David Scott Mitchell.

1890.

VICTORIA.

ROYAL COMMISSION ON VEGETABLE PRODUCTS.

Eighth Progress Report,

AND

CONTINUATION OF THE MINUTES OF EVIDENCE

TOGETHER WITH

LIST OF WITNESSES AND GENERAL INDEX.

By Authority:

ROBT. S. BRAIN, GOVERNMENT PRINTER, MELBOURNE.

EIGHTH PROGRESS REPORT OF THE ROYAL COMMISSION ON VEGETABLE PRODUCTS.

To His Excellency the Right Honorable JOHN ADRIAN LOUIS, *Earl of Hopetoun, Viscount Aithrie, and Baron Hope in the Peerage of Scotland; Baron Hopetoun of Hopetoun, and Baron Niddry of Niddry Castle in the Peerage of the United Kingdom; Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George; Governor and Commander-in-Chief in and over the Colony of Victoria and its Dependencies, &c., &c., &c.*

MAY IT PLEASE YOUR EXCELLENCY:

We, the Commissioners appointed by your Excellency's predecessor in office, Sir Henry Brougham Loch, on the 7th September, 1885, "For the purpose of inquiring and reporting respecting the Vegetable Products other than Wheat, for the growth of which the climate of Victoria is suitable, both with and without irrigation," have now the honour to submit to you a Progress Report — the Eighth of the Series — embodying the further evidence which has been given before us on the important matters committed to our investigation.

In placing in your Excellency's hands a complete record of the proceedings of the Commission up to this date, we avail ourselves of the opportunity to offer to you our loyal and respectful congratulations on your appointment, by Her Most Gracious Majesty the Queen, as Governor of Victoria; and we rest confident that your Excellency will extend towards the objects of our inquiry and its practical results that sympathy and support which has been hitherto so thoroughly displayed by your Excellency's distinguished predecessor in that high office.

A reference to our Fifth Report in this collection will show that since its publication your Excellency's Advisers have seen fit to give effect to many of the recommendations we had the honour to make to the Government, founded on the valuable evidence gathered by us from those persons best able to speak on these subjects. Thus it will be seen that the Department of Agriculture for Victoria has been strengthened and developed in the direction of an Entomological branch and a Board of Viticulture, whilst the Honorable the Minister of Agriculture has appointed various Experts whose work cannot fail to be of great benefit to the Vine and Fruit-growing, Dairying, Tobacco, and other Industries, and the question of Forest Conservancy has received due attention at the hands of the Government.

Taking one subject as an instance of the useful results which have followed our investigations, it may be mentioned that the present favorable season turned general

attention to the question of Ensilage as a most important factor in increasing the carrying capacity of the lands of the Colony.

A hand-book on the subject, founded on the Evidence, was therefore prepared, and 20,000 copies distributed in ample time to enable the Farmers of the Colony to avail themselves of the advice given. The large demand for this pamphlet which came to the Commission from other Australian Colonies is evidence of the general interest which is felt in this question, and it is gratifying to note that a special edition of 10,000 copies was reprinted in South Australia. Arrangements have been made by the Government Statist of Victoria to obtain accurate information in the coming census as to the result, which we have every reason to believe will be satisfactory.

The Evidence now submitted to your Excellency touches upon Fruit-drying, Insect Pests, Flower-farming, and Viticulture, while the valuable testimony of Professor Wallace, who holds the Chair of Agriculture in the University of Edinburgh, will acquaint your Excellency of the continued progress which is being made in the agricultural advancement of Victoria generally, at the Colleges established by the Council of Agricultural Education, at Dookie and Longerenong.

At the time the Commission began its work the Mildura Irrigation Settlement on the Murray was commenced by the Messrs. Chaffey. We have watched with much interest the development of this important enterprise, and perhaps no part of the evidence taken

by us will be read with more satisfaction or bear larger fruit in the future than that which, in the present report, records the successful issue of this great undertaking.

We have the honour to be,

Your Excellency's most obedient servants,

J. F. LEVIEN,	President.	(L.S.)
WALTER MADDEN,	Vice-President.	(L.S.)
CHARLES YEO,	Member.	(L.S.)
JAMES BUCHANAN,	„	(L.S.)
JAMES McINTOSH,	„	(L.S.)
JOSEPH KNIGHT,	„	(L.S.)
ANDREW PLUMMER,	„	(L.S.)
T. K. DOW,	„	(L.S.)
JOHN WEST,	„	(L.S.)
D. MARTIN,	„	(L.S.)

JOHN J. SHILLINGLAW,
Secretary.

Public Offices, Melbourne,
11th March, 1890.

NOTE.—The Honorable Fredk. T. Derham and the Honorable John L. Dow, Members of the Commission, have not signed this Report, owing to the fact that they are Members of the present Ministry, and as such are among His Excellency's Advisers.

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MINUTES OF EVIDENCE.


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PLAN

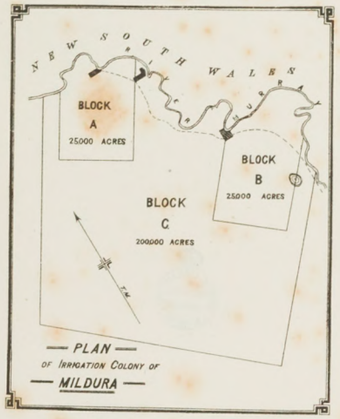
SHEWING PART OF

MILDURA

BLOCK A

NOW BEING DEALT WITH

COMPRISING 25000 ACRES INCLUDING TOWN OF MILDURA

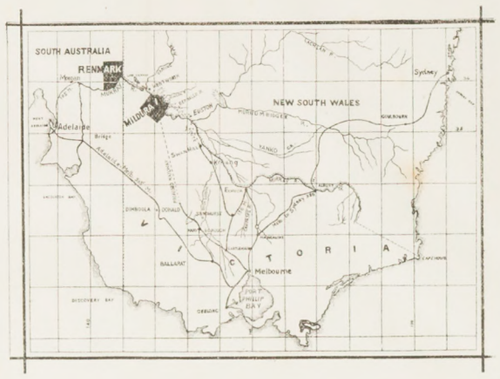


Scale

BLOCK D—Town of Mildura.
" E—Horticultural Land in 10 Acre Lots.
" F— " " "

CURETON AVENUE
DEAKIN "
DOW "
} 3 Chains Wide.

Other Avenues and Streets, 1½ Chains Wide.
Total Area—D.E.F., 25000 Acres.
Irrigation Channels



CHAFFEY BROS
(LIMITED)

CONTINUATION

OF

MINUTES OF EVIDENCE

Taken before the Royal Commission on Vegetable Products.

WEDNESDAY, 5TH JUNE, 1889.

Present:

The Hon. J. F. LEVIEN, M.L.A., in the Chair.

J. Knight, Esq.,	Andrew Plummer, Esq., M.D.,
Hon. W. Madden, M.L.A.,	Chas. Yeo, Esq.

Rev. Thomas Hill Goodwin, examined.

10796. *The Witness.*—I should tell you first that in the *Argus* of the 14th ultimo I saw a paper on "The Exportation of Australian Fruits." It wound up with a reference to cured fruits, and said, "So far the secret of their preparation has to be discovered," and "although figs have been cured in the northern districts of the colony, they are unaccountably tough as compared with the best Smyrna figs," and suggested as a remedy "the allowing of the figs to remain on the trees until they fall." The latter clause is a perfect absurdity, because my own experience is that figs which fall from the tree are not eatable at all. I answered this article in the paper, and thereupon your secretary communicated with me. My experience is not recent. In 1855 I went to establish a mission to the Aborigines at Yelta, on the Lower Murray, about 25 miles below where the Mildura Irrigation Colony now is. I was told when I went there, "You will not grow a cabbage." I said, "I will try." One gentleman told me he would eat his hat if I would ever have a garden there. I knew I could not without irrigation. I first of all erected a hand pump. In a few years after I found it necessary to construct a windmill for the working of this pump, and I gradually brought about three-quarters of an acre under cultivation, growing vines, figs, and other fruit and vegetables. The fig I procured from Albury; it was a white fig. In 1866 I attempted the drying of figs. I experimented in two or three ways with regard to the manner and time of drying. I first tried two days' drying, then three days, and four days; but found that three days' drying was quite sufficient. T. H. Goodwin, 5th June, 1889.

T. H. Goodwin, *continued*, 5th June, 1889.

The idea of the method that I adopted I gained from some letters written by someone travelling in the Levant. First of all I prepared a strong lye of wood ashes. The writer of the letter stated that the lye should be made from fig-wood ashes; but of course those were not available where only a few trees were grown, and I found that the ashes of the box-wood answered just as well. I saved all the fig cuttings I could spare the next year, and made a small quantity of lye with the fig-wood ashes, but I found no difference between that, and that made with the box-wood ashes. I scalded the figs for about half-a-minute to a minute, and then laid them out to dry. When they were sufficiently dry I packed them in a box, carrying the figs above the level of the box, and then pressed the lid down close. In two or three days I noticed a treacly substance exuding from the box, and I was afraid they were going wrong; but when I opened the box I found they were just the thing, so I re-packed, and after a little while this treacly substance dried on the figs and made the sugary substance that is seen on dried figs. I was so well pleased with them, that I sent a sample-box to a friend in Adelaide, and another to a friend in Melbourne, and the latter showed them to a merchant here, and he said they were "equal to the second best imported." In Adelaide, where they have attempted drying figs, they were pronounced to be "the best colonial figs they had ever seen." It requires judgment in regulating both the scalding and drying. That is only to be gained by experience; but I have no doubt anyone following my method would be able to produce marketable figs. Our mission was given up at the end of 1867, so that I had not the opportunity of any lengthened experience in the matter; and my time since has been principally spent in districts where I have had no opportunity of growing figs. I shall be glad to supply anyone interested with a copy of my method. Since my letter appeared in the *Argus* I have had very numerous applications for a copy of my method.

10797. I understood you to say you got those figs from Albury?—Yes, the cuttings were sent by a friend from Albury; and I know the same fig is growing there, as a few years ago I had a box of similar figs sent to me from there.

10798. Is there anything exceptional about the fig?—I do not know that there is, it was labelled the "White Provence."

10799. You have only tried that one fig?—Yes, that was the only one I had, and I had only one tree; but as to the cultivation of the fig, my experience is that it will take as much water as a willow, and the more water it gets the better it grows; and it will take any amount of manure.

10800. You have noticed other figs growing?—Yes.

10801. Do you know if it is the fig in general cultivation?—I have not seen the fig anywhere about Melbourne. Most of the figs I have seen about here are dark figs.

10802. Then it is different from the fig in general cultivation?—About here it is. I think it must be grown largely in the Albury district.

10803. Had you any special method of putting them out to dry?—No, merely lay them out on a table, and turn frequently. The following is the method to be used:— T. H. Goodwin, *continued*, 5th June, 1889.

TO CURE FIGS.

"A week or so before the operation of curing commences, prepare a strong lye from the ashes of fig-wood, but when these are not available, the ashes of box-wood will answer. All cuttings from fig trees should be kept for this purpose. Half bucketful of ashes to 10 gallons water will make a good lye. Stir well occasionally. When required, pour off the clear water into an open vessel, such as a copper, set to boil and keep at simmering point. Having gathered your figs, which should be fully ripe, but not over ripe nor withered, place them in the boiling lye for a minute. An easy plan is to have a sieve that will fit into the boiler, place a layer of figs therein, and dip into the boiling lye for the requisite time; take out and lay figs on a table in the sun; turn twice a day for three days. If the sun is very scorching, an awning of thinnest calico will prevent their drying unevenly, or being scorched, which produces toughness. Cover up or take under shelter at night. Have boxes ready—small ones are best. Pack figs evenly until you have one row above the top of box, place on lid, press down and nail, or place heavy weight on it. Set boxes in dry place. In a few days a treacly substance will exude from figs, which when dry produces the sugary appearance peculiar to dried figs. The figs are then ready for market."

The witness withdrew.

Ernest Anderson, examined.

10804. *By the Commission.*—What are you?—I was about 15 years secretary of the City of London Entomological Society. At present I am collecting insects and working at artistic work in connexion with entomology. I have only been in this colony about seven months. Seeing some references to the codlin moth attacking peaches and plums in the Parramatta district, N.S.W., I wrote a letter to the *Age*, which was noticed by your secretary, who requested my attendance before you. E. Anderson, 5th June, 1889.

10805. You have given considerable attention to the subject of entomology here?—Yes, as far as I have had opportunity I have done so; but I have been prevented by other business from devoting the whole of my time to it. Whenever I have had time I have gone into it, and I was much astounded when I came here to find the lack of knowledge that there appears to be. I visited the Melbourne Museum almost directly to find out what I could, and I found that in the University Museum there is practically no economic entomology submitted to the public. I subsequently found out that there was a very good collection in the Curator's room, which I was allowed to see. That is a very good collection, and reflects credit on those who brought it together; but it is only a collection of one stage, the perfect stage, there is nothing of the preliminary stages, and those collections are not considered economic entomology, it is mere collecting; it teaches the people nothing whatever.

10806. Have you given any special attention to the troubles that the fruit grower is subjected to in consequence of insect pests here?—Since I came here I find the codlin moth is attracting a great deal of attention, and I have looked into the matter a little; but the life history of the

E. Anderson, *continued*, 5th June, 1889.

codlin moth takes a year to study through all its stages; I found larvæ in some fruit perfectly white, but the true larvæ of the codlin moth is always of a pinkish colour. I had both kinds of larvæ spun up in the little nests they make—[*exhibiting the same*]—and on opening some of those I found the pinkish ones fade rather to white; but I have distinctly had the white ones in the apples, so it appears there is more than one species here. It may be a native species that attacks us as well as the C. pomonella, the one that is imported. I cannot say for certain whether there are two species, I only judge by the caterpillar.

10807. Are they always pink from the very earliest stage?—Yes, they always have a pinkish hue.

10808. Might not the colour be affected by the food that they get from a red apple?—No, I think not; the colouring matter is only on the skin of the apple. I never noticed in England that we have a white one, and it is not mentioned in any of the books. I believe that it is not the codlin moth; that white one is an indigenous species of moth.

10809. Is this one of English growth?—No, but it is undoubtedly the pomanella, because it was pink when I had it first; it is gradually turning into the chrysalis and will turn into the moth later on. It is highly probable that we have two species here. I have had more than fifteen years' experience of entomology in England, at first as a hobby, and subsequently I was appointed as secretary. Here I have a commission to collect certain orders of insects for a nobleman in England, so it is part of my business here also. We have the pomonella in England and all over Europe, but it is not so common as it is here; and I think it is very probable that the pomanella has been imported here; but the parasite, that nearly all insects have, has not been imported, therefore in England it has a natural check; here it has a free field. Some parasites attack indiscriminately various species of caterpillars, if they are about the same size. Others confine themselves always to one species, that is to say, that the pomanella may have a special parasite upon it; and while the pomanella has been imported here its parasite may have been left behind. The parasites are chiefly ichneumon flies, which come in the order hymenoptera. That is, the chrysalis or pupa case of one of the large moths—[*exhibiting the same*]—that occur here very abundantly on the gums. It comes in the same order as the silk producers. There it is waiting for the spring; waiting to develope into a moth. But if ichneumon flies have taken the trouble to lay their eggs in the caterpillar, all the time the caterpillar is feeding, the parasite is feeding inside it. It has the instinct to avoid the vital parts, and feed in the fatty matter until nearly full grown; and then the destruction of the caterpillar is completed finally by its feeding on the vital parts, and forming its own chrysalis inside that of its victim, as shown here—[*exhibiting same*].—So you see if you can find out there are natural parasites in England of the codlin moth and introduce them here, they will fly about the fields and orchards and do their work. The natural checks furnished by nature are of the utmost importance. In the ordinary way there are always checks in nature to prevent undue

increase. There are many species which would strip all creation if allowed free scope. The number of eggs one moth lays are from one to two hundred, and sometimes up to one thousand, each of those producing a voracious grub feeding on various vegetable substances. There are an enormous quantity there —[*exhibiting a specimen*].—There seems to be such a lack of knowledge on this codlin moth here ; that is what first drew my attention to it. Some told me the codlin moth was a white moth, some yellow, some brown. Then I saw statements in the papers in which it said the codlin moth was attacking plums and cherries and peaches. That is in the highest degree improbable. The nature of plums and peaches is sufficiently different from apples to constitute an element that would probably kill the pomanella. Therefore I wrote to the papers, and pointed out that the matter ought to be more looked into. The one that feeds on the plum is another species, the C. funebrana, an allied species. From a farmer's point of view, of course, it may be the same ; but its habits and dates may be different.

E. Anderson, *continued*, 5th June, 1889.

10810. What method do you recommend as the best for coping with insect pests in this colony?—Taking insect pests generally, they are so varied you must first of all study the life history of each ; and probably each one or set would require a different remedy.

10811. I mean, rather, is it necessary, in your opinion, to have legislation?—Yes, decidedly. I was going to proceed to that. You cannot make one general rule to clear off all the pests here ; and the life histories are not known, and the insects themselves not known ; but so far we have not had the inducement to go into those things here ; and therefore I consider it is highly necessary that the scheme which I see in your evidence has been already propounded should be carried out—that legislation should take place, and that a State entomologist or inspector should be appointed. It would be his duty to go into this matter. He would devote the whole of his time to do it, and have power, where necessary, to order the destruction of certain trees if so infested that they would be no good to the owner and a source of danger to the owners all round. I think that certainly necessary.

10812. Would it not be desirable to impose upon the owner of the trees the necessity of destroying the insect pests by some method ?—It would be rather hard on them. No doubt if you could have a law to that effect and enforce it, it would be a most valuable one; but the difficulty would be to get it and enforce it.

10813. I do not mean that the law should describe the method necessary, but the necessity for destroying the insect or keeping it down should be upon the owner of the property, otherwise those who have properties they do attend to would suffer from those who do not ?—Yes, I quite agree with that ; but the difficulty is that you make a law for the owner to see that the trees are free from insects, and it is their interest to do it ; and one may say, "I am most willing to do it, but I do not know how; will you give me expert information as to how to do it and I will do it."

E. Anderson, *continued*, 5th June, 1889.

10814. I mean on the principle of the necessity to prevent the destruction, and every man being responsible for the insects being destroyed on his own place?—If you want to clear the colony there is such a necessity; and you will probably never do it without.

10815. Does such a law exist in England?—No.

10816. Does it exist anywhere to your knowledge?—I think in some of the States in America they had legislation for certain insect pests; and I believe in South Australia and Tasmania there is some legislation.

10817. In England, where there is no legislation, has it ever been mooted as to the necessity of legislation there?—Though there is no legislation there is a great deal done. Miss Ormerod, Consulting Entomologist of the Royal Agricultural Society of England, sends circulars to all the agricultural districts and to all the natural history bodies, of which we have a great many in England, in which all the pests known are enumerated, and blank spaces left for any others; and a record is made of whether they are unusually abundant this particular year, with any remarks that may suggest themselves to the correspondents. Those reports are sent in each year, and by that means they get a most valuable mass of information, which they digest, and from which they in return give a great deal of valuable information, with advice as to treatment. There is no law, but at the same time a great deal of work is done.

10818. And that does good by educating the people as to the best means of destroying the pests?—Yes, that is a great thing to educate the people. If you can do that, of course they help themselves without the aid of laws or anything else. That is why I think it is necessary in all museums and public places to have the life history of the thing, and a plan and precise account of what is best. This is the plan we have in England—[*exhibiting a small case with specimens*]. That case shows the life history of the moth that feeds on the vine—the agarista glycina in every stage. Here is one where I have the parasite—[*also exhibiting the same*]. This species is a general feeder; and is peculiar because the female has no wings. Here are the living chrysalides of the vine moth. It has about six successions of broods during one year, and of course they feed up very rapidly, and then when the cold weather commences the last lot of larvæ lie over like that till the spring in the chrysalis state.

10819. Could you give the Commission your idea as to the best means of destroying the codlin moth or keeping it down?—That was a valuable idea mentioned by Mr. Jerrold Knight—the burning of all the rubbish. No doubt that is a help. They make those little cocoons on the bark of the tree, and anywhere else that is at all handy, if in a dry situation; and, by clearing away the rubbish and loose pieces of bark, you destroy an immense amount of insect life. A clean, well-kept orchard would not have nearly so much insect life as a dirty one. Then, you can cope with it, as they do largely in America, with sprays, when the eggs have been laid. I also think, in many cases of insect pests, that

hand-picking by children is one of the best things you can resort to. I wanted to get some caterpillars of that vine-moth for preservation. I did not know where to get them, and I offered to some children round about a penny a dozen; and, in the course of two or three days, I found I got more than I possibly knew what to do with. I did not like not to take them, as I had promised the money; but I had to kill them off, and get rid of them. So, if the children had a little inducement offered, they can find the things very easily. In that way they would destroy an enormous amount. I believe, years ago, in connexion with the May-bug beetle, which is most destructive, that the mayor of one town organized a grand hunt, for which they voted money out of the town funds; and the number they destroyed was enormous—millions and millions. The whole town turned out for the purpose. I might mention, when the Colorado beetle scare was on, the English Government issued throughout the various counties hundreds of little cases like this, only they were models, not the actual specimens, showing the life history—the grub state, the perfect state, and the egg. They distributed those throughout the country to farmers, so they knew what to look for, and the few cases that did occur were immediately reported. No matter what amount of printed matter you might distribute, probably a man could not comprehend it; but, by just having a little thing like that, he can use his eyes and see what it is. Therefore, in educating the people it does a great deal of good. Messrs. McCarron, Bird, and Co., of this city, have the subject under consideration as a business speculation as to getting out charts on various subjects, including noxious insects, bee-keeping, and so on. I have their permission to show you some of these sketches. These two—[*exhibiting the same*]—are the most destructive to timber trees that you have here. There is hardly a single native tree but what is attacked by this moth, eudoaxylia eucalypti, or some of this tribe of beetles.

E. Anderson, *continued*, 5th June, 1889.

10820. They are wood borers?—Yes; longicorn beetles. They take the name from the extreme length of the antennæ. The firm propose to bring out this as an educational thing, so that children might get a rudimentary knowledge at first. I believe the Board of Education have given it their favourable consideration. The want of a hand-book is most urgent here, because, though information has been recorded to a certain extent, it is distributed in the reports of this society or the transactions of that, and there is more information in the home reports than there is here. The collection together of information on these pests, and the issuing of it in a concise form, I think, would be hailed as a boon by thousands here. There is absolutely nothing of the sort, and there is nowhere where anyone in search of information could turn.

10821. You think the most important thing to be done is to educate the people as to the nature of these insects, so that they can have an object lesson of the thing they have to deal with?—Certainly. If a person saw this sort of beetle with a long antennæ about his place, he would say, "That is almost exactly like the thing I have been taught about, the same shape, the same sort of antennæ; it must come

E. Anderson, *continued*, 5th June, 1889.

in the same tribe, and they are destructive," and he would take means to destroy it. On the other hand if people do not know something of this they may see those ichneumons—[*exhibiting the same*]. You see that long sort of sting that is behind, which is really the greatest benefit to man; people may go destroying those. They say here is a thing with a great long horrid sting, whereas the ichneumon might lay hundreds of eggs in the caterpillars feeding on their crops. Education is no doubt the great thing. Even if you have a few men appointed to inspect the pests, they cannot cope with the whole colony. It is necessary to educate the people, and it should be their duty to do that also; to get information gathered together like that of these life histories, and issue it as much as possible to people. In England we go in for entomology so much more, we take it up as an amusement. We have six or seven Entomological Societies in London, not to speak of Microscopical Societies. In every centre there are two or three societies and they are constantly exchanging with Scotland and Ireland and other places, and there are five or six papers devoted to it. The whole thing is so taken up. But here, beyond the Field Naturalists' Club, I do not think there are any societies.

10822. I understood you to say that you have various parasites that prey on the codlin moth at home? — Not on the codlin moth in particular. I never gave much attention to the codlin moth at home, because the pest that we have to cope with at home is not the codlin moth at all. We have the winter moth there; a most destructive insect, that feeds not only on apple but every tree. The female is wingless, and lays her eggs during the winter or early spring months on the trees. Directly the buds come, the little caterpillars eat into them and eat the buds, young leaves, and blossoms; and they are in such numbers that they completely strip the tree. Afterwards the tree recovers and throws out leaves, but the blossoms have all gone, so you get no fruit at all.

10823. Do you know any parasite that preys upon the codlin moth at home?—No.

10824. Would the parasite you showed just now prey on it?—No.

10825. I thought you said a parasite was the means of checking the codlin moth at home and in Europe?—Yes, probably. At the same time that parasite I showed you is one that attacks caterpillars in the open; but there are others that would do it. They attack the larvæ of these things that feed in the trees. Their instinct is remarkable. They get their egg in through the crevices.

10826. Is there any means of discovering as to what the parasite is that feeds on the codlin moth?—Yes, by corresponding with the people at home. No doubt there is one, and it could be discovered and imported out here, and would do a great deal of good.

10827. As to the necessity for legislation, you thought that the owner should be compelled to destroy the insects, how would you manage with those that did not comply with that?—You would have to impose a fine. A man has to keep his premises in a clean condition.

If he allows filth to accumulate there is the sanitary inspector and he is brought up and fined, so it would apply to a man who kept his place dirty as regards insects.

10828. You would make it penal to have noxious insects on the place?—Yes, but I would have warning given to a man, that is where the education comes in. He would plead ignorance. A man has a place full of those, and is shown it; and he is told he must have them destroyed within a certain time; and if not I would make it penal. It would not be fair without proper warning, especially as this is rather an outside question. I have brought up a species of moth (heliothis armigera) here that is very injurious to green peas—[*producing the same*]. I bred this out of peas bought at South Yarra. It is rare in England. A genuine English specimen of that flying in England would be worth a guinea. A preserved specimen sent from here would be worth only 4d. It feeds in the pods and clears them out. When small it gets hidden in the pod, and when large it sticks part of its body out. The fact of my getting them at South Yarra shows how easy it is to distribute them. That—[*exhibiting same*]—is an Agrotis. The caterpillars are called by the Americans "cut worms," and they will feed on cereals and anything. The turf is so undermined in some places by them that you can lift it up—they are very destructive to lawns. This one must do a deal of damage here, because, in the perfect state, it is so common. I have also observed insects here infecting carrots, potatoes, dried currants, and other products but will not prolong my evidence. In my opinion, this insect question is so vast in importance that if it was more generally understood there would probably be action taken. We spend thousands of pounds in defences, forts, &c., to keep a foe from coming and exacting a war indemnity; but here we have, year by year, these insidious little foes working silently in our farms and forests, annually robbing the country of thousands of pounds.

10829. Have you a collection of parasites?—No, I have no collection of insects. I collect and send to England. I collect them for a pecuniary advantage. Economic entomology is of no pecuniary value to me.

10830. You would consider it as of as much importance to teach the youth all about their insect friends as their foes?—Yes. The value of the insect friends is quite as important a question as the insect foes.

10831. There is a great variety of the ichneumons?—Yes, very large. It is perhaps, almost the largest family that we have.

10832. Have you found any parasites on the aphis?—Yes, there are parasites on the aphis of the same family. They are so minute that they lay two or three eggs in the body of one aphis.

10833. Are there any parasites on the scale?—It is probable there are. In the whole scale of creation there are parasites; as the old rhyme says:—

> "Big fleas have little fleas,
> Upon their backs to bite 'em;
> And little fleas have lesser fleas,
> And so *ad infinitum*.

I may say that Mr. French's collection is the only one of economic entomology I have seen in the colony.

E. Anderson, *continued*, 5th June, 1889.

The Chairman thanked the witness for his practical and interesting evidence, and requested he would further communicate with the secretary with a view to the preparation of small cases of special pests, for distributions to infected centres.

The witness withdrew.

Jerrold Ernest Knight examined.

J. E. Knight, 5th June, 1889.

10834. *By the Commission.*—What are you?—Nurseryman, at Sandhurst.

10835. Will you give the Commission the result of your experience in insect pests in connexion with orchards?—I have visited all the large orchards in the district, and collect specimens wherever I can get them. I have a few specimens here—[*exhibiting the same*]. Mr. Anderson, the last witness, has given you all the scientific part of the life of the grubs. I think it would be well to go into the practical part of the subject, the simplest methods of trapping and destroying them.

10836. As adopted by yourself?—Yes, and others as well. I have been studying it for many years.

10837. What method do you adopt?—I can show you here in a very few moments. These are some of the traps that are placed round the trunk and branches of the tree in spring—[*exhibiting the bandages made of bagging that had been used for the purpose*]. In these traps you will find hundreds of them in their cocoons. The trap means a bandage of bagging or anything that will do to afford shelter. I visited Mr. Craike's extensive orchard at Sandhurst, and he uses paper only, with a bit of string tied round it, or a bit of flax; and they will congregate under it to spin their cocoons in the autumn. They will stay in their cocoons till spring, and from now till then you can destroy them; but I would not advise anyone to leave the destroying of them after July. In this band I expect there must be 200 or more. Here they are now—[*pointing out the same*].

10838. How long were these bands on the trees?—About two months since they have been dipped.

10839. What is dipped?—It means dipping the bandages in boiling water. These bands have been dipped twice during the summer to kill the grubs; and then after that they are placed back again on the tree. One gentleman recommended to trap and destroy them in November, and I recommend to kill them at every opportunity. It all depends on the climate. If it is very warm you get more than one hatchment of them during the year. The first hatchment does the serious damage. If you can find out in your climate the exact time they go into their cocoons then you can destroy them. The climate alters the time of their emerging from the chrysalis state into the moth very considerably. The bandages during the summer months should be removed at least twice and all grubs destroyed; but the winter is different.

10840. You think bandages or shelter and boiling the bandages is a good method for destroying them?—Yes, or burning the bandages.

10841. Do you put anything on the bandage to entice them?—No.

10842. Have you any other means to destroy them?— Yes. Besides removing the bandages and burning or boiling them, remove all the old bark, and burn all the clippings, dead fruit trees, and all the débris off the place; pick off all diseased fruit, and gather up all that falls and boil them. J. E. Knight, *continued*, 5th June, 1889.

10843. Is there any other method you adopt?—There is the spraying in the spring-time as well.

10844. With ley?—Yes.

10845. How often would you spray them?—Twice at least, or more if found necessary; that must be decided by watching them. That is when they emerge from the chrysalis state into the moth.

10846. Did you ever adopt the plan of candles or lamps in the orchard at night?—No.

10847. Is that a good thing?—Don't think so. The light would attract some of the moths, but I doubt if many moths would be destroyed that way. Would adopt every feasible method for their destruction.

10848. Did you ever do it or know any one to try lamps to catch them?—No.

10849. Did you ever know people use bottles with treacle to catch them?—No. When you remove the bandages you will find in some cases half the cocoons have been attached to the tree; and if you do not watch the grubs will drop, and those grubs can attach themselves again, and recover themselves during the winter time.

10850. Care is requisite in removing the bandages to see the grubs do not fall?—Yes, great care. There is one there came out, and it re-formed its cocoon on the paper. You will find them under the old bark —[*exhibiting the same*]. In all this bark there are cocoons attached to it. If that old bark is taken off the tree and burned there is an end of them. I received a letter from Mr. Snell, an orchardist at Castlemaine.

10851. What is the purport of it?—He agrees with me in all the main points. There is another matter I think is very important. I would also advise that all empty fruit cases that have been used for apples or pears, &c., should be steamed, or boiled, or placed in a kiln, so as to destroy any grubs secreted in them. You will find that a great quantity are spread through the country by empty cases. I know it means a lot of work to carry out the above suggestions, and the question is what is the cheapest and best means—steaming, boiling, or putting in a kiln.

10852. You recommend that heat in some shape should be applied to all cases before being circulated?—Yes; and I think all cases, even those from Tasmania and other places, should be similarly treated. You do not know what they have been used for unless they are new orange cases, that is a different thing altogether.

10853. Even in that case it would do no harm to steam them?—No.

10854. You recommend that all old fruit cases before being used again should be steamed or boiled?—Yes, steamed or boiled. There is another question—legislation. As the last witness said, I believe in educating the people. I am of the same opinion. I feel sure of this, that if once the orchardists throughout the country know, they will be

J. E. Knight, *continued*, 5th June, 1889.

only too willing to adopt any feasible system that is put before them for the destruction of the grubs, because it affects their pockets. But you want to get at the private growers, and any Bill that is passed should compel all fruit-growers to use the traps and all other systems that are adopted for the destruction of the pests.

10855. You think there should be legislation?—Yes. Where I got these specimens from one man is doing his level best to cope with the codlin moth, the neighbour next is doing nothing. The neighbour on the other side is doing his best, and the man in the centre is doing nothing; and no matter what amount they kill they have to put up with part of his, and to reach that man is what is wanted.

10856. Did you read the Bill that was before Parliament last session?—No; the only thing I know is this, that unless every man is compelled to keep his orchard clean, or do his best to keep it clean, the codlin grub will never be checked or eradicated, practically speaking; while one man has done his level best for two or three years past to destroy the grubs on the place, his neighbour does nothing; and he will never get rid of all his grubs.

10857. As to compelling the fruit-growers, is it not a fact that the insect is distributed largely by the nurserymen—would you not have some restrictions on nurserymen?—The Bill should include every fruit-grower.

10858. Is there not a great danger in having these insects distributed from the nurseries to clean districts, such as Horsham or Shepparton; should there not be some restriction placed on them?—No, there is not the danger as there is through the cases.

10859. Is there no danger?—I do not think so. The young nursery stock are grown out in the nursery clean. There may be some, I will not say there are not any.

10860. Is there no danger—nurserymen importing to this colony some very serious insects which have been referred to to-day?—Yes. Have enough insects to cope with now without importing any new species. I would suggest then for the nurserymen to clean the imported trees on arrival from Europe by dipping them in a strong solution of tobacco-water, or soft soap, or any solution that would kill the insects.

10861. Should there not be some legislation to restrict the importation of these plants?—No; you would restrict the industry if you did.

10862. Should there not be a sort of quarantine ground where they would be placed before they are scattered about, to check the introduction of noxious insects?—No, I would suggest the nurseryman clean the imported trees on arrival from Europe; but to quarantine the trees somewhere down the bay, and open the cases and send them to the nurseryman after a delay of probably a week or more, what good would that be? Who would pay for the damages that would occur through the delay and exposure, &c., &c.?

10863. You import oranges largely from New South Wales?—Yes.

10864. Did you ever find any of the cottony-cushion scale on them?—No, I have found the black scale on them, and any trees with the scale on always clean them, as nurserymen object strongly to dirty trees going out. J. E. Knight, *continued*, 5th June, 1889.

10865. And you can make no suggestion as to any means of preventing these being scattered through the clean districts being planted so largely now?—I would make this—that they would send out the imported trees from Europe clean.

10866. You would insist on the nurseryman cleaning the trees before they leave the nursery?—It all depends on what it is. Take for instance red spider—I will guarantee you cannot show me an orchard in the colony that is not affected by red spider, more or less.

10867. Should there be any restriction in your opinion placed upon the importation of trees and plants from abroad, in order to prevent the spread of disease?—Do you mean on the importing of them, or that they are to clean them when they come?

10868. A restriction that they shall not be allowed to import and circulate trees diseased from Europe?—Yes, I am quite in accord with that.

The witness withdrew.

Adjourned.

TUESDAY, 19th JUNE, 1889.

Present:

The Hon. J. F. Levien in the Chair.

Dr. Plummer,	J. McIntosh, Esq.,
The Hon. J. Buchanan,	The Hon. W. Madden,
J. Knight, Esq.,	D. Martin, Esq.
C. Yeo, Esq.,	J. J. Shillinglaw, Esq., Sec.

Professor Robert Wallace examined.

10869. *By the Commission.*—What is your profession?—I am professor of agriculture of the Edinburgh University. I was brought up a farmer, and succeeded to a professorship about eight years ago at Cirencester College, Gloucestershire, and four years ago to the professorship of the Edinburgh University. Professor Robert Wallace, 19th June, 1889.

10870. At present you are merely on a visit to the colonies?—Yes, including New Zealand.

10871. What is the object of your visit?—To extend my own knowledge. I have no official capacity.

10872. Do you know the nature and scope of this Commission?—Yes, I have a general idea of it.

10873. It is this—to inquire into and report upon the vegetable products other than wheat, for the growth of which the climate of Victoria is suitable, with and without irrigation; in fact, to inquire into and report to the Government as to any novel products that might with advantage be

Professor Robert Wallace, *continued*, 19th June, 1889.

introduced or grown in this colony. From your observation of this colony, so far, what industries might, with advantage be taken in hand here by the farmers, other than the ordinary ones of wheat, oats, barley, potatoes, and so on?—Of course, my experience of the colony, so far, is but very limited. In fact, the growth of the grape is the only one industry which I have thoroughly examined yet. I think there seems to be a wonderful prospect for that, particularly the light wines. We could drink a great amount more of them at home.

10874. What districts have you visited so far?—The St. Hubert, Mr. Castella's.

10875. You are very much struck with the facility with which we can produce a good sound wine?—Yes, very much.

10876. You have had an opportunity of comparing the production here with the production on the Continent?—Yes.

10877. Do you think our conditions are as favorable or more favorable than most elsewhere?—That is a question I could hardly answer. I do not know that I know the Continental systems thoroughly; it is only from reading that I know them. I have not gone into it as I have done here.

10878. You were much struck, however, by the production of wine, and by the great facilities therefor?—Yes; the evident capability of the country.

10879. From the climate and situation of the country, are there any products that suggest themselves to your mind as being desirable to produce here?—An answer to that question could only be given by trial; but it has been my general belief that as yet neither here nor in any of the other colonies that I have seen is there a thoroughly qualified staff to judge of the products of other countries—I mean to say the introduction of products is merely done in a sort of haphazard way, by chance. It seems to me there ought to be a thoroughly scientific and at the same time practical system of getting at the knowledge of what does well under certain circumstances; so that in the first place you might disseminate trials which would, on the face of them, be impossible to carry out in the eyes of a thoroughly good man; I mean a man who understands the thing both scientifically and practically. So far, I do not know that you have a staff of this kind who ought to make investigations; I mean thoroughly qualified inspectors who would travel as I am now, to discover what exists in different parts of the world; for instance, in different parts of the world that have similar climates and soil to those of your own in this colony.

10880. You think it would be desirable, in fact, to disseminate the very knowledge that we are seeking to amongst the farmers to educate them?—But the point I mean is, you must not attempt to disseminate knowledge till you have it, that is where the difficulty arises in England and at home. Knowledge is attempted to be disseminated before those who attempt to disseminate it have the knowledge themselves.

10881. Would you recommend the introduction of experts?—Yes, that is what I mean; travelling inspectors who are not selected by chance or for expediency, but after a sufficient and thorough training,

both by science and practice. I speak, not for this colony only, but a general principle that would apply to our own country as well as India.

10882. You would suggest a specialist for some of the leading products that reasonably might be expected to be grown here with advantage?—That is it. Of course an inspector might be selected as temporary inspector—men who know vine-growing for instance or the culture of any other products—allow them to go and make investigations in different quarters.

10883. Are there any special subjects that you would yourself consider it would be likely to be of interest to the Commission; for instance you have had some large experience in ensilage?—Yes, I have paid a good deal of attention to that subject.

10884. Do you think this climate would be suitable for the production of ensilage?—Yes, I think so distinctly; and where you have a country liable to drought no doubt ensilage must be a very important feature in all successful agriculture.

10885. Have you seen it made with success, and if so, where?—In very large experiments both in England and in India. I have seen very large pits at Allahabad in India, and many centres in England and Scotland and Ireland.

10886. Is it the native grasses used in India?—Yes, the natural grasses; and a very large number of them they have.

10887. What method is adopted?—The silage is put into pits, just holes in the earth—large holes dug in the ground; many of them have no preparation of building, but simply holes dug in the ground.

10888. Is the grass pressed into the holes? Yes; trodden in and earth thrown on the top. The ground is simply flat. I rode over one that had been three years in the ground, and the horse did not sink.

10889. Would it answer where water was prevalent—would not that injure it?—This place, certainly, rain fell heavily at certain seasons. It is a point that is not easily explained. The Indians preserve their dry grain in those pits in the dry ground; that does not seen to go down far in the pit.

10890. What thickness of earth is put on the top of the grass?—Between two and three feet.

10891. Is it not heaped up like a grave?—No; simply level with the ground.

10892. What becomes of the surplus earth?—That is thrown back.

10893. Not heaped on the top?—No.

10894. Is it put in the shape of grass or chaff?—Simply put in as grass.

10895. Are the silos never made above ground in India?—Yes, I have seen them built. I saw them at Outacumund, built and pressed in the most approved style.

10896. In your book you recommend the pit?—No, I do not. I think that you can make silos with less expense in a stack on the surface, and it is equally good, provided you make the stack big enough; if you make a large stack you can do away with the waste on the side—you reduce the proportion of the waste.

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10897. As to the time of cutting the grass or grain for silo —take ordinary oats—would you cut it immediately when it is in the ear ?—When it has got to its full growth, without becoming hard, it must be green after it is in flower—in the full growth; but where the product has not begun to ripen as it were.

10898. And you have seen stock fed on this ensilage and do well ?—Every description of stock, even to fowls.

10899. Just as it comes from the silo ?—Yes, as it comes from the silo. Horses have to be treated with caution in administering silage, you do not want to give them the full allowance of silo, you must mix some dry feed. You can give it to cattle and sheep perfectly moist and by itself, but horses must be treated according to their work and what they are eating.

10900. You consider then that in this colony that a very much greater amount of stock might be kept if the grass were cut in a green state and kept ?—From my knowledge of it, I should say it would be a great means of preserving the grass; because I understand this rain comes and the goodness is washed out of the grass, so there is a distinct loss. With silage there is a loss equal to the loss sustained in making hay, when good silage is made; but that loss would be much less than allowing it to stand in the ground I should think.

