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AGRICULTURAL GAZETTE OF NEW SOUTH WALES.

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OF

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Vol. IV, Part 7. *JULY.*

Contributions to an Economic Knowledge of Australian Rusts *(Uridineæ)*

By N. A. COBB,
Department of Agriculture.

CHAPTER VII.

Keeping Seed-wheat true to name. Causes leading to Mixed Seed.

The title of this chapter may seem to indicate that we have left our subject and are wandering into irrelevent discussion, but reference to later parts of our work will show that many of our recommendations are based on the supposition that wheats are true to name, and that seed-wheat is pure and good in every respect. Unfortunately this supposition is not always a safe one to make; therefore, we have felt obliged in the preceding chapter on varieties of wheat, and in the present chapter on the quality of seed-wheat, to deal with this doubtful element in wheat-culture in such a manner as to leave beyond doubt what our recommendations mean.

There is no truth clearer than this, that the market value of a product depends in no small degree upon its uniformity and reliability. We all know what it is to come to rely upon a given brand of goods, because of its excellence and uniform quality. Consider for a moment what lies at the bottom of this reliance which we, every day of our lives, place upon the names of various articles. It is simply that the name is made to stand in a commercial sense for the article itself. If we order any brand of goods by name the merchant has no moral or legal right to deliver and charge for any other. So highly is this connection between name and thing valued that we find names and trade-marks protected by law, and it is no uncommon thing to see men or firms so jealous of any imitation of their trade-mark or name, or any sale of other goods under this trade-mark or name, as to spend large sums of money in exposing the fraud. We shall not be far wrong in saying that the exact naming of commercial articles is the very back-bone of trade.

The greater the number of varieties of a given useful article the greater is the necessity for correct nomenclature.

The raising of wheat has been for a long time one of the greatest and most important of industries, and the number of kinds of wheat has increased to several hundred. We need not, therefore, dwell further upon the necessity for a system of wheat nomenclature. It is of great importance to the farmer, the miller, and the seed-merchant that wheat should be accurately and suitably named, and that they shall be able to get wheat true to name. It is a fact that this matter has suffered such neglect in this country that until recently a sample of wheat strictly true to name was an uncommon thing. A sample of wheat not containing a considerable percentage of grains of another sort than the majority was a rare occurrence. Several different wheats are here known under one and the same name, and, on the

other hand, the same wheat sometimes goes under several different names. This is a state of things proved to exist, and our assertions are not, therefore, simply so many assertions.

We leave out of account, for the present the kind of wheat it is best to grow, as we wish to speak at first only of the quality of the seed. We know from several years of very careful examination, that our wheat-farmers as a whole are not using seed of the best quality, and that every year sees the sowing of thousands of bushels of very inferior seed. Seed to be good must be pure and uniform; by which we mean that the grains should be all of the same kind, and as nearly uniform in size as possible, and at the same time large and solid. Solid seed produces a harvest of solid grain; large seed produces large and vigorous plants; uniform seed produces a uniform crop. These are rules that have been proved by the most careful experiment, and they have no exception in ordinary seasons. On the contrary, it is just as true that light seed gives a harvest of light grain, that small seed gives small plants, and that impure seed and seed not uniform in size give an irregular stand of wheat. The reasons for these facts are so self-evident that it seems almost foolish to point them out, but our eyes have recently been opened to the tremendous amount of carelessness that prevails in this matter of seed-wheat, and we are bound to speak out fully.

First of all, it is certain that four out of every five samples of seed-wheat, as it comes into our market, are impure; that is, are mixed or are not true to name. The seed, instead of being of one kind, is more often a mixture—in most cases, in fact, it is of from three to five sorts. No matter how carefully such seed may have been winnowed, it is very poor policy to use it. The different sorts will ripen at different times, and will be of different heights. How is it possible to harvest such a crop economically? If the grower waits for the late plants to ripen, he loses on the early part by shelling, and if he does not wait for the late part to ripen, he loses in yield in that part by cutting before it is ready. Again, how is it possible for harvesting machinery to handle economically wheat of varying length? Where the ears range all the way from a man's hips to his head, it is impossible with a stripper, or even a harvester, to get the crop into bags economically, for though the harvester may secure all the ears, the threshing machine will not work economically on uneven feed.

The case is much the same with uneven seed. The large grains give rise to large plants, the small grains to smaller plants, and the result is an uneven stand and a wasteful harvesting. The largest miller in the world, Mr. Pillsbury, of Minnesota, U.S.A., last year carefully winnowed at his mills a large amount of seed, and gave it away in the district on which he draws for his grist, remarking: "I think the idea of having wheat thoroughly cleaned, with the smaller kernels all taken out, would result in an increase in yield of at least two or three bushels per acre." These words, from one who has handled more wheat than almost any man living, should be carefully considered by wheat-growers.

Another point in the quality of seed-wheat is this: Let the farmer be careful to get the best strain of the variety he wishes to grow. Purple straw is a very popular wheat in some parts. Are our wheat-growers aware that there are nearly twenty sorts of purple straw, and that some of them are vastly better than others? We venture to say not; in fact, from numerous inquiries, we are positive that this is not generally known. When one sort of purple straw will ripen fully three weeks earlier than another sort, when the yield of some sorts of purple straw is fully thirty per cent. more than that of other sorts of purple straw, and at the same time

of a much superior milling quality, surely it is worth while to guard against putting in anything but the best.

It will be profitable to review the various ways in which wheat becomes mixed. The accidental or unintentional mixing of seed does not occur in any particular place or operation. We find that all parties connected with the raising, marketing, and milling of wheat are more or less responsible for various accidents and mistakes. The farmer, the thresher, the miller, and the agricultural show-man have each their share in giving rise to mixed seed.

The Farmer and Mixed Seed.

Where wheat follows wheat there is danger of mixing the seed if one variety follows another on the same piece of land. Self-sown wheat from the first crop comes up and mixes with the second crop, and so on. Mixing sometimes takes place very rapidly in this manner.

Where two different varieties are sown in the same paddock the broadcasting is often so done that the two wheats are mixed at the margins, and unless care is taken in harvesting mixed grain results.

Bags that have been imperfectly emptied of wheat are often used again for wheat of another variety. The grains of the first sort left in the bag become mixed with those of the second sort.

Mistakes are made in labelling bags—labels get lost or misplaced.

The Thresher and Mixed Seed.

A threshing machine may be a prolific source of mixed wheat. The thresher visits farmer A, and having threshed his wheat proceeds to farmer B. Unless the threshing machine be carefully cleaned, farmer B's wheat becomes mixed to some extent with farmer A's. Connected with this mixing is the danger run by farmer B of the introduction on his farm of weeds from A's farm. The danger of spreading weeds by threshing machines going from place to place is so great that some Governments have passed laws inflicting a fine on any owner of a threshing machine who fails to have his machine thoroughly cleaned before proceeding to a fresh farm. Such a law is not necessary if every farmer, in making his bargain with the thresher, stipulates that the machine shall come on to the premises thoroughly clean. No thresher careful of his reputation would think of hauling on anything but a clean machine.

The Miller and Mixed Seed.

The miller's bins and bags are a fruitful source of mixed seed. A bin or bag not thoroughly emptied, and then used for another variety of wheat, results in contaminating the second variety. When we recollect how much of the seed-wheat purchased by farmers comes from the local miller, we easily understand how a miller, careless with respect to these small matters, may soon introduce confusion into the wheat of the surrounding district.

The Agricultural Show and Mixed Seed.

Picked samples of seed-wheat competing for prizes at agricultural shows usually stand side by side open to public inspection and handling. It is impossible for some persons to resist the temptation to plunge the hand into a bag of fine looking wheat. As one bag of wheat looks very much like another to the inexperienced, a handful taken from one bag is frequently returned to another standing near by. Most of the seed thus exhibited becomes seed-wheat, and is consequently likely to be mixed seed. We have seen judges of wheat themselves mix samples in this manner.

We have not mentioned all the numerous ways in which seed-wheat becomes mixed, but what we have said may perhaps suggest care where formerly there has been none, and if so, we shall have done so much the more towards a solution of the rust problem, inasmuch as the purity and reliability of seed-wheat have something to do with its solution.

CHAPTER VIII.

The Artificial Cross-fertilising of Wheat.

Wheat is naturally close-fertilised, that is to say, each wheat plant contains in itself all the elements necessary to fecundation, and uses them exclusively for its own purposes. Doubtless, cross-fertilisation does take place occasionally through natural agencies; doubtless the fertilising element of one plant does in certain rare cases find its way to the ovary of another plant, and thus produces a natural cross; but this occurs so seldom that it must henceforth be left out of account in practical agriculture. It is well known that two wheats of different variety may be grown side by side for years without any change in the character of the resulting seed; the two sorts will reproduce truly year after year, each after its kind, and there will be no crosses, or so-called hybrids—that is to say, plants intermediate in nature between the two original sorts—or at least only very rarely. This rare occurrence of natural cross-fertilisation is due to the nature of the flower of the wheat plant, which is so constructed as to open only after fertilisation from its own elements has already taken place.

It is clear then, that if man wishes to produce new races of wheat by commingling the qualities of wheats already known, and to do it systematically and with speed, he must resort to artificial cross-fertilisation.

There are no great obstacles in the way of producing these artificial cross-breeds. The fertilising element of any variety of wheat acts perfectly well on the ovaries of any other variety, and produces cross-bred seed which is perfectly fertile; the operations necessary to bring about this artificial impregnation are simple and require no very special skill and no elaborate instruments; in fact, there is no reason why anyone having sufficient patience and skill to thread a needle should fail in crossing one wheat on another. Practice only is necessary. We do not mean by this that anyone may at once set himself up as an expert wheat-breeder, any more than he could in a day qualify himself as a breeder of race-horses or stud-sheep. There is just as much scope, nay, there is *more* scope, for the exhibition of judgment in breeding wheats than in most sorts of breeding, and no one may expect the highest success without years of experience.

Our object in the following paragraphs is to tell the novice how to go to work to produce a cross-bred wheat, and we shall begin by describing the wheat-flower and its organs, believing that if the breeder knows beforehand the exact nature of the organs he is working upon he will not only secure better results, but will take deeper interest in his work.

An ear of wheat as it first peeps forth is composed of from one to two dozen groups of flowers, called *spikelets*, arranged on opposite sides of a zig-zag stem called the rhachis. The spikelets are not opposite one another, but are arranged in an alternate manner, any one spikelet being attached to the stem or rhachis at a point between two spikelets on the other side. If a spikelet be cut away from an ear of wheat that is in blossom, it

will very likely present the appearance illustrated in the left hand figure of the adjacent illustration; hanging out from a cleft in the spikelet are seen three

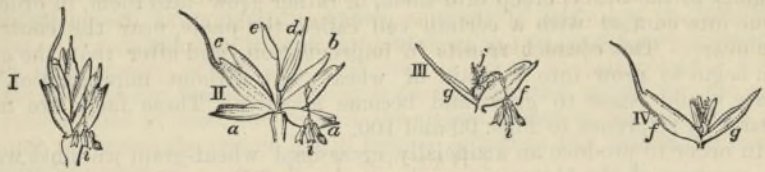


Fig. 98.—Wheat flowers, natural size.

yellow bodies called *anthers*, each anther being suspended by a delicate filament or thread. If the spikelet be opened with needles or a knife, it presents the appearance shown in the second figure. The two pieces of chaff, *a a*, are called *glumes*, and serve to protect the inner and more delicate parts; *b*, *c*, *d*, and *e* are flowers, each of which is composed of two pieces of chaff (called *palets* or *glumules*), enclosing the essential parts, the *anthers* and the *pistil*. The flower *b* has blossomed, and its three anthers are now hanging out, and will soon wither and be blown away; the flowers *c*, *d*, and *e* have not yet blossomed, in fact it is very often the case that the topmost flower (*e*) fails to blossom because it lacks some of the essential parts. Our two right hand figures show the interior of the flowers *b* and *c*; it will be seen that the palets are of unequal size and are unlike in form, and that where they join each other at the base, they enclose a small white body with two feathery plumes issuing from its top, though this is less clearly to be seen in figure IV because the three anthers, which have not yet been thrown out, partly hide it from view. This little white body with the two plumes (*j*, Fig. III) is the ovary, and is the part which by growth becomes the grain of wheat; the plumes, or *stigmas*, as they are called by botanists, wither as soon as the blossoming is over and almost entirely disappear, though traces of them can sometimes be seen on the tip of a full-grown wheat-grain.

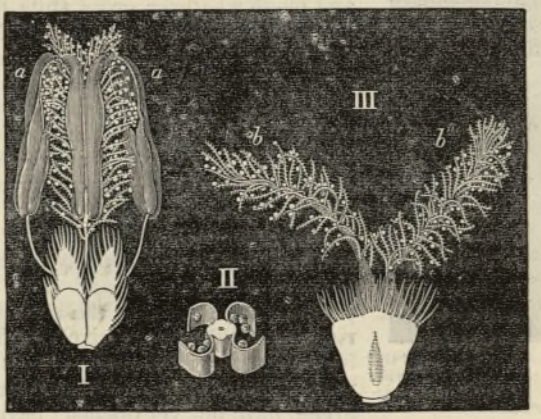


Fig. 99.—Ovary, stigma and anthers of a wheat-flower; magnified, after *Bauer*. I, the three anthers (*aa*) shedding their pollen-grains upon the branches of the stigma, the pollen-grains being shown as white balls (the ovary is hidden by the ciliated scales which immediately surround it inside the palets); II, cross-section of an anther more highly magnified; III, the ovary and its two stigmas (*bb*).

It is customary to speak of the anthers as the male organs of the flower, and of the ovary as the female organ. The anthers when ripe burst open

and let out a yellow powder, the *pollen*, composed of microscopic grains, and these grains, when they are caught on branches of the plumes or stigmas of the ovary, creep into them, or rather grow into them, in order to come into contact with a certain cell called the *ovule*, near the centre of the ovary. This contact results in impregnation, and after that the *ovule* can begin to grow into a grain of wheat; but without impregnation the ovary would cease to grow and become abortive. These facts are made clearer by reference to Figs. 99 and 100.

In order to produce an artificially cross-bred wheat-grain we must watch the progress of the blossoming and get ahead of Dame Nature. An ear of wheat begins to blossom near its middle, not at the bottom or top. As soon as blossoming has begun we shall find on searching among the flowers and opening them, that the stamens are in various stages of ripeness; this is indicated not only by the size of the stamens but also by their colour. A ripe stamen is yellow, an unripe one is green, and when approaching ripeness its colour is yellowish-green. The nicest point in making an artificial cross is undoubtedly in judging just when to operate. If we wait too long the stamens will have burst, and the pollen will have impregnated the ovary; it will then be of no use to apply any other pollen, for the decisive point is passed—the parentage of the future grain is already determined. If, however, we can find a flower whose anthers are on the point of bursting, and can remove them before any of their pollen gets loose, and can then supply a pollen to suit our own purpose, we can control the parentage and make whatever cross suits us. We must, however, guard against operating too early. There is a certain stage, a certain time only, at which the stigma will receive, and if the stigma is not yet ripe for receiving pollen, we may daub on pollen without end, and yet produce no cross. Fortunately there is a means by which we can judge unerringly of the ripeness of the stigma. As the wheat is naturally a self-fertilised plant, it ripens its anthers and its stigmas simultaneously; when, therefore, the anthers are ripe and ready to emit their pollen, the stigmas in the same flower are also ripe and ready to receive it. The rule then, is to open flower after flower until one is found whose stamens though they are yellowish-green, have not yet opened; having made absolutely certain of this, the three stamens are removed, care being taken not to burst them in the operation. This process of removing the stamens may be called *emasculating*. Having emasculated a flower, the ripe anthers of another variety of wheat are dusted against the stigmas, and the flower may be closed up again with the assurance that cross-fertilisation will take place without fail if all the operations have been carefully performed.

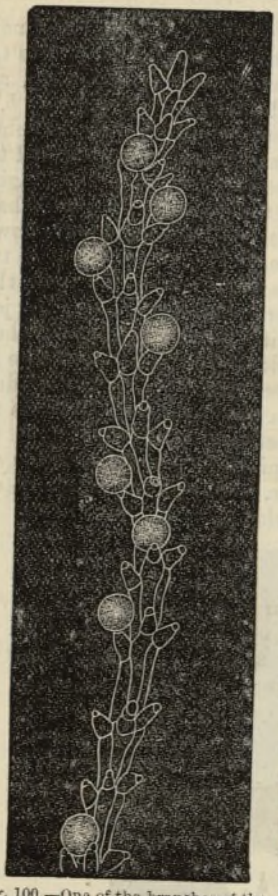


Fig. 100.—One of the branches of the stigma of a wheat-flower with grains of pollen adhering; magnified, after *Bauer*.

Some operators prefer to emasculate the flower while the anthers are quite green, and then wait a day or two before applying the pollen, the idea being that if pollen be supplied at once the stigma will not be ripe to receive it, and that before it can ripen the pollen applied will have lost its fertilising power. We do not believe that this resorting to two operations on separate days is necessary or advisable. If care is taken to emasculate a flower whose anthers are *already beginning to turn yellow*, the pollen for the cross may be applied at once, and even if the stigma is not at that moment ripe enough to receive the pollen, it will become so before the pollen has lost its fertilising power.

Equal care must be taken to select for the purposes of cross-fertilisation stamens that are neither too old nor too young, but in the zenith of their fertilising power. This is the case after they have become bright yellow in colour, and before they have been thrown out by the flower. It is necessary to guard against such ripened and empty stamens as the flowers have failed to throw out, for it not unfrequently happens that stamens accidentally remain in the flower long after fertilisation has taken place, and, of course, the pollen of such stamens is worthless.

It remains to describe the tools used in making crosses, and the methods found in practice to be most efficient and expeditious. While it is true that the

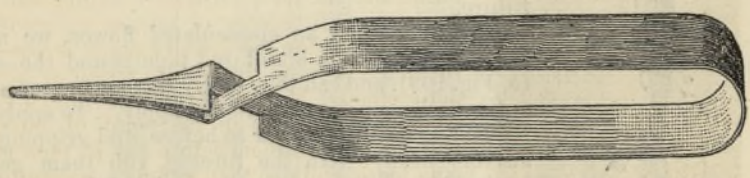


Fig. 101.

operations are so simple that they can be performed without special tools of any sort, it is far better to be provided with a suitable pair of forceps. To emasculate a flower with a pointed stick, is not difficult, but it requires much more time, and involves greater risk of injury to the flower than with

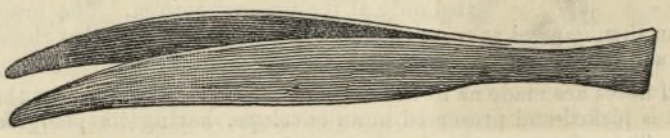


Fig. 102.

forceps. Two suitable forms of forceps are here shown. One remains shut when not in use, while the other remains open; the one is curved, while the other is straight. Both have their advantages. It will be found convenient to have the forceps fastened to an upper waistcoat button-hole by means of a cord about eighteen inches long.

The operation of emasculating is performed as follows: Take hold of the ear of wheat with the right hand and give it a slight curve over toward the right; with the thumb-nail of the left hand pry open the flowers successively until a suitable one is found; hold the flower open with the left thumb-nail while removing the stamens by means of the forceps with the right hand; seize only the very tips of the stamens with the forceps, and endeavour to remove all three at once. If the grip of the forceps is too low on the stamens, there is danger of injuring the stigmas.

Having emasculated a flower, it is necessary to so mark it as to make it easy to find it again. This is best done by marking not the flower emasculated, but the one below it or above it or opposite it. A very good and permanent mark is made by cutting off the tips of the spikelet with a pair of small scissors carried in the same manner as the forceps, *i.e.*, attached to the waistcoat. Accidents are less likely to occur if the scissor-blades are round-pointed. If much crossing is to be done it is best to have some system of marking; thus, having emasculated a flower, or made a cross, if the flower is on the right-hand of the spikelet, we clip the top of the spikelet above; if on the left hand of the spikelet we clip the top of the spikelet below. This clip will be indelible, and very clear to be seen, and consequently easy to find in future.

Fig. 103.—An ear of wheat marked with red tape (*b*), and tied up in mosquito netting (*aa*).

Having marked an emasculated flower, we mark the head by tying a bit of red tape round the stalk (*b*, Fig. 103), and can then safely leave it to secure the anthers whose pollen we wish to apply. To apply the pollen we open the flower as before, and gripping the anthers firmly with the forceps, rub them gently against the stigmas of the emasculated flower. Each time that the forceps are used they should be carefully wiped; this will prevent fertilisation with the wrong pollen, which might otherwise occur.

After the pollen has been artificially applied, the flower is allowed to close, and the whole ear is tied up gently in mosquito netting for a day or two (Fig. 103). The object of this is to keep the flower from accidentally receiving any further pollen. In two days time the ear is untied, and again enclosed in netting tied only at the top and bottom. The grains in the ear can then expand as necessary, and there is no danger that the cross-bred grain will be lost out.

Full notes are made as to the nature of the cross, and when the seed is ripe it is picked and preserved in an envelope, having its pedigree marked on it. Thus, for example,—

White Lammas (p) × Purple Straw (m)

which indicates that the seed is a cross between White Lammas and Purple Straw, and that White Lammas was the father (*pater*, hence p) or variety that furnished the pollen, and Purple Straw was the mother (*mater*, hence m); or we can omit the (p) and (m), it being always understood that the father variety is written first. Thus:—

White Lammas × Purple Straw.

Fixing.

To produce a single cross-bred seed is one thing—to produce a new breed or variety of wheat is another. The new cross-bred seed will produce a single plant, bearing, we will say for example, 300 seeds. When these 300 seeds are sown the labour begins. The 300 plants will not be all alike; on the contrary, there is in plants from newly cross-bred seed a marked tendency to "sport," or vary. In consequence, it is necessary to cull from among the 300 plants above mentioned all inferior and undesirable plants, and decide on what shall be the standard for the new variety. This decided, it is necessary to sow the seed from year to year until, by constant weeding out of the sports, there is no longer any tendency for the variety to vary. When this is done and the variety comes true, it is said to be "fixed."

Fixing a variety of wheat takes from three years upwards. There are some crosses that require a long series of years of the most careful attention, and some even that it has never been possible to fix at all. In general it may be said that the more violent the cross, the harder it is to fix it. By a violent cross is meant one in which the parents are very dissimilar, as for instance a cross resulting from a *durum* or bearded flinty wheat on a fine

Fig. 104.

beardless sort, for example, Medeah on White Velvet. We figure on this page ten ears from ten plants of the second generation of such a cross. That such a variety of heads should result from *one seed* in two years will, no doubt, astonish many readers, but it will cause less surprise to those who understand something of the laws of stock-breeding.

What the laws are that govern the properties of a cross-bred wheat is at present unknown, so that it is impossible to predict what sort of offspring a cross between two known varieties will produce. Moreover, there are two different crosses possible between any two varieties of wheat, as for instance when we cross White Lammas on Purple Straw we may use the Lammas first as the father and then again as the mother. The two resulting crosses will not be identical. In general we may say that the cross will be intermediate between the parents, but the chances are that it will be much more like one than the other. There are no doubt definite laws which govern the nature of the offspring, to discover which would be most interesting, and, we have no doubt, useful.

To make a cross it is of course necessary to have both parent varieties in blossom at the same time. To bring this about requires some forethought. If a very late variety is to be crossed on a very early variety it is necessary to sow the late variety very early and the early variety very late. If necessary the early variety can be kept from coming into ear by cutting back. There is no way of hastening a late variety to any great extent; careful culture and removing all the stalks from the stool except two or three are the only measures worthy of mention.

CHAPTER IX.

Improving Wheats by Selection.—Experimental Plots.

ANY variety can be improved by careful and methodical selection. This method has been in vogue for many ages, and it is to it that we largely owe the gradual improvement that has taken place not only in wheat but in all cultivated plants. There is still plenty of room for improvement, however, and in the present chapter, we point out in particular not only the possibilities ahead, but give plain directions that will enable anyone so inclined to follow up our suggestions. All artificially obtained varieties tend to deteriorate, so that even if it were no longer possible to improve the wheat-plant by selection, it would still behoove us to practise careful selection for the purpose of keeping up the quality we have already secured.

While it is true that selection can be carried on in the field as ordinarily cultivated, and that this is the method anciently practised and one that is still in vogue, we strongly recommend the putting aside of specially selected and specially tilled land for the growth of plants from which to select.

An experimental wheat-plot must be carefully sown and carefully tended. The question is often asked "Is it possible to tell from the way wheats behave in a plot tended with the utmost care, how they will behave when sown broadcast in the usual way? Does it follow that because a wheat turns out well when drilled in and kept free from weeds by continuous cultivating—does it follow that it will do well in the hands of the ordinary wheat-grower?" The reply to these questions is this: "No; it does not follow that a wheat that does well in the one case will necessarily do well in the other; nevertheless experience has shown that in most cases we can tell from the behaviour of wheat in an experimental plot how it will behave in general culture." It would be absurd to say that because a given variety yields in a small experimental plot of one-fortieth of an acre at the rate of thirty bushels to the acre, that it will yield thirty bushels in the hands of wheat-growers generally. On the other hand, however, if on two experimental plots of equal size and similarly treated it was found that one variety yielded twice as much as another, it would be quite safe to say at once that the wheat which yielded the double amount would yield the better in general culture. Experimental plots will never be managed on a great scale on account of the expense. Experiments are ventures, and in most cases failures. There are nine failures to one success and each failure costs just as much as the one success, if not more. It is only when we can apply on a large scale the knowledge gained from successful experiments that the benefits of experimental work are seen. In the case of wheat-growing, experimental plots are so valuable that we advocate their use by all those who grow wheat on a large scale.

To be useful the plots must be situated on land suitable to wheat-culture—such land as is used by the wheat-growers it is intended to benefit. This

land should be as uniform in quality as possible, so that we may know when we get certain results that we have not to allow for that unknown element, the fertility of the land. We may illustrate this matter best by a simple example. Suppose we are trying two wheats for their relative productiveness and find that one, the first, yields ten per cent. more than the second. In such a case our result is worthless unless we know that the land in both cases was the same in every respect. To get uniform land is not easy, but it is not impossible. Small areas sufficiently uniform can be found in most localities. When a uniform area of sufficient size cannot be secured it will often be found that one varying in a slight degree can be secured. Such land may be used for experimental purposes if the change in the land takes place gradually in one direction. Thus if on the slope of a hill or near the bottom, land is found that in the upper part is a little coarser than lower down, we may compensate for this fact to some extent by placing the drills in our experimental plots so that they run in the direction of the change, that is up the hill, so that part of each drill is on the coarser soil and part on the finer. In any case too much attention cannot be paid to this matter of uniformity of soil. A deficiency in this respect has spoiled the results of more experiments in agriculture than any other one cause. In this connection it is well to recollect that the larger the experimental plot the less likelihood there is of the land being of uniform quality; it is all the more necessary to mention this fact because there is a notion prevalent that large experimental plots are to be preferred for the reason that any small irregularity in the land will be made up for in the average result of a large plot. This is to some extent a fallacy. The smaller the plot the more thoroughly we can control its uniformity. The only reason why the smallest possible plot is not the best is that individual wheat-plants vary so much from each other that it is necessary to grow a considerable number in order to obtain reliable results. The number of plants it is desirable to grow varies according to the object of the experiment, but there are few experiments that require the growth of above one thousand plants of a given variety.

In giving directions for the method of cultivating an experimental plot we assume that it is not the object of the experiment to find out the best method of culture; in such a case the experiment itself must determine what kind of treatment the land shall receive. For all other purposes the following will be found a good method:—1. Plough three to eight inches deep. 2. Harrow twice over, across the furrows. 3. If the soil is lumpy break the lumps apart with a spade or mallet after each harrowing. 4. Make perfectly straight parallel drills sixteen to eighteen inches apart and two to three inches deep in a direction across the furrows. 5. Sow the wheat by hand, grain by grain, putting only one seed in a place. Sow in an exact line at the bottom of the drill and place the seed exactly five, six, or seven inches apart as may be desired. If necessary have a line marked every five, six, or seven inches so as to get the seed sown exactly as directed. 6. Cover the seed uniformly one and a half to two inches deep. 7. Hoe once every week or ten days, and keep every weed down. 8. In moving about the plot be careful to avoid treading down the earth to the detriment of some plants more than others. A systematic arrangement of paths at right angles to the direction of the drills will be found serviceable in this connection. [*See* diagram.]

Let us consider each of these eight points more in detail.

1. The best experiments, and the most reliable opinion based on general observation, both favour a firm seed-bed for wheat. Very deep ploughing immediately before sowing is, therefore, undesirable. Eight inches is not

too deep where there is a good rainfall. Where the climate is very dry even three inches will answer.

2. Harrowing twice, or three times if necessary, brings the top of the soil into a fine and uniform condition, and harrowing across the furrow accomplishes this object quicker than harrowing with the furrow. Both ploughing and harrowing should be done in a regular and thorough manner, so as to secure regularity in the mechanical condition of the soil. If one part of the plot is ploughed or harrowed differently from any other part, the plants will be growing under different conditions in the two parts, and such plants cannot, therefore, be compared with each other in other respects. If, for instance, the yield is different in the two parts, it will be impossible to say how much of the difference is due to difference in the manner of ploughing and harrowing.

3. The soil should not be allowed to remain lumpy, for the obvious reason that such soil is less likely to be uniform in quality.

4. The drills should be straight, because the subsequent labour of cultivating and keeping down the weeds is much less if the rows are not crooked, aside from which, if the rows are not straight and parallel, and evenly

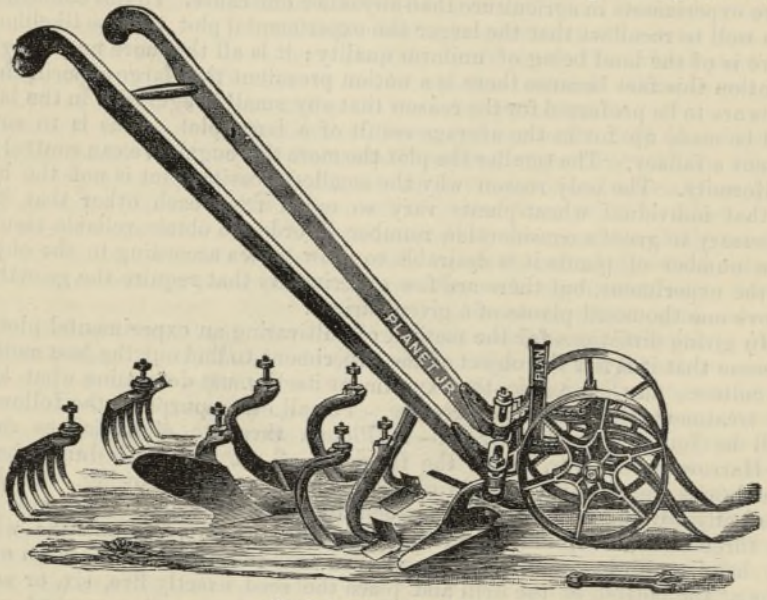
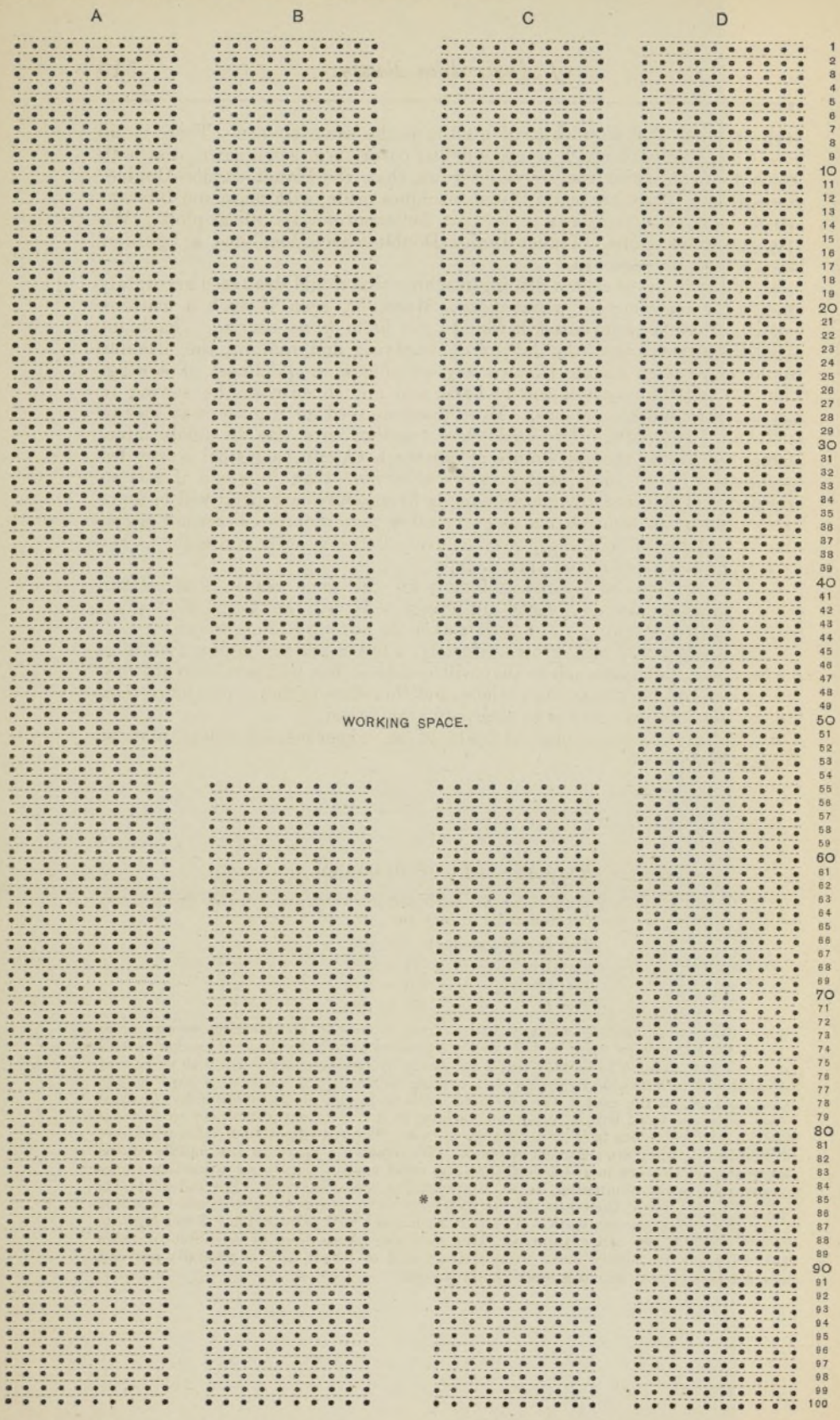


Fig. 105.—Planet Junior Hoe.

spaced, some rows will have a better chance than others, and the object is to give all rows the same chance. Experience has shown that sixteen inches is a convenient distance between the drills. A drill two to three inches deep allows of covering at least two inches. In general, it is best to cover wheat one and a half to two inches deep. Drilling across the furrows gives more uniform results than drilling with the furrows. The harrow fails to obliterate the furrows. If, therefore, the drills are made in the same direction as the furrows, it may happen that one drill lies on the top of what was a furrow, while the next may lie between two furrows, and the two resulting rows of plants would be likely to differ on that account. We must always



keep in mind that we wish to give all rows the same chance. There is no better machine with which to make drills, cover them when sown, and with which to keep down the weeds later on, than the Planet Junior Double-wheel Hoe. There are many Planet machines made, with more and different attachments, but the above is the best for experimental wheat-plots. We give the exact name, "Planet Junior Double-wheel Hoe," and a figure of the machine, on page 514.

