON HORTICULTURE.

The third National Conference on Horticulture, held in Wellington, consisted of the annual gathering of the Institute, the New Zealand Horticultural Trades' Association, the Horticultural Seedsmen's Association of New Zealand, and the Association of Directors of Parks and Reserves. The delegates were given a civic welcome by Mr. F. Meadowcroft in the unavoidable absence of the Mayor (T. C. A. Hislop Esq.), after which the Conference was officially opened by the Hon. C. E. Macmillan, Minister of Agriculture. After the annual meetings of the bodies mentioned, they, in conjunction with the Hutt Valley and Wellington Horticultural Societies, held the third National Flower Show in the Town Hall and Concert Chamber, etc. On the Friday afternoon of Conference week, the delegates were hospitably entertained by Mrs. Knox Gilmer, at her residence, Te Marua, Upper Hutt, when her spacious well-laid-out grounds were much admired and the hostess was thanked for her generous hospitality and a most enjoyable outing which included, on the return trip, visits to the beautiful gardens of Mrs. Macarthy Reid and Mr. George Cooper.

EXAMINATION PAPERS, NOVEMBER, 1932.

PRELIMINARY EXAMINATION (Syllabus No. 1).

HORTICULTURAL BOTANY.

Note.—*Any six only* of the following questions to be answered, including No. 9 which is compulsory.

1. Describe the structure of seed, the process of germination and the seedling of the following:—Sweet Pea, Onion, and Carrot?
2. What is meant by transpiration and respiration? Of what importance are they to plants and how are the processes accomplished?
3. What are the essential elements necessary for plant growth and how do plants obtain them?
4. Why is moisture essential to the growth of plants and under what conditions is a high degree of moisture disadvantageous?
5. What growth reactions are involved in budding, grafting and layering?
6. What is meant by self-pollination and cross-pollination? Give examples.
7. What are the main characters of the family *Rosaceae;* name six fruits and six garden plants belonging to the family?
8. Describe in detail any fungus disease you may be acquainted with.
9. Describe in technical language the botanical specimen supplied by the supervisor. (Iceland Poppy).

PRELIMINARY EXAMINATION (Syllabus No. 1)

HORTICULTURAL ZOOLOGY.

Note.—*Any six only* of the following questions to be answered.

1. Give the general characters, habits and life history of a slug and an eelworm?
2. What is meant by complete and by incomplete Metamorphosis? Give examples of each.
3. Give a full account of the New Zealand grass grub *Odontria zealandica* and compare it with the grass caterpillar.
4. What do you know of Biological Control of insects?
5. What are the main contact insecticides and against what classes of insects are they used?
6. What fumigants are used against insects infesting stored grain and what precautions have to be taken in their use?
7. Give an account of the main poison insecticides and against what insects is each most effective?

INTERMEDIATE EXAMINATION (Syllabus No. 2).

PRINCIPLES OF HORTICULTURE.

Note.—*Any six only* of the following questions to be answered.

1. The water holding capacity of soils varies enormously with their physical condition. How can this be controlled to the advantage of horticultural practice?
2. Seeds when embedded in moist soil and exposed to suitable conditions, germinate freely while those of the same variety kept dry under artificial conditions may lose their viability. Give reason for this.
3. What do you understand by the terms "mono," "di" and "tri" as a prefix to the words "calcic phosphate," and how may one form be changed to the other either naturally or artifically?
4. What are the advantages and limitations of a chemical analysis of the soil?
5. Transplanted trees usually have their tops pruned at time of shifting. What are the underlying principles of this practice?
6. Enumerate numerate either the several advantages of shelter.

   or

   Describe suitable trees for shelter in the district you are living in.
7. What are the underlying principles of plant "layering?" Name six plants that may be economically propagated by this means.
8. Name two good general purpose fungicides and name two groups or fungoid diseases they are respectively used for.
9. Write a short essay on the influence of stock on graft or cion. Give examples of good and bad stocks.

INTERMEDIATE EXAMINATION (Syllabus No. 2).

THE PRACTICE OF HORTICULTURE.

Note.—*Any three only* of the following questions to be answered also *any three only* of the questions on the special subject nominated.

1. What is meant by the water holding capacity of soil? How may this be controlled by (a) mechanical means (b) physical means?
2. Judging by appearance of the vegetation only, what would indicate to you a soil deficiency in (a) Nitrogen (b) Potash (c) phosphoric acid, and how would you proceed to make good the deficiency?
3. For commercial bulb growing specify kinds of soil for the following bulbs, Narcissus, Tulips, Iris, Anemones, and Ranunculus.
4. Give a list of not less than twelve sorts of climbing plants, other than roses, suitable for pergola work, mention time of flowering and make brief remarks about each.
5. What do you consider the more notable examples of recent introductions of new plants?
6. In recent times new methods, both chemical and biological, have been devised for the control of plant disease and insect pests. Write a note as to this and give specific examples.

INTERMEDIATE EXAMINATION (Syllabus No. 2).

Special Subject: THE FLOWER GARDEN IN ALL ITS ASPECTS.

Note.—*Any three only* of the following questions to be answered in addition to *any three* from the paper on the "Practice of Horticulture."