10901. Is it used much in England ?—Yes, very extensively; the increase has been quite enormous the last few years.

10902. Is the use of the silo pretty general amongst the farmers who keep much stock at home ?—It is extensive—I could hardly say general; but there are a very large number of silos, amounting to thousands, throughout the country.

10903. It is more or less a modern introduction ?—Yes, as regards the English farmers quite a matter of a few years. We do not hear as much about it now as we ought to have done had the silage society remained in existence; but silage got such a success that the society was not necessary. Everybody got to know about it from a few handbooks and they did not see the necessity of keeping up the society, and we do not hear about it so much.

10904. Then I gather that as soon as farmers become aware of its great use they adopt it ?—Yes, where they have facilities for it, they now stack silage so successfully—when a man has the stuff, there is no reason why he should go into it—a very small stack. I do not mean that silage will ever take the place of hay, because where good hay can be made without risk of loss, silage does not make any way; but it is where there is a risk in stacking hay that silage will undoubtedly get a footing.

10905. Is not the silage more nutritious than hay. It is impossible to compare them, weight for weight, but if you take a sample crop of clover, that is, say, put five acres of grass of the same sort or character into a silo, and five acres made into hay under the most favourable circumstances, they are just about equal in value; but this is the point where silage gains, you can always make good silage, whatever the weather, whereas you cannot always make good hay, so you can avoid loss.

10906. Is not there this difference, that many growths unfit for hay are fit for silage?—There are some growths, but I do not think there is much in that, because you cannot improve the material by putting it in silo.

10907. Take, for instance, maize—you would not use that for hay?—You could make it into maize straw, which they use in America.

10908. We find here it makes excellent silage?—Yes.

10909. In many places thistles and other things make silage?—Yes; but those are not very extensive products. They are side products. I always fight against that, that by putting the material in the silo, you can improve its quality. You cannot, if you put bad grass into the silo you take out bad silage.

10910. That rather applies through all agriculture?—Yes.

10911. In this colony there are a great many thousands of tons of grass going to waste every year, could not a great portion of that be made into silage advantageously?—No doubt all the natural grass here could.

10912. In your book on India, you say, amongst the rest, that ensilage would be the future salvation of India—cannot ensilage be made also a considerable help to us here?—No doubt; wherever you have droughts. That is what I meant in India; they have enormous droughts there which cost them their cattle, and prevent the crops ripening. That remark applies to all hot countries, where you have a large amount of green nutritious food in one season, and dry another.

10913. Have you been to New South Wales yet?—No.

10914. Does the silage put in stacks spoil sometimes; is it not liable to spoil the same as hay?—If you make a large stack, some hundred of tons, say, the percentage of loss is reduced very much. You have always a certain amount of loss, a few inches, say two or three inches round the edge; if you make a small stack ten feet square you, of course, lose more in proportion.

10915. I mean entirely?—No, there is no fear of that if it is properly made.

10916. No matter how wet or green when put in?—If you put in wrong material, too dry for instance, you may get your heat up.

10917. You cannot err on the green side?—If you err on that side, you will run a lot of juice out; but that is a matter of manipulation.

10918. Do they put machine pressure?—Yes, Johnson's press is one that is used. We have another local press; both are successful.

10919. It is necessary to use those?—I think so. But I have seen it made about twenty miles south of Dublin, where the stack silage was made by piling it in between upright posts, twenty-five feet up, and the material allowed to weigh itself down; but I should not advise that.

10920. Will it keep more than one year?—Yes, if there is proper pressure put on.

10921. Have you seen stock refuse it?—Yes, all kinds of stock will refuse it, because they require to be taught to eat it. I have seen stock refuse the best of oats, because they did not know what it was.

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10922. Is it your opinion that stock do as well on ensilage as on hay made of the same quantity of grass. Do not you think that the green food taken off five acres would do more good than that taken off in the shape of hay?—The answer to that requires to be given in a qualified manner, because, in the first instance, I do not think it is fair to ensilage to feed it alone. I think it should be given as a mixture. If you give half hay and half ensilage you will get better results than either from the ensilage or hay. Your question has been fully answered by the late Sir John Lawes on dairying. He showed that by giving ensilage alone they did not do so well as with other foods; but the value of ensilage given in a proper way was about equal to the same amount taken off the same amount of land made into hay.

10923. Of course you refer to the meadow hay in the old country?—Yes, the clover hay.

10924. Not oat hay?—They have not oat hay, because of the climate.

10925. Then your comparison is with the natural hay?—Yes, or the clover hay.

10926. In feeding dairy cows does it affect the milk in any way in the taste?—I think it depends a good deal on how you treat the cow. I do not think if ensilage is given properly it should affect the milk injuriously; but if you give sour ensilage I have known it taste the milk badly. But sweet silage given as part of food gives the best product in the winter season, and does not taste the milk at all. You spoke of the succulent character of food; of course there is always an advantage in the case of milch cows, in giving succulent food as compared with hay. There you have a distinct advantage for the silage.

10927. All those farmers who have tried the system in the old country follow it out and continue it?—Yes. It would be a benefit from a different point of view from your point to save the loss we would sustain through rain. The advantage is equally great from a different standpoint.

10928. Have you had any experience in the growth of the beet-root sugar?—No, I have not. We grow mangolds at home, but not beet sugar.

10929. Have you had any experience on the Continent at all?—No.

10930. Will you describe the two kinds—the sour and the sweet ensilage?—The difference between the sour and sweet ensilage is brought about by the different fermentation that takes place. I will describe it in general terms—sour silage: The acidity is produced by organism that exists in lower temperatures, 120 deg. Fahrenheit; and if you keep the temperature down to that height you will get sour silage by excluding the air. If you admit the air the fermentation process goes on more rapidly. The temperature rises over 120, the acid fermentation organisms are destroyed and other organisms takes the place of them, and sweet silage is produced. Well, with sweet silage you have a greater combustion as it were; the temperature rises

higher and the burning goes on. Of course fermentation is merely a slow process of burning, and, therefore, you have a greater waste of material, but then you have it of better quality. Professor Robert Wallace, *continued*, 19th June, 1889.

10931. Then undoubtedly you would recommend the stack system? —Yes, where you could regulate the temperature and make sweet silage.

10932. You have been speaking before of concrete silage—what is your experience of chaffed silage? — It makes no difference for the preservation. It may be convenient in handling, but uncut grass and all grasses of forage plants of small dimensions will keep equally whether uncut or cut; of course, Indian corn you require to cut to get it to pack.

10933. What is the usual practice adopted at home?—People with the convenience chaff it in putting in the pit; but in the stacking the material is left in because you build it more conveniently then.

10934. But we understood you prefer stack to pit silo? — Yes, because you get it much more cheaply, provided that you make the stacks big enough.

10935. In your travels, has any product come specially under your notice that you think could be introduced with advantage in this country?—I know so little about the country yet, that it is a difficulty to answer that question. I do think, speaking generally, knowing what has been done in other places, that there is no doubt that there are products in similar countries as regards climate and soil, that might be introduced with advantage. Of course I cannot say what they are. I am looking after fibres at present. That may be one branch.

10936. The object of the Commission is to ascertain what products other than wheat this colony is suitable for; but the first recommendation you make is, that there should be an independent and thoroughly well organized department of agriculture?—Yes.

10937. That is your strongest recommendation in your Indian book?—Yes; and it is the same here I should say.

10938. That experiments should be made extending over some years, and that those experiments should be carefully watched by competent people?—Right.

10939. In the meantime that means a delay of some eight or ten years?—Yes.

10940. Eight or ten years is a tremendous time in the history of a new country like this; and in the meantime we want to ascertain what products are likely to succeed?—I can only answer that in a very general way. In the first instance, you seem to have grown wheat consecutively to improve the farming. You did not want to be at very great expense, and you can certainly improve the capabilities of your land by the introduction of a system of rotation of crops. Now there is one general remark I might make as to that, that you must for the benefit of the land in whatever rotation you adopt have a certain amount of leguminous crops. The advantage derived from the growth of leguminous crops on the succeeding grain crops is very great. It

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has not been possible to explain it till quite recently; but there are some experiments which I have not fully studied myself which were published just as I left England, by Heilregel, a German. His methods and experience go to show that it is impossible to get the best results in grain growing without the proper intermixture and in rotation of some leguminous crops, clover, vetches, peas, beans, sainfoin. All those crops belong to that special class. It is shown by those experiments that those plants are able to take up from the air the free nitrogen that is worthless to grain crops, and manufacture it into the most valuable product which acts as manure to the grain crops in the shape of combined nitrogen. Thus you can, by growing certain crops, manure your land. Of course it is very much less expensive than applying artificial manure, which might be applied wrongly where there is a want of knowledge.

10941. But to grow many crops you refer to irrigation as necessary in many parts of this colony, and, therefore, it is your opinion that irrigation will be a very great advantage in helping farmers to carry out the rotation you recommend?—I have seen a good deal of irrigation in one part and another. I have seen a great amount of failure in irrigation. I do not think that irrigation is to be looked upon as uniformly successful. I think that very intimate knowledge of the results must be had before you can say that irrigation will be the salvation of a country. Of course with a very dry country no doubt you must supply water some way, but it requires very great care to put it on in a way that will not do harm instead of good.

10942. But we cannot have the crops you mention without irrigation, therefore if irrigation enables us to carry out that rotation, irrigation in our case will be a good thing?—Yes.

10943. In your remark about those crops that will be likely to benefit the farmers in bringing a crop between oats and wheat in the shape of peas—would it benefit the farmer by cutting off that crop the same as any other crop or ploughing it in, such as peas ploughed green into the ground?—I meant at the time that he should use the crop for fodder, and not plough it in, because green manuring may sometimes in a dry climate open the soil too much and do harm. So I think it is better to consume the crop with sheep or some flock. And the object I spoke of is gained by the growing crop; because after you have taken off the crop you crop more than you had before, although you took away the crop, because the supply is got from the air.

10943. You would recommend that we should manure those leguminous plants?—No, you cannot manure leguminous plants as a rule. Leguminous crops do not answer to manure in the same way as other crops.

10945. If I understand you right, you would try and obtain a good leguminous crop?—Yes. However you would do I cannot say, whether by irrigation or any other process; but if you can procure a good leguminous crop you will ensure a good grain crop afterwards.

10946. Could you suggest any means whereby we could get that?—I do not know enough about the country yet. It may be by irrigation.

10947. Have you in your experience had any means of forcing on the leguminous crop beans?—You cannot force beans by manure at home unless by farmyard manure or artificial manure, which do not do any good to beans as a rule.

10948. On wheat-sick land, how would you induce a crop of peas? —Its being wheat-sick would not interfere with its growing peas. In fact, it would almost ensure its growing a leguminous crop.

10949. Does it apply to all leguminous plants?—Yes, clover and vetches.

10950. Root crops?—No, root crops are not the same. You do not get the same benefit from water as in leguminous.

10951. Peas sown in wheat-sick land will grow a crop, you say?— Yes; and you will do away with your wheat-sickness by growing leguminous crops on it.

10952. The great point we wish to bring before you is this, that although we put a crop of peas or beans in any ground with no moisture to bring them up, they simply dry rot; and without irrigation it would be impossible to grow those crops in the northern portion of our colony?—Then, of course, if you can grow them by irrigation, it is an immense gain, because you get the benefit of that crop and a succeeding benefit of the next crop.

10953. Do you consider root crops useful in rotation?—Root crops are useful with us as cleaning crops and for supplying a succulent food in winter season; but I do not think root crops are so much to be aimed at in your case as leguminous crops. I think you will find the expense of working root crops with your high rate of wages will be practically prohibitive as compared with the leguminous crops, which cost nothing but the putting in.

10954. The average quantity of land held by our selectors, say, is 200 acres—would it be a very great advantage for every farmer to have a crop each year which he could turn into ensilage in connexion with his farm, not interfering with his wheat-growing?—Distinctly; especially when he has no roots.

10955. It will give him good fodder for his stock during the long dry summer months when food is scarce?—Yes, and if you can get the land clean otherwise, it is not necessary to have root crops. Our object in England is gained by root crops.

10956. Does not a root crop at times pay as well as any other crop? —You cannot get it to pay much more than expenses.

10957. I have seen it pay here?—It is a kind of crop cultivated by a few, and by that you get a special price. If you were all growing root crops you would not find it profitable.

10958. Would green peas or beans make good ensilage?—Yes.

10959. Would you give us an idea, what is in your mind when you speak of a perfect department of agriculture, and any idea on that subject as to what a perfect department should consist of. You refer to that in your book on India, and you speak very strongly on the subject, but you do not indicate there what you consider to be necessary as an efficient and proper staff for such a department [*referring to*

Professor Robert Wallace, *continued*, 19th June, 1889.

Professor Wallace's book on India]?—I think if you notice I do in that I go into the full details there. You must not only have a head, but the means of communicating with farmers throughout the country, and you require officers in different districts of the country to carry out this communication. It is not given in my book in the form that would be applicable to your case here, because we are employing native officers in India. We class them under different headings.

10960. Would it be convenient to come before the Commission after you have seen more of the colonies than you have seen now?—It might be; but my time will be very short in Melbourne.

10961. Your evidence after you had made yourself thoroughly acquainted with these colonies would be exceedingly valuable, because then you will be able to realize what the colonies are, and what they are capable of?—What I can see of the colony in two or three weeks will be very little after all; but I shall know more of it than I do now.

10962. Still you could give us your idea of the way you would recommend the agricultural department being carried out here?—Yes.

10963. From this interview with us, you can see pretty clearly the direction we require, bearing in mind that our principal object is to ascertain what crops, other than wheat, the soil and climate of this colony are suitable for?—Quite so. No department could be perfect without the means of training officers suitable for the lower branches.

10964. Will you be able to see the colleges here?—I have seen the one in the north-west, Longerenong.

10965. That is only in its initial stage, at present. Have you seen the French colleges?—I have seen the English, Irish, and American ones. We have just got a splendid Government report on those colleges, quite recently.

10966. Have you that?—It is Major Cragie's report on "The recent advances of education in France."

10967. Have you seen any schools in Germany?—No.

The witness withdrew.

Francis Mellon examined.

Francis Mellon, 19th June, 1889.

10968. *By the Commission.*—What are you?—Fruit and vine-grower, and agent for perfumes from the south of France.

10969. Where do you reside?—Dunolly. I am agent for the manufacturers and growers of perfumes; the best houses in the south of Europe.

10970. From flowers and herbs?—Not herbs; all the essential oils prepared for medicine and perfumery.

10971. The Commission would like to hear a statement from you—you know the scope of the Commission?—To begin with. Last time I was here, I heard a gentleman say something about figs. I would suggest before we try to dry the figs we must have the right sort.—[*The witness produced a sample.*]—I showed this to the greatest importer of

dried figs in Victoria, and we compared with the figs coming from Naples, and there is nothing to compare with the flavour. These Victorian ones are the best. This is named, the "Goddess of War," Bellona; these are grown at Dunolly. Two years ago I brought out a lot of those trees for the Government. The Minister gave me instructions when I was in Europe to bring those trees. Instead of distributing them to different people, I believe they have been put in some of the Government establishments. Francis Mellon, *continued*, 19th June, 1889.

10972. How many were imported?—Of that sort 24 plants. There were 2,000 different plants with the perfumery plants.

10973. How old was the tree these were produced from?—I brought the tree from the last exhibition in Paris, in 1878.

10974. Is this fig usually used for drying?—Yes, this is the best fig we have in the south of France, and I imported 22 different trees at the same time, and all the rest have been failures, not giving the produce they give in the old country; the chemical properties of the soil make them deteriorate.

10975. Might not figs good in other countries fail here?—Yes, out of 22 sorts this is the only one that produced as well as in the old country; in fact a trifle better. I have imported figs by the ton from the same plant, but not equal in flavour. It seems to me that the soil has some properties that it imparts to the figs.

10976. How many years has it been bearing?—Three years.

10977. Was it from 1878 to 1886 without bearing?—Yes, it is like everything else, it must have the strength before it bears the fruit.

10978. The tree is fifteen or sixteen feet high?—Yes.

10979. How much does it bear?—Two to three months a year. It has scarcely any flower figs; but when it begins to produce it keeps on for three months.

10980. What weight of figs?—It would produce 2 cwt. of green figs—one tree.

10981. How much would that be dried?—About one-fourth would remain dried.

10982. What is the commercial value of that?—One shilling per pound, and the person I showed this sample to this morning, seeing the superiority of the fig, will, I believe, offer me a trifle more.

10983. How are those dried?—Simply by the sun. Let them ripen thoroughly on the tree, and in five or six days the fig is ready to be stored, no preparation whatever. If preparation is required the fig cannot be the right sort. In the south of France we have no preparation; and if you use preparation you must deteriorate the quality of the fig.

10984. How many sorts are generally used in the south of France?—Fifty sorts I would say, but this is the best fig we have for drying, the Bellona.

10985. Is it commonly known here?—I do not think there are any in the country except mine. I distribute as many cuttings as I can take off, gratis; but our farmers here, or our producers, want practical demonstration, that is, plant for them and wait for the fruit till it is ripe, to make them understand the thing.

Francis Mellon, *continued*, 19th June, 1889.

10986. Then you think that fig growing and drying will be a very profitable business in this country?—Yes, from what I know I imported figs from the south of Europe, the minimum you could get them at is from 7d. to 8d. a pound, and the maximum would be about 1s. 1d. less, I believe, on the best crops. If you have a suitable soil for it, it is a most valuable crop, and the quantity is practically unlimited. You know, gentlemen, in Algeria, an Arab will start a hundred-mile journey with a handful of figs; the nutritiousness of those figs is simply wonderful.

10987. You have only a limited number of those trees?—I propagate every year. I have about 40 now in different stages of growth. Before I ascertained the quality of the 22 trees, I required information, now I graft those with this sort.

10988. They may be propagated—what way would you propagate?—Grafting or putting the cutting in the ground.

10989. Have you ever budded the figs?—No, never.

10990. Do you know whether they are capable of being budded?—I do not think you could detach the bud from the fig like you would from another tree. You see the milky matter makes it so adherent, and I think it would take away all the vitality of the sap. The grafting is the best. I repeat again, they require no preparation whatever; the fig when ripe droops down, then pull them off and they are ripe enough for drying. As long as they stand out straight they are not ready. The soil required for the fig is deep, rich, moist soil. Figs like the dampest place in the orchard.

10991. Plenty of water?—You never give too much water to a fig. The fig wants its foot on water and its head on the sun. I think the fig-growing industry is a very important one in this country.

10992. Have you found any particular kind of stock more suitable than another?—No, not yet. All figs grow well, but some will not produce fruit.

10993. They are all equally hardy?—Yes.

10994. Have you found them subject to any class of disease?—No, not yet.

10995. Then as to essential oils?—I will mention first the plants most easy of cultivation. Well, we all know the scented geranium of Africa. We grow another geranium with lanceolated leaves like the parsley, and if you have it in the garden you would see at once the essential oil—[*exhibiting a sample*]. If I tell you the price of that you will see the importance of the industry. I imported that oil and paid 40s. a pound for it. It is a plant very productive of oil. That is the most easily-grown plant. If you stick it in anywhere it grows. I will say this, that if one of our farmers covered five, ten, or twenty acres with geranium, and the law allowed him to have a still free, I do not see why he should not put it straight into the still and produce the oil. It is as simple as saying "good morning."

10996. What quantity of that oil is imported here?—This geranium is not one of the foundations of perfumery, but its principal use is mixing and for adulteration of oil of roses, which is worth about £45

a pound. This geranium being similar to the oil of roses, is used for the adulteration. Generally we use the water from the rose to distil geranium, so the geranium is impregnated with the rose flavour, and we use it very much for increasing the oil of roses, which fetches that enormous price.

10997. Is that the ottar of roses?—Yes, the essential oil of roses. Last year it reached as much as £90 sterling the kilo.; but we have not the kind in Victoria. The perfume is three-quarters geranium and one quarter roses.

10998. You say that notwithstanding that we import £7,000 worth of essential oils per annum into this colony, there is nothing whatever done in the direction of growing or producing those essential oils ourselves?—Not to my knowledge.

10999. You are of opinion that our soil and climate are well suited for their production?—A great deal better than the south of France—ten times better than the south of France, because where they grow those plants there they have one acre of arable soil against 100,000 acres of rocks; the soil is simply disintegrated rocks, and still they manage to grow the best plants, and are the richest community in France by the production of that. Without exception, they are the richest community.

11000. What quantity of essential oils is annually exported from the south of France, unfavourable as it is for their growth?—It is simply enormous. You could form an estimate of the export from the town of Grasse, in the centre of the floriculture of the world. They have 52 distilleries in a town of 11,000 inhabitants.

11001. Large distilleries?—Immense ones, employing 500 people at a time in each one.

11002. And yet you say our climate and soil are better suited than even the soil and climate of Grasse?—I cannot establish a comparison; ours is so much superior.

11003. Then, in your opinion, there is no difficulty in Victoria supplying itself with essential oils, and all the colonies round?—Not only ourselves, but we could export it. My country is always open to buy, because they supply Europe. Anyone in commerce who wants oils must go to the south of France.

11004. And in the same way as our wines are now largely worked for that purpose, so would our essential oils be imported into France to be made up?—Yes, now Algeria has become a producing country to export to France. I referred to the geranium, they grow immense areas under geranium to send to the south of France to be manipulated. To show the difference of our soil, here is the cultivated lavender in France, and here is the cultivated lavender in this country—[*producing the same*]. That seed there came two years ago for the Government, but I must tell you we have no lavender in this country. The produce of that other specimen—[*exhibiting the same*]—is not worth 2s. 6d. a pound. That is the bastard lavender, usually grown in this country.

11005. What is the difference?—The difference is in the ear, but it is better produce.

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11006. Is it from the cultivation? What is the difference between the two?—The difference is this—this branches out like oats, that has only one ear, like wheat —[*referring to the samples*].

11007. Is that owing to the difference in the seed?—This is the bastard lavender by itself. This is what is sold as lavender, by the nurserymen, but that other is the only real one. That is now cultivated in Mitcham, Surrey, England.

11008. We have a gentleman here from Mitcham in Victoria, a Mr. Slater—have you seen his productions?—Just before giving evidence I read what this gentleman referred to. He produces medicinal plants for the herbalist; but I believe, in my opinion, he has no connexion with what I am speaking of—the produce of scents.

11009. Then, supposing that anybody determined to start a plantation for the purpose of raising essential oils, he must not only prepare his land properly, but be careful to get the right seed?—Exactly.

11010. No use having an inferior quality?—No, you must have the right thing. This—[*referring to a sample*]—is simply like hay.

11011. Can you give that common stuff a name?—The spike lavender.

11012. And the other is, what?—The Lavender Alba. Here is the oil of lavender. That is pure—[*exhibiting the same*].

11013. What is the value of it?—The French lavender in this market has a value from 7s. to 10s. a pound, but the cultivated lavender from England has a value from 60s. to 64s. a pound.

11014. What is the reason of that?—By cultivation. This lavender grows wild on the Alps. This is from cultivation—[*referring to exhibit*]. We could produce lavender superior to England, because the sun is more propitious, and the soil is as good, if not better; but the sun that gives the influence required is more powerful, so that if the English lavender gave one kilo. per 100 lbs., this will give us one kilo. and a-half with the same quantity, because the plant is more impregnated with oil, which is due to the sun.

11015. Then you would recommend the cultivation of lavender as one of the products that will pay where the climate and soil are suitable?—All those plants, the geranium and all, will pay very well. Lavender, as the mainstay of perfumery will pay better still. When I came here two years ago from Europe I threw broadcast this seed of lavender over a grass paddock without any cultivation whatever, and here is the produce—[*exhibiting plants*].

11016. And, even grown broadcast, it thrives well here?—Yes.

11017. Has much of that grown on the grass?—I threw the seed over the grass paddock. This is another plant—[*exhibiting the same*],—the red thyme, we use for soap perfuming. This is a sort of mint that grows wild on the Alps; but all these are so well suited to the soil here that there is no difficulty in growing them.

11018. What sort of soil does that grow in?—If the soil is poor it gives a certain produce; but if the soil is rich it gives you much better.

11019. Does it grow as well on dry land?—It grows anywhere, but according to the soil the produce. Here is the peppermint—[*exhibiting the same*]. All these are grown in a grass paddock without any preparation whatever.

11020. What is this one?—The peppermint of commerce.

11021. Is this grown from seed?—No; from dividing the roots.

11022. That makes the oil of peppermint?—Yes; when these plants are in blossom we cut them and put in a still simply.

11023. What is this—[*referring to another exhibit*]?—The mint, wild from the Alps; but it grows freely on the ground. That is useful for soap perfumery.

11024. What is this—[*indicating*]?—The leaves of the real lavender.

11025. Are the leaves used for distilling?—I read in the evidence that the leaves contain no oil—a witness said that. When you can detect the perfume in the leaves the essential oil must be there—how could there be no oil when the scent is there?

11026. So your view is that the leaves as well as the flower may be distilled?—Yes; they do not contain so much, but the oil is there.

11027. Have you any other plants now?—No, but we all know the roses grow anywhere.

11028. Have you imported some oranges?—Yes. This is the Bergamot, from the bitter orange—[*exhibiting the same*]. It is the most hardy of the tribe and grows without care.

11029. Is it the Seville orange?—Yes, but the true name is the Bergamot. That is obtained from the blossom.

11030. Supposing orange trees of that sort were grown largely for perfume purposes?—It would pay far better than for the fruit.

11031. And would give a large occupation to children?—To children principally, because picking the flower with the index and the thumb is necessary.

11032. The trees are allowed to fruit only to a small extent?—Yes; so as not to kill the tree. Two hundred fruit on a tree 10 feet in diameter. No other orange will give the same quantity of oil as that.

11033. Is the manufacture as simple?—Simply the distillation and the water used in distilling; orange-blossom water is worth one franc per bottle.

11034. But the oil itself?—It is worth £30 per lb. to-day in Melbourne. If you want to know anything about the cultivation I would recommend that the Minister of Agriculture should take notice in our colleges to have a piece of ground set apart to show the cultivation of these plants. In my district, being president of the society, I do all I can to disseminate the knowledge by the reports of your Commission; but the practical demonstration in a plot of ground goes far further than all the papers you could present to them.

11035. Is it all sun-drying of figs in the south of France?—Yes, no artificial.

11036. And the prunes?—All fruit, nothing artificial. Out here, where the sun is so much more powerful than in the south of France, except on a large scale, there is no reason why it should not be done

rancis Mellon, *continued*, 19th June, 1889.

similarly. In France, every farmer dries his grapes that are worth drying, and then a certain day of the year this same farmer who has anything to sell, brings it into the market, and the middle-man buys from anyone. They have no men possessing such an amount of ground as our farmer possesses. It is all small holdings, and that is what is the richness of the country. I consider our Government has given too much ground to our farmers. They do not know what to do with it. In France the farmers bring the dry grapes and the dry figs on certain days to market, and the middle-man is there ready to buy, and the farmer goes back with the money in his pocket. But here we like to go on a larger scale—to have a speciality. We have to make our farmers grow those things individually, and bring them to market. That is the way all over Europe. The proper course for us is to impress on every farmer to grow whatever he can, and then bring it to market.

11037. Where is the market here?—This year I have a few hundreds of pounds of currants of my own drying, and I have about twenty times the demand for them. I have the figs; and if I had 20 tons to bring to Melbourne, they would be sold immediately. We will never overdo the fruit-drying, because it will become more in consumption; why, there is not a child who will not eat two or three pounds of figs a day if he could get them, and men will be glad to take a fig before dinner as an aperient. For fifty years, I predict, we will not grow dry fruit enough for our consumption, because the children are so fond of fruit here—the young people born in the country are.

11038. You think that the sun-drying is better than the artificial drying?—There is no comparison.

11039. It produces a better article?—Yes, and better flavour. I have dried them artificially, and can speak of it. The artificial drying takes away a good deal of the flavour, and a good deal of the colour. That is why figs in Melbourne are white, because they are passed through sulphurous acid; and that is not good for the "bread basket."

11040. Could you make any suggestion as to how to make our farmers go more into the cultivation of those perfumes?—Yes; the thing has been said so often. You must find a person to go to the farmer and say "That piece of ground will be suitable for flowers, why do not you use it?" I believe it will be money well expended for the Government to teach the people who do not understand the way to do it. There is nothing more simple if you are told about it.

11041. As to the distilling of the herbs, there would not be a market?—Melbourne is an emporium for those essential oils; and I believe, if I make no mistake, the Customs returns show £7,000 or £8,000 worth imported of essential oil. I believe it must be three times that, because I import nearly that quantity. I believe there is some mistake.

11042. You pay all the duty perhaps?—There is no duty to facilitate the growing of it.

The witness withdrew.

Adjourned.

MONDAY, 5TH AUGUST, 1889.

Present:

The Hon. W. MADDEN in the Chair.

A. Plummer, Esq., M.D.,
D. Martin, Esq.,
T. K. Dow, Esq.,
J. McIntosh, Esq.,
J. West, Esq.,
J. Knight, Esq.,
J. J. Shillinglaw, Esq., Sec.

Professor Robert Wallace, recalled, further examined.

11043. *By the Commission.*—You hold the position of professor of agriculture at the University of Edinburgh ? —Yes. Professor Robert Wallace, 5th August, 1889.

11044. You have also written books on agriculture and kindred subjects ?—Yes, my work on India in 1887 treats generally of agricultural subjects.

11045. You have been in Canada ?—Yes, and the western states of America.

11046. You are now on your way to America ?—Merely passing through, after going to New Zealand. I have another book called *The Live Stock of Great Britain,* going into a second edition just being published now.

11047. You have given very special attention to questions of agriculture and stock breeding ?—Yes; I have been brought up to it all my life.

11048. This Commission is appointed for the purpose of ascertaining what products other than wheat the climate and soil of this colony is suited for, and we would be glad to have your opinions on several points. You have made yourself acquainted since you have been here with our system of agricultural government—our Agricultural Department ?—Yes.

11049. Have you thought out that question as to whether the present arrangement is completely satisfactory or whether it is capable of improvement ?—So far as it goes I think your council governing the education department of agriculture is very good, and its work is shown by the most perfect institution you have—Dookie College—which is very excellent. I have seen Dookie, and although I came prejudiced against colleges of that description, because we have no class of men corresponding to the students of the Dookie College at home requiring agricultural education, and notwithstanding that I have quite changed my mind, and believe that Dookie College is doing exceedingly good work under the circumstances. You have got men who have not had the advantage of being brought up in the agricultural line, sons of others than farmers, and the character of the Dookie training seems to me to be very excellent for that class of men, that is, it is very largely practical, and at the same time scientific teaching is also attended to up to a certain point. The work at Dookie, I think, is very excellent.

Professor Robert Wallace, *continued*, 5th August, 1889.

11050. You have noticed an important point—that the Council of Agricultural Education have deemed wise to place a practical man rather than a scientific man at the head of that institution. Do you think that is wise?—Yes. There is no reason why a thoroughly practical man should not have a scientific training, but no scientific man would be of use unless he was a farmer. He must have been brought up to the business.

11051. You know our system as to agricultural education is this :—A council has been established, partly nominated by the Government and partly elective. That council has been endowed with a large area, 250,000 acres of land, from which at the present time they are receiving about £10,000 a year income. That income is not capable of being touched by any Government power ; it must be devoted to the work of agricultural education only. Does that system meet with your approval?—Yes, I think you may congratulate yourselves that you have got men in this permanent board thoroughly representative as it is, and at the same time not liable to changes which are associated with political life, with changes of party.

11052. And you think the system of having the council partly nominated and partly elected is a good one?—I think it seems to be very good, because it gets the confidence of the country.

11053. Then you think that extending the operations of that council in the same way will be beneficial to the colony?—I think so. If you have a number of colleges established in addition, so that you will cover all the districts as well as where the colleges are already established. Then I think the work could not be better carried out than by the same council that you have already established.

11054. We think that these colleges, besides providing agricultural education for the youth of the colony, also being model farms, that is thoroughly practical model farms, is a point in their favour, as the adult farming population in the neighbourhood can also obtain largely benefit from the experiments and experience that they see there—does that seem to you to be desirable and advantageous?—I think so, where the farms are carried on as the Dookie farm is managed, that is, a farm worked on ordinary principles—a well-managed farm. I like to see a distinction between what you would call a model farm and a farm of an ordinary nature, worked under ordinary conditions, because model farming has never been made to pay, but good farming is of course a desirable thing; and if you have a good farm in connexion with these colleges, you are of course showing those men what they are able to carry out themselves ; they could not follow the work of what you would call a model farm, that is a great landlord who could have everything of the best quality, with a farm well managed, and have good stock at the same time.

11055. You are aware that, practically, Dookie is self-supporting? —Yes.

11056. Does it commend itself to you as a thoroughly practical farm?—Yes; and associated with the experimental parts which every farmer should have. He should always be trying something new. That is done at Dookie; but yet the farm is managed on ordinary principles, such as an ordinary farmer could manage himself.

11057. So that, as well as being a practical paying farm, there is an effort made there to put agriculture on a higher level?—Yes, by means of simple and useful experiments.

11058. Then again I think it is in the minds of the Council of Agricultural Education, by-and-bye to establish a central college or university of agriculture to which the students—the more talented students from the country colleges—may ultimately be drafted and be made specialists—what is your view on that?—I think it would be a very excellent thing indeed if you could establish a central agricultural university, especially looking to the fact that you have such a large sum of money before you in the future; and also that you want to make agriculture a very special branch of study. At home one can, by associating it with the university, have a university department. There we get the university influence to carry forward our schemes; but here with the Minister of Agriculture, as representing this special branch, I believe that you, with your money, would be able to establish an agricultural university which would be supplemented by these country colleges and be really a better plan than associating directly with the University.

1159. Our idea also is to establish that central university in such a position as would enable it to have experimental grounds surrounding it of a higher class—is it your opinion that that also is desirable in connexion of course with a museum, illustrating the products in every possible shape and form?—Yes, I believe it would be very excellent, because you have the minor experiments carried out in the schools in the country, and you have ordinary farming shown there. You do not want to have an ordinary farm in connexion with a very high-class instruction. You want a man to devote himself to the science of agriculture, and having got the practical part provided for to keep the model farm here, would be liable to the same objections as those I stated as to the model farm, whereas the experiments you speak of would be of very great service. You cannot be expected to have in the country colleges anything like the very best trained and complete staff. Now, you ought to have a school of that sort here. You want something on the type of the Rothamsted experiments. These were carried out and lately endowed by the late Sir John Lawes in the neighbourhood of St. Albans, England. He has endowed them with £5,000 a year. Now you want to have some such sum before you would be enabled to carry out really experiments which would be of thoroughly national importance, the reports of which could be printed and circulated throughout the whole English-speaking world, such as Sir John Lawes' experiments have been. You want to try over again his experiments in Australia, and see wherein they differ, and carry out a lot of new ones for yourselves also.

11060. And a museum illustrative of products in various shapes would be in connexion with it?—Yes, that would be very excellent; and you could have specimens of different grains and food stuffs which are not generally met with in this country, which would also be of an educational character for the students.

Professor Robert Wallace, *continued*, 5th August, 1889.

11061. Then, to sum up the whole, you approve of a system of country colleges and a central university endowed by the State and not subject to political fluctuations; and that they should be endowed with land to give them a regular income to be devoted entirely to agricultural education?—Yes, because if there is one thing more than another of importance in agricultural education it is the certainty of its being continued in a settled direction. You could not get a high class man who might be turned off in a year or two, because a grant had not been voted for his work.

11062. On the establishment of such a university it would be necessary to obtain a really high-class, first-rate man—are such men to be obtained in the old country?—We have a few men who take the highest positions, and we find the men who take the highest positions in the examinations are those who have been trained numbers and numbers of years before they go in for the scientific examination, showing that the examinations test the practical as well as the scientific.

11063. Now, coming to another question—to the Department of Agriculture. We have here a Department of Agriculture, which is not a department thoroughly independent, it is more or less connected with another department, and consequently unable to make those strides forward that should be made by an agricultural department. What are your views upon what you consider a first-rate agricultural department, a subject you mentioned in your work on India?—Yes, I noticed there the department associated with the Department of Land Records was altogether overshadowed by what was considered by the general public a more important department; and consequently its work was simply curtailed, and was of very little value whatever. No doubt a department like yours, supported by the money and interests of the public, should be a distinctly separate department with its own machinery and its own head. We found that at home they have tried it for many years to work it with several other departments, but this year there is passing through the Parliament at home a Bill to establish a department of agriculture with a separate head, with a Minister we hope, and at the same time a distinct body of men who have agriculture as their special work, and no great department can ever do really good work unless under those circumstances.

11064. You think the Department of Agriculture here should be made one of the great departments of the State?—Yes.

11065. And not be overshadowed by the Lands Department or any other department?—Certainly not.

11066. In employing such a department as that, would you give the lines on which it would be best to go as to the principal officers of that department, for instance?—Of course, in the first instance, you would have a minister of agriculture, who would be a member of the Government of the day; then, of course, you would have a secretary for agriculture, a permanent officer, who would be an administrative officer. He would have the whole threads of the department at his fingers' ends; and then in addition to that, you want a specially trained agricultural officer, with not only practical knowledge, but the best

scientific knowledge to be had, and who would have under him a number of minor departments, for instance, a botanical department, an entomological department, a department which dealt with vegetable physiology. I should like to say this department should have a highly trained man, an entomologist and vegetable scientist. Those are two specially qualified men whom you would require to appoint with the special object of investigating the injury to crops and trees from insect pests; and also on the other hand, by a vegetable physiologist, the injury from the fungoid pests.

Professor Robert Wallace, *continued*, 5th August, 1889.

11067. We will deal with that presently. Then I suppose, there will be the other great departments?—Yes, forestry and veterinary you would have in time. I am only giving those as illustrations; also a stock department.

11068. That is, all departments connected directly or indirectly with agriculture or stock should be under that department?—Yes, all branches of interest to the farmer or the student.

11069. So the department would be given that prominence that is given in France and some other countries?—Quite so. I might only refer to that recent publication which we have had published in France, Major Craigie's. He is an English officer appointed to report on French agricultural matters.

11070. You think that such a department, as you have sketched it out, would be a great boon to this young colony?—Yes; in fact, I feel quite certain that, unless you get such men into the position of managing such a department, any efforts could not be successful; unless you got men in that way thoroughly qualified for the appointment, it would be impossible to carry out a successful department. I refer to the way matters have been managed in India. They have had a department of officers appointed who were altogether unqualified for their work, men without special training; and the result is that the Agricultural Department in India, as a whole, has been a failure. I say that advisedly, because it is a subject I have gone into fully. In the first place because it was associated with a greater department, and it was officered by men who had not a special training for the purpose.

11071. Then the two principal officers that you refer to are the secretary, who should be a thoroughly capable administrator, managing the whole of the sub-departments from an administrative point of view, and a professional officer as highly trained as could be obtained managing the professional division of the department?—Yes; and who would issue annual reports, and perhaps monthly bulletins, and have a general supervision over all the sub-departments. He would have a training that would enable him to teach men in these departments and be a general guide, as it were.

11072. It is your view then that that is the first thing to be done to place agriculture in this colony on a proper footing?—Certainly; because, unless you have a man such as I describe, and give him time to study the position, you have no one to do it. I have travelled about the colony for two months. The most prominent thing I feel is, that I am not competent to advise as to what would be necessary in the details

Professor Robert Wallace, *continued*, 5th August, 1889.

of the work. I should want, perhaps, twelve months before I should like to become a guide in the matter of agriculture, even in small things. A man would require to see the whole course of the seasons and see what is what before you can begin to instruct.

11073. One of the most important things to avoid in agriculture is hasty conclusions?—Yes; and those with no practical knowledge and some scientific knowledge, are liable to fall into the error that they have grasped a matter before they really have done so.

11074.—There is a feeling that our agriculture in the past has been more or less slipshod in the colony, and that the colony is capable of very much higher things in agriculture than has been attained in the past—is that the impression on your mind?—Yes. I think your agriculture has been one sided and slipshod; it is certainly not high class, and I should say from what I have seen in the colony that the improvement would be in on the lines of increasing the numbers and varieties of crops grown. We have lucerne and root crops largely at home. I fancy that lucerne crops to begin with, and such crops as do not require much labour, would take precedence of the root crop at first; but in time as the population increases you will come to grow root crops very much as we do. You want an increased local market and when you have that your position is very much changed. With more people settled through the country you will have less carriage to the centres of consumption.

11075. Of course, as you know in the past, we have devoted the most of our attention to wheat, and practically that only, and our desire is, if we can do so with safety, to cultivate other things?—Just so.

11076. Do you see any reason why this colony should not become a great stock fattening country with irrigation and lucerne, just as you describe?—Of course I could not say very definitely, but it appears that there are enormous resources yet to be developed in the colony. Stock fattening is, no doubt, one that might be developed; but to what extent time and experience will tell.

11077. Stock can be raised further north in immense quantity, and, with the help of lucerne and other crops, can be fattened here?—Quite so.

11078. Then, of course, you have said that we want variety and rotation of crops?—Yes.

11079. That strikes you particularly?—Yes.

11080. We propose going into the cultivation of fruit in this colony, the climate and soil being suitable, and we think, being at the antipodes, the markets at the other end of the world will be open to us at a time when they have not any fruit?—There is no doubt you will grow large quantities of fruit, and we can consume a considerable amount of fruit more than at present; but you must remember that the fruit will only be a subordinate branch of agriculture, not the main. There will be considerable development in those subordinate branches. I think the fruit will be a very important industry, but only a subordinate one.