5. We have never seen a drilling-machine that would drop seed accurately enough for experimental wheat-plots. Moreover, even if such a machine existed, or could be invented, it would be of little or no service. Each lot of seed is so small that the labour of emptying and refilling the machine would more than counterbalance any advantage in quickness of sowing. The only reliable way is to sow by hand, and not to entrust the sowing to any but very reliable persons. More than one seed in a place may lead to mistakes of two sorts. Two seeds close together give rise to stools interlacing, but having the appearance of one stool. Again, each stool is crowded by the other, and consequently grows otherwise than it would if not so crowded. If the seeds are placed exactly by measure each plant will be more likely to have the same chance as every other than if the seeds are not placed exactly. A field line is easily marked every five, six, seven, or eight inches by sowing in a piece of red yarn or tape.

6. The seed is to be covered uniformly for the same reason that all the other operations are performed uniformly. It will be found that good harrowing and breaking up of clods makes the covering much easier.

7. If weeds would only grow uniformly, a few would not do much harm in a wheat-plot, but inasmuch as they will not do so, but will persist in growing nearer some wheat-plants than others, and therefore robbing some more than others, the only safe plan is to extirpate every weed.

8. We insert here a plan of part of an experimental wheat plot at Wagga Wagga.

EXPLANATION OF DIAGRAM.

A, B, C, and D are four tiers of wheat, separated by paths, and sown in drills thirty feet long. There are one hundred drills in each tier.

Tier A contains drills 1 to 100.
Tier B ,, ,, 101 to 200.
Tier C ,, ,, 201 to 300.
Tier D ,, ,, 301 to 400.

This enables us to easily locate any drill. Thus, if we find on referring to our notes that White Lammas is sown in drill 284, we proceed at once to the drill marked with a star. We are enabled to do this the more easily by having every tenth drill of one of the outside tiers indicated by a sign-post bearing its number in characters large enough to be read across the plot. The alternate drills (indicated in the diagram by the faint dotted lines) are sown with a rust-liable variety, as it is our constant object to test our varieties with reference to their resistance to rust. These drills of rust-liable wheat are not numbered; they are regarded as blank. We reserve a space in the middle of the plot as a space to work in at harvest time and other times. This reservation introduces no confusion in the numbering, as we simply fail to sow drills 246 to 254 and drills 346 to 354. By reserving the *centre* of the plot for working room we save much travelling in the course of a season's work. The plot is enclosed with wire netting 3 feet high, to exclude poultry and other animals. This is a wise precaution, as a rabbit or other small animal will quickly make away with a drill of wheat, and is generally perverse enough to select that which is most highly prized.

Tobacco as a Farmers' Crop in New South Wales.

(*Continued from page* 430.)

By G. F. SUTHERLAND,
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Liquid Manures.

In some countries, such as India, where individual plots of tobacco cultivation rarely exceed a quarter of an acre in extent, it is not unusual to apply a liquid manure to the plants at this stage of their growth, with very beneficial results. Potash nitrate (saltpetre), where available, may be most economically supplied in this form.

Hilling.

When the plants have attained a height of 12 inches to 15 inches, they should have the earth drawn or heaped around the stem to afford them the necessary support. This work, termed *hilling*, may be done by either a light single or double mould-board plough, or an implement similar to the latest fashion of maize cultivators, which can be gauged to various widths and carry two mould-boards on the after teeth, that heap the soil round the plant to the desired height. In the past this work was done by the hoe, but the above method will be found more economical, while equally efficient, if performed with care. In the case of very high-growing plants they may require to be hilled twice in the course of the season.

Priming and Topping.

The field life of the tobacco plant in this Colony, with favourable weather, should range from ninety to not more than one hundred and ten days, the flower-buds commonly making their appearance from the seventh to the ninth week of this period. These, and two or more of the upper leaves, after attaining a certain development, should be nipped off, except in the case of those plants required for seed. This operation, styled topping, is generally conducted at the same time with the somewhat similar work of priming, or the removal of the ground-damaged and broken bottom leaves. Although some farmers, notably in France, where the crop is most carefully grown under the superintendence of the *Regie Nationale*, prime as early as the fourth or fifth week after setting out, so that the juices of the plant are not wasted on the nourishment of unmarketable leaves.

The object of both operations is to retain only such number of perfect leaves on each plant, as it can thoroughly develop and mature. The sap that would have gone towards the growth of flowers and seed is thus diverted to the enrichment of those leaves which will form the crop, and upon the merits of which, individually, the farmer entirely depends for a reward for the labour and expense of their growth. When topping is per-

formed too high, the upper leaves remain poor and papery, much depreciating the value of the yield. Should a plant that can only properly mature twelve leaves be left with sixteen, there will not only be no gain in weight, but a distinct loss of quality will be apparent. What a prominent agriculturist of this Colony termed the science of "common sense" is particularly requisite in this work, as no arbitrary opinion can be laid down as to the number of leaves to be left on each plant. So much depends upon the variety of tobacco grown, the strength of the soil, and resultant condition of the plant. The number of leaves to be retained ranges, according to circumstances, from six to twenty-two, and must in each case be decided by the observation and experience of the farmer interested, guided by the object to be attained. This method is much more likely to be productive of correct results than the blind following of such dogmatic aphorisms as "prime high and top low," inculcated in some hand-books, and which, like many more wise saws, is only partly true and no guide of action. There is a consensus of opinion on the part of the most experienced tobacco planters and German chemists, who have carefully investigated the matter, that there is a decided loss of aroma in the leaves from the premature removal of the flower buds that is not often recouped by the increased yield so obtained. It is therefore advisable, except in the case of late crops, to defer the operation of *topping* till the flower buds have appeared with some regularity throughout the field, so that the work once entered upon may be performed without much interruption, and so tend to uniformity in ripening. The pinching off of flower, stalks, and leaves, is work for which children are well suited. It should be neatly and deftly performed, so that the wounds may not hinder the growth of the plant by dissipating its resources, or damage be caused to the remaining leaves, which will now rapidly expand and increase in body after receiving the above attentions.

Seed Plants.

Plants reserved for seed should be of the strongest in the field and distinguishable by being attached to a tall rod, firmly fixed in the ground. This will also serve to support them against strong winds. They should receive the same care in suckering as the other plants, and, as insecticides may not be used on them with safety, worming should be done by hand. When the seed-pods have ripened, which may be known by their turning a dark-brown colour, they may be harvested either by cutting off the seed-heads and hanging them head down in a dry place, or, where field insects attack the pods, which they frequently do, the whole plant may be pulled up by the root, even before perfect maturity, and allowed to ripen in a like inverted position in the curing house.

Suckering.

Flower buds having, with the above exception, been remorselessly destroyed, nature immediately asserts its will by throwing out buds (suckers) at the axils of the leaves and stem which if left to themselves will develop into leaves and flower stalks. These intruders must be constantly removed and should never be allowed to grow beyond 2 inches in length. Their existence of course is at the expense of the vitality of the plant which we are interested in making as perfect as possible. This work, known as *suckering*, becomes almost continuous for the remaining period of the field life of the plant. This will vary from two to four weeks, according to the merits of soil and climate, which in some measure determine the number

of growths of suckers that will be thrown out. This number will vary and will be greater in the more stimulating climate of the northern seaboard than elsewhere; but in every case a careful examination and trimming of the plants will be necessary every three or four days. In the earlier work of tobacco growing, intervals of varying length will occur during which the every-day presence of the labourer among his plants may not be necessary. From the appearance of the first sucker, however, till half the crop has been placed in the curing shed, his attention will be fully occupied in doing justice to his 3-acre charge, either indoors or out. It will greatly conduce to the perfection of the crop if the field operations just described are carried out after the dew has left the plants, when they have become tougher and less liable to injury.

Second crop.

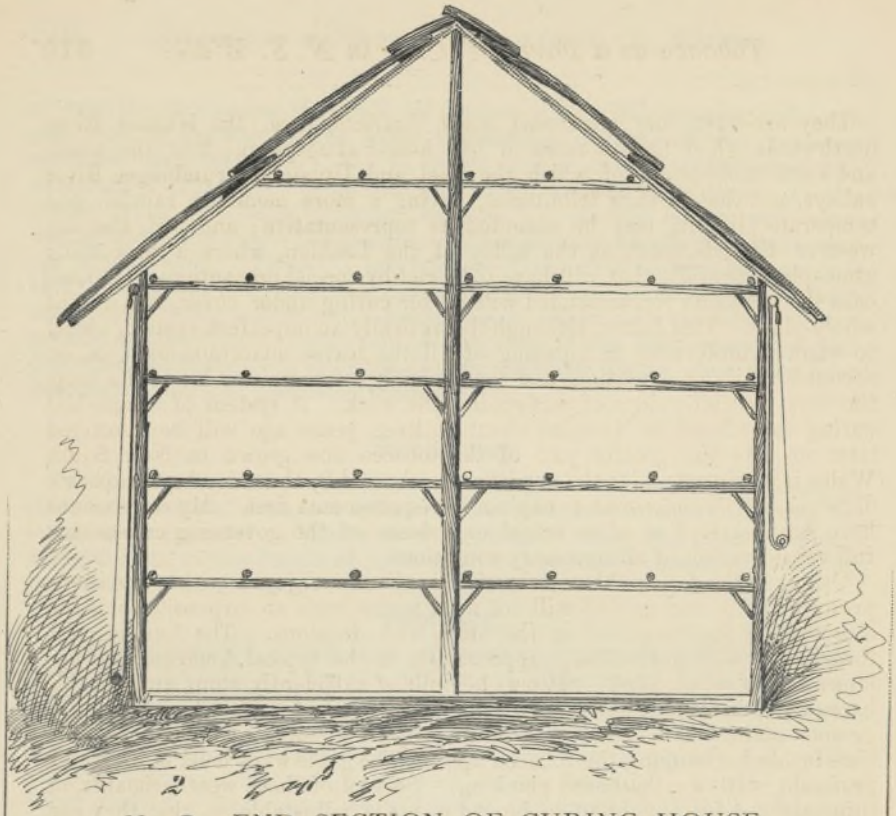
In the northern half of the Colony, if the harvest is moderately early, a second or "ratoon" crop, not inferior to the first, may in many districts be legitimately expected Where such conditions exist, the same assiduity and attention to the details of cultivation as previously commended will be necessary.

Ripening.

Within the period stated, signs of advancing ripeness will be observed throughout the field, and are not difficult of discernment by anyone even slightly acquainted with the crop. The luxuriant green of the plants gives place to a marbled or mottled pale green and yellow colour; the veins appear swollen and the leaves heavy and fleshy with a gummy feel, while the tips, when doubled back, break with a clean fracture. At this period, being ready for harvesting, we will leave our crop for a little while, to consider the subject of curing-shed accommodation, which it is incumbent should at this time be in perfect readiness for its reception; but before temporarily leaving the field, it may not be amiss to suggest what ought to be done with the primed leaves and suckers removed from the plants. There are two methods by which they may be usefully disposed of One is to place them in the compost heap, whence their valuable properties may be returned to the soil, and the other is to dry them in the shade, after which they make an excellent infusion, in conjunction with washing soda, for the destruction of insect pests on fruit trees, flowering plants, &c. On no account should primings be sent to market, where, apart from the distinct dishonesty of supplying the basis of the "cabbage-leaf" cigar, and the "oil rag" plug, the more powerful argument of insufficient price will show the unadvisedness of such a proceeding. The maxim that "the whole world wants good tobacco," is with little exception the guiding principle of the modern mannfacturer, and if the New South Wales grower will undertake to supply such only, the present depression in prices would I think speedily disappear.

Curing-houses.

The style of structure and accommodation required in a curing-house will depend upon the system of preparation of the leaf to be adopted. This, in the present initial stage of the industry, and for economic reasons, may be best decided by consideration of the climatic conditions that prevail in the various circles of tobacco cultivation in the Colony. Of these there may be said to be three, enjoying comparatively different and definite circumstances, and demanding a similarly varied treatment of the plant.



No. 2.—END SECTION OF CURING HOUSE.

(116 143-93.)

No. 1.—CURING HOUSE.

They are—1st, the north-east coast districts, from the Hunter River northwards, which have a more or less humid atmosphere; 2nd, the north and south table-lands, of which the Peel and Upper Murrumbidgee River valleys, and that of their tributaries, having a more moderate rainfall and temperate climate, may be accepted as representative; and 3rd, the dry western districts, such as the valley of the Lachlan, where a desiccating atmosphere prevails that will have to be met by special precautions. In each case the provision recommended will be for curing under cover, and of the whole plant. This latter, although theoretically an imperfect system, owing to want of uniformity in ripening of all the leaves simultaneously, is, on account of labour conditions and the probable commercial value of the crop, the most feasible means of performing the work. A system of single-leaf curing introduced in America about thirteen years ago will be described later on. As the greater part of the tobacco now grown in New South Wales is produced under the conditions embraced by the second or temperate divisions, I will endeavour to explain its requirements first. My conclusions have been arrived at after actual experience of the governing causes and full consideration of all necessary conditions.

Owing to the favourable nature of the climate enjoyed within the limits prescribed, the curing-shed will not need to be such an expensive or solid structure as that required in the other two divisions. The building for these latter will more closely approximate to the typical American curing-house of the tobacco *belt*. It may be built of sufficiently stout and durable barked but undressed posts, supporting a well pitched weatherboard, shingle, or good stringy-bark roof, with wide projecting eaves and the necessary tiers inside for hanging the tobacco upon. The gable walls must be enclosed, preferably with weatherboard planking. Several of these weatherboards, at intervals of 4 feet, ought to be hinged or made adjustable so that they can be opened for the admission of light and air when necessary. The side walls should be protected by movable screens of strong bagging cloth hung on rollers (smooth saplings, 2 inches in diameter) that will enable them to be drawn easily up or down in the same manner as a window-blind, as may be desired or required by the vicissitudes of the weather. A batten and loops at the bottom to keep them in position when drawn will also be useful. The roof should have ventilators at intervals of 10 or 12 feet along the ridge of the building that may be opened or shut at the pleasure of the curer.

The shed should occupy a dry and well-drained position, and be end on to the direction from which rain storms are principally experienced. If this is impracticable, that side of the house on which bad weather mostly prevails should have its roof, or a skillion, continued so far towards the ground as to prevent damage. Provided, however, a sufficiently strong and close material is used for screens, and ordinary care is observed in their manipulation, no injury from this cause need be anticipated. If the cloth is first treated to a good wattle-bark tanning, a simple process which any farmer can perform for himself, and carefully stored in a dry place when out of use, these screens will last and do efficient service for many years.

The hanging area required for 6 acres of tobacco, which may be taken as a guide in the construction of larger or smaller buildings, will be embraced in a shed, the inside measurements of which are: Length, 65 feet; width, 25 feet; height at wall-plate, 17 feet; and at ridge, 27 feet or more. The interior should have five tiers of scaffolding for the support of the tobacco sticks, the lowest being 5 feet from the ground, and the others at intervals of 4 feet in height. This distance will, as a rule, afford ample hanging space for goodly sized plants without touching those above or below. The length

of the building will be divided into five sections of about 12 feet each by the uprights and cross-beams, as shown in figure 2. The latter, as may be seen from the plane section of a single tier figure 3, support the parallel poles on which the tobacco sticks in their turn rest. The poles (*b*) of about 3 inches in diameter should be nailed to the cross beams (*a*), spaced about 3 feet 10 inches apart, thus affording 6 rows to the width of the house, and leaving the poles of each tier directly over one another. The sticks or laths upon which the plants are to be hung will require to be 4 feet 6 inches long, to give a 4 inch rest on the poles at either end, ½ inch thick, 1½ inch wide, and, where tobacco is speared, be slightly tapered at one end to receive the dart. Fourteen sticks or thereabout will be required for every 100 plants.

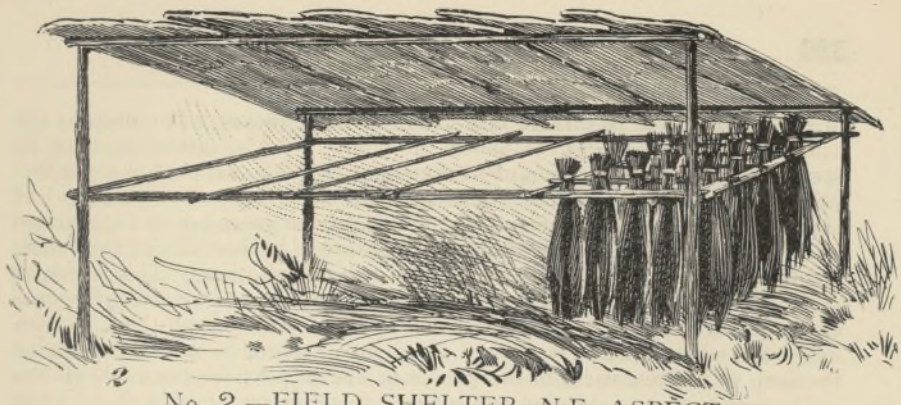
The accompanying sketches will give a fair notion of the kind of building and fittings recommended, from which iron, except in the form of the necessary nails, should be rigorously excluded. Its use in the past for roofing purposes has had a most prejudicial effect upon the tobacco growing industry of this Colony. With the above description of house, perfect curing may be performed, and where more extensive cultivation is practised its capacity may be quadrupled by the adoption of the following auxiliary.

Flue Curing-house.

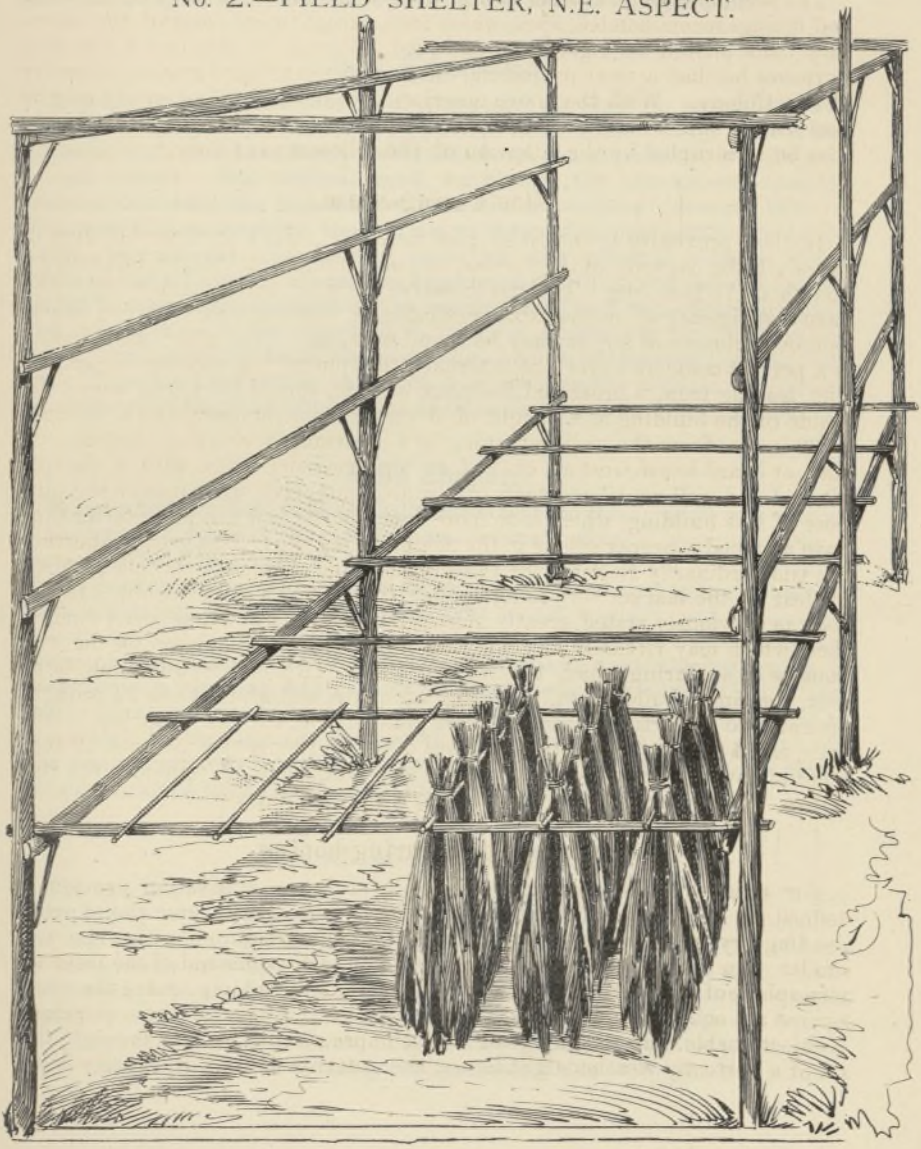
In close proximity to the shed just described, erect another building of one-sixth the capacity of the former, *i.e.*, of similar width, height, and fittings, and about 11 feet long. It must, however, be wind and weather tight, and have a sufficiency of manageable ventilation in walls and roof for the admission or exclusion of air, as may be found necessary. Its chief desideratum is a perfect command over the internal atmosphere. A circular sheet-iron flue, leading from a protected fire-place outside, should be taken round the inside of the building at a height of 6 inches from the floor, and a distance of 30 inches from the wall, returning to a convenient chimney outside. A slab, or board-house, resting on 3 feet high masonry walls, with a sharply pitched and well ventilated roof, of suitable material, will answer the purpose of this building, which is to more speedily dry out the plants after they have attained a proper colour in the neighbouring shed. This greatly shortens the time ordinarily required for this purpose, and enables the farmer to place his leaf on the market very much earlier than he otherwise could. It will also, as previously stated, greatly increase the capacity of the ordinary curing-shed, which may virtually be filled four times with green tobacco in the two months or so during which the harvest lasts. In limited cultivation, however, the single building will be found adequate, and when it may be thought desirable to use artificial heat the best plan will be to sink trenches in the floor, say 4 feet by 2 feet, by 20 inches deep, in the centre of each 12-foot section, having perforated sheet-iron covers over them to minimise the risk of fire. Partly, or wholly dried tobacco is very inflammable.

Fully enclosed Curing-houses.

For either of the other two circles of tobacco cultivation previously defined as the humid districts of the north-east coast, and the corresponding dry localities of the west, the curing-house requirements will be very similar. In both instances they demand a complete command of the internal atmosphere of the house in the one case against excessive damp, and in the other against an equally injurious desiccating climate. Either of these extremes is objectionable, and renders good curing impracticable, except through the aid of a perfectly weather-tight house, the internal fittings of which will be



No. 2.—FIELD SHELTER, N.E. ASPECT.



No. 1.—PLAIN SECTION, SHOWING LOWER TIER OF CURING HOUSE.

(11 6143-93)

the same as that previously described, the difference being only in the material of the shell.

For the coast a wooden structure will best answer, being more safe from fire, and lasting longer, if raised on 1 or 2 feet of masonry foundations. In the west a less permeable material will be required, for which *adobe* (sun-baked clay) walls, with a projecting wood or bark roof, will best suit the climate and purpose. Such buildings are cheap, easy of construction, and lasting, particularly if the clay is puddled with well thrashed wheat-straw, chopped to about 4-inch lengths. It will make equally good dwelling houses, being cool in summer, and warm in winter. The shutters of doors and windows required for access and wall ventilation may be of grass or straw hurdles, bark, or any rough material, so long as it is efficient.

Roof Ventilation.

A properly ventilated roof is in every case an absolute necessity. The natural tendency of the moisture evaporated from plants being to rise, and if means, such as I have freely indicated above, are provided, it will duly do so and escape. But without such ventilation the atmosphere speedily becomes saturated, the plants sweat, and will house-burn (decompose). A portion of this atmosphere, condensing on the roof, subsequently falls on the plants, permanently discolouring them, all the affected tobacco being rendered unfit for sale. From this experience it will not be difficult for the reader to realise the demerits of an unventilated, and non-absorbent iron-roof, which, it is to be regretted, is in such general use for this purpose. Grass, straw, or rush-thatch forms an ideal roof in all, except the risk from fire. From the next article, in which it is proposed to explain the various processes of curing, the importance of this subject will be better understood.

Field Shelter.

When a tobacco-field is at some distance from the curing-shed, and carting of the plants thither at the proper time may not always be practicable, a temporary field-shelter of bark or thatch, as shown in figure 4, will be found of the greatest assistance. This is especially the case during early harvest, when a burning sun usually prevails that would speedily and irreparably damage any cut plants left unduly exposed to its influence. The accommodation of such shelter may be for 700 or 800 plants, that number, owing to irregularity in ripening, being about an average day's cutting off a 6-acre field. Its aspect should be such as to afford shade from all but the morning sun, which, by the time the shelter will be occupied, shall have passed off. The shelters are only intended for temporary use, and each day's contents should be carted to the curing-shed in the afternoon or evening.

Methods of Hanging Plants.

The two principal methods of hanging tobacco are by "spearing" and "straddling" the split plants, the latter system being the most popular, and one which is in general use in New South Wales. The former is done by temporarily adjusting a spear head on the end of a tobacco-stick, made small enough to receive it. With one end of the stick resting on the ground against the hollow of the foot, or in a mortise hole in a log, take the butt of the plant, and, with both hands, force it over the spear-head on to the stick. This, when full, is ready to hang, the spear-head being slipped off and on to

another, and the operation repeated. A conical, hollow, sheet-iron spear, 7 or 8 inches long, having a ¾-inch flattened socket to fit the stick, is all that is wanted.

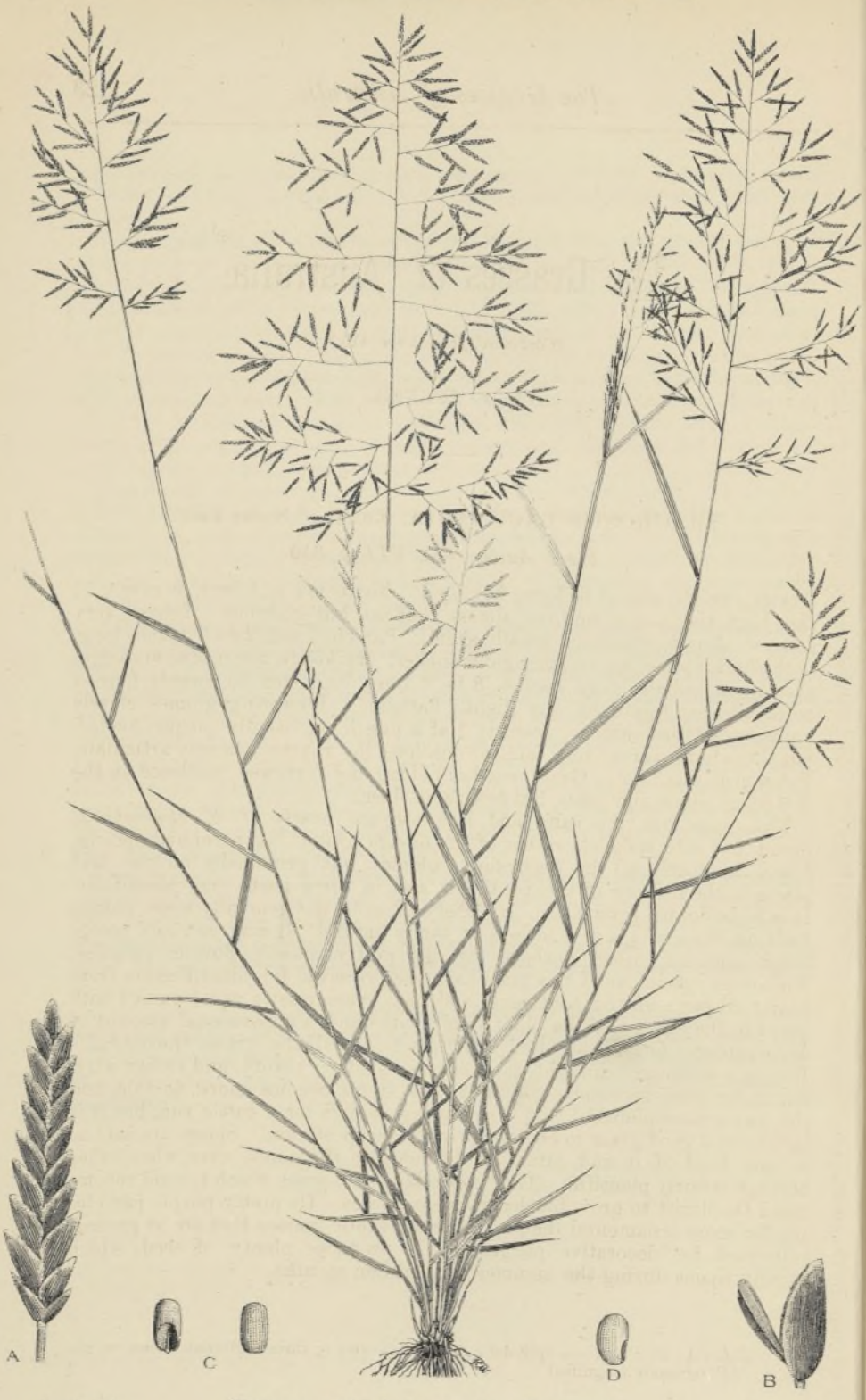
For "straddling," which has many recommendations, the plants are split in the field at the time of cutting by a heavy chisel-headed knife, which divides the main stalk from the crown to within a few inches of the ground, close to which point they should be cut. Split plants will certainly cure quicker, some say brighter, than by the other method, but at the cost of a certain loss in weight. They are also convenient to handle in the shed. But where a light-bodied tobacco has to be cured in a dry climate "spearing" will recommend itself. The process of evaporation of moisture from the plant by this means being more prolonged, will afford a better chance of the leaves attaining a good and uniform colour, and minimise the danger of green curing from their premature drying.

The system of hanging plants on small 54-inch sticks, here commended, will be found much more convenient than the present cumbersome habit of using 10 or 12-foot poles. These latter require two men to lift them, and render their elevation from tier to tier, or *vice versa*, a work of difficulty, generally resulting in damage to the plants. The lighter sticks, however, carrying seven or eight plants, may be freely handed up or down by a lad.

All necessary preparations for harvesting the crop being completed, ripe plants should, weather permitting, be cut and housed without delay. It is better that this should be done "a day too soon than a day too late," which means that slight immaturity has a less prejudicial effect than over-ripeness on the quality of the cured leaf, but, as far as possible, the happy "mean" ought to be observed. That the reader may realise more fully the necessity for due care in harvesting only at the proper stage of ripeness, I would further show that plants which through any cause may have been cut in an immature condition will be more backward in curing, and have always a tendency to dry up green, while the produce does not smoke so mellow as of that which is cut at the proper time.

Over-ripe tobacco, again, cannot be cured a uniform colour, it is generally spotted or mottled. But what is more important, by being harvested too late, it has lost more or less of its potash and other valuable and necessary constituents that go towards the making of good tobacco, which, after the plant has attained ripeness, descend into the stalk, leaving a gradually impoverished leaf.

One more condition to be borne in mind before commencing the work is not to cut tobacco on a wet day, or immediately after heavy rain. Such rain will have washed some of the gum out of the leaves, and, unless overripe, one or two days' grace should be allowed them to recover this necessary constituent.



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Eragrostis lacunaria, F. v. M.

"Never Fail."

The Grasses of Australia.

(*Continued from page* 415.)

By F. TURNER.

ERAGROSTIS LACUNARIA, *F.v.M.* "Never Fail."

Flora Austr., Vol. VII, p. 649.

Stems slender, almost filiform, but rigid. Six inches to 1 foot, or rarely 1½ feet high, the base sometimes almost bulbous, but glabrous. Leaves very narrow, almost setaceous, usually short. Panicle loose, 2 to 5 inches long, with short, spreading, rather rigid branches. Spikelets, few on the branches, shortly pedicellate, very narrow, 3 to 6 lines long, ten to twenty-four or more flowered, terete or very slightly flattened. Flowering glumes closely appressed, broad, obtuse, scarcely ¾ of a line long, usually purple, keeled, but the lateral nerves very faint or obsolete, the rhachis scarcely articulate. Palea nearly as long. Grain ovoid or oblong, not furrowed, enclosed in the flowering glume and palea, but free from them.

