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ORGANIC MANURES
in Commercial Vegetable Growing

By T. WACHTEL, Adviser, Horticultural Division

At one time organic manures provided the only means to return the plant nutrients into the soil, which were removed by cropping. With the rapid increase of mechanisation, these materials have become very scarce, and their cost extremely high. It is, therefore, necessary to consider whether the benefits gained from their use are sufficient to warrant their high purchase price, or indeed whether the use of manures is warranted at all.

For a long time it was believed that no satisfactory growth of plants could be expected without the use of organic manures, and that they contained certain essential compounds which could not be supplied in chemical fertilisers. Today we know that this is not the case. It is possible to grow plants fed entirely on chemical fertilisers, in fact it is even possible to grow plants without soil, in water cultures. Once we know that it is technically possible to grow vegetable crops without the use of organic manures, the question of whether or not to use them becomes a matter of comparison of costs and gains.

Organic manures serve a twofold purpose in vegetable growing. They can be looked upon as a source of plant nutrients, or as a source of organic matter, or humus, which has an important effect on the physical properties of soils.

AS A SOURCE OF PLANT NUTRIENTS
Concerning the value of manures as a source of plant nutrients, vegetable growers would not be justified in buying manures for the sake of nitrogen, phosphate and potash they contained, as these elements could be purchased more cheaply in chemical fertilisers. To give an indication of the money value of the major plant nutrients in, say, a ton of horse manure of average analysis, it may seem surprising that the same amount of nitrogen, phosphate and potash could
be purchased in chemical fertilisers for something like 25 shillings. In general, nitrogen is the most plentiful in manures and phosphorus the least abundant. The chemical composition of manures varies according to their source and handling, but even poultry manure, being the highest in plant nutrients, would be too expensive to buy solely for the sake of its nutrient content.

Related to this question is that of availability of plant nutrients. The values in analysis are not strictly comparable to the same amounts of nutrients supplied in chemical fertilisers owing to the differences in availability in the two forms of material. The nitrogen in manures is slowly available, and only about 25 to 50 per cent. of it becomes available to the crop the first year after application. The nitrogen in chemical fertilisers is more readily soluble and may easily be leached out of the root zone. Since the nitrogen in manure is slowly available and does not leach, it may sometimes be a major factor in producing higher yields on soils subject to leaching.

The rate of release of nitrogen from the manure depends on the soil temperature. The higher the temperature the faster the release, provided that there is sufficient moisture and air for decomposition to occur. Since the growth of vegetables is also related to soil temperature, the periods when the plants make rapid growth may coincide with the faster release of nitrogen from the manure. However, slow availability of nitrogen is not always desirable since many vegetables require large amounts of nitrogen over a short period of time. Also, the same gradual availability of nitrogen could be achieved by timing applications of nitrogen top dressings. Here again, comparative costs should determine which is the more profitable practice.

The speed of release of phosphorus and potash is roughly the same in manures as in chemical fertilisers.

ORGANIC MATTER CONTENT

The main benefit of manure in vegetable growing is in its organic matter content. But again we have to pay close attention to the costs involved and benefits gained. One of the most difficult problems facing the vegetable grower is to maintain the organic matter content of the soil. Usually the crop residues are not sufficient to replace the organic matter lost annually through cultivation and cropping. The loss of organic matter is due to the action of micro organisms which decompose it ultimately to carbon dioxide.

In light sandy soils the importance of organic matter lies in its capacity to increase the amount of nutrients the soil can hold in a form which resists leaching. It also increases the waterholding capacity of these soils, but does not have a great effect on the soil structure since these soils have a low clay content. In heavy soils with a high clay content organic matter has an important function in developing a good soil structure. Various compounds formed during decomposition cement clay particles together into aggregates which make the soil more permeable to water and improve the aeration of the soil. Organic matter has only a slight effect on the waterholding capacity of heavy soils.

It requires fairly large amounts of manure to replace the organic matter lost each year during cultivation. The amount may be as high as 10 to 20 tons per acre per year, depending upon the cropping system and the area. An important point to remember is that for each prevailing climatic condition and soil type there is a normal equilibrium level of organic matter which the soil can maintain in the long run. With soils that are well aerated and receive a high amount of moisture and temperature—like the sandy market garden soils around Perth—the organic matter decomposes very rapidly, and the normal organic matter content is naturally low.