11081. A useful adjunct to the growth of crops?—Yes.

11082. You referred just now to the great necessity that exists for the appointment of an entomologist for this colony. You seem to have in your mind some thought on that subject, and perhaps you will give us the benefit of it?—I have noticed in passing along that the injury from insects is much greater in this country than it is at home, and the variety greater. Of course I was not able to settle in my mind what insects were causing injury, but I saw a great amount of injury, not only to the grain crops but to fruit trees, and that, of course, should be very much lessened by a special knowledge of entomology. Professor Robert Wallace, *continued*, 5th August, 1889.

11083. It is your opinion that there should not only be an entomologist but another officer?—Yes; a vegetable physiologist, who would work with his microscope, and who is in really quite a different line of study from the entomologist. I think the subject is quite great enough to employ both experts. You have, even in the wheat growing, a far greater injury from rust than we have, taking one year with another, at home; in fact, some of the districts in New South Wales and Queensland which I have visited, which used to grow wheat well, cannot grow it now to seed on account of the rust injury.

11084. Then it is your opinion that one of the things we have most to guard against in these colonies in the future is the ravage of insect pests?—Yes; and the fungoid pests.

11085. There was a Bill before Parliament in this colony last session, did you see it?—No.

11086. Do you think there should be a stringent law passed making it penal to keep orchards clean?—That is a difficulty; because, though you can overcome the greater injury, I am not sure you can perfectly destroy the insects; but with a specialist here to teach orchardists and others they would for their own benefit take advantage of the remedies recommended. I do not know that it would amount to recommending that very stringent measures should be carried out against those growers. I think what you want first is to show what can be done and allow them to adopt it themselves. When once you have the facts at your fingers' end you might then consider what should be done in the way of bringing force to bear on the growers.

11087. Should not men who are disinclined to keep their orchards clean, and thus contaminate others, be compelled by law to do so?—I think that will come after a time. I do not think you can enter into measures of that description the first year or two till you see what can be done?

11088. Then, to sum up the position, you think that in this colony it is essential first that there should be a complete system of agricultural education and that we are doing fairly well in that direction to begin with; that there should be a thoroughly organized department of agriculture, with a ministerial head, under which all the sub-branches should be controlled, and with administrative heads; and that we must be careful not to carry all our eggs in one basket, but rather increase the number and quality of our crops, and be particularly careful to prevent the ravages of insect pests?—Quite so.

Professor Robert Wallace, *continued*, 5th August, 1889.

11089. Those are the heads you have spoken on principally, and would impress on us strongly?—Yes. I should like to say one word as to the system of education we have carried on at home, which might be taken into consideration in the further development of the teaching of agriculture here. We have found it a very good way of getting at the masses to employ the schoolmasters in the rural districts to teach the principles of agriculture and the principles only—not to attempt practice in any shape or form, but to teach the elementary principles by way of giving an interest to boys who are not able to go to those agricultural colleges—to get at the masses by means of the schoolmasters.

11090. At the present moment we are having a number of agricultural lessons, such as you describe, specially prepared to be taught in our common schools throughout the country?—As to the development of that, it is a mere matter of the possibility of training the teachers. For that purpose you ought to have the sort of man you contemplate at the head of your University. If you had such a man he could train the schoolmasters in their holiday time, those already at work, and the young masters in their training colleges. A vast amount of work might be done in those elementary branches. We have found that a very important branch at home.

11091. How are the teachers trained?—We have only started at one of our schools recently, in Scotland, special classes in the University of Edinburgh, the Government supplementing them by a grant of £300 for maintenance, the schoolmasters receiving three guineas maintenance a month during the holiday time. That is not sufficient training to make a man an agriculturalist, but it goes a long way towards showing the schoolmaster all the principles of agriculture, and pointing out what he might teach, and not leave out, in the training of the boys. At the same time we have had for some years a certain number of schoolmasters together at South Kensington, from all parts of the country, for a few weeks, learning the principles of agriculture. It has not been at all satisfactory, because the lectures only extend to some twenty-nine or thirty. That is rather few to give a man a proper grip of the subject.

11092. But still even useful practical reading lessons would be better than nothing?—Yes, and you could read an agricultural book in the schools which would give the boys an interest more than perhaps anything you can think of. Their connexion with agriculture, and the explanations, would give them a large amount of interest in the object-lessons daily going on before them.

11093. And probably create a desire to join the colleges?—Yes, there is no doubt of that; and if the work is really good, the farmers, who are not well skilled in agriculture, who have gone from some other employ, will take an interest in it, and discuss with their sons the matters which are being taught in the schools. It will encourage and develop the knowledge of agriculture.

11094. You have seen a good deal in your travels of the stock of Victoria and Australia, sheep and cattle. We would like to hear from you on that subject?—There is no doubt you have very excellent stock

in the country. In those main breeding studs you have very excellent stock, shorthorn cattle, thorough-bred horses, and so on; but the common stock of the country is very poor indeed, the difference between that high class of stock and that in the hands of the common farmers is very extraordinary, a thing that no one could imagine unless they saw it themselves.

11095. You think there is very great room for improvement in that direction?—Yes, the principles of breeding must enter into the work of the schoolmaster in the country schools, and in that way encourage the improvement of the stock with no other instruction.

11096. Have you thought of any method of improving the breeding of stock by our present farmers?—Of course it will have to come to them through the teaching of those institutions which we have been discussing; and, in addition, those agricultural experts who would form part of the department of agriculture would naturally be asked to go to certain districts and lecture on those subjects. He would go, naturally, on his travels and investigations and address meetings of farmers, and bring them in touch with what is known at home or in the higher spheres here. You are very far advanced here in sheep, but there are points that deserve attention. I believe the quality of the wool might be raised very considerably in the great mass of stock bred here. There is some very fine wool, and some who devote special attention to it; but a great number of sheep could grow better wool than now.

11097. That would add to the wealth of the colony?—Yes. It might be desirable to have a special branch employing a specialist in wool in the department. I am sure it is worth it, the improvement by studying wool microscopically and getting to know what is suitable for the markets. I think very little is known of that. A man does not know what the market is where wool will go to, he takes his chance of that; it makes a man in touch with the market at home.

11098. That point has struck you that there is a deplorable difference between the particular classes of stock and the great bulk?—Yes; that is particularly speaking of cattle.

11099. Speaking of India, are the laws relating to irrigation administered by the agricultural department?—No, it is not under that department, and that is one of the defects of the Indian irrigation, that they are not under the department. They are good engineers and put the water on, but they that are not governed by an officer with a training as to the amount of water required in a certain district, and some districts are not practically benefited by irrigation at all, there being some difficulty in some soils to get the farmers to take the water at all.

11100. You think irrigation and agriculture should run hand in hand?—Yes, I am sure of that; for the knowledge necessary to the distribution of water is far more extensive than many people imagine; and the results are very different, according to the soil and according to the water. It is a very important matter to know about the water you are applying, because many waters are poisonous to land, not only directly poisonous to what it is employed on, but it may be containing a mineral residue which may accumulate into injury. Such is the case in this soil in Northern India.

Professor Robert Wallace, *continued*, 5th August, 1889.

11101. The character of the water and the time for applying it are very important?—Yes.

11102. You think that agriculture and irrigation should run together?—Yes; and that irrigation will require very special study before it is made as perfect as we hope it will be in this colony in time.

11103. As to the schoolmasters, is it your opinion that the schoolmasters could be made use of with reference to the insect pest; could it be brought about by a collection of insects at the various schools?—Yes, I think it would be one of the most important functions with schoolmasters; because suppose you had a specialist here who could tell the schoolmaster by correspondence, with a specimen of the insect, all about it, the schoolmaster could then at once be directed as to telling the scholars how to get rid of that pest; and that would be worked by the entomologist in getting rid of the pests. It would be one of the best object-lessons you could get for the boys to find those insects.

11104. We find in the agricultural colleges boys take a deep interest in collecting insects?—Yes.

11105. A knowledge of the useful and injurious so as to destroy one and keep the other?—Yes.

11106. Have you any special text-book provided for the schoolmasters?—We have great difficulties about that. We have a few that we recommend, but it is only because we consider we have not got what we consider perfect text-books; but your text-books would have to be specially prepared text-books, prepared by such men as we have been describing.

11007. It is part of the work still before the Agricultural Department?—Yes, and an exceedingly important one; and you cannot have text-books till you have given time for the various men to study the actual conditions of the country.

The witness withdrew.

Dr. G. Ruhland examined.

Dr. G. Ruhland. 5th August, 1889.

11108. *By the Commission.*—You are commissioned, I understand, from the German Government to report upon agriculture in Australia?—About all the resources of the colonies, and not only the colonies but every country where we have any market in agricultural commodities.

11109. You have special knowledge as to the cultivation of hops?—I have no special knowledge as to the cultivation of hops, because I must say I am no specialist, but deal rather with the political and legislative aspects; but I have been on my farm and passed an examination in agricultural science, and travelled through Austria and Germany and India, and I have been interested in the hop culture. I am acquainted with one hop plantation, worked by one of my greatest friends.

11110. Will you be good enough to give your views on that subject?—I am not able to give you a real criticism about your plantations here; the only thing I can do is this: I looked over the evidence in your

reports and a special paper on the hop plantation in Gippsland, and I am able to compare that with what I know of experience in Germany and different other countries, and it seemed to me as if there are quite different opinions in Europe to what you have expressed in the principal parts of your evidence. For instance, I find mentioned at different times that the male hops should have any influence on the yield and quality of the hop. There is nobody in Germany or Hungary or Bohemia who believes that. Every planter has very carefully taken out of the soil every male hop and has only female hops. A large amount of experiments showed that the quality and quantity is influenced very much by the presence of male hops. Then again the evidence always mentions as an example English hops and English hop plantations as being of the best. Now, the price of the English hops is about five or six times less than the best German or Bohemian. With the English hops the care of the plant is not so very great. It is, I believe, connected with a kind of English brewery. Your English beer must not have such a good hop as our German lager beer, and our German breweries buy at once, as soon as possible, the best hop they can get, and that is the reason the best hop does not go out of Germany and Bohemia. It is bought up before the crop appears, and what is sent to England is second and third quality. But the consumption of your lager beer here is increasing, and your lager beer breweries are increasing, and consequently you want a better hop, and there are great difficulties in the way of getting a good hop here. I have tasted in different breweries the hop sent from Germany, and I was astonished at the bad quality. I could not recognise it as German hop, and they paid a very high price; but notwithstanding that it is better than your hop, because there is not enough lupulin in yours. Then there is a great point—I always find that the yield and the growth is one of the principal points on which they prove the special advantage of a certain system. As far as experience goes in Europe, I know that a certain hop garden which gives the greatest yield never gives the best quality of hop. It is never the case that the highest yield is also the best quality of hop; but as soon as your market would require the best quality you could not expect ten and fifteen and sixteen hundredweight per acre, that is too much.

Dr. G. Ruhland, *continued*, 5th August, 1889.

11111. That is, if you have quantity, it is at the expense of quality? —So it is. And you cannot prove the value of a certain system of plantations by the yield only and the quantity; but I think the principle of plantations of hops must always be carried out just as the market requires. As soon as you would produce for export of hops to England, I think it would be a mistake to go in for the best quality of hop. In this case it would be your business to try to get a very large yield of a middle quality of hop taking the whole of Europe; but as soon as you have more lager beer breweries and are able to compete with the Continental breweries, it will be necessary to have a very good quality of hops, and that part of the plantation must be something quite different.

11112. Is the hop plant here the same as you have in Germany?—I did not see till to-day the hop plant here; but as far as I could see they mentioned the different varieties you have here in the report; but they are always English and American names. I do not find the names of

Dr. G. Ruhland, *continued*, 5th August, 1889.

Continental or European hops. Also, one man, Mr. Lucas, wrote on the whole a good paper about a so-called Collin system of plantations. Well, that name is taken from the American; but I think this Mr. Collin has not the right to call this system by his name, because they had this system of plantation 20 years ago on the continent of Europe. This system, I think, is indeed very valuable for you as long as you want hops for your English beer, as long as it is carried out in the right style. It saves from one-third to one-half of the labour expense and the principle simply is that you take some sticks at a certain distance, and you put wire on top of the sticks, and then you take some strings and put the strings instead of the sticks on the different lands, so the hop is grown up on the strings. The height of the wire must be such that a man is very easily able to pick the hop from the plant direct as soon as the harvest is there; so they save a lot of work in putting in the sticks for every plant, and pulling out the sticks and taking off the top, &c., and at the same time the quality of lupulin is more safe by this kind of harvest. But always consider the question that you are not producing the best quality of hop. Experience shows that the best quality of hop does not grow on this string system; but the old system of sticks is used everywhere where the best hop is grown in Europe.

11113. Is the quality of the hop regulated by the amount of lupulin it contains?—As far as I am informed about this question, I must say our knowledge in regard to hops and what is the real reason is limited. There are only two small towns where the best hops in the whole of the world are grown, but we do not know the reason; it is a dark place in our knowledge, and we are just beginning to go in in a scientific way into these matters, and at a certain time we may have more information than we have to-day. The general idea is that the quantity of lupulin gives in the first instance an idea of the value of the hop; but that is not all, and that has been the reason for the establishment of a society of the hop-planters in Germany, and Bohemia and Austria, and this society has issued to every hop-growing centre series of questions, and those are answered and sent back to the society, which gives some direction as to the way they should improve their crops; and then the whole experience in the whole of Germany, Austria, and Bohemia is put together every year, and the gentleman at the head, who is a specialist in hop plantation, tries to find the best results of the whole, and to give the best advice; and at the same time hop-planters in all parts of the world are connected with this society. Australia is the only place that is not connected with the society, and I think it would be good for both parties if you would put this society in possession of the experience you acquire in a certain place, and if you would ask for their questions to make experiments here, and they send your experiments back and get at the same time from this specialist the right direction in carrying on your plantations.

11114. What is the name of the society?—The Society of Hop-planters in Germany, Austria, and Hungary, and the gentleman I refer to is Professor Dr. Pott, of the University of Munich.

11115. You say the quality of hop here is inferior?—Yes. I saw different kinds of South Australian hops, not in the hands of planters, but

in the hands of the traders and the brewers, and I opened those and saw a very small quantity of lupulin. I tried them. I took a piece of paper, wrapped them in the paper and smelt the hop, and it is not a good one. The flower is sometimes very large, instead of being middle-sized, and they have no elasticity; they do not keep together the different parts of the flower, that is the reason they lose so quickly the lupulin. The presence of the male plant may have had the result that the flowers do not grow in the right way.

Dr. G. Ruhland, *continued*, 5th August, 1889.

11116. What is the practice as to the male in Germany?—Every man takes care from the morning to the night, the whole time necessary, to take out of his garden every male plant. As soon as one appears he is cut out.

11117. You saw in Mr. Lucas's evidence where he said that we had not got here the proper male hop?—Yes, I was very astonished to see that. I have not been quite sure in this case, so I looked over my literature with me, and I have a book here with the authority of the University of Vienna. I will translate it word by word. He says hops are only grown from female plants, and as soon as male plants are present the quality is less and the quantity is less, because the plant begins to give seed instead of lupulin, and as soon as the plants do that then the production of lupulin is less. This is the opinion of Dr. Guido Krafft.

11118. Does not the water have an effect on the lager beer?—That is the general idea, not at all right. It is quite a mistake. I studied some time ago under an official commission the position of the beer breweries in Germany, and I went to all the leading men, and I know the general theory in our university, where I passed my examination, is, there is no doubt about it that water has no influence at all. One of our leading breweries in Munich, for instance, they tried at first to take the water from the river; then they had a well, and they took the water from the well; and then they got the water quite fair, straight from the mountains; so they had three different waters, and it had no influence on the beer whatever. Of course a certain quality of water, for instance, water that has very much calcium, the so-called hard water, is not fit for making good beer; but taking such extreme cases away you have a large amount of water that is always fit for good beer. But the principal thing for good lager beer is hops, the best hop in the world, the best barley you can get, and then the right fermenting agent.

11119. You are clear in your mind that our hop cultivation is capable of improvement?—I think there is no doubt about it. But you have special difficulties we have not in Germany. For instance, your hop is always growing, as I saw mentioned in the different evidence. That is not the case in Germany. During the winter time the hop does not grow any more. Then, perhaps, it may be the kind of your plantation, the room you give for certain plants is not large enough. But that is a thing I cannot tell you. You must make a certain kind of experiment, as it is indeed necessary to take the exactest measurement from the different size of the area given for plantations, and compare in an exact way with the different results; and I do not think that every farmer could make those experiments. Very few farmers are scientific enough to do

Dr. G. Ruhland, continued, 5th August, 1889.

that, and as soon as he begins to carry out experiments it often happens that he observes the kind of results but he has not any instruments to carry it out.

11120. The general impression in your mind is that there is nothing in the climate or soil to prevent the best kind of hops being produced here?—I cannot give an answer on that, because we do not know what is the reason. There are two towns, one in Bohemia and one in Bavaria—Saarz and Spalt—those two places produce the best quality of hop in the whole world, and there is no competition by any other place. We do not know what is the reason of the quality, and this hop is so highly estimated that it is bought up years before the harvest by the largest brewers, and every hundredweight of hops that goes on the market from this place is planted, and signed, and sold by the authority of the local government.

11121. Is there any effort that we could make to get out a collection of the hop plants you have in Germany?—No difficulty at all. In Spalt, one of those two best places for hop planting, they have a large garden for only making experiments, and there they have nearly all the specimens in all the world together; and they are trying to carry out the different experiments and find out the best plants, and then to prove what is the reason of the difference in the qualities. I think they would be only too glad to send you anything you wanted from there.

11122. Do you think that the climate has any influence on the crop?—No doubt it has.

11123. The getting a first-class hop here may alter its character altogether?—I do not know whether you could ever produce the Saarz or Spalt hop, but I should be astonished if you could not produce a very good hop, and a better one than the English one.

11124. Would irrigation have any evil effect on the hop?—I do not know one hop plantation with irrigation.

11125. Those that you do know have a plentiful rainfall?—Yes. As soon as the rain fails there must be water given.

The witness withdrew.

Walter W. Pownall examined.

W. W. Pownall, 5th August, 1889.

11126. *By the Commission.*—You are the representative of the Australian Wine Company?—I am the proprietor of the company. It was started before I had the business, and I have carried it on in the same name.

11127. You have given special attention to the question of Australian wines?—Yes, I have been brought up in the wine trade and been in it the last seventeen years, and after the 1886 exhibition I bought that company. I should like to ask you a couple of questions. First of all the remarks I make, do they apply to Victoria only, or to South Australia and to New South Wales; because I have been three months in these colonies?

11128. That will depend upon the remarks, I should think they would apply mostly to all the three southern colonies?—Is this Royal Commission appointed to inquire into the wine industry connected with the three colonies?

11129. No, Victoria alone?—Then I would say I have come out to the colony for my own business purposes, and am very anxious to add any information I can as to the industry for your Commission. Of course the questions of price I shall withhold to myself. I have made out a few notes since I was asked to appear, and my general impression of the prospect of the wine trade in this country is favourable; and I beg to say I speak only for export and, practically, the English trade —I have no knowledge of the local trade. My impression is favourable, but on both sides we have much to learn, in England about Australian wines and in Australia about English trade, and what is suitable for it. I know that the Australian wine trade has made great strides at home since the exhibition in 1886. That is partly owing to better wines being shown and partly owing to the dearth of wines in France of late years. I would point out that this is an opportunity that may never occur again in our lifetime for Australian wines to take a prominent place in England. "France's misfortune is Australia's opportunity." Another point, I think, if I might suggest it, is that the Government would benefit the trade by seeing if the English Government would contemplate taking Australian wines in on more favourable terms than they do the wines from foreign countries. As a precedent for that, I would mention that 25 or 30 years ago Cape wines were received by the English Government on more favourable terms than wines from France or Spain. W. W. Pownall, *continued*, 5th August, 1889.

11130. Is that on what is called "the most favoured nation terms?"—No, I think it was not. It would be more than "the most favoured nation terms."

11131. That is a well understood term?—Yes. On those terms Australian wines are now received. But of course at home it would be useless for a man like myself to advocate such a policy, because people would say I simply wanted to avoid paying duty, but the four Governments interested in producing wine should combine together about that. I have put down my experience as regards vineyards somewhat limited, but my impression is that they are well kept. The choice in planting, and what grapes to choose, has been fairly well ascertained; and I think that for English trade any man now planting a vineyard would do well to grow Red Hermitage, Mataro, Malbec, Carbinet, and for white wines White Hermitage, Reisling, Pineau, Verdeilho, and Tokay. Each vineyard ought to aim in making a standard quality of wine, so that merchants might know what to expect from that vineyard. Two or three white and red wines are ample for each vineyard. As to local shows, I cannot speak from practical knowledge because I have not been to any; but from what I learn I think that the judges ought to insist that each sample represents at least 1,000 gallons. The price at which the wine is offered for sale ought to be a consideration in estimating the merits of the wine. The wines throughout Australia ought, as far as possible, to bear uniform names. I have met wines in various vineyards grown from the same grape and called by different names. That may be a trivial matter, but it leads to confusion, and it would be very

W. W. Pownall, *continued*, 5th August, 1889.

easily rectified. In local shows if you can get men with a knowledge of European wines, or wines from a distant part of Australia, it would be very advantageous. Every man who is in the habit of tasting one class of wine appreciates that class of wine more than others, his taste becomes accustomed to it; and, unwittingly, he ceases to be as good a judge as if he had a larger sphere of experience. Casks necessarily play a very large part in the wine trade. It does not seem at present that there are any known woods well suited for casks. It has occurred to me that the Government might offer a reward of £1,000 or £2,000 for anyone who would make the discovery. There is an idea that wood might be used, and a wash found which would enable it to be used without detriment to the wine. I have heard of a company being started to reduce the sap in Australian wood. I have no particulars of that, but such an undertaking would be advantageous. The custom of keeping wine in Australia in large vats—I speak of vats of over 1,000 gallons—after the wine is one year old, I consider most detrimental to wine industry. Wine should be placed after one year in casks of about 50 gallons to 100 gallons. If the Australians can settle what sized cask is most suited for their trade and make one uniform size, the same as at Oporto the pipe, or Bordeaux the hogshead. The difficulty that the vine-growers find in using small casks I attribute, in a great measure, to the protective duty that is levied on casks and staves. As Australia at present is not in a position to manufacture native wood to any extent for their casks, I do not see how protection comes in. I am further of opinion that as far as the coopers are concerned if staves were allowed free into the country their business would increase fivefold in putting up the staves, because the casks would be in greater demand, and a greater quantity used, as the smaller size would be more popular. Now there is a duty of 25 per cent. as to export trade. If the wine-grower was allowed to import say staves for any 100 or 200 casks at the present rate of duty and allowed a rebate on exporting 100 or 200, never mind whether they are identically the same pieces of wood; at present each piece of wood is stamped with the Government mark. The storing of wine has been done on a rough and ready system hitherto. I would advocate the cellars being underground, and in taking up a position the side of a hill can always be used with advantage ; it facilitates work so much, because by taking in the grapes at one end with a gradual slope, the wine will rack itself and will save labour, which is a most important item, for Australian wine requires frequent racking. It has occurred to me that the Government architect (if there is such a gentleman) might draw some plans as to what is suitable for wine-cellars; at present they are not built on any system.

11132. Would it not be better to get plans from the old country, where they have had large experience?—Certainly. I think it is immaterial how small a man begins as a vine-grower, he should build his cellar with the idea as he plants his vineyard of extending it. I have seen a cellar so made, and it is now three times what it originally was, and yet it all works one part with another. If a man does not prosper in his business he need not extend it.

11133. So that it grows with his growth?—Yes. Always begin with a system. Some of the places that I have seen wine kept in are most deplorable. W. W. Pownall, *continued*, 5th August, 1889.

11134. When you say that not only are the buildings unsuitable, do you mean that the surroundings are entirely unsuitable by reason of their being uncleanly?—Yes. I have put here on my notes, "Avoid dirt." And some of the cellars must be subject to such a tremendous change of temperature that it would ruin any wine.

11135. Wine is very susceptible to the effect of bad smells in the neighbourhood of the cellar?—Yes, especially where the casks are open, and it is being racked; and during the process of fermentation, in open vats, particularly. In going over some of those large stores one sees what a great business is being done now, and what an encouraging prospect there is. In some of the cellars I have been horrified with the amount of wine which I should describe as "perished," and as "perishing." It is astounding. I can hardly express the quantity. And very often the vine-grower is so ignorant of his business, that he shows one wine which is "tart" and "sour," and even praises it. I find those wines are generally exceeding three years old, and I attribute it to the lack of cellar knowledge and treatment; because in the same cellar where I find large quantities of bad wine, I find this year's and last year's wine good, and promising well; but if longer kept, and so treated, after a few years will be utterly useless. A knowledge of cellar routine and cellar work would avoid that. A man thinks when he has grown the wine that is all that is necessary. The fact is, a wine-grower has never done with his wine till it has passed out of his hands.

11136. And every year it is capable of being made more payable?—Yes, up to a certain age. I do not think that any of those wines should exceed three or four years in casks. I consider that enough. Then, as at Bordeaux, they should be bottled. If a man in France cannot sell his wine in bulk, he bottles it and sells at the best price he can; but he does not leave it in the large vats and casks. If he did, it would perish as those wines I have mentioned perish. I now come to a question which has occurred to me, and that is the benefit that many of the young vine-growers would gain by going to France or Germany, not only going to places of commerce and vineyards, but go to the Government schools of vine culture. There is no difficulty in their obtaining admission. They ought to study the language of the country they are going to for a year or a year and a half before they start. I believe the cost would be comparatively very small. An amount of knowledge there has been stored up for hundreds of years. In some instances where men have done this, I have seen demonstrated with Australian wine, wonderful results. As to having experts out here, of course it is a beneficia measure. The only thing I would venture to suggest is that if you want good experts you must pay good money for them; because a bad expert is more harm than good.

11137. Is it your view that it would be more advisable to the colony to send those students home to become experts than to import our experts?—I would do both. I would assist some in going home; and

W. W. Pownall, *continued*, 5th August, 1889.

those men who come out require some time before they get accustomed to the change of climate which influences the growth of the vine, and its treatment.

11138. Some of our vignerons have sent their sons home to Europe and to America to obtain information on that subject?—Yes.

11139. You think that is capable of extension with advantage to the colony?—Very great advantage. Such men have shown a knowledge on the subject that I did not meet with any where else. In comparing Australian wines with European, I think a man is very often misled by seeing wines quoted at high prices, which, in certain instances, have been kept for, perhaps, ten or twelve years in bottles. A wine-grower hears of wine being offered and sold, in say the London market or the Bordeaux market, at high prices, but he is not comparing the younger wines. Also when he tastes European wines, I doubt if he is in a position to obtain the finest wine; every year you find it varies very much. The wines of one year will sometimes fetch as much as double, if it is a fine year, as what it will fetch next year if a poor one. If he hears a quotation of one year and tastes another year's wine he forms an inaccurate opinion. I think also that Australians are misled by newspaper cablegrams and newspaper correspondents, who pick out news connected with the colony of any success that may be obtained at the exhibitions held at different times in Europe. He hears of that, but he fails to hear that the same class of rewards are going to other parts of the world. What I have seen of the country, I am sure that the wine-growing industry could be extended to any degree. I believe that it would be a very good opening for any man to turn into a vine-grower; and I know that England is capable of taking large quantities of Australian wine. English people are very willing to use Australian wine, and see English money going to the colony in preference to the Continent; but they expect to have equal quality and value.

11140. Can you give us any idea of the amount of trade that Great Britain is doing with the Australian colonies?—That is easily ascertained by import returns. I cannot give that authoritatively. But there was this point that your question gives rise to, that the Government of Australia might request that the Custom House in England should schedule Australian wines apart. They are now placed with "colonial" wines generally and that implies wines from other colonies and the Cape, but it has increased greatly since the 1886 exhibition.

11141. You spoke of the size of casks—what size would you recommend to export?—A cask of 50 gallons, I think, is the most suitable.

11142. Can you give an idea of the cost of shipment to send from here to England?—It varies, of course, with the rate of freights. You must take the rate of freights when the wool season is on as almost double what it is at other times. You may take 220 gallons to the ton, as a rough measure. Of course freights vary from 35s. up to 60s.

11143. Of course that might arrange itself by shipping at a slack time of year?—We do that; but then we have not got stores at home large enough to hold all that we require at one time for the year's consumption.

11144. What Australian wines have come most in favour in Great Britain ?—The dry red wine is the most suitable. W. W. Pownall, *continued*, 5th August, 1889.

11145. Wines of the Hermitage type ?—Yes.

11146. You seem to give special prominence to Hermitage, both red and white ?—I do not wish to convey the idea those are best, though I mentioned them first—they are both good wines; I like all the wines I have mentioned.

11147. There is a very important point about the naming of our wines. There is that question of Hermitage. A number of us call it Hermitage, and again in the Murray Valley they call it Shiraz—which name would you suggest that we stick to ?—I believe the origin of it was a grape from Shiraz in Persia, and taken to France and grown at Hermitage.

11148. A number of us call the very same grape Hermitage and Shiraz; it is very confusing to the growers here ?—The word Hermitage has the disadvantage of resembling the French, and the word Shiraz is more distinctly Australian; but the word Hermitage is more generally known in the colony and in Europe.

11149. From a trader's point of view you think Hermitage is the better name for it ?—Yes, I think it is. I dislike the use of the term for Australians to call themselves "vignerons"—they are vine-growers. A vigneron in Europe is a man who works at the vines, and you might just as well call a farmer a ploughboy. "Wine-growers" is a very good term. It is only two letters longer.

The witness withdrew.

Paul de Castella examined.

11150. *The Witness.*—On a former occasion I made a few remarks on casks, a subject which is of the greatest importance to the wine industry of this country. I was in hope that this might have provoked some discussion, but in this I have been disappointed; and now again I venture to urge the importance of the matter. In the new tariff it is proposed to put a tax of 25 per cent. upon imported casks, and to make up the loss the vigneron thus sustains to allow him 3d. per gallon for each gallon of wine exported. Is the object of the tax to protect the cooper or to force all interested coopers as well as vignerons to make use of the excellent wood, suitable for this purpose, we have in our own forests; because I maintain we have. I have used blackwood since 1863, and found it in every respect equal to oak. By blackwood I do not mean what is often supposed to be the same, namely lightwood, which is utterly unsuitable for wine, though good enough for tallow. I bought from Gippsland four years ago £34 worth of staves. Instead of being blackwood as I was promised it turned out lightwood, and they are at home still. They cost £15 for carting and I have not used one. Mr. Ramson, one of the judges of Australian timber at the last London exhibition, recommended mountain ash as suitable for cooperage; and I have been told that this timber is largely used at Albury. Here again a vast difference must be made in favour of what is called blackbut, which is quite different timber from the mountain ash, as between blackwood and lightwood. The proposed bonus of £5,000 to a wine credit is Paul de Castella, 5th August, 1889.

Paul de Castella, *continued*, 5th August, 1889.

I suppose to encourage exportation ; but the great drawback to exportation is the price and quality of the casks, which cost from 5d. to 6d. per gallon; a price which, added to the great trouble of obtaining them, renders exportation a difficult matter. I make these remarks in the hope that this subject, the importance of which I cannot sufficiently impress, may receive the attention of all interested, as well as the co-operation of the Minister of Agriculture, who has already shown his anxiety to help the wine industry. Mr. Pownall mentioned about the size of the casks, and I think that is another point that ought to be mooted whilst the industry is still in its infancy, that we ought not to have a Victorian but an Australian cask, that would hold a fixed amount, so that if a man buys 20 or 30 hogsheads he buys so many casks. Now the fashion is to have them 65 gallons. I do not know whether it has reference to so many gallons to the tun. We used to reckon four hogsheads to the tun. My idea was in view of the decimal system being adopted all over the world; why not make the casks 50 gallons. A Bordeaux cask is 47 to 50; but 50 would be a convenient size, that is Bordeaux size. And Mr. Pownall is a better judge of those things than I am, because I have experimented very little with those things. If taken now in hand by going on with South Australia and New South Wales we can arrange it—they may say 55, but the decimal system must be ultimately adopted, and there would be a beginning. But I think that is very important, the size of the cask.

11151. From your knowledge which would you recommend of all the colonial wood ?—We have tried them all a long time ago. I recollect when I first began to make the casks oak was the only timber supposed to be used. There was not a plank of oak in all the colonies. Mr. Higinbotham was just making those railway carriages and he said "Why not use blackwood as we do in the Railway works" and I got a couple of planks and made a cask of 130 gallons, and I made big casks, 1,500 gallon casks, and it is an excellent wood. And then the mountain ash has to be tried. There is some prejudice against those things. In England some people say they will not have the wine in any cask except Baltic oak.

11152. What is the difference between blackwood and whitewood ?—I asked when I was buying staves, of Mr. McQuiggin, the timber merchant, whether there was any difference between blackwood and lightwood, and he took me to the wharf and showed me that if you crosscut the blackwood the blackwood is as hard as horn and the whitewood porous. As the cooper puts his mouth to it his breath comes through. The one is useless for wine and the other is excellent, but the coopers do not know that generally.

The witness withdrew.

W. W. Pownall further examined.

W. W. Pownall, 5th August, 1889.

11153. *The Witness.*—I wish to adopt the view suggested by Mr. Castella, to have the decimal system, and to have the Australian cask of 50 gallons. I think it would be a very good idea.

The witness withdrew.

Adjourned.

The following communication was subsequently forwarded by Mr. Pownall to the Commission:—

"ADDITIONAL EVIDENCE RESPECTING WINE CASKS.

"In accordance with your request, I beg to place before you my opinion on the subject of 'casks' in respect to the Australian wine industry.

"It is acknowledged by growers and merchants that the present difficulty in obtaining suitable wine casks is one of the greatest drawbacks to a prosperous business.

"The Australian cooper has up to this time failed to produce casks made of native wood which can be depended upon.

"Can the Government assist in this by offering a reward of £1,000 or £2,000 to a cooper or other individual who can solve this problem?

"One hears of Australian wood treated to reduce the sap, or treated with a wash so as not to damage the wine, but in my experience I have not met with any.

"I have visited about seventy-five vineyards in Australia, and perhaps a hundred wine cellars during the last three months.

"The tens of thousands of gallons of 'sour' and 'tart' wine in these cellars, which ought to represent a value of thousands of pounds, must be seen to be believed.

"I am convinced that this tremendous loss to the wine-grower is caused by his using large vats—1,000 to 3,000 gallons each—to store his wine in.

"They admit such is the case, and reply we cannot obtain small casks of, say, 50 gallons each.

"In France no wine is kept in large vats, and in no part of the world are they used for natural or pure wine to my knowledge.

"The use of vats till the wine is twelve months old is not so dangerous, but after that time the wine in them is far more liable to start a second fermentation than if in small casks.

"I find the 'bad' wine in Victoria is chiefly over three years old, and believe it arises from the vats, which cost from £25 to £100 each, being tainted with wine acid, and thus one wine damages that what follows it into the vat.

"The vat is too costly to be destroyed, but if small casks were to be obtained this would not apply

"With regard to the export trade, with which I have considerable experience, it is found that only imported staves or casks can be used to any extent. I believe one or two firms are trying native wood, simply as an experiment.

"Formerly a reduction was made to the wine-grower if he declared imported casks or staves would be used for export, and thus the duty of 25 per cent. was not demanded. Now, we understand, no reduction will be made. Is this in the interest of the cooper? No, it will limit the quantity imported; he will have less work in putting up staves into casks.

"I have no hesitation in saying that if there is no duty on staves the coopers will have five times the work to do that they have at present.

"The Government are disposed to encourage vineyards and wine-growers; in no way can they do so to greater advantage than by assisting these men to obtain casks for their cellar use and for the export trade, and let not the small industry of the cooper sacrifice that far larger one of the wine-grower, as it is now doing.

"WALTER W. POWNALL.

"Melbourne, August, 1889.

"To the Secretary of the Commission."

WEDNESDAY, 4TH SEPTEMBER, 1889.

Present:

The Hon. WALTER MADDEN, M.L.A., in the Chair;

The Hon. J. Buchanan, M.L.C.,	J. McIntosh, Esq.,
Dr. Plummer,	J. Knight, Esq.,
J. West, Esq.,	C. Yeo, Esq.

Frederick McArthur examined.

F. McArthur, 4th Sept., 1889.

11154. *By the Commission.*—What are you?—I am a farmer in Gippsland.

11155. You have given some attention to the question of the cultivation of the castor oil plant and its manufacture?—Yes, I have studied it in all its phases.

11156. Will you kindly give us the information?—As the object, I presume, is to ascertain, whether it would be a plant that could be grown with productive results in Victoria?

11157. Yes?—There are several kinds of castor oil plant. The two most commonly grown are the *Ricinus communis* and the *Ricinus spectabalis*, the *Ricinus communis* being the common castor oil plant commonly grown. It will grow in any country almost, and will thrive on almost any soil—a sandy loam being the most suitable for it, a clay, wet, heavy soil not being adapted to it in any way. The plant is as easily cultivated as maize, and the crop is ready for gathering, if sown in suitable places, in four months from the time of planting. In colder climates it grows from 10 to 15 feet high, but in hotter climates, it being a tropical plant, indigenous to tropical countries, it will grow as high as 20 to 25 feet in one year, but it is not advisable to let it grow as high as that on account of the difficulty of collecting the seed pods. Baron von Müeller says that it will thrive in any soil and can be raised even on arid plains without being scorched by hot winds. It is grown largely in California, Texas, Kansas, Iowa, Algeria, Italy, Rajpootana, Madras, and Calcutta. Those different places which I mentioned are within the parallels of latitude from 33° to 46° N., the latter in Italy being about the most northern part in which it is cultivated. Maryborough, Seymour, Heathcote, and Mansfield are about the parallel of 37° S., the centre of California, Texas, and Kansas, where it is successfully grown, being in 37° W. Mordialloc, Stratford, and Maffra are only 38° S. In the northern hemisphere they plant about April and collect in August. I presume those seasons would be similar to October and February here. In Japan and China it is grown as far north as Shanghai, and in the United States as far north as New Jersey. It is easily acclimatized to any country where the mean annual temperature is over 56°, especially where it is not likely to be killed by frost in winter. The soil should be prepared

F. McArthur, *continued*, 4th Sept., 1889.

as for maize, the drills being from 7 to 8 feet apart each way, and if the climate is warmer the plants should be further apart, as more room should be given to them as they grow larger. The seeds require soaking in warm water from twelve to twenty-four hours before planting to make them more readily germinate. Two seeds are planted in each hole and when they are about 3 or 4 inches high they should be hilled by ploughing close to the plants and the weakest plant of the two put in one spot should be taken out when they are from 8 to 10 inches high. When the plants are from 18 inches to 2 feet high they can be left to themselves, and do not require any further attention. The seeds are gathered as they turn from a reddish brown to a reddish green brown, the ripening colour, which I can hardly describe. The method of collecting is generally by a cart being driven between the rows, and the pickers gathering the ripe pods as they go along. There should be a good deal of care taken in selecting the seeds, which should be sound, plump, and well grown, not small and withered. After the pods are gathered, they are spread in a well enclosed space, with a warm aspect, as the pods burst and shoot the seeds out; it should be a well-rolled yard with a little enclosure round, and great care has to be taken that no water gets to the seeds when exposed. All the work of drying and cleaning the seeds can be done by children. After gathering the seeds, there are different methods of dealing with them in India and America, and also on the Continent. In some places they press the seeds through rollers which are carefully adjusted at such a distance apart, that the husk of the seed may be broken, then cleaned and picked over. In some places the oil is expressed by hydraulic pressure, the seeds having been put in gunny bags. In other places they are first of all compressed into bricks, and placed between hot iron sheets, which have a constant pressure put on them, by hydraulic power generally, and the oil is so extracted. The oil after being taken from the marc or cake, is placed with equal quantities of water and boiled until the extraneous matters, including some alkalies, are separated from the oil. All the pressing is done as quickly as possible, exposing it to the air just colouring the oil at that stage. The bleaching process is generally done simply by exposing it in clear glass vessels to the sun. The oil is used in soap-making; as a dressing for leather, principally morocco boots, harness, and so on, it is unsurpassed; it can be applied to boots, making them soft and pliable without being sticky, and it does not prevent them from taking a polish after. It is well known as a lubricant, and as a medicine of course, it is highly thought of; and also as an illuminating power. The streets of Lima are lighted by castor oil, also many places in India. It is used for feeding silk worms—the *Bombyx Arrindi*; the fibres of the stems and leaves treated like hemp are useful as a textile material. Jeypore in Rajpootana is lighted by castor oil gas altogether. It is stated by a reliable authority that the light is soft and powerful, easy of storage, compressible, and has no dangerous explosive properties. The works are kept going only 218 hours a month, producing 98,720

F. McArthur, *continued*, 4th Sept., 1889.

feet of gas, at a total cost of 8s. 6d. per 1,000 feet; but if the consumption reached 260,000 feet per month, the price could be reduced to 5s. per 1,000 feet. The exhausted marc from which the oil has been expressed is a very valuable manure. I do not know whether there is anything more of importance that I could mention. If the Commission desire I could give some details as to the quantity exported.

11158. Will you kindly do so?—In 1881 the Madras Presidency was estimated to have 67,000 acres under castor oil cultivation. The exports of oil from Calcutta in 1870 and 1871 were 654,917 gallons, and in 1877 and 1878 the quantity had increased to the large total of 1,411,216 gallons. Of course you are well aware of the ready means of obtaining cheap labour in India, and that should be taken into consideration with the Indian production; but America, I apprehend, is very similar to this country, and I may mention that in 1875 Kansas, U.S.A., had 24,145 acres under crop, producing 361,386 bushels of seed. One bushel of seed should produce from five to six quarts of oil, that is taking 46 lbs. to the bushel; 1 cwt. of beans should give about five gallons of oil. I went through the books in the public library some twelve months ago to see the quantity that was imported here and also to New South Wales, putting down the consumption of New South Wales as equal to that of Victoria, and putting South Australia and Queensland at one and a half times that quantity. The three years average for 1885, 1886, and 1887, imported into Victoria, was 240,446 gallons; for New South Wales for the same period 389,676 gallons.