This grass has the habit and inflorescence nearly of *E. chætophylla*, Steud, but with spikelets rather of *E. falcata*, Gaud. A perennial species, found in nearly all the Australian colonies, but principally on the arid plains in the interior of the continent, and in some parts very plentifully. It is to be found growing on a variety of soils, but generally more plentifully on those of a red chocolate or sandy nature. It may be easily recognised amongst other herbage by its pretty, mostly purple, panicles. Numerous specimens of this grass have been received for identification from nearly all parts of the continent, and they were mostly accompanied with notes to the effect that the plant would withstand a phenomenal amount of dry weather. On this account many stockmen call the grass "never fail." During a prolonged drought the herbage is often scanty, and rather wiry, but under more favourable conditions the stems become more flexible, and the leaves more plentiful. It is not bulky enough for a cattle run, but it is said to be a good grass to encourage on a sheep station. Sheep are said to be very fond of it, and often eat it down to the roots, even when other herbage is fairly plentiful. The "never fail" is a grass which I could recommend the florist to grow for decorative purposes. Its pretty purple panicles are far more ornamental than many dwarf exotic grasses that are at present cultivated for decorative purposes. It produces plenty of seed, which usually ripens during the summer and autumn months.

Reference to Plate.—A, spikelet; B, floret; C and D, three different views of the grain. All variously magnified.

POA CÆSPITOSA, *Forst.* "Tussock Poa."

Flora Austr., Vol. VII, p. 651.

An exceedingly variable species from under 1 foot to 3 or more feet high, usually densely tufted, and glabrous. Leaves narrow, flat, convolute or setaceous, chiefly at the base, sometimes longer than the inflorescence, sometimes very short, the ligula, always very short or obsolete. Panicle branched, compact or spreading. Spikelets usually four to six flowered. Flowering glumes usually surrounded by a few fine, woolly hairs, but sometimes the whole spikelet glabrous, the cilia of the palea-keels, when present, very minute. Grain oblong, usually narrow, enclosed in the flowering glume, and palea, but free from them.

There are several marked varieties of this exceedingly variable perennial grass. Mr. Bentham records eight. The one which I have chosen for illustration in this issue is the *Var. latifolia*, which is found in the colder parts of Australia, and principally in the mountainous regions. Until recently it has been found only in New South Wales and Victoria, but Mr. Bailey has lately recorded it from Mount Mistake, in Queensland, so it may have a wider geographical range in this country than is generally supposed. This variety attains sometimes a height of 4 feet, with leaves 2 to 3 feet long, and often more than ½ an inch wide. Panicle 8 to 11 inches long, and 7 inches or more wide. The specimen from which the drawing was made was collected on the Australian Alps, where it forms a large portion of the rich, succulent herbage of that region. Both cattle and sheep are said to be very fond of this grass, the former particularly so, and however poor they may be, provided that they are healthy when first put upon this and other mountain herbage, they soon get into excellent condition. The seeds of the broad-leaved variety of the "tussock poa" are well worth disseminating in all the colder parts and mountainous regions of this country where the plant is not already growing, and the grass is worthy of conservation where it does already exist. Judging from the bulk of herbage which it yields in an ordinary season, it is well worth taking into consideration to cultivate for silage, or for hay if cut before the flower stems are too far advanced. I can highly recommend it for trial. When this grass is allowed to grow undisturbed for a time it produces a great amount of seed, so that there would be no difficulty in the way of collecting any quantity for dissemination in suitable situations. The seeds usually ripen during the summer and autumn months.

Mr. F. M. Bailey, F.L.S., Colonial Botanist of Queensland, speaking of this grass, says :—"This is a tall, luxuriant variety, well worthy of cultivation ; its broad leaves and large panicles of flowers remind me of the guinea grass (*Panicum maximum*, Jacq.) It seems to be naturally a mountain grass, as its only known Queeensland habitat is the top of Mount Mistake range."

Reference to Plate.—A, spikelet ; B, floret ; C, grain (back and front views). All variously magnified.

(11 b 143 - 93) Poa cæspitosa, Forst. Var. latifolia.

"Tussock Poa."

New Commercial Crops for New South Wales.

(*Continued from page* 419.)

By F. TURNER.

The Cultivation and Uses of the "Caper Bush." (*Capparis spinosa*, Linn.)

It was thought advisable to figure and describe the caper plant of commerce in the *Agricultural Gazette*, so that no mistake could possibly occur in correctly identifying it. During the past few months specimens of a plant known to botanists as *Euphorbia lathyris*, Linn., and commonly known as the "caper spurge," have been forwarded to this Department for identification by a number of persons who called the fruits "capers," thinking, of course, they were the commercial article of that name. In some instances information was asked for as to the best means of pickling them. In other cases it was stated that persons had experienced severe burning sensations in the throat after eating some, and not a few children were taken ill in consequence of having partaken of the fruit. The "caper spurge" is cultivated in many gardens, and in some instances the plant is growing as an escapee from cultivation. A common description of this plant is given in the *Agricultural Gazette*, vol. IV., page 215.

The caper plant of commerce is indigenous to Southern Europe, to the Mediterranean region, to India, and also to some of the Australian Colonies. The typical species grows into a shrub of from 3 to 4 or more feet high, with numerous slender branches, bearing a pair of short hooked spines at the base of each leaf stalk. Leaves alternate, ovate, or nearly orbicular, thick, and often shining. Flowers about 2 inches in diameter, white, tinged with red on the outside, solitary, on rather long stalks, arising from the axils of the leaves. The fruit is ovoid, and marked with longitudinal ribs. The seeds are kidney-shaped, and of a greyish-brown colour. Apart from the economic value of this shrub, it is, when in flower, a beautiful sight, and, from an ornamental point of view, should find a place in every garden. In Europe there is a variety of the caper plant without spines, and it is said to reproduce itself true from seed.

About 120 species of the genus *Capparis* have been found and recorded from different parts of the world, but principally in tropical and sub-tropical regions. The fruits of some species are of great economic value, as affording an important article of food to the inhabitants in those countries to which they are indigenous. About sixteen species are found in Australia, and they are fairly well distributed over the continent, from the coast to the arid interior. At one time the fruits of many of these plants formed an important article of food to the aborigines. The ripe fruits of *Capparis sarmentosa*, A. Cunn., are very delicious, as also are those of several other species I have eaten.

Capparis mitchelli, Lindl., is commonly called the "native orange." It grows into a tree with a spreading head of dense foliage, and bears a rough, globular fruit, about 2 inches in diameter, the pulp of which is eaten by the blacks. The Hon. Dr. Norton, M.L.C., informed me that when travelling in the interior of New South Wales some years ago, this tree, which was then in full bloom, was the most beautiful object he saw in that then drought-stricken portion of the continent. This very ornamental tree is well worth cultivating in gardens, but should only be planted in a well-drained soil.

Capparis nobilis, F.v.M., commonly called the "native pomegranate," is a coastal tree, which I have seen growing about 25 feet high. It bears a globular fruit, from 1 inch to 2 inches in diameter, the pulp of which is eaten by the blacks. This is also a very ornamental tree, which is worthy of place in any garden in the coastal districts. The fruits of *Capparis canescens*, Banks, are often called "native dates." Most of the other Australian species of *Capparis* are of shrubby habit, and many of them are worth cultivating, either for their beautiful and often singular-looking flowers, or for their delicious pulpy fruits.

The caper plant of commerce would grow nearly all over New South Wales where the soil and situation are suitable, and in places were the winters are not too severe. It will bear a few degrees of frost without injury, provided the situation is a dry one. Some years ago a few fine caper bushes grew in the Brisbane Botanic Gardens. I planted these in a very dry sandy soil, having a north-easterly aspect that was exposed to the full force of a sub-tropical sun. Mr. W. Hill, then director of those gardens, had some capers prepared for the Botanic Museum. The caper bush is capable of enduring a phenomenal amount of dry weather, and will even flourish on land that is unsuited for most other kinds of economic plants; it might, therefore, be very well planted on rather stony hill-sides, or on gently sloping but rough embankments, thus utilising land that is practically lying idle from an agriculturist's point of view. It is said that the caper bush is more productive when grown on calcareous clays than on any other kind of soil, but of this I have had no experience. Whatever may be the nature of the soil that is chosen for the caper bush to grow on, it must be broken up where practicable, and be thoroughly drained if not naturally so situated, and be fully exposed to sun and air. Nothing, in my experience, injures the plant more than stagnant moisture and shade.

Propagation.

The caper bush can be propagated by suckers, by cuttings, and from seed. The latter is the most natural, and, of course, a very simple and expeditious way of raising the plants. The seed should be sown in August in places where it is intended to grow the plants permanently, or in extemporised shallow boxes, the seedlings to be afterwards transplanted to their permanent situations. If it is decided to raise the plants in shallow boxes, and these should have tight-fitting sides and bottom, a few holes should be made with an augur, so that any superfluous moisture may drain out quickly. Two or three inches of rather coarse cinders or charcoal should be placed at the bottom of each box to act as drainage. Over this place a thin layer of half-rotten leaves to prevent the soil interfering with the efficiency of the drainage, then fill up nearly to the top of the box with some light open soil, press it firmly down, finally leaving it about 1 inch from the top; on this sow the seeds thinly and evenly, and only slightly cover them with soil; set the boxes in an open situation, where the seedlings will have the benefit of plenty of sun-

Capparis spinosa, Linn.

"Caper Bush."

(116 143-91)

light, and do not water the young plants too liberally. With ordinary care seedlings raised in this way will be ready for transplanting in about twelve months after the seed is sown. In sowing the seeds, where it is intended that the bushes are to grow permanently, two or three should be planted together, and when the seedlings are about 6 inches high, thin them out, leaving the strongest plant at each place to develop into a bush. Cuttings can be struck in sand under a hand-glass, but to be very successful it requires the skill and attention of a professional gardener; therefore, I would not recommend any farmer to attempt this mode of propagation. From near the base of established bushes suckers are often formed, and in the spring of the year these can be severed from the parent plant, and be successfully transplanted to their permanent quarters, provided that each sucker is well rooted before performing the operation.

Planting.

The best time to plant the caper bush is in August or September, according to situation, and also on the state of the weather, which should not be too wet. Where it is intended to grow the caper on a commercial scale, the bushes should be planted quincunx in rows 5 feet apart, and 5 feet distant from each other. At this calculation it will take about 1,742 plants to the acre. When they are set out in this way, the produce will be more easily gathered than if planted on any other plan, and it will also facilitate what cultivation may be required. The only work in this direction will consist in keeping down weeds and other undergrowths, more especially whilst the plants are young. The caper bush will require some attention in the way of pruning, but this will chiefly consist in cutting well back the too straggling growths in winter, so that the plants may present a fairly even appearance. Under ordinary conditions the caper bush will begin to flower the second year after planting, but after the fourth year good annual crops of buds can be gathered for pickling, and fruits, if desired for eating. The above is written from a colonial experience point of view.

Vilmorin says, "The caper-bush can only be cultivated profitably in the climate of the olive-tree, where it is almost always planted in dry stony places—on embankments, declivities, and other positions which are difficult to utilise in any other way. In some of our colonies it could be easily grown. The flower is very beautiful and distinct, especially to those not familiar with it, in countries where it grows freely. Under the name of "capers" the flower-buds, gathered when they are as large as peas, are pickled in vinegar. They are much used in cookery, and are valued in proportion to the smallness of their size."

Le Maout and Decaisne say:—"Among the *Capparideæ* with fleshy fruit, *Capparis spinosa* must rank first. It is a shrub of the Mediterranean region, the bitter, acrid, and astringent bark of whose root has been esteemed from the most ancient times for its aperient and diuretic qualities. The flower-buds, preserved in salt and vinegar, are known as capers, and are much used as a condiment."

The Treasury of Botany, speaking of the genus *Capparis*, says:—"The most generally known plant of this genus is the common caper (*C. spinosa*), which grows on walls, &c., in the south of Europe and Mediterranean regions. In its mode of growth it resembles the common bramble. The flower-buds, and in some parts of Italy the unripe fruits, are pickled in vinegar, and form what are commonly known as capers. They are chiefly imported from Sicily, though the plant is also largely cultivated in some parts of France."

Masters, quoted by Baron Von Mueller, says:—"The buds, after their first immersion in slightly salted vinegar, are strained, and afterwards preserved in bottles with fresh vinegar. In the sheltered plains of Provence annually about 1,760,000 lb., worth at an average of 7d. per lb., are collected. The shrub comes into full bearing at the fifth year, the harvest continuing well for many years afterwards."

The following particulars are from Dr. Watt's *Dictionary of Economic Products of India*:—"In India the ripe fruit of the caper is either eaten raw or made into pickle. In Sind and in some parts of the Panjáb, a compound of oil, mustard, fenugreek, &c., is used in pickling capers. In Ladak the leaves are eaten as greens."

Fodder.—"The leaves and ripe fruits constitute a favourite food of goats and sheep."

Chemical composition.—The root bark is said to contain a neutral bitter principle of sharp irritating taste, and resembling senegin. The flower-buds, distilled with water, yield a distillate, having an alliaceous odour. After they have been washed with cold water, hot water extracts from them capric acid (C_{10} H_{20} O_2), and a gelatinous substance of the Pectin group; capric acid is sometimes found deposited on the calices of the buds in white specks, having the appearance of wax.—(*Rochleder and Blas*, Watt's Dict., Chemistry.)

The following extract from *Rural Cyclopædia* shows the method of cultivating the caper (*C. spinosa*) in the following countries:—"This species is cultivated in Spain, Italy, Sicily, and the south and centre of France, for supplying the market with capers, and it requires little care, and is of very easy management. In autumn, the stems of the plants are cut down to within 6 inches of the ground, and are covered all over with soil from the intermediate spaces; and in spring, they are uncovered and trimmed, and are dressed and earthed up with soil to the points at which the new shoots are likely to be produced. In the latter part of the spring they begin to bear flower-buds, and during the whole season, till the restraining of the flow of sap, or throughout a period of about six months, they continue to yield an unintermitted series of buds. A gathering of buds is made every morning, and immediately thrown into a tub of vinegar; gathering after gathering, throughout the season is thrown into the same tub; and a little common salt is dissolved in the vinegar, in order to prevent bad effects from a diluting of it with the watery portion of the buds. At the end of the season, caper merchants, who travel through the country for the purpose, purchase the accumulations of gatherings in the tubs, and partly by sifting through sieves, partly by testing the quality of the vinegar, divide them into two sorts. The smallest are the most highly esteemed; the next in size are the next in esteem; three other sizes are of gradually decreasing value; and all the fine sizes are completely separated from one another, disposed for sale in five distinct sets of bottles, jars, and barrels, and named respectively the Nonpareil, the Capucine, the Capote, the Secondes, and the Tierces."

NOTE.—The caper-plant of commerce grows well in the vicinity of Sydney, and has done so for years. Sir Wm. McArthur introduced it to Camden Park very many years ago, and it succeeded there admirably. I grew it with great success within a few miles of Sydney, and can highly recommend it, not only as an ornamental plant, but for use for domestic purposes.—ED.

Reference to Plate.—The plant was drawn from a figure by Vilmorin, and the details after Le Maout and Decaisne. A, flower; B, flower, cut vertically; C, fruit; D, transverse section of fruit; E, seed.

Notes on Economic Plants.

A very great deal of interest has been taken in the "Australian Nut"* since it was figured and described in Part I, Vol. IV, of the *Agricultural Gazette*. The article and also the illustration have been republished in a number of Australian journals.

Dr. Joseph Bancroft, of Brisbane, who is so well known in Australia for the great practical interest he takes in economic botany, made the following remarks with regard to this nut, in a letter which Mr. Turner received from him. "Some years ago I planted two trees at Kelvin Grove. Both give an immense crop of nuts every year, and some hang on for months. and give nuts the greater part of the year. If struck carefully with a knife and mallet on the small spot and along the furrow the two halves separate as when the seed bursts them. If warmed a little on the fire-range the kernels shrink a little and then fall out readily. They should be brought to table so prepared. When one finds such splendid yields from trees of 10 to 20 years old one regrets not to have planted more."

Dr. Bancroft also wrote the following interesting remarks with regard to the "Vigna" or "Catiang bean," a figure and description of which appeared in Part II, Vol. III, *Agricultural Gazette*. "When mature I had them cut with a sickle and baled up and sent to town by train. We chaff up all together for the horses, beans, stalks, and leaves. The horses fatten on them, and I believe do better than with maize.

"The white-seeded variety with buff eye is here the best bean and is good human food. This will prove to be the best summer bean for the coast country. It is much injured by a weevil and is best kept for seed in the shells."

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* Note.—The "Australian Nut" better known as the "Queensland Nut" grows with great freedom in the Botanic Gardens, Sydney, where some fine specimen trees produce nuts freely, and also in many suburban gardens. Nuts for sowing should be obtained as fresh as possible, otherwise they are unlikely to germinate. They must not be buried deep in the ground. If just pressed into the surface, and covered with leaf mould, or even moist dead leaves, they are most likely to succeed.—Ed.

Report on the Grazing Leases of the Mount Kosciusko Plateau.

By R. HELMS,
Department of Agriculture.

It may be said that the Kosciusko Plateau forms an almost rectangular triangle. With its right-angle at Pretty Point, one side extending along the Ramshead Range for 12 miles in a S.W. direction to the point where its highest peak gives this range the name, then turning in a N. by E. direction along the Snowy Range for 15 miles the longest side is formed, and from this point a line continued for 9 miles in a S.E. direction will reach Pretty Point, and make the third line of this triangle.

From Pretty Point, which is about 5,700 feet above sea-level, the country rises very gradually, more or less undulating and interrupted by low ranges, towards the Snowy Range, where an average height of 6,500 feet is reached, with some of its most elevated peaks up to over 7,000 feet. None of the ranges are inaccessible or very abrupt, and in but few instances rise over 500 feet above the intermediate valleys; in fact, the low elevations and gentle sloping valleys with their extensive flats are characteristic of this part of the country, and therefore it may fairly be called a "plateau," although in the strict sense of the word this term may not be applicable.

The area of this highland comprises about 38,000 acres, the greatest part of which is splendid grazing country and covered on the open parts with a dense coating of grass, assuming in many places a carpet-like compactness. The most of the ridges are more or less covered with stunted arborescent growth and scrub, and on the flats in many places small peat bogs are formed; but the slopes, and more particularly those of the Snowy Range, are covered with a very nutritious sweet grassy sward interspersed with succulent mountain herbage, all equally greedily eaten by horses, cattle, and sheep.

Near the elevation of 6,000 feet the arborescent growth ceases and only occasionally small patches of *Eucalyptus gunni*, Hook., are met with and also the low growths of *Eriostemon obovalis*, *Prostanthera cuneata*, *Epacris petrophila*, *Bossiæa foliosa*, and a few other similar shrubs appear here and there on the slopes in dense patches.

Besides the area of the plateau, which is the choicest part of the country, a good deal more land has lately been surveyed adjacent to it, the whole of which comprises 81,000 acres, and is divided into twenty-two "snow leases." The land being yearly covered for months with snow has no doubt given rise to this term; but for five months of the year, viz., from early in November till the end of March, the pasture is in excellent condition, and during this time herds of cattle and sheep are depastured upon it when food is getting dried up on low-lying plains.

There is always an abundance of the purest water to be found throughout the district, fed from the accumulations of snow that remain even into the height of summer, and, hanging on the south-eastern slopes of the highest peaks, rarely disappear entirely. Particularly during times of drought this pasturage is very valuable and the leases would be readily let but for the rather high rental and the surveying expense, which is considerable. I have, however, been informed that last year similar leases near Kiandra were let at a rental of 9d. per acre, which is above the upset price.

The highest slopes of the Snowy Range are the most favourable parts for sheep, on account of their drier nature and freedom from scrub. The abundance of feed found everywhere soon puts stock in good condition, because they do not require to travel over much ground. Besides, on the eastern slopes, they often find shelter in the high growing patches of *Danthonia robusta*, a grass much liked in spite of its coarseness, and which grows tall enough to hide them completely.

The valleys and flats in many places are rather boggy for sheep, and are, therefore, better adapted for cattle which everywhere do remarkably well and soon put on condition.

A great number of unowned horses are found all over the ranges. These must often have hard times of it during the winter, when snow covers the ground, and the bones of some, particularly those of young and inexperienced animals that failed to escape in time to sheltered valleys, and succumbed, may be found in places. Sheep, also, that are not mustered at the end of the season will generally die of starvation.

The weather in these ranges, as in most elevated places, is at times very changeable, and frosty nights often follow warm days. Fogs are of frequent occurrence, and even snow-storms may pass over the heights at any time during the early part of the summer. This is often hard upon sheep when they are first brought up from a warmer district, having but a thin fleece, and some of the weak individuals may be killed; but on the whole, when once acclimatised, they do remarkably well.

Up to the present time the ranges have been, so to say, a free country, and anyone who liked took stock up there. This, of course, will not be so when the country is leased. A common, and, in my opinion, very improvident practice, will probably be continued as hitherto, viz., the constant burning of the forest and scrubs. This proceeding has only a temporarily beneficial effect in regard to the improvement of the pasture by the springing up of young grass in the places so cleared, for after a year or two the scrub and underwood spring up more densely than ever. On the very high slopes the dense low scrub, consisting of the plants mentioned above, which in common phraseology go by the name of *heathers*, certainly do not reappear quite so readily, on account of their slower growth, and in places when the burning is done with discretion a permanent improvement may be effected by the removal of them in this way; however, I have seen some very detrimental effects from this practice here, because the heavy rains wash the soil away from the steep declivities, and it is either carried into the creeks and rivers and entirely lost, or it accumulates in the boggy places, and thus become useless. The more or less constant diminution of humus in the soil of the slopes is a danger not generally recognised.

Cane Disease and Cane from Seed.

THAT the visitation generally known as "Cane Disease" is not confined to the sugar districts of New South Wales is evident from the writings of experts in all parts of the world where sugar-cane is cultivated. As in this country, many causes are given for the deterioration in the cane plants, but an article which has been reproduced in the April number of the *Louisiana Planter*, being a translation of an article by M. Raoul in *Le Courrier de la Guadeloupe*. appears particularly worthy of note. From time to time investigations have been made by authorities in this country, and in the majority of cases their reports have practically proved that there is a general deterioration of cane attributed, among other causes, to the present system of reproduction. Many recommendations have been made with a view to improvements in this respect which doubtless are excellent so far as they go, but M. Raoul would appear to go a step further, and, as will be seen from the following extracts from his article, to have very strong reasons for the ground which he takes up.

While bringing forward the article in question as a considerable factor in the process of improved sugar production, we desire it to be distinctly understood that the question as to soil exhaustion still remains unsettled. We still consider that so long as there is an absence of rotation or of necessary manuring, deterioration will continue to a greater or less extent, although probably the appearance of the so-called "disease" may not become so rapidly noticeable. The joint causes, no doubt, are answerable for the present condition of affairs, and it will be by means of the intelligent application of combined remedies that any well-defined improvements will take place.

In order best to explain the position taken up by M. Raoul, we reproduce the following paragraphs from his article:—

"The cane, like the vine, has always enemies, but there are no diseases, nor even parasites, that destroy them when they are cultivated as they should be, and in their own normal habitat. Some words are necessary to combat these beliefs and to account for them, which, in my opinion, we must assume in discussing the multiplication of the vegetable species. The natural reproduction of a vegetable is through the seed, under whatever form it is developed. In addition to this natural mode of reproduction, and the equally natural mode of reproduction by stolons, tubercles, &c., all other methods practised by man are artificial, against nature, and full of danger. If this mode of artificial reproduction is exercised on a plant with a single stalk, developing neither shoots, stolons, nor tubers, which produce a new plant, the difficulties are reduced, and may not appear perhaps for thousands of years—that is to say, they are perhaps hypothetical.

"But if the vegetable periodically mutilated develops a seed tassel; if this ablation of the stock does not kill the mother stalk, but determines only the formation of a new shoot, destined to replace the mother stalk; if the future needs of man lead to the frequent repetition of these operations, let us see what results.

"The stalk leaves are the organs which liberate and preserve the nourishing juices for the growth of the roots, tubers, &c. In cutting the stalk this food reserved for the roots is abolished, and this portion of the plant finds itself in identical conditions with those of the organisation of an animal that one nourishes very highly in order to obtain from it methodically every day the quantity of blood furnished by its organs already developed by intensive feeding.

"Further, by cultivating a plant out of its habitat, there results with it a modification analogous to a condition of equatorial anæmia, which is so easy to produce in Europeans by a sojourn of some years within the equatorial zone. It is under these conditions of pathological receptivity, produced by one of two causes, continual transmissions by heredity, and not by parasite, which is but the result, whereon we must place the real cause of all parasitic affections of vegetables. Cultivators of canes and vines have arrived, without desiring it, at a condition produced in animals by analogous treatment, with this aggravation, that there has never been any termination in the continuity of the practice, and the modification of the roots thus obtained has never been lost, since the reproduction by cuttings perpetuates the evil. There have thus been created through some centuries varieties of vines and canes with roots relatively feeble."

One of the effects of this gradual modification has been, says M. Raoul, "the provision of edible roots for the beetles and insects which live in the soil. . . . The insects, provided with a large subsistence, have multiplied like weeds, and by the destruction of the essential organs of the plant have brought about the various conditions described thus far under the name of cane sickness, vine sickness, sereh, phylloxera, &c., under which the attack and destruction of the root is the cause of the death of the plant. All the world, as I have many times said, demonstrates experimentally the truth of this theory. In the midst of a cane-field destroyed by a parasitic affection of the roots, plant a spontaneous cane. You will see it vegetate perfectly in the midst of a yellow shrivelling field."

The remainder of the article consists practically of data upon which Mr. Raoul bases his deductions. Without going into these, it may be mentioned that they disclose circumstances remarkably similar to those existing on our northern rivers, and moreover, they include the result of a careful investigation, proving that if animals or plants are transported to a climate to which they are not adapted, at the end of generations they are stricken in the organs necessary for the reproduction of the species.

We now come to a definite point, reached by M. Raoul, on what is evidently a fair line of argument:—"Cane reproduction by means of cuttings is unnatural, and the only natural mode is by seed." This brings us to a question which for some years past has been a theme of interest in every sugar-producing country. As far back as July, 1891,* we published a paragraph from the *Revue Agricole* (Mauritius), announcing a successful attempt by Mr. A. Daruty de Grandpré to raise sugar-cane from seeds. Since this time there have been many others equally successful, wherein the experiment has been not only more extensive, but carried to a degree which tends to bring this mode of reproduction more within the scope of commerce.

Dr. W. T. Thistleton Dyer, Director of the Royal Botanic Gardens, Kew (England), writing on this subject, says:—"Since the time of the rediscovery, at Dodd's Botanical Station, Barbados, of the seminal fertility of the cane was authenticated, realising its potential importance, a sys-

* Vol. II, page 428.

tematic experimental work has been carried on at our own Botanic Gardens, as our columns have before disclosed. That the very earliest varieties of sugar-cane can reach maturity the first year of their growth from seed has been shown as possible under favourable circumstances this season at the Botanic Gardens, though it must be admitted that even with these very early varieties, both the proportion of canes in a stool, and of plants to a bed of the same variety, which flower the first year, is small. Seed of the variety "Karakarawa," which is one of the two earliest kinds in the Colony, was sown on the 1st October, last year. Three months later the young plants were taken from the seed boxes and pricked out in a basket, five or six in each basket. Six weeks later again they were shifted singly into larger baskets, which were about 6 inches deep and wide, and in which they remained till they were from 1 to 1½ feet high, when, on the 19th April last, they were planted out in the open ground. At that time each plant consisted of a solitary shoot, none having begun to sprout from the base. A few weeks later, however, they began to tiller freely, and to grow rapidly, and by the middle of September the more advanced plants were in flower, thus completing the cycle of growth. As when they were planted out in the ground in April, the young plants were only in an equivalent stage to that of a cane top put into the ground at the same time, the record above given shows that seedling sugar-canes of the earlier varieties make rapid and vigorous growth once they get past the tedious period of infancy, which occupies from four to six months. Only, however, the very earliest varieties mature the first year, all the rest, though they may be only a month or so later in their period of flowering, miss the first season of arrowing, and consequently have to go on to the following autumn before the chance of performing that function occurs again; so that, for the great majority of varieties, it may be said that two years are required from the time the seed was sown for the seedlings to mature, or from fifteen to eighteen months from the time they were strong enough to be planted out in the open ground."

The next experiment which we reproduce in full from *The Planters' Monthly* for April, 1893, is that which deals with the matter on a larger and more commercial basis. It will be seen that the necessity for selection, as in the case of all seedlings, is fully recognised in this instance, and the plan adopted is one well worth imitation by New South Wales cane planters:—

"We have on various occasions presented to our readers accounts of experiments in the reproduction of cane from seeds made by two of our most skilful cultivators, Messrs. Littee Freres, on their estate at Parnasse. We are now glad to be able to furnish particulars of extremely encouraging results obtained by these gentlemen.

"Before entering on the scientifically accurate details which we find in the documents communicated to us, we will just remind our readers of the manner of procedure adopted by Messrs. Littee Freres.

"The observations which we are considering refer to two categories of canes descended from seed; one being young plants sprung spontaneously in 1889, and found by the observers in consequence of indications given in this journal; the other having come from sowings made in 1890, and been carefully tended from the earliest stage of growth.

"The parentage of some of these is unknown. Of others, the origin is partly known, the variety from which they proceeded having been noted. Messrs. Littee have not pursued a purely scientific object; they have not gone in for growing this or that kind of canes. On their estates are cultivated only the best kinds of cane, which have been recognised as such after

a long course of successive selections. In common with those in our hemisphere who have discovered the seminal fertility of the cane, and for six years have been devoting themselves to the study of this new science, they thought that the spontaneous products of the best kinds offered every chance of giving the best results, and have left to chance the care of fertilising the flowers, trusting to their sagacity and their long practice to discover when the time had come, the finest specimens, and to separate them from the ordinary ones. At the same time they noted the variety from which the seeds sown by themselves had been obtained.

"They have not been deceived in their calculations, and experience has shown that the same thing had happened elsewhere, and Messrs. Harrison and Jenman, in a very voluminous report on this subject published in 1891, express themselves as follows on the point:—

"'There is no proof that the chances are not equal, or even greater, of finding a new greatly improved cane by natural production, left to the care of chance. Incomparably the most marked progress at present achieved has been realised by heterogeneous wild canes, of unknown paternity, gathered in the fields of Barbados.'

"Having said this much we will allow the documents to speak which have been communicated to us. The first of these documents is a letter of Messrs. Littee to M. Rouf, accompanying samples of cane sent to that skilful chemist for analysis. This letter is dated 28th October, 1892, and runs as follows:—

"'This sample, and those which follow it, come from our sowings of seed commenced on the 12th November, 1890; the plants which have sprung from these seeds were turned out of the pots and planted in the ground in May and June, 1891, to the number of about 4,000, on a superficies of one carre (1·29½ hectare=3¼ acres). As you see, they were planted wide apart, They have been manured with farm-yard manure, and had two months afterwards a dose of 60 grammes of your fertilisers S. P. R.

"'It is therefore about twenty-three and one half months since these cane were sown, and seventeen months since they were planted out.

"'At the time of the cyclone they had attained a certain amount of development, and were completely ruined, so that we had doubts of being able to save them. Happily they had got through this first trial, and if it had not been for the worms, and for what people have agreed to call the *cane sickness*—to whatever cause it may be due—by which they have been specially attacked, they would certainly have done better. Anyway, the plot of land, on the whole, has produced a lot of canes, and now these have been cut, there remains on the stumps a large quantity of cuttings of all sizes, so that we have let them stand for another crop.

"'We shall inform you of the final result, in litres of juice, of the whole plot, compared with what it habitually gives in canes planted in the usual manner.'

"A letter of the 22nd November gives the comparative yields promised in the preceding one. The same plot gave:—

In 1892	... ...	43,103 litres of juice.
In 1888	... ...	65,008 ,,
In 1882	... ...	42,703 ,,
In 1877	... ...	58,955 ,,

"'While falling below the yields of 1888 and 1877, it slightly exceeded that of 1882, which might have been affected by various adverse circumstances, but certainly had not to suffer from the effects of a cyclone, nor yet at that time of any disease whatever.'

"Such is the net result, and we may say with Messrs. Littee that 'there is not very much to complain of,' especially when we consider that the general yield of the canes affected by the cyclone was inferior in 1892 by half.

"But in the lot, as a whole, there were both splendid canes and abortions; and the task is to distinguish and pick out the former and destroy the latter. It is to this practical selection that Messrs. Littee are now devoting themselves, guided in their labours by the analysis of M. Rouf, and we may add that no one is more fitted to bring this delicate task to a good end.

"From the 4,000 canes planted on the one carre of ground, Messrs. Littee took a certain number of samples which seemed to them the most noteworthy. Six of these samples were analysed by M. Rouf.

"Four of these samples, Nos. 12, 13, 14, 15, came from seedlings; two are from shoots from canes found springing up spontaneously in 1889, from which a previous crop had been taken. These are Nos. 7 and 10. On coming to classify these six samples in order of extractible sugar, we see that there are, per stool:—

No.	Of Extractible sugar.	
	kilos.	pounds.
15	19,473	42,838
10	13,237	29,187
7	11,104	24,484
12	9,827	21,668
14	7,027	17,258
13	3,746	8,260

"Nos. 15, 7 and 10 are, therefore, very remarkable varieties; Nos. 12 and 14 are somewhat poorer, but they are superior to the canes which we are at present cultivating, for a carre, planted with canes such as No. 12, would give 39,308 kilos (86,674 pounds) of extractible sugar, and with canes of No. 7 (*sic*) quality, 28,108 kilos (61,978 pounds.)

"Sample No. 13, the poorest, would still surpass our first-class cane, with a yield of 14,984 kilos (33,040 pounds) of extractible sugar per carre.

"If we make similar calculations for Nos. 15 and 10, we shall get formidable figures.

"The cane No. 15 gave, per stool, a weight of 311 pounds of cane, and 43 pounds of extractible sugar; with 4,000 plants of cane to the carre, this would mean a production of 1,244 pounds of cane and 192 pounds of extractible sugar. The cane No. 10 would yield 968 pounds of cane and 117 pounds of extractible sugar, and the cane No. 7, 894 pounds and 104 pounds respectively.