It is very difficult, and very costly to attempt to increase the organic matter content of a soil above a normal level for the prevailing soil and climatic conditions.

USING ORGANIC MANURES

Here are a few practical hints for the use of organic manures:

At present prices, organic manures would be too expensive to use for the sake of their nutrient content, but in many cases their use is justified as a means of increasing the organic matter of the soil.
Nutrients in organic manures are seldom in a desired balance, and must be supplemented with chemical fertilisers, especially phosphorus.

In some areas there is a possibility of using manure substitutes such as composts, sewage sludges, and other organic waste materials.

The rate of manure to be used is governed by the kind of crop, character and fertility of the soil, but above all, it is governed by economic considerations. Heavy applications cannot be justified on crops that bring a relatively low return. Where the supply is limited and the price high, light applications will usually bring the greatest net return. With most vegetable crops 10 to 15 tons of horse or other animal manures that contain similar percentage of nitrogen, supplemented with chemical fertilisers, will give greater money return than heavier applications of manure. The rate of application of poultry manure should be lower than that of any other kinds that contain less nitrogen. It is again emphasised that manure is not a balanced fertiliser. For this reason it is more economical to use a moderate quantity and to supplement it with chemicals.

The manure should be used on crops which give the greatest response or on crops of the highest value. With a limited supply it would be far better to use it on melons and similar crops, which give good responses, rather than on crops like sweet corn or dry beans which give relatively small responses.

Well rotted manure contains the nutrients in a more concentrated form, and the nitrogen is more available. It is also safer to use than fresh manure, as the latter may often cause ammonia burn to young plants.

Fresh manure, or manure which contains a large proportion of straw, sawdust, or other undecomposed material of high carbon content, may lead to a temporary nitrogen starvation of the crop, as most of the available nitrogen is being used up by micro organisms engaged in breaking down the organic matter. However, on newly ploughed swamp soil a single application of a small quantity of fresh manure might have the benefit of supplying the necessary bacterial population for the breakdown of the high amount of organic matter present. The bacteria would also use the excess nitrate, and thus prevent its toxic accumulation.

The most common method of application of organic manures is to broadcast them before ploughing in. Ploughing in is essential where fresh manure is used. Rotted manure may be broadcast and harrowed in lightly. With short supplies application in furrows—especially for melons, cucumbers and similar crops—is the most economical method, even if this involves more labour. With horse manure applied in furrows, the heating effect may hasten germination and early growth.

**NATURALISED GARDEN PLANTS CAN BE DANGEROUS**

By R. D. ROYCE, Officer in Charge, Botanical Branch

A poisonous plant is only dangerous in so far as human beings or animals come in contact with it, or ingest it. Even the most toxic plant growing in the protection of a garden is unlikely to cause trouble.

However, every poisonous plant cultivated in gardens, particularly in country districts, is a potential menace to the pastoral industry. From past experience it can be stated quite definitely that the more popular they become, the greater the risk. It is inevitable that sooner or later the garden refuse dumped in the open paddock or, as so often occurs, along the roadside, will contain viable seeds, bulbs or corms of species which are capable of developing in competition with the native flora and other weeds. Seeds may also be blown by the wind or distributed by some other means into areas outside the garden where they can germinate, develop and spread. And so new weed species become established.

This is how the Prickly Pear and Lantana became naturalised in Queensland and New South Wales and how Patersons Curse, Arum Lilly and Cape Tulip became established in this State. It is bad enough.
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if the newly established garden escapee proves to be a vigorous and aggressive weed, but if it is a toxic species, such as Lantana or Cape Tulip, it is of much greater economic significance, and its establishment may well be the forerunner of the deaths of hundreds of head of stock. The garden lover should therefore be very careful in disposing of garden refuse, particularly if recognised toxic species are amongst the plants being grown.

Various species of bulbs, as well as Iceland Poppy, Chili and Primula have been mentioned in previous talks, and if any of these became widely naturalised they could cause serious trouble amongst stock. Delphiniums and Larkspurs too, are highly toxic and annually cause losses in America where they are native plants. Foxgloves, Eschscholtzia and Ranunculus are free seeding plants which are known to contain a poisonous principle, and if any of these manage to become established as garden escapees, they would undoubtedly in a few years become widely naturalised plants of a most undesirable character.