11159. Have you the value?—Yes. Victoria, £32,733; New South Wales, £47,234.

11160. Is that the average?—The average for each colony, but the mean average for the two colonies of Victoria and New South Wales for the three years was 289,761 gallons per annum. Reckoning that quantity each for Victoria and New South Wales, and one and a half times the amount for Queensland and South Australia, the annual imports may be estimated at 1,014,763 gallons. For the four leading colonies of Australia this quantity, valued at 2s. 6d. per gallon, makes a total of £126,770 7s. 6d. I reckon it at 2s. 6d., so as to be well within the mark, but the market value then was 2s. 9d. Of course the price fluctuates, as with other things.

11161. You spoke of two kinds of castor oil plants?—Yes, but there are about sixteen kinds altogether.

11162. Which of the two is recommended as the better?—One of them has large seeds, the other small, and the smaller seeded one has the credit of yielding the best oil. There is a little difference in the value of the oils.

11163. Which has the large seed?—The *spectabalis*.

11164. But they are both recommended for cultivation?—Yes.

11165. As the best of the fourteen kinds?—Yes.

11166. You are quite clear that being a tropical plant, it will grow to advantage in this sub-tropical climate?—It will. From my own knowledge of the country from the north of Queensland down to Gippsland

it will grow very luxuriantly; and it could be grown to advantage down as far as Seymour at any rate. Further south than that you lose the heat of the inland parts, and you come a little too close, I think, to the coast for this latitude—too much of the cold winds. I should not think of planting it in Gippsland for oil purposes, though it might be grown as a shelter plant for stock on open plains.

11167. You have stated how it is planted, how cultivated, and how gathered—you say it is planted like maize?—Yes; in rows sufficiently far apart to allow the limbs to have freedom.

11168. Then the land would be ploughed in the same way as maize? Yes.

11169. The gathering is not a matter of difficulty?—No; children can do all the gathering and preparing.

11170. Is irrigation necessary for its cultivation?—No; it will grow in hot dry climates.

11171. Without irrigation?—Yes.

11172. Is it subject to frosts?—Frosts certainly affect it. Any place with a mean temperature of about 56° it will grow readily in; but you can plant from year to year, as there are only four months to the time you get your crop.

11173. According to your opinion, does it thrive best in a dry arid district or a wet district?—You want a sandy open loam for the cultivation, but heat and warmth do not affect it; but it would not do in heavy, wet, or cold clayey soils; but it would do splendidly in the Murray and all Riverina and in any part about Seymour, and from there to Euroa and Glenrowan—any part that was not rocky—anywhere with sufficient soil—any ground suitable for wheat and maize; but you depend on the climate for the returns of oil; with an unsuitable climate there will not be so large a crop.

11174. Is it very exhaustive to the ground?—No, it is the other way; and the marc or refuse from which the oil is extracted is a valuable manure.

11175. How long do you suppose it could be grown in succession on the same field, and what is the sort of preparation that is necessary in the shape of manure, if any?—You do not require any manure for it, the refuse from itself is sufficient. And I have not been able to gather from any source at all that it exhausts the soil.

11176. Is it a profitable crop?—It is profitable in America, where I mentioned the wages are about the same as here, and they are larger areas there—thousands of acres under crop.

11177. What would be the yield per acre about?—The yield depends on various considerations—season, care in cultivation, and in gathering and ripening, all these being elements of success. The character of the season also affects the yield; the general average should be from 15 to 20 bushels an acre.

11178. Yielding how much oil?—One bushel would yield 5 to 6 quarts, or a hundredweight of beans—about 5 gallons of oil.

F. McArthur, *continued*, 4th Sept., 1889.

11179. Speaking of an acre, it would yield 15 bushels per acre, which would again yield 5 quarts per bushel, making 75 quarts per acre?—Yes.

11180. What is the value per quart?—It is about 2s. 9d. a gallon, that would be 8d. or 9d. a quart; 2s. 9d. a gallon, that is the crude castor-oil. The cold drawn, for medicinal purposes, it would be much more. The duty on it here is 1s. on the pints, and 6d. a gallon on the bulk.

11181. Is the manufacture of it expensive?—No; it is very simple—the oil is expressed from the seeds by hydraulic pressure. Sixteen to 20 bushels an acre is considered a good crop, but in California and Texas they have 30 to 50 bushels (of 46 lbs.) per acre.

11182. What would be the cost of a press for a man to carry on the manufacture of the oil on his own farm?—I should think any of the foundries could make you a suitable press for certainly under £10, one that would last a man for a great many years. It is only a worm and two plates, and fixing it into a good strong wooden bed.

11183. And the vessels and the other things necessary to carry on the undertaking, what would they cost?—You would require drums for carrying the oil, glass vessels for clarifying, and boilers for treating the oil after it is expressed.

11184. What do you make the value in money of the average yield per acre. Have you taken that out?—No, I have not worked that out, I have only reckoned the quantity per acre.

11185. I make it about £8 or £9 per acre. Now I would like some information as to the total cost per acre of obtaining that yield?—I have explained that the cost would be very similar to that in growing maize. The ground would require to be top-ploughed and kept free from weeds till the plants were 2 feet high, and then hilled; and after that left alone.

11186. It would take very little seed?—Very little, and it is not advisable to let them get more than 8 or 10 feet high, on account of the difficulty of gathering.

11187. Do they top them off?—Yes; the cost altogether would be from 36s. to £2 an acre.

11188. The labour of gathering the castor oil would be much more than with maize—how much more do you suppose?—I cannot see that it would be more. With maize you have to go along and hand pull the cobs; with castor oil you have just to nip off your pod spikes. They are not like the bean pod, but in a small bunch with the pods standing off from them.

11189. Are there a great number on each tree?—You can only pick them as they ripen.

11190. Still the labour is there in gathering them—in picking maize you have two or three large pods, whereas in this case you have perhaps a hundred on a plant, and a difference in time in picking them, and the picking of a hundred means money?—Yes, but you can only put a certain number of your beans through at a time.

11191. That all adds to the cost. You stated that children would be sufficient to do the picking?—Yes.

11192. Would not the children require to be educated as to what was ripe and what was not?—I do not think so, it is so palpable—the ripeness is so plain.

11193. What I want to get at is this—we have made out from your information that the probable yield per acre would be £8 or £9. Now I want to find what it would cost per acre to produce the marketable article. We have arrived at 30s. for cultivation, and then there would be the picking and the manufacturing—what is a fair thing to allow for those two items per acre?—Of course you have to calculate the labour and time and the utensils that you require, bottles, cans, drums and so on. The kind of soil will also be a factor in the calculations. It would be impossible for me to give all that accurately without going into figures.

11194. Will you kindly make the calculation, and let us have the figures when complete?—I will endeavour to do so.

11195. That is a most important point?—Yes.

11196. I want to ascertain what margin of profit there is, so that any man reading your evidence may be able to judge whether it is the sort of thing that would suit him or not?—Just so. I may say that in Kansas the yield is from 15 to 25 bushels to the acre, though 20 bushels is considered a fair crop in Iowa. It is there found to be a profitable crop, the yield being from 15 to 25 bushels per acre.

11197. I would like to know what are its advantages over other crops?—In having a certain crop and a quick return.

11198. And being suitable for a dry climate?—Yes; it is not affected by droughts or heat or anything of that sort, only by cold, damp, and frost.

11199. From your knowledge, can you say what is considered a fair average profit per acre—taking all the expenses of labour and preparing for market, and sending to market, or reducing it into the different states wanted for the market—what is supposed to be the average gain per acre out of the crop?—I will supply you with what information I can obtain.

11200. As it comes to maturity in four months, could you have more than one crop a year?—No; you can only grow them at one time of the year; but the ground would be available for other purposes after they had been gathered.

11201. Have you had any experience in cultivating?—In Queensland and in New South Wales I have, but not for the purpose of making castor oil.

11202. Have we the two varieties you mentioned in the colony?—Yes, the seeds can be obtained.

11203. Have you seen any of the varieties grown?—I have not seen them grown for oil purposes, only as foliage plants.

11204. Do you know which variety we have here?—I could not say from my own personal knowledge.

11205. Do you know the sizes of the beans of the *R. communis* and the *R. spectabalis*?—Yes; they are about the size of a French bean.

11206. Is an expensive plant necessary for the manufacturing of the oil?—No, quite a cheap plant.

F. McArthur, *continued*, 4th Sept., 1889.

11207. Have you any idea of the cost of such a plant as would be suitable?—I can only tell you how they express the oil. In India they have one method, and in California another, and in Kansas and the eastern states of America they have another.

11208. I would rather have the exact figures on that head also, so that a man could judge about the expenditure he would have to go to in order to make his calculation on some definite basis?—I will supply any information I can obtain.

11209. You spoke of Indian cheap labour, and also said that in America the labour would be about the same as here—yet they grow it successfully and profitably?—They do.

11210. Then you are of opinion that we can, here in this colony, supply not only ourselves, but the other colonies, with all the castor oil they require?—I think so.

11211. Is the cultivation increasing in America?—That is a matter upon which I could not speak definitely, but I will try and find out.

11212. It is important to know that—whether people are encouraged to go on?—In India the export of oil from Calcutta increased from 654,917 gallons in 1870 and 1871 to 1,411,216 gallons in 1877 and 1878; that is in a period of seven years. I have not the statistics from America, but will try and obtain them.

11213. It is important to know what is being done, where the conditions of climate, soil, and labour are nearly similar to our own?—Just so.

11214. After a tree has borne its pods, is it then necessary for it to be pulled up, or can it go on for another year's crop?—It depends very much on the climate where you are growing it; it grows as an annual in a cold climate, and as a perennial in tropical climates. From about two to three years you would require to renew it; in a climate from 37° north, that is the northern districts of the colony, about Seymour, and from there up to the Murray, excepting the higher lands about Bright, where it is cold, all about Hamilton and Coleraine, would be particularly adapted for it; and it would be specially applicable, if a man has a bad piece of land to grow something on where he could not grow wheat and maize—where there would not be enough moisture for the grain crop he could try a crop of castor oil.

11215. It strikes me in observing the growth of the plant that something would need to be done to prevent it growing over tall. Is that so?—Yes.

11216. What is the treatment in that case?—You just simply nip the tops off, so that the strength goes into the lateral branches.

11217. Has the bean any feeding quality for stock?—No.

11218. Not even for swine?—No; it is a very poisonous thing for human beings in its native state. A person eating one seed, it might cause his death—it is a drastic irritant.

11219. After you gather those pods, you say you lay them out?—Yes, in a place with a sunny exposure, that is to make the pods burst and throw out the seeds. They shoot about, and you want a small enclosure with palings about 4 feet high, so that the seeds cannot scatter.

11220. How long are they left?—A few hours. Some may throw out their seeds in half-an-hour, and some may take two or three days. F. McArthur, *continued*, 4th Sept., 1889.

11221. It depends on the amount of sun heat?—And the period of their maturity.

11222. Is the expression of the oil a very slow process?—Not any slower than pressing wine.

11223. Have you not to leave the pressure on much longer?—Eight or ten hours altogether.

11224. Like expressing the oil from olives?—I presume so.

11225. Do you know any kind that would stand frost?—No; it is a tropical plant.

11226. Does the frost top them back?—Yes. I have seen them growing in Melbourne when there was heavy frost, and not affected in any way; but I imagine that if they were growing in the open fields they would be affected.

11227. Were those you have seen growing the right sort?—No; but I have seen it growing on the Darling, and in places in Queensland. I have only seen one of the varieties growing here.

The witness withdrew.

Robert George Ely examined.

11228. *By the Commission.*—What are you?—The postmaster at Keilor, and I have a small piece of land. R. G. Ely, 4th Sept., 1889.

11229. You have given some attention to the cultivation of the cactus plant?—Yes.

11230. Will you give the Commission your views as to that plant—its economic value and so on?—The plant grows between 45° north and 45° south all round the earth, a belt of 90°. It will grow without planting at all, merely throw the leaf down and it will take root and grow; but I plant it and it grows very quickly. It has been examined by Mr. Pearson, Chemist to the Department of Agriculture, and he has given his analysis of it which is here; and he has also given in his report on my mode of preparing it. It is armed with prickles, and no animal will touch it until it is prepared. Knowing that the plant was edible for cattle I experimented on it for a long time, and at last I found out a quick costless method of preparing it for cattle. It grows to about 25 feet high here; the highest I have seen is about 25 feet. I have portions of it here in various stages—pieces prepared and a section of the stem and some of fruit. Looking at Baron von Müeller's work on "Select Plants," you will find there are a great many species of it. This is a section—[*exhibiting the same*]—that is all edible for cattle. The preparation is instantaneous and costless. This is the leaf prepared—[*producing the same*]—and this is the leaf unprepared. It has the spines on and the imperceptible hairs which you see. One good man, used to the work, can prepare the cactus and attend to 100 head of cattle by my process. Mixed up with one pound of cotton-seed meal or cake, or equivalent, to every ten pounds of prepared cactus

R. G. Ely, *continued*, 4th Sept., 1889.

it will produce the finest beef in 90 days, singularly juicy and tender. The stem has not been analyzed, only the leaf and the fruit have been analyzed by Mr. Pearson; but I find the stem will fatten quicker, when ground up and mixed with corn, than the rest of the plant. The apples when ripe are eaten by almost every animal. Hogs get fat on them. For sheep it is both food and water; they do not require water with it. As a hedge it will prevent the burning of grass by engine sparks and save claims for compensation against the Railway Department. As a fence, posts and wire being sufficient, the cost of rails is saved; and the prunings will sell for as much, weight for weight, as Swede turnips. As a lubricant the whole plant is used, costing about a penny per pound, which will do as much work as 3d. or 4d. worth of grease and rags. It is specially useful for preventing and cooling hot boxes. It is mixed with pine tar to hold the albuminoids, sufficient to keep the albuminoids from decomposition. I do not think that I have anything more to say; the plant is so well known.

11231. Have you cultivated it regularly?—Yes.

11232. Have you cultivated an acre?—The way I did was I cultivated along the fences, but it should be cultivated broadcast.

11233. It cultivates itself broadcast?—Indeed it will.

11234. Is not that a serious element of danger?—It would be, only now we have the means of hindering it by preparing it and using it.

11235. You think that the difficulty found in New South Wales and elsewhere is overcome by your process. It is stated that in New South Wales they had to have a law specially passed to prevent its cultivation, and have it eradicated?—Yes, but I have a letter from New South Wales saying they are going to analyze it. Before Mr. Pearson made the analysis I wrote to all the colonies stating I had found a process to convert it into edible food for cattle. I got Mr. Pearson's report printed in a contracted form, of course, leaving out the *modus operandi* of cleaning it, and sent a copy to almost all the 130 states between 45° north and south. These are all the letters I received—[*exhibiting the same*].

11236. Have you any idea what quantity can be produced per acre, and what the cost of producing that quantity will be?—The cost is *nil* in fact. I run a ploughed track along the fence and I just plant the leaves; they will grow anywhere, being thrown down.

11237. Is not this the same sort of thing that grows wild all the way from the Grafton and Clarence rivers?—Yes, different species of it. There are ten species enumerated by Baron von Müeller.

11238. And the New South Wales Government is worse against it than they are here against the Scotch thistle?—Yes, they have legislated against it in New South Wales. I do not know whether they have done so in Queensland, but I have all their letters, their replies about it, here.

11239. What would it cost per acre to apply your process to make it edible?—Nothing at all, it costs nothing. In America I perceive they have gone to a great deal of trouble in preparing it; but their mode of preparation is difficult, so much so that they spoil it in the preparation. Now I claim for my invention that the plant is not spoilt.

11240. And your invention you still desire to keep secret?—The Department of Agriculture has my secret. I have no objection to give you my secret.

11241. We do not desire to press you for it?—I can prepare this piece of cactus before your eyes in a moment.

11242. You said what one man could do with so many cattle—what do you mean?—The man understanding my process can prepare the cactus and attend to 100 head of cattle, feeding them with a preparation of 1 lb. of cotton-seed meal cake or its equivalent to every 10 lbs. of prepared cactus. He can attend to 100 head of cattle, feeding them with about 60 lbs. weight of the preparation a day each.

11243. Did you try it with horses, cows, or goats?—I tried horses, cows, hogs, and fowls; I have no sheep.

11244. Did you find any difficulty in getting them to take it?—Not the slightest.

11245. Did you starve them a day or two?—No, they rush to it. In fact, Mr. Pearson says in his report—"I saw both operations quickly effected at Keilor, by Mr. Ely, and I saw his cattle eat the cactus with relish; in both cases they seemed to enjoy the change of diet, notwithstanding they were pasturing amongst abundant fresh grass.

11246. The rabbits will not touch it?—Nothing will touch it until it is prepared.

11247. I do not think they ever touch it in the hedges where it is grown; unless prepared by your process cattle will not touch it?—No, they will not. My cattle pass it every day and do not touch it.

11248. If this block—[*referring to the cactus on the table*]—were put down before a cow or a horse, would they eat it in that state?—Yes, without any mixture. The Department of Agriculture know all about the process, why should they not give it to you?

11249. What is your view as to utilizing your process?—My view is that there will be no more starvation of cattle or cutting the throats of sheep; as I have seen on the plains. I have been 34 years on the plains and have seen many cycles of drought. I have opened cattle and seen scarcely anything but clay in their stomachs, and I have seen sheep running mad for want of food and water. Sheep will live on cactus without water. It is water and food both.

11250. What you desire to convey to the Commission is that the cactus can be made valuable food for cattle by your treatment, but you do not care to divulge your method at present?—The reason is I am sorry I am not in the position to do so. I would divulge if I had just as much from the outer public as would defray my expenses.

11251. You have given the process to the Department of Agriculture?—Yes, but they are kind enough to keep my secret.

The witness withdrew.

Adjourned.

(Taken at Mildura Irrigation Settlement.)

MONDAY, 21ST OCTOBER, 1889.

Present:

T. K. Dow, Esq., in the Chair;

J. West, Esq., | J. Knight, Esq.

J. J. Shillinglaw, Esq., Sec.

Gunnar Kjelburg, examined.

G. Kjelburg, 21st Oct., 1889.

11252. *By the Commission.*—How long have you been at Mildura?—Nearly three months.

11253. You came from where?—Riverside, California, United States.

11254. What is your occupation here?—Overseer over the water distribution.

11255. On behalf of Chaffey Brothers?—Yes.

11256. And your experience in California was in a similar business?—Yes.

11257. We understand you have a short paper prepared upon the fig?—Yes.

11258. And you will give your experience of the plant, and the drying, crystallising, and pickling in vinegar of the fruit?—Yes. I will hand in a paper.

11259. You have had experience of growing figs?—Figs, oranges, lemons, and wheat.

11260. What are your impressions as to the suitability of this settlement for the fig?—I think this settlement is very well adapted for growing figs. I think you could not find any better.

11261. And in your paper you give details, not only of the growing of the fig, but the preserving and drying of it?—Yes.

11262. Have you successfully carried on the drying of figs?—Of late years I have; formerly we could not compete with the Smyrna fig or the white Adriatic figs, but lately we sent experts to find out those things, and to-day we can put up as nice a box of figs as anywhere.

11263. You speak of California?—Yes.

11264. The information was derived from those experts who were acquainted with the processes adopted in European countries?—Exactly.

11265. And now the Californians have been successful?—We get just as good a price for what we ship, and some experts say they are even better in some respects.

11266. You mean sent by train to the eastern markets?—Sent by train to the eastern markets and to Europe.

11267. What is the extent of the industry in California?—In Riverside, about 600 acres are planted with figs, and in other localities of course. I was never much outside Riverside; I never took much observation of other localities, but I have read that they have cultivated very extensively of late years.

11268. What varieties of fig are used?—We use the white Adriatic or what we call the genuine Smyrna fig.

11269. Is that the principal one?—They are the best varieties known for drying and sending away; they are good looking and a very good fig. G. Kjelburg, *continued*, 21st Oct., 1889.

11270. Have you seen any of that variety in Australia since you came here?—I have seen that variety planted right here at Mildura.

11271. Do you know where they are obtained from?—I suppose the firm had them shipped from California; they look like it, so they must be the same kind.

11272. Have you visited any orchard in Australia?—Yes.

11273. Have you seen any of that particular kind of fig growing?—I have. There is one I would specially like to mention; the name of the proprietor is D. Byrnham, he has 25 acres—a large orchard; it is eight years old. He has got very good returns; he has packed and shipped and sold them.

11274. When I asked if you had seen any growing in orchards, I meant had you visited any orchards in Australia?—No, I have not.

11275. Are you using any other kind successfully, as well as that white Adriatic?—We have used them, but somehow or other we never had any success in putting them up to compete with foreign markets. We had the black ones, they are very good pickling and are good food for some purposes of drying, but they do not look so well as the Smyrna or the white fig. They may be just as good, but certainly they do not look so well.

11276. Do you know any other white fig that can be recommended as well as the Adriatic?—Those two varieties are the only ones I know. —[*The witness handed in the following paper:*—]

"The Fig Tree.

"The introduction of the new varieties of fig trees to California, such as genuine Smyrna and white Adriatic figs, which within a year or two have been found to have the qualities most desired, it has apparently awakened renewed interest in this fruit among horticulturists.

"The tree does well on almost any soil where there is not any surface water too near. It is troubled with no insect pests, and these alone would make it popular in those sections where this trouble has so interfered with some branches of fruit-growing.

"It seldom has an off year or light crop, and in a fogless climate like this can be dried inexpensively. Use could be made of land in irrigated districts a trifle low for orange growing. The fruit has always a market when well cured and packed; besides, it is very excellent for pickling in vinegar.

"The market created for it by the crystallising process now using so large a portion of the crop gives an assurance of profit not formerly obtainable. Nearly all the early failures with the figs were due to the use of inferior varieties, then the only ones obtainable.

"The trees are planted about 20 or 25 feet apart. I have also seen them planted along roads and hedges. During the hot season, they form an excellent shade. My opinion is that, next to orange and raisin vineyards, the fig is the most important fruit that can be grown."

The witness withdrew.

Alexander Bradford Skene, examined.

A. B. Skene, 21st Oct., 1889.

11277. *By the Commission.*—You are the nurseryman and fruit-grower of the Mildura settlement?—Yes.

11278. You have had experience specially of oranges and other citrous fruits?—I have.

11279. You have had experience in Florida?—Yes, and also in this colony.

11280. How long were you engaged in orange-growing in Florida?—Thirteen years.

11281. And how long is it since you left there?—Five years and a half.

11282. And you have been here, how long?—In Mildura, for two years.

11283. Are you continuing to grow oranges here?—Yes.

11284. What are your opinions as to the suitableness of this settlement for oranges, lemons, and so on?—I think the land at Mildura is suitable for the profitable cultivation of the citrous family altogether—very much so.

11285. And the climate, you think, is favorable?—Very favorable, and the land more so.

11286. Of course with irrigation?—Of course with irrigation.

11287. Have you had any actual results yet to justify you in your opinion, that is, the growth of the existing trees?—We have had actual results from the point that I would take notice of, namely, that the growth of the young trees with the altered condition of treatment from America to suit this climate is very beneficial. I think it will make a first-class fruit, judging from the progress already made in the young trees.

11288. Would you expect to be as successful here as in Florida?—Yes, just as successful, with less cost.

11289. In what way?—For instance, the great cost in Florida to produce a first-class crop is the great outlay for lime. That is already in the land here, and, therefore, has not to be supplied.

11290. You had to dress the land there with lime?—Yes, at the cost of 20 dollars per ton once a year for a bearing grove.

11291. How much would be put on at a dressing?—About half a ton to the acre.

11292. What kind of lime was applied?—Shell lime, burnt in a kiln. That is found there in large deposits—30 feet and 40 feet in thickness in some places.

11293. Do you regard citrous fruits generally as profitable to grow here?—Yes; not all varieties of the citrous family.

11294. Would you kindly indicate the varieties you regard as best?—The orange and lemon are the most remunerative varieties of the citrous family to grow.

11295. And the particular varieties of the orange?—The best varieties of the orange are not obtainable here.

11296. What are those?—I should say the Washington navel, the Homosessa, and Mediterranean sweet.

11297. What are our chief Australian varieties that you regard as good?—The Siletta is a very good orange, and the Parramatta seedling is good, and the Rio, that is very nearly identical with the Siletta.

11298. Are you acquainted with our Australian navel?—Yes; it is not so good as the other.

11299. What is the difference between that and the Washington?—Both distinct in foliage and the fruit.

11300. What are the distinctive properties that the Washington navel has that makes it better?—Smaller in size, finer in the rind, smoother and clearer colour than the Australian navel, and it is more apt to have the navel a protuberance than a depression. The foliage of the Australian is larger and coarser. The Riverside Washington navel is finer and smaller, and the tree a surer cropper.

11301. Is it a vigorous grower?—It is, until it attains a certain age; but it is considered a semi-dwarf among the oranges. It does not grow so large as the Homosessa and Siletta and others.

11302. You said the Australian varieties were good—do you think this is as good as the other Florida varieties you referred to?—No, I do not.

11303. Do you find soil or situation makes any difference to the appearance of the orange?—I do not think it makes any difference in the navel, because the Australian navel was introduced into Florida by General Sandford directly from Australia. It grew and fruited there under my care side by side with the Washington navel, and it appeared to be just the same as I have seen it here.

11304. You have not had experience of the Washington navel here?—No.

11305. And the Australian navel is like its growth in Florida?—Just the same.

11306. Could you describe that Mediterranean sweet?—It is a very prolific bearer, very nearly similar to one called Rio in Australia or the Siletta. They all three resemble each other.

11307. In regard to the culture of the orange, do they require any particular class of soil or situation?—There are some particular classes of soil that would be unsuitable for the profitable cultivation of the orange.

11308. Could you describe those?—That is the clay heavy bottom lands; I think those unsuitable for the cultivation of the orange.

11309. And with the absence of lime as you said?—Yes, that would not make much difference, because the water we use for irrigation is impregnated with lime, and there are other things the tree requires that would not make much difference.

11310. Those superior varieties you have mentioned, are any of those varieties on the Mildura settlement?—Yes.

11311. Where were they obtained?—In Southern California.

11312. Are they plentiful here?—No.

11313. They are being planted out?—There are a certain number of young trees in the settlement imported from Southern California, but no quantity.

A. B. Skene, *continued*, 21st Oct., 1889.

11314. There are sufficient to enable those who are planting to adopt those superior varieties largely?—Not yet.

11315. Can they be propagated?—Yes, but it takes a year or two for that.

11316. In regard to importing varieties from Florida or California, that has been successfully done?—Yes.

11317. How was it done?—They were packed in a case with moist rough mould with the tops all exposed, decayed vegetable matter; an equal proportion of that and of moss.

11318. Pruned back?—No, just packed in, and the tops left exposed.

11319. And brought in that condition to Mildura?—Yes; two months on the journey.

11320. What proportion of them grew?—Ninety-five per cent.

11321. Did you make the shipment yourself?—They were sent to me.

11322. In regard to soil, you have answered now as to situation, is there any point that your settlers ought to know in regard to the position of an orange grove?—An easterly aspect would be the best, but I think that with shelter, and as the trees grow up, any of those high lands are very suitable for an orange grove.

11323. Do not you think it is desirable to provide shelter for a citrous grove?—I think it is very imperative that it be done.

11324. The wind being detrimental?—Yes, for the first two or three years.

11325. The chief cause is the cold winds we get in the spring?—And hot wind, the winds we get at any time.

11326. What kind of shelter is the best for the young trees?—The thing to be selected is something that will become a shelter in about the quickest time possible, that is, some very quick-growing tree. It would be better probably to select a tree that would act as a shelter and give a return, but very often that requires too long a time to wait. The *Cupressus membrocarpa* I think would grow quickly, and make a proper wind-break.

11327. Would you plant that in a single line?—Yes, because you can trim it to any width.

11328. How far would that give as a shelter; what area would a single line be sufficient to protect?—I think, with the undulating nature of the land here, that such a shelter on the west and north would shelter any ten-acre block.

11329. What is the effect of frost?—The effect of frost is injurious; but I do not think the frost in Mildura is likely to injure the trees, the winds are the worst.

11330. You have been here how long?—Two winters, and the frost has not been enough to damage the young trees planted out.

11331. And that is the tenderest time?—Yes, the first year, before they are properly established, settled.

11332. In the event of being in a district where the frosts are severe, what would you recommend the planter to do?—To get his trees in a dormant condition before the winter set in; to stop the growth.

11333. How do you do that?—In Florida we have to do that, because that is the great drawback. For one or two years, we plant thickly with Italian rye, that will take all the soluble matter in the land and force the tree into a dormant state in winter.

11334. Is that the only way?—Stop cultivation. The orange tree is peculiar, the more you cultivate the more it grows. When you stop it will stop, so that before the frost season comes you should stop cultivation.

11335. Now as to the preparation of the soil?—I think, for the soil here, that a good deep ploughing and a thorough breaking up, as is done with the implements used on this settlement, is quite sufficient for the first planting of an orange grove.

11336. What depth is the soil worked to?—Sixteen or seventeen inches.

11337. Is it worked fine?—Yes, that is the nature of the soil; it works fine itself; it is not a hard retentive soil.

11338. What are the other steps required, such as marking out and so on?—The ground is marked out and the pegs put in. The best distance is about 24 feet.

11339. Are there any particular points that have to be alluded to?—A very particular point is to avoid too deep, that is where, perhaps, the greatest failure is caused—through deep planting.

11340. How deep should you plant?—Just to the collar of the tree, so that the roots may be just covered.

11341. What time is the most suitable time to plant the citrous family?—In this country, say, September; say, into October.

11342. Have you seen any at home planted in the month of April?—I have tried it, but I do not think it is a good plan.

11343. Why?—Because you cannot get the tree in a condition to leaf; it grows on too late in the season, it is too tender; there is to much sap up.

11344. What method of raising young trees is preferable, that is, in reference to seedlings or worked trees, and on those trees which is the better way of working them; for instance, from buds or grafts?—That is only a matter of opinion, both ways are successful—buds and grafts. I prefer buds for a young tree and grafts for an old one; it heals up quickly and makes a prettier tree.

11345. Is the practice in Florida to plant seedlings in a grove and let them take their chance?—It has been done, but not in later years.

11346. It has not proved to be a success?—It was a success in the early time of that industry in Florida, but it is so difficult now to get a true seedling; they are so much mixed up with lemons and citrons, so that seed taken for oranges now is likely to be pretty well hybridised.

11347. You do not recommend that method?—No, I do not think it is a very good plan.

11348. As to stocks there has been a wide difference of opinion in Australia as to the most suitable stock for the orange tribe, can you give any information on that point?—I think the most suitable stock for the orange is the orange itself, although I should not hesitate to plant oranges worked on the lemon stock, but if worked on the lemon it is apt to multiply the danger of going wrong.

A. B. Skene, *continued*, 21st Oct., 1889.

11349. Which is the stock preferred in Florida ?—The native wild orange.

11350. And what methods are being adopted in Victoria in regard to that ?—Both ways are being tried.

11351. And you do not think the black disease that has been so prevalent throughout Australia can be attributed solely to the lemon stock? —Oh, no. That might be attributed solely to deep planting; but there is one thing the orange will stand deeper planting, if worked on the orange than if worked on the lemon stock. The lemon is more tender and delicate, and shows it sooner than the orange. The lemon stock is all right if you plant it right.

11352. The orange stock is liable to the black disease also ?—Yes, if too deeply planted.

11353. You are of opinion that the stock influences the scion ?—To a certain extent that influence goes on in all varieties of trees.

11354. That is your objection to using the wild lemon stock ?—Yes.

11355. Have you made observations on that point in Florida ?—No, not in Florida. The objection to the lemon stock in Florida is that it is not hardy enough.

11356. In regard to the frosts ?—Yes, we have found that there in the winter if we get a severe frost the trees worked on the lemon suffer the most.

11357. Do you find that check by the frost affects the citrous tribe seriously ?—No, I have always felt that if it does not kill it outright it does a great benefit to it. It cleans the tree and puts it dormant, and makes the tree more vigorous or robust next year.

11358. In other words, it is equal to a pruning ?—Yes, it hardens the tree. It gives the tree a rest.

11359. Has any other method of propagation of raising citrous stock come under your notice ?—The best way is to raise the seedlings, and then bud them.

11360. Has any other method come under your notice that you could recommend, for instance, layering ?—I do not like that as well as worked-on seedlings.

11361. At what age do you think the orange tribe is best to be transplanted—as yearlings or two year olds ?—As yearling trees on good stock. I prefer those to the two year olds.

11362. As to lemons, I presume the same treatment that you have indicated you can recommend for the lemon ?—About the same.

11363. And for the other members of the citrous family ?—Yes.

11364. As to the varieties of the lemon, can you give us some information about them ?—The Lisbon lemon is the best obtainable in Australia. There is another good lemon grown in America called the Eureka, which is identical, I believe, with the one grown in Florida, called the Tahiti; that is a very superior lemon, and we find it more profitable for growing in America, because the fruit is a more uniform size—a little smaller in size than the Lisbon lemon—and sells better in the New York market.

11365. Is it a better bearer than the Lisbon ?—I could not say that, because the lemons are generally very heavy bearers as a rule.

11366. You regard the Lisbon we have here as a very fine variety?—Yes, a very good lemon.

11367. And with citrons and limes and shaddocks, can you indicate the most suitable varieties in those?—I have never cultivated those to any great extent. We never made much of them in Florida. I have sent shipments to the north, and never realized any price for them. I consequently stopped the cultivation for shipping. They are used there for the distillation of Florida water, and scents and perfumes, and essential oils.

11368. Are they grown extensively for that purpose?—Yes, there is a great deal of it. They get a great deal of bloom from the groves, that are intended to bear, rather the little oranges that are used for that purpose, and the distilled water, oil, and so on.

11369. What method of cultivation for the growing period do you recommend for a citrous grove?—As I said before, the more you cultivate the more they grow, which means a thorough cultivation and keep at it.

11370. Would you cultivate close up to the stem?—Not close up to the stem.

11371. What is your reason for that?—It interferes too much with the roots that ought to be near the surface.

11372. The citrous stock feed near the surface?—Yes, very near the surface.

11373. And just a light hoeing round the tree is sufficient?—Yes, to keep the surface broken and the balance of the land thoroughly cultivated.

11374. As to mulching, what is your opinion on that?—I think that where mulching can be done it will well repay the trouble.

11375. What kind of mulching?—Any light litter, straw, or any grass or weeds, or spent manure—almost anything at all to keep the surface covered.

11376. You do not recommend strong manure?—No.

11377. Just a covering?—Yes.

11378. So they practise mulching in Florida?—Yes, to a great extent.

11379. Is irrigation carried on there?—In some places it is; but not as a general thing. They depend on the natural rainfall.

11380. Can the mulching be carried out advantageously with irrigation?—I think it could.

11381. You consider irrigation essential to the successful orange culture?—Yes, even in Florida where we have a rainy season; still the groves that I know of that are irrigated are the best groves in the country.

11382. Do you recommend any manure for oranges?—Where it is necessary you would put it on as a top dressing—loam is the best thing—super-phosphates, bone-dust, but no animal manure.

11383. Just a light dressing and work it in?—Yes.

11384. At what time of the year would you recommend the application?—I should think in the winter time, after it has stopped growing, or before the growing takes place in the early part of the season.

A. B. Skene, *continued*, 21st Oct., 1839.

11385. Do you recommend pruning for the citrous trees?—Very little.

11386. As to the young trees and the bearing trees?—As to young trees, I think it is best to let them shape themselves to a great extent when they are young. I have always found out here and in America that when the orange trees are young they all grow the same, if the little branches that they have are allowed to grow they will grow out and hang down. When the growth stops at that particular part it will stop there, and the next tier of branches will grow further out, then the other ones can be cut out of the inside—they have served their time and can be done with. The large trees must be kept clean inside—light and air, and keep down insects.

11387. As to irrigation, would you indicate the method of applying water to a citrous grove?—I think the best way is the way it is done here. I have not had much experience with irrigation, though I have seen it in Florida. It is done with pipes there with holes all along the trees, but I think the way here is superior. It is by plough furrows—the land is prepared for that beforehand, so that by taking plough furrows along the rows of trees they are fed from a hedge ditch at the higher part of the ground—the rest is fed by those.

11388. How far are the furrows from the rows?—It depends on the size of the trees. The first year the furrow is pretty close to the trees, about a foot is quite right; the second year a little further away, and so on, keep shifting them.

11389. And bye-and-bye one good furrow between the rows would be sufficient?—Yes.

11390. How is the land previously prepared?—By grading to suit the irrigation so that the water can be let on to the higher portion and to all the block.

11391. Is the water running down those furrows confined to the furrow?—Yes.

11392. It does not flood over the surface?—No, avoid flooding.

11393. It reaches the trees through the sub-soil?—Yes.

11394. What is the objection to flooding?—It gives you a great deal of unnecessary work, and it cakes the surface, and it gives a great deal of work to cultivate it immediately after to prevent evaporation.

11395. And when you flood by furrows do you cultivate and obliterate the furrow afterwards?—Yes, every time; thorough cultivation takes place after every irrigation.

11396. So that each time the furrow has to be made again?—Yes, except the hedge ditch, which is permanent.

11397. That is to prevent the caking of the soil?—Yes.

11398. Does it involve a great deal of labour?—No, the instruments used here do the work very lightly.

11399. What instrument is used?—A small plough, and a small cultivator goes on and obliterates the furrows when it is time, and between the land is cultivated by a larger cultivator and a pair of horses.

11400. What is the cultivator like?—The cultivator that is as well adapted as any for it is the Planet Junior, that is, for the furrows between the trees. A. B. Skene, *continued*, 21st Oct., 1889.

11401. Is that quite strong enough for the work?—For the furrows it is.

11402. An then for the cultivator?—Between the land in the open portion of the trees, you can use anything more powerful and cultivate deeper. An ordinary scarifier or anything will do the work.

11403. Do you raise the land where the trees are planted above the ordinary level?—No.

11404. You do not gather the land and plant on the crown?—No. The ground is graded perfectly level.

11405. Is there much levelling required to be done here?—In some blocks a good deal of levelling is required, and others again scarcely any at all.

11406. What is the method of levelling?—First with a scoop or other improved implements such as are used here. I have done a good deal of it here with the ordinary common scoop and lifter.

11407. Is there any better implement?—There is a better implement used here, it is called a buck scraper. I have not used it.

11408. You cannot say much as to its value?—Only for the work I see it do. I see it do good work, and I would have it in preference to any other I know of.

11409. How often do you apply water in a season to a citrous grove?—You could not set any specified time. It all depends on the rainfall and the weather.

11410. What are the indications of a tree wanting water?—The tree will soon let you know it.

11411. What is the average rainfall here?—I could not answer that from memory.

11412. Do you know what rainfall would be regarded as sufficient for maturing oranges without irrigation?—I think in Florida we sometimes average 25 to 30 and 35 inches per annum, but that falls sometimes altogether, in a period of six months. If it could be given distributed over the whole year it would be much better.

11413. You think about 26 or 28 inches would be sufficient?—Yes, if it fell at the right time.

11414. What indication does the tree give of requiring water?—One indication is that it wilts its leaves, and generally stops its growth if it is not watered when required. At the same time it ought not to be allowed to get to show that indication.

11415. You mean a slight colour in the leaf?—Yes.

11416. Is that an indication of the want of water?—Yes.

11417. About how many times would you require to water it, leaving out of account the rainfall altogether?—I should say for the first year probably once in six weeks.

11418. All through the year?—For the growing part of the year—the summer season; probably, the first watering and the second and third

A. B. Skene, *continued*, 21st Oct., 1889.

would be a little closer together, but the average would be six weeks. Then again, there are some lands that are more retentive of moisture, and would not require so much as others.

11419. And then do they require more when they come to the bearing stage?—Yes.

11420. Would they be watered as much as once a month?—Not as often as that.

11421. What are the chief diseases that the citrous stock are liable to?—The chief disease I know of is caused by insect pests, such as the scale insects, and another disease, I have noticed it much in Australia, is called "die back" in Florida, the top of the trees dying back and this ring bark rotting.

11422. What do you attribute the die back to?—The roots sticking in the hard sub-soil which they cannot penetrate.

11423. Would a wet undrained soil have the same effect?—I think so.

11424. An unsuitable sub-soil?—Yes. I have proved that.

11425. What do you mean by the bark disease?—That is the collar rot, as some people call it. The decaying of the bark at the ground line. That is caused by the rupture of the sap cells and the fermentation of the sap, caused principally by too deep planting.

11426. Can you indicate any cure for that?—I have cured many trees of it by lifting them up, letting the air get round it, and put some lime to it.

11427. Would you undertake to raise a pretty large tree affected that way?—Yes, I have raised trees in Australia nine years old.

11428. And were they cured?—Yes.

11429. What is your method of doing that?—I cut the roots away out and get a lever and lever the tree up; pack in underneath.

11430. Would you make any effort to cut out the diseased portion?—No, just clean it out and allow the air to get at it, it will all heal up.

11431. About mulching, you would not recommend the stuff near the stem?—Not close to the stem, because of that danger. It is better to let the air get to the stem.

11432. And the same in watering?—It is not so injurious in the watering to lay round the stem of a young tree. I have not found it so.

11433. At the same time, you would not recommend allowing the water to come in contact with the bark?—No.

11434. You attribute the bark disease principally to deep planting?—Yes.

11435. The chief insect pests are the scale disease?—Yes.

11436. What are the remedies for that?—Different emulsions, that is, suppose the tree has scale on it, but it is a very easy matter to keep it off, not allowing it to get on by keeping it clean from the commencement, and keep the tree in a healthy state and it will be very rarely attacked.