"It is, of course, understood that we may have only drawn up these figures as a matter of curiosity, and that we do not for an instant cherish the hope of seeing such results verified in practice. We know what is the difference between a cane plant which has sprung up under all the most favourable circumstances, whether due to the care of man or to chance, and a field of canes exposed to the vicissitudes of actual vegetation. But as we have recorded the incredible retrogressions which have been met with in these experiments, and described a cane raised from seed hardly as big as a plant of guinea grass, so we now tell of exceptions in the contrary sense.

"These extraordinary canes can be fixed as species by means of cuttings. This is what Messrs. Littee have done, and we may imagine the care that has been taken with these plants If they only preserve even a portion of their original properties, the margin is so great that we may hope to see obtained from them a greatly improved cane, perhaps a means of salvation for the

industry. However, that may be, we are fully warranted in characterising the results obtained by Messrs. Littee as very remarkable and exceedingly encouraging, and congratulate them warmly on their success."

We have also received a report on a stool of cane raised from seed by Mr. Samson of the Colonial Sugar Refining Company's mill at Harwood. In this report Mr. O'Kelly says "it is at the present time a very fine specimen of the *Rappœ* variety. It is, I believe, about eighteen months old, and has now about 4 feet of crushable cane on it, and has stooled out very well. It possesses all the physical and morphological characteristics of the parent stock, but shows a marked tendency to improvement. Over 100 cuttings will be available from this plant for planting this season, and the following year sufficient cuttings for several acres will be the result."

In Dr. Watts' "*Dictionary of the Economic Products of India*," Vol. VI, Part II (1893), there is a record of several instances of the germination of cane-seeds in India, although considerable difficulty exists in that country in getting supplies of cane-seeds, "owing to the strong prejudices of the people" to the flowering of cane. "It need," says Dr. Watt, "be only repeated by way of conclusion that the practical interest in the subject of the seeding of the cane lies in the possibility of producing improved sugar-yielding forms. It is admitted by all sugar-cane planters that continued propagation from cuttings grown, year after year, on the same soil, results in serious degeneration. On this account planters at a distance periodically exchange seed-canes, or special nurseries are resorted to for the purpose of producing seed-canes. The same fact is fully appreciated by the native cultivators of India, and the dangers of too continuous a cultivation of any particular form are quite understood. Thus, for example, a native cultivator wrote in the Agri.-Horticultural Society's journal, on the destruction of the red Bombay canes of Bengal. This was due to the appearance of a worm in the cane after it had been grown in the same district without intermission for a great number of years. Fresh stock grown side by side remained free from disease. It seems highly probable that the degeneration of the imported canes was largely due to the same cause, and that nurseries for interchanging stock from one province to another, or from district to district, would therefore effect greater improvements in the Indian sugar industry than anything else that could for some time to come be undertaken."

The chief importance of the above extract, apart from its confirmation of the necessity for seedling canes, would appear to lie in the suggestion as regards the establishment of nurseries where seedlings could be grown, selected, and exchanged.

In view of inquiries which have already been made, and will naturally arise as this matter comes in a practical form before our cane planters, we reproduce a description of Mr. Daruty de Grandpré's method of obtaining and planting the seeds of cane:—

"After the cane has arrowed, and is in full bloom, a piece of thin muslin is taken and thrown over the flower and tied to the stem, so as to prevent the loss, and catch every spikelet that may fall from the flower. This is left there until the flower is well matured; then the panicles are gathered, and as the seed does not separate easily from the glumes, and cannot be discerned by the naked sight, all the material is rubbed off the panicle, and the muslin first mentioned. Boxes are prepared with very small holes perforated in the bottom, and filled with loamy soil. The sowing is made, and placed in sufficient shelter, but the material is so light that care is taken, only using the hand to press it a little, but no soil must be used to cover it, for the seeds are so delicate that if covered they cannot penetrate

through to the surface, and to water them the boxes are dipped in water until sufficient moisture has reached the surface of the soil. Apparently not more than two or three spikelets among a hundred are fertile. The seed takes from a week to a fortnight to germinate, and must be sown freshly gathered, for the vitality is very fugacious. During the first three months the plants are very slow, and resemble very much buffalo grass, after which they grow very rapidly, and can be planted in the ground in six or seven months."

In order to show the unanimity of the results obtained by experiments in various parts of the world, we add the following further extract from Mr. Daruty de Grandpré :—

"The canes thus produced are very thin, but by replanting these stalks in the present way the result is very good—the cane large, healthy, and of different variety. The chief duties of the future will be raising, testing, and selecting the new cane stocks, with the object of obtaining varieties superior to any now in cultivation; consequently, by chemically analysing, and with a careful growth, side by side, will come to a conclusion."

National Prize Competition, 1892.

Mixed Farms.—Western Plains District.

G. GODFREY, Judge.

I now have the honor to submit for the approval of the Minister detailed reports and awards in connection with the mixed farms in the western plains district entered for the National Prize Competition of 1892.

The farms entered were eleven in number, situated at Moama, Jerilderie, Forbes, Berrigan, Coonabarabran, Deniliquin, and Young, and over and above the railway journeys I was compelled to travel upwards 650 miles by road.

Generally speaking the entries were quite up to the average, and in the cases where prizes have been awarded the farmers show signs of exceptional knowledge and energy. Naturally in visiting so many different portions of such an extensive district one could not help noticing many matters of general interest to farmers. The most noticeable fact is the success which attends the farmers who combine sheep and wheat farming. In almost every instance where the system is followed the beneficial results are apparent in comfortable and even luxurious homesteads and handsome annual returns. There are, of course, differences in the methods followed which vary not only with the surrounding circumstances, but also with the ideas of different farmers. Thus it will be seen on reference to my report on the farm of Mr. Anderson, of Altcar, that this gentleman has achieved great success by the intelligent sowing of part of his fallow land in September, with rape. The rape, in addition to forming an excellent change crop, is utilised for feeding sheep. The beneficial effects of this method are observable in many ways, such as keeping the ground free from weeds, providing a heavy manuring from the sheep droppings, and, what is probably most remarkable, little or no rust occurs amongst wheat grown after rape treated in this manner. Then again, some farmers use lucerne as a change crop, feeding it green to the sheep and also preserving some in stacks for winter use. This plan is, however, in the experimental stage and no reliable details were obtainable regarding its success financially.

The absence of the necessity for underground drainage was another fact which struck me very forcibly. This is a point greatly to the advantage of a farmer and, combined with the generally rich soil to be found in the district, renders the occupation of land for farming purposes peculiarly profitable.

I was pleased to find that the practice of working a garden and orchard to supply home requirements is very general, and in some instances a fair return is obtained by the sale locally of vegetables and fruit. Large numbers of vines are being planted, and in the case of one competitor about 3 acres has just been planted under raisin grapes. In no instance, however, were the vines of sufficient standing to obtain any reliable estimate as to returns.

The serious losses inflicted on farmers by bush fires have led to precautionary measures being very general. In some instances crops of wheat are secured by cutting a chain wide round the fences for hay, and afterwards ploughing the space and leaving the balance of the crop to come to maturity. Some plough a chain wide outside the fences, while others again adopt the double precaution.

I feel that my duties would be incomplete without a slight suggestive reference to matters which my visits have shown could be easily and advantageously improved upon. Every farmer running a quantity of stock must have a certain percentage of deaths, and I would suggest that in all such cases the bones should be saved and utilised for manurial purposes in the manner pointed out in the *Agricultural Gazette*, vol. III, page 466. On farms where the areas are so extensive as those under consideration, I would suggest also that more attention should be given to poultry raising. Not only is this a ready source of revenue, but it affords a pleasant change of diet which is much wanted in the bush. I am aware that many farmers give as a reason for the small quantity of poultry kept that they do so much damage. My own experience, however, enables me to state that any damage they may do is more than counterbalanced by the quick and satisfactory return, both in eggs and market birds, and I would strongly recommend all farmers to pay this matter a little more attention.

There is a matter which I think it advisable to call attention to as affecting the present system of awarding points in connection with the National Prize Competition. One of the necessary inquiries relates to income and expenditure, and I cannot help feeling that farmers, although they supply the information, feel that the publication of detailed figures is hardly fair to them. If I may be allowed to do so, I would respectfully suggest that only the totals be published and in that event I feel sure that the competitors would be willing to go more fully into figures with the judge to enable him to certify to their correctness.

In conclusion I have the honor to recommend the following awards to the favourable consideration of the Minister:—

First Prize.—Wm. Anderson, Pine Hill, Altcar, Moama.

Second Prize.—Chas. M'Allister, Murray Hut, Jerilderie.

Third Prize.—Messrs. N. A. Gatenby & Co., Jemalong, Forbes.

Highly Commended.—S. Nixon, Daysdale, Jerilderie.

" " J. Jones, Senr., Berrigan.

Mr. William Anderson, Pine Hill, Altcar, Moama.—Recommended for First Prize.

I visited this farm on the 12th November, 1892, and was much struck with its particularly neat and clean appearance. The paddocks are well arranged, the crops luxuriant and entirely free from weeds, and the fences and gates are substantial and in excellent order. The horses, sheep, and cattle are of good quality and in good condition, and the homestead buildings are substantial, and indicate prosperity and comfort. Mr. Anderson works his farm with the assistance of his three sons, additional help being obtained in busy seasons.

The property covers an area of 3,500 acres, of which 400 acres are under wheat for grain, 20 acres for hay, and ½ an acre under a good crop of potatoes. There are also 200 acres of fallow land, 100 of which are devoted

to the cultivation of rape for sheep feed. This is the system of rotation followed, and the feeding off of the portion devoted to rape keeps that portion not only quite free from weeds, but highly manured, securing continued fertility. Mr. Anderson informed me that after seven or eight years experience of his system he has never known rust to occur in wheat crops sown after rape. It may be of advantage to mention that the practice is to sow the rape in September, and to feed it off lightly in a few weeks. The sheep are then taken off, and the rape allowed to grow until after harvest, so that when the dry weather comes there is a crop ready for fattening purposes. The system is one which may safely be commended to farmers in the western district, as not only does it pay well, but is a handy means of securing rotation of crops.

The subsidiary aids to the farm comprise butter, cheese, poultry, fruit, preserves, and during February and March, when the grass is very dry, fat sheep and lambs. With the exception of the stock, which are usually disposed of in Melbourne, most of the subsidiary products are sold locally or "down river" as it is termed, but I was unable to obtain particulars as to the prices realised.

As regards conservation of water and its economic application, there are two underground and several iron tanks to catch water from the roofs of the house and other buildings, which provide a never-failing supply for homestead purposes. A pump for the underground tanks is the only appliance. For stock purposes open tanks have been constructed in every paddock, and although the means of economic application are not in evidence in the shape of appliances, I felt bound to award a high percentage of points in consequence of the very careful and satisfactory method of distribution.

The means used for conserving fodder consist of a good hay-shed and chaff-house, together with outside stacks strongly thatched.

The implements comprise a double and a treble furrow plough, scarifiers, and all others necessary to work the land. For harvest purposes there are two combined harvesters, worked by four horses and a man, each team being capable of cutting and bagging 50 bags per day. There is also a reaper and binder, and a winnowing machine. The whole of the implements are in fair working order.

As regards productiveness of crops the wheat growing at the time of my visit was estimated to realise from 25 to 30 bushels per acre, and the hay 2 tons per acre. The grass paddocks, being cleared of all fallen timber, show highly satisfactory crops of nutritious herbage.

No underground draining has been attempted, and in my opinion none is necessary. As I have pointed out in my general report, the nature of the soil in this district renders such an expense quite unnecessary so far as my visits enabled me to form an opinion.

The system of manuring is to feed off the rape crops, by means of folding sheep, thus securing their droppings to enrich the land. For garden and orchard purposes, the ordinary farm-yard manure is collected in convenient heaps, and turned over so as to be ready to apply as required. I would suggest more care on the part of farmers in this district in regard to covering their manure to prevent waste.

The stock is good, both as regards class and condition. There are twelve draught horses used for working the farm. The cattle consist of twelve cows and their increase of the Durham breed, and there are also 4,900 Lincoln sheep and lambs. Mr. Anderson breeds his own stud rams.

The fences are post and wire, made sheep-proof, and together with the gates, are kept in very good repair.

The farm-house is constructed of wood, with an iron roof, and contains six rooms. It is well built, and is kept in excellent order. The kitchen, which is separate, is a substantial building, and, as in the case of nearly all other buildings, is constructed of wood and iron. The dairy, with which is combined a cellar and store-room, is built of brick, and is fitted with an iron funnel going out through the roof, surmounted by a revolving appliance, so fitted as to turn the opening windwards. This has the effect of securing a continual draught of fresh air into the building, which is thereby kept very cool and wholesome.

The mode of book-keeping is to jot down each item of income and expenditure, and to balance the account each year end. According to this statement the income for the year 1891 is shown as £2,004 12s. 1d., and the expenditure at £1,493 11s. 8d. As, however, no record is kept of the amount expended on improvements, it is difficult to arrive at the nett profits for the year.

The garden appears well attended to, and more than supplies home requirements. It contains also a number of fruit-trees, kept in good order, and entirely free from weeds, and the whole is surrounded by a paling fence.

Mr. Chas. M'Alister, Murray Hut, Jerilderie.—Recommended for Second Prize.

My visit of inspection to the farm of Mr. M'Alister was paid on the 17th November, 1892, and occupied also a portion of the following day. The property comprises 4,600 acres of freehold land. The portion cultivated consists of eight paddocks, 150 acres each, the balance being used for grazing purposes, carrying no less than 5,560 sheep.

The crops at the time of my visit consisted of 200 acres of wheat, 70 acres of wheat for hay, and 300 acres of lucerne for sheep feed. There are also 270 acres fallowed for next year's wheat crop.

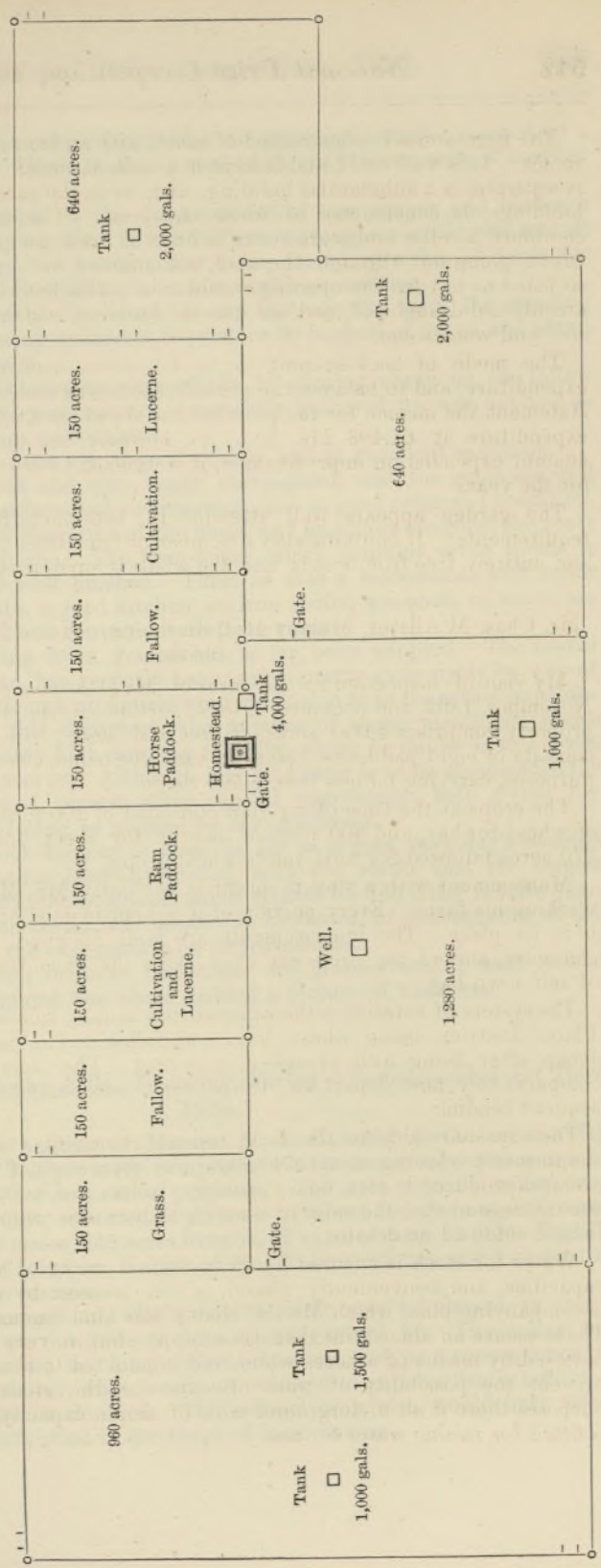
Management with a view to profit is evidently Mr. M'Alister's object in working his farm. Every portion of it is kept in good order, and everything is in its place. The improvements are well designed, and substantial in character, and all the crops are clean, with the exception of a small patch of self-sown hay.

The system of rotation is the same as that usually followed in the Western Plains District, being wheat, hay, and fallow. The fallow is grazed by sheep, after being well ploughed in winter. The lucerne crop, which is a comparatively new departure, will be dealt with more fully under a subsequent heading.

The subsidiary aids to the farm consist principally of sheep and wool, the former producing about £300, and the latter about £800 yearly. There are also produced butter, honey, poultry, bacon, and fruit, but as I am under the impression that the sales of these products are comparatively unimportant, I obtained no details.

Water for stock is ensured by means of six tanks of various and ample capacities, and conveniently placed, as will be seen by a reference to the accompanying plan, which Mr. M'Alister was kind enough to hand to me. These secure an almost inexhaustible supply, but in very dry seasons water is raised by means of a horse whim, and conducted to the different dams to prevent the possibility of want of water by the stock. For homestead purposes there is an underground tank of ample capacity, to which a pump is fitted for raising water for use.

SKETCH OF MR. C. McALISTER'S FARM, MURRAY HUT.



The means used for conserving fodder are principally stacks, covered by a substantial thatch. There is also a well-built chaff store, with a boarded floor.

The implements used on the farm consist of one reaper and binder, a stripper, a winnowing machine, two three-furrow ploughs, a wool press, and all other tools necessary for working the farm, including a kit of tools for blacksmith's work. Everything is in fair working condition.

The productiveness of the crops is very fair on this farm, the standing crops which I saw being estimated to produce 20 bushels of wheat and about 30 cwt. of hay per acre.

The system of manuring consists chiefly in grazing sheep on the fallow land, but all the farm-yard manure is carefully gathered up and applied as required to the garden and orchard.

The stock on the farm are of good quality, and in excellent condition.

The fences are post and wire, made sheep-proof, and the gates are well placed, all being of substantial construction, and in good order and condition.

Both the plan and character of the house and buildings are good, the roofs in all cases being of iron. The farm-house, which contains seven rooms, is built of timber, and well finished. There is also a store-room, with cellar and dairy underneath, a good kitchen, an iron roofed woolshed, to which are attached substantial and convenient drafting yards.

No system of laying down grasses has, so far, been adopted. The useful fodder plant, lucerne, has recently been sown pretty extensively by way of experiment, and although no figures were obtainable as to the actual improvements effected by this departure, the number of sheep mentioned above shows an extraordinary high carrying capacity, which no doubt is to a great extent due to the lucerne. Although Mr. M'Alister is to be commended for this new departure, I cannot, after careful comparison, help giving my opinion in favour of rape, as utilised by Mr. Anderson.

The system of book-keeping is good as far as it goes, each day's receipts and expenditure being carefully booked, with the result that the former amounts to about £2,000, as against about £1,000 for the latter for the year.

Unfortunately, no actual nett profit can be shown, in consequence of the omission to record the expenditure on improvements.

The garden, which includes fruit-trees and grape-vines, is well looked after, and snugly fenced, the whole looking a picture of neatness.

Messrs. N. A. Gatenby & Co., Jemalong, Forbes.—Recommended for Third Prize.

I inspected the holding of Messrs. N. A. Gatenby & Co. on the 5th December, 1892. The property comprises 47,000 acres, only 400 acres of which are set apart for cultivation purposes. The area actually under crop at the time of my visit, consisted of 40 acres of wheat for grain and 30 acres for hay, 40 acres of maize, 140 acres lucerne, 22 acres of peas, 11 acres English grasses, $2\frac{1}{2}$ acres of sorghum, 5 acres of rye, 20 acres of oats, and $\frac{1}{2}$ an acre of potatoes, and some mangels.

The general management, with a view to profit, may be classed as fairly good. The crops are not quite as clean as they might be. The maize, for instance, had been left too long without cleaning, and, as a consequence, it was stunted. Moreover, when weeds are allowed to gain too firm a hold, the labour of cultivation is doubled. The mangel crop also would have been better for a little attention in the shape of hand hoeing.

The system of rotation is fair, being to crop the land for a few years, and then sow lucerne for feeding the stock used for breeding stud sheep.

The subsidiary aids to the farm are bacon, and preserves for home use. Wool was mentioned to me under this heading, but in view of the return for the year of this product (£5,000), and to the fact that the property is more nearly a squattage than a farm, this could hardly be quoted in such a connection.

Conservation of water and its economic application, are strong points on this property, and Messrs. Gatenby have already secured a National Prize. I may perhaps mention that the water is pumped from the Lachlan River by means of a 30 horse-power engine and pump, and carried through open drains not only to the homestead and all over the cultivation area, but in exceptionally dry seasons arrangements are easily available for replenishing the stock-tanks, 5 miles back on the run. As far as I could ascertain, the machinery is sufficient to do more than is at present required of it, and even now the crop of lucerne shows distinct signs of the beneficial effect of a copious supply of water. The system of drain-cutting is worth more than a passing description. The land in the direction a drain is required is ploughed to the width desired by means of a bullock team. The bullocks are then hitched to a delver which is passed along the ploughed track to shift the loose earth. This delver is constructed something like a plough at the point or share portion, and a board shod with iron is fitted on so as to act as a scraper, which brushes the loose soil to the sides of the drain. This board is made in sections which are movable, and as depth is required the board is altered accordingly. The cost of the drains constructed on this system is 1s. per chain.

Conservation of fodder is another matter which receives considerable attention. There is a well-built grain shed, and all the stacks are carefully thatched with rye straw. The hay is drawn to the stacks by means of horse-rakes, a method which I find causes it to taste and smell very dusty.

The implements used include a portable engine for chaff-cutting, stump-jumping ploughs, stripper and cleaning machine, mowing machine, and all other necessary tools for working the farm.

The productiveness of the crops may be regarded as fair.

There is no system of manuring, only a portion of that made on the farm being collected and applied to the potato and some other vegetable crops.

The fences and gates are not in very satisfactory condition, and would be all the better for a few necessary repairs.

The stock consists of 47,000 sheep, 800 cattle, and several horses, the class and condition of which may be stated as good.

The farm-house is a well-finished wooden building containing nine rooms. There is also a kitchen and two rooms, bath-room and store-room, under a separate roof, all the roofs being of iron. There are also some fairly good out-buildings.

Some English grasses have been laid down with fairly good results.

The mode of book-keeping appears to be perfect, all the different accounts being kept separately and clearly, but beyond the return of £5,000 for wool, and £700 for hay and maize, I did not obtain any figures, as most of the produce is consumed on the estate.

The new points of interest about the farm are the irrigation works and a pit of silage containing about 50 tons.

The garden, which is well fenced, supplies the homestead with fruit and vegetables.

Mr. Samuel Nixon, Daysdale.—Highly commended.

I inspected the farm of Mr. Nixon on the 22nd November, 1892, the situation of which is 12 miles from Daysdale, in the Corowa district. The property comprises an area of 860 acres of freehold land, the quantity under cultivation being 330 acres of wheat, 30 acres of oaten hay, a small paddock of lucerne, 1 acre of potatoes—a good crop, and 110 acres lying fallow.

This property is very well managed, and great improvements have been effected. The crops are as clean as it is possible to keep them, although the greater part of the work is performed by Mr. Nixon alone.

The system of rotation is similar to that followed on the majority of farms in the district, viz., one-third fallow after two crops of wheat and hay.

The subsidiary aids to farm consist of fat sheep, wool, butter, bacon, poultry, and fruit. The wool harvest comes in first, and the cash realised pays for gathering in the wheat crop.

Conservation of water is effected by means of a well and open tanks, or dams; while for the use of the homestead there are several iron tanks and an underground tank fitted with a pump, this being the only appliance.

The means used for conserving fodder consist of a good chaff-house and outside stacks, which are all well thatched.

The implements used comprise two and three furrow ploughs, reaper and binder, strippers, and a number of smaller tools necessary to work the farm, all of which are in fair working condition.

The production of the crops is very fair.

The system of manuring followed is to collect all the farm-yard manure into a heap, and apply it as required for the growth of vegetables.

The stock consists of 14 milch cows of the shorthorn breed, 12 draught horses to work the farm, 900 sheep, and some good improved Berkshire pigs. The whole are of a good class and in good condition.

With regard to the character and condition of the fences and gates, the former are constructed of posts and wire. The gates are in fair order, but are not very strong, being made of light saplings.

The house and out-buildings are only of fair construction, the former containing four rooms. Having only been in possession four years Mr. Nixon will probably improve upon these later on.

There is no system of laying down grasses, but a small paddock of lucerne is grown as a stand-by.

The garden is well stocked with fruit and vegetables, and well fenced. There are also six acres of young vines looking healthy and very clean.

There is very little attempt at book-keeping, but a statement handed to me of receipts and expenditure, taken from Mr. Nixon's banker's pass-book, shows receipts for the year 1891 at £1,466 12s., and payments £133 17s., leaving a balance of £1,332 15s. As, however, nothing is charged for Mr. Nixon's own labour, and other items necessary for an accurate statement of profit and loss, these figures must be taken for what they are worth. There is no doubt that the farm is a paying concern.

Mr. John Jones, Berrigan.—Highly commended.

I visited this farm on the 21st November, 1892, for the purposes of inspection. The property consists of 1,280 acres of freehold land. Of this there are in cultivation 360 acres of wheat, 50 acres of this being for hay, 24 acres of oats, 16 acres of barley, 22 acres of rape, and 22 acres of lucerne for sheep feed, and 200 acres of fallow land. There are also 7 acres of grape-vines and 4 acres of vegetables and fruit.

The crops are above the average as regards cleanliness and cultivation, the results of which are clearly shown by their healthy and forward condition.

The system of rotation is wheat followed by oats, and then fallow with rape and lucerne for sheep feed and to clean the land, and, considering that Mr. Jones has only been in possession about four years, I have no doubt that this farm will take a much more prominent position in future competitions.

The subsidiary aids to the farm consist of fat sheep, wool, poultry, bacon, butter, and fruit, but I did not obtain any particulars regarding markets or prices realised.

Conservation of water is effected by means of a dam, with iron tanks for homestead use. There are no appliances.

The means used for conserving fodder are simple stacks; but the short time of occupation will probably account for this, as well as for want of appliances in the previous item.

The implements used are of fair kinds, and in fair working condition.

The production of the crops per acre is estimated at 20 bushels wheat, 35 cwt. hay, 60 bushels oats, and 35 bushels barley.

The system of manuring is to collect all the farmyard manure in a heap and place it as required on the garden and orchard.

The character and condition of fences is very good, they being constructed of posts and wire, and made sheep-proof. The gates are strong, serviceable, and in good repair.

The farm-house is well built of timber, with an iron roof, and contains seven rooms. The kitchen is also wood and iron, and the outbuildings are of wood with straw thatch roofs. The store room and cellar are well ventilated by means of pipes running some distance out underground and then branching upwards, the end being fitted with a movable top piece, so fitted as to bring the opening always facing the wind, and thus ensuring a direct current of air into the building.

There is no system of laying down grasses followed, but the fodder plants, lucerne and rape, are sown for sheep-feed.

The mode of book-keeping is to enter up each day's transactions; but as these, though entered were not balanced, I am unable to give the results.

The only new point of interest is a small stack containing about 10 tons of silage. This consists of sheafed hay, and is weighted with timber.

The vegetable and fruit garden is kept very clear of weeds, and no less than 7 acres of raisin grapes have recently been planted.

Mr. Samuel Wilson, Currah Farm, Jerilderie.

I inspected Mr. S. Wilson's property on the 11th November, 1892. The farm is situated 6 miles from Jerilderie, and comprises 2,405 acres of freehold and 791 acres of leased land. The portion under cultivation consists of 145 of wheat for hay, 30 acres of lucerne for sheep-feed and 110 acres fallow. There are also 14½ acres under orchard and vineyard from which Mr. Wilson sold £200 worth of fruit last year.

The general arrangement with a view to profit is very fair.

The state of the crops as to cleanliness and cultivation is not so good as it might be. Mr. Wilson grows all hay, and the wild or black oats have a very firm hold on the land.

The system of rotation is to grow wheat for hay, and then leave a portion fallow, which is ploughed and worked in the summer time, and grazed with sheep.

The subsidiary aids to the farm are wool, bacon, butter, poultry, and fruit.

Under the head of conservation of water and its economic application may be mentioned six open tanks or dams, one underground tank, and two wells, while the only appliance is a pump fitted to the underground tank.

Fodder is conserved by means of a hay-shed, a chaff-house, and well thatched stacks.

The implements consist of three single-furrow, two double-furrow, and one stump-jumping ploughs, and all other necessary implements for working the land, also two reapers and binders, one mowing machine, one chaff-cutter and bagger, and one 7-h.p. engine.

The productiveness of crops is fair.

The system of manuring consists in collecting all the farmyard manure into a heap where it is allowed to rot, and is put on the garden and orchard as required. Some green peas have also been ploughed in to renovate a a portion of the land.

The stock consists of 12 draught horses, 13 dairy cattle, and 2,000 sheep. The quality is not high as regards breed, but all are in good condition.

The fences are constructed of posts and wire—sheep-proof, and all the gates are in fair condition.

The farm-house is built of brick, and contains seven rooms and cellar. There are also a dairy, kitchen, and store-room; all good buildings covered with iron.

There is no system of laying down grasses, but lucerne is sown for sheep-feed.

The vegetable and fruit garden covers 7½ acres, the whole of which is kept in excellent order. There are also 3 acres of grape-vines, 1 acre is planted with orange trees, and 3 acres with fruit trees, which look very healthy, and show evidence of great care and attention.

A careful record is kept of income and expenditure, the income showing a large profit on the outlay.

Messrs. Drummond Bros., Berrigan.

I inspected Messrs. Drummond Bros.' property on the 21st November, 1892. The area of the farm is 680 acres; of which 400 acres, are under wheat; 30 acres for hay, 8 acres fallow, 4 acres of orchard and garden, and 18 acres under vines, not yet in bearing. The wheat land is only partly cleared, and is not as clean as it should be.

The system of rotation is fallow after wheat and hay.

The subsidiary aids to the farm are butter, milk, poultry, and bacon.

Water is conserved by means of wells of permanent water raised by ropes and pulleys worked by horse-power. There are also iron-tanks for supplying the homestead. The only appliances are the ropes and pulleys already mentioned.

The only means used for conserving fodder are stacking and thatching.

The implements consist of six-furrow, four-furrow, and single-furrow ploughs, reaper and binder, and stripper; also, a number of tools necessary for working the farm.

All the farmyard manure is gathered up and applied to the garden.

The stock are of a good class and in good condition.

The fences are all posts and wire—sheep-proof, and the gates are strong and kept in good repair.

The farm-house is built of timber, is well finished, and contains five rooms. There are also a large kitchen and a bath-room with iron roofing. The out-buildings are wood with straw and thatch roofs, and include a blacksmith's shop with a good supply of tools.

All transactions are entered daily, but no balance having been struck at the time of my visit, I am unable to give any idea of profits.

The only new point of interest is a small pit of silage containing about 10 tons.

The vegetable and fruit gardens are kept in excellent order.

Mr. H. J. H. Keeping, Boogaldi, Coonabarabran.*

I inspected the property of Mr. H. J. H. Keeping on the 10th and 12th December, 1892. The farm consists of 390 acres of freehold land, and out of this there are under cultivation 35 acres of wheat, 6 acres of hay, 14 acres of maize, 1½ acre of potatoes, 4 acres orchard, 3½ acres vineyard, and 1 acre of a vegetable garden.

The general management is fair. This is only a new place, and many of the improvements are as yet incomplete.

The crops are fairly clean with the exception of the maize, which requires some attention. Some of the cultivation area is not cleared of timber.

The system of rotation is good.

The subsidiary aids to the farm are vegetables, bacon, wine, and butter, with preserves and jam for home use.

Water is conserved by means of tanks for the use of the homestead, and there is also a creek running through the property which affords a plentiful supply. There are no appliances.

The means of conserving fodder consist of a good hay-shed with iron roof.

The implements consist of a double-furrow plough, reaper and binder, stripper, and cleaning machine, together with other necessary tools to work the farm, all of which are in good order.

The production of crops is very fair.

The system of manuring is to camp travelling sheep in the land, and as large numbers travel that way the method is very effective. The manure made on the farm is also collected and applied as required.

The class of stock is fair, but their condition leaves something to be desired.

The fences are fair, the greater part of them being of palings. The gates are good and kept in good repair.

The farm-house is a new building of timber and iron roof. All the out-buildings are roofed with iron, and are in good condition.

The fruit-trees look healthy and are well attended to, and the garden is well stocked with vegetables.

The system of book-keeping is inadequate, and the entries are not kept up to date.

Mr. Thomas Treloar, Studley Park, Deniliquin.

I inspected the holding of Mr. Treloar on the 15th November, 1892. This farm is situated 10 miles out of Deniliquin, and contains 1,280 acres of rented land. The fact of Mr. Treloar being only a tenant places him at some disadvantage in regard to improvements, as he is a most industrious and persevering man, and, from what I saw, I feel sure that were he owner there would be many useful improvements effected which it would hardly be reasonable to expect him to do under existing circumstances.

* Note.—This farm was fully described in connection with the previous year's competition.

