Vegetable Growing

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This article has been written in response to many requests from people wishing to grow vegetables for sale. Problems of marketing, however, must not be overlooked. Accordingly, this article on the technical aspects of growing vegetables concludes with a brief discussion on marketing by D. R. J. Densley, Chief Agricultural Economist.

MOST European-type vegetables can be grown in Papua and New Guinea, in areas which are sufficiently elevated to provide a temperate-like climate. Generally speaking, vegetables can be sown at any time of the year in the Highlands, provided they can be watered adequately, because the temperature does not vary much from season to season, and there is a fairly constant day length throughout the year. Even at sea-level it is possible to grow some vegetables such as beans, tomatoes, pumpkins and Mignonette lettuce.

Preparing Seed Boxes

Some plants do not transplant satisfactorily, and best results are obtained by sowing where they are to remain. These include spinach, peas, beans, cucumber, pumpkin and corn. Others are best sown first into seed boxes.

The boxes or trays should be of convenient size, say 18 in x 12 in and not deeper than 4 in, so that one person can carry them easily to the planting site. There are also special plastic trays of 12 in x 12 in on the market which are very suitable.

A useful medium for filling the trays is three parts of sifted top soil with one part of clean sand, mixed thoroughly.

The seed should be sown sparsely and covered with approximately $\frac{1}{8}$ to $\frac{1}{4}$ in fine soil, so they will have enough space to develop into strong plants. If sown too thickly the young seedlings will grow up spindly and will never grow into strong, vigorous plants.

When the seedlings are about 3 in to 4 in high, they are ready for planting into the field.

Care should be taken that the seed boxes are never allowed to dry out, but are kept in a shaded place until two weeks before planting out. At that time they are placed in the sun for hardening off for one hour the first day, and gradually increasing the hardening off periods so that they are in the sun all day for the last week before planting out.

When transplanting, it is very important to make sure that the roots hang free in the planting hole and are not bent in any way.

Preparing the Beds

A convenient size of bed is 4 ft wide with a path of 18 in between the beds. The soil must be worked until it is fine and friable. It is advisable to have the beds raised approximately 8 in to allow drainage of surplus water. All the paths should run into a deeper drain capable of carrying away all the water.

After the block has been dug over to an even depth, not disturbing the sub-soil, the beds are marked out and the soil in the "paths" placed on the beds. When all the beds have been formed this way they are raked to distribute the soil evenly on the surface and level the edges.

If animal or poultry manure is available, it should be well dug into the beds. This will reduce the need for artificial fertilizers. The fertilizer should not come into contact with seeds but be raked into the soil beneath them.

Watering

Care should be taken to see that the vegetable beds always have adequate water, and in

dry weather regular watering will be needed. The vegetables will then grow quickly and will therefore be more succulent and appealing. This applies particularly to leafy types such as lettuce and cabbage. On the other hand, too much water can stagnate the root systems, making the plants unhealthy.

Weeds

Apart from robbing the soil around plants of nourishment, weeds provide a harbour for snails, slugs, thrips, aphis and other pests which damage or destroy plants.

It is better not to allow the weeds to grow so big that they have to be removed from the garden. Lightly chipping them as soon as they appear and leaving them to decompose on the surface provides a useful light mulching. In this way any nutrients removed from the soil are eventually returned.

Planting Notes

BEANS AND PEAS: Plant direct into bed, approximately 2 in deep, 6 in between plants and rows 2 ft apart. Varieties recommended: Climbing beans—Westralia, Snake (Yard Long, Asparagus) bean. Dwarf bean—Brown Beauty. Peas—Telephone, Greenfeast.

BEETROOT AND PARSNIP: Plant sparingly in drills in bed approximately 1 in deep and thin to 4 in between plants; rows 1 ft apart. Beetroot variety recommended: Early Wonder.

BROCCOLI AND BRUSSELS SPROUTS: Sow in seed box and transplant at 18 in in the row and rows 2 ft apart. Varieties recommended: Broccoli—Green Sprout. Brussels Sprouts—Champion.