11437. Would you keep it clean by spray?—I have never found it necessary to spray a tree to prevent the scale insect. If the trees were kept growing healthily, I never found them to be attacked.

11438. What is the best emulsion you have found?—The best I know is kerosene dissolved in water in the milk process. It was discovered through the instrumentality of Professor Riley, an entomologist of the United States. He was sent to Florida to discover a means of destroying it. He takes about a gallon of milk to half-a-gallon of kerosene and churns it up like butter, and makes a thick paste, and one pint of that used with sixteen of water is an effectual remedy. Apply it with a spray, pump, or syringe. A. B. Skene, *continued*, 21st Oct., 1889.

11439. Warm?—Warm or cold.

11440. Have you to heat the milk?—No; pump it from one vessel to the other. It takes about twenty minutes to make half a barrel of it.

11441. Does that apply to the red scale?—Yes. The worst scale we have in Florida is the red scale.

11442. Does it apply to the Assyrian scale?—Yes; and all insect life.

11443. How often would you apply that emulsion?—If a tree is affected with scale, I think a couple or three doses will cure it.

11444. That is not sufficient to destroy the egg?—Everything will scale off the tree; but there is another thing, if a tree is thoroughly infested with scale insects, the best plan is to take it up and burn it and plant another.

11445. If it is badly affected?—Yes, I have generally found there is something else wrong. If the tree is in an unhealthy state it will get them as often as you kill them. The best way is to get the tree in a healthy state, then it is easily cured.

11446. You would use a spray as an assistance?—Yes; not rely on it as the main remedy. One or two applications of that will scour everything off easily.

11447. Have you seen the cottony cushion scale in Australia?—Yes, any quantity.

11448. Have you taken notice to identify it as that scale?—Yes, that is the cottony scale right enough.

11449. You have no doubt in your mind that it is identical with the one you had in California?—It is the same.

11450. Do you think it will be very troublesome here?—I think not.

11451. Where have you seen it in the colonies?—In New South Wales, and also in the northern portion of New Zealand.

11452. What remedies do you adopt in California for that scale?—There is very little of it in Florida.

11453. You say that remedy you spoke of just now would cure that too?—Yes. We had it in Florida, but that is not the worst scale we had in Florida; the red Florida scale is the worst.

11454. You have not seen that here?—No.

11455. Have you seen the red scale here?—I have seen the one called red scale; it is different from the one in Florida.

11456. How does it differ?—The Florida scale is, like the red, like a fine thread, which perfectly covers the branches; it is a greyish-brown colour.

11457. The same shape as the other scale?—No, it is different.

A. B. Skene, *continued*, 21st Oct., 1889.

11458. Have you the red scale introduced from Japan? I do not know that scale.

11459. You think the red scale here is not the same as the Florida red scale?—It is not.

11460. You import trees in Florida from Japan?—Yes, from all parts of the world.

11461. Have you seen any on the trees that you imported from Japan? —No, they are generally treated before they are allowed to be landed.

11462. As to the method of packing oranges and lemons adopted in Florida for sending to market?—The method we use there, the oranges and lemons are cut off the trees not pulled off. We use a small thing like a shears, very small, that fits on the forefinger and thumb, and you cut off close to the rind as quick as you can. You take a ladder to a very large tree; and we have netted pipe as it were that we take up the tree, and fasten it on the first rung of the ladder, and put the other end in the basket, and it goes down slowly without bruising, and we can pick one whole side of the tree without coming down.

11463. What is the object of cutting?—It will keep better, and send better. If you pull them they will not ship long distances.

11464. Are they selected and sorted?—Yes, they go from the tree to the packing house. They are then sized and put on the tables, and very often sweated if they go a very long distance.

11465. How is that done?—Put them on the racks, a foot or so deep, and cover them over and close the ventilator, and allow them to stay there for about 24 hours. That takes out the acid of the rind, and shrinks the rind over the orange. Then the ventilators are opened, and they are spread out and dried, and the orange is shrunk.

11466. That is to a limited extent?—Yes.

11467. That is if they are going for a long voyage, say, to Europe? —Yes, or to some of the Northern States. A long journey.

11468. Then they are put in boxes?—Yes, wrapped in tissue paper.

11469. What sized boxes?—A bushel, with a division between—half-a-bushel in each half—holding 150 to 160 in a case.

11470. Is there any ventilation in the box?—Yes; that is, the sides of the box. The boards used are very thin, and the wood half-an-inch apart, so that you can see the tissue paper.

11471. Would it be possible to make shipments of oranges to Europe from here?—I think so.

11472. To do it in such a way as not to have the shipments going bad—to make it reliable?—I think it could be shipped as reliably as from Florida to Chicago. I do not think it would take as long.

11473. What route do they take from Florida to Canada?—By steamer to Jacksonville. Most of the orange groves are situated in South Florida. That takes a week, stopping at all the places. Then they are generally sent by rail to Fernandina, and then by steamer thence to New York, then by rail to Chicago, 1,000 miles.

11474. Are they placed in cold chambers in the boats and trains?— No, just stowed down the hold; the whole steamer loaded up, inside and out.

11475. So you think there would be less danger of destroying the fruit, if properly packed, in sending from here than on that route?—Yes, they would not have so much handling. A. B. Skene, *continued*, 21st Oct., 1889.

11476. How long do you think they would be on the journey from Florida to Chicago on the average?—About two weeks and a half, very often more; but they would take about that.

11477. If they were sent to Europe they would be some time longer?—A little longer, not much. They are oftener over two and a half weeks than under, through delays.

11478. As to some other articles, tomatoes, Lima beans, and sweet corn as crops for canning, will you give some ideas as to that—take tomatoes?—I have never had a great deal of experience of those, except that I know in some portions of America, especially places where I have been myself, that the growing of those crops has been very remunerative, and with the knowledge that I have I believe that they would be grown here to perfection. They ought to be just as remunerative and become a valuable thing to grow, until such time as the grove would come into bearing—that refers to tomatoes and Lima beans and sweet corn.

11479. Would the last do for canning?—I think so.

11480. Whom would you get to eat it?—I do not understand how it is not used here. There is no one in America but must have sweet corn and Lima beans.

11481. Would it be practicable to send the sweet corn, without canning, any distance to market?—It could be sent to Melbourne from here and be perfectly fresh—that is with the rail.

11482. The Lima and butter beans?—That is a bean I have never seen in Australia. The Lima bean I know it is to be got in Australia, but I have never seen it, but no garden is complete in America without it. I know a man that makes 150 dollars per acre on Lima beans in North Florida.

11483. Does he send them fresh to market?—Yes.

11484. They could be likewise sent to Melbourne?—Yes, they could be sent—they carry well.

11485. Would you describe that Lima bean?—It is a pole bean, and it can be grown 3 feet apart in rows on poles. It grows very fast, and bears enormous crops. It is a large flat bean, a pod contains about four or five to six beans in a pod. It is grown something like a Windsor bean but flat.

11486. Is it like the scarlet runner?—No, that is round. It is a flat bean, and when cooked it just comes out the same; it discolours.

11487. Is it an annual?—Yes.

11488. In the canning of this, you would offer to us a means of preserving the surplus, after sending the other to market?—Yes.

11489. Is that extensively done in Florida?—Yes, in North Florida. Lima beans and corn mixed makes the succotash of America—in every shop you get that.

The witness withdrew.

Adjourned to to-morrow, at half-past Two.

(Taken at the Mildura Irrigation Settlement.)

TUESDAY, 22ND OCTOBER, 1889.

Present:

T. K. Dow, Esq., in the Chair,

J. West, Esq., | J. Knight, Esq.
J. J. Shillinglaw, Esq., Sec.

J. E. Brown, F.L.S., further examined.

J. E. Brown, F.L.S., 22nd Oct., 1889.

11490. *By the Commission.*—You are Conservator of Forests, South Australia?—Yes.

11491. You have travelled down the Murray with the Commission from Swan Hill to Mildura?—Yes, and I have written out a paper which draws special attention to the immense value of the timber from there to here.—[*The same was handed in as follows:*—]

"TIMBER ON THE MURRAY.

"The present is the first visit paid by me to this portion of the Murray, and my impressions of it with regard to its timber capabilities and resources are such that I shall be pleased to have them made public through this Commission.

"I would like to draw attention to the immense undeveloped wealth that you have in the timber on this river. To me, coming as I do from an almost treeless country such as South Australia is, the dense natural forests which I have seen on my trip down the river is something wonderful. The timber alone, and about which I first wish to draw your attention, is of a much greater value than perhaps you have any idea of. Even to me, accustomed as I am to the inspection of trees and forests of all kinds, the natural growth of timber upon the Murray is to a very large extent immense. It may surprise you to know, as I positively here assert, that it would be a very easy matter indeed to turn out at the very least one million of broad-gauge sleepers from the redgum trees now growing upon the Victorian side of the river. I do not hesitate to say that the timber which I have seen on your side of the river is in a commercial point of view worth at the very least £3,000,000. This statement may appear somewhat extravagant, but I make it after very careful consideration of the subject and shall adhere to it without any hesitation. It appears to me that both you and New South Wales have utterly overlooked and neglected the natural timber resources of the Murray. Had we such wealth of timber in South Australia it would, I venture to think, be utilized to advantage and thereby realize a very considerable revenue to the State. It may, perhaps, appear somewhat startling, but I feel confident that there are at the very least something like two millions of trees upon the river which are available for manufacturing purposes. For the Barrier Mines trade you have an immense supply of all kinds of timber, and as these mines require at least some £20,000 worth of timber each year, it is for you to consider whether or not you should endeavour to secure their trade. That it can be done, I have no doubt, and I would therefore recommend your Forest Department to see into the matter. There is alone sufficient native-grown timber, and its capabilities upon the river, to engage the attention of your Forest Department. The immense capabilities of the river in regard to timber is so great that I would respectfully and earnestly beg to draw your attention to the matter. In a forestry point of view, the matter is of the greatest interest, in that the capabilities of the soil and situation are almost beyond copying. You are now importing timber to the value of over £1,000,000 per annum, of which, at the very least, one-half could be grown in your own colony. On the banks of the Murray there are immense capabilities in regard to the growth of exotic timber trees, and these of such a character as to materially

reduce the present importation. That we can grow trees which will produce the deal of commerce there is no doubt. Such trees as Pinus insignis, Pinus pinea, Pinus halepensis, Pinus inops, and other pines, the English ash, elm, oak, the American ash, oak, elm, maple, and hickory could be grown with great advantage upon the flats of this river, and as these trees can be grown at the very least in half the time which they could be grown in their native countries, the matter is a very serious one for your Forest Department to consider, because, speaking individually, I think much might be done in this way upon the lands in question. Upon these lands you certainly ought to be able to grow most of the exotic timber which you are now importing, and thus in time save some hundreds of thousands of pounds to the State and ratepayers. If I may be allowed to make a remark of this kind, I would suggest that at least some portion of these Murray flats be handed over to your Forest Department for the purpose of growing trees of timber sorts which cannot elsewhere be grown successfully in the colony. With your soil, climate, and situation, the matter of success in this way is assured.

J. E. Brown, F.L.S., *continued*, 22nd Oct., 1889.

The witness withdrew.

Alexander Crossthwaite, J.P., examined.

11492. *By the Commission.*— You are a settler at Mildura?—Yes.

A. Crossthwaite 22nd Oct., 1889.

11493. You are engaged in what?—Agricultural and horticultural pursuits.

11494. You have had some experience in growing lucerne at Mildura?—Yes, and other places.

11495. Are you pleased with your success with lucerne at Mildura?—Extremely pleased.

11496. Where did you grow it before?—In the north-eastern district, on the Ovens.

11497. Did you use irrigation there?—No, we did not.

11498. Here you have been growing it by irrigation?—Yes.

11499. Will you tell us your system of preparing the ground and growing lucerne?—I have prepared the ground first by sub-soiling, and then planted the seed on the first of May last.

11500. How deep did you cultivate the ground?—Sixteen to eighteen inches sub-soil.

11501. Did you work the ground up fine?—Yes, harrowed it fine.

11502. Did you roll at before you sowed?—No, I did not. I simply sowed.

11503. And after sowing what did you do?—Within one month I found there was a growth of depth of root of from $6\frac{1}{2}$ inches to 7 inches is the average within one month. After that I put the harrows over two or three times, as soon as ever it got grown a little bit.

11504. What was the height of the lucerne at this time?—Just showing above the ground. It was all root depth.

11505. You did not roll at all up to this point?—I did not.

11506. Do you think rolling would be an advantage?—No, I think the loosening of the soil is a better plan.

11507. When did you first cut the lucerne?—I have not cut it yet.

11508. You are well pleased with the growth it has reached?—Very well pleased.

A. Crossthwaite, *continued*, 22nd Oct., 1889.

11509. Have you seen other persons growing lucerne on the settlement?—Yes.

11510. Is the growth satisfactory?—In every case extremely satisfactory.

11511. You think it would be a most profitable crop?—Yes, either for an ensilage or a fodder crop. I think it will be the most profitable crop here.

11512. What do you recommend in regard to a dry district where there is not irrigation; would you recommend farmers to attempt to grow lucerne without irrigation?—No, undoubtedly not. Lucerne will not grow without water, as far as my experience goes. I have tried it, even in a country where it does get a saturation of wet, but if the soil is not thoroughly pulverized it will not grow, that is, the heavy black soil on the river flats. It will not take root unless the soil is thoroughly worked before. I have tried it several times.

11513. Do you propose to cut this lucerne on the settlement?—Yes.

11514. You think it is preferable to grazing?—I decidedly think so, for this reason, that by cutting you encourage the crop to grow thicker—you get more out of it—you get two crops where you get one by grazing.

11515. Will lucerne stand submersion under the water?—No; my impression is it will not. If it is flooded when it is first sown, in most cases it will die completely out. After it is fully established I think it would do. It is in the early stages that it is dangerous to submerge it. After it is established it will benefit by flooding.

The witness withdrew.

William Sturm, examined.

William Sturm, 22nd Oct., 1889.

11516. *By the Commission.*—What are you?—Gardener.

11517. For the firm of Chaffey Brothers?—Yes.

11518. Have you been long at Mildura?—Sixteen months.

11519. Where were you previously?—For seven years in Australia, for five years in Cape Colony, and for the remainder of the time in Germany.

11520. Have you had any experience in growing lucerne?—Very little. If you wish, I could give some points on orange growing.

11521. What are the points you would like to bring out?—Mostly in reference to the stock used. I have seen oranges growing in the Cape which are generally seedlings, and, undoubtedly, as far as my experience goes, it shows that the seedling forms the most healthy and vigorous tree.

11522. Do you mean by that that the tree is raised from the seed fruited without grafting or budding?—Without grafting or budding. The fruit so obtained is certainly of a very inferior quality. By judiciously choosing the seed from good varieties, you are able to obtain a better sample. We generally get at a very good variety and very mature fruit from the topmost branches, and when we have the seed we carefully look over and select those pips which are round, full, and

plump, and discard any that are in any way flat or shrivelled. As far as the lemon stock is concerned, I have been in South Australia also, and it has not been a success there.

11523. The lemon stock for orange?—Yes, the orange grafted or budded on the common lemon. Trees budded or grafted on the lemon stand transplanting far easier than on orange stock; they grow most vigorously for the first five or six years, but then decay sets in—the trees seem to go back. In the Parramatta district the lemon stock has proved a thorough success; they have beautiful trees grown on the lemon, so I think that the different soils must have an influence. It shows that the lemon is not adapted for soils.

11524. You spoke of Queensland and South Australia before?—Yes, it was a failure there.

11525. But it was a success at Parramatta?—Yes. As to the mode of propagation, I certainly prefer budding to grafting.

11526. Why?—It gives a cleaner trunk, and it does not inflict such a big injury on the tree, the wound heals far quicker, and it is consequently better for the health of the tree. You are aware of the way they graft in Sydney. The stock is of a good thick size. It is cut like this—[*illustrating*]—and a small scion inserted, and there is all this big place to overgrow.

11527. What time have you found the most suitable for budding the orange?—Autumn.

11528. About what time?—About March.

11529. Will you describe briefly the method of budding?—I think it is so well known amongst almost all horticulturists that it hardly needs description.

11530. Are there particular ways of treating the bud?—I make a "T" cut into the scion, and I lift the bark generally with the lifter on the budding knife, but take care not to injure in any way the fine inside of the bark. I take the bud the same way, then a cut is made this way—[*illustrating*]—over the bud, and in case the bark that they had does not slip easily I put a bit of wood adhering to the eye, but if possible it is best to remove that piece of wood.

11531. As to the tying up of the bud and its treatment while it is uniting, will you explain that?—As soon as that shield is inserted, I tie on the best material for tying, which I have found to be raffia fibre. Say this is the tongue of the stock, the bud is inserted here. I commence holding a piece of fibre in my hand like this—[*illustrating*]—say the bud is here, I commence beneath, draw it together and cross it again and again, at the back of it, through it, round here, over here and back again, and then this way over it, so as to tie it nicely there, towards the shield, but the upper part of the shield must join the top stroke of the "T." No space must be left after tying. I generally by inserting the bud cut the leaf off. I cut off the foot stalk.

11532. Do you use wax of any kind?—No, though in the climate of Mildura in a very dry season, I think it would be advisable to exclude air.

William Sturm, *continued*, 22nd Oct., 1889.

11533. Would you describe the most suitable wax that should be used for that purpose ?—I certainly prefer the liquid grafting wax, which consists of bees' wax, 2 lbs. of turpentime and linseed oil, each one part, stir it gently over a slow fire, but you must be careful not to ignite the turpentine, and then, when cool, apply it.

11534. Would you cover the bud all over ?—Oh, no. Never cover the bud entirely over, only the tie.

11535. Now as to untying, just describe the process ?—The best sign whether the bud has taken or not is when the leaf stalk falls off the leaf. If this has taken it will be necessary to untie, then the bud is allowed to remain till the next spring, and then growth of the stalk sets in and is headed back over the inserted bud.

11536. That is, the stalk is cut back just over the bud ?—Yes, but in a dry climate like Mildura I should advise to leave about 6 or 8 inches of the stalk.

11537. For what reason ?—To tie the shooting bud to it, and then again acting as a draw for the sap of the bud.

11538. How long would you leave that ?—Until the shoot has hardened, and then cut back in the usual way ; care should be taken to pinch all shoots of the stalk, so as not to take nourishment away from the bud.

11539. As to the seedling orange, you mentioned about the seedling oranges giving unsatisfactory fruit ?—Yes.

11540. And then you went on to describe selecting the best varieties, you meant that, I suppose, for the purpose of getting seed, not for the purpose of getting trees to propagate ; you do not approve of growing seedling oranges ?—No, not as a commercial success.

11541. Are you quite clear on that?—Yes. I would not recommend that. I would recommend budding.

11542. As to the stocks—you spoke of the effects of the soil ; on the whole, what stock would you prefer to use—lemon stock or orange stock?—Orange stock. I even believe that the lemon has a deteriorating influence on the quality of the fruit.

11543. Have you noticed that from experience ?—I have tried the experiment of budding the Siletta on the West Indian lime at Queensland, and that fruit was something wretched ; a very sour nasty taste.

11544. What kind of orange would you prefer as stock ?—I prefer a hardy kind—the Poor Man or the Parramatta—a vigorous grower.

11545. I understand you that the wild lemon stock did well in some places and not in others ?—Yes.

11546. What is the reason ?—I attribute it to unsuitableness of climate and soil.

11547. What is the lifetime of the orange ?—About 150 years.

11548. Is there any difference between the orange worked on the wild lemon and the orange stock ?—As far as my experience goes, I have seen the trees generally decay earlier when worked on the lemon in Queensland and South Australia. I think as an evidence we can

fairly take into consideration all the trees that are in Europe; they have very old trees there (of course kept in houses) which are known to be 200 or 300 years old, and they are certainly all seedlings or worked on orange stock.

11549. Did you speak of the orange dying back when planted on a lemon stock?—Yes.

11550. Can you give any reason for it?—I think that the lemon finding the sub-soil not suited for it decays.

11551. In speaking of the grafts, you did not state the time when we should bud?—I said March. The orange can safely be budded at any time when the bud is ripe.

11552. Do you aim at a growth the season after, or do you wish to have a silent bud?—Yes, I prefer the silent bud.

11553. You prefer not to have the bud strike out the season it is inserted?—Yes.

11554. Then in various climates, where that would take place, what method would you take to prevent that?—Budding later.

11555. If the district and season are such as would bring forth your bud, you would bud later?—Yes.

11556. You spoke of the effect of the soil on the lemon stock and the orange stock, could you describe the kind of soil that the lemon stock seems to thrive in, and that which the orange stock seems to thrive in?—Generally the orange stock can give better success in soil which you might class inferior, that is, of a stiffer nature, more clayey.

11557. And the lemon seems to be successful where the soil is of a lighter character?—Yes, more sandy. The lemon generally delights in a very freely-drained situation. It cannot stand stagnant water at all.

11558. In planting out originally, would you use orange stock in any case, no matter whether the soil were clayey or sandy?—I should most decidedly prefer orange stock, because I also believe that the quality of the fruit is improved through being budded on orange stock.

11559. Have you any experience of the cumquat as a stock?—Yes.

11560. What is your experience of that?—It is a very small-growing tree, and the fruit is only fit for preserving purposes, but it gives an exceedingly nice preserve.

11561. Is the stock suited for the orange?—On account of its dwarfish growth, I should not recommend it. It might do very well for experimental purposes where a man desires to have the greatest amount of varieties in the smallest space, but not for general purposes.

11562. With regard to the bark disease, do you think that oranges grafted are more susceptible to the disease than oranges budded?—I do not think so, provided they are budded high enough.

11563. It is frequently the case with nurserymen to graft near the ground?—Yes.

11564. Do you think that grafting near the ground enhances the danger of securing the bark disease?—I am positive of that.

William Sturm, *continued*, 22nd Oct., 1889.

11565. You think that budding is safer in all cases?—Yes, on account of the graft being placed too low to the ground, or in some instances even below the ground. The first thing is to get the stock to take well, and they usually can exclude all air with earth; but generally with unexperienced persons it is the custom to plant oranges too deep, and it happens that the place where the scion is inserted is covered with earth; now the sap cells are generally of a more tender nature near the ground, and they get covered and are consequently injured.

11566. You believe that deep planting is the chief cause of the bark disease?—Yes.

11567. Do you know of any cure?—The only cure to my knowledge is lifting the tree, and, if the injury has not gone too far, burning the injured part.

11568. How would you do that?—With a hot iron; where this disease appears there is a fungus growth.

11569. And would you apply any remedy after burning it?—Any insecticide wash which is calculated to destroy fungus growth would suit.

11570. Would you apply wax?—Yes, afterwards to close the wounded part; should the wound be very large, tar can be employed to cover only the woody part, but it should not touch the bark at all.

11571. Is not the wax better?—Tar has a tendency through the creasote to kill the wood to a certain depth and excludes insects. You see, large ones are very expensive to cover if they are treated with wax—tar is the cheaper article to apply.

11572. Is it coal tar you would apply?—Yes.

11573. Would you adopt both burning and raising, or would you only use one of those remedies?—Both.

11574. Would you apply the burning without raising the tree?—It would be no use, unless the earth can be removed from the trunk. I speak of the most serious cases where the orange is put a foot or 9 inches too deep.

11575. What is the effect of lime upon the orange?—It generally improves the health of the tree; in general, there is a tendency to bring it into better bearing.

11576. In the event of the soil being deficient in lime, would it be necessary to manure with lime?—Yes.

11577. Has the soil here sufficient lime?—It has an abundance.

11578. What did you mean by the "sap cells"?—I mean the sap wood.

11579. About the lime, which seems to require the most lime—the orange or lemon?—I think the orange.

11580. Would you describe the varieties that you have seen to be profitable in Australia?—The Emperor and the Thorny mandarins. Citrons are grown in Queensland to a certain extent. I have not found them very profitable.

11581. What other oranges?—The Siletta and the Queen; they are both good. The Parramatta and the Teneriffe.

11582. The Australian navel?—I would exclude that on account of its being such a shy bearer.

11583. The St. Michael?—That is one of the best.

11584. The Maltese?—I do not think it is useful for general purposes; on account of its colour, people have an objection to it, but it is a very good eating orange.

11585. Are the mandarins good grafting oranges?—Yes; and the tree is hardier than the orange, and stands a colder temperature. It is a dwarf and comes into bearing earlier.

11586. Can you say what amount of frost an orange will endure?—It generally depends on the state in which the tree is. We, here in Australia, are generally blessed with an amount of moisture in the autumn, but if the previous season has been dry it starts the orange into growth, and that of course in a growing state a slight degree of cold is sufficient to injure the young wood.

11587. Only that?—Yes.

11588. And that is not highly detrimental to the tree?—To young trees it proves to be a very serious check.

11589. And the old trees?—Not so severe.

11590. What degree of cold would be, under those conditions, fatal to a tree?—Freezing point—not fatal, but highly injurious. I consider that the orange tree in a good healthy condition in a dormant state will not suffer any injury if the temperature sinks down to 27° or 28°.

11591. Have you had any experience of frosts in this district of a dangerous character to the orange or lemon trees?—The winter before last was a rather severe one and has frozen the young growth which had just come out.

11592. Not to do any serious injury?—No.

11593. Not even to the young stock?—No.

11594. Do you think this district is specially suitable for orange and lemon culture?—I think as far as Victoria is concerned that it is very good.

11595. The northern districts of Victoria?—Yes.

11596. Do you regard shelter as necessary?—Indispensable.

11597. What means would you suggest as being most suitable for providing shelter where it does not exist?—It is rather a hard question to answer. As far as Mildura is concerned, we are trying to grow the *Cupressus macrocarpa.*

11598. With reference to native timber, do you think that belts left here and there are desirable?—Yes.

11599. As a means of shelter?—Yes. I have found that oranges grown in an exposed position not only suffer in their growth but also the fruit is of an inferior quality; the rind is thick and the pulp is increased.

11600. What is your opinion of the laurel as a shelter plant?—The laurel I would not advise; first and foremost, it is a bush that would not grow high enough and extend its sheltering influence far enough, and the trials of laurel here have not been a success; it is an exceedingly slow grower. It does not stand the amount of heat we have here.

William Sturm, *continued*, 22nd Oct., 1889.

11601. You want quick-growing trees, such as the sugar gum?—On small holdings I object to all the native gums on account of the roots having an injurious influence on everything they touch.

11602. What would you recommend?—Any of the cyprus, like *Cupressus macrocarpa*, *Cupressus torulosa*, and *Cupressus goveniana*.

11603. Is not the *Cupressus macrocarpa* not very short lived grown from seed?—It has proved so in the colonies. I should recommend a variety grown from cuttings—the *Cupressus lambertiana*, the *Cupressus sempervirens horizontalis*. We are trying to find out ourselves which would be best for shelter.

11604. Have you any knowledge of any of the privet family; would any of those be suitable?—They are too low.

11605. Have you any experience of the olive as a shelter tree?—Yes. I consider that is a very good break-wind, besides yielding sufficient fruit to pay the interest of the land they occupy.

11606. You think the olive one of the most suitable?—Yes. The only objection I have is the long time that it takes the olive to grow; it is in its infancy of very slow growth.

11607. Have you tried the Osage orange as a hedge?—Yes, as a hedge; but we want something growing 30 or 40 or 50 feet high; the higher the better, to extend the shelter as far as possible.

11608. As to orchard fruits, have you had any experience of prunes?—Very little of prunes; what experience I have was mostly gained in Germany.

11609. Can you give any information on that subject?—My information on that point will be rather scanty.

11610. What other fruits have you had experience of?—Figs, apricots, peaches.

11611. As to the fig, can you give any information as to that, the best method of preparing, the planting the varieties, the distance apart, and the method of cultivation?—I consider the fig pre-eminently adapted for cultivation in Victoria in the northern districts; it is a tree which responds well to the influences of irrigation and it will bear any amount of drought. The mode of propagation is generally from cuttings. The soil should be prepared in the usual manner by subsoiling to a depth of at least 18 inches. Trees may be with safety, even with increased success, planted deeper than they have previously stood in the nursery rows, to encourage increased root formation. The distance apart I would recommend to be 24 feet each way. The most economical way is the septuple system. Of course I have no experience about the white Adriatic fig. I have seen figs dried in South Africa. The varieties which were used were the Black Ischia and the White Genoa.

11612. Both of which we have here?—Yes. No figs are dried there for export, and I consider they are an article of a very inferior quality. I have no experience in Australia about fig drying.

11613. Have you had experience in the varieties we have here?—Yes.

11614. What are the best varieties that we have in this colony?—For drying purposes, I think I would recommend the Smyrna, the Ischia, and the White Genoa. William Sturm, *continued*, 22nd Oct., 1889.

11615. Any others?—No.

11616. Is there any other method of propagating fig cuttings?—From eyes, but it is only profitable for increasing new varieties.

11617. Is the fig liable to any insect or fungoid pests?—I have never seen it infested with any disease or pests whatever.

11618. On that account, it is extremely useful to those who have not had experience in horticulture?—Yes; a little or no pruning is required.

11619. How would you apply water to figs; what method of distribution?—Generally by sepage, by furrows.

11620. You have no experience of preparing them for market?—No.

11621. What is your opinion as to the suitableness of this settlement for fig drying?—Very well adapted.

11622. Have you had any experience of the growth of the fig here?—Yes, during my stay here I had part of the care of the station garden, and the figs planted there are doing exceedingly well.

11623. As to the apricot and the peach, what are the best stocks for those?—I always consider that a stock of the same kind is decidedly the best.

11624. Does that apply to all soils?—No. It is often desirable and profitable to grow apricot trees in a class of soil that is naturally not adapted for it, that is to say, where the soil is of too stiff a nature. I would in that case advocate the plum stock. A tree so treated is not so long lived of course. The peach may occasionally be used as a stock also for the apricot.

11625. Does not that make a very good stock for the apricot in a dry district?—Yes, but I prefer the apricot on its own stock.

11626. What is your experience of the almond stock?—I generally found a tree lived very vigorously the first few years, but they are very liable to be broken off by winds. They do not seem to unite properly.

11627. As to the varieties of the apricot, which have you found the most suitable for a district such as Mildura?—The Moorpark—the varieties of the Moorpark type.

11628. Such as Hemmskirk?—Yes.

11629. Which is the better way of propagating—by budding or grafting?—Budding.

11630. Does that refer to the peach also?—Yes. Stone fruit in general succeeds best with budding, with the exception of the cherry. I have had some experience of the apricot drying on the Cape; they are dried largely there, and I can testify to the excellent quality and the good dish they make.

11631. Are the kinds you have met suitable for drying?—Yes.

11632. Can you briefly describe the method?—The method is of a very rough and ready kind. They are picked and put in a slow oven, and remain there until they are in a condition to be put in bags.

William Sturm, *continued*, 22nd Oct., 1889.

11633. Where are they sent to?—Intercolonial places, the diamond fields, and so on.

11634. Could you give an idea of the yield of apricots per acre?—That greatly depends first on the climatic conditions, the soil, and the situation.

11635. Could you indicate a fair average?—About £40 to £45 per acre.

11636. And the same for the peach?—If nearer market—well, peaches can be sold in a green state.

11637. What varieties of peach can you recommend as being profitable to grow?—It just depends for what purpose; peaches are also capable of being dried. I have seen them dried. They were all seedlings; no special varieties chosen. The custom in South Africa is to grow peaches from seed; chosen fruit is selected, and they generally come pretty true. Records of the varieties are not kept. All stone fruits have a tendency to come true.

11638. What varieties would do here?—There is the early and late Crawford, Maiden's Blush, Early Rivers, Royal George.

11639. Do you think peaches will do well in Mildura?—I think the peaches require even more wind-break than apricots.

11640. You think they will grow well here?—Yes.

11641. About the stock—peaches are very much subject to aphis blights—have you any experience of grafting them on stocks for the purpose of getting rid of those diseases?—No.

11642. They are liable to the aphis on all stocks?—Yes.

11643. Do you know any means of eradicating the aphis?—Only syringing with the insecticides used in the colonies—kerosene solution, with water and soft soap and tobacco water.

11644. Are you acquainted with the quandong that grows in the Mallee?—No.

11645. What is your experience of the blight; does it rise from the roots?—No.

11646. You have carefully looked into that?—Yes, certainly. Trees in a diseased condition are more liable to an attack of aphis or any other disease than vigorous healthy trees, so the grower's aim should be to always keep his trees in a healthy vigorous condition to help them to stand the attacks of all insect pests better.

11647. Does the aphis take shelter or breed in the roots of most of the deciduous trees—the apple for instance?—Yes, that is the apple aphis.

11648. Not the other?—Not to my knowledge. I think the apple blight is quite a distinct blight to the peach blight.

11649. Have you had any experience of apple and pear growing in the dry districts, or do you think this district will be suitable for their culture?—I would not recommend the cultivation of the apple in districts like this; not even with irrigation. I think in the cooler districts they can produce a superior class of fruit with less expense, and I think we should limit ourselves to those fruits that will give us the best results.

11650. What about walnuts and chestnuts and almonds? —I think the walnuts may be tried. The Spanish chestnut in my opinion will not stand the excessive heat of summer sufficiently well to prove profitable. The almond is undoubtedly well adapted for this district. William Sturm, *continued*, 22nd Oct., 1889.

11651. They might be used as a break-wind?—They might be used as a break-wind.

11652. Is there any other point you would like to bring out?—Pears, I consider, may be profitably grown in the north, provided proper varieties are chosen. Up till now it is a matter of experiment, but I firmly believe that pears will eventually prove a success. Pears also may be dried; it is largely done in Germany.

11653. Can you indicate the varieties that would be suitable for a dry district?—My experience in a dry district has been too limited to give a definite opinion as to pears, besides we have no trees in a bearing state, except one which I do not know the name of. I think it is the Vicar of Wakefield. I should strongly advise intending planters to plant the sweet potato.

11654. You think that it would be suitable for this district?—Yes, I think it will eventually be a substitute for potatoes.

11655. Will you describe the method of planting and culture?—In the early spring, tubers are procured by means of a hot bed or dung heap; force the growth. As soon as the shoots are large enough, say, 6 or 8 inches long, cuttings are made about 6 inches long, inserted into the ground about 4 inches deep, leaving about 2 inches over the ground. In a dry district I do not approve of planting in thrown up ridges, on account of the rapid evaporation.

11656. You would plant on the flat?—Yes.

11657. What distance apart would you plant the cuttings?—The rows 4 feet apart, and 3 feet in a row. The after cultivation will consist in irrigating, cultivating, and pegging down shoots.

11658. What is the object of pegging down shoots?—To produce more tubers.

11659. When may they be gathered?—There are different varieties, but when planted early, some come to maturity in about three months growth after planting. The others again require six or nine months.

11660. Are they dug up in the usual way?—Yes, with a fork, just the same as ordinary potatoes.

11661. As to figs, are you acquainted with the White Adriatic?—I have no experience of that.

11662. Or the White Marseilles?—No.

11663. You do not propose to give any information about vines and raisins?—I have a very good experience amongst grape vines, because the Cape is pre-eminently a vine-growing country.

11664. You have had some considerable experience there?—Yes, I have seen raisins dried. I have planted vineyards, but I have never had anything to do with the making of wine.

William Sturm, *continued*, 22nd Oct., 1889.

11665. What are the varieties grown in the Cape for raisin making?—Raisins are made from a variety called the Honey Pot, very similar to our Tokay I should say.

11666. Have you identified the grape in this colony?—No, I consider our varieties of grape—the Gordo Blanco and the Hardy's Muscatel—are more suitable than the varieties I have seen in the Cape.

11667. Do you know any other Australian varieties you can recommend as suitable?—I think those two will be the best success.

11668. Have you had any experience of others?—No.

11669. The Sultana?—Yes, the Sultana; I have seen it fruiting. I have never dried any Sultanas myself.

11670. What is the method adopted for growing?—I consider that the trellis will give a greater yield for all raisin grapes.

11671. What method of pruning would you recommend?—The French system on arms; the shoots I prune at 18 inches, two arms; they have the shoots 18 inches apart.

11672. Would you treat all vines alike?—No.

11673. Have you any experience of the Zante currant?—No.

11674. As to providing shelter for the orchards, you condemned the growing of native trees close to orchards?—Yes.

11675. We presume you referred to planting rows of those trees around orchards, such as ten-acre blocks?—Yes.

11676. But we were thinking more about providing shelter belts for the entire district—your objection would not apply in that case?—No.

11677. You think some of the tall-growing timber, such as the sugar gum and others, would be valuable used in that way?—Yes, undoubtedly.

11678. Not quite close for the roots to reach the blocks?—No.

11679. The sugar gum is being planted here in the avenue?—Yes, in the Deakin-avenue.

11680. For that purpose you think they will serve well?—Yes.

11681. Your objection was to allowing them to be put close to orchards?—Yes.

11682. You have seen the Bergamot lemon growing?—Yes, I think it is a distinct species; it is called *Citrus Bergamotta*.

11683. Where have you seen this growing?—In Italy.

11684. Is it extensively grown there?—I have seen pretty large orchards.

11685. What is it used for?—To make perfume—the essence of Bergamot.

11686. You have not seen it in the colony?—No.

11687. Is it a tree that would grow well in the colonies?—Yes.

11688. And treated in the same way as the ordinary citrous family?—Yes.

11689. You think it it would grow at Mildura?—Yes.

The witness withdrew.

Charles Loftus McGuirk, examined.

11690. *By the Commission.* — You are a settler of Mildura?—Yes. C. L. McGuirk, 22nd Oct., 1889.

11691. How long have you been here?—About fifteen months.

11692. And you have been engaged in what cultural industries?—Mostly growing kitchen vegetables, until the last few months. I have started on my own place.

11693. Vegetables, sorghum, maize, and such?—Yes. I have made a rough list of what I did grow:—"Cabbage, cauliflower, lettuce, turnip, carrot, celery, parsnip, pease, beans, tomatoes, onions, beet root, potatoes, thyme, sage, parsley, mint, rhubarb, pumpkin (New Jumbo and Mammoth, 56 to 80 lbs. weight), pie melon (half-a-ton, produce of one seed), sorghum (Planter's Friend), amber cane, maize (90-day), millet (French); also sweet maize, Dolly Dutton mangolds, sorghum, (produce of one seed 5 lbs.); linseed also can be grown."

11694. Was that without forcing?—Yes, without manure.

11695. What has the result generally been with all those various plants?—Very fair to good.

11696. And some very good?—Some very good.

11697. With irrigation?—Yes. That was only limited at that time.

11698. The water supply at that time not being complete?—Just so.

11699. Take sorghum—how much sorghum, how many acres?—About an acre and a half.

11700. Does that include the amber cane?—No. I only grew that—a few plants.

11701. When was the sorghum planted?—In October.

11702. Was it drilled?—No, broadcast.

11703. How often was it watered?—About once a month; sometimes I got the water over it and sometimes I did not; partially watered every month.

11704. Did you prepare the seed-bed by means of irrigation—did you water before the sowing?—No, pulverized it all down with a harrow until I got it level and harrowed, and then let the water over it, or rather at that time, just as I sowed it, there was a change—there was rain, and it just started it, and then I put the water on.

11705. How long was it till you cut the first crop?—In five weeks.

11706. What height was it then?—Three feet.

11707. You cut it for the purpose of green fodder?—Yes, for horses chaffed it; then I found it was not first-class food, it being too young, for the horses gnawed the rails and sticks about the yard until I mixed one-third dry maize straw, and found it was excellent. I came to the conclusion that that required something dry, so I cut these dry maize sticks. When I used to feed with this before I used to carry it out in the paddock, and there was plenty of dry grass then, but there was no dry grass here last year, so the dry maize acted instead; but afterwards when it matured and got up into seed it required nothing. It is excellent feed.

C. L. McGuirk, *continued*, 22nd Oct., 1889.

11708. When was the second cutting—how long afterwards ?—I simply kept cutting the heavy parts of it until it beat me. The crop beat me several times, and then I had to cut it all down and sold it principally as dry hay.

11709. How many cuttings did you have over the whole area ?—I think I must have cut some a dozen times, and all of it eight, and left a fair crop standing then.

11710. Did you get as much as 3 feet every time you cut ?—Yes, and 7 and 8 feet in some places, it was perfectly astonishing.

11711. What length of time, that is when did the last cutting take place ?—It extended till the frost came on; that would be in June or the latter end of May.

11712. When was the first cutting ?—About from the beginning of November till June, and the more you cut it the more it grows, and the thicker.

11713. And the water was applied after each cutting ?—Yes, if it is possible. Of course there was no regularity with the water then. I could not give you any idea when it was watered. I watered it when I could get the water.

11714. It must have been a very heavy yield off that piece of ground ?—I was often sorry I did not keep a record of the weight per acre.

11715. Did you regard it as a heavy weight ?—Yes.

11716. Have you ever seen as heavy before ?—No. I have grown it at Wagga without irrigation—it fairly astonished me.

11717. Then you mentioned maize, how much maize had you ?—About an acre of that.

11718. Was that all sweet maize ?—The 90-day maize, and about half-an-acre, I suppose, of sweet maize.

11719. Did you use that for fodder or for grain ?—For fodder; I cut it up and mixed it with sorghum all through the season as long as it lasted, and I sold it readily for horse feed.

11720. Was that as satisfactory as the sorghum ?—Yes; there was only the one cutting. I did not put the maize in till Christmas time, about November.

11721. And let it grow right up till it came into cob ?—Yes.

11722. Did you save the seed ?—No, only one cob, about a foot long, covered densely with seed.

11723. What is your opinion as to the relative merits of maize and sorghum as a fodder crop—which do you prefer ?—I think I prefer the sorghum, if I had to choose.

11724. Why ?—I have a cow, and giving an ordinary tubful of feed of sorghum at night makes a difference of twice the butter and milk—it doubles the quantity.