The general management, with a view to profit, is good, and must give satisfactory returns.

The state of crops is only fair as they are not quite free from weeds such as wild oats, drake or rye grass, and barley.

The system of rotation is wheat, hay, and peas, with a proportion of fallow land.

The subsidiary aids to the farm consist of butter, poultry, eggs from choice fowls, wool, and fat sheep for sale, also preserves, pickles, and fruit for home use.

The means for conserving water consist of open and covered dams or tanks, and iron tanks for homestead use; there are no appliances.

The means used for conserving fodder are stacks, well thatched, and a good chaff-house.

The implements consist of single, double, and three furrow ploughs, scarifiers, harrows, and all necessary tools for working up the land; reaper and binder, stripper, and winnowing machine, all in good working order.

The productiveness of the crops is fair.

The system of manuring is to collect all farm-yard manure and place it in a catch-hole below the stock-yard, and apply it as required to the vegetable garden. Some artificial manures have been used with good results, but only for vegetables.

The stock are good both as to class and condition.

All the fences are constructed of posts and wire—sheep proof, and there are both gates and slip-rails, the condition of the whole being fair.

The farm-house is built of brick with an iron roof, the inside walls being plastered. It contains six rooms, and is a good substantial building. There is also a good kitchen with an iron roof, but the out-buildings, though strong, are somewhat rough in appearance, owing to their thatched roofs.

The garden contains a good variety of vegetables and a few fruit trees, the whole being very clean and showing careful attention. A portion of the garden is planted with seventeen different varieties of wheat, looking very healthy and free from rust.

Mr. C. Gaymard, Forbes.

I inspected the property of Mr. Gaymard on the 2nd December, 1892. This farm consists of 140 acres of land, the portion cultivated comprising 55 acres of wheat, 20 acres of hay, 2 acres of pumpkins and maize, 12 acres of vines, and 11 acres of fruit-trees and vegetables, the former preponderating.

The general management with a view to profit is very fair. The vines and fruit-trees are kept very clean, and are well attended to, but the crops do not appear to receive so much attention.

The place having been but slightly cropped as yet, no system of rotation has been adopted.

The subsidiary aids to the farm are fruit, wine, bacon, and poultry.

Water is conserved by means of tanks for stock, while for homestead use there is a well and an underground tank. The only appliance is a pump worked by horse-gear for watering the garden.

For the conservation of fodder there is a hay-shed covered with iron, while all the stacks are thatched.

The implements used comprise single and three furrow ploughs, mowing-machine, and stripper, winnowing-machine, together with tools necessary to work farm, orchard, and vineyard. The whole are in fair condition.

The production of the crops is fair.

Manure is not much needed, but what is made by the pigs and that gathered about the place is applied to the fruit-trees as mulching.

Only a few horses, some milch cows, and pigs are kept, but they are of fair quality, and in good condition.

The farm-house is a well-constructed wooden building, roofed with iron, containing seven rooms. There is a detached kitchen and out-buildings, all well constructed and roofed with iron, including wine-cellar, store-room, &c.

The character of the gates and fences is very fair, the latter being of posts and wire.

The accounts are kept in the French language, but, upon explanation, I allowed the points given under this head, as it was shown to be a paying concern.

The orchard and vegetable garden is certainly the best managed part of the property, and I consider it would have been better to have entered it in the section for orchards.

Mr. James Casey, Piney Range.

I inspected the property of Mr. Casey, the nearest town to which is Grenfell, on the 1st December, 1892. This farm consists of 9,545 acres of freehold land, the portion under cultivation comprising 54 acres of wheat, 22 acres of hay, 12 acres of maize, 3 acres of peas, 3 acres of potatoes, and half an acre of table grapes.

The general management is only fair, and the crops are not so clean as they should be, the maize crop particularly being choked with weeds. The land is only partly cleared of timber, and there are some stumps in the hay crop. This probably accounts for the hay being cut with a scythe, and gathered by means of hand-rakes and forks in the old-fashioned way.

The rotation adopted is wheat, hay, and maize.

The subsidiary aids to the farm are bacon, poultry, butter, wool, and sheep, together with jam and preserves for home use.

Water is conserved by means of eleven open tanks for stock, measuring from 1,000 to 3,000 yards, and there is an underground tank for homestead use, but no appliances.

Fodder is conserved under a good hay-shed roofed with iron.

The implements consist of two double and one single furrow ploughs, one stripper and winnowing machine, harrows, scarifiers, and other smaller tools.

The productiveness of the crops is only fair.

The system of manuring is to graze sheep on the land, while the other manure collected on the farm is applied to fruit-trees and vegetables.

The class and condition of the stock is very fair.

The fences are constructed of posts and wire, quite sheep-proof. The whole of the property is fenced, but the dividing fences are not so good as the outside fence. The gates are not very good.

The farm-house is built of timber, with an iron roof, is fairly well finished, and contains seven rooms. The kitchen is well built and roofed with iron, and the underground dairy and out-buildings are fair.

The mode of book-keeping is fairly good, and the accounts appear properly kept, and show the yearly income from the farm and 6,700 sheep to be £2,000.

The cultivated portion of the farm is on the east side of the property, about 4 miles away from the homestead.

MIXED FARMS—WESTERN PLAINS DISTRICT.

TABLE showing the points obtained by the various competitors.

	Wm. Anderson, Moama.		Chas. McAlister, Murray Hut.		N. A. Gatenby & Co., Jemalong, Forbes.		Samuel Nixon, Daysdale.		John Jones, Berrigan.		Samuel Wilson, Currah Farm, Jerilderie.		Drummond Bros., Berrigan.		H. J. H. Keeping, Boogaldi, Coonabarabran.		Thos. Treloar, Studley Park, Deniliquin		C. Gaymard, Forbes.		James Casey, Piney Range, Young.	
	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.
General management with a view to profit	125	125	125	120	125	105	125	125	125	125	125	110	125	120	125	100	125	120	125	110	125	100
State of crops to cleanness and cultivation	100	100	100	80	100	85	100	100	100	100	100	80	100	80	100	90	100	75	100	85	100	80
System of cultivation, rotation, &c.	80	80	80	60	80	60	80	70	80	60	80	50	80	60	80	60	80	60	80	60	80	40
Number and condition of subsidiary aids to farm ..	80	60	80	70	80	60	80	60	80	50	80	70	80	40	80	60	80	50	80	60	80	70
Conservation of water and its economic application..	80	60	80	80	80	80	80	60	80	60	80	70	80	65	80	50	80	50	80	50	80	50
Means used for conserving fodder	60	50	60	40	60	40	60	40	60	40	60	50	60	50	60	55	60	40	60	50	60	50
Kinds of implements used, condition, &c.	60	60	60	50	60	50	60	50	60	50	60	50	60	50	60	50	60	50	60	50	60	40
Productiveness of crops	50	45	50	40	50	45	50	45	50	45	50	40	50	45	50	45	50	40	50	40	50	45
System of underground drainage	50	*	50	..	50	..	50	..	50	..	50	..	50	..	50	..	50	..	50	..	50	..
System of manuring	50	45	50	20	50	20	50	30	50	20	50	30	50	30	50	30	50	40	50	20	50	20
Conservation of manure made on the farm	50	30	50	20	50	20	50	20	50	20	50	20	50	..	50	20	50	40	50	20	50	20
Class and condition of stock	50	50	50	50	50	50	50	50	50	50	50	40	50	50	50	45	50	50	50	40	50	45
Character and condition of fences and gates.. ..	40	40	40	40	40	35	40	38	40	40	40	35	40	40	40	35	40	35	40	30	40	35
Plan, character, and condition of farm-house, buildings, &c.	40	35	40	40	40	35	40	30	40	30	40	40	40	35	40	40	40	25	40	35	40	35
System of laying down grasses	20	..	20	15	20	20	20	5	20	10	20	10	20	..	20	..	20	..	20	..	20	..
Mode of book-keeping	20	20	20	20	20	20	20	10	20	18	20	20	20	18	20	10	20	..	20	15	20	20
Any new point of interest, and commercial value, such as new crops, ensilage, &c.	20	..	20	..	20	15	20	..	20	10	20	..	20	10	20	..	20	..	20	..	20	..
Vegetable and fruit-garden	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Total	1,000	825	1,000	770	1,000	765	1,000	758	1,000	753	1,000	740	1,000	718	1,000	715	1,000	700	1,000	690	1,000	675
Percentage of excellence	..	% 82·7	..	% 77	..	% 76·5	..	% 75·8	..	% 75·3	..	% 74	..	% 71·8	..	% 71·5	..	% 70	..	% 69	..	% 67·5

*Not required.

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Citrus Orchards.*

JAMES HAROLD, Judge.

As Judge of Citrus Orchards for the year 1892, I have the honor to report that I commenced my duties 23rd November, 1892, and ended them 25th January, 1893, having been engaged in the actual work of inspection seven days. The competing orchards in my section were situated in the county of Cumberland, save one. There were eight competitors in all, six in the class for small orchards of under 10 acres each, and two in the class for orchards of over 10 acres. Taken as a whole the competing orchards were hardly representative of the great Citrus industry of New South Wales. Many of the most flourishing and largest orchards of the country were not entered, while five of the eight competing orchards were young, only ranging from 4 to 9 years of age, and, of course, had not therefore come into full bearing. As to results and conditions they consequently could not be compared with older and full bearing orchards. As representative orchards of their area, conditions and age, they were however very good specimens and yielded handsome results. Of the three old orchards entered, one was eight acres in extent, and was 23 years of age; one was 5½ acres in extent, and was 21 years of age, and the other was over 20 acres in area, and the trees in it ranged from 22 to 45 years of age. I found an inspection of these orchards very instructive and very illustrative of the capabilities of the country for the production of Citrus fruits, of the longevity of the trees under the conditions afforded, and of the results of the growing of this class of fruit. As to results, I spared no pains to arrive at a just estimate of the expenditure necessary for the production of the fruit and the income derived from its sale. The statements of expenditure and income which will be found appended to my detailed statement of each orchard, I obtained under the hands of the proprietors, and they are in every case the owner's own statement just as he chose to make it.

In these statements there may be discrepancies, some of the figures given are for 1891, and others for 1892, and as the price of fruit varied considerably during these years, one orchard may in consequence be made to appear to produce much more than another. Yet, notwithstanding these discrepancies the figures as a whole are most valuable as illustrating the average productiveness under good conditions, of this valuable industry.

I do not say that the statements herein given of the profits derived from the year's operations of the orchards in the competition are to be taken as the average results of the Citrus fruit-growing industry throughout New South Wales. To make up the average for the whole country every orchard, good, bad, and indifferent would have to be enumerated, and I am painfully aware that many orchards would have to be accounted for in that average that yield the proprietors no returns at all. To strike an average for the whole country from the profits derived from the cultivation of the eight orchards inspected by me would be manifestly unfair and would be too high. But it would be just as unfair to strike an average by the incorporation of all dead and decaying orchards in the statistical statement of the year's operations for this branch of industry.

* Note.—The statements of account given in this report were obtained by me on the understanding that they were for publication.—J. H. (Judge).

Apropos of dead and decaying Citrus orchards, I might be permitted to say in passing that in the county of Cumberland there are too many of them at the present time; and, as many of them are beyond all hope of rejuvenescence, measures should be at once taken to uproot and destroy them. As they now stand they are useless to the owners, an eyesore to the community at large, a harbour of insects and diseases generally, a source of danger to the fruit-growing industry, and a standing stigma on the efficiency of our agricultural system. They yield no adequate return for the labour bestowed on them, and many of them are a dead loss to the owners. They help to depreciate the value of property immensely in the districts in which they are situated, for what stranger in search of an investment for his money would care about buying an orchard if he had to pass half a dozen dead and dying ones on the road to inspect it. As well might a merchant try to sell goods at remunerative rates if his counters were littered with rotten and damaged pieces of the same material he wished to sell. Land-owners should insist on the destruction of these worthless orchards in their respective districts, for they have a depreciating influence on everything near them. They help to lower the average of the earnings of the orchards generally, and thereby materially depreciate the value of really good orchards. The lands of the county of Cumberland are certainly not the best for growing citrus fruits, but by reason of marketing facilities the bulk of the orchards have been planted there. The orange-tree thrives best in a deep calcareous, well drained, well sheltered loam, and in many situations in which decaying or dead orchards are to be found these conditions are entirely wanting. In too many cases these orchards are planted in a poor thin loam, with a cold yellow clay subsoil, with no shelter, either natural or artificial, deficient drainage, deficient tillage, no manure, and no repression of insects. Still, the owners of some of them wonder why they decay. The only wonder is that the plants ever lived at all under the conditions. Their lives must, however, be of short duration.

In the orchards which I visited I found considerable diversity of opinion among the owners as to the best methods of cultivation, manuring, draining, pruning, &c. In some of them nearly all the labour is done by horse power and modern improved implements, while in others the cultivation is wholly done by hand labour with the spade, hoe, and fork. The hand labour certainly costs the most, but I saw no difference in the vigour and health of the trees, all things being equal, in the hand labour over the cheaper horse power. Several of the competing Citrus orchards formed a portion of a mixed orchard of deciduous, pomaceous, and citrus fruits, and sometimes grape vines. While I have not the slightest inclination to dictate either to the Department of Agriculture or to the owners as to the principle upon which competitions shall be carried out, yet it is a question in my mind whether the most satisfactory results would not be obtained by a man entering all his property for competition. If he grows Citrus fruits only, let him compete in that section, but if he is the cultivator of a mixed orchard and a farm perhaps besides, let him compete in a section for those properties. Where a portion of an orchard or a property only is entered for competition it may happen that that portion is well cultivated for the year of competition at all events, while the other portion is more or less neglected. In fact, I have seen cases in point. Again, in cases where a portion only is under competition, it is difficult to adjudge the proportionate amount of labour due to each, and sometimes considerable produce from other parts comes in as subsidiary aids and helps to swell the total receipts, which is unfair to the man who depends wholly on one class of fruit, and has no such aids to swell his accounts.

I found a very general opinion among the competitors that citrus orchards should be judged (say) in September, when the fruit can be seen to the best advantage upon the trees, and I promised to make this matter the subject of a special note to the Department.

Orchards under 10 acres.

Mr. G. H. Dempsey, Orchardleigh, Emu Plains; 8 acres orchard.—Recommended for first prize.

Mr. G. H. Dempsey's orchard is situated about 1 mile from the Emu Plains railway station. The orchard contains a total area of 10 acres, but only about 8 acres of that extent is planted to Citrus trees. The land slopes gently towards the Nepean River, and is composed of a deep friable loam of several feet deep and a subsoil of boulder drift. A better situation or a more suitable soil for an orange grove could not be found in the district. The orange-trees are now 23 years of age, and they are still exceedingly healthy and free from any serious disease. The land shows a good state of cultivation, and where necessary it has been drained, although it is so favourably situated for natural drainage that artificial drainage would be thought to be unnecessary. Mr. Dempsey has, however, experienced the greatest benefit from his drains, a fact that might be noted with advantage by other fruit-growers similarly situated.

This orchard is one of the few irrigated properties in the coastal districts. For furnishing it with water, a well 28 feet deep and 7 feet in diameter has been sunk. In the well there is 15 feet of water, which percolates from the Nepean River, and is well nigh inexhaustible. The well is 12 feet deep through soil to the gravel. To raise the water to the necessary level to water the orchard by gravitation a 3-h.p. Tangye engine and pump, which will raise 1,200 gallons of water per hour to a height of 30 feet, is used. The water is pumped into two 400-gallon tanks, which act as pressure tanks, from which it is allowed to flow by gravitation where desired.

The orchard is free from pests, with the exception of the orange mite, but a spraying of soft soap, sulphur, and water keeps these pests in check. The property is well-fenced, and there are the necessary modern implements for working it. The trees are now, however, grown so large that much of the labour must be done by hand. There is a good dwelling-house and the necessary out-buildings for packing, storage, &c. The result of the year's operations for the year 1891 was £470 9s. 6d.

	£	s.	d.
F. Arendt, Bourke	56	18	0
Nancarrow and Bartlett, auctioneers, Bourke	16	19	3
J. W. Critchley, fruiterer, Nyngan	29	12	6
W. H. Clarke, fruiterer, Bourke	3	4	0
J. Cunninghame, fruiterer, Dubbo	20	6	0
W. Doherty & Co., auctioneers, Bourke	9	6	6
W. Cumming, fruiterer, Dubbo	6	7	6
G. Edwards, fruiterer, Dubbo	20	4	9
W. Ellison, fruiterer, Emu Plains	7	0	0
T. Freeman, refreshment room, Penrith	5	12	0
G. Granger, fruiterer, Dubbo...	16	1	0
W. Hill, fruiterer, Wallerawang	7	9	0
Wright, Heaton, & Co., agents, Warren	5	12	0
R. C. M'Kinney, auctioneer, Hay	23	8	6
H. Kuhner, fruiterer, Bourke	14	16	0

	£	s.	d.
J. Meade, fruiterer, Ipswich, Queensland	12	2	6
Montgomery and Sons, agents, Sydney	11	5	0
J. Rowling, fruiterer, Nyngan	5	18	0
A. M'Roy, fruiterer, Nyngan	5	14	0
H. Simpson, fruiterer, Murrumburrah	12	2	0
Sweeney & Co., fruit exchange, Sydney	27	8	0
J. Tilmie, fruiterer, Warwick, Queensland	3	12	0
A. Thompson, fruiterer, Molong	34	13	0
W. Reed, fruiterer, Townsville	16	15	0
A. White, fruiterer, Nyngan...	6	0	0
Williams and Colless, agents, Bourke	4	0	0
A. Johnstone, fruiterer, Hay	88	3	0
	£470	9	6

This account is exclusive of the summer fruit; that is about £80 a year, which I reckon pays the labour for the year. I attribute the good results to irrigation. The figures do not include the quantity of fruit sent away, and omit to give any charges for cases, transportation, &c. The labour is calculated at £80 per annum, and is paid for by summer fruits. Then there is no calculation of interest on capital invested, horse-feed, wear and tear, &c. If these calculations were made, no doubt Mr. Dempsey's gross income of £470 9s. 6d. would be materially lessened. This sum gives a gross earning for the 8 acres of £58 16s. 8d. per acre, a very handsome return indeed. Counting all charges at the highest figure, and allowing for fluctuations in price, it can be reduced by one-half and still leave a handsome profit. There is not the slightest reason to misdoubt Mr. Dempsey's figures. Several of his trees yield as much as £4 or £5 worth of fruit each year. He considers the great yield of the orchard is due to irrigation, and probably this is true, but it must not be forgotten that the orchard was established before ever irrigation was thought of in the district. Mr. Dempsey's orchard is well worthy a visit. It is seldom that one can see so clean and handsome an orange grove. I have much pleasure in recommending him for the First Prize in his class.

Mr. Edwin Smith, Rosedale, St. Ives, 5½-acre orchard. Recommended for Second Prize.

This orchard is situated at St. Ives, Gordon, and is composed of the ordinary soil of the district. It has a fair depth of surface loam, with a gravel and clay subsoil. For planting the land was cleared and dug over to a depth of 15 inches. The trees are planted 18 feet apart, and it contains 485 orange and lemon trees, most of which are now 21 years of age. The land has been drained by pole drains, although it has a good slope. The trees are all remarkably healthy, and give good results for the labour bestowed upon them. The orchard is worked wholly by hand labour, the fork, hoe, chipping-hoe, and spade alone being used. It is manured every alternate year by the addition of about 18 lb. of bonedust to each tree. Scrapings from the bush are also added, and any other manure that can be gathered up about the place. The property is well fenced, and is well sheltered from the west and south by the natural forest of the country. There are surface drains for keeping the rainwater from coming in contact with the butts of the trees, which seems to be a very necessary precaution on sloping hill sides, as the water is collected and run off the land, and the land kept from washing, and the bark of the trees kept dry. Mr. Smith hands in the following statement of his year's operations, and it will be seen that he sets down £150 for working

5½ acres of land, whereas Mr. Dempsey only allows £80 for 8 acres. Mr. Smith allows nothing for subsidiary aids, although, as a matter of fact, he has considerable summer fruit, butter, and eggs, &c. I consider Mr. Smith deficient in implements. Hand labour is all very well, and in his case has given grand results, he having cleared £11 per acre on 5½ acres of land, without calculating any subsidiary aids, which he might have done. But his labour bill for the area of land under cultivation is a very large one, and might be materially lessened by the employment of a light plough, cultivator, and a "nuggetty" horse. The house and grounds are neatness itself, and the trees show great care, and notwithstanding his deficiency in implements, I do not feel that I would be justified in passing Mr. Smith over in favour of a younger orchard, when his trees, at their age, are so healthy and remunerative. I have much pleasure, therefore, in recommending Mr. Smith for second prize in this class.

The average sales for fruit, on account of the low prices realised, was £5 per week, being the lowest average for years past, amounting to £260, less £199 10s. expenses, leaving a credit balance of £60 10s.

	£	s.	d.
£5 per week	260	0	0
Per contra	199	10	0
Balance to credit	£60	10	0

	£	s.	d.	
Expense of punt and market fees, about	6	0	0	per year.
Working tools, about	1	10	0	,,
Horse feed, wear and tear, about	30	0	0	,,
Wear of carts, about	2	0	0	,,
Expenses of artificial manure, about	10	0	0	,,
Beside home-made manure	.....			
For wages, about	150	0	0	,,
Total	£199	10	0	,,

Mr. A. F. Wooster, Carlingford—6½-acre orchard. Highly Commended.

This orchard is situated a short distance from the railway station, Carlingford. The land is on a rise, and is fair ordinary soil, with a gravel and clay subsoil. It was prepared for planting by breaking up 18 inches deep with a pronged hoe, the soil being left in its natural position, only broken up. About two-thirds of the land is drained 2½ feet deep and 36 feet apart, with 2 and 3 inch pipe, and in some cases 1½-inch pipes are placed in branch drains. The trees were planted 18 feet apart each way, and are now 6 years of age, and are principally Siletto and St. Michael oranges, and Emperor and Thorny mandarins. The orchard, so far as it has gone, shows good results, and the plants are remarkably healthy, and well cared for.

Mr. Wooster shows considerable skill and ingenuity in saving and conserving manure. In his stables he dissolves a quantity of the sulphate of iron in water, and mixes it with saw-dust, and uses it for bedding for his horses. The sulphate of iron is credited with fixing the ammonia in the horse manure. Gum leaves are also used for horse bedding, and then the whole, with the horse manure mixed, is placed in a shed to rot and decay. All other waste material about the premises containing fertilising ingredients is added to this heap, and when decay has proceeded sufficiently in order to admit of application to the soil it is used. Bonedust to the extent of 5 or 6 cwt. per acre is used, as are also scrapings from the bush. Flushings from tan-

neries are used with good results, only as it comes from the tanneries it is generally too crude for immediate use, and is better after being placed in a heap to rot and disintegrate for a time before application to the land.

Insect pests have not been very troublesome up to the present, but sometimes the fruit is fumigated to correct any latent disease. Mr. Wooster considers that fumigated fruit keeps better, because insects are destroyed, and the skin is better dried out.

The tools and implements are of the most modern description, and very suitable for the work in hand. There is a Planet Junior Cultivator with all the appliances and a reversible plough, with chipping-harrow, horse-hoe, roller, hand impliments, spring-cart, and dray. The packing-shed and store-room is capacious and substantial, and in fact every appliance is on hand for the economical and convenient handling of the fruit.

For insects there is the cyclone spray-pump and appliances. The dwelling house is a most substantial brick structure of six rooms, and is very neat, commodious, and containing all the modern conveniences. There is a brick cottage for the hired men, poultry-house, &c. A substantial paling-fence surrounds the property, and the gates are good. When the trees come into full bearing the orchard promises to be a model, and Mr. Wooster brings a good deal of sound and advanced agricultural knowledge to bear upon his business. The following statement of profit and loss for the year, gives a credit balance of £124 18s. 5d., for 6½ acres of land for the year's operations, something over £19 per acre of profit.

Cr.	£	s.	d.	Dr.	£	s.	d.
593 gin-cases oranges... ...	106	2	0	Wages	62	0	0
515 „ lemons... ...	125	10	3	Manure	20	0	0
171 „ mandarins ...	52	19	6	Loss of cases	9	8	4
26 „ passion fruit ...	5	5	0	Commission, freight, interest,			
Fruit retailed	1	10	0	&c.	75	0	0
	£291	6	9		£166	8	4
				Cr. Balance... ...	124	18	5
					£291	6	9

You will please note that this balance-sheet is for the year ending 30th April, 1892. I always calculate from the 1st May, because the crops are not divided then. Of course I could easily give you the figures for the year 1892.

Mr. E. T. Osborne, Rosedale Orchard, Thornleigh, 9-acre orchard, commended.

This property contains 12 acres, 9 acres of which are planted to trees, principally lemons and oranges, but there are about 3 acres of mixed fruit-trees. The trees range from 4 to 9 years of age. The land was prepared for planting by ploughing 7 inches deep, then digging with a fork about the same depth in winter, and at the same time manuring with about 12 cwt. of bonedust per acre. The trees are planted a little too close together, but they have made good growth and show good results. The land is a strong brown loam with a stiff red clay subsoil. The surface is undulating, and to catch and divert the surface water open shallow drains have been dug, but no subsoil covered drains have been made. The surface drains have a good effect in keeping the surface water clear of the butts of the trees, which Mr. Osborne considers a great advantage as it obviates root-rot. The land is principally worked by the chipping-hoe, hoe, forks, and digging hoes. There is a four-roomed frame cottage, out-buildings, &c., on

the property. The fencing is paling on two sides, and there is fair natural shelter. There is a horse and cart and harness. The number of trees on the premises are: Oranges, 144; lemons, 700; apricots, 25; peaches 150, and plums, 125. The statement of accounts shows sales amounting to £544 3s. 6d., less expenses £340 12s. 6d., leaving a credit balance of £203 11s., or £22 12s. 4d. per acre. I recommend Mr. Osborne for a commended certificate. His orchard is a very good one, although deficient in drainage and working appliances.

ACCOUNT OF SALE, 1892.

	£	s.	d.
Lemons, winter crop, 1,650 cases, @ 3s. 3d.	268	2	6
Lemons, summer crop, 335 cases, @ 8s.	134	0	0
Oranges, 180 cases, @ 5s. ...	45	0	0
Plums, 110 cases, @ 5s. ...	27	10	0
Peaches, 76 cases, @ 6s. ...	22	16	0
Apples, 70 cases, @ 4s. 6d. ...	15	15	0
Passion fruit, 24 cases @ 5s....	6	0	0
Vegetables, preserves, and sundries	25	0	0
	£544	3	6
	340	12	6
	£203	11	0

EXPENSES.

	£	s.	d.
Wages, one man...	65	0	0
My own labour	80	0	0
Manure and lime	50	0	0
Fruit cases	20	0	0
Tools	4	10	0
Horse feed	15	0	0
Interest on money	45	0	0
Commission for sale of fruit ...	61	2	6
	£340	12	6

Mr. John Kenny, Vanceville, Turramurra, 4½-acre Citrus orchard.

The surface soil of this orchard is a good brown loam, of fair depth, with, in some places, a pipeclay subsoil to a depth of 3 feet. The orange-trees are 10 years of age, some of them 9 years, and some of them 8 years old. There is one acre of very fine lemon-trees. The land was prepared for planting by breaking up 18 inches deep, and the trees were planted shallow. The orchard is well drained, 3 feet deep and 18 feet apart. Some of them are of tile, but the most are broken stone drains to a depth of 18 inches. The stones for these drains are broken to a size of 2 inches, and they act well. The land is worked by hand implements, digging in winter and chipping in summer.

The land has been manured with 3½ tons of manure per acre—600 lb. kainit, and superphosphates and bonedust in alternate years, with occasional dressing of sulphate of ammonia. The kainit, Mr. Kenny says, contains something like 33 per cent. of common salt, and he therefore does not care for it. The orchard is well fenced, and it has a good water supply in the shape of a creek. Mr. Kenny shows considerable skill and intelligence as an agriculturist, but his appliances for working the land I consider deficient. I consider Mr. Kenny's orchard a very good one, and improvements in the way of labour-saving appliances would place him in the front rank as an orchardist.

Mr. J. W. Farlow, Freeman's Reach, 7-acre Citrus orchard.

This property is beautifully situated on a gentle hill bordering the low lands of Freeman's Reach. The soil is a light loam surface, and a shale subsoil. Mr. Farlow has but recently acquired the property. Since it came into his possession he has ploughed it twice a year and harrowed and scarified it twice a year. It has been hand-worked around the trees. It has received no manure other than the grass which grew on its surface which was gathered up and placed around the trees as a mulch. There is no drainage other than a deep cut in the road in the brow of the hill on which it is situated, and one drain in the lower corner. The orchard appears to be worked in connection with a farm of 150 acres owned by the Farlow family. It contains no buildings of any kind. It is securely fenced, but appears to me to be lacking in shelter, except natural shelter from the west. The orchard appears to advantage, and the trees are remarkably clean and healthy though they are still young. Mr. Farlow seems to have improved the orchard considerably since it came into his hands, and it promises well. The following is Mr. Farlow's statement of accounts from which it will be seen that the total receipts from the property in 1892 amounted to £100 10s. 9d. from which must be deducted working expenses, which are not stated, but they could not be less than about £10 per acre, which would leave £30 to the credit of the orchard for the year. An orchard of this kind, although it may be a good one, has a poor chance of competing against a property of equal merit, which has improvements in the shape of dwelling-house, outbuildings, &c., on it. It is deficient in various ways notably in saving manure, conservation of water, shelter, and drainage.

	£	s.	d.
Planted August, 1884; labour, with hoe and horses to 1st January, 1885 ..	1	2	6
From 1885 up to 1st January, 1886	4	7	6
From 1886 up to 1st January, 1887	4	11	0
From 1887 up to 1st January, 1888	4	16	0
From 1888 up to 1st January, 1889	4	18	6
From 1889 up to 1st January, 1890	4	14	0
From 1890 up to 1st January, 1891	5	3	0
From 1891 up to 1st January, 1892	5	13	0
Interest on money paid out, and pruning orchard	3	15	6
	£39	1	0

Cases of oranges and lemons sent to market, 1887; 25 cases realised ...	5	12	6
Cases of oranges and lemons sent to market, 1888; 85 cases realised ...	14	16	0
Cases of oranges and lemons sent to market, 1889; 190 cases realised ...	36	0	0
Cases of oranges and lemons sent to market, 1890; 284 cases realised ...	50	7	6
Cases of oranges and lemons sent to market, 1890; 560 cases realised ...	60	15	0
Cases of oranges and lemons sent to market, 1892; 1,200 cases realised ...	100	10	9
	£268	1	9
Interest received	16	2	6
	£284	4	3

Class II.—10 acres and over.

Mr. William Waddell's Townhead Orchard, Singleton, 20 acres. Recommended for First Prize.

For the following outline of facts respecting the orchard I am indebted to Mr. Fell, Mr. Waddell's son-in-law, the lessee:—

"On the property is built a substantial one-storey brick house, containing eleven rooms, with detached kitchen and outhouses, situated on a rising knoll, overlooking the orchard, having a carriage drive with ornamental trees on either side, leading from the Maitland Road. There are also provided fruit-packing house, fruit-case and tool-shed, buggy-house, cart-shed, stables, hay-shed and piggeries, &c., about 12 acres being allotted to house and grass paddocks. The whole property is securely guarded by a 6-foot paling fence, and prickly-pear hedge, which runs parallel with fence; the fence is provided in convenient places with strong and substantial painted gates.

It comprises about 20 acres devoted entirely to members of the Citrus family, and about 35 acres are allotted to peaches, pears, apples, plums, nectarines, apricots, and grapes; all the several varieties of each different kind of fruit being well represented."

It is with much pleasure that I supplement the information given by Mr. Fell, by adding my testimony to the untiring energy displayed by Mr. Waddell in planting, and the skill evinced in keeping this large orchard in efficient health and cultivation. Some of the Citrus trees in the orchard are now 45 years of age, and while some of them show signs of decay, the greater number are still in health and vigour. As many as twenty-five cases of oranges are sometimes picked off one tree, and some of the trees are 15 inches in diameter at the butt. The soil is a rich black sedimentary vegetable mould several feet in depth, with a sand, gravel, or drift subsoil, a deposit by the Hunter River, to which it is adjacent. Here and there elevations of a light sandy loam have formed, which answer the conditions of plant life admirably, as upon these formations the crops are always early. The whole is fenced by a substantial fence and a cactus hedge, which affords excellent shelter to the trees. The implements are of the most modern description, and the cultivation is done wherever practicable by horse-power, the trees being planted 30 feet apart each way in the younger portion of the orchard, while in the older portion they are from 20 to 25 feet apart. The average crop is about 3,000 cases of oranges. For the repression of pests a very serviceable spray pump is in use, with tanks and all complete. Mr. Fell has added an agitator to the apparatus, which keeps the liquid in motion by the working of the pump, and so ensures an equal quality to the whole solution. In dry seasons the orange-trees are watered from tanks, and they are kept mulched with saw-dust, which answers that purpose most admirably, and works down in a fine mould. Taken as a whole, Mr. Waddell's orchard is one of the most interesting it has ever been my lot to inspect. Interesting in the great age of the trees that have been kept remunerative all these years, and which furnishes valuable data as to the life of the orange-tree in Australia. It would be interesting to note the effect of drainage on these trees. Certainly they are on land that is generally thought to be sufficiently porous to admit of natural drainage; in fact, such land as is not drained in any part of the world. But at the same time, I believe drainage would act beneficially on this orchard in staying the disease that is now manifesting itself in some of the trees.

As to the profit and loss for the season's operations, the following Dr. and Cr. statement by Mr. Fell will be interesting.