1. Give a list of six biennial flowering plants; stating time of sowing and planting out of each.
2. Write a short essay on the cultivation of either the Dahlia or the Chrysanthemum.

   or

   Give a list of twelve of the newer sorts of the former.
3. Name twelve sorts of Herbaceous plants suitable for cut flowers and state the time of flowering of each.
4. Name the different sorts of bulbous Irises known to you and give notes on their cultivation.
5. Name nine dwarf trees or shrubs suitable for Rock garden work with brief notes on each.
6. Explain how you would grow water lilies (*Nymphaea*) with special reference to rooting medium and depth of water for the different sorts.

INTERMEDIATE EXAMINATION (Syllabus No. 2).

Special Subject: A KNOWLEDGE OF TREES AND SHRUBS, TOGETHER WITH THEIR PROPAGATION AND USE IN HORTICULTURE.

Note.—*Any three only* of the following questions to be answered *in addition to any three* only from the attached paper on "The Practice of Horticulture."

1. Give a general review of the genus Rhododendron (including Azalea), its general distribution and its place in horticulture.

   or

   Give the name of twelve of the well-known kinds with their parentage.
2. It is desired to bring from the "bush" a collection of New Zealand trees and shrubs such as Beech, Rimu, Lancewood, etc. How would you collect, pack and subsequently handle these to harden them for the garden?
3. Give two examples of effective grouping of flowering shrubs, having regard to time of flowering and colour effect.
4. Give a list of twelve trees or shrubs having coloured autumn foliage.
5. Choosing New Zealand trees or shrubs, give an effective composite grouping that would provide a good wind-break.
6. Write a brief essay on the propagating, pruning and general management of Hydrangeas.

DIPLOMA EXAMINATION (Syllabus No. 3).

PRINCIPLES AND PRACTICE OF HORTICULTURE.

Note.—*Any six only* of the following questions to be answered.

1. How does light affect the functions and growth of plants: and how is it used to advantage in practical horticulture?
2. Write a critical statement of the present practices relative to packing and transportation methods of importation of the different kinds of flowering bulbs from the Northern Hemisphere. Describe the conditions under which you consider such importation can be best accomplished.
3. Write a short essay on vegetable seeds; referring to their vitality, germination, strain, diseases affecting them, etc.
4. Write a short essay on the ventilation of glasshouses at all seasons; having regard to the modifications that would be necessary in the case of three or four typical crops, giving reasons.
5. Describe an economical heating system for a selected crop under glass. Deal fully with the special problems and difficulties.
6. What are the merits of the different kinds of phosphates, potash and nitrogenous artificial manures on the market.

7. Write an essay on the bean-wilt disease *Phytomonas medicaginis* or the cabbage butterfly *Pieris rapae*.
8. Describe a suitable association of trees and shrubs for shelter and ornament on alluvial land in any particular district with which you are acquainted; using to fullest advantage the opportunities of soil and climate.

DIPLOMA EXAMINATION. (Syllabus No. 3).

Special Subject: LANDSCAPE GARDENING.

Note.—All of the following questions are to be answered.

1. Show by sketch plan your idea of the lay-out of a quarter acre section. Size of dwelling 35 feet by 40 feet.
2. Explain and show diagrams illustrating your meaning of how a drive way twelve feet wide should be formed.
3. Write a contract specification for the laying down of a full sized grass Tennis Court.
4. Give a percentage lawn grass mixture for (a) heavy land, and (b) light land.
5. Give a list of New Zealand plants suitable for shelter planting with notes on the special virtues of each.
6. What kind of timber would you select for rustic pergola work? Give reasons for your choice.

INSTITUTE NOTES.

1932 *Examinations.*—The following passes were recorded:—

Junior Certificate: Miss C. G. Williams (Dunedin), Messrs. W. S. Watters (Auckland) and L. Lannie (Wellington).

Senior Certificate: Miss E. B. Thomas (Christchurch) and Mr. A. McK. McEwan (Dunedin).

Diploma: J. A. Hunter (Auckland).

Yearly Examinations.—On the recommendation of the Examining Board the Executive has decided to fall into line with other educational bodies and hold yearly examinations in November in future instead of half-yearly.

Fruit-culture Examinations.—The Examining Board has been in touch with prospective examiners in Fruit-culture and acceptances have been received in the majority of instances. Orchard Instructors are now being advised that the necessary machinery has been completed and that this matter requires to be introduced in fruit districts.

Nomenclature Board.—The question of finance raised in connection with the setting up of a statutory Nomenclature Board has been met by the interested bodies offering to guarantee reasonable expenses of such Board and the Government has been requested to pass the necessary legislation.

Membership.—It will be noticed in the Summary of the Conference Proceedings that an important alteration has been made in membership conditions. The annual subscription of 12/6 now includes a members' wife and junior membership (under eighteen years of age) is now available for an annual subscription of 2/6

Lily Conference.—The Secretary of the Royal Horticultural Society advises that his Society is holding a Lily Conference and Exhibition in the Royal Horticultural Society's Hall, Westminster, London, from July 11th to 13th. A small supply of circulars, giving full particulars, has been received for distribution to members interested.

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