11725. And the same quantity of maize ?—Then green maize chaffed and mixed with it improves it still again, for some reason I do not know.

11726. Would the maize not be as good ?—No, not in my opinion.

11727. You do not make any into ensilage ?—No.

11728. Have you lucerne ?—No.

11729. Any other fodder crops ?—I grew French millet, but it was so bitter they would not eat it, it was a mistake in the seed. I got the French millet instead of the Pearl. The seeds are very much alike, and I grew an immense crop of that, about half-an-acre, and everything attacked it ravenously for a mouthful or two, and then they could not be induced to touch it on any occasion; but there was an immense crop of seed and it was valuable for the fowls.

11730. In planting the maize did you drill ?—Yes.

11731. What other treatment did you give to that ?—I simply did nothing to it except drill it in, earthed it up, and watered it.

11732. At what stage did you earth it up ?—When it was about a foot high.

11733. Was it watered as frequently as the sorghum ?—Yes.

11734. How far apart were the drills of maize ?—About 2ft. 6in.

11735. And in the drill was the seed continuous ?—Yes. They might average about 3 or 4 inches apart.

11736. Did you take any of them up after they came up ?—No, except I pulled a few out of the thickest part.

11737. Was there any preparation of the seed before sowing ?—No.

11738. Did you steep the seed before sowing ?—No.

11739. You mentioned amber cane ?—That was a little patch. I do not fancy it so well as the sorghum, it may be only a fancy. I had not much of it. I did not fancy the appearance of it. It does not grow so fine and flaggy. You could make better hay from the sorghum.

11740. You would not like to express a very definite opinion on that point ?—No.

11741. Have you any quantity of rhubarb in ?—I got the seed last autumn, and it is fit to pull after being planted last winter—raised from the seed; it is fit for use now.

11742. Is the crop satisfactory ?—Yes.

11743. How did you get on with tomatoes ?—Very well. They yielded abundantly, several sorts without any trouble.

11744. How did you plant them ?—Just simply put them in the seed-bed, and replanted them out all the year round.

11745. What time did you sow the seed ?—I sowed a little in October, and several lots through the year, and transplanted them out. In fact they can be made to live here all through the winter; the plants fruit again in the early spring.

11746. What is the earliest date you could get tomatoes here ?—I cannot say that yet.

11747. Have you much of an area of root crop in ?—No, two or three roods mangolds.

11748. What time were they sown ?—December; sown broadcast.

11749. They were not worked afterwards ?—Not touched afterwards, only the water thrown over them occasionally.

11750. Did they turn out satisfactory ?—Yes.

11751. Do you know the weight of any of them ?—I could not say. I had long red mangolds a foot to 15 inches.

C. L. McGuirk, *continued*, 22nd Oct., 1889.

11752. Is that a system that you would recommend ?—Oh, no. It was only a makeshift. I would recommend drilling everything, even wheat.

11753. Do you think those root crops could be grown profitably here ?—Yes.

11754. Have you put out any this year ?—Not yet.

11755. You would recommend what portion of the year for them to be put out—what month—September ?—No, not so early. I want to prove a lot of these things yet. Mangolds succeed better when we get a cool autumn, the same as turnips.

11756. Onions succeeded with you ?—Yes ; those were all grown in small patches.

11757. Did you bulb any of the onions ?—Yes.

11758. What time were they sown?—In October, tree and potato onions; the others were later. They were smaller, they were the red brown Spanish.

11759. Pumpkins and all kinds of melons grow well ?—In fact tons of them there went to rot.

11760. What system would you recommend in the growing of those ? —Plant the seed and let them rip.

11761. Would you plant them in drills along the channel banks ?— That is a good plan, but anywhere you can get the water round them or through them.

The witness withdrew.

George Christopher James, examined.

G. C. James, 22nd Oct., 1889.

11762. *By the Commission.*—What are you?—Manager of the nursery for Chaffey Brothers.

11763. How long have you been in the district ?—About five weeks.

11764. Where were you previously ?—At Parramatta.

11765. You have had experience in orange culture there ?—Yes, all my life time in that district and the surrounding locality.

11766. Would you like to describe briefly your ideas as to orange culture ?—In what particular branch ?

11767. Take the raising of the young plant—the method of preparing the soil—the transplanting and culture and so on?—The soil, of course, should be prepared in the usual way, trench about 12 to 18 inches, that is about the usual depth at Parramatta.

11768. Do you mean the usual method of trenching ?—Just surface ploughing.

11769. Subsoiling, not trenching ?—Yes, you do not bring the subsoil to the surface. It is not suitable for our soil over at Parramatta. In procuring seeds, of course, every precaution should be taken in getting the proper kind, in selecting full grown early fruit and obtaining from the fruit the choicest seeds, rejecting all the smaller shrivelled up seeds.

11770. Would you recommend planting a grove with seedlings ?— I will treat of that directly. Apart from the growth of the young

plant we sow the seeds in drills, in beds about 3 inches under the surface—we leave them in that state. There is an orange and a common lemon. At Parramatta we almost exclusively use the common lemon for stocks.

11771. Do you regard that as a good stock?—As the best. I myself have been experimenting on the most suitable kind of stocks for the last 20 years, and I have made that a particular study.

11772. You recommend the common lemon as the best of all kinds?—Yes, the best of all kinds.

11773. Better than the seedling orange?—Yes, better than the seedling orange. The seedlings, after being sown, are left in the beds for twelve months before transplanting.

11774. What distance apart are the drills?—That does not matter how close they are—sow them as thickly as you like.

11775. Are the seed-beds protected from the heat?—Yes, we shade them. The cheapest way is a bush covering at a height of 2 feet or 2½ feet above the ground. At the end of the year we then transplant them into rows about 2 feet apart, and the plants about 4 to 6 inches, on the average about 6 inches, apart. We leave them in that state for twelve months and then we bud—we prefer the budding to the grafting. Budded tree plants are more vigorous and earlier through than grafts and not so liable to the collar disease. The common lemon is the seed that we sow for stock principally.

11776. Your statement as to the superiority of the lemon stock applies to your experience in the chief orange-growing districts of New South Wales?—Yes.

11777. You are sure of the superiority of the lemon stock in this district?—Yes.

11778. You have experimented in different soils in those districts?—Yes.

11779. You do not say that the orange stock would not be suitable in other places?—No. It may be preferable in this locality.

11780. Have you seen the orange stock liable to the collar disease in New South Wales as well as the lemon?—Yes; in fact that takes it with us before the lemon stock.

11781. What is the objection to the orange stock?—The lemon is preferable to the orange; it is a far better rooted plant and throws out more roots and fibres than the orange, and is hardier in transplanting; and, of course, is of more vigorous growth than the orange.

11782. Would you describe the soils in those districts?—The soil in the Parramatta district is of a stiff clayey nature.

11783. Differing very much from the soil here?—Altogether different.

11784. Here it is free sandy loam?—Yes.

11785. The climate of the orange districts of New South Wales is a coast climate, comparatively?—Comparatively.

11786. Although pretty dry in parts?—Very dry in Parramatta.

11787. But irrigation is not practised?—No, we do not irrigate at all.

G. C. James, *continued*, 22nd Oct., 1889.

11788. That shows it is a moist climate, because you could not grow oranges at Mildura without irrigation?—The rainfall is altogether different here. I have had the sending over for the company of something like 25,000 trees for the last four or five months to Mildura, and since coming over I have examined all the trees sent over and I find that all trees grafted or budded on the lemon stocks are in a far healthier condition and look better than those from the common orange—the Seville stocks. As they are now in the plantations, they are far and away better than those budded on the common orange and Seville stocks.

11789. As to the life of the tree on this lemon stock, what is your opinion as to that?—As to the life, I find the orange grafted on the lemon lives longer than that grafted on the orange, I have thoroughly tested the matter in three different localities, in the Illawarra district, the Parramatta, and Dural, which is part of the Parramatta district, and in every locality the lemon stocks live the longest.

11790. Does it influence the class of fruit at all?—No, it does not; in fact I think the quality of the fruit is rather better than that from the orange or Seville.

11791. Will you take up the point about budding and describe the method of treating the bud after inserting it?—We simply insert the bud in the ordinary way, and bind it up and leave it. We generally bud in autumn; of course you can bud at any time when the sap is up in the tree.

11792. Do you use any wax?—Nothing at all.

11793. No special tie?—Yes, you want to tie to the bud not from it.

11794. But no special material?—No.

11795. Now the after treatment?—We bud in autumn and leave it until spring, and in the spring, as soon as we find the bud beginning to shoot, we cut right back to the bud.

11796. Is there any danger of the bud striking in the autumn?—No, very rarely; it simply unites with the other bark.

11797. You guard against that if possible?—I do.

11798. Now as to transplanting; what is the most favorable time for transplanting?—With us July and August; that is before there is any possibility of the tree forming any growth. If you leave the tree till it becomes too dry you lose the growth of the tree for that year, because of the check it receives through the transplanting.

11799. Do you try autumn planting during April and May?—No, not to any great extent.

11800. You do not recommend the transplanting of trees in silent bud?—No.

11801. As to the method of planting after the ground is prepared in the usual way?—Care should be taken first of all in lifting trees, as the success of the tree depends to a great extent on a proper way of lifting. The method we adopt in lifting trees is to have a man on each side with a spade and put the spade under and both lift at the same time

from each side, and in planting it we have the soil thoroughly loosened up all round the hole where the tree is to be planted, and the roots laid out in the direction in which they have a tendency to go, and not planted too deep; that is special danger that must be guarded against.

11802. What are the evils likely to arise from planting too deep?—The collar disease.

11803. The chief source of that is in planting too deep?—Yes, if you plant them too deep and allow water to stagnate about the roots of the trees; those are the two chief causes of the collar disease.

11804. Do you recommend pruning or cutting back?—With young trees I would not recommend cutting back if the roots are lifted properly; but if the roots are injured, of course the tree must be cut back to meet that.

11805. Well it almost invariably happens when trees have to be sent a long distance with orange stock, the roots do suffer?—If the roots are properly protected they suffer very little; in fact, they should not suffer at all if properly packed.

11806. Wherever the tree shows signs of injury you would recommend cutting back?—Yes.

11807. Do you favour the stripping of the leaves?—No, I do not.

11808. As to the transplanting of young trees—the seedlings—would you recommend taking the tap of the root off?—No; it is not advisable to interfere with the tap root of the young seedlings. If it goes straight down it may be turned or the very end clipped. We do the same in planting trees into the orchard. If the tap root has a tendency to be too long to go down we just clip the end off.

11809. That would be only in extreme cases?—Yes, the rule is not to interfere with the tap root, more particularly in young trees planted out for budding purposes.

11810. What distance apart do you favour in planting?—Six inches, and the rows 2 feet to 2½ feet apart; in permanent planting 20 x 22. When the trees are young, as a rule, we sow wheat or barley or oats all through between the trees, keeping at some distance from the tree. That is done because it cannot possibly interfere with the growth of the tree, and it acts as a shade and a break-wind to the trees.

11811. And you keep the soil regularly stirred round the trees?—Yes, you should not let the soil cake or harden round the trees. That is very important, even close up to orange trees, taking care not to injure the roots by not working too deeply. They plant where they can get proper drainage because that is a great point in planting young trees.

11812. You spoke of shelter; is not that very important for citrous stock?—Yes, for all kinds of orange trees.

11813. What method would you recommend?—The hawthorn is one hedge that is reared round a couple of acres in the Illawarra district.

11814. That would be unsuitable for a dry district?—Yes, but in a district like that it forms an excellent hedge; I do not know any better. The roots in no way interfere with the trees.

G. C. James, *continued*, 22nd Oct., 1889.

11815. Do you find the passion fruit grown as a shelter?—It would form a very good protection, and I think this district would be very suitable for that vine.

11816. How would you plant it?—A kind of terrace work round the boundary, and train the vines round this trellis work. It can be done very cheaply in a rough way; a few ordinary bush posts put in the ground and just battens or small bushes of trees nailed from post to post.

11817. And the passion fruit is very profitable?—Very profitable.

11818. Can you indicate its value?—About 10s. a case with us, and, in the winter time, as high as £1 a case in the Sydney markets—30s. a case last year.

11819. That is more valuable than oranges themselves?—Yes.

11820. And they are easily grown?—Very easily, little or no care being required.

11821. What age are they before they come into bearing?—About three or four years. It all depends upon the kind of soil they are planted in, and the age when planted out.

11822. What variety is suitable?—Just the *passiflora edulis*—the ordinary one.

11823. Has any effort been made in the orange districts to provide shelter belts throughout the whole district?—No, there is not a single orchard that has a shelter belt except our own, and we use the loquat tree by planting a row of trees round the windy quarter of the orchard.

11824. The loquat is also of commercial value?—Yes, it forms a very good shelter and is profitable also.

11825. They would be suitable for this district?—This district would be specially suited for the growth of the loquat, and it is a tree you can plant very close without injury; the branches can intermingle without injury to the trees.

11826. What distance apart would you put them?—About 6 feet apart.

11827. And more than one row?—One row only.

11828. Will you give us your opinion as to the yield of the orange tree—the average yield?—In a good orange grove the trees will yield on the average about four cases each.

11829. How many oranges in a case?—They range from ten to sixteen dozen. It is the gin case used by the fruit-growers I refer to.

11830. Could you indicate the number of dozens that a tree would average per annum?—About 60 or 70 dozen, there are trees with 100 and 120 dozen and even higher; but I speak of the average.

11831. What age do they yield at?—In the grafted trees five or seven years; and they yield before that a little, and come into profitable bearing about seven years old.

11832. You now speak of the unirrigated district of New South Wales?—Yes; the grafted trees will commence to bear at five years. The seedling ungrafted will not commence until seven to nine years.

11833. Twenty feet apart, how many trees to the acre?—About 80 trees to the acre—70 to 80.

11834. What price do you get per dozen in the Sydney market for the oranges?—It all depends on the season. A fair average is about 4d. a dozen.

11835. That is about £1 a tree?—Yes, that is what we average. We always base our returns on that—£1 a tree.

11836. Eighty pounds an acre?—Yes, there is one orchard I should like to refer to, I planted for a gentleman in Illawarra, he allowed me two acres to plant on. I planted one and a half acres with seedlings, it is the only orchard in the district. I planted them in the ordinary way and the trees now, I suppose, average in height from 25 to 30 feet.

11837. How many years ago?—Fifteen years, they are very large-bodied trees, and very heavy croppers of the best quality. I have never seen in the whole of New South Wales a better quality of fruit or a better tree. I believe it is the best orchard to-day in the whole of New South Wales, grown from a seedling.

11838. How do you account for that?—It is the soil; it is a deep, dark, loamy soil.

11839. Well drained?—Yes.

11840. Was the seed specially selected?—The seed was specially selected from our own orchard.

11841. Do you know the name of the varieties?—Yes, the St. Helena, the Teneriffe, and the Parramatta.

11842. Are those all those good varieties?—Yes.

11843. Would you tell us the other varieties that are regarded as profitable?—The Silletta, St. Michael, the Queen, and the Navel. The Navel with us is not a sure bearer, not a regular cropper. Some seasons the tree crops very heavily and others just the reverse.

11844. Is the fruit of greater value?—Yes.

11845. What are its relative merits in that respect?—The Navel is a better flavour than the other orange.

11846. What price would you get?—You get at least one-third more than you do for the common orange. The Navels are never less than 7s. to £1 a case; we get that in the Sydney markets for them.

11847. Have you found mandarins profitable?—Mandarins, the Emperor, are very profitable and very heavy croppers.

11848. Are any of the others valuable?—Yes, the Thorny and Canton are fair croppers, but fruit not of so good a quality.

11849. In regard to second growth, have you had any experience of that—I hear them speaking of second growth?—It is second crop, but of course it is a very small crop—very few in comparison with the regular crop. The second crop does not average more than about five dozen a tree.

11850. Have you made use of that crop, or use the flower for perfumery?—Only make use of the fruit; the flowers have not been used for any purpose whatever in the New South Wales district in that respect, and the second crop of course is coarser and not so valuable, nor has the flavour or juice that the ordinary crop has—it is a drier fruit.

G. C. James, *continued*, 22nd Oct., 1889.

11851. In speaking of the crops, you mentioned from five to seven years as being the time of coming into bearing?—Yes, for the grafted trees.

11852. You speak of profitable returns then?—Yes, they may bear earlier to a small extent.

11853. You are not acquainted with the earlier growth of the orange in a hot climate under irrigation?—No.

11854. Do you suppose there will be a difference in a district like this—earlier returns?—Yes. My opinion is so far you will get earlier crops here. The district, I think, will produce a quicker tree and earlier growths. The growth seems to be more rapid here than with us.

11855. And you believe, on the whole, that this will be a very suitable place for orange culture?—Yes, I do not think it would be possible to obtain a more suitable locality, care being taken, of course, to procure suitable sites for the planting, having an eastern aspect as much as possible—a gentle slope to get the early sun—that is a very important thing with the orange.

11856. In the event of local markets being over supplied, will there be any difficulty in exporting oranges to other markets—Europe, for instance?—Not the slightest. We have sent home several shipments from New South Wales to Europe.

11857. Were they successful?—The majority. It was through not thoroughly understanding the packing system that some were not successful.

11858. Has the system of packing become thoroughly understood now?—Yes.

11859. Will you kindly describe it briefly?—First of all, we have to be very careful in selecting the orange for packing—that the skin is not injured or pricked in any way with the thorns or any way diseased. Get a thorough clean wholesome skin, and in packing the orange not to handle it at all; cut it off with clippers and drop it into a little bag, held for the purpose—a bag or net.

11860. Keeping the oranges from bruising each other?—Yes, and even handling, without possibility of bruising, injures the orange for packing purposes; each orange is rolled carefully in tissue paper, then packed in ordinary packing cases, before shipping. There are rooms in the vessel of an even temperature, so that climatic changes will not interfere with the orange.

11861. Not in a frozen chamber?—No.

11862. But kept cool?—Yes.

11863. And there is no doubt that it can be successfully done?—No doubt. It has been proved beyond a doubt by several of us in the Parramatta district, who send oranges to the English market.

11864. Have you any experience of the bitter orange?—Not more than growing it as a stock.

11865. It is not made use of for commercial purposes in New South Wales?—No, it is very little used.

11866. There are no bitter oranges sent to market from the New South Wales district?—Yes, but they really do not pay for the trouble of

picking. I saw the bitter orange sold in the market at 1s. 6d. a case—a beautiful orange. They are heavy croppers, and would be very profitable if there was a market for them. They are a very hardy variety. G. C. James, *continued*, 22nd Oct., 1889.

11867. It is simply a market that is wanted for them?—Yes. Little or no value is set upon them with us as yet—that is the value set on it.

11868. As to diseases?—What diseases is the orange liable to?—The scale and the collar disease. There are two scales that we have, commonly known as the white louse and the red louse.

11869. Is the white louse the cottony cushion scale?—Yes, something similar.

11870. Has it proved destructive?—Yes, some years ago. It is almost eradicated now from the oranges; the red scale is the worst with us now.

11871. What did you do?—Tobacco juice was the principal thing done, by spraying the trees; and lime, that has been used a good deal—that is the method adopted for the red scale.

11872. And also for the other?—Yes. Those diseases generally come on sickly or decayed trees, not a tree that is healthy and robust, they are not so liable to those diseases; and the first thing is to try to get the tree back to its original health, or else there is scarcely any possibility of curing the disease at all, because if you get rid of the disease it comes back immediately unless you get a tree into a healthy condition.

11873. You mention having imported a number of trees from New South Wales to Mildura for the company?—Yes.

11874. Is there any method adopted of preventing the introduction of those diseases?—No, only to see that no trees with diseases should be allowed. Nothing can be done to a tree that I am aware of to prevent anything of the kind. The only thing that we can do to keep it back is to take care not to send any diseased trees over.

11875. What method do you adopt for curing the collar disease?—The only thing we do, is simply to loosen the soil, or take the soil away from round the tree, and just slit the bark up—a perpendicular slit.

11876. Has the method of raising the tree been tried?—No.

11877. Not burning?—No, nothing but take the earth away from the injured parts and slitting the bark; in some cases it has cured the tree, and in the others it has had no effect, and the trees have died.

11878. Nothing has been done in regard to guarding against the disease, excepting that the taking care to select clean trees to send here?—Yes.

11879. You have not adopted any method of disinfecting?—No, nothing of that kind had been done.

11880. How can you secure that the trees are carefully selected?—When the trees are being lifted to see that they are not affected with any of those diseases, a person accustomed to trees, can tell that at once.

G. C. James, *continued*, 22nd Oct., 1889.

11881. Have you an agent of your own to see to that?—I was doing it before I came here. There were some few got here, and Mr. Chaffey thought they came from our side, although every precaution was taken to reject all diseased trees.

11882. You are not acquainted with any method of disinfecting the trees?—No. With such a quantity sending over at a time a few may get into the bundles, because nurserymen, as a rule, are not over careful unless they are well watched.

11883. Would it be possible to introduce legislation to compel people to desist from sending diseased trees out of their orchard?—The Parramatta Fruitgrowers Union is agitating at the present time for something of that kind.

11884. Would it be practicable to carry out legislation of that sort?—I think so. I think something of the sort should be done, because these diseases may be introduced into districts where they are not now in that manner.

11885. Is the lemon regarded as profitable as the orange?—Yes, equally as profitable—that is the Lisbon lemon.

11886. That is the only variety you grow?—We grow Persian lime, and the sweet lemon, but not in any quantity, and the common lemon is grown only for stocks. It is of no commercial value whatever.

11887. Do you know anything about the growth of the bergamot variety of lemon?—No. The only ones I have had experience in are the ones I have mentioned.

11888. Any citrons?—Yes, but they are not largely grown, because we have not a market for them. It would be very profitable if we had a market.

The witness withdrew.

James Matthew, further examined.

J. Matthew, 22nd Oct., 1889.

11889. *By the Commission.*—You are a nurseryman?—Yes, at Deakin Avenue, previously at Geelong—resident at Mildura for one year.

11890. You have written a paper?—Yes.—[*The same was handed in and is as follows:*—]

"It is becoming increasingly clear to those working and cropping mallee land that with suitable irrigation it is immensely productive. Without water it is comparatively valueless; but the elements of fertility latent in the soil manifest themselves instantly when duly supplied with moisture. Nothing shows this more than the promptness with which all kinds of cuttings strike. It has large power to form roots, and they are the source of plant life. Leaf growth is so rapid that it has scarcely time to get acclimatized, and the heat tests the tender tissue. Where mallee clumps have stood, the charred débris and burnt ash left behind make the soil rich, but dry as charcoal. Combined with a calcareous subsoil and due moisture, it is evident the ingredients of growth are then there in fullest measure. In a wheat paddock, the extra height and greenness of the crop tell where the mallee has been. Of course, the expense of clearing is greater than blue-bush land. It is not to be understood that blue-bush or sandy land are not in measure fertile too. The proofs are accumulating that what is generally known as mallee land, with or without trees on it, responds with amazing activity and fulness of growth to the application of water.

J. Matthew, *continued*, 22nd Oct., 1889.

"What we are able to grow at Mildura may fairly be taken as growable, with irrigation, over all the north-west corner of Victoria. The following experiences and observations are given as indications of what has been so far proved; but they must be taken as subject to more extended and varied trial:—

"Of vegetables, the growth of onions, cabbage, cauliflower, lettuce, without any manure is remarkable. Asparagus, okra, egg plant, cucumbers, rock and water melons, marrows, pumpkins do thoroughly well. Broad beans grow to fine stalk and flower, but rarely pod, presumably from the absence of bees. Carrot seed is very shy of starting, but those that grow are very good. Peas are only successful in the cooler months. Tomatoes are very prolific and large, and are available to the end of June. The Cape gooseberry grows like a weed.

"Of cereals and root crops, I have made no trial; but evidence of the rooting power of the soil is seen in the clumps of root and stalk that a single seed of wheat or oats spreads out to. I am of opinion that oats and potatoes should be left for cooler heavier lands, or attempted only in our cooler months.

"Of fodder plants, three kinds of sorghum tried, all did well—the amber cane especially. Brown millet grew to excellent heads, and this should be one of our industries, if open enough market could be found. The heat we have seems to suit it admirably. Egyptian lentils showed well on trial. Lucerne and maize I did not try; but I see them growing to profitable results all round.

"Of deciduous fruit trees, the growth of the apricot is phenomenal. Nectarines, prunes, plums, pears, apples, figs, quince, walnut once established show power of healthy growth. There is difference of opinion about the almond; both last season and this it has been a disappointment to me. The cherry grows to a good tree, but it is said not to fruit. Filberts and chestnuts are doubtful.

"Of evergreens, large breadths of orange and lemon have been planted. The date palm grows well, but is not expected to fruit. Seeds of the edible passion flower have been grown by me in an open seed bed, have withstood our night frosts, been lifted with open root, and are coming away well. The olive zone all over the world is a limited one as respects profitable fruit-bearing. I am surprised at the small number of Victorians who have ever seen an olive tree. The whole of the mallee region is well within this zone, and the greenness and growth of young trees here are worth seeing.

"It is the air more than the soil that makes raisins and currants. With a rainfall of 8 inches, and an average annual temperature of 65·7°, about 8° above that of Melbourne, this district should become the raisin district of Victoria. But, if the air is excellent and dry, the limy sub-soil gives also good foothold and promises abundant success.

"Of forest and ornamental trees, the following are doing well:—The elm, Oriental plane, English maple, American ash, poplars, ailantus, willows, white cedar, pepper trees, sugar gum. The blue gum, the linden, the Spanish chestnut are doubtful. The cork and Valonia oaks need trying. Arbor vitæ and Cupressus torulosa show excellent green promise. Pinus insignis jaundices all over, and is perhaps no great loss. But the Stone and Canary and Aleppo pines promise well when carefully transplanted.

"As you can understand, our time for growing flowers has not yet come. Notwithstanding, there is evidence to show that low crouching flowers such as verbenas, pinks, and bulbs like gladioli and the tuberose, will ripen very perfect colour and perfume. Some tuberoses when taken up by me had, big and little, from twelve to twenty new ones gemmating from them. This has a bearing upon the scent industry. Roses promise to do well. One great charm of our flowers is they are so seldom spoilt by rain, and the sunlight tints them so delicately.

"These facts and experiences are data in proof of the value of the mallee region. They go to prove that it can produce the finest and most profitable fruits of the world. From what I have seen of it in travelling, there are vast areas capable of reclamation. These lands should not be lightly parted with. Politically it should be realized, that under a comprehensive scheme of irrigation they might become a vast national asset, and the home of many a thriving family."

The witness withdrew.

Julius T. Grossman, examined.

J. T. Grossman, 22nd Oct., 1889.

11891. *By the Commission.*—What are you?—I am irrigating for Chaffey Brothers.

11892. That is looking after the water distributing?—Yes.

11893. What are the subjects upon which you feel that you could give us information—the distribution of the water, or the cultivation of fruit?—The cultivation of fruits in this part of the colony and in the Geelong district, and in the Gippsland district.

11894. You have had experience at those places?—Yes.

11895. How long have you been at Mildura?—About twenty months.

11896. Would you prepare a short paper on your experiences in fruit growing?—I will.—[*The same was handed in and is as follows:*—]

"I may preface this short paper by stating that I have been a resident of Mildura for about twenty months. Prior to that I had visited some of the finest orchards in New Zealand, the Canterbury Agricultural College, the gardens around Hobart and Sydney, and was engaged for ten years in fruit cultivation in the Geelong and South Gippsland districts of Victoria.

"On arriving at Mildura, I was particularly interested in gathering information from settlers who had plantations on a small scale in various parts adjacent to the Murray River.

"The principal fruits grown were the orange, lemon, peach, apricot, fig, and vine. Some of the orange trees ranged up to an age of sixteen years, and these, with the younger trees, appeared healthy, with vigorous growth, and were heavily laden with fruit. The varieties of the orange chiefly grown were the Navel, Cluster, Queen, and Maltese Blood. A lemon tree was pointed out to me which had yielded last season 275 dozens of fruit, which sold last season at 1s. 6d.; and at the time of my visit this tree was equally heavily laden.

"The apricot, wherever I see it growing, is in a flourishing state, all the trees having made wonderful growth, and set their fruit well though as yet so young. This fruit will be found as profitable for canning here as it is in California.

"The peach tree thrives well, giving fruit of more excellent character than I have seen elsewhere. This also will prove a fruit well adapted for preserving by the canning process.

"The fig tree we have ample proof of the suitability of soil and climate at Mildura, as I have never seen the tree flourish as well elsewhere.

"The apple grows well here, though not as yet much planted, the trees above mentioned, with the vine, being more popular with planters here. Varieties specially suiting this locality are Rome Beauty, and I expect the kinds found to do so well in South Gippsland—the London Pippin, King of Pippins, Rymer, Yates, Nickajack, and Sturmer Pippin—will also thrive at Mildura. During my stay in Gippsland, I witnessed the offer of £100 cash for 200 cases of the varieties named above, and I am satisfied apples grown at Mildura will yield a handsome profit.

"Vines at Mildura planted as cuttings twelve months ago have made most vigorous growth, and some of these have more than a dozen well-set bunches of fruit on this present season.

"My experience of the mallee soil convinces me that it is similar in its absorbent power for moisture—too much of the Gippsland formation. It is soon cultivable after heavy rainfall or copious irrigation, so that no time need be wasted in waiting to get upon it for any process of cultivation.

"The extraordinary growth trees and vines have made which were planted last season is sufficient proof that the land is all that can be desired."

The witness withdrew.

F. T. Fitzroy, examined.

11896A. I am a settler at Mildura.—[*The following paper was handed in:*—] F. T. Fitzroy, 22nd Oct., 1889.

"As requested I have the honor to send in the following paper. My experience at Mildura has been, for a season, with blue-bush lands. Cereal crops have done well, especially oats, which have returned about three tons to the acre, without irrigation. I think that raising a cereal crop just before planting vines or fruit trees is most beneficial, the soil generally lacking fibrous matter.

"Lucerne appears to grow well. Planted last May, it has been cut twice; after each cutting it has been thoroughly harrowed with ordinary pin harrows, and then irrigated by flooding.

"With vegetables, the potatoes have grown well and give promise of a fair return; they have been kept moist by frequent irrigation, and when irrigated, by allowing only a small trickle of water between each furrow for twenty-four hours —(with all vegetables a little water, running for say 24 or 36 hours, does the most good to the plants). Transplanted onions are making a great growth. Irrigation by seepage showing the best results.

"In the Orchard, almonds, apricots, peaches, nectarines, apple, plum, greengage, and quince are growing well.

"Vine cuttings, put permanently in the vineyard, have made a good start; those planted the deeper being the best—that is, those with only two eyes above ground."

The witness withdrew.

William Clarson, F.L.S., examined.

11897. *By the Commission.*—What are you?—At present I am a journalist and settler in Mildura. For many years I was hon. director of the Royal Horticultural Society's gardens, Melbourne. William Clarson, F.L.S., 22nd Oct., 1889.

11898. You have had a very long experience in all the colonies, and other parts of the world?—Yes.

11899. In horticultural matters?—Yes.

11900. How long have you been at Mildura?—Only about two months.

11901. And you will prepare a paper upon several branches of culture?—Yes. The pistachio and pea-nut are the chief points I wish to call attention to, and especially the Carob-bean tree, in which I have had a great deal of experience in Italy and Algeria and Egypt.

11902. You understand that the scope of the Commission includes the information upon plants that may be cultivated, as well as those tha are, and your experience in suggesting plants that would be suitable fo the colony generally will be specially interesting?—Just so. Another matter I wish to call attention to is the weeds, and especially one wee that is scarcely expected to exist, that is the Dodder (*cuscuta*) of Australia.—[*The following papers were handed in by the witness;*—]

"PREFATORY NOTE TO PAPERS ON THE CULTURE IN AUSTRALIA OF PLANTS OF TROPICAL OR SEMI-TROPICAL CLIMES.

"The recent establishment of the vast irrigation schemes on the Murray at Mildura, on the Victorian side, and at Renmark, on the South Australian bank, with the great awakening which of late years has brought the whole subject of irrigation into notice in all parts of Victoria, calls for very special remark.

"Taking the case of the Mildura settlement, with which I am most familiar. Here is a vast region which but two years ago was an arid, desolate, and waterless

William Clarson, F.L.S., *continued*, 22nd Oct., 1889.

waste. At the present moment young thriving vineyards, orange groves, and orchards, with large areas under cereal and root crops, are dotted over its surface, and preparations on a large scale are made for the extension of these in every direction. The water-raising machinery is calculated to distribute over the surface soil no less than 48,000 tons every hour it is working. This is distributed by many miles of open main channels, with incalculable lengths of smaller gutters, feeding the soil as it is found to need. The success already attained is no doubt very gratifying in every way, but really is no more than was to be expected on the application of water to a soil of the character met with at Mildura. What I desire to call public attention to is the probability that, at no very distant date, the whole character of the climate hereabouts will have undergone a total change. With even twelve hours' work the present pumping power can distribute over the soil of the Mildura district more than half-a-million tons of water daily ! This quantity will be absorbed or evaporated, but must, of course, in time find its way to the atmosphere. It is only therefore to be expected that this treatment of the soil, persevered in over a series of years, must visibly affect the whole character of the climate. Even already in the district, which but a short time ago was described as destitute of even nightly dews, we find vegetation in the early morning covered with moisture in the neighbourhood of the channel reticulations. The soil being of so absorbent a character to so great a depth will soon get charged with moisture, and its heated condition during the day will be promotive of rapid evaporation. The cool nights characteristic of the district will rapidly condense the humidity of the lower stratum of air, causing heavy and refreshing nightly dews to all vegetation.

"So that, in addition to the present novel conditions under which cultivators deal with the soil here, I feel certain that the time will come, and that before long, when the original arid and dry character of the district unfitting it for culture will be changed to one of humidity, like that of Ceylon and Jamaica, eminently adapted for growing the vegetable products of those regions, but destitute of the malarial marshes and swamps so common in those countries. The great depth and astonishing power of the limestone soil of Mildura to absorb water will always secure healthy conditions for human habitations ; and if, in course of time, we get the humidity of climate of a tropical country it will be with a pure air, untainted by miasma from stagnant accumulations of water.

"Holding these, as I think, reasonable views as to the early change of climatic conditions likely to take place under irrigation in these warm districts, I have thought it well to bring under the notice of the Royal Commission on Vegetable Products a few notes on fruit-yielding trees suited for such regions. In the second volume of my work on '*The Fruit Garden*' I have dwelt pretty fully on many of these, but that work was written some years ago, before I had had the advantage of more extended travel and the close practical experience I have since had with tropical fruits and their culture.

"The Custard Apple.

"(*Anona cherimolea.*)

"Following up the suggestions preceding these notes on tropical fruits, I would call attention to the Custard Apple. The tree does well north of Port Macquarie, and would be at home in Riverina in sheltered spots. The tree attains a height of from 15 to 20 feet, forming a spreading shrub of very pretty glaucous habit. It may be propagated by cuttings in sand, over heat, and from seed, which is better sown fresh from the fruit. The plants require shelter from high winds, and yield abundantly at about five or six years of age. There are two varieties, one having fruit of a dull velvety purple hue, as large as an ordinary orange, and heart-shaped; and the other yielding a dark-yellow fruit of the consistence of firm custard, and having a reticulated or netted skin. Both have a delicate flavour, and Humboldt declared the Cherimoyer to be the finest fruit in the world after the Mangosteen.

"The Sour Sop.

"(*Anona muricata.*)

"This is another popular variety, cultivated extensively in the East and West Indies. The fruit is large and succulent, of a flavour resembling black currants, being a blending of sweet and acid, very grateful and cooling in hot tropical countries. It is grown from the seeds with which the flesh of the fruit is studded.

William Carson, F.L.S., *continued*, 22nd Oct., 1889.

"The Sweet Sop.

"(*Anona squamosa.*)

"Of the East and West Indies; is the size of a globe artichoke, of a green colour, and the pulp, which is enclosed in a thin satiny skin, has a sweet agreeable taste, with an odour of cinnamon. It is eaten raw or cooked, the flavour being delicious, the Sweet Sop being deemed by many the most valuable of all the species.

"The Longan.

"(*Euphoria longana.*)

"In a conversation held with Mr. Walter Hill, the then talented Curator of the Brisbane Botanic Gardens—about the year 1860—I suggested to him that the climate of Queensland would be found admirably adapted for the growth of nearly all the fruits of India, China, Java, and other tropical or semi-tropical climes. I particularly mentioned the Mango, Mangosteen, Jack Fruit, Bread Fruit, Tamarind, Litchi, and Wampee, and urged these upon his attention, and had the pleasure some few years ago to partake of several of the fruits named from trees introduced and cultivated by him at Brisbane.

"The fruit under notice is a great favorite with the Chinese, who call it Long-yen, or Dragon's Eye. It is esteemed more wholesome, sweeter, and more fragrant than the Litchi. The fruit grows of about the size of a greengage plum, in clusters, and is covered with fine hair. The pulp is white and translucent, having a sweetish acid taste, like lemons and sugar, admirably adapted for allaying thirst.

"The Leechee.

"(*Euphoria Litchi.*)

"As known in these colonies this is a dried fruit with a soft outer shell, and a thick glutinous sweet flesh covering a hard kernel. In this form it is largely imported by the Chinese, who regard it with great favour. But this bears little resemblance to the fresh fruit as grown in the countries producing it. Taken fresh from the tree it is found to be covered with a scaly hardish skin, which is red on one side, and green on the other, containing a delicious white sweet pulp, with a brownish seed. The trees have fruited in Brisbane, and promise to succeed well in the warmer parts of the interior of the continent with water available.

"The Wampee.

"(*Cookia punctata.*)

"The Chinese hold this fruit in great favour. It is raised from seed, and the trees yield fruit in from three to four years. The tree is very handsome, evergreen, in height 12 to 15 feet, thriving well in sandy peat soil. Young trees may be procured by any of the China tea ships or other steamers trading between Hong Kong and Sydney or Melbourne. There are several varieties of the Wampee, and trees introduced by Mr. Walter Hill during his administration of the Brisbane Botanic Gardens flourished and fruited well at that establishment.

"Other plants worthy of notice, and yielding excellent fruit are:—The Rose Apple (*Jambosa aquea*); the Rambutan (*Euphoria Nephelium*); the Jujube (*Zisypus*); the Alligator Pear (*Persea gratissima*); and the Anchovy Pear (*Grias cauliflora*).

"The Pistacia Nut.

"(*Pistacia vera.*)

"In the vast mass of evidence taken by the Royal Commission on Vegetable Products, no mention has been made of the tree yielding the Pistacia nuts of commerce. It is equally strange that the culture of the tree has not long ago been entered upon in some of the Australian colonies.

William Clarson, F.L.S., *continued*, 22nd Oct., 1889.

"The *Pistacia vera* is a deciduous tree growing to a height of about 40 feet, and is extensively cultivated in Sicily, Egypt, Syria, and of late years in Algeria. The nut affords a very nutritious food, which is very popular in the countries growing it. The fruit is of the size and shape of the Spanish olive, but convex on one side, and concave on the other, with rather a rough surface. It has a tender crimson pulp enclosing a nut, which opens with two valves disclosing a greenish kernel. This is sweet and agreeable to the taste, and enters largely into cookery for flavouring creams and ices, besides being preserved in sugar and in other forms as confections. The nuts also yield an oil of great purity; preferred by the Sicilians to the best oil of the olive.

"For the dry Murray regions, the tree would be a great acquisition, and with irrigation as at Mildura and Renmark it could not fail to yield a very profitable crop. The tree is a very handsome one, attaining a height of 40 feet in the dry soils of Sicily, and in fertile valleys near Algiers it exceeds that height. The tree also yields galls of value, being rich in tannic acid.

"Fresh nuts of this tree might be readily obtained from Cairo or Alexandria, and if brought in clean damp sand they would retain their germinating qualities unimpaired.

"One of the Pistacias (*terebinthinus*), also deciduous, makes a very ornamental bush with fragrant foliage, and yields by exudation from the stems the aromatic Cyprian or Chio turpentine frequently used as incense.

"Two other varieties of the family—the *P. Atlantica* and the *P. Lentiscus*—both being evergreen, yield a gum-mastic from incisions in the bark. Both these form beautiful rapid-growing shrubs, well adapted for dry zones, and for forming wind-breaks or shelter-belts for orchards, gardens, or cattle grounds. The foliage has a very strong flavour of mastic, and, as a consequence, is rarely touched by cattle. The *Pistacia Atlantica* has been referred to by Baron von Mueller as being highly recommended for raising forests on the high plateaux of Algeria—a region almost identical in soil and climate with that of the Mildura district and the waterless country in the neighbourhood of the Lower Murray. The tree grows well at Longerenong station, where it was planted 25 years ago by Sir Samuel Wilson.

"The Brazilian Cherry.

"(*Eugenia uniflora.*)

"All the Eugenias (several being indigenous) do so well on the Australian continent, that it is matter for wonder why the Brazilian cherry is not more generally grown. The tree is very handsome, with glossy dark-green foliage and bright crimson fruit of grateful acidulous flavour. When ripe, the fruit is juicy, and very refreshing on a hot day, allaying thirst, and it may be taken freely without any disturbance of the bodily functions. It also forms a preserve which has a delicious aroma and flavour somewhat resembling the conserve of rose hips. The seed should be sown in sandy soil, on a hot-bed, and the plants pricked off in pots when handable till ready for transplanting to their permanent positions in the shrubbery. The Brazilian cherry grows well in Queensland and the Gosford district of New South Wales; but at Lord Howe Island it flourishes well and yields enormously.

"The Papaw Apple.