Dr.	£	s.	d.	Cr.	£	s.	d.
To labour	176	6	2	By orange crop	565	8	7
,, cases, &c.	41	2	2				
,, transportation	2	0	0				
,, management	160	8	6				
,, wear and tear, &c. ...	8	0	0				
,, profit and loss	177	11	9				
	£565	8	7		£565	8	7

In the above statement it will be observed that £176 6s. 2d. is set down for labour on twenty acres of an orchard. This gives at the rate of £8 16s. 3d. per acre. Then there is a sum of £160 8s. 6d. for management. This gives £8 0s. 5d. more per acre, or a total for labour and management of £16 16s. 8d. per acre. There is nothing, however, set down for horse feed and manure, nor for interest on capital invested; but with all these items added, the figures are too high. It will be seen that the total profits of the 20 acres is set down at £177 11s. 9d., which is certainly a small amount, considering the size and excellence of the trees. Taken all round, the orchard is a very excellent one, and is well deserving the First Prize for which I have recommended it.

Mr. P. F. Richardson, Vernon Park, St. Ives, 14 acres. Recommended for Second Prize.

This property is situated on the Cowan Road, about 2 miles from Pymble Station, on the Hornsby to St. Leonards railway. It is only a little over ten years since the first clearing was made, and its present state shows what can be accomplished in a short time by energy and skill.

The total area of the property is 27 acres, which is surrounded by a good post and rail fence, the part occupied by the orchard (about 14 acres) being secured on all sides by a paling fence, which protects it completely from the inroads of hares, rabbits, and other destructive animals. On the south and west it is well sheltered by a row of *Pinus insignis*, filled in with pittosporums, camphor laurels, &c.

The dwelling-house consists of seven rooms, including kitchen, and has a wide verandah on front, back, and east sides. There is also a dairy, larder, wash-house, and wood-shed, as well as an office and a room for the incubator, &c.

In the yard there is a stable and shed for general use, with a carpenter's bench (as all repairs are done as far as possible on the premises) on the one side, and on the other there is a large room for packing and sorting the fruit, a men's room, a closed-in coach-house, with a loft overhead, also an open cart-shed, where cases are stored, and a shed for storing potatoes, and feed, or bonedust, with a fire-place for preparing the fowls' and pigs' food when required.

There are two 1,500-gallon tanks and a well 30 feet deep by 10 feet diameter, bricked round more than half way down, which give an ample supply of water for all purposes in the driest season.

A considerable portion of the orchard has been drained with 2½ and 2-inch pipes at a depth of 3 feet, and the remainder has open drains about 18 inches deep and 38 feet apart, which are being sunk to 3 feet and laid with pipes as quickly as time and opportunity will permit.

In the way of tools, all the usual orchard and garden requisites are in good supply. In addition there is a small Planet Junior Cultivator, which has

proved of great service, saving much time and labour. One man can do more in a day with it than three men with the ordinary chipping hoe.

The orange and lemon trees, and most of the other fruit trees, are planted 19 feet apart. The trees are in excellent health, while great care and skilful attention has been paid to the pruning and shaping of the trees. This is more particularly observable in the orange and peach trees, which are very regular and symmetrical in size and shape.

The manures used are bone-dust of extra quality, obtained from Mr. Charlish, of Willoughby, and the Colonial Sugar Company's No. 4, which is most suitable, and a perfect manure for the purposes required here. Besides these manures, everything in the way of rubbish, bush leaves, &c., is mixed with the stable, cow and fowl manure, and used as required. It is found of great value in improving the character of the soil, which is generally rather poor and hungry, without much depth, and requires constant working and attention, but this is repaid by the extra fine quality of fruit produced. The whole orchard is dug and manured every year, with the exception of some of the summer fruits, such as apples, &c., among which the plough is used, but Mr. Richardson considers that ploughing is injurious to the Citrus trees, except when young, as it is very severe on the surface roots.

The fruit when picked is sorted and carefully packed and marked, according to quality, before being sent to market, so that the agent can sell according to the market, and is able to get a better price than if it was carelessly packed without sorting. He (the agent) reports that the oranges sent from here this year were the best he received from the district, and that he always obtained the highest market price for them.

Next to the oranges and lemons come the peaches, which do well, and in the early kinds, such as Briggs May, Waterloo, Early Alexander, Early York, &c., the fruit has always held its place amongst the buyers in Sydney.

The Japanese date plums succeed admirably, and it was from here first that the new and large kinds were sent to market a few years ago, before they were so generally grown.

The grape vines are trained on the French system, along wires, and produce a larger quantity of fruit than those trained in the ordinary way.

The vegetable garden merits special notice, as it is kept very trim and neat, and contains every variety of seasonable vegetable; asparagus, seakale, spinach, Globe artichokes, cucumbers, tomatoes, rhubarb, &c., do well, also rock-melons, custard marrows, and strawberries. There is a good sized pond at the bottom of the garden, surrounded with a very luxurious growth of pampas grass, the flowers of which sell well in Sydney.

Outside the orchard there is a cultivation paddock of about 2 acres fenced off from the rest of the land, in which green feed, hay, &c., are grown.

Adjoining there is a cow-shed and piggery, a covered shed for saving the manure in, and another for cutting and storing firewood in wet weather.

There are also four good fowl-houses, with large yards, enclosed with wire netting, in which are to be seen about 250 head of poultry, principally Langshans and White Leghorns, with a few fine Pekin ducks. The hatching of chickens is principally carried out with one of Hearson's incubators, which is started about the end of July, and closed the end of October. Mr. Richardson finds that the chickens raised from the incubator are quite as strong and sometimes better than those hatched and brought up by the hens, and it is especially suited for rearing ducks.

I should also mention that there are twenty stocks of Ligurian and Hybrid bees, but this has not been a good season for honey, so that very little has as yet been obtained.

The results of the operations for the year just ended will be seen in the accompanying statement of income and expenditure, and when the age of trees, the character of the soil and other conditions, more especially the low prices obtainable for all sorts of fruit during the last twelve months, are taken into consideration, it must be freely admitted that the balance to the credit of profit and loss is more satisfactory than could have been anticipated.

I am indebted to Mr. Richardson for the above very full and accurate description of the property. The soil of the orchard is not the best in the district, yet the best has been made out of it, as will be seen by reference to the following statement of the year's operations. It will be seen that off 14 acres of land, most of the citrus trees being only from 7 to 8 years of age, Mr. Richardson makes a profit of £172 12s. 1d., which amounts to £12 6s. 7d. per acre, which is about double the amount of profit derived from Mr. Fell's much older and full-bearing orchard. He, however, does not pay so much for labour by more than one-half as that paid by Mr. Fell. Nevertheless, it would be altogether nonsense to place Mr. Richardson's orchard before Mr. Fell's in the prize-list. Probably, if Mr. Fell's orchard had been entered as a mixed orchard, it would have shown better commercial results. It will be seen that much more than half the amount of Mr. Richardson's receipts came from products other than Citrus fruits.

Income.	About.					
	s. d.	£ s. d.	£ s. d.			
Oranges, 306½ cases, average price	6 1¼	93 13 6				
Lemons, 156 „ „	4 6¾	35 18 6				
„ 15 „ held over	5 0	3 15 0				
Peaches, 325 half cases	4 4	70 12 5				
Nectarines, 49 „	4 0	9 18 6				
Apricots, 14 „	4 0	2 17 0				
Plums, 14 „	7 9	5 9 0				
Date plums	.....	6 3 3				
Grapes	.....	4 15 5				
Apples, 67 cases	4 9	16 0 0				
Sundries, including loquats, figs, &c.	.....	17 19 6				
Violets	.....	12 19 2				
Vegetables sold	.....	4 18 0				
Honey	.....	4 12 6				
Bacon and ham, 220 lb., house account	0 9	8 5 0				
House—milk and butter, per week, at	10 0	26 0 0				
„ fruit and vegetables „	12 0	31 4 0				
„ honey	2 6	6 10 0				
Value of manure made from stable, &c., 80 loads	4 0	16 0 0				
Poultry and eggs, deducting cost of food	.....	37 9 10	415	3	7	
Expenses.						
Labour, one man all and one part of year	.....	96 10 0				
Manure	.....	26 0 0				
Commission on sales, including cases	.....	23 8 6				
Tools bought	.....	3 15 0				
Horsefeed, &c., per week	10 0	26 0 0				
Cow feed, per week	4 0	10 8 0				
Sundries, repairs, garden seeds, &c.	.....	7 10 0				
Interest on capital, taking land at £70 per acre	.....	49 0 0	242	1	61	
Balance to credit of profit and loss	.....	.....	£172	12	1	

TABLE showing the points obtained by the various competitors.

	Orchards under 10 Acres.												10 Acres and Over.			
	H. Dempsey, Emu Plains.		C. Smith, St. Ives, Gordon.		A. F. Wooster, Carlingford.		E. F. Osborne, Thornleigh.		J. J. Kenny, Turramurra.		T. W. Farlow Freeman's Reach.		W. Waddell, W. J. Fell (lessee).		P. F. Richardson, St. Ives.	
	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.	Maximum points.	Points awarded.
Selection of trees suitable for district...	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
General cultivation and cleanliness	100	85	100	85	100	80	100	85	100	80	100	80	100	95	100	95
Training and pruning of trees...	100	95	100	95	100	85	100	90	100	90	100	80	100	95	100	95
Repression of pests	100	95	100	90	100	90	100	85	100	90	100	85	100	95	100	95
General commercial results and system of book-keeping ...	100	100	100	90	100	95	100	95	100	75	100	70	100	85	100	95
Method of planting trees, preparation of land, choice of site	100	95	100	95	100	90	100	95	100	95	100	90	100	95	100	80
Conservation and intelligent application of manure... ...	50	40	50	40	50	50	50	40	50	50	50	...	50	40	50	40
Selection of best available position for each kind of tree grown	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
System of underground drainage	50	25	50	25	50	35	50	10	50	50	50	15	50	*	50	30
Conservation and application of water, where available ...	50	50	50	40	50	25	50	25	50	10	50	...	50	35	50	20
Shelter—artificial or natural	50	40	50	45	50	15	50	30	50	25	50	10	50	50	50	40
Economy in working, including implements...	50	45	50	25	50	50	50	35	50	25	50	40	50	45	50	40
Excellence of varieties of fruit	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Utilising surplus fruit and other subsidiary aids	50	25	50	20	50	20	50	25	50	15	50	25	50	40	50	35
	1000	895	1000	850	1000	835	1000	815	1000	805	1000	695	1000	875	1000	865

* None necessary.

Report on Bee Farms.

ALBERT GALE—Judge.

I have the honor to submit my report upon the bee farms competing for the National Prizes offered by the Department of Agriculture. The number of entries was nine in the first class, those containing 30 to 100 hives; and five in the second class, those having 100 hives and upwards, in all a total of 14 entries, being an increase of 4 upon the entries of 1891. One competitor, who sold his apiary, and another whose farm was so damaged by floods as to almost destroy his chances of success, withdrew.

The arrangement of the two classes differs in this year's competition. For 1891, the first class was 100 colonies and upwards, and second class 30 to 100 colonies. For the competition of 1892 this order is transposed, those bee farms containing 30 to 100 colonies are termed first class, and those having 100 and over second class. Hereinafter, in each case where they are referred to, those apiaries of 100 colonies and upwards are designated A and those with 30 and under 100, B.

The prizes in class A were awarded as follows:—

First.—Mr. J. E. Taylor, Cowra.

Second.—Mr. William Niven, Eugowra.

Highly commended.—Mr. R. Macansh, & Co., Narara.

Commended.—Mr. W. J. Dockrill, Casino.

In class B.—

First.—Mr. Seabrook, St. Ives.

Second { Mr. Geo. James, Gordon.
Mr. B. Carlill, Casino.

Highly commended.—Mr. C. Mansfield, Largs.

Commended.—Mr. H. B. M'Farlane, Rooty Hill.

The points that were approved of by the Minister were the same as that for the competition for the year 1891. (For points see tabulated form, page 580). These were divided into sub-points, and each sub-point again divided by two, giving half points where necessary. Taking this arrangement into consideration, the points gained are really double what they appear to be. The value of the points was arrived at in the same manner as was the case for the 1891 competition, and the judging conducted by the same method and standard.

The total number of colonies in class A was 630, being an increase of 38 as compared with the previous competition. The total in class B was 511, being 249 more, or nearly double that of the former year; an aggregate of 1,141 and an increase of cent. per cent. The average for the year 1891 was 69·3 and in the last competition 73, being an increase of an average of 3·7. The highest number of points gained in 1891 was 81, and the lowest 38, and in the last competition 84·5 and 50 the highest and lowest respectively. An increase of 3·5 over the highest and 12 over the lowest of the previous year.

In the following table the average points gained in the competition of each year are contrasted:—

	91A.	92A.	91B.	92B.
General Arrangement	8·2	8·7	7·0	8·0
Strength, &c....	7·6	7·8	7·0	7·8
Handling	4·2	3·9	3·4	3·4
Home-made hives	7·8	7·9	7·4	8·1
,, appliances	7·0	6·5	4·0	6·1
Honey...	4·4	5·2	4·0	3·7
Wax	2·6	3·5	1·8	3·2
Nuclei...	4·0	3·4	1·6	2·8
Honey Plants...	1·8	0·8	2·0	0·8
Operating-house	3·2	3·0	2·0	3·1
Workshop	3·2	4·0	3·0	3·4
Extracting	4·4	4·1	3·0	3·5
Cleanliness	7·8	8·1	7·0	8·1
Enemies	10·0	9·7	9·2	9·2
	76·2	76·6	62·4	71·2

The first two columns A represent farms with more than 100 colonies and the last two B farms with less than 100, but more than 30. In columns A it will be noticed that there is a very slight increase of 0·4 only. Two of the competitors in class B were competing in 1891, and again in 1892—Mr. Seabrook and Mr. Mansfield—the former taking second prize with 70 points, and the latter, highly commended, with 68. The following will show progress made:—

	First prize.	Second prize.	Highly Commended.
B 1891.....	78 points.	70 points.	68 points.
B 1892.....	79 ,,	77 ,,	75 ,,

To gain highly commended eight points more are required this year than last; five points more than the number that gained the second prize in 1891.

In columns A the progress has been still greater (8·8) than in 1891. Three of the farms that competed in 1891 were again in the field, one had changed hands. The improvement is as follows:—

	First prize.	Second prize.
A 1891...	81·0	79·0
A 1892...	84·5	78·5

These figures show that the Second Prize was slightly lower, and that the improvement was scattered among the whole of the competitors. The most notable increases are in home-made appliances, arrangements of operating-house, and general cleanliness. That these three show the greatest improvement must be highly satisfactory to the honey-consuming public in that the article they buy under the label "Pure extracted honey" is from bee farms of known reputation for cleanliness, &c.

General arrangement of stocks, the cultivation of honey plants, and freedom from enemies, show a slight downward step, the last only by two-tenths. This was caused chiefly by two competitors, one who had sadly misunderstood the value of foundation comb, and it was found impossible to manipulate most of his hives. The other case was where all black bees are kept. There were not a great many moths, but enough to make him lose one mark. One or two moths in the pupa form in hives that had not been opened for some time, were also seen.

General Arrangement of Stocks.

An easterly aspect was that generally chosen. If two colonies are placed side by side, one facing east and the other west, that facing the east will commence work earlier in the day than its westerly neighbour, whilst the one facing west will continue to work later than the easterly one. But the easterly one has its advantages over the westerly. "The morning flowers display their sweets," and there are far more honey-secreting flowers that open in the early mornings than late in the day. East to north-west are the best directions. A westerly or southerly is too bleak in winter time, more especially on the table-lands. Most of the sites were well chosen. One or two farms visited were objectionable owing to force of circumstances. The situation of an apiary from which the best results may be obtained is on a small plain at the mouth of a wedge-shaped valley, the thin end of the wedge pointing southerly; or on a small plain situated at the bottom of a valley, and surrounded on every side by mountains. The flora of the same variety in such situations open consecutively, beginning low down in the most sheltered situations, and continuing to bloom day after day, higher and higher up the sides of the hills, long after those the bees had first worked upon are in seed pod. In such situations the honey flow of the different varieties of flowers in the same locality is continued much longer than is the case where the same variety of flowers bloom on a plain. In some cases the hives were exposed to the full influence of the sun, and not the slightest protection was attempted. Under such circumstances it is not the bees that suffer so much from the situation as the operator. Mr. Taylor and Mr. Niven have much improved their trellised vines, and in some cases trellised protections have been commenced by others. The circumscribed space of one or two apiaries was detrimental and unsightly, and the crowded way in which the hives were arranged must be a source of annoyance to timid visitors. Where the hives are in rows of not less than 12 feet apart, and about 6 feet from stock to stock, there is much more freedom for the operator as well as the visitor. In the cases referred to, where they have but a limited area to carry on bee-culture, dissimilarity of location is provided for by intermixing flowers and shrubs with the hives, thus ensuring the return of the queen to her own home after her nuptial flight.

Strength of Colonies.

This varied remarkably in early spring where the Italian blood predominates. Take these two cases, about 40 miles apart, both bee-farms located on the western slope of the Great Dividing Range, similarly situated and having the same floral advantages. I visited the former (Italian bees) on the 12th December, and found them in full spring vigour and activity, and swarming had been going on some weeks before my visit. Three days later I arrived at the farm of black bees; they had been well wintered, and during that season they had had plenty of stores, had recovered from spring dwindling but were only *preparing* for the swarming season. Still more remarkable is a case I met with at Murrurundi. I called in there on my return from visiting the northern competitors, and found that the Italian bee had only been introduced into the locality in the early part of the summer. Up to that time black bees reigned everywhere. I looked into some of the hives of black bees of an amateur bee-keeper and found them on the verge of starvation. I then visited another amateur not more than a quarter of a mile from the former. This bee-keeper had Italian bees, they were

obtained from Mr. Pender, of Maitland, who took the first second-class prize in 1891. Here the black bees were able to live, but there was no surplus honey. Nevertheless, the owner had obtained 120 lb. of honey from his Italians, although the eight or ten colonies of black bees in the same garden had not given him a pound.

The discarding of drone comb from the brood-chamber is systematically carried on, perhaps a little too much so, in localities where the Italian bee has almost superseded the black. In such localities the purity of the drones should receive some attention so that the black bee in the bush should receive as much Italian blood as possible. The very black combs from the brood-chamber are more frequently destroyed by some bee-keepers than formerly, and empty worker comb from the honey chamber substituted. I know, that black comb is a vexed question, both in America and here. That a working bee whose metamorphosis has taken place in a much used brood cell is smaller when it emerges is admitted, and it is asserted that in the earlier periods of its imago life it rapidly grows. In a letter before me are these words, "The workers are characterised by a peculiar fluffiness at birth, and are somewhat small, but increase quickly in size during the first three or four days after emerging." A bee whilst in a chrysalis form, in a brood-cell just before it emerges *completely fills the cell*, whether the cell be in a virgin state or has many old cocoons lining its walls. If such be the case, and it is so, how is it possible for that bee to *re-enter that cell* with such perfect ease as we so frequently see them, if they have grown after they have emerged from it? For an imago insect to grow is contrary to the laws of insect life.

Wiring is becoming a thing of the past, being rapidly superseded by a centre bar. It is quicker to insert this bar than to wire, and it secures the comb whilst the honey is being extracted equally well. In like manner one pound sections are being superseded by half sized supers, the latter being more profitable to work than the former.

In the hands of amateurs the strength of colonies is largely disregarded. A queen and 5,000 or 6,000 workers is calculated as a workable swarm. One hive from 25,000 to 30,000 will gather more honey and winter upon less stores than half a dozen colonies of 8,000 inhabitants each. The necessity for equal or natural spacing, having the boxes perfectly plumb, and the fixing of foundation comb-starters, appears to give amateur bee-keepers the greatest amount of trouble to understand.

Handling.

The subduing of bees by the aid of smoke is not so generally carried on as formerly. A few bee-keepers who are old in experience frequently handle bees without its aid. If carefully handled and honey be coming in freely there is little to fear. Various materials are used to produce smoke—rotting wood, old bagging, rags, thick brown paper, old cotton-waste that has been used to clean machinery, and cow-droppings. This latter must be perfectly dry, when it has advantages over all other, for it consumes away slowly, produces a good smoke, and is sparkless. In two or three cases the bees were very irritable. In one instance this was caused by an accident, and by a bush fire not far off. The worst case was where no blankets were used and the bur comb had glued the top of the bars to the cover of the hive. This bur comb is a great source of trouble and annoyance, and a great waste of labour for the bees. I have for a long time been on the look-out to see if I could discover the cause of such an apparent waste of time, labour, and material. I find, after examining some hundreds of

frames covered with it in various parts of the country, that bees have a very justifiable reason for their bur comb proceedings. Comb built by bees in a state of nature—that is, where no foundation is used—has holes, frequently called "pop" holes, at irregular distances, for the purpose of permitting the bees to pass from one side of the comb to the other, instead of being compelled to descend to the bottom, to reach the point required by ascending the other side. If a burred comb bar-frame be examined it will be seen that it is chambered with galleries having frequent openings on either side. The reason, therefore, undoubtedly is to form passages so as to pass from one side of the comb to the other, without having the trouble to always descend to get to the other side. To counteract these passages, I made some frames with thick top bars perforated with elongated holes, large enough to admit two bees to pass each other. From reports I have received from bee-keepers who have been using them, the improvement has proved successful. Holes made of tin, and inserted in the comb, will answer the same purpose. In opening hives where no blanket is used, it too often happens that the operation is accompanied with a sudden jerk, and the anger of the bees aroused, to the danger of the operator and onlookers.

Home-made Hives and Bar-frames

are now in general use with the more experienced bee-keepers. In one case only were professionally made bar-frames used. The work is carried on in the winter evenings. In many of the workshops I saw small circular saws, that showed signs of being well used. With the aid of these saws, almost every inch of the wood of old packing cases, bought from country store-keepers, can be utilised. Where railway or water carriage is not available the saving is very considerable.

Home-made Appliances.

Some of the less experienced competitors seemed to lose sight of the usefulness of appliances, and substituted quantity in lieu thereof. In one case a competitor went to work armed with implements of bee torture rather than appliances of utility, and boasted of his dexterity in using them. There were knives for cutting the frames from the sides of the boxes; others designed for loosening them from the bottoms of hives, and levers for lifting out the frames. In his case the implements were absolutely necessary, on account of the spaces between the bar-frames and the bottom and sides of the boxes being so great that the bees had used it for comb-building. Some of the appliances in use were very interesting and novel in their use. A catalogue of the various appliances used on the various bee-farms would be an interesting study to inventive minds for the purpose of bringing out appliances that would be found of service in the hands of most bee-keepers. A very good and useful wax-melting can, made by Mr. Nevin from two tin-billies, rendered first-rate service, and answered well the purpose for which it was designed. There was also a light four-wheeled hand waggon, fitted by Mr. Halsted for carrying smoke-bellows and other appliances, and having ample space for holding frames for the purpose of taking them to and from the extracting-room, and a machine, by Mr. McFarlane, for lifting heavy hives for the purpose of renewing the bottom boards, &c., all of them well worthy of a place in other apiaries.

Honey.

The points given for honey in 1891 were—extracted 2, comb 2, 1-lb. sections 2, = 6 points. Owing to the difficulties in packing comb-honey for transportation last year, I left out the two points given for it, and, in lieu thereof, gave 4 points to extracted honey. This alteration met with the general approval of all the competitors, as honey in the comb is not nearly so profitable as the extracted article. The system adopted for testing its purity was the same as that followed in 1891, but the method of bringing the various samples together into one place for comparison differed. In 1891 the various samples were all sent to Sydney, and there adjudged. I afterwards learnt that it was possible, and even probable, that at least one of the samples forwarded was not gathered from the neighbourhood of the apiary from which it was said to have been. To frustrate any possibility of a similar fraud, I had the frames taken from the hives, and the honey extracted and bottled in my presence, and placing it in my hand-bag, brought it away with me. By this means I was assured that the honey I had was the article gathered and marketed from that particular district, although, perhaps, the samples were not as ripe as they otherwise would have been had the competitors forwarded what samples they thought fit. Some years ago it was a usual thing to see honey exposed for sale under the headings "bush honey" and "pure garden honey." The former could be purchased at a much lower rate than the latter. Bush honey differs not in flavour, consistency, or colour, from "pure garden honey" obtainable in the same district, the many impurities that are always to be met with in bush honey, made it so inferior that it became a drug in the market. The method of running garden honey differs in no respect from that of straining bush honey from the comb. The foreign matter it contains is the same, excepting that in the "bush honey" there are fragments of the decayed trees in which the bees' nests were found. Bush honey and garden honey are obtained from the comb in the same primitive fashion, *i.e.*, straining through a bag after the honey-comb and all it contains, honey, bee-bread, and bees in every stage of development, have been crushed to a pulp. These in conjunction with an adulterated article that has been largely imposed upon our honey consumers from foreign markets, have had all to do with the non-consumption of honey for dietary and domestic purposes. Honey, says Virgil, is "Heaven's gift, food fit for the gods," but it must be remembered that he wrote in a period before the adulteration of food had become an art. It is only within the last few years that the bee-keepers have commenced a campaign against the wholesale practice of adulterating honey. Only the product extracted from flowers by bees can be called by, and sold under, the name of honey. Not all the sweets that are gathered, placed in the cells, and sealed over by the bees can be designated by that name.

Frequently in the honey cells, glucose, fruit-sugar, sugar-cane, Swiss table-honey (a manufactured article), conifer honey, aphidian honey, &c., are to be met with, especially so in a season when flowers are yielding little or no nectar, or when bees have been artificially fed. Dr. Haenle, in his report to the Apicultural Congress, held in Strasburg in 1890, wrote, "Up to five years ago a thick mist hung over the chemistry of honey." The mist is rapidly being swept away. The Australian public are being gradually educated to know that the honey from our apiaries sold under a label bearing the words "Pure extracted honey from ——— apiary" is "heaven's gift"—honey extracted by bees from flowers, and flowers only. Among the samples of honey I have in my possession, all gathered from Australian or introduced

flowers, there are some that have all the qualities and flavours that were sought for before the introduction of cane sugar. The honeys of Crete, Minorca, and Narbonne, are flavoured with rosemary. The honey from Hymettus, so celebrated by the ancients, is flavoured with thyme. The grateful flavour of the honey of Provence is due to the flowers of the lavender. The honey of Cuba owes it delicious perfume and taste to the oil of neroli, obtained from the orange groves in which the bees work. The early spring honey from the district around Sydney is highly celebrated for the same flavour. The honey from our white, red, and yellow box ranks highly in consistency and colour, and the agreeable flavour imparted to it is due to the volatile oils of the various species of trees from which it is gathered.

If we can rely on the published statistics of the results of bee-keeping both in Europe and America, New South Wales should indeed be proud of her honey harvests, as compared with those of the continents above named.

The following is an extract from one of the Sydney newspapers :—"The world's honey producers.—The largest bee-keeper in the world is Mr. Harbison of California, who has 6,000 hives producing 200,000 lb. of honey yearly. In Greece there are 30,000 hives producing 3,000,000 lb. of honey; in Denmark, 80,000, producing 2,000,000 lb.; in Russia, 110,000, producing the same; in Belgium, 200,000, producing 5,000,000 lb.; in Holland, 240,000, producing 6,000,000 lb.; in France, 950,000, producing 23,000,000; in Germany, 1,450,000, and Austria, 1,550,000, each producing 40,000,000 lb. of honey. But in the United States of America there are 2,900,000 hives belonging to 70,000 bee-keepers, and producing 62,000,000 lb. of honey yearly."

The following is the average quantity of honey produced by each hive in the various countries named :—Greece, 10 lb.; Denmark, 20; Russia, 18·2; Belgium, 25; Holland, 25; France, 24·2; Germany, 27·5; Austria, 25·5; United States of America, 21·5.

The 2,900,000 hives of the United States of America are owned by 70,000 bee-keepers, being an average of nearly 42 for each one, and we can see the average quantity of honey from each hive is but 21·5 lb. The 12 bee-farms that I visited, wintered 862 hives, an average of nearly 72 each, and the quantity of honey produced by them was 122,042 lb., an average of over 140 lb. per hive, being 6·5 times more than was obtained by the average American bee-keeper, and nearly 6 times more than that produced by any country in Europe.

As already stated the largest bee-keeper in the world is Mr. Harbison, and the results of his honey harvest are quoted above. His average is 33·3 lbs. per hive. If we take two of our bee-keepers who obtained the largest yield of honey last season, Mr. Taylor and Mr. Niven, the former obtained from 105 hives, 17,920 lb., or an average of over 170 lb. per hive, and the latter from 136 hives, obtained 24,640 lb., being an average of over 181 lb. per colony. The largest quantity of honey taken from a selected hive on Mr. Taylor's farm was 250 lb., and from Mr. Niven's, 253 lb. 10 oz. The 862 hives referred to are those that were carried through the winter of 1891. The aggregate number of hives adjudged during this inspection was 1,141, being an increase of 211 over last year. It must be borne in mind that at the farms visited in the early part of my inspection, the swarming season had only just commenced, and in two cases had not begun.

The following information is taken from a diary kept by Mr. Niven, recording the rise and progress of his bee-farm, and goes to show how successfully the bee industry may be followed up :—In 1885 he had twenty colonies in common boxes. 1885 to 1888 were good seasons, and the bees

gathered large quantities of honey, and threw off many swarms, but bee-keeping was not a success, the bees not having sufficient hive-room, In 1888, 127 colonies, sixty of them in bar-frame hives, but the whole were neglected, owing to Mr. Niven following other occupations. The season 1888-1889 was a very bad season for his bees; sixty colonies were destroyed by the bee moth. (Was it not the neglect, and not the season that was the cause of the destruction?) In the end of the season 1889, he had seventy-eight colonies and very little honey coming in. The bee moth again became troublesome, which, by the end of August, 1890, had reduced the apiary to sixty-six colonies. "We have now made up our minds to make bee-keeping pay, or abandon it altogether," are the words following this entry. In October there was an increase of one colony, but the bee moths still continued their ravages. By November, there were 110 stocks doing well, and gathering honey of a very good quality, which sold at 5d. per lb. in Sydney market. In 1891, there were 124 hives, and the quantity of honey gathered was 7½ tons, being an average of 135½ lb. per hive. At the end of season 1891-1892, 10 tons 19 cwt. 11 lb. of honey had been obtained from 134 colonies, an average of 183 lb. for each one. If California, the greatest honey-yielding country mentioned, was equally as good a honey-producing country as New South Wales, the 6,000 hives referred to should have yielded 1,098,000 lb., instead of 200,000 lb., or 898,000 lb. more than stated.

It may be interesting to note the debit and credit sides of the accounts of bee-farm the first year, when the Niven's had "made up their minds to make bee-keeping pay." The following are the results of the season 1891-1892:—

Receipts.	£	s.	d.
Value of honey sold ...	140	0	0
Value of honey in stock ...	135	0	0
Beeswax	11	0	0
23 swarms (sold) @ 30s. per hive	34	10	0
	£320	10	0

Expenditure.	£	s.	d.
6 months labour for self ...	58	10	0
Assistant	15	10	0
Wire	0	1	10
Solar extractor	1	5	0
Cases for making hives ...	1	14	0
Lime for white-washing ...	0	4	0
Barnes' circular saw	10	0	0
Bee journals	0	13	0
Small articles	1	0	0
	£88	17	10
To profit	231	12	2
	£320	10	0

Nuclei for Queen-raising.

Five points. Classes A and B obtained an average of nearly three. In class B, Mr. Chas. Mansfield, Largs, and Mr. J. E. Taylor, Cowra, obtained the full number. Queen-rearing is the most important branch of the bee industry, and no bee-keeper can be considered a practical man without having a knowledge of a regular system of superseding his old queens by those reared by himself, or by purchasing. Queen-rearing may be classified as natural and artificial. By natural, I mean cases where an extra strong colony is made queenless, and as soon as the workers have constructed and capped over the larval queens, and removing them to the colonies as required, or in about twelve days after the queen has been so removed, inserting a frame containing brood comb, with newly laid eggs or larva. The younger the larva the better, the older the selected larva the shorter will be the

life of the queen that is bred from it. In these inserted combs, it is better if the eggs and larva be exposed by removing some of the walls of the cells. If there be plenty of nurse bees in the hive, the bees will build natural queen-cells. By artificial queen-rearing, I mean that method advocated by American bee-keepers (Doolittle, and others), and adopted by many of the Australians, viz., making queen cups of wax.

In a state of nature a queen cell is not made wholly of wax, but a large portion is built with a mixture of wax and pollen. The capping of brood comb, both drone and worker, is built of the same material. It would appear from the porous nature of queen cells and brood cappings that a greater quantity of air is required to develop a drone than a worker, and the queen bee whilst developing must have all the air obtainable by both abdominal and thoracic spiracles. Abdominal respiration in the breathing space given to the queen cell appears to be one of the chief agents in the development of the ovarium of a queen, while the contracted air-space and the air-tight wax walls of the worker cells appear to be the cause of the non-development of the same organs in working bees. In a pupal or larval state respiration in insect life is performed equally by all the spiracles, but chiefly by the abdominal. On account of the air-tight cells and the cocoons wholly enveloping working bees whilst in a larval state these abdominal spiracles are almost, if not wholly, prevented from working; but the thoracic spiracles come fully into play. The abdomen of an embryo queen bee is free from the encasement of a cocoon, and undoubtedly this is one of Nature's reasons why the larval queen has only her head so shrouded and so protected. Another reason for leaving the abdomen of the queen entirely undefended by such a covering is, that the imprisoned queen may become an easy victim to the one reigning. But this absence of cocoon from the larval queen's abdomen, the porous nature of the material of which the cell is formed—its shape an inverted cone; the cavities in the exterior surface of that cell (the convexities being given to add strength to its tissue-like walls); the position of the young queen within, the abdomen being higher than the head so that the air within the cell by the heat imparted to it by the incubating bees clustering around the semi-detached and pendulous royal cell, have more to do with the development of the generative organs of queen bees than feeding with larger quantities of food. "I claim," says Doolittle, "that the food fed to all larvæ up to the time they are thirty-six hours old, is exactly the same whether the larvæ are designed for drones, queens, or workers; and that the difference comes by the queen larva being fed with larger quantities of this food all of its larval life, while the others are fed sparingly later on, or else a different kind of food given after they are thirty-six hours old."