CABBAGE AND CAULIFLOWER: Sow in seed box and transplant at 30 in in the row, and rows 2 ft apart. Varieties recommended: Cabbage—Select Succession, Sugar Loaf, Savoy King (warmer areas), Prize Red (pickling). Cauliflower—Snowball "A", Snowball "X", Early Shorts. When the cauliflower heads start to form, it is essential to protect them from rain.

CHINESE CABBAGE: Sow in seed box and transplant at 12 in in the row, and rows 1 ft apart.

CAPSICUM: Sow in seed box and transplant at 12 in in the row, and rows 1½ ft apart.

CARROT: Plant sparingly in drills in bed ½ in deep, and thin to 3 in between plants; rows 1 ft apart. Varieties recommended: Topweight, Western Red. These are both resistant to carrot virus.

CELERY: Sow in seed box and transplant at 6 in between plants, rows 1½ ft apart.

CUCUMBER: Plant direct in beds in groups of 3 seeds, and thin to 1 plant. Spacing 4 ft each way.

LETTUCE: Sow in seed box and transplant at 12 in in the row, with rows 1 ft to 1½ ft apart. Varieties recommended: Winter Lake, Great Lakes, Pennlake, Imperial 615, Mignonette (warmer areas).

ONION: Sow in seed box and transplant at 4 in in the row, with rows 1 ft apart. Varieties recommended: Hybrid Granex Brown and White, Early Lockyer Brown and White, Early Crano Brown.

PARSLEY: Sow in seed box and transplant at 12 in in the rows, rows 1 ft apart.

PUMPKIN: Plant direct in position in groups of 3 seeds and thin to 1 plant. Spacing 10 ft each way. Varieties recommended: Butternut, Buttercup, Golden Hubbard Squash.

RADISH: Sow in drills in the bed, ½ in deep, and thin to 2 in in the row, with rows 6 in apart.

RHUBARB: If using seed, sow in drills ½ in deep and thin to 18 in in the row, with rows 2 ft apart. Crowns can be planted direct 18 in apart in the row, with rows 2 ft apart.

SILVER BEET AND SPINACH: Sow in drills 1 in deep and thin to 6 in in the row. Rows 1½ ft apart.

TOMATO: Sow in seed box and transplant at 24 in in the row, with rows 3 ft apart. Varieties recommended: Devlin's Choice, Grosse Lisse No. 45.

TURNIP: Sow in drills in the bed and thin to 6 in in the row, with rows 1½ ft apart.

PESTS AND DISEASES OF VEGETABLES

Diseases can be caused by fungi, bacteria, viruses, nematodes, and other micro-organisms. In order to keep the amount of disease as low as possible, the following recommendations should be observed:—

1. Use commercial packeted seed if possible; if not, use seed from plants which are free from disease.
2. If a disease occurs, send specimens to the District Rural Development Officer, or to the Principal Plant Pathologist, D.A.S.F., Konedobu, for identification and advice on control measures.
3. Many fungus diseases such as leaf spots can be controlled by spraying with a fungicidal spray such as copper oxychloride or "Zineb", but to be effective the spray must be applied as soon as the first spots appear. Mildews are more effectively controlled by sulphur dust.
   Virus diseases are often carried from plant to plant by insects such as aphis and thrips, so some measures of control may be obtained by destroying these pests. Affected plants should be weeded out and burnt.
4. After the vegetables have been picked, destroy the plant residues by burning if disease was present in the crop.
5. Special measures, such as rotation of crops, should be taken if a soil disease is present.

Spraying and Dusting

In most cases, spraying is more effective in controlling plant disease than dusting, provided the spray is applied thoroughly.

It is necessary to wet all parts of the plant with spray, particularly the underside of the leaves.

Dusting may also be effective, but its efficient application is limited to periods when the air is very still, preferably in the early morning when the leaves are still wet from overnight dew. Shaking or sprinkling dust over a plant is not successful because the dust does not reach the underside of the leaves. The best method is by a dust gun or puffer-type squeeze duster.