Many species of Asclepias, usually referred to as Cotton Bushes are popular garden plants. They have unusual though attractive flowers, feathery seeds, and a white milky sap. Queen Anne's Lace or Lace Plant is a popular plant in gardens at the present time, and its white masses of flowers are undoubtedly attractive. However, it produces an abundance of seeds and in N.S.W. where it is widely naturalised it is known as Bishop's Weed. All of these plants, together with such old favourites as Salvia, Lobelia and Zinnia, are very decorative in the garden, but should be kept there, since if allowed to become naturalised, nearly all of them would be capable of causing stock losses.

Although Hemlock has long been regarded as a bad weed and toxic plant, it is still grown to a certain extent in gardens. Actually it is naturalised in this State already, and it was this plant which was used as flails or whips by some Albany schoolboys a few years ago in a game which resulted in serious illness from allergic reactions to the plant sap. It is known that foliage of the related parsnip is capable of causing dermatitis in a similar manner.

All of these plants depend mostly on seeds for their spread and persistence, but it is the perennial garden plants which are a much more serious menace. Succulent plants such as Cotyledon, Sedum, Cactus, Euphorbia and particularly Kalanchoe, the Tree of Life, are capable of remaining alive on a rubbish heap for months during the summer time and then developing roots during winter. Even single leaves and small fragments of stem are capable of rooting and continuing growth. Deep rooted plants are also of particular significance. The Potato Creeper or Madeira Vine is a vigorous plant which develops an extensive rooting system, and if it once became established as a weed it would be extremely difficult to eradicate. Similarly Four O'Clock produces large carrot-like root structures which would give it a great advantage as a weed, while the Woodsorrels and Vinca develop underground structures by means of which the plants can spread vigorously and rapidly. Many of these perennial species are known to be toxic and when garden beds are being thinned out or the plants cut back, it is important that the plant refuse should be burned or otherwise destroyed and not scattered about on unofficial rubbish heaps.

### Planting Fruit Trees

By K. T. Whitely, Horticultural Adviser

**Over the next few months many fruit growers will be busily engaged in the task of planting fruit trees. Many mistakes can be made in this apparently simple task, and to avoid these it pays to follow a few simple rules in planting procedure.**

The best time to plant depends on the type of tree concerned. In general, deciduous fruit trees should be planted in June-July and citrus in August-September when the main risk of frost is over.
On arrival from the nursery the trees should be thoroughly examined. As a result of measures taken in the nursery they should be free of pests and diseases but a careful examination is still warranted and can be a practical safeguard against later troubles in your young orchard. A careful inspection should be made for crown gall, scale and woolly aphids. Anything doubtful should be set aside for examination by your local horticultural instructor.

Should the trees arrive before you are ready to plant it will be necessary to "heel them in" by digging a trench deep enough to take the root system, filling moist soil in around the roots and watering, preferably in a shady spot. With citrus however, heeling in is to be avoided if possible due to the extra handling, exposure and damage to the roots and in their case watering of the packing material will be sufficient if they are only to be held for a couple of days.

The weather at transplanting time is important. Trees should never be transplanted on days which are unusually warm or while any drying winds prevail. Cool or showery weather gives best results though even on such days ample care must be taken in covering of roots with wet bagging to prevent drying out while awaiting planting.

If possible holes should be dug just in advance of planting; they should be large enough to accommodate the root system easily and a 2 ft. diameter hole a foot or so deep will be adequate for most trees. The amount of fertiliser placed in the hole at planting should not be overdone and 2 or 3 lb. of mixed fertiliser such as potato manure is ample.

If desired a shovelful of well rotted compost or animal manure may be added. The mixture should be worked into the bottom of the hole and covered with a good layer of fresh soil to prevent direct contact with roots. Fresh manure or any appreciable quantity of chemical fertiliser is apt to cause injury to root growth.

To get proper alignment of the trees it is advisable to use a planting board. This is a simple yet effective means of ensuring that the tree is in exactly the same position as the marker peg and also acts as a guide to the correct level to set the tree in the soil.

The selected tree should have its roots trimmed with secateurs to remove any diseased or broken rootlets, but the root system should not be reduced more than is necessary before planting.