Newport has shown that the development of heat in insects depends on the "quantity and activity of respiration, and the volume and velocity of the circulation." Bees possess the voluntary power of generating heat by breathing faster.

Huber observes in an article on Insect Incubation, "The manner in which the bee performs her incubatory office is by placing herself upon the cell of a nymph (pupa) that is soon to be developed and then beginning to respire, at first gradually. In a short time the respirations become more frequent, until at length they are increased to 120 or 130 per minute; the fluff on the bees aiding in retaining the heat. The bodies of the incubating bees soon become of a high temperature, and on close inspection are often seen to be bathed in perspiration. When this is the case the temperature of the insect soon becomes reduced and the perspiring insects leave the cell, and others almost immediately take their places.

When respiration is performed less violently less heat is evolved. The same bee will often continue on the cell for many hours in succession." This extreme amount of heat is evolved entirely by an act of the will of the bee. All observant bee-keepers know that the colder the weather the more restless are the incubating bees on the brood comb. The heated air produced by these bees clustering on the brood comb cannot affect the abdomen of worker larvæ to the extent it does their head and thorax. Whilst, as before mentioned, the position of the royal cell and the porous material from which it is formed, the position of the royal inmate, and its freedom from an entire cocoon covering, the constantly changing position of the incubating bees that cluster around these royal chambers, are the agencies employed by Nature to fully develop the ovarium at the sacrifice of the honey sac, and produce that most interesting inmate of the hive, a queen bee. The absence of these agencies in the cells of the worker larvæ causes the development of the honey sac—the wax pockets and pollen baskets with which the working bee is provided—at the sacrifice of the ovarium. From the foregoing it will be seen that the conditions exacted by nature for the production of the all-important mother bee are not only extra food, but, in conjunction with it, extra air, extra heat, extra space, and another position to that of worker-larvæ. These extra conditions produce female bees capable of fertility. Their absence produces female bees incapable of fertility. All bee-keepers know that a bee capable of fertility is perfected from the laying of the egg to the time the chrysalis emerges from the cell in sixteen days. But, if all the conditions I have named be withheld, the same insect would have taken twenty-one days to mature, or five days longer than is required for the development of a queen bee.

I have been led into these remarks by observing the extraordinary artificial queen cups manufactured by some bee-keepers, and the instructions given for making the same in some books on scientific queen-rearing. A bee-keeper once showed me some artificial queen cups he had made, drawing my attention at the same time to their remarkable strength—that strength being their chief witness against them. Here are the words from a scientific work on queen-rearing:—"As soon as the wax on the cell (mould for making the cell) was cool enough to set, it was again dipped, not allowing it to go as deeply in the wax as it did the previous time by about the thirty-second of an inch, when it was cooled as before. In this way I dipped it from six to eight times, when I had a queen cup that pleased me, as the outer edge was thinner than the bees made theirs, while the base was so thick that it would stand much more rough usage than would cells built by the bees. . . . I find by measuring that I dipped the sticks in the wax nine-sixteenths of an inch the first time, measuring from the extreme point, and dipping less and less each time, as before stated, so as to get the base of the cell very thick, which I consider a great advantage." If the artificial queen cups are thicker than those made by bees they cannot be as porous as if they were made from wax. The thicker and deeper they are made the less chance will the bees have to build their natural additions thereto. I have now lying before me an artificial queen cup from which the imago has emerged. It is nearly one-sixteenth of an inch thick, very strong, and three-quarters of an inch deep, and before being given to the bees it had a plane surface. A natural queen cup under the same circumstances would be about one-eighth of an inch deep, and the concavities almost transparent. On the outside of this artificial fabrication the bees have tried to supply the conditions required by nature, by adding thereto a covering of the usual porous materials. To raise queens artificially is of the very utmost importance, but if all the conditions

demanded by nature be rejected it will be at the cost of the queen. It must interfere with her longevity and her fecundity. The shallower and more fragile the artificial cup is made, so that the bees can add all the requirements of nature, the better in every respect will be the queen so reared. In the early spring, when bees are eager to swarm, shallow artificial queen cups will be accepted, but this will not be the case later in the season.

A far greater amount of attention is now given to queen-rearing than was the case two years ago, and indeed a great stride has been made since last year. No bee-keeper will ever arrive at the apex of success who disregards this important branch of the industry. The competitors who have been most successful in this competition are in nearly all cases those that have given most attention to this subject. When it is considered that out of a colony of from 25,000 to 30,000 bees success or failure depends wholly on one of those inmates, the importance of queen-rearing cannot be overrated. Is it any wonder that under the old "gin case" method there are so many failures when we consider that we cannot introduce a new queen into them no matter what may be wrong. One might as well expect to get milk and butter from a cow 30 years old, or eggs from an ancient hen, as honey from hives containing an old queen. Whatever goes wrong in a colony it must be taken for granted that it is the queen's fault, and the sooner the queen of an unsatisfactory colony is superseded the better will be the results.

Some of the bee-keepers that I visited are as particular in selecting their queen bees as farmers are in selecting their stud sheep, cattle, and horses, or as a fowl fancier in choosing his pen of birds with whose progeny he expects to come off victorious at the next annual show. Before long queens will be selected by their points as much as a Devon bull or a merino ram now is.

At present the Italian queens hold the foremost place of honor, and justly so. The superior traits in their working stock are well known to most people—docility, fecundity, energy, and recovery of numerical strength earlier in spring; they are more easily manipulated, bear artificial swarming better, and are more defensive against robbers, bee-moths, &c., than other varieties. At present there appears to be four recognised strains of Italian bees, that I will here designate as A, B, C, D. Mr. C. Mansfield, Largs, who is an enthusiastic queen-rearer, is the only bee-keeper I ever met with who considers the honey harvest as only secondary to queen breeding. Possibly this is because the district in which he lives is not great in its honey-yielding plants, but is eminently conducive to the breeding of bees. The whole neighbourhood abounds in pollen-bearing plants—maize, millet, pumpkins, &c. At this apiary can be seen these four strains very distinctly. Messrs. Seabrook and Mansfield and some others are constantly importing new queens from Italy and America to improve the strains they already possess.

"A" is a bee from northern Italy, and is found in a state of nature in the basin of the rivers Po and Adige and in the plains of Lombardy. The dorsal rings near the thorax are tan colour, but vary in shade just about as much as the fashionable tan-colour boots do of to-day. The extremity of the abdomen is very dark, almost black. The second abdominal ring is very wide transversely, and the abdomen tapers abruptly downwards. These characteristics are indicative of a largely developed ovarium. They are remarkable for quietness, gentleness, and docility. Indeed, it is not an unusual thing for the queen to be seen depositing her eggs while the comb is in the hands of the manipulator. The working bees from this strain are very pretty. The width of the abdomen of the queen descends to the workers, showing that the honey sac has a great capacity; they are active and vigorous, and have the character of being great honey gatherers.

"B" is a queen narrower and longer, and possesses all the external distinctions of "A," excepting that of the width of the abdomen, and the workers are not so aldermanic. They are equally energetic, but their honey-carrying capacity cannot be so great as the workers from the strain "A." In a bee-keeper's eye the difference is almost as great as between a thorough-bred racehorse and a Clydesdale.

"C" is a queen of a bright golden colour, and a native of Southern Italy. This strain is met with on the lower slopes of Vesuvius, and on all the southern portions of the Italian peninsula. From their colour the strain appears to have a large share of Cyprian blood, but from their docility one may argue against such a supposition. They are equally as prolific as "A," but the form would indicate that this fecundity is not so lasting. The workers of this strain are not so energetic under all circumstances, or, to put it in Mr. Mansfield's words, "the strain is a first-rate good-times bee but is not so much of hard-times sort as "A." The beauty and usefulness of this bee may be retained if crossed with "A." Mr. Taylor's queens appear to be of this type, and the best of the queens I saw among the competitors at Casino were somewhat similiar. Our beekeepers are hard at work, and are unwittingly raising a bee that will become an "Australian strain."

"D" is a Doolittle queen (unfortunate for the busy bee to receive such a name). If "A" and "B" are pretty, "C" and "D" are perfectly handsome. I have never seen a queen come up to the form and beauty of a Doolittle queen that I saw at the Hunter River Apiary, at Largs. The head and thorax were beautifully formed and full of animation, the whole of the abdomen, excepting the merest tip, a richly burnished gold, and the whole insect as lady-like as a princess. In fact it was a bee that might be trotted out at any time for exhibition purposes; nevertheless I am doubtful if she be as useful as she is handsome.

Beeswax.

The samples of wax were far superior to that of 1891; the average points then gained were 2·2, and for this season they are 3·6. The dirty grey wax that was so frequently exhibited has now almost disappeared. There are three distinct grades of wax—white, straw colour, and deep yellow—each one having its own value. The aim with all bee-keepers is to produce as clear a white wax as possible for exhibition purposes. White wax is mostly used by artificial flower and fruit makers and in other branches of the fine arts. The straw colour wax is the favourite with makers of artificial foundation comb. The most valuable from a commercial point of view is the deep yellow. It is not an unusual thing for white wax to be coloured with annatto. I find from inquiry that the wax-dealers in England will give a ton of bleached (white) wax in exchange for a ton of pure deep yellow. The profits they make are derived from the adulterations. Yellow wax always realizes a higher price in the home market than the paler colours or white.

The Cultivation of Honey-producing Plants.

Less has been done this year than last in the way of obtaining a regular yield of honey by the cultivation of plants solely for that purpose. It has been proved beyond doubt that to till the soil for the growth of such plants as will give a crop of honey only is in no way remunerative. But where that cultivation will give two crops, one of grain or seed and one of honey, it will pay to grow crops for that purpose. Some of our largest and most successful bee-keepers are amongst our smallest land-owners, and others are on small areas, and have no fixity, &c., of tenure. Where a person goes fully

into bee-keeping combined with the cultivation of the soil, the grain harvest too frequently interferes with the honey harvest. Agriculturists, orchardists, and florists sow the crops and the bee-keeper reaps the honey harvest. This is but a fair division of profit. The crops that the cultivators of the soil produce are chiefly entomophilous, they are dependent wholly upon insect life for the removal of the pollen from the anthers to the stigma, for the purpose of fertilization. The most important diurnal insects that nature employs for this purpose are the bee family, and honey-gathering bees are pre-eminently useful for the fertilization of fruit crops. Blossoms that open late in the evenings or at night are fertilized by moths. Bees are in reality our forest makers, fruit producers, and florists. No bees or other insects (but chiefly bees), no fruit. Last year the largest area that was put under crop for honey was 1½ acre of Japanese buck-wheat. This year the largest area was a few square yards only of the same grain. Most competitors had a few sample plants of either borage, salvia, serradella, or sunflower, but nothing that might be regarded as a crop. The indigenous vegetation is what the bee-keeper has to rely upon for his honey harvest. Dividing the colony into its three natural geographical divisions, I found upon inquiry that the bee-keepers on the coastal district favour blue-gum, blackbutt, stringy bark, and spotted-gum as producing the greatest quantity of honey, while the best quality honey is produced by the blackbutt and clover. On the northern rivers of the coast district red-gum, black tea-tree, and mahogany yield the greater quantity, and the honey from the black tea-tree is the most superior. On the table-lands white box is preferred, both as regards yield and quality. On the western slope of the Great Dividing Range and on the great plains white box and river gums are the favourites for quantity, and the white box the superior for quality. The average number of points gained in the season 1891–92 were two each out of five for this section; and in this last season the average was only one out of the same number. The bee-keepers do not believe in raising crops for honey and honey only.

Arrangements of Operating Houses.

The operating houses in general have improved. The average number of points gained are 3·1, maximum 4½, minimum 2, as compared with 2·5 of last season, maximum 4, minimum 1. Nevertheless, there is ample room for improvement, more especially in class B. Any kind of material is made to do duty for the purpose of putting up those very essential buildings, old iron and wood that has been used for other purposes half a dozen times over, and full of bolt-holes giving free ingress and egress to all the vagabond bees in the neighbourhood. In other cases there were no bee escapes, so that if the door should happen to be shut, as is frequently the case, the robbers are completely imprisoned, the death of hundreds being the result. One competitor, Mr. James, of Gordon, has around the base of each post of his operating house cemented circular troughs filled with water, for the purpose of making it ant-proof; an improvement that could be adopted by other bee-keepers with great advantage. It is an effectual remedy against the ravages of pests. Workshops fitted with carpentering tools were found with all competitors. There were no make-shifts, as on my previous visit, and only one or two of a temporary character. The improvement gave nearly a full mark all round more than that of last season. One in class A obtained full marks. Small circular saws were in use in nearly every workshop. In two cases the gearing of old corn-shellers had been utilized, all with one exception were driven with a treadle, the exception being that of Mr. Carlill, of Casino, whose saw was driven by means of horse-power. The shops, for

most part, were well arranged ; every tool being in its place and easily found. Boxes or drawers containing the various sized nails and other small materials used in making appliances were labelled and within easy reach of the workman, the work being carried on with ease and system.

Cleanliness and Neatness.

As in the last competition so in this—there is a large difference between individual competitors. In the competition of 1891–92 the highest number of marks gained was nine, and that in one case only, and the lowest four. In 1892–93 four competitors gained nine points each, the lowest number of points being seven. Trellised grape-vines overhead are far more general than formerly. In some cases the culture of the vine for shade purposes is in its infancy. Of course, it will take time to bring to the perfection of utility, as is the case in the apiaries of Mr. Taylor or Mr. Niven. At one place visited the hives were, for the most part, placed under trees and arranged along a paling fence. To any one unaccustomed to work among bees it looked very neat, and appeared to give the best of protection to the hives from the heat of the noonday sun. The branches of the trees were so low, especially where supers were in use, that it was next to impossible to get underneath to fully inspect the inmates of the hives. The overcrowding observable last year was also met with this year, notwithstanding there was ample room where it occurred for the establishment of a much larger bee farm. The spaces occupied by the apiaries are well and neatly laid out. The hives were interspersed with a few ornamental flowers, or picturesquely arranged along gravel paths, that were scrupulously free from weeds, or dotted over small well-trimmed lawns, thus giving an air of attention which indicated that the very great interest taken by the proprietors in the insects was not altogether a selfish one of greed, but that bee-keeping was to them a very interesting as well as a profitable pastime.

Not the slightest sign of disease was noticeable. From inquiries made in the districts I visited, foul-brood appears to have been fairly stamped out of the apiaries of the competitors. On completing my tour of inspection, I immediately visited the Dubbo district, where I saw unmistakable signs of the disease above referred to. A few cases of paralysis were also met with, but not amongst the competitors for the National Prizes. A want of care in keeping the inner side of the bee-hives and their surroundings free from cobwebs, had caused the destruction of a good number of bees in going from and returning to their homes. Bee-moth is almost an enemy of the past with the bee-keepers of to-day—I refer to those having bar-frames. Those who still persevere in keeping bees in any make-shift box will never be free from them. The destruction caused by this well-known bee-enemy is largely contributed to by bee-keepers themselves, if such a term may be applied to those who put bees in a box, and bestow no thought or attention upon them from year's end to year's end, or only when they expect to reap an abundant harvest of honey. The sole causes of the ravages of the bee-moth are boxes with entrances everywhere, numerically weak colonies, robbing them too late in the season, leaving them no time to gather in their winter stores, and general carelessness and neglect. The remedy is the antithesis of these: Well-made bar-frame hives, having but one entrance; strong colonies of Italian bees (this bee is far more defensive than the black); when extracting late in the season, seeing that there is a sufficiency of honey for the winter's consumption; a regular and general supervision of the hives, and a lively interest in the general welfare of the bees, treating them as pets, and always seeing to them as you would any other valuable live stock.

Interesting Facts.

Amongst B Class competitors, two only prefer the pure Italian race, and one of them preferred the northern or leather-coloured to its more southerly neighbour. The reason given was that they were by far the best workers, were steadier on the comb under manipulation, are more gentle than any other known bee, build up quicker in the spring, and recover earlier from spring dwindling. Another competitor of this class had a preference for the southern bee for the same reasons. The remainder of Class B have a much stronger liking for the so-called hybrid, *i.e.*, German or common bee crossed with the pure Italian. In one instance preference was given to a Carniolian-hybrid Italian again crossed with a pure Italian drone, in this way producing a bee having two-thirds Italian and one-third Carniolian blood. Among the five competitors in Class A only one of them gave an all-round advantage to the hybrid. Another thought the hybrid worker commenced to store earlier in the spring, and the pure race better in the autumnal season. The experience of the remaining ones was that no variety of crosses came any way near the purest Italian race, and from information I received from bee-keepers who were non-competitors the verdict in favour of the purest of the Italian race is a just one. The pure Italian races are more suitable for the warmer districts, and the so-called hybrids for the colder parts of New South Wales. The term hybrid is a misnomer as applied to the cross between the black and Italian bee or the Carniolian bee and Italian. A hybrid is a mule or mongrel, an intermediate individual between two species. A species is a conception subordinate to a genus with attributes extending to fewer individuals. Instead of the term hybrid we should use the word variety, *i.e.*, something varying or differing from others of its kind. Hybrids are seldom fertile, or rarely remain so for any length of time, whereas varieties are frequently more prolific than the parent on either side. A hybrid is the mixture of two species, a variety the mixture of two individuals of the same general kind. A far more comprehensive term would be that of yellow-banded bees; thus, we could say the variety is one, two, three, &c., &c., banded.

In class B the wholesale price of honey was from 3d. to 4d. per lb., and class A sold at from 3½d. to 5d., averaging nearly 4½d., and the average of B nearly 3¾d.

There appears to be a general consensus of opinion as to the most suitable kind of season for the greatest supply of honey. A dry summer following a wet spring will be sure to be followed by a good honey flow. A wet autumn, dry winter, showery spring, followed by a dry summer, was the kind of season that produced the greatest yield of honey that one bee-keeper had ever known. The experience of another was that the honey obtained in a dry season is always darker and not so saleable as that obtained in a wet one.

It would be as well if all bee-keepers kept a diary of the seasons, and also the dates of flowering of all honey-producing plants. I obtained the following authentic information on the subject from Mr. Dockrill, of Casino. The dates can only have reference to the northern coast district:—Red gum, from July to August; red ironbark, from July to September; prickly tea-tree, from October to November; small-leaf tea-tree in December; apple-tree, from January to February; bloodwood, from February to March; mahogany, in November; white box and swamp tea-tree, in April; flooded gum, in May; spurwood, in June and July. From the above it will be seen that no month passes without one or more of the indigenous trees giving a crop of honey.

STATEMENT showing Points obtained by the various competitors.

	Maximum.	CLASS A. First Prize, £15. Second Prize, £10.					CLASS B. First Prize, £10. Second Prize, £5.						
		J. E. Taylor, Cowra.	W. Niven, Eugowra.	R. Macansh and Co., Narara.	W. J. Dockrill, Casino.	F. A. Maxwell, Albury.	Seabrook and Co., St. Ives.	B. Carlill, Casino.	Geo. James, Gordon.	C. Mansfield, Largs.	H. B. M'Farlane, Rooty Hill.	J. Halsted, Eglinton, Bathurst.	F. Drummond, St. Lawrence.
General arrangement of Stocks	10	9	9	8	8½	9	9	8½	8½	7	8	7	8
Strength of Stocks	10	9	7	7½	8½	7	8½	9	8½	9	7	7	5½
Handling	5	4½	4½	3	3½	3½	4½	4½	3½	4½	3	2	2
Home-made Hives and bar-frames ...	10	9½	7½	8	8½	6	4½	8½	7½	9	9	8½	7
Professionally made ditto ditto	5	...	...	...	...	...	2½	...	...	...	...	...	...
Home-made appliances	10	6	7½	6	7	6	8	6	7	7	7	8	...
Professionally made appliances	5	...	...	...	...	...	...	...	...	...	...	...	...
Stored Honey (purity not quantity) ...	6	5½	6	5	3½	6	4½	3½	3½	4	3½	4	3
Beeswax	4	3½	3½	3	...	4	2½	4	3	3	4	2½	3½
Nuclei for Queen rearing	5	5	2	3½	4	...	3	4	4½	5	4	...	...
Cultivation of honey-producing plants ..	5	2	2	½	½	1	1½	...	1	½	1	1½	...
Arrangements of operating house ...	5	3	3½	4	2½	2	4	3½	4½	2	2½	2½	3
„ workshop	5	5	3½	3½	4	4	3½	3½	4	3	2½	4	2½
Freedom from enemies and disease ...	10	10	9	10	10	9½	10	10	10	10	9½	10	5
General cleanliness and neatness ...	10	8	8½	9	8	7	9	9	8	7	8	9	7
Extracting in presence of Judge... ...	5	4½	5	4½	4	2½	4	3½	4	4	3	3½	2½
Total	100	84½	78½	75½	72½	67½	79	77½	77½	75	72	69½	50

Poultry.

By SAMUEL GRAY,
Sub-Editor.

The Plymouth Rock.

Of the many breeds produced by the ingenuity and patience of Americans, certainly none have been more successful or more highly appreciated than the Plymouth Rock. This breed is the outcome of one of the many attempts to produce the ideal bird—a bird which as a layer shall equal the best laying varieties, and as a table bird shall equal the best table varieties. That complete success has crowned this effort I cannot admit, but that a great step has been made towards this goal will be frankly acknowledged by all experienced breeders.

According to Lewis Wright, the first authentic account of the modern Plymouth Rock was given in 1871, when Mr. W. Simpson, of West Farms, New York, refers to them as an "improved Dominique." In a communication dated in 1873 the same gentleman refers to them as "single-combed Dominiques crossed with Asiatics." Whether the cross used was the Cochin or the black Java is immaterial for our purpose here in Australia, neither will it be necessary to go into the difficulties which beset the early breeders. I do not by this statement wish to convey the idea that it is a simple matter to breed perfect birds, far from it. Quite as many difficulties exist as in the case of other equally-established breeds. But there is at the present day less tendency to "sports" than was the case when the breed was first fixed as a type. It was then a common occurrence to get chicks which were quite black, but the present-day chicks from well-bred parents generally come out "cuckoo."

There is one curious fact in the breeding of Rocks which it is worth while to remember. The Americans have studiously bred their birds with a view to reducing the size of the markings, so that the plumage has become what is known as "barred." This has had a tendency to make the American bird considerably lighter in colour. The English breeders, on the other hand, appeared to prefer the heavier markings, which partake more of the character of a "spangle," and the English bred birds, the hens particularly, appear very much darker. This difference in shade, however, is merely a matter of taste, and the main point on both sides of the Atlantic is distinctness. There is a strong tendency of the markings degenerating into a smoky or cloudy feathering, and the prevention of this is one of the difficulties with which the Plymouth Rock breeder has to contend. In this country, although the Rock possesses a coat of "good wearing colour," the effects of a hot sun soon become apparent. It is quite common, particularly when there is an absence of shade, for the plumage to turn rusty, and this is a point which any person desiring to keep the breed should pay attention to.

It must never be forgotten that the main idea in breeding the Plymouth Rock was and is to obtain a bird of an eminently useful type. In order, therefore, to be successful, it will, at times, be advisable to overlook slight defects in marking in favour of size, symmetry, and laying qualities.

The chief quality which the Plymouth Rock has to recommend it to the farmer is rapidity of growth. Numerous carefully-conducted trials have proved its superiority in this respect. The weight for cocks is from 9 lb. to 12 lb., and for cockerels 8 lb. to 11 lb., and my own experience has proved that a healthy cockerel will often give a pound in weight for each month of age. Such a bird should certainly be sold for table purposes at per pound, and I am under the impression that this system has been adopted by Mr. J. W. Pender, of West Maitland, one of the largest importers and most successful breeders of Rocks in New Sonth Wales. As regards their laying qualities, I would refer to a table which appeared in Vol. III, part 12, at page 1028, which shows that the Rock held its own very fairly, even against the Leghorn, during the three coldest months of a Canadian winter.

There is no doubt they do very well in almost any part of this country, and they are very hardy birds. Like all rapidly maturing birds, they are large feeders, but being as well good foragers, their appetite, in view of their size, is certainly no detriment. The hens, which lay a good-sized brownish egg, are not great sitters, and once during a season is usually enough for them. Great care is required in selecting hens for this purposes, as I have found it necessary in many cases to keep the hen away in order to prevent her gobbling up the "tit bits" intended solely for her family, and some mothers will leave the chicks too soon. Their dispositions, however, vary considerably, and I have also found hens which made excellent mothers. It will thus be seen that the Plymouth Rock can be kept for all purposes, and this I claim as another point in its favour.

The breed of fowl which has no weaknesses or failings is one which I have never yet come across, but in this respect also the Plymouth Rock comes well to the front. The only thing it appears to be subject to is a sort of rheumatism in the legs. I believe this may be prevented to a great extent by giving the birds a perfectly dry roosting-house and a well-drained run. Another point which I consider of great importance for all heavy birds is to keep them on *low* perches; 3 feet from the ground is quite high enough. It may be added that with proper attention Rocks do very well in confinement.

Amongst the breeders in New South Wales probably the most successful prize-takers are Mr. J. W. Pender, of West Maitland; Mr. H. Cadell, of Tamworth; Mr. T. Hall, of Fairfield; Mrs. W. H. Webb, of Bathurst; Mr. G. B. Moran, of Pennant Hills; Mr. S. R. Watkins, of Seven Hills; and Mr. W. F. Weeks, of Wentworth Falls.

The Plate and the following schedule are taken from Lewis Wright's work:—

GENERAL CHARACTERISTICS OF COCK.

Head and neck.—General appearance of head resembling a Cochin. Beak short and stout at base, somewhat resembling a parrot's bill; comb single, upright, medium-sized, neatly-arched, perfectly straight, free from excrescences, fine in texture, and symmetrically notched or serrated; wattles rather long, thin, neatly rounded, and fine in texture; deaf-ears well developed and pendent; neck rather short, well arched, and very full of hackle, causing it to appear very wide at the shoulders and tapering at the head.

Body.—General appearance large and deep; back, broad and short; saddle rather broad, with a gradual rise to the tail, as in Cochins; wings medium-sized and neatly carried; well buried in the body-feathering; breast very deep, broad and full; the Cochin breast to be avoided.

PLYMOUTH ROCKS.

Legs and feet.—Thighs, large and strong, well furnished, but not fluffy; shanks rather short, very thick, and set on wide apart, to be perfectly free from feathers; toes large, straight, and well spread out.

Tail.—Rather small, but larger than Cochins; furnished with two sickles, but smaller than usual.

Size.—Very large, ranging from 9 lb. to 12 lb. in cocks, and 8 lb. to 11 lb. in cockerels.

General shape.—Massive, but compact.

Carriage.—Upright and commanding.

GENERAL CHARACTERISTICS OF HEN.

Head and neck.—Resembling the cock's, with the usual differences.

Body.—Somewhat more plump and square than the cock's.

Legs and feet.—Similar.

Tail.—Rather small, and rising almost upright out of a rising saddle.

Size.—Averaging (say) 7 lb. or 8 lb.

General shape.—Square and massive, yet neat.

Carriage.—Very plain and matronly, with a dignified air.

Colour.—Beak, bright yellow; comb, face, deaf-ears, and wattles a brilliant scarlet red; shanks, bright yellow; plumage, a bluish-grey ground, pencilled or barred across the feathers with bands of dark bluish-grey, verging to black. Depth of colour in cockerels, and bright marking as fine as possible in hens, desirable.

STANDARD OF PERFECTION.

A bird perfect in shape, style, colour, &c., and in perfect health and condition, to count in points	100
If of extraordinary size, add on that account	5

DEFECTS TO BE DEDUCTED.

Bad comb and head	12
Want of hackle...	10
Bad shape or carriage of tail... ...	6
Primaries out of order...	15
Curved toes	7
White in deaf-ears	6
Faults of plumage	20
Want of size	20
Want of symmetry (especially of breast)	15
Want of condition	15
,, ,, (if total)	35

DISQUALIFICATIONS.

Legs feathered, or any colour but yellow. Red, white, or black feathers. Wry tails, or any other deformity. Birds not matching in pen. White ears. Any fraudulent dyeing, dressing, or trimming.

NOTES.

The Breeding Season.

BY the time this appears the hen-birds intended for the season's breeding in temperate districts should have been penned off for about a month, and such eggs as they may have laid used for cooking. The cock may now be introduced, and under ordinary circumstances, the hens will be clear of all previous impregnations, and, moreover, will be anxious for his attentions. It is very essential that birds used for chicken production shall be of strong constitution and in vigorous health, and three or four hens will be quite enough to allow to each cock-bird. This insures greater fertility in the eggs and stronger chicks. It is a great mistake to allow a large number of hens, as although more chicks may be hatched out from the pen, the mortality will be much greater, and eventually there will remain only a few miserable chicks, as against a fair average of chicks with excellent constitutions.

As regards the pens, it goes without saying that they should be kept thoroughly lime-washed, and that the droppings should be constantly removed from the roosting houses. There are some small matters which are constantly overlooked by farmers when breeding poultry. It must be remembered that when fowls have unlimited range they find for themselves

almost every essential for keeping them in healthy condition. When they are shut up, however, there are many necessaries from which they are cut off. As a consequence, it is customary amongst experienced breeders to fix up a shade, either of corrugated iron or brush, about 3 feet from the ground, and forming a roof only. Under this are placed the drinking water, a box of dry earth and ashes for a dust bath, and a little box containing sharp grit, crushed bone, and oyster shells. The shade should cover sufficient space to permit of the birds resting beneath it out of the sun, in addition to covering the articles above enumerated. Care must be taken that fresh green food is provided in each pen daily, and it is a good plan to give the birds a good sized turf to scratch at. An occasional feed of good sound oats will be found beneficial to the hens.

Although it is preferable to have the pens ready in July still there are parts of this country where breeding will probably commence later. A few words therefore as to the building of breeding pens may not be out of place. A fair size, where space permits, is to have the wide enclosure, say, 30 feet by 8 feet. In order to save wire, and prevent birds getting either out or in, I have adopted a height of 4 feet, and then the same width of wire may be utilised for wiring over the top. Such a pen does for all kinds of birds, whereas without a roof it would be necessary to go up at least 10 feet to keep in Hamburgs, Games, and the like strong-winged birds. While the roosting and laying-house should not be too much closed up, arrangements should be made to give the laying hens as much privacy as possible.

In order to insure accuracy each pen should have a distinguishing number or name, with which each egg should be marked when being removed, and a record should be kept of the number of eggs obtained daily from each pen. A few moments' consideration will show in how many ways such a record will be valuable. It will serve to show the laying qualities of the particular breed or breeds; it will enable the breeder to check the mortality amongst chicks, as well as the fertile qualities of the males and females used; and it will be of great assistance to a breeder who may sell settings of eggs in calculating returns, and guiding him in arranging his pens for another season. Another point which should not be forgotten is that it will bring about methodical habits, cause increased interest, and so benefit generally the poultry industry.

Practical Vegetable-growing.

Directions for the Month of August.

Settlers in the country districts very seldom trouble themselves about growing vegetables for the use of their families, and seem either to fail to recognise the importance of good wholesome vegetables for food, or else do not know how to grow them or what to grow, or perhaps considering that the time likely to be occupied in their cultivation, could be better employed at other, apparently, more remunerative work. The fact is, however, that but very little time need be set apart for this work if a proper system be followed, and an abundant supply of wholesome food can be produced at but little cost. Even a few vegetables would be better than none at all. The only difficulty will be to enclose a small piece of ground and make it proof against the various animals common to an ordinary farm. When this necessary work has been done, vegetable-growing will become easy enough, and a very few minutes intelligent work a day, occupied in this enclosure, should soon show excellent results.

With a view to encouraging the growth of home vegetables a few simple directions will be given every month in the *Agricultural Gazette*, and the various habits of different kinds will be explained so that there need be no difficulty for anyone who can read, to understand the various necessary operations.

In order to attain success in vegetable-growing it is absolutely necessary that the ground be well drained and thoroughly well dug, the deeper the better so long as the surface soil is kept as much as possible on the top 6 inches. If the ground can be dug 18 inches or 2 feet deep so much the better; but if the subsoil is brought to the top, it will, in most cases take a long time before it becomes properly fit for use. The more level the ground the better the vegetables will grow, and if not naturally fairly so the various beds should be made as level as possible. It is a curious fact that seeds will come up better on level ground than on a slope. When enclosing the land make it as square as possible, and let all the beds be square also for this will save a great deal of time and trouble in the long run. Another most important matter to bear in mind is that all vegetables should be planted or sown in rows. A beginner who attends carefully to these matters will soon get into the habit of regularity and system, and when this is attained half the battle is over. A small portion of the enclosure should be set apart for a seed-bed in a rather shady situation, say, the southern or eastern side of the fence, but not on any account under the shade of living trees. In this small space various kinds of seeds such as cabbage, lettuce, cauliflower, leeks, celery, and others can be reared for planting out in the garden. Directions for all these things will be given from month to month. There should be no difficulty in providing a good heap of manure, for the garden, on any farm. Horse and cow dung, fowl droppings,

dead leaves, and litter should be collected and well rotted in a heap, protected from rains if possible. When digging up the soil make it as fine as possible; if it is very stiff and hard collect all the ashes and burnt rubbish obtainable, and apply; or if lime is available a good dressing may prove to be very beneficial. Heavy dressings of dung, vegetable matter, &c., will, in time, make a hard, stiff, sticky soil friable and easy to work, but it must be well drained in the first instance.

A few flowers planted about the edge of the beds will add considerable interest to the work, for they need occupy but little space, and will assist to make a place homelike, cheerful, and comfortable.

When following the directions given considerable allowance must be made for differences in seasons in various parts of the Colony. A little judgment must be exercised, but experience will soon teach caution.