Insect Pests

Many insect pest problems can be avoided by spraying routinely with 0.05 per cent malathion every 7 to 14 days. Malathion is supplied commercially as a 50 per cent concentrate. To dilute this to a 0.05 per cent solution, add $\frac{1}{2}$ fluid oz to 3 gallons water. Recommendations for specific pests are given in the accompanying table.

The application rates stated on the pesticide labels should be carefully followed. Lower rates may be ineffective, while higher rates are wasteful and may burn or otherwise damage the plants. If pesticides are applied to excess, a harmful amount will remain on the vegetables after harvest. Under no circumstances should pesticides be applied to vegetables closer to harvest time than 30 days for DDT and lindane, 7 days for dicofol and maldison, and 3 days for carbaryl.

Snails and slugs are controlled by a bait containing metaldehyde or a mixture of metaldehyde and B.H.C. The bait is placed in small heaps in several places on the bed.

Ants are a general nuisance and can undermine beds, interfere with the feeding system of nearby plants, and carry aphis to plants and

PEST CONTROL RECOMMENDATIONS FOR VEGETABLES

Pest	Chemical	Method of Application	Interval Between Treatments
Leaf-eating caterpillars	DDT or carbaryl (Sevin^{R}, Septene^{R} Resistox^{R})	spray or dust	7 to 14 days
Cabbage moth	carbaryl	spray	7 days
Cutworm	lindane	water into soil	14 days
Grasshoppers	lindane	spray or dust	7 to 14 days
Leaf-eating beetles	lindane	spray or dust	7 to 14 days
Aphis	maldison (Malathion^{R})	spray	7 days
Thrips	DDT or maldison	spray	7 days
Green vegetable bug (shield bug)	maldison	spray	7 days
Red spider, mites	dicofol (Kelthane^{R})	spray	7 days
Bean fly	DDT or lindane	spray	3 days after seedlings emerge; 3 days later, thereafter 7 days

Note.—DDT must not be applied to cucumbers or pumpkins as it can kill them. Lindane must be applied cautiously on these crops.

then tend them there. They can also do considerable damage in seed boxes by carrying away small seeds. They can be controlled by spraying or dusting the soil surface in the seed box with DDT immediately after sowing, to protect the seed, and then treating the ants' nest itself by saturating with 2 per cent chlordane in water.

VEGETABLE MARKETING IN THE TERRITORY

Over recent years concern has been expressed at the inability of areas around Port Moresby, and to a lesser extent around other major Territory centres, to supply requirements of fresh fruit and vegetables. Shortages have occurred with both native and European type vegetables and prices in Port Moresby continue to remain relatively high. Territory imports of fruit and vegetables in all forms in 1968 to 1969 were valued at over $2 million. In addition the import bill for rice and other substitutes for local food continues to grow.

Several European and indigenous growers have successfully started to grow fruit and vegetables in areas adjacent to Port Moresby. Attention is now being directed towards the economic possibilities of using irrigation for cash cropping.

Production of fruit and vegetables in other parts of the Territory, especially in the Highlands, has increased substantially over recent years, but further development has been hampered by high transport costs in gaining access to markets.

The Department of Agriculture, Stock and Fisheries together with other departments is attempting to overcome some of the problems faced by Territory fruit and vegetable growers. Apart from examining problems associated with the actual growing of fruit and vegetables, attention is being given to problems of packing and transporting produce. In addition, an interdepartmental committee is examining the question of the desirability of the establishment of an Administration fresh food holding centre-wholesale market complex in the Port Moresby area. Growers throughout the Territory have expressed the need for a centralized market centre catering for the volume grower of both native and European type vegetables. The number of growers now selling large quantities of fruit and vegetables direct to wholesalers and retailers, and to Administration hostels and other institutions indicates that a commercial fruit and vegetable industry in the Territory is rapidly developing.