"(*Carica papaya.*)

"This is another important plant which has not been brought before the Commission. The produce of this tree is very largely used as a culinary esculent on the islands of the South Seas, being rarely absent from the table. The Carica is a diœcious tree, growing to a height of 20 or 30 feet in the stem, with a crown of broad foliage, and the fruit nestling almost hidden within the leaves. The flowers emit a strong Jasmine-like odour, and the fruit (though sometimes eaten raw when ripe) is taken before ripe and boiled like that of the vegetable marrow, the hot peppery seeds being extracted before serving the vegetable at table.

"The Papaw tree has one very remarkable quality—so strange indeed, as to be regarded by many as a mere tradition or romance—but the writer can vouch for

the actual possession of this property by the plant. Water impregnated with the juice of the Papaw renders all sorts of meat steeped in it tender, and even the flesh of old pigs and old poultry fed on the leaves and fruit is soon made perfectly tender. In the islands people hang joints of meat in the upper part of the tree to prepare them for the table.

"The seeds germinate freely when sown fresh from the fruit, which not uncommonly is to be seen in the Melbourne market. The stem of the tree is soft and succulent, and grows with amazing rapidity, and the fruit follows the bloom so quickly as to be gatherable in a week. Both male and female plants give an edible portion.

"The Date Palm.

"(*Phœnix dactylifera.*)

"For many years our respected Government botanist has repeatedly urged on the dwellers and travellers in the interior of the Australian continent, the great good they would do by sowing the seeds of the Date Palm on their holdings or about camping places. Plants, from seeds supplied by him to the Mission station, now form a beautiful grove, and are about to yield fruit. My only reason for referring to the tree here is, if possible, to emphasise Baron von Mueller's advice to settlers. At his suggestion, I have urged on the notice of the planters at Mildura the importance of the tree, and have only to offer one or two suggestions as to its culture, which is of the simplest.

"Looking at the climate of the Lower Murray region and the great similarity of its soil to many parts of Egypt where the Date Palm thrives—as at Ramlee, Zagazig, and the country lying between Alexandria and Cairo—I have no hesitation in declaring that the palm would thrive well in the Mildura district. The Murray has been aptly termed the Nile of Australia, and the resemblance to that mighty river will be heightened when its banks and approaches are fringed with the tree that gives nearly the entire food of the Egyptian and Arab races. Writing some ten years ago on this subject in the second volume of *The Fruit Garden*, I said, 'The date plays so important a part in constituting the chief food of the hot and arid territories of Egypt, Algeria, and Arabia that it is well worth while to consider whether the seeds might not, with advantage, be most extensively sown throughout the dry and fruitless districts of the interior of the Australian continent. The tree is found to thrive well in Queensland and New South Wales, and, though growing slowly, it endures the cold of the colonies further south, where it forms a most striking object in the gardens affording it a little shelter or protection. The Date Palm may be raised from seeds of the dried imported fruit, but they should be soaked in warm water for several days before being planted in a hot-bed. When sufficiently grown—the plants having attained four fully developed leaves—they may be transplanted to their permanent resting place. There are two varieties, one yielding yellow fruit on ripening, the other fruit of a vivid crimson. The bunches are cut on the fruit attaining its full colour; they are then hung up in the sun, or under awnings, and the dates, as they lose colour and shrivel, are picked off and packed for export without further curing. Sometimes, however, a syrup is formed of the fruit of the Carob Bean, and the dates are smeared over with this preparatory to packing. Like the Carob tree the Date Palm is diœcious, having the male flowers on one tree and the female or fruit-yielding organs on another. They should, therefore, always be grown in groves, so as to secure pollen impregnation from the proximity of the sexes, though in many parts of Egypt a single male plant suffices for a whole district. It is customary, too, for the Arabs in the event of male plants failing to yield a copious supply of pollen, to go to distant groves and cut out the blooming spadix of a male plant and convey it to the desired place, and by tapping the flower stem with a stick, scatter the pollen over the female flowers and thus promote the setting of the fruit. The Date Palm bears on arriving at the age of nine or ten years, and is said to be increasingly productive till reaching the age of over a hundred years. In addition to the sweet fleshy fruit, the stones even are ground to flour by the Arabs, and formed into a nutritious bread, and of the leaves they make very useful and even ornamental baskets. The midribs of the leaves are used for fences, and

William Clarson, F.L.S., *continued*, 22nd Oct., 1889.

the stems of the trees are used for building purposes. The lace-like threads of the integument between the fronds make excellent rope and rigging, and by making incisions in the flower spadices a copious supply of juice exudes, from which an agreeable wine is made and a strong spirit distilled.

"The Carob Bean.

"(*Ceratonia Siliqua.*)

"A few months ago I wrote a monograph on this tree for the *Bulletin* of the Department of Agriculture. In that I gave my experience a few years previously of the tree in Italy, Sicily, Egypt, and Algeria, and more recently of the trees under my charge at the Longerenong Agricultural College Garden.

"The exceptionally favorable conditions for the growth of the tree at Mildura, and especially the great need of shelter-trees and durable wind-breaks, led me to sow a good number of the beans in the experimental garden of *The Cultivator* newspaper, and generally to closely note the growth of the young plants to be found about the settlement.

"The seeds sown have germinated freely, and the young plants are now getting their true leaves, not having been attacked by grub, aphis, or beetle, which have prevailed on other plants in the neighbourhood. There are scattered about the neighbourhood a few plants of the Carob entering upon their second year, and growing healthily—neither hot winds or the cold westerlies of winter seeming to affect them prejudicially.

"In the article referred to, I have dwelt at some length on the culture of the Carob, which may be propagated by *cuttings* of the young growth, placed on a hot-bed and under a frame, in the months of April and May; by *layers* of the outer branches pegged down in moistened trenches around the trees, on the first autumnal rains; and by *seeds* sown any month from March to August. It is to the great value of the tree, when planted around orchards, vineyards, and cultivated holdings, that I desire now to draw the attention of the Commission.

"There can be no doubt that a great error is committed in the wholesale denudation of the mallee and other vast districts when taken up for settlement. Those who have witnessed the fierce hot dust storms which periodically pass over such districts during the spring and summer months, and the biting cold winds of the winter period, cannot wonder at their blasting effects upon vegetation. To remedy this state of things, or greatly modify the severity of the winds one of the earliest works of the settler should be the surrounding of his holding with, not a mere hedgerow, but a substantial belt of some tree suitable for the purpose.

"Now the Carob will be found to meet all requirements. It grows well in exposed places in Central Italy, in Sicily, Egypt, and of late years in Algeria. The late Monsieur Prosper Ramel (who will be gratefully remembered for his ceaseless efforts to popularize the Australian Eucalyptus and its products in Europe) cultivated the Carob tree extensively on his estate near Algiers, and trees planted in 1875 by him were four years ago reported to have reached 20 feet in height, forming dense spreading bushes, and yielding valuable fruit abundantly.

"The trees at Longerenong were planted less than twelve years ago; had little care and attention; no water beyond the rainfall; a thin surface soil, with a dense retentive clay sub-soil; little trace of organic matter in the soil; and are fully exposed to the sirocco-like north winds of summer, and the blizzard-like westerlies of winter, characteristic of this part of the Wimmera district. They now average 12 feet in height, form bosky masses of spreading branches, well clothed with their glossy evergreen foliage, and annually yielding fruit abundantly, which cattle eat ravenously. No doubt had these trees received ordinary care and water during the several severe droughts which have occurred from time to time of late years, they would have been of much greater stature, and even more luxuriant than they now are.

"The *Ceratonia Siliqua* is diœcious—having the male organs upon one plant and the female or fruit-yielding ones on another. It will, therefore, be essential to have both sexes represented in any plantation where a fruitful result is required. But as one staminate tree will suffice for many pistillate or female trees, there is little risk of having sterile trees in the collection. Of course, when grown from cuttings

and layers, the sexes of the trees from which such are taken should be marked, so that in planting they may be alternated in the row so as to facilitate pollen impregnation. When the plants are raised from seed, of course there is just a remote chance that there may be a preponderance of one sex; if this should turn out so—and this cannot be determined until the plants bloom—then branches of the required sex may be grafted in the centres of those of the opposite sex. William Clarson, F.L.S., *continued*, 22nd Oct., 1889.

"Last year I discovered on one of the trees at Longerenong, a singular departure from the normal type—one of the branches of a staminate tree bearing pistillate, staminate, and hermaphrodite or perfect flowers. I brought the circumstance under the notice of Baron von Mueller, who was much interested in this "sport" from the accepted character of the tree. I had photographs taken of the three characters of bloom—the pistillate, the staminate, and the hermaphrodite or polygamous. These I have the honour to hand in for the inspection of the Commission on Vegetable Products, but desire to have them returned when they have served their purpose."

The witness withdrew.

Dr. Otto L. M. Abramowski, examined.

11903. *By the Commission.*—What are you?—Medical practitioner at Mildura. Dr. Otto L. M. Abramowski, 22nd Oct., 1889.

11904. Where were you formerly residing?—At Terowie, in South Australia.

11905. How long have you been resident here?—About a year and three months.

11906. Are you well pleased with the prospects of the settlement as a fruit-growing district?—Yes, I am sure it has a great future before it, and for the short time I have been able to watch it I am perfectly satisfied with the results already attained. I think they have got the proper men, not only as to Chaffey Brothers, but also as regards the settlers. If they go on as they are doing now, they will soon make it a success.

11907. You have brought a transplanting apparatus?—As you seem to be pressed for time, I think I might give a little essay on it, and its history, and a full description.—[*The witness handed over the apparatus to the Commission, and showed it in action.*]

The witness handed in the following paper:—

"A NEW TRANSPLANTING MACHINE.

"I beg to bring under the notice of the Commission a little machine for transplanting. I first saw it mentioned in Wm. A. Spalding's book on "The Orange," and was so much struck with its usefulness that I gave the description of it to our local tinsmith, Mr. T. R. Barrows, who has executed it in a very creditable manner, and is now making it for sale. It is certainly worthy to be known, and to be used whenever young plants are raised, and will do away with many failures and disappointments in transplanting.

"Judge Widney, in California, has invented the little machine, and says, 'that he never had more that 1 per cent. failures by using it for transplanting seedling of Oranges, Eucalyptus, Pine trees, &c.'

"The machine is made of galvanized iron, and consists of two tubes so fitted that the smaller one runs smoothly in the bigger one. This latter, the outer tube or real transplanter, is 6 inches long and 2 inches in diameter; its lower end is sharpened so that it will cut into the soil. On the upper end are fixed two round straight handles, at a right angle, about 4 inches long, just big enough to give you a firm hold of the machine by using both hands.

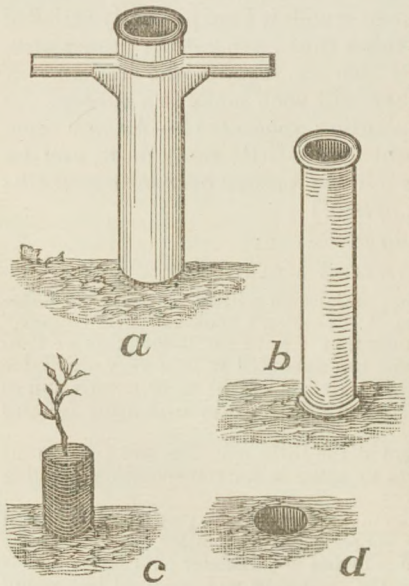
"The inner tube, or protector, is a little narrower and about half-an-inch longer than the outer tube. Its lower margin is rendered blunt by bending it inwardly about one-eighth of an inch all round. The upper margin is widened just enough to prevent this tube from slipping altogether through the outer one.

Dr. Otto L. M. Abramowski, *continued*, 22nd Oct., 1889.

"If your nursery-bed is well prepared, the soil in it loose and friable, and the plants at a distance of a little over 2 inches apart you can by the help of this machine transplant every plant without exposing its roots, and therefore without the slightest check. If your seedlings are in a box, so much the better, because in this case you can carry your plants to the spot and fix them in their position at a very quick pace.

"You first put the machine upright, with its centre exactly over the spot where your tree shall stand, get hold with both hands of the handles, and by a slight pressure and rotation of the outer tube you sink it into the ground to a depth corresponding with the length of the roots of your seedlings. The inner tube will now stand out by the same length out of the upper end of the transplanter. You now remove the whole machine, and will find that a ball of earth is taken out with it and leaves you a plant-hole of 2 inches diameter, and your intended depth.

"After pushing out the ball of soil from the machine by a pressure with both your thumbs on the upper margin of the inner tube, you put your machine over your seedling, where branches and leaves are now protected by the inner tube, and sink the outer tube by a continual pressure straight down into the seed-bed round the roots of the seedling to the required depth. In removing you find again the inner tube (with the branches and leaves of the seedling) protruding out of the upper end of the transplanter, the lower end of which contains a ball of earth with all the roots of your plants undisturbed in it. You now drop this end of the machine into your prepared plant-hole, put your thumbs on the upper margin of the protector and pull the outer tube gently over it, the lower blunt end of the inner tube keeps the plant and the ball of earth in the position, and when the upper end of the outer tube is on a level with the upper end of the inner tube, you lift the whole machine over the plant and will find your seedling in its position as fresh and vigorous as if it had not been moved at all.



"I have used this transplanter for all sorts of seedlings and find that it answers admirably for all straight-rooted plants, so much so that I have shifted some young trees ten and fifteen times without ever seeing them droop or wither. But, for Almonds, Walnuts, and such like you will want a machine of somewhat bigger dimensions, as you are likely with a 2-inch machine to cut the roots or part of the young roots off, which seldom go quite straight down.

"If you always empty the ball of earth from the plant-hole into the spot where you last removed a seedling, you can always keep your seed-bed full, and can work your machine better than in a honeycombed soil.

"I feel certain that there is a great future in store for this little machine, and am thankful to your Commission for giving me an opportunity to bring it before the public of Victoria and Australia generally who take such a lively interest in your proceedings, and in all matters relating to horticulture and agriculture."

The witness withdrew.

Adjourned.

(Taken on board the Murray Steam-ship "Ellen.")

WEDNESDAY, 23RD OCTOBER, 1889.

Present:

T. K. Dow, Esq., in the Chair;

J. Knight, Esq., | J. West, Esq.
J. J. Shillinglaw, Esq., Secretary.

George Chaffey, examined.

11908. *By the Commission.*—What is your connexion with the Mildura settlement?—I am head of the firm of Chaffey Brothers, the promoters of the Mildura colony. George Chaffey, 23rd Oct., 1889.

11909. How long is it since you commenced operations at Mildura?—We got possession on 4th August two years ago.

11910. When did the actual work commence?—Six months later; the surveying began in August.

11911. The actual work commenced six months after?—Yes.

11912. That is eighteen months ago?—Yes.

11913. And the country is supplied with water by a pumping scheme from the Murray River?—Yes.

11914. Will you give us an account of the channels already constructed?—First of all, there is the pumping plant on the river Murray, at Psyche Bend. The engine will be a triple-expansion engine, driving four 40-inch pumps direct indicated power 1,000 horse. The pumps are so arranged that one or four can be used at once. The lift will be from 20 feet to nil, according to the state of the river. The full capacity of the pumps will be 120,000 gallons in a minute, which water is pumped into the channel which leads to a billabong, which we propose to use as a reservoir. This billabong is 6 miles long, and averages 150 yards wide, and at present there is 26 feet of water in it. The water is pumped from this reservoir again into a channel, known as a 50-foot channel. All those figures of levels are from summer level, not from the present flood level of the river. The engine is a triple-expansion engine. It is known at present as King's billabong, and on the books as Station No. 3. The engine is a triple-expansion engine, driving four 20-inch pumps direct—capacity, 40,000 gallons a minute. The engine is also supplied with pulleys to drive two other pumps, if necessary, and when the billabong is full. The pump is 1,000 horse-power indicated. This water is delivered into a 50-foot channel, which is 25 feet wide on the bottom and 6 miles long—that is our largest and main channel. We then come to Station No. 2, which has a triple-expansion engine 450 horse-power, driving two 20-inch pumps—capacity, 20,000 gallons

George Chaffey, *continued*, 23rd Oct., 1889.

a minute. This raises the water to the channel known as the 70-foot level, from the 50-foot. This channel is 15 feet wide on the bottom, 4 feet deep, and will be 20 miles long. There is also another channel called the 85-foot level supplied from the same station. It is 4 feet wide on the bottom, and 4 feet deep—capacity, 7,500 gallons a minute. That is all the pumping plant in that direction. Then there is the plant at the township for the town supply, and to irrigate all the high-level land about the township; one compound engine of 200 horse-power, driving duplex Blake pump—capacity, 1,000 gallons a minute. This water is forced up through a pipe, and the township is reticulated by pipes. The water used in irrigating is also conveyed to each allotment by a pipe. This engine has the power to drive another smaller pump when required. There is also in the same engine-house a duplex pump, which is used in case of accidents—its power is about 500 gallons a minute. Then, at the homestead of the old station, there is an engine similar to the last one, in fact, a duplicate of the last one, which will drive a pair of 20-inch pumps—capacity, 20,000 gallons a minute collectively, which are delivered into a channel 35-foot level.

11915. Is there any other pumping plant?—Yes, there is another small plant to irrigate 300 acres of land at the lower end of the settlement, that is Lord Ranfurley's. The capacity of that is 1,000 gallons a minute. That includes all the stationary plant. There are some half-dozen temporary ones, which will be used elsewhere until permanent ones are erected.

11916. Is this scheme you have now given us the complete scheme, or what has actually been done?—That is what has actually been done, except the pumping plant at the river, which is not complete.

11917. That is the first one you mentioned?—Yes.

11918. In what stage is that?—The foundations are almost in, and the engines, I believe, are on the sea, and will be erected in a few months.

11919. Will that be used during the present season?—It will not be necessary, because the billabong has filled naturally this season.

11920. How many miles of those main channels are there completed now?—Thirty-four miles.

11921. Then the branch channels—what you call the subsidiary channels—what are the sizes of those?—They are all sizes from the capacity of a cubic foot a minute, which is the smallest one, up to 1,200 cubic feet a minute—there is completed of the subsidiary channels about 30 miles.

11922. What about the engine-houses?—First at Psyche Bend, that engine will be housed in a brick building, the walls laid in with cement. The dimensions of it are 36 x 80 feet, and 31 feet clear in the walls.

11923. That is not yet completed?—No, it is being built. The excavation for the foundation of the Crib Point work is 32 feet—the foundations of the engines are concrete.

11924. The next building, at King's billabong?—That is also a brick building, it is 27ft. 6in. inside by 70 feet, and 30 feet high. The foundations for the building are concrete—the engine foundation is concrete and brick, 14 feet deep. George Chaffey *continued*, 23rd Oct., 1889.

11925. And the other buildings?—At this place the boilers are housed in a separate building—it holds six boilers.

11926. Are there any other engine-houses?—The building at Nicol's Point, or Station No. 2 as it is called, is also a brick building and on concrete foundations, 25 feet by 75 feet foundations, and so on similar.

11927. Then the next one at the township?—That is also a brick building, 25 by 40.

11928. Where were those materials obtained for the buildings?—The bricks were all made on the place.

11929. Is there good clay for bricks?—Very good, and the redgum was sawn at Mildura and also the Murray pine.

11930. You use that for lining?—For lining and finishing.

11931. Where is the lime obtained?—At Mildura.

11932. Plentifully?—Quite plentifully.

11933. The pipes used in connexion with the works—what has been the extent?—About 12 miles of pipes, ranging from 22 inches to 8 inches in diameter.

11934. What kind of pipes are they?—Iron pipes riveted, wrought iron immersed in hot asphalt to preserve them.

11935. Where were the pipes got?—The pipes were made in Melbourne, some of them, and some were made by ourselves. In future, we shall make all the pipes we use.

11936. Have you facilities for making pipes?—Yes, I may say on the pipe question that we are just going to reticulate some 2,000 acres with cement pipes, 10 inches to 24 inches in diameter.

11937. Will those be made by yourselves on the settlement?—Yes.

11938. By a particular process?—It is unknown in Australia, I think.

11939. Is it an American process?—Yes, we have used it in our colonies in California.

11940. With satisfactory results?—Very satisfactory.

11941. Have you the same materials for making the pipes here?—The materials are cement, sand, and gravel.

11942. Portland cement?—Yes.

11943. Is it proposed to carry all the water in the subsidiary distribution in pipes?—No, not all the water, only in some places that cannot be commanded by open channels.

11944. Where the levels necessitate the use of pipes?—Yes, where the roads are irregular it is necessary to employ a pipe to get the water at the highest corner.

11945. You spoke of making iron pipes at the settlement—what facilities have you for that work?—We have the necessary rolls, shears, and multiple punches.

George Chaffey, *continued*, 23rd Oct., 1889.

11946. The foundry seems to be a large and well-appointed establishment?—It has all the necessary tools to do the work that we require on the settlement.

11947. Would you specify any of the classes of work that you have been undertaking there in addition to making pipes?—We can do anything in casting up to two tons in iron, and any ordinary brass castings.

11948. Can you work timber also?—We have no appliances for working timber except a saw-mill, a planer, and so on. There is room for about 50 men in the shop there—there are about 50 men on the roll now.

11949. Does that include the saw-mill as well?—No.

11950. We saw there were a number of men clearing land, planting, and cultivating—are they cultivating your own private land, or on the land of the settlers?—Cultivating settlers' land—nothing of any consequence is doing for ourselves.

11951. All for the settlers?—Yes.

11952. How many men do you employ on those works altogether now?—One hundred and twenty men in connexion with preparing the land and clearing and cultivating it.

11953. How many men do you employ altogether?—There are about 250 men on the roll.

11954. Could you tell us how much it costs to clear that mallee?—It depends upon the density of it—from £2 to £4 an acre.

11955. Do you contract to do it at those prices?—Yes.

11956. Was all of the land that is being cleared by settlers covered by mallee and had to be cleared?—No, through the mallee there are small plains, only a few hundred acres in extent, that are covered with a small bush, that costs about 10s. an acre to clear.

11957. Will you tell us how much land has been cleared and occupied by settlers about?—Three thousand acres.

11958. How much land has been sold now?—Seven thousand acres.

11959. How much has been planted with fruit trees and vines?—Two hundred and eighty acres planted with vines; 425 acres, oranges; 150 acres, lemons; 100 acres, apricots; 50 acres, dates; 30 acres, prunes. That is all planted by the company and for settlers. Beside that there are about 200 acres of various fruits planted by others, and 600 acres of cereals, and 200 acres in course of preparation for maize, and between 20 and 30 acres under lucerne.

11960. Do you know what the population of the entire settlement is?—About 1,200. I can send you a lithograph plan giving all the details, and also a statement of the cost of preparing the land, and of maintaining it from year to year, also a plan of the town with a short description of what has been done in it. [*The same was handed in.* (*See Appendix*).]

11961. Will you tell us, after eighteen months' experience, what your opinions are as to the suitableness of Mildura for the industries that are being established there?—Everybody knows my opinion, or I would not be there.

11962. You have seen no reason to alter your first impressions?—No, rather had reason to confirm them. The soil is just as good as we expected; some of the settlers have raised three crops a year on it. It is better than any land of the same area I know of in California. George Chaffey, *continued*, 23rd Oct., 1889.

11963. As far as you can see, the climatic conditions are favorable?—The climatic conditions are exactly right. I do not think we could make them better if we had the ordering. During the drying season for fruits there is an entire absence of fogs. During the time I have known Mildura—for three years—there has not been a single fog, whereas in California we are tried very much at drying time by fogs, which necessitate the covering of the fruits at night. The climate also is more uniform—that is the changes do not occur every 24 hours, and consequently we think it is a better climate for maturing fruit than California.

11964. I suppose the railway will be very beneficial to the enterprise?—Unquestionably.

11965. What is the present method of reaching the settlement?—From Melbourne by train to Swan-hill—thence by steamer to Mildura, or by coach to Mildura from Swan-hill, three times a week; or by Adelaide by rail from Adelaide to either Morgan or Murray-bridge, and there are two boats weekly from there to Mildura.

11966. What is your experience as to the sepage of the channels—have you had any trouble in loss of water through that?—We have had no trouble whatever. The channels in the course of three weeks become so tight that almost the sun evaporation will account for the loss of the water.

11967. What loss?—The loss by evaporation.

11968. You have made some tests?—The capacity of our temporary pumps is greater than we require for the present business, and we fill the channels periodically and allow them to remain so, as reservoirs, and they draw from them until it is exhausted, and we pump again; so you see if there was much percolation we could not afford to do anything of that kind.

11969. During the summer, when the Murray is low, and in the most dry season, what was the character of the supply for your purposes; was there sufficient?—Do you mean the quantity in the river itself?

11970. Yes?—The quantity we withdrew from the river was an infinitesimal proportion of the whole—it made no perceptible difference in the river whatever. During the last season the minimum of the volume of water at Mildura was 133,000 cubic feet a minute; the river was then 4 inches below summer level.

11971. So that you do not anticipate in the driest season any scarcity of water for the entire settlement?—There will be no scarcity whatever. Also, I should like to mention that the water we are permitted to withdraw by licence from the Government is a quantity double the quantity per acre which is supplied to Riverside, one of the most flourishing colonies in California. The licence is given to us on a sliding scale.

George Chaffey, *continued*, 23rd Oct., 1889. We are permitted to take the greatest quantity from the river when it is in flood, and we require the greatest quantity at that season, during the summer. When the river is at its lowest we require the least quantity, and are permitted to take the least.

11972. Persons buying land at Mildura have a certain right to a sufficient quantity of water for irrigation purposes?—They have the right which the Government gives us, and we are not permitted to transfer to any purchaser one acre of ground without also transferring the right to use the water on that acre.

11973. In the event of a settler failing to get water, can he have an action against you to compel you to fulfil that part of the contract?—The method of distribution of the water is this—a company is formed, divided into shares. The division of the shares is simply to represent the division of the waters. There is a share given in this company to each purchaser for each acre of land that he purchases. In this company are vested the water rights, the machinery, the channels, and all the conduits, he then being a member of the company has his divisional right in that company free of cost.

11974. That company which comes into existence will carry on the irrigation works *in perpetuo*?—Yes, and that company will maintain the works. All those works will be handed over by the Chaffey Brothers Limited without cost. That is included in the cost of the land; at least, they pay for it in the cost of the land, and when we have sold all the land Chaffey Brothers Limited will own neither land nor water—the settlers will own it all, and will manage their own affairs.

11975. As to those large pumping engines you described, who designed and made them?—I designed the engines, and I have given the maker's name already. They were designed specially for this work, and there are no other engines like them in existence.

11976. Are you acquainted with any other pumps of equal size being used anywhere else for irrigation purposes?—No, there are no pumps I know of for the purpose so large that I have actually seen. I have heard of pumps of larger capacity that have been used for drainage, but I think there are no pumps of that capacity driven by a single engine.

11977. You think that is the largest pump in the world driven by a single engine?—Yes, for irrigation purposes.

11978. Have those engines been at work yet?—One set; the set at Station No. 2 has been at work.

11979. What has been the result?—The performance has been very satisfactory indeed, it exceeded our calculations.

The witness withdrew.

William Davidson, M.I.C.E., examined.

W. Davidson, M.I.C.E., 23rd Oct., 1889. 11980. *By the Commission.*—What are you?—Inspector-General of Public Works and Engineer of the Melbourne Water Supply.

11981. You have just visited the Mildura settlement?—Yes.

11982. We shall be glad to have your opinion on what you have seen?—The pumping works are entirely within the scope of a mechanical engineer to speak of, and I do not claim very intimate acquaintance with that branch of engineering. That water can be pumped from one level to another we know, and it is only a question of the cheapest application of the power necessary to do it. The Mildura system of irrigation, so far as I have seen, seems to be the taking of a very large volume of water from the river at one point and elevating that by three successive lifts, or galleries, as we might call them, at different heights; taking off a proportion of the original abstracted quantity at each of the galleries or contour channels. The water in those channels afterwards to be conveyed to the farms by subsidiary channels, and in some cases by pumps. These are all works of construction, operations that any engineer of experience would naturally be able to carry out at reasonable cost. From what I heard in my inquiries at Mildura yesterday, I think that, with similar appliances and doing the work in a manner similar to that adopted on the irrigation settlement, other engineers could produce results almost as good—that is to say, almost as cheap. The point that struck me above all others in connexion with the scheme is the beautiful grading of the land. Any one might construct channels and bring the water along and let it off at apparently suitable points, which might, without the exercise of great skill and special experience, prove altogether unsuitable, inasmuch as there might possibly be a surplus of water in patches and no water in other patches. The business of irrigation is not in my line. What I saw at Mildura is something new to me, and that struck me as the most notable feature in the affair. Of course there are points to admire in the development of the whole thing, but as the result of my visit with the Vegetable Products Commission, there is the one point of all others that I think forthcoming irrigators—those who will irrigate independent of the Chaffey Brothers or their scheme—will do well to take note of. Any engineer can bring water, but it requires special experience and skill, to which an irrigator must be educated, to properly apply the water on the ground so as to get the greatest results from the smallest quantity. Apart from being astonished at what has been done in so short a time, I do not know that I have made any special observations that would be of interest to the Commission.

W. Davidson, M.I.C.E., *continued*, 23rd Oct., 1889.

11983. You do not express the opinion of a mechanical engineer?—No, I would not criticise the pumps.

11984. At the same time, you have had great experience of water schemes and waterworks?—Yes.

11985. And you have a general idea of how work should be well and faithfully carried out?—Certainly.

11986. What impression have you as to the works at Mildura in that regard?—So far as I could see they are carrying them out in a manner that would be done by the Government. In a few trifling cases I think there has been an excess of material used, to the present absorption of

W. Davidson, M.I.C.E., *continued*, 23rd Oct., 1889.

capital, though to future advantage, no doubt. I expressed the opinion, yesterday, to one of the promoters that under similar circumstances I would have used less material in some cases.

11987. It would have been less expensive work?—Yes, and the work would not have been so substantial as it is. However, the promoters' opinion is that it is required. So far as I could see the works are substantial. I knocked the bricks together and obtained the ring that we like. The cement brands are such as we use in ordinary Government works, and so far as I could judge the setting of the material has been done very much as we do it on Government works—certainly very much in the style that I do work myself in my own department.

11988. Are you acquainted with large pumping plants?—No, I am not. I have never been connected with any water scheme in which pumping was the essential part—it has all been gravitation work.

11989. In regard to the time in which the work has been carried out, and taking into account the character of the work, you consider good progress has been made?—I think very great progress has been made. I think to have cut all those channels and to have laid all those miles of pipes is a very wonderful thing to have been done in eighteen months, as, I understand, it has been done—it is a very surprising performance; it indicates that large gangs of men have been on, and that money has been freely spent.

11990. You have had, I suppose, considerable experience in laying pipes?—Yes.

11991. Do you consider the pipes laid are of a substantial character?—Yes, I think, under the pressure they have to carry, the pipes are very suitable—in some cases they are on the heavy side, so far as regards hydraulic pressure, but I dare say the exigencies of the places made it advisable to have them the thicknesses they are. So far as I can see, they are entirely wrought-iron pipes, which I introduced into the colony myself, and which we are using to an enormous extent in the Melbourne Water Supply—in fact, I can tell you that for some purpose recently I had to calculate how much we had paid for wrought-iron pipes the last three years, and it comes to £165,000—that is in connexion with the Melbourne Water Supply alone, and I know in various parts of the colony they are being used for conservation works and irrigation works.

11992. Do you know anything of cement pipes?—No; I do not remember ever to have seen one. Such information as I have about them has been derived from reading about American works and hearing of American works, especially Californian. I would not like to speak, except on the engineering aspects of the case, beyond what I have said. I do not think my opportunities have been enough to be a very deep critic of the scheme.

11993. So far as you have gone, you consider the work is of a permanent character?—Yes, I consider that is settled beyond any question of doubt.

11994. As to the position of the settlement above the river, you have had an opportunity of seeing the Murray in a very high state of flood?—Yes.

11995. Did it seem to you that the settlement will be safe from damage from any possible floods in the future?—Yes, I think that is also put beyond question, judging by this exceptionally high flood, which I have ascertained is the highest since 1870, and possibly the highest on record, and now it seems to come pretty nearly up to the 30-foot contour which floods the low lands and foreshore. To get any higher, with each additional foot of rise, the volume of the river would have to increase in a greater proportion at a greater rate than it has done hitherto, because the velocity of the stream increases with each additional inch of rise, and the area of country to be flooded is greater with each increasing rise. I think the question of flooding at Mildura is settled now, and people all must know the worst that can happen to them there.

11996. Do you think the system of pumping plants that have been supplied are sufficient to supply all the water that may be required on the settlement?—I cannot express any opinion on that. I might make a general remark on the matter, that for a certain area of country, with a certain number of floodings, a certain specific defined quantity of water, and that water to be raised to the required height, demands a certain mechanical power which is easy of computation; it is in the working out of this power that the skill of the mechanical engineer and the mechanic himself comes in. It would be easy in a few minutes to demonstrate by calculation by figures how much those pumps would produce—in fact, nowadays, pumps are ordered to do work; a pump to lift 150,000 gallons a minute to a height of 50 feet is ordered, and it comes. There might be a miscalculation on the part of the promoters as to what water they want—if it is on the side of too little, they must increase their pumps, but that is not difficult. A pumping scheme is actually cheaper very often than a gravitation scheme.

11997. To all outward appearance the provision made is adequate?—I could not give any opinion about that as I have not gone into the figures as to what is required and what is supplied. I have heard that something like 160,000 gallons of water a minute will be taken at a certain point. I do not know from my own observation that that will be taken, or that that will suffice for what it is intended to do.

11998. Do you think in the case of irrigating the Mildura country that a pumping scheme would be cheaper and more economical than a gravitation scheme?—Of course each system has its advantages, under certain circumstances. At Mildura I was on ground 85 feet above the summer level of the river, and that land could be irrigated by gravitation only by going to some point on the Murray which should be at least 85 feet above summer level, plus the fall for the channel required to bring it, and from the little I know of the mallee country I imagine that would involve starting head-works some 100 miles or more up in the bush between here and Echuca or Swan-hill. The capital sunk in such a work as that, I mean the interest on the capital sunk in such a work

W. Davidson, M.I.C.E., *continued*, 23rd Oct., 1889.

as that, would be infinitely greater than the capitalized cost of a pumping plant and its maintenance. A gravitation scheme is best where the source of supply is easily to be commanded, and at a sufficient elevation.

11999. Did you observe the character of the soil through which the channels were carried?—Yes, from place to place, I did.

12000. You think they will be sufficient to carry the water without an undue proportion of loss?—Yes, I think that 70-foot channel, which was the one we chiefly saw, that when the water is turned in there, at first very considerable quantities will go away. I have had a good deal to do in similar country, and we know that with an occasional shower with the water itself there is a certain amount of scour even under the small velocity which brings the silt down to the bottom and makes a lining, but that will ultimately make it, I should say, altogether impervious.

The witness withdrew.

Nathaniel B. McKay, examined.

N. B. McKay, 23rd Oct., 1889.

12001. *By the Commission.*—What are you?—Editor and part proprietor of *The Mildura Cultivator*, and an orchardist, at Mildura, and also part proprietor of an orchard and vineyard in the Goulburn Valley.

12002. Do you irrigate your vineyard at the Goulburn Valley?—Yes.

12003. You are prepared to supply a paper giving some particulars of the soil and the water-right at Mildura?—Yes, based upon my experience in the Goulburn Valley and my observations here.—[*The same was handed in as follows:*—]

"MILDURA IRRIGATION COLONY.—PREPARATION FOR CULTIVATION.

"Clearing the Land.

"The indigenous timber growths on the Mildura horticultural areas consist for the most part of blue bush, 'bull' mallee, balar, pine, and needle bush. Before the land can be ploughed, it must be thoroughly cleared. This is usually done by contract, the cost per acre varying with the character and density of the growth on each block. Thus blue bush costs from 6s. to 10s. per acre to remove, balar and pine from 20s. to 30s., and mallee from 40s. to 70s., just according to the amount of labour involved.

"A well-established bull mallee is a problem to the ordinary grubbing contractor. The butt is a great flattened bulb of curly timber, sometimes 8 or 10 feet through. It is set firmly into the soil, and even if all the roots were cut off, the tree would stand in its place just the same, as the upper growth is very insignificant compared with the base. Chopping a mallee out is an obvious impossibility, and as the wood is full of moisture it would be an almost endless task to attempt burning it out. Dynamite and rack-a-rock have proved equally useless.

"Before or rather behind the traction engine the difficulty disappears. For the rapid removal of timber from land there is nothing equal to it. The only preliminary trouble lies in obtaining rope and tackle sufficiently strong to enable the power of the engines to be exerted. The cable used for hauling out the mallee stumps at Mildura is a steel-wire rope having a breaking strain of 100 tons, and the

shackles and anchoring gear are correspondingly stout. The first operation is to cut down all the trees, leaving the stumps about 2 or 3 feet high. The trunks and branches are chopped up for firewood and the leaves and litter are raked up into heaps and burned. The traction engine, with an attendant gang of a dozen men, then comes on the scene. The front end of the engine is first moored up to a stump, and the hind wheels are chocked up with heavy billets of wood carried for the purpose. The main axle carries a revolving drum on which is wound the steel cable before referred to. The engine being securely fastened forward, the cable is unwound from the drum and is then carried back to a stump and the running noose at the end is dropped over it. Then the drum is set in motion, and when the rope straightens the stump starts up out of its resting-place and hurries towards the engine. It must come. Sometimes it is necessary to try back and give a few tugs, but the stump has finally to come up. It facilitates the work to cut the surface roots and clear away the earth to the depth of a foot or so round the biggest ones, but with the small stumps this is not necessary. When the timber is light, the rope is carried round in a semi-circle to a stout stump, and as it is straightened by the strain the intervening small fry are literally 'rubbed out.' Balar and pine are easily cleared in this way, and the gang makes short work of a ten-acre block, unless the mallee is extraordinarily heavy. When all the stumps are uprooted, the adhering earth is knocked off, and they are readily burned. The holes are then filled and the firewood carted off, and the work of clearing is complete.

N. B. McKay, *continued*, 23rd Oct., 1889.

"The clearing of blue-bush land is a much easier matter. The blue bush is a salsolaceous shrub, growing in bunches 2 to 4 feet high and 5 or 6 feet apart. It is shallow-rooted and easily extracted; in fact, the cultivator or the steam plough pulls it up readily. It is, however, necessary to clear it off before cultivation, as the roots and débris choke the implements. The method adopted is to chop it down with mattocks. It is then put together in heaps and burned readily.

"Grading for Irrigation.

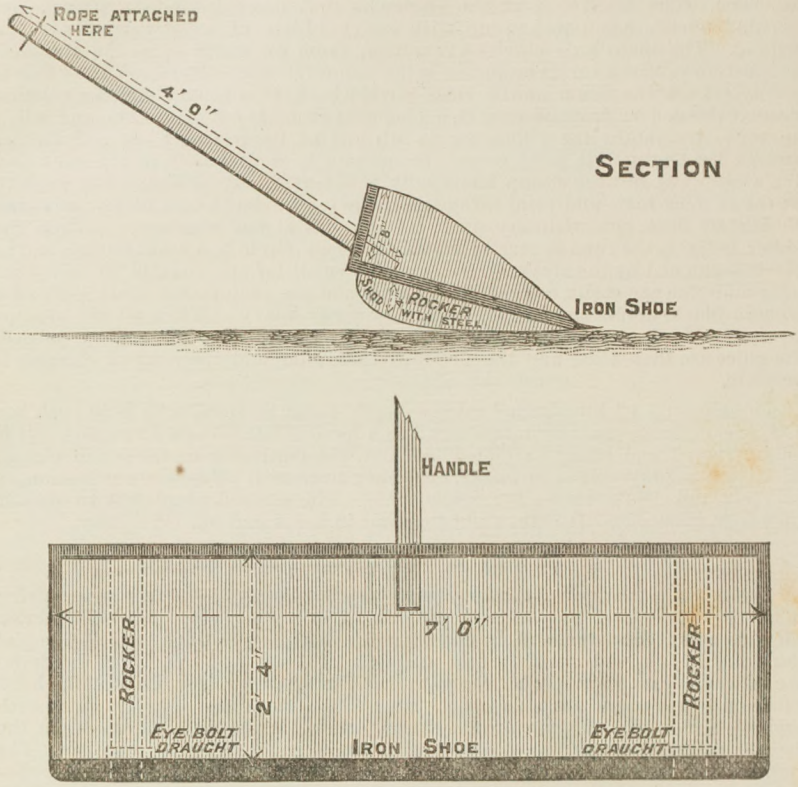
"To enable the water to be conveniently and evenly applied to a plot requiring irrigation, it is essential that the surface of the land shall slope uniformly down from the point where the water is introduced. A hollow in the centre of the plot would collect the water and form a stagnant bog-hole, and the ridges and hummocks would escape irrigation altogether. The grader takes the land in hand before cultivation, and he removes all the surface inequalities, leaving a smooth sloping surface like the top of a writing-desk. The implements used are the plough, the buck scraper, the ordinary earth scoop, and finally the smoother The buck scraper used at Mildura, of which a rough sketch is appended—[see *infra*]—is a most serviceable implement. Its merits are that it can be manipulated by the driver so as to enter the earth at any point, scraping off a light or heavy layer at will. It can carry its load to any distance required, and either discharge the contents in a heap or distribute it in a thin layer, as circumstances render necessary. It is drawn by four horses—two being attached to each of the eye-bolts shown in the sketch. The effective handling of the buck scraper requires considerable nicety, and, as the driver has no assistant, the work is one which an unskilled or inexperienced man should not be intrusted with. So much importance do the Messrs. Chaffey Bros. attach to the matter of grading the ground properly that they have gone to the expense of bringing over experienced men from California to attend to this work at Mildura.