During the month of August preparations should be made for the planting and sowing of tender vegetables such as French beans, tomatoes, sweet potatoes, cucumbers, pumpkins, vegetable-marrows, squashes, capsicums, and others, especially in the warm districts near the coast where late frosts are not likely to occur. It is highly desirable to look ahead and be prepared for the most active planting season of the year. If the ground is quite ready, little time need be taken up with sowing and planting when the season comes round. The work of preparation to be done now is a thorough digging and manuring of the ground, and the sowing and planting of the following vegetables:—

Asparagus.—This excellent vegetable should be planted at once, if roots can be procured. Although it must occupy the ground for two or three years before the shoots will be fit to pull or break off, this should not prevent it being planted, for after it once begins to produce, it will keep on for years bearing heavy crops of most wholesome food, if a little care be taken to provide it with a sufficiency of manure from time to time. It will succeed admirably in many parts of the Colony, where, at present, it is not to be seen. Indeed it is difficult to say where it will not thrive.

Although not a deep rooting plant, the ground should be dug at least 18 inches deep. It prefers a rich, light, warm soil, but this is not absolutely necessary for the production of good shoots. A dressing of dung, say 3 or 4 inches, should be well mixed with the surface-soil to the depth of about 6 inches. When the ground is quite ready for planting, dig holes about 6 inches deep, and large enough for the roots to be spread out evenly without touching the sides. Fill in with fine soil by hand, and firm it well down, but take care not to break the fleshy roots. The crown of the plant should be about 2 inches below the surface when covered up. The plants should stand about from 2½ to 3 feet apart. A dozen or eighteen plants will give a fair supply of "grass" when they have become well established. If plants cannot be procured, the grower will be obliged to sow seeds and raise his own plants, and the work of sowing had better be done some time during September or early in October. Directions for sowing will be given next month.

Artichoke, Jerusalem.—If tubers can be obtained they should be planted as soon as possible. This is a useful, wholesome, and nutritious vegetable, easy to grow, and very productive when planted on good soil. It belongs to the same family of plants as the sunflower. The ground should be dug deep, drained, and well manured with rotten dung. Plant whole tubers in trenches made about 6 inches deep, 3 feet apart, and the tubers about 1 foot apart. When the artichokes have all been dropped in, cover up the trenches and tread the soil down lightly until the bed

is level. Keep free from weeds, and when the plants come up, use the hoe occasionally between the rows. The artichoke may be dug for use when the stems begin to wither.

Beans, French, or Kidney.—Sow a few rows in the warmest districts if it be thought all frosts are over. This vegetable is very tender, and will not stand against frost. It is an easy, productive vegetable to grow, and very wholesome. The ground should be well dug, and if the land is poor let it be well manured. Beans will grow all the better if lime can be applied to the soil. Manures containing chiefly nitrogen, such as sulphate of ammonia, should not be used, but those containing chiefly potash and superphosphate of lime may be used freely, in addition to stable manure. Sow the seed in rows about 2 feet 6 inches apart, or 3 feet if the soil is very rich. Make drills about 3 inches deep, drop in the seeds from 4 to 8 inches apart, and cover with fine soil. The best variety for general purposes is that known as the Canadian Wonder.

Beet, red.—This is an excellent vegetable to have for a change. The ground should be dug deep, but it should not be manured expressly for this crop. It would be the best plan to sow the seed on ground that had been used and manured for another vegetable. Sow the seed in drills 18 inches apart, and about 1 inch deep. After dropping in the seed along the drill cover by hand with fine soil, and press down firmly with the back of a spade.

Beet, silver.—This is grown for the leaves only, and is one of the most useful of vegetables. The ground should be well manured with rotten dung, which should be thoroughly dug in. Sow in the same way as directed for red beet.

Broccoli, Brussels sprouts, cabbage, cauliflower, and Savoy.—These vegetables belong to the same family, indeed, they originated from one plant, the wild cabbage; but by careful selection, and high cultivation the above well-known varieties have been established. Seed may be sown of these in small seed-beds. Make the soil fine, and keep the beds level. Sow in little drills about 2 inches, or so, apart. The Brussels sprouts, broccoli, cauliflower, and Savoy will succeed best, at the present season, in the coolest parts of the Colony. Where plants are available they may be planted from 2 to 3 feet apart on well-dug and well-manured ground. The richer the soil the wider apart. In order to produce good cabbages, cauliflowers, &c., the seedling plants should be lifted without injury from the seed-bed, and planted with care. It is the general practice to pull the seedlings from the seed-bed, make a hole with a dibber, and plant in a very rough way. But there is no occasion for this kind of work in a small garden, and the more care that is taken with young plants the better they will succeed, no matter what kind they may be.

Celery.—Sow some seed in a small seed-bed or in a box of good soil. Let the box be well drained with holes in the bottom to let surplus water away easily. Make little drills with your finger about half-an-inch deep, drop in the seed thinly and cover with fine soil. Do not let the soil become dry. Shade, if necessary, from the sun, but let the shading be very light, and remove it before the plants grow much, otherwise they will become weak and "drawn." When the plants have grown to the height of about 2 inches move them to a small bed, well prepared and the soil made fine, set them out about 3 inches apart, in order that they may grow and develop into strong, sturdy plants, when they may be transplanted into their permanent places. The celery is a plant that needs plenty of manure and good regular supplies of water. A bed should be prepared for the young plants as soon as possible. Further particulars will be given next month.

Carrot.—Seed may be sown largely on ground that should be prepared in the same way as that for red beet. Sow in rows about 1 foot apart. The seed, being provided with numbers of little hooks, get stuck together; therefore, before sowing, they had better be rubbed well with some sand, in order to separate them. Carrot seed takes a long time to come up, and unless the beds are kept well weeded the young plants are likely to become smothered. When old enough to handle, thin out well.

Leek.—A most useful, wholesome vegetable, well worth growing. It requires rich soil and an abundance of manure. Some seed may be sown in a small seed-bed, from which the plants may be transplanted when they have grown to about 6 or 8 inches in height. The seed should be covered very lightly—in fact, barely covered with fine soil.

Lettuce.—Sow a little seed in a seed-bed for planting out when the young lettuces are large enough to handle. Plants may be put out if they can be obtained. The roots should not be broken more than can be avoided. Manure the ground with well-rotted dung before planting. In warm districts it is sometimes advisable to sow lettuce seed where the plants are to stand and not transplant, for this prevents, to a considerable extent, the tendency of the lettuce to "bolt," or run to seed too quickly.

Melons, Cucumber.—Seed may be sown in warm spots where the young plants can be protected from frosts. When all danger of frost is over, the plants may be moved to their permanent places.

Onion.—Sow largely of this important and wholesome vegetable. The ground should be well drained, heavily manured, and the surface of the onion bed made as fine as possible. Sow the seed in drills about 12 or 15 inches apart, and be very careful to merely cover the seed with fine soil. On no account must weeds be allowed to grow, or else the seedling onions will soon be ruined. When the plants come up and are fairly strong thin out to 6 or 8 inches apart.

Parsnip.—Sow largely in drills as was directed for red beet. The ground should be deeply dug, but, as in the case of red beet, fresh manure should not be applied.

Peas.—Should be sown largely in well-prepared ground enriched with rotted dung. Avoid the use of manure containing a large proportion of nitrogen, such as sulphate of ammonia. If artificial manure has to be used, apply superphosphate of lime two parts and kainit one part, at the rate of about a large handful to the square yard. Fine bonedust is useful, and so also is lime, lime rubbish, and wood ashes. Sow in drills about 3 feet apart. Do not cover the seed with more than 3 inches of soil. The peas should not be sown closer together than 4 inches. As soon as the young peas come up, put in sticks along the rows to support the plants from trailing over the ground. Keep the ground between the rows frequently chipped with a hoe.

Potato.—Plant a few rows of one of the varieties of Kidney potato, or if none can be obtained try the Early Rose variety. Dig the ground well and deep, drain it well, and manure it heavily with dung, and if considered necessary supplement this with a little sulphate of ammonia and kainit, or potash manure. The rows should be 3 feet apart, and the potato sets should be planted 1 foot apart and about 5 or 6 inches deep in the soil. Use fair sized potatoes to plant whole, or they will probably succeed as well if cut in half. Let the cut side dry in the shade before planting.

Radish.—Sow a few short rows of seed in rich soil. Use well-rotted manure for this vegetable.

Rhubarb.—A most desirable plant to grow. It needs rich, well-drained soil heavily manured. If roots can be obtained they should be planted as soon as possible 3 or 4 feet apart, and the crown about 2 inches below the surface of the soil. Plants can easily be raised from seed, but the leaves will not be large enough to pull for some considerable time longer than from planted-out roots. Seed may be sown next month, when further particulars will be given.

Turnip.—Sow a little in drills about 1 foot or 15 inches apart. Cover the seed with not more than an inch of fine soil. The ground should be heavily manured with rotted stable dung, or superphosphate of lime, or fine bone-dust or lime.

Tomato.—Sow a little seed in a warm, sheltered place, and protect from chance frosts. In the warmest parts of the Colony seed may be sown in the open garden, or if plants have already been raised they may be planted out.

Pressure of time prevents more complete directions being written for the present issue, but in future more information will be given about the nature and habits of the different kinds of vegetable recommended for cultivation. In the meantime it is hoped some attention will be given to the important matter of setting aside a small area for vegetable growing by every farmer who reads the *Agricultural Gazette.*

Dairy Notes.

A Report has been prepared by the British Board of Agriculture, on the condition of dairy farming, and the development of the trade in dairy products in Denmark, Sweden, Germany (ex Bavaria), and Bavaria. Such a Report naturally conveys a large amount of valuable information, and it is therefore proposed to extract certain matters which appear to be of particular interest in regard to the present condition of the industry in New South Wales.

It seems that the immediate cause leading to the preparation of the Report in question was the large increase of butter into the United Kingdom from Northern Europe, imported during recent years. Within the last ten years the receipts of Danish butter in English ports have risen nearly threefold, or from 304,722 cwt. to 876,211 cwt., and those from Sweden in a still greater ratio, or from 67,821 cwt. to 234,987 cwt.

While these two countries must be considered the chief rivals of the Australian butter maker in the English market, it appears that great activity is at the present time manifesting itself in developing dairying in Schleswig Holstein. As all the countries named not only adopt the most modern and approved principles, their products commanding (those of Denmark in particular) high prices in the market, but investigation and experiment are continually being conducted, with a view to attaining still greater perfection, it behoves us on this side of the world to leave no stone unturned to maintain the high reputation which the best New South Wales butters have obtained in the English markets. This can only be done by adopting the most improved methods, and making sure that only the best and most suitable butter is shipped.

Turning to that portion of the report which refers to Denmark, considerable space is devoted to the treatment of cream intended to be made into butter. Thus it has been found that very appreciable differences might arise in the yield of butter if cream is not immediately cooled off to from 46°–56° F. after separation.

The production of a defined and uniform sourness in cream is another question, as to which the Report contains the following:—"Bacterial preparations for souring cream are said to be used with advantage in a few dairies, but they have not yet found general application in Denmark. M. Böggild (consulting dairy expert to the Royal Danish Agricultural Society) states that it is becoming more and more recognised that the quality of the butter depends largely on the souring of the cream. In those cases where the cream cannot be allowed to stand and get sour, the cream is soured by the addition of butter-milk, or cream reserved for that purpose from the previous day.

"A preparation known as 'new sour' is now largely used for souring the milk. It is generally made by exposing cream, half-skimmed milk, or new

milk, to such a degree of heat as is considered sufficient to develop the souring processes. M. Böggild urges the necessity of keeping the souring uniform from one day to another, otherwise the butter will vary on different days.

"Experience has shown that uniformity in quality seems to be best obtained by using as a souring medium the butter-milk produced in the dairy. The use of the 'new sour' is recommended in those instances where the quality of the butter is unsatisfactory, and especially where the milk comes to the dairy in various conditions as regards freshness, purity, and flavour."

It would appear from the following paragraph that it is not the practice to wash butter in Denmark. "It seems that it is not the practice in Denmark to wash the butter in the churn. The butter is either not washed at all or the strainer holding the mass taken from the churn is merely dipped into a tub containing water, which has been boiled and allowed to get cool, in such a way that a part of the water flows over the whole, thereby washing off the butter-milk which still clings to the small grains of butter. Many dairymen consider this latter system of washing the butter to be very effective in removing the butter-milk, and if carried out in a proper manner with water at a temperature equal to the churning temperature, it is, to some extent, to be recommended, although there is reason to suppose that in some cases it is detrimental to the *bouquet* of the butter, by carrying off the delicate aromas. In washing butter, Danish farmers are advised never to use water which has stood overnight in the cistern or reservoir of the dairy, and also not to throw water over the butter when passing the product through the 'worker.'"

On the subject of co-operative dairies the report says:—

"The development of the dairy industry in Denmark has been accompanied by a remarkable extension of the co-operative system. This system has been adopted to meet the want of organisation felt by the farmers, and has proved eminently successful as far as the dairies are concerned.

"It is estimated by M. Böggild that there are now about 1,000 co-operative dairies in existence throughout the country. In nearly all cases the farmers who produce the milk are also owners of the dairy buildings and plant. The milk is always paid for by weight and not by measure, but at many dairies, between 300 and 400, the price is also regulated by the percentage of fat in the milk.

"In the rules of most co-operative dairies, it is provided that the cows shall be milked dry, the hour also is sometimes fixed at which the milk for domestic use shall be taken, and in several instances members are not allowed to take any milk out of the churns after it has once been strained into these receptacles. The dairyman is advised always to be on the alert to discover any addition of water, or of skim milk, to the milk; but since the introduction of the system of paying for the milk according to its fat contents, there has been less necessity for vigilance in this direction."

The above should impress on co-operative dairies in this country the necessity for adopting the like system here. As has many times been pointed out in the *Gazette* the payment to a farmer of just what he is entitled to, no more and no less, is the very best lesson he can receive. In fact it is the only means of bringing the fact home to the dilatory or unscrupulous farmer that his tactics do not pay.

The educational, political, and commercial phases of the industry are also fully dealt with, and with regard to the first named it is evident that the Danish Government fully appreciate its importance. The following extracts clearly state the position:—

"It appears that in Denmark there are at present only three agricultural schools where instruction is provided in the theory of dairying and allied subjects. A large number of dairies, however, take in pupils, and train them in practical dairying. The good work being done by these schools and dairies is supplemented by lectures on the higher branches of dairy science at the Royal Veterinary and Agricultural College in Copenhagen.

"The Government exercises no control over the dairies, nor does it directly support the dairy schools, but indirectly it assists them in many ways. Besides offering bursaries and scholarships, the State makes a large grant annually to the Experimental Laboratory for Rural Economics, this institution being mainly occupied at present in arranging a series of butter shows in which more than 400 dairies take part. Other special grants are made in aid of experiments. The State has also appointed three consulting dairy experts in Denmark and one in England."

In future issues we propose continuing these notes and hope to deal fully with the question of butter shows and their objects and also to look shortly to the other countries embraced in the reports for valuable hints towards the improvement of our own export trade. In the meantime we desire to emphasise the fact that, as will be seen from the preceding extracts, every effort of the Danish dairy farmer is towards improvement. They are not yet satisfied even with their present pre-eminent position in the London market. Doubtless this state of affairs is influenced by the arrival and success of Australian butter, but it must always be borne in mind that Denmark is working on a longer experience and that there is no way but that of consistent improvement based on scientific discovery to even catch up with, much less to outstrip her.

General Notes.

National Prizes—Poultry Farms.

The competition for National Prizes amongst poultry farmers was this year robbed of a certain amount of interest in consequence of the withdrawal of three of the competitors, owing to floods and other causes. The judge, Mr. Albert Gale, has duly submitted his awards, which have been approved by the Minister for Mines and Agriculture, and the following have been successful:—

First prize, Ambrose Hallen, Toongabbie

Second prize, Messrs. E. P. Capper and Sons, West Maitland

Highly commended, Mr. J. J. McCue, "Moorside," Telegraph Point.

A Durable Whitewash for Farm Buildings.

We have tried the mixture as stated in our May issue, which was copied most carefully, and find it necessary to vary the directions in the following manner. Instead of half a bushel of unslaked lime as recommended, one bushel at least was found necessary, and again, although it may be advisable to add five gallons of water, it was found that when boiled up for use, after standing the required time, the mixture was far too thin, and did not show at all when laid on. Ultimately the whole of the clear water was taken off, and the sediment when heated formed an excellent whitewash of the consistency of paint, which will cling to perfectly smooth timber, and look very white and smooth. The cost of materials was about 4s. 6d. bought in the quantities stated, and sufficient was made to thoroughly cover the walls of a good sized four-roomed weatherboard cottage.

Dishorning.

The following method of dishorning, says the *Australasian*, is recommended by Mr. Leslie H. Adams of the Wisconsin Experimental Station. The operation is performed on calves by means of an application of caustic potash which can be obtained in the form of sticks about the size of a lead pencil from almost any chemist. The recommendation is as follows: "The best time to kill the horn is when the calves are from three to six days old, or as soon as the little horn button can be definitely located. With a pair of scissors clip all the hair away from the embryo horn. Dip a finger in water, and moisten the horn, dry the fingers, and, after wrapping all but the lowest end of the stick of potash in paper, to prevent the fingers coming in contact with it, hold it as one would a pencil, and rub on the horn. All

portions of the horn must be treated. During the process of applying the potash the horn must be kept moistened; but great care should be observed not to put on so much water as to cause the dissolved potash to run down the calf's head, and cause unnecessary suffering. When the horn takes on an inflamed appearance, and the skin that covers it has become loosened, it will be evident that it has received sufficient treatment. This application, or indeed that of any other fluid prepared to accomplish the same purpose, does cause some pain, but it does not last so long, nor is it as severe as in the case of the mature animal when the saw is employed."

Draining Pipes.

Having found it necessary to obtain quotations for agricultural drain pipes, in order to supply the information to correspondents, we give them for the benefit of our readers. Messrs. Goodlet and Smith (Limited), of 493, George-street, Sydney, quote as follows:—

1½ inch,	40s.	per	1,000	Less 20 % discount
2 „	60s.	„	„	
3 „	100s.	„	„	
4 „	15s.	„	100	
6 „	25s.	„	„	

in railway trucks, carriage paid to Darling Harbour railway station.

Treatment of Diseases.

A line of treatment for apple-scab is recommended in the *California Fruit-grower* of 11th March, the following "conclusions" being those of Professor S. A. Beach, of the Geneva, New York, Experiment Station:—

"In the light of our present knowledge of the nature of the apple-scab fungus, and guided by personal experiments and those of other investigators, the following line of treatment is suggested:—

"After the buds open, and before the first leaves are half-grown, make the first application, using either the ammoniacal solution of copper carbonate or dilute Bordeaux mixture. Mr. G. D. Fairchild found, last spring, that the pear-scab infection begins before the blossoms open, and the writer found that the same thing occurs also with apple-scab. The foliage and the calyx and pedicels of the unopened flower-buds become thus early infected with the scab fungus. Spraying at this time is therefore considered very important. The second application, using the same fungicide as before, should be made after an interval of ten days, and shortly before the flowers begin to open. The third application should be made immediately after the blossoms fall, using also at the same time Paris Green or London Purple for codling moth. Many prefer to use the dilute Bordeaux Mixture at this time, because Paris Green can be added to it without fear of injurious results, whereas if the ammoniacal solution of copper carbonate be used, the Paris Green must be used by itself. A fourth application should be made after an interval of ten days or two weeks, using the same material as before, including the Paris Green.

"After another interval of ten days or two weeks make a fifth application, using the same material as before, including the Paris Green. If it is desired to make further treatments after this time, the Paris Green may be omitted."

Successful Treatment.

The following reports have been received of the successful treatment of various diseases as recomended by the Department, and are reproduced solely with a view to inducing other orchardists to follow suit ;—

Mr. J. D. Robertson, of Bowning, writes: I have followed advice offered in the *Gazette* on spraying with Paris Green for codlin moth with considerable success; also spraying with Bordeaux Mixture for apple-scab very successful.

Mr. W. J. Washer, Maguria, Cootamundra, writes: I here give you the details of my experience this past season with spraying vines, &c. I may state that the two seasons previous to last a plot of grape vines of 1¼ acres in extent, in full bearing, was badly affected with anthracnose; one season to the extent of 90 per cent., and the other season about 50 per cent. of the grapes were destroyed or rendered unfit for sale. This induced me to purchase two of the machines described in the *Agricultural Gazette*, vol. II, part 10, as the Vermorel spraying and sulphuring machines, and I fully endorse all that is there said of them. All through the winter of 1892, and up to November, the season here was wet and cold, the ground being boggy. As a consequence, anthracnose put in an appearance soon after the buds of the vines burst open, and as I was watching for its appearance, I at once began operations and sprayed them with Bordeaux Mixture as advised by you. It checked the disease immediately. I still watched, and after an interval of three weeks I found it necessary to repeat the spraying, and again just when the vines were on the point of blossoming. I did not find it necessary to use any more spray. I sulphured each time between the sprayings, lightly. The cost of the materials used was as follows:—

	s.	d.
Sulphate of copper (bluestone), 6s.; lime 6d.	6	6
Flowers of sulphur	10	0
	16	6

The labour of mixing, spraying, and sulphuring combined would not amount to more than one day's work, and if the materials were purchased wholesale, and a larger area treated, the cost would be considerably below £1 per acre. The vines treated were free from disease, the bunches larger than they have ever been before, with no refuse of any sort. I can freely say that the spraying saved the greater quantity of my grapes. . . . . One other success I had with spraying a plum-tree. It was badly affected with aphis (black and green) and a small green slug. I used the resin and soda wash as advised by you, and I had not to repeat the first spraying."

M. Edwin S. Rush, Willow Vale, Mittagong, reports the successful result of using equal parts of sulphur, pig's lard, yellow clay, and fresh pig manure for plastering on trees which had been completely deprived of bark 1 foot to 2 feet up the stem by hares. The trees, he states, were completely cured, and have since borne fruit of good quality.

Mr. J. G. Piggott, of Bundarra, reports that he acted on the advice of the fruit expert, and pared away the bark of some of his cherry-trees which were gumming badly, and found the remedy completely successful, stopping the gumming at once without the loss of a limb.

Loss of Bees by Drowning.

A communication from Mr. L. F. Woolrych, of Bee Hill, refers, amongst other matters, to the loss he experienced last year in consequence of his bees getting drowned when visiting the tanks for the purpose of drinking. The

loss became so serious that he tried a number of means for preventing it. Floating wood, &c., was of no avail, so he mentioned his difficulty to Mr. Charles Moore, Curator of the Botanic Gardens. Mr. Moore supplied him with *Nymphœa lutea* and *N. alba* which have grown well and have more than answered their purpose. The bees may now be seen alighting on the leaves to drink, and not one dead bee is to be seen in the water. There has not yet been sufficient time to ascertain whether they are partial to the flowers, but in any case the experience is worth the attention of other bee-keepers who may have been losers under similar circumstances.

The White-throated Nightjar.

In march last a letter appeared in the *Sydney Morning Herald* over the signature "Richard Edward Nancarrow" calling attention to a bird which had recently made its appearance in the orchards at Lane Cove. Mr. Nancarrow was good enough to forward a specimen to the Department which he described as a species of Moth Hawk, and mentioned that it could be seen about twilight flitting about the trees devouring all kinds of insects. That Mr. Nancarrow is correct in his statement of its habits is evident from the particulars given of this bird, which has been identified as the White-throated Nightjar, in Gould's *Birds of Australia*, where they are described as being "gorged with insects, principally Coleoptera (beetles) and locusts." That it also devours the codling moth is questionable owing to the small size both of the moth and the larva, and the latter stage would be more likely to attract the bird. The fact that it can swallow locusts and that they can be removed from its body in a sufficiently perfect state for preservation in a cabinet would imply a preference for larger kinds of insects than the codling moth. His suggestion that the White-throated Nightjar should be included in the list of protected birds under the Game Act, in order to prevent reckless destruction by thoughtless people with guns, would appear worthy of consideration as there is no doubt of its utility to the orchardist.

With a view to assisting orchardists and others in identifying the bird we append the following notes which have been kindly supplied to the Department by Mr. Alfred J. North, F.L.S., of the Australian Museum :—

"The White-throated Nightjar, *Eurostopodus albigularis* of Vigors and Horsfield, belongs to the family *Caprimulgidiæ* of the order *Picariæ*, and is in no way allied to the *Accipitres* or birds of prey as referred to by your correspondent. It is considered rather a rare bird in the neighbourhood of Sydney, only two specimens being acquired by the Trustees of the Australian Museum during a period of seven years, one being shot at Botany, the other at North Shore, and it is by no means common in any portion of the Colony. In form it approaches near to the well-known Tawny-shouldered Podargus, *Podargus strigoides* of Latham, to the latter of which is frequently applied the erroneous name of "More Pork" by the residents of New South Wales, but it is less robust, more elongated and considerably smaller in size. The plumage is moth-like in its markings especially on the scapularies, and being soft and downy, is well adapted for noiseless flight. The mouth is disproportionately large for the size of the bird, but well suited for capturing its prey, and is covered almost to the tip of the bill with very fine hairs, the bill being weak and flexible, and fitted only for procuring insects which constitute its sole food. The most conspicuous markings of this bird are the large oval spots of white on each side of the throat which stand out in bold relief against the blackish-brown tints of the centre of the throat and the chest.

For the purpose of breeding, this bird deposits a single egg on the bare ground which, however, is well protected by its environment closely assimilating to the colour and markings of the egg, as well as the parent bird itself when engaged in the duties of incubation, the site usually selected being on the side of a gravelly ridge, or near some stump or stone in open forest lands. The egg is elliptical in form, and of a rich cream colour, marked with rounded or oval spots, and dots of inky-black sparingly scattered over the surface of the shell; it measures 1·55 of an inch in length by 1 inch in breadth.

This bird rears but two young ones during the breeding-season, which lasts from August till the end of December, and being strictly insectivorous should be zealously protected both by the orchardists and farmers."

A Private Experimental Farm.

A report by Mr. E. de P. O'Kelly, late Departmental Inspector for the North Coast, contains a quantity of interesting matter resulting from a visit which he paid recently to Mr. E. Seccombe's Experimental Farm at Wollongbar. This farm is situated on the Ballina Road, distant about 8 miles from Lismore, and is divided into two portions, about 2 acres being devoted to growing new plants, and the remainder laid out in pasture paddocks, a matter which Mr. Seccombe has made a speciality. The soil is a volcanic, loose, red loam, with a good depth of humus.

With regard to the grasses, the endeavour of Mr. Seccombe is to introduce such new ones as are likely to prove suited to the conditions of soil and climate, and to foster such local grasses as are of known value. In regard to this work, he has been in constant communication with the Department, and is growing, with considerable success, several species, amongst which may be mentioned cocksfoot, Poverty Bay rye grass, Kentucky blue grass (*Poa pratensis*), and several others of the *Poas*, *Paspalum dilatatum*, &c.

Coming to the new plants of commercial value, rice is the first dealt with, and the following particulars were supplied by Mr. Seccombe with regard to the variety known as *Kyba Sava*, the seeds of which were supplied by the Department. The seed was sown broadcast over a ground surface of 102 yards, or 1–47th of an acre. It was planted on the 29th October, 1892; germinated on November 4th; flowered February 16th, 1893; harvested March 26th, 1893; and yielded 56 lb. clean seed, equal to 47 bushels or 2,632 lb. per acre. This rice grew vigorously during the whole period of ground occupancy, and was not affected by either blights, fungus, or insect pests. It attained a height of 4 feet at flowering time. A material loss of seed occurred through continuous wet and the rice falling. Mice also cut off a great deal of that lying down. The crop can be readily harvested with the hook without necessitating a great reduction of green feed, which latter forms one of the principal factors in favour of rice cultivation. Rice straw of this description is succulent, being green and fresh at harvesting period, therein differing from wheat, oats, and barley when cut at maturity. Stock consume it readily, while horses eat it to the last straw supplied. Rice must be harvested immediately it arrives at a general state of maturity, otherwise the loss would heavy. Fully-ripe rice drops with any unusual force, be it wind or rain, or the hand of the harvester. The average weight of fodder in this instance, after the seed was gathered, would be from 25 to 32 tons per acre, and it is believed that this cattle food would not deteriorate in quality or quantity if permitted to stand undisturbed even for a considerable time. It can therefore

be utilised by cutting out and hand-feeding at the convenience of the producer. With regard to the grain itself it was described by Mr. O'Kelly to be a fair sample, though small and not very well filled out, but these are points where improvement may be confidently looked for as time familiarises it with the soil and climate of our North Coast districts.

Madagascar Rice.—This variety was planted broadcast on the 28th November, 1892, and at the date of Mr. O'Kelly's visit (17th May last), was over 4 feet high, and just coming into seed. The seed heads, however, are nearly all without grain; but this is a matter which will improve by more complete acclimatisation. Ths straw of this rice is very large, the leaves are about ¾-inch broad, and the growth would yield about 40 tons of fodder to the acre. The *Double Coarse Rice* planted 8th November, 1892, and *No.* 1 *Patna*, planted 29th October, 1892, although growing well, showed no sign of seeding, and did not appear likely to do so. It was Mr. Seccombe's intention to utilise them for fodder.

Amongst other plants cultivated were 150 Australian nut trees (seedlings). This plant was figured and described in Vol. IV., page 3, as a New Commercial crop. There was also an excellent crop of arrowroot, which was estimated to produce tubers at the rate of 50 to 60 tons to the acre.

Pea-nuts.—This crop does very well in the locality, giving a yield estimated at over 2 tons to the acre. The plant and fruits were figured and described in Vol. II., page 5, and the result of this experiment by Mr. Seccombe should convince farmers on the northern rivers of its suitability as a commercial crop.

There are numerous other crops embraced in Mr. Seccombe's collection as to which it will be sufficient to mention that they include coffee, jack fruit, tea, papaws, dates, lee chee, and chocho, all of which appear to flourish.

Lemons for the United States.

In connection with the curing of lemons advocated in the *Gazette*, Vol. III., page 666, it is worthy of note that there is a large market open in the United States for this fruit. According to the Citrus Fair edition of the *California Fruitgrower*, the import of lemons into America is steadily increasing, the value rising from 2,510,426 dollars (£502,085) in the year 1885, to 4,831,334 dollars (£966,267) in the year 1892. As in the case of all other outside markets, it is useless sending any but first-class well-cured fruit, and moreover, grading and careful packing will be important elements in ensuring success.

Distribution of Rust-resisting Seed-wheats—Season, 1893.

No. of applications received	451
Quantity of wheat obtained	61 bus.
No. of packets distributed	2,763

These wheats were all grown (with the exception of 1 bus.) in the Colony, by farmers who had been supplied with seed the previous season, and these gentlemen must be congratulated on the great improvement in the samples, the grain being much plumper and far cleaner than the seed supplied to them. A number of the varieties were sent out in 2½-lb. samples, and the remainder in quantities of from ½ lb. to 1 oz. The applications for these

wheats were far more numerous than was expected (showing the great interest taken in these experiments), and as a consequence the packets had to be reduced, whilst some of the late applications could not be complied with. The following is a list of the varieties sent out:—

Australian Glory
Australian Wonder
Amethyst
Allora Spring
Algerian
Bega
Belatourka
Bird-proof
Blount's Lambrigg
Blount's Fife
Broderick's
Brisbane
Cook's
Early Para
Egyptian Mummy
Farmer's Friend
Fillbag
Fluorspar
Flourball
Fountain
Frampton
Fultz
Galland's Hybrid
Goldsmith's Pedigree
Hornblende
Hundredfold
Improved Fife
Jacinth
Jordan's
King's Jubilee
Manitoba
Médéah
Niagara
Pride of the Market
Prince of Wales
Pringle's Defiance
Quartz
Rattling Tom
Red Californian
Saxon Fife
Smith's Nonpariel
Square-headed Sicilian
Stand-up
Steinwedel
Summer Club
Talavera
Thomas' Rust-proof
Tourmaline
Vermont
Victorian Defiance
Ward's Prolific
Ward's Prolific, Marshall's White
White Fife
58 A

AGRICULTURAL SOCIETIES' SHOWS, 1893.

Society.	Secretary.	Date of Show.
Urana P. and A. Society	E. C. Lukey / P. R. Brett	July 12, 13
Warren P. and A. Society	... F. C. Thompson	July 18, 19
Deniliquin P. and A. Society	... H. J. Wooldridge	July 20, 21
Riverina P. and A. Society (Jerilderie)	... M. Curtin ...	July 25, 26
Gwydir P. and A. Society (Moree)	.. S. G. Cohen ..	July 25, 26
*Hay P. Association...	... T. W. Blanche..	July 26, 27
Condobolin P. and A. Association...	... A. James ...	Aug. 1, 2
Corowa P., A., and H. Society	... A. A. Piggin ...	Aug. 2, 3
Narrandera P. and A. Association	... J. F. Willans ...	Aug. 2, 3
Forbes P., A., and H. Association	... W. G. Dowling..	Aug. 10, 11
Grenfell A. and H. Society...	... G. Cousins ...	Aug. 16, 17
Horticultural Society of N. S. Wales	... E. S. Sawtelle...	Aug. 23, 24
Northern Agricultural Association (Singleton) ...	... C. Poppenhagen	Aug. 23, 24
Burrangong P. and A. Association	... C. Wright ...	Aug. 24, 25
Cootamundra A., P., H., and I. Association ...	... T. Williams ...	Aug. 30, 31
*Moama A. and P. Association	... C. L. Blair ...	Sept. 5, 6
*Murrumbidgee P. and A. Association (Wagga)	... H. T. Davidson	Sept. 6, 7
Albury and Border P., A., and H. Society ...	... G. E. Mackay ...	Sept. 13, 14
Burrowa P., A., and H. Association	... J. H. Clifton ...	Sept. 14, 15
Junee P., A., and I. Association	... M. H. Davis ...	Sept. 20, 21
Yass P. and A. Society	... B. A. Nicholls...	Sept. 20, 21
Germanton P. and A. Society	... G. V. Rahn ...	Sept. 20, 21
Upper Manning A. and H. Association (Wingham). (Spring Flower Show)	... P. Doust ...	Oct. 24.

* These Societies get District National Prizes.

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