**Planting Depth.**

It is usual to plant the tree at approximately the same depth as it was in the nursery, due allowance being made for the settling of the soil, and as this "ground" line is usually visible on the trunk, it acts as a good guide for planting depth. *Having the bud union above the soil level is particularly important for citrus as the scion varieties are much more susceptible to phytophthora root rot than the rootstock.*

A good spreading of the roots is achieved at planting if a cone of soil is formed up in the bottom of the hole and the lower roots spread over this cone. Fine soil is then worked in with the hands until the hole is partly filled. The tree is then moved gently up and down to allow the soil to sift into the root system and the remainder of the hole filled and tramped, leaving a shallow basin which is immediately filled with water.

In windy localities, the tree should be arranged so that the strongest lowest limb is in the direction of the prevailing wind, trying as far as is possible to have the scar left by the removal of the stock at the bud union on the south to south-east side, that is, the shady side of the trunk.

In order to restore the balance between the shortened roots and the tops the latter should be cut back to about 18 in. above the ground. This may mean the complete removal of all branches or the selection of the three best shoots below 18 in. and shortening them back to approximately 6 in. All other growths should be completely removed.

With citrus it is also necessary to drastically reduce the leaf area of the
tree. This can be done by cutting the leaves on the remainder of the tree in halves, crossways.

Especially in more exposed localities it may be necessary to tie the tree to a stake to keep it upright in growth and reduce wind damage. If possible a “guard” of newspaper, strawboard or hessian should be tied around the tree to deter rabbits and to prevent sunburn.

Every effort should be made to maintain the growth achieved by this careful planting by proper husbandry through the growing season. In short, having planted the tree carefully, grow it properly.

REARING ORPHAN LAMBS

By Dr. L. C. SNOOK, Animal Nutrition Officer

ORPHAN LAMBS are easy to rear if a few basic principles are understood.

The milk of the ewe is quite rich, containing about twice as much butterfat as is present in ordinary cow’s milk. It follows that cow’s milk should never be diluted with water if it is to be fed to lambs. In fact, the aim should be to obtain milk which is as rich as possible. If fresh cow’s milk is not available, reconstituted dried milk can be used with every confidence. Do not add sugar to the milk fed to lambs.

Under natural conditions, the young lamb has small drinks at frequent intervals. Obviously, there is a limit to the number of feeds which can be given to an orphan lamb, but, if possible, feed it five or six times daily during the first week. A cup full of milk given at each of these feeds should be adequate for the young lamb. As it grows, the lamb will drink more, and the number of feeds can be reduced.

Overfeeding is a serious fault. In most cases a lamb will stop drinking when it has had enough and no attempt should be made to encourage it to drink more. Lambs which are fed only two or three times daily become quite hungry and tend to drink too much too quickly. Such overfeeding can produce stomach upsets, but even so many lambs are reared successfully on twice-a-day feeding.

A small clear-glass tomato sauce bottle is very convenient for feeding young lambs. A cup full of milk will just about half fill such a bottle. An ordinary rubber teat from a baby’s bottle completes requirements.

Cow’s milk can be expensive. Fortunately there are a number of substitutes which can be used easily and which will cost less. My young daughter now has a robust young lamb which was reared for several days on fresh cow’s milk. For the next week it was given only one feed daily of the rich creamy milk from the top of the bottle. Reconstituted dried skim milk was used for the other feeds. Now the lamb receives only the skim milk. This is made by mixing two heaped up tablespoonfuls of dried skim milk powder in a pint of warm water. Dried buttermilk powder is equally good.

Lambs start to eat at an early age. Rather surprisingly, they seem to prefer hay to fresh green grass. Young tender green grass is also attractive. Lambs should be given every encouragement to eat natural feed.

Fresh clean water is another essential. Lambs soon learn to drink water, particularly where green feed is unavailable.

Where hay and green grass is unavailable, a mixture of crushed cereal grains and linseed meal should be prepared to encourage the lamb to eat solid food. Just what is put into this feed mixture will vary according to circumstances but so long as the lamb eats well, this is the main thing.

There is no need to feed milk to an orphan lamb after it is three months of age. In fact, if the lamb has been taught to eat good quality solid food it can be weaned even younger. As soon as the lambs drink a reasonable amount of water, for example, they can be given dried skim milk or dried butter milk in a meal mixture, rather than through a bottle.

Cleanliness, of course, is essential. Milk which is not consumed should be discarded and not kept and returned to the bulk supply. After the first week, it is not necessary to warm milk to blood heat. Naturally, a young lamb should not be given milk direct from the refrigerator but no harm will result from the use of milk at ordinary temperatures.