"The surface configuration of the greater part of the horticultural land on the settlement is naturally well adapted for irrigation, and a few turns with the buck scraper, after the land has been broken up by the steam scarifier, generally suffices to bring it into proper shape. In some cases, however, where the surface is very uneven, the grading has to be completed before the work of scarifying is begun.

"The smoother is simply a stout flat frame which is drawn along the ground. It has a steel scraping blade, set at an inclined plane, on the front beam. The smoother has a board nailed across it, on which the driver stands, and by stepping forward on this board and so bringing his weight to the front he presses the

N. B. McKay, *continued*, 23rd Oct., 1889.

implement down. The small ridges and lumps are thus scraped away, and the earth is pushed along to the hollow places, where by bringing his weight to the rear the driver causes the front of the smoother to lift and glide over, leaving a smooth clean surface in readiness for the planter to set out his pegs."



12004. I have also prepared a short statement as to the *Water Right at Mildura*, and the *Value of Mallee soil for cultural purposes*, which I hand in as my contribution to the practical information which the Commission is seeking:—

"THE MILDURA WATER RIGHT.

"It has been truthfully alleged that the Mildura water right is the most ample and the most secure that any irrigation scheme in the world can boast. There is, however, nothing in connexion with the Mildura enterprise that is less clearly grasped and understood by the general public than its water privileges; and the object of this paper is to show what the Mildura water right is, how it is conveyed to the settlers, and in what manner it is made inseparable from the land. So far, these points have never been put plainly and intelligibly upon paper; and when the writer remembers what a bewildering array of legal documents are employed to shroud the facts set forth below from the average comprehension, he can easily understand how every one who has written about the settlement has 'worked wide' in treating of its water privileges. These documents are obtainable at any of the offices of Chaffey Bros. Limited, should the statements given require verification.

"1. Under an agreement dated 31st May, 1887, Messrs. Geo. and W. B. Chaffey obtained authority from the Government to enter upon 250,000 acres of land for the purpose of forming an irrigation settlement, with the right, on fulfilment of certain conditions, to acquire the fee simple of the whole or any part of that area. A right to take from the river Murray water sufficient for the irrigation of that area was embodied in the agreement, under the express condition that every acre of Mildura lands sold by the Messrs. Chaffey should carry with it, 'as a perpetual easement,' a proportionate share in such water right.

"2. By an agreement dated 30th November, 1887, the firm of Chaffey Bros. Limited took over from Messrs. Geo. and W. B. Chaffey all the rights, privileges, licenses, and authorities obtained from the Government under the agreement previously mentioned.

"3. For the purpose of apportioning the water right and of conveying it to purchasers of Mildura lands, the Mildura Irrigation Company was formed; and by an agreement dated 25th January, 1889, the firm of Chaffey Bros. Limited vested the water right in this company, and handed over to it the management, control, and supervision of all waterworks in connexion with the Mildura scheme.

"All pumping machinery and appliances, dams, channels, reservoirs, sluices, pipes, and other means for raising and conserving water, and for carrying a sufficient supply for irrigation purposes to the highest point of each block of ten acres, are provided by the firm of Chaffey Bros. Limited, and handed over in working order, *free of cost*, to the Mildura Irrigation Company. This means that the works are handed over to the people who own the land, each owner securing an interest in such works in proportion to his acreage. This will be explained by a few words as to the constitution of the Mildura Irrigation Company. There are 250,000 shares in this company, corresponding to the number of acres comprehended in the scheme. Every acre represents one share in the Mildura Irrigation Company, and the acre and the share go together. When anyone buys land from Chaffey Bros. Limited he receives a paid up share in the Mildura Irrigation Company for each and every acre transferred to him. He must sign an agreement, which is attached to the title, that he will transfer none of such land unless to persons willing to also take over the shares in the Mildura Irrigation Company. These shares must go with the land, however conveyed, whether by sale, deed of gift, mortgage, assignment, or execution under process of law. Every precaution that legal knowledge and ingenuity can devise is taken to incorporate the water right, which is represented by these shares, with the transfer of the land. Any failure or neglect on the part of the proprietary firm in this respect would be regarded as a distinct violation of the agreement with the Government.

"When all the land is sold the entire water right will have been conveyed with it to the various purchasers.

"As each system of works is completed and set in going order, it is handed over by Chaffey Bros. Limited, and the after expenses of maintenance and working are borne by the Mildura Irrigation Company. The affairs of this company are managed by a Board of Directors, elected by the shareholders (*i.e.* landholders), who will levy an annual charge on each owner of land for the purpose of raising the funds necessary for maintenance and working expenses. Up to the present time (11th November) water has been supplied to the settlers without charge, and the annual rate has not yet been fixed. It is expected, however, that it will not exceed 6s. per acre.

"The Magnitude of the Water Right.

"That the water right is sufficiently ample may be seen from the following table of quantities, which is taken from the agreement dated 31st May, 1889. The volume of the Murray river varies considerably during the different seasons of the year, and the maximum quantity authorized to be taken therefrom by the Messrs. Chaffey is regulated accordingly. It is provided that the flow of water in the river must not be reduced below a certain minimum in each month, which has been fixed as follows:—(The figures denote cubic feet per minute)—January 30,000, February 24,000, March 20,000, April 24,000, May 30,000, June 60,000, July 60,000, August 100,000, September 200,000, October 240,000, November, 150,000, December

N. B. McKay. *continued*, 23rd Oct., 1889.

60,000. An officer of the Water Supply Department, Mr. E. Checchi, C.E., has completed a series of gaugings of the Murray at Mildura, extending over several months. The minimum flow occurred at the beginning of April last, when the river was lower than it had been for many years. The lowest discharge recorded was 132,000 cubic feet per minute, so that the limitation as to the minimum flow to be left in the river is not likely ever to interfere with pumping operations at Mildura. The quantities which the Messrs. Chaffey have been authorized to take from the Murray river are set out in the agreement as follows:—

During the month of—	Cubic feet per minute.
January	30,000
February	24,000
March	20,000
April	24,000
May	30,000
June	40,000
July	48,000
August	48,000
September	60,000
October	60,000
November	60,000
December	40,000

"These figures are the maximum quantities which the Mildura settlement can claim for the irrigation of the whole area of 250,000 acres. The amount to be actually taken is regulated by the number of acres under irrigated culture; on the following scale :—

During—					
January	1	cubic foot per minute for every	8	acres	
February	1	„	„	„	10 „
March	1	„	„	„	12 „
April	1	„	„	„	10 „
May	1	„	„	„	8 „
June	1	„	„	„	6 „
July	1	„	„	„	5 „
August	1	„	„	„	5 „
September	1	„	„	„	4 „
October	1	„	„	„	4 „
November	1	„	„	„	4 „
December	1	„	„	„	6 „

This, when worked out, allows to each acre under irrigated culture a total supply of 88,488 cubic feet—a depth of over 24 inches per annum. Supplemented by the moderate rainfall experienced at Mildura, this supply will be ample for all cultural purposes."

12005. "MALLEE SOIL, ITS VALUE FOR RAISING ECONOMIC PRODUCTS OTHER THAN WHEAT.

"Before locating in the Mildura settlement, I had gone through over 20 years farming experience in the northern parts of Victoria, and for the last four years of that time I was connected with fruit growing and vine raising pursuits in the Numurkah (Goulburn Valley) district. In 1884, considering that the land could be turned to better uses than stock raising or grain growing, I, with my partners, the Messrs. Thompson, established an irrigation orchard and vineyard, and with such success that we secured one of the Government prizes competed for last summer, beating many competitors who had been years longer at the business. I mention this by way of showing that the work done on my farm was of a thorough and practical kind, and that I may therefore claim to speak with some authority about soils and about systems of culture. My business as a journalist, with irrigation proclivities, necessitated my travelling a good deal, and in this way I have also acquired a fair general knowledge of the fruit-growing localities of Victoria.

N. B. McKay, *continued*, 23rd Oct., 1889.

Consequently, in making comparisons as to the cultural capabilities of different districts, I do not speak as a novice. Having been a resident of Mildura for over 20 months, I have had abundant opportunity for noting the capabilities of mallee soil, and I give it as my unqualified opinion that, with sufficient irrigation, it is ahead of any other land in the colony of Victoria for all round productiveness. The mallee country, judging by actual results obtained in this settlement, is just a vast forcing bed, with all the conditions filled. A rich free soil, a long summer and a mild winter, are what we find here, and it only needs the intelligent application of the water to develop the latent fertility of the land. The vine, the olive, the orange, the peach, the nectarine, the pear, the fig, and the apricot, all seem to have found a congenial home here. Not only are their rapidity and luxuriance of growth unexampled, but they mature and come into bearing at an age when, according to all horticultural canons, they should have barely recovered from the shock of transplanting. Thus, raisin and Zante currant vines, set out as cuttings last year, have developed extraordinary growth and are now showing for a fair yield during the present summer. The same is true of apricots and orange trees planted last year. The most experienced horticulturists we have, and there is no small number of them, are delighted to find their theories, about waiting five or six years for the orange or the Zante currant to fruit, completely upset. Experiments with fodder, root crops, and kitchen vegetables have led to equally encouraging results. Cereal growers, who find that two crops can readily be raised from the same land during the year, are abundantly satisfied with their Mildura investments. For some time past a series of experiments with new or rare products has been carried out in a half-acre plot of ground belonging to the proprietors of the *Cultivator*. These experiments have been conducted with great care under the supervision of Mr. W. Clarson, F.L.S., and they are noteworthy as being the first occasion under which these products have been tested in mallee soil with irrigation. The results, so far as rapidity of growth is concerned, have been very satisfactory, but sufficient time has hardly elapsed to fully test the suitability of the various plants to the locality. They comprise most of the plants recommended for Victorian culture to the Royal Commission on Vegetable Products, and it will afford me pleasure, when the experiments are more advanced, to send the Commission any facts of interest that may come to light in connexion with them. Should we succeed in proving that the mallee country is well suited for the culture of Ramee, Ginger, Gram, Tamarinds, Caoutchouc, Sumach, Dates, Teosinte, and other products of great economic value, the more publicity is given to such facts the better. And, in this connexion, I would respectfully direct the attention of the Commission to an article which appeared in *The Mildura Cultivator* of the 7th November. It is there suggested that some of the Mildura lands set apart as an endowment for the Chaffey College of Agriculture should be utilized for experimenting fully with some of the special cultural products recommended so highly in the Commission's reports. The Council of Agricultural Education would, I feel sure, heartily approve of the proposal to turn a part of this land to immediate account in the manner proposed, and the value to the country of such a series of experiments would be inestimable. Possibly the Commission may see its way to back up the suggestion with a strong recommendation in its next report."

The witness withdrew.

(*Article referred to in above evidence.*)

"About one-fourth of the area of Victoria is composed of mallee country, which hitherto has been regarded as being almost worthless for agricultural and grazing purposes. It is a dry region. The yearly rainfall in the mallee belt ranges from seven to fifteen inches as a general average, and the soil is so loose and porous that this supply is of little use in developing its latent resources. But with irrigation a different story has to be told. The productiveness of mallee land under an ample water supply is simply incredible to those who have not witnessed it. People must see it before they can form any adequate conception of the cultural capabilities of the soil. The mallee country is just a vast forcing

N. B. McKay, *continued*, 23rd Oct., 1889.

bed. Under irrigation it produces grass, fodder and root crops, cereals, fruit and vegetables of all ordinary kinds, in greater abundance than any other district in Victoria—perhaps in all Australia. A visit to Mildura will convince the most hardened sceptic of this fact.

"The purpose, however, of the present article is not to sound Mildura's praises, but to bring a practical suggestion with regard to this great territory under the notice of the Government of the day. The development of the country's resources is the principal function of the rulers of any young colony, and the settlement of the mallee is a problem which has so far baffled all our legislators. The Mildura scheme is at last leading the way to a solution, and its success will literally and actually mean the addition of a new province to Victoria. But we want to see the investigation carried a step further. *The researches of the Royal Commission on Vegetable Products have brought into notice hundreds of products of great importance, which have not as yet found their way into our industrial economy.* A few of them may be enumerated here: The Sumach, the Rhea or Ramee, Ginger, Gram, Liquorice, Cinchona, Tamarind, Custard Apple, Litchi, Papaw Apple, Wampee, Caoutchouc, Date Palm, with the many fibre, perfume, tanning, dyeing, and medicinal plants; the Teosinte, Sainfoin, Lentil, and other novel plants yielding valuable forage. Leading authorities, at the head of whom stands Baron von Mueller, assert that these products are suited for industrial culture in the warm districts of Victoria. An attempt should be made to test their suitability to the mallee country. If they are found to be adapted to the soil and climate, the economic resources of the colony will be enormously increased, and it would be well worth the cost of carrying out a series of experiments of the kind. Now at Mildura the people are up to the hilt in the fruit business. They can see money in it, and they have no doubt about the result. There is no need for the Government to make experiments with the ordinary cultural products in the mallee—we have set about doing that ourselves. But there is more to be done. An experimental irrigation farm should be established at Mildura by the Department of Agriculture, for the purpose of trying some of the special plants so highly recommended to the Vegetable Products Commission. And why at Mildura? We shall set out one or two weighty reasons. In the first place, Mildura is a typical mallee centre, the soil and climate being fairly characteristic of the whole belt. In the next place the conditions for carrying out experimental work here are especially favorable. No land need be purchased for the purpose. Under the agreement between the Government and the Messrs. Chaffey an area of nearly 17,000 acres was to be set apart as an endowment for agricultural college purposes. As this land has not yet been vested in any board or person, it lies practically at the disposal of the Government, and a better use could not be found for a portion of it than that suggested. Every acre, moreover, has an ample water-right inseparably vested in it, and it is at Mildura, and at Mildura only, that the proper application of water for irrigation is fully understood and practised. Then the proposed experiments would be carried on among a community of people already schooled in careful methods of culture, and keen to turn every valuable discovery to immediate account. In no other locality can equally favorable conditions for thoroughly testing the capabilities of the mallee land be found, and we put it to the Minister of Lands, who has shown great zeal in the development and settlement of this immense desolate tract, whether a few hundred pounds expended in carrying out our suggestion would not be money well spent."—*Cultivator*, 7th November, 1889.

François de Castella, examined.

F. de Castella, 23rd Oct., 1889.

12006. *By the Commission.*—What are you?—I am managing the St. Hubert's vineyard, Lilydale, for the firm of De Castella and Rowan.

12007. You are a son of Mr. Hubert de Castella?—Yes.

12008. You have received a special training in viticulture?—I have been in St. Hubert's vineyard nearly all my life, and I have been four years at home in some of the best vineyards in France, studying viticulture.

12009. Will you kindly supply a short paper on your impressions of Mildura, particularly in regard to viticulture? —I shall be happy to do so.—[*The same was handed in as follows:*—] F. de Castella, *continued*, 23rd Oct., 1889.

"In compliance with the request of the Commission, I have prepared a short paper setting forth my views as to the capabilities of the Mildura Irrigation Colony for viticulture.

"It is, of course, impossible to say what the success of the vine will be; all I can do is to indicate what it may probably become, if proper attention be paid to peculiarities of soil and climate, and care be taken to suit both the kind of vine and mode of pruning to these conditions.

"That the soil of Mildura is remarkably rich is a fact which strikes every one who visits the place; in addition to this, it has physical properties which render it eminently suitable for irrigation, such as friability and complete freeness from clogging or caking after treatment with water.

"The original station was celebrated in old days for its stock-carrying capabilities, and was considered one of the best in the district. I have not, as yet, been able to obtain any analysis of the soil, but, from the geological formation, it is easy to see that it is rich in phosphorus, lime, and most probably in potassium and nitrogen. Although all these elements are indispensable to the vine, there is one it demands in greater quantity than any other, and that is potash. I may quote one or two passages from George Ville's work on chemical manures in support of this. When speaking of the effects of want of potash on the potato, he says, 'Vines are subject to similar effects, and although my experience is less extended in this direction, it enables me to be equally positive. Where potash is lacking, the leaves do not attain their full development; in the month of July they become red and spotted with black, after which they become dry and are easily reduced to powder under pressure of the fingers. The stem does not reach a fourth of the dimensions it attains with the normal manure.'

"In an appendix to the same work he again says, 'Until lately I always thought that the leguminosæ and the potato were the plants which showed a special preference for potash, but the vine distances them in this respect in a most surprising manner. In the case of the potato the suppression of potash manifests itself by a diminution of the crop; with the vine, however, little or no fruit makes its appearance, and we virtually get no crop at all. The vine itself barely sends forth two or three feeble shoots, and the few shrivelled leaves are hardly as large as a crown piece, whilst those of the plants which have been dressed with normal manure are as large as a man's hand. In the plot without potash, as early as the beginning of the month of June, the leaves first turn red and then black, drying up and shrivelling like those of potatoes which have received the same treatment. The following figures are instructive:—

	Yield per acre— tons cwt.	galls.	per cent. of sugar.
Normal manure	4 15	848	14·8
Manure without N	2 10	442	16·4
„ „ P	2 18	512	16·4
„ „ K	—	—	—
„ „ Ca	3 2	548	15·4

On the plot without any manure two vines gave only a few shrivelled grapes, in fact, the crop may be counted as nothing. These grapes gave 12 per cent. of glucose.'

"These few extracts suffice to show the great importance of the presence of assimilable potash in the soil for the culture of the vine.

"I do not wish to imply that the soil of Mildura is deficient in potash; indeed, I should imagine from the luxuriant appearance of some young vines I saw there, that the contrary was the case, but I wish to draw attention to one thing I remarked, and it is that a good many settlers have planted vines in blue-bush

F. de Castella, *continued*, 23rd Oct., 1889.

country, keeping country which has been cleared of mallee for other cultures; now the blue bush, being a salconaceous plant, thrives in a soil containing salt, and therefore sodium, whilst the mallee country is more likely to contain potash. It therefore struck me as being irrational to plant the vine, which of all vegetables demands most potash, in a soil which is likely to contain less of it when both soils are at the settler's disposal, and he is at liberty to be guided by his own judgment and plant where he thinks best.

"As far as the other elements necessary for plant life are concerned, if there is enough of them for other cultures there is certainly enough for vines, therefore we need not take them into consideration.

"With regard to the climate, it is about that of Spain or Sicily, and ought to be most suitable for the growth of the vine; in fact, from what I saw of the vines there, none of them more than two years old, I was most favorably impressed and consider that, for vines of that age, they had attained a most remarkable development. On the other side of the river, at Wentworth, I saw some vines in a garden, about seven or eight years old, which fairly astounded me by the show of fruit they had on them; it was just before flowering time and they were perfectly free from oïdium, anthracnosis, or other disease.

"As to the quality of the wine likely to be made, I do not consider that any high-class wine would ever be produced, but good commercial wines, suitable for blending, and which could successfully compete with the coarse wines of Spain and Italy, so extensively imported into France, could be grown in such quantities as to be very profitably sold at a low price. I consider it quite certain that these wines can be grown. It is possible that a superior wine may be produced, of the type of a Sherry or Port as far as alcoholic strength is concerned, which may command a good price, but I do not think it very probable.

"Most of the settlers I met told me that they intended to prune their vines short. Now, in my opinion, they could not make a greater mistake, for wine growing at least; as for raisin growing I have never taken any interest in the subject, and having no experience do not wish to express an opinion on it. I must say that all the settlers I had occasion to speak to were raisin-growers, but I should warn any future wine-grower at Mildura who may chance to read these few notes to beware of short pruning.

"Most of our vineyard labourers come from the cold parts of Europe, such as Switzerland, where grapes ripen with difficulty under ordinary circumstances, and where the vine does not take any considerable development. There, short pruning has to be resorted to in order to make a drinkable wine. When these men arrive in Australia they bring all their old habits and prejudices with them and tell the inexperienced vineyard proprietor that long pruning weakens the vine. The proprietor thinking that they know more about the subject than he does allows them to do as they like, and they set to work to cut the vine down to such an extent that, unable to take advantage of the genial climate to which it has been transplanted, it gives only one-eighth ($\frac{1}{8}$) or one-tenth of the quantity of grapes it could be made to bear with intelligent pruning, besides being much weakened, whereas long pruning strengthens a vine if the climate be favorable to its development.

"Another disadvantage of short pruning in warm climates is the well-known fact that the less grapes you have on a vine, the more glucose the must will contain; therefore, instead of making much more per acre of a drinkable wine which they easily could do, they content themselves with a much smaller quantity per acre of a wine which ferments so badly that alcohol has to be added to prevent the production of lactic acid, resulting from the excessive temperature reached during fermentation favouring the development of this particular germ.

"The resulting wine, a curious mixture of alcohol, sugar, lactic acid, and water, is most unpalatable, sour, uninviting, and unwholesome, besides ruining the name of Victorian wine when sold as such.

"I may here warn vine-growers against the advice given to them by some would-be authorities who tell them they can make a light wine by picking grapes

before they are ripe. This is absurd. The unripe grape contains a certain percentage of vegetable acids, such as tartaric, malic, &c., &c., some of which are themselves converted into glucose during the process of ripening, whilst others are eliminated after helping to transform the starch of the vegetable tissues into glucose. It stands to reason, that if the fruit be picked before complete maturity, these acids, which are not capable of fermenting, will be found unchanged in the wine produced, thereby rendering it acid and undrinkable. It is, of course, necessary, in warm climates, to pick the grapes before they get over ripe or shrivel up, but it would be just as foolish to rush to the other extreme, and pick the fruit too soon.

F. de Castella *continued*, 23rd Oct., 1889.

"If, instead of blindly following the mode of culture which has been adopted in a cold climate, the vine-grower would listen to the dictates of reason, and were to try a few inexpensive experiments, he would soon find out his mistake, and confer a boon on himself as well as on his neighbour, not to speak of the consumers of his wine.

"Even in the cooler districts of Victoria, such as the Yarra Valley, I do not know of any variety of vine which is weakened by long pruning, even in a series of years; whilst certain varieties are so influenced by short pruning as to bear no fruit at all. If this be the case on the Yarra how much more must it be so on the Murray?

"Another thing which struck me was the distance from each other at which the vines were planted, and which I consider excessive. The distance adopted at Mildura is in nearly every case 8 x 10 (feet). Now I consider this to be a waste of land, and would not recommend any one to plant wider than 7 x 7 or 8 x 8. I do not say this from prejudice, living as I do in a cool climate where 4½ x 4½ is not too close. I admit that the northern wine-growers are quite right when they plant at 10 x 10 and even 12 x 12, but at Mildura they are placed in a different position.

"The chief factor which influences the distance apart is the amount of moisture in the soil, and the northern vine-growers have on this account to plant wider than would be the case if they only had to consider the development they were going to give to the vine; unless this is extraordinarily great I hold that no vine requires a space 8 x 10, or eighty (80) square feet.

"At Mildura they need not consider the quantity of moisture in the soil, as they can regulate it at will, therefore they have only to consider the space the vine requires for the development they intend to give it. If, for raisin growing, it be necessary to prune short, it is also necessary to plant closer than they do, otherwise there will be an inevitable waste of soil, which must be utterly incompatible with the principle of intense culture.

"There is one more point to which I desire to draw attention, and that is the kind of grape which it would be advisable to cultivate.

"It is of the greatest importance to only cultivate the varieties whose grapes contain a feeble percentage of glucose, and which are at the same time heavy bearers; these, if pruned long, will give an immense yield per acre of good sound wine requiring no addition of alcohol or noxious preservatives.

"Such kinds as the Mataro, Grenache, &c., &c., possess these properties, in fact all the kinds which will not ripen well in the southern districts of the colony would give abundant yields of good commercial wine at Mildura.

"To these may be added the Hermitage or Shiraz, although the must of the latter is much richer in glucose than that of the former varieties.

"For the White, the same properties are necessary, and I should recommend the Gouais, Pedro Ximenes, Tokay, &c., and I believe the Chasselas would suit admirably, as I have noticed that although it is with us one of the first kinds to ripen, even at the end of the vintage the must has not acquired a greater percentage of glucose. This is due to the thickness of the skin preserving the juice in the interior of the berry from concentration by evaporation; more especially would this be so if this peculiarity be further assisted by the shade of the great number of leaves left to the vine by the long pruning which I have already advocated.

"As a general rule, however, I should recommend the cultivation of the same kinds as are grown in Spain and Italy, as from the similarity of climate I believe they are the ones which would give the best results.

F. de Castella, *continued*, 23rd Oct., 1889.

"In conclusion, I may say that the vines before mentioned planted at say 7 x 7, pruned long, and assisted by irrigation, may be expected to yield in fair seasons crops of from 500 to 700 gallons per acre of wines, which ought to command a price of at least 1s. 6d. per gallon. Allowing £5 per acre for expense of cultivation and £4 10s. per acre for interest on outlay, buildings, &c., this will give a clear profit of from £28 to £43 per acre, if not more.

"I contend that no other culture will give such magnificent returns, do so much good to a country, or have greater attractions for the happy proprietor of the vineyard, as there is no branch of agriculture which presents such a vast field for experimental research, or which is so extensively benefited by the practical application of scientific laws and principles as viticulture."

The witness withdrew.

Joseph Bosisto, Esq., C.M.G., further examined.

Joseph Bosisto, C.M.G., 23rd Oct., 1889.

12010. *By the Commission.*—You have just visited the settlement of Mildura with the Commission?—Yes.

12011. The Commission are desirous of having your impressions as to the Mildura settlement, and as to the products suitable for the soil there?—I shall be happy to write a paper on the subject.—[*The same was handed in as follows*:—]

"During my late visit to the Mildura settlement I was greatly pleased with what I saw; there were signs of the strongest character that the intention of the proprietors is to make Mildura a real irrigation colony.

"The settlers are not at all behindhand in planting fruit trees, olives, vines, and even cereals over the irrigated lands.

"The plan of irrigation appears to me to be excellent. I have witnessed the extensive irrigation system throughout Bengal and the North-west Provinces of India, in order to supply the parched lands of the ryots (small farmers) with water. These people live upon and farm from three to five acres of land; they grow chiefly sugar-cane, indigo, cotton, poppies, maize, gram, and other grain. Before irrigation was in operation over their lands they suffered greatly from scarcity of food, but now, under the present altered circumstances, the lands produce sufficient food for themselves and their families, leaving on hand a surplus to carry to the markets of the numerous villages which surround their farms.

"The system of regulating the water rates is very simple and equitable. A cultivator gives notice to the assessor or other officer in charge of the district that he proposes sowing so many acres with maize, wheat, indigo, sugar-cane, or other crop, and that he will require a certain number of waterings during the season of growth, according to the character of the crop, from the nearest distributory or sub-canal, for irrigation. Some crops require more water than others, and differential rates are consequently charged. Every person using the canal water knows exactly how much he will have to pay beforehand, and, as no complications are possible, the system readily commends itself to the native mind.

"My opinion of Mildura as an irrigation district is therefore based upon observations made during my travels over India.

"The condition of lands subject to irrigation presents a better opportunity for the growth of many utilitarian trees and plants, which under a similar climate without water supply would prove failures.

"The growth of Pyretheum Roseum (insect powder), safflower, chamomiles, poppies, lavender, mints, are articles in constant demand, and being annuals would give a speedy return. Numerous other paying annuals and biennials might be quoted, but it is well known that settlers dread experiments of this nature lest by so doing the whole of their labour might be lost and ruin follow.

"I do think that in order to help the settlers at Mildura, and throughout that vast country, the Mallee, a Government Experimental Farm should be established in that country for the purpose of assuring cultivators what to grow, and the plants to avoid growing."

The witness withdrew.

George Neilson, F.L.S., further examined.

12014. I am the Curator of the Royal Horticultural Society of Victoria, and beg to make the following remarks on my visit to Mildura:—I had the honour to receive an invitation from the President of the Royal Commission on Vegetable Products to accompany the Commissioners upon a visit to the Mildura Irrigation Settlement. The Murray was overflowing its banks, appearing a continuous flat on both sides, densely covered with valuable redgum and other timber trees. In some parts the water covered an area of four miles on each side of the stream. All that could be seen for 40 hours was water and gum trees. I must confess that I was not prepared to see the progress that had already been made—and in what may be termed a few months only—in a district that was always considered to be Victoria's barren waste, the mallee country. From what I saw, it only strengthened the opinion previously held, that not only the mallee country, but other parts of this colony at present considered worthless, may yet become great centres of prosperity if taken in hand with the same energy and experience as the Messrs. Chaffey are bestowing upon the Mildura settlement. Any one to see the well laid out and rising township, the substantial buildings throughout the settlement, massive and expensive pumping machinery, the busy hives of industry—workshops—present, the large areas already under cultivation, the healthy and vigorous appearance of the fruit trees, vines, and other minor products already planted, they cannot fail but feel surprised at what has and can be done with energy and skill combined. Mildura will become a great educational centre in the art of irrigating and successfully cultivating supposed waste and useless lands, showing what can be done, and will be yet accomplished, by irrigation worked upon scientific principles. It will also be the means of bringing the fruit supply within the reach of the masses at all seasons of the year. It will open up sources of wealth to thousands who may have the courage to leave the towns, where they are now earning very low salaries, to a more healthy and lucrative employment in the country. The whole area of the settlement inspected appeared to be well adapted for the orange, lemon, citron, fig, peach, apricot, prune, vine, olive, and other minor products. By the time the fruit trees already planted are bearing, the canning factory will be prepared to begin operations, and will reduce the necessity and uncertainty of marketing the fruit in its green stage to a minimum. The raisin, currant, wine, apricot, fig, peach, and olive oil will, I think, become the staple products of Mildura. I could see no signs of anything but success attending the settlement, and every settler appeared to have confidence in the scheme. The soil is volcanic, of a reddish-brown colour, inexpensively cleared (12s. to 20s. per acre), easily worked at all seasons, and, as informed by the Messrs. Chaffey, admirably adapted for irrigation. I, however, think that it is a mistake to clear the whole area of the mallee timber, and denuding the cultivated block of shelter from prevailing winds. Stripes or belts of the native timber should be

George Neilson, F.L.S., 23rd Oct., 1889.

George Neilson, F.L.S., *continued*, 23rd Oct., 1889.

left at stated distances to form breakwinds, until the settlers can form artificial belts around their own holdings for such purpose. In my humble opinion, Mildura is well worthy of a visit from any one interested in the fruit industry of Australia. Employment is plentiful and easily obtainable by those who have taken up selections, and find that their time is not necessarily required upon their holdings throughout the year. The fruit industry of Victoria is only in its incipient stage ; we require a population of industrious fruit-growers and mechanics to face and conquer the mallee lands, replacing the scrub with vines and fruit trees. If water can be made available for irrigation, in a few years, I venture to state that the barren mallee country will be one of the wealthiest country lands of Victoria.

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ROYAL COMMISSION ON VEGETABLE PRODUCTS.

Comments on the Reports by the Press of Australasia.

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The most minute details of the visit to the vineyards of Rutherglen were taken down for publication, and the report of the Commission on this district will be highly instructive.

The experienced opinions of those best qualified to advise show how great are the neglected resources of the Colony.

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idea of the value of the evidence given, nothing, apparently, that relates to any branch of the subject (Forestry) being omitted. . . . The Commission has accumulated a mass of information which cannot fail to prove valuable to enterprising occupiers of the soil. . . It is to be hoped that every farmer in Victoria will be put in possession of a copy of the Report to read and study during the long winter evenings. . . . As usual imparts much useful information.

Weekly Times

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The Agricultural Department should be the foremost official institution of the State.

Farmers' Gazette

Strongly recommend to read. The Commission covers a multitude of sins. . . . Thoroughly reliable.

Adelaide Observer

A deal of valuable information.

Ararat Advertiser

The charge can never be laid against this Commission that its labour has been in vain.

Avoca Mail

A mass of information of the most valuable kind. . . Greatly appreciated throughout the Colony.

Bacchus Marsh Express

We shall republish the evidence. . . . Varied and useful.

Ballarat Courier

The Commission is one of the most valuable of the public bodies extant.

Ballarat Star

Full of instructive and interesting matter. . . . Such knowledge just now is particularly timely.

Extremely interesting. Their labours will bear a very high national value. . . . With commendable promptitude and foresight have lost no time in making the information available. The scope of the enquiry is almost unlimited, and the excellent work done stimulates the wish that the Commission will continue its investigations.

Ballarat Evening Post

Brimful of interest.

Belfast Gazette

Will prove invaluable to the general interests of the Colony.

Bendigo Evening News

It is one of the most valuable books, compiled by a Commission, in the Colony. A copy should be in the hands of every farmer in Victoria. . . . A vast amount of information.

There is not one page whereon something instructive, if not entirely new, will be found. . . . Its usefulness cannot be overestimated.

Bendigo Independent

Is of such value that it could not be obtained under a cost of hundreds of pounds if the task of collaboration were undertaken by an individual.

Bendigo Advertiser

A *rara avis* amongst Royal Commissions.

The researches of the Commission have been of a most interesting and valuable nature. They will undoubtedly be productive of great good.

Boroondara Standard

Our agriculturalists and horticulturalists cannot fail to receive enlightenment on perusing.

Brunswick Medium

The important enquiries of the Commission. . . . They are performing their task admirably, and have entered into the enquiry with that careful diligence which demands the greatest approbation.

Brunswick Reformer

Will be of lasting benefit to the Colony. It is not too much to say that a more important Royal Commission has never been appointed, for they are dealing with a subject of immense importance to the Colony.

Buninyong Telegraph

Of an eminently practical character.

Very Valuable.

Camperdown Chronicle

Must prove of almost incalculable value to the people of this Colony. The Commission has gone about its duties in a business-like manner. There have been few Royal Commissions the labours of which have been so much calculated to advance the prosperity of our Colony as this.

Charlton Independent

With no small satisfaction we have received, etc.

Chiltern Times

Should be in the hands of everyone who cultivates in Victoria.

Clunes Guardian

They have been unremitting in the intelligent discharge of the duty they were appointed to perform. We are firm believers in the efficacy and public usefulness of their investigations. . . Eagerly availed of.

Collingwood Observer

Has been doing good work.

Creswick Advertiser

Excellent work—full and clear. . . A perfect mine of information. . . The great practical value of these reports. . . Its well-directed labours.

Daily Telegraph, Napier, N.Z.

One of the most valuable works that we have seen.

Daylesford Herald

Most valuable. . . Well worth perusal.

Dimboola Banner

Can be recommended to every small landowner.

It is evident that the Commissioners are not spending their time for nought.

Donald Times

Undoubtedly one of the most valuable that has ever emanated from a Royal Commission in this Colony.

A quantity of useful information.

Dunmunkle Standard

Very industrious and useful body of men, the R.C.V.P.

Continues to pursue its important work in such a thoroughly systematic and intelligent manner as to confirm the good opinion previously expressed as to the usefulness of the enquiry.

Dunolly Express

Good and useful work. . . If the various suggestions of the Commission are acted upon this country will be one of the most fruitful of the world. . . It is impossible to estimate its value.

We cannot attempt to do justice to the results of their labours. . . . A vast fund.

Eastern Star

Doing good work in a quiet way.

Elmore Standard

Of a most instructive character. . . Will have an influence on the future progress and prosperity of Victoria. . . We earnestly hope that it may be read by all who have a desire for the material progress of the Colony. One of the most important and valuable contributions to the literature of Victoria.

Federal Standard

Invaluable. . . One of the most useful Commissions ever appointed in Australia Felix.

Fitzroy Free Press

The index adds to its value as a work of reference.

Footscray Advertiser

Invaluable. . . A veritable *multum in parvo.*

Footscray Chronicle

One of those quiet and unostentatious Commissions which create no stir, but which is doing good and lasting work. Its labours will undoubtedly confer a lasting benefit upon the whole of Australia. Their efforts are being watched by a large proportion of thinking men.

Geelong Advertiser

Contain most valuable information.

We have no hesitation in saying that it has performed grand work. . . Than which no Commission of greater value to the community has ever sat in this country.

Gipps Land Farmers' Journal

Of engrossing interest and the highest importance.

Gipps Land Mercury

We bear willing testimony to the admirable work which is being done by the Commission and its secretary. We regard it as one of the most useful which has ever been appointed in the Colony. . . The excellent work which is being done by this most useful Commission. . . Its earnest hopes have already been amply realised.

Gipps Land Times

An immense amount of information from the best authorities. . . . No agriculturist can afford to be without a copy if he wishes to be in possession of the results of the latest and best knowledge and experience. . . We express our approval of the method adopted by the Commission of publishing their reports as occasion called for without keeping the country waiting for the full notes of the very valuable evidence taken. . . We have always welcomed the reports of the Commission.

Gordon Advertiser

Of a highly practical character. . . A vast amount of very interesting and useful information.

Hamilton Spectator

We congratulate the Commissioners on the exhaustive character of their enquiries and the able manner in which they are conducting their investigations, which will prove of incalculable value.

Horsham Times

Will be read with deep interest by all agriculturists. . . Information which could not otherwise reach them. . . Bound to prove very valuable to the Colony. . . Every sentence is fraught with interest.

Inglewood Advertiser

Comes at a most suitable time.

Kaniva and Lillimur Courier

Very judicious, exhaustive and valuable suggestions.

Kerang Observer

We intend from time to time to make extracts. . . The Commission has not outlived its usefulness yet.

Kilmore Free Press

A very valuable publication.

Kowree Ensign

The valuable nature of the work is abundantly evident.

We feel justified in asserting this record is in no way behind their previous reports.

Launceston Examiner

Valuable practical essays.

Maffra Spectator

No farmer should be without one on his bookshelf. . . The Commission have done good service.

Maryborough and Dunolly Advertiser

The Commission are to be complimented upon the vast amount of useful information which their reports will diffuse throughout the Colony. . . Of great service to the community.

Mildura Cultivator

The Budget Speech is a triumph for the Vegetable Products Commission. It must be highly gratifying to its members to find that so much of what its report advised has been embodied in the Government proposals.

Mt. Alexander Mail

Very interesting.

Should be turned to practical account.

McIvor Times

The results of the work of the Commission should be most valuable.

Nagambie Times

No effort is left untried to teach the agriculturist.

National Agricultural Society's Journal

Remarkably interesting and very instructive.

Nhill Free Press

Of enormous advantage to the Colony. . . Teeming with the opinions of experts.

Nhill and Tatiara Mail

Cannot be too widely distributed. It is a credit to the gentlemen engaged in its production.

Parramatta Gazette, N.S.W.

The valuable service the Government of Victoria has rendered to the agricultural industry by the appointment of the Commission. . . Straining every nerve to acquire valuable information. Volumes of priceless information. . . Truly the contrast is not in our favour.

Pleasant Creek News

Money well spent.

Portland Guardian

Opens a wide field for thought.

Prahran Telegraph

Information of an invaluable character.

Port Melbourne Standard

Will be eagerly studied.

Will be read with interest by all agriculturists and every one interested in the resources of the Colony.

Richmond Australian

One of the most useful Commissions that has yet sat on any industrial question.

Richmond Courier

Must tend to the enrichment of the Continent of Australia generally.

Riponshire Advocate

Doing its searching work thoroughly and well.

Exceedingly interesting.

Romsey Examiner

Full of interesting information.

Are to be congratulated upon the success which continues to attend their labours.

Royal Horticultural Society's Report, Melbourne, 1886

The value of this most practical contribution to horticulture cannot be overestimated.

Rupanyup Spectator

Of great interest.

Rutherglen Sun

A perusal would well repay farmers and others. . . A vast amount of useful information.

Its members have done their duty not only with rare intelligence but with an earnestness and diligence which are deserving of all praise. They met fortnightly, often weekly, and have carried their investigations into various parts of the Colony, often sitting for days together for the convenience of those from whom they sought information.

St. Arnaud Times

The members of the Commission are entitled to the greatest praise for the interest they evince in the welfare of the agricultural community.

St. Arnaud Mercury

Excite much attention and interest. . The investigation it is to be hoped will be continued.

Shepparton Advertiser

Their enquiries have not been marked by that bustle and parade which some people regard as necessary signs of practical work, but, nevertheless, in a quiet, unassuming manner they are eliciting information of the deepest interest. . . Twenty years ago these facts would have been regarded as incredible.

South Australian Register

Very interesting, valuable and practical information.

S. Bourke Journal

Contains the evidence of men very competent to give it.

S. Gipps Land Express

Anyone interested may see reports at this office.

Stawell Gazette

Should undoubtedly be in every agriculturist's library.

Swan Hill Guardian

Every farmer should procure and study this work.

Sydney Daily Telegraph

The work of the Commission is highly appreciated.

Sydney Mail

If Victorians do not keep in the front rank of agriculturists it will not be the fault of their Royal Commission on Vegetable Products. It is of the working class.

Sydney Town and Country

In Victoria agriculture is taught upon a large scale, and there is a special Commission appointed. . . The expenses of the Commission have been exceedingly small.

Traralgon Record
A mass of useful knowledge has been obtained.

Walhalla Chronicle
Of considerable value.

Wangaratta Chronicle
Must have a potential educational influence.

Of the greatest value to farmers.

Warrnambool Standard
Should be in the hands of every cultivator of the soil.

Wentworth Advocate, N.S.W.
An agricultural library, in fact so full of interesting matter tha the reviewer hardly knows which to treat first.

Yarrawonga Chronicle
Are doing a vast amount of really useful work.

Yarrawonga Mercury
Most important.

The Hon. the Premier
The Reports are of the utmost value and will be of the greate use to the community. . . The gentlemen on the Commissi who gave their time and labour to this question have done an incalc lable service to the people of this country, a service that cannot over-rated.

The Hon. the Minister of Agriculture (*at St. Arnaud and the Fruit Conference*)
The Commission was a marked exception to the rule. T value of their reports was everywhere referred to. . . They h got together information which was not attainable in any other p of the world. . . The Commission had no doubt been one of t greatest educators the country has ever been blessed with. A gr part of the usefulness of the Commission has been the manner which its reports have been disseminated throughout the country.

The Government of W. Australia
The work is highly approved.

NOTE.—Many hundreds of columns of the Press of t Colonies have been filled with extracts from t Reports.