

# My Organic Food Garden



How to grow organic healthy food at home

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## 1. Introduction

For anyone with a garden, it seems simple: grow your own produce. But the chemical industry is big business, so gardeners have, over the years, been persuaded that they too can "benefit" from research carried out by the commercial growers and farmers. After all, what is good for the professional must be good for amateurs. In fact, nothing could be further from the truth.

While we can certainly benefit in some ways from research, there is absolutely no need for the home gardener to follow commercial practices blindly. Remember, the professional grows on a large scale for profit, while we do so on a small scale for pleasure. He needs all his harvest to be ready at the same time, while we want to stagger it. What's more, there is no need to sacrifice anything in terms of yield and quality. Let me give you an example.

If a farmer has twenty acres of cabbages, he can almost certainly expect an attack of cabbage white butterfly, since no self-respecting butterfly could miss such an opportunity. So, to stop the hungry caterpillars from devouring the entire crop, the farmer may have no alternative but to spray. The gardener, on the other hand, has perhaps only ten or a dozen plants. And, if he is an organic gardener, they'll be interplanted with other crops and so effectively camouflaged from the butterflies, who recognize them by sight and perhaps smell. Chances are, the cabbages

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will be missed altogether, but if a butterfly does see them and lay her eggs, there is still no need to reach for a spray. All you need to do is walk down the row occasionally, pick off the offending caterpillars, and drop them into a jar of kerosene. You will get one hundred percent control and it will cost you nothing. What's more, your cabbages will be perfectly clean and healthy. Even better, if you grow the right kind of plants in the ornamental borders and among the vegetables, the birds and the ground beetles will do the job for you.

The same philosophy applies to fertilizers. In a natural soil there are millions of microorganisms beavering away on our behalf, producing the nutrients that plants need for healthy growth. Look after them by feeding the soil (rather than applying chemical fertilizers to feed the plants) and they'll repay you a thousand-fold. They'll not thank you for a daily dose of paraquat.

## 2. About Soil

The soil is the basic raw material of the gardener's art. It should never be dismissed as a mere collection of mineral particles used to anchor roots, or worse still as "dirt". It is much more than that.

Certainly, its basic structure consists of rock particles broken down by frost and thaw action, wind and river flow, to produce the different textures that give us soil "types". However, a large part of its make-up is organic matter vegetable and animal remains in various stages of decay - along with air and water, which are all essential for the support of plant and animal life. All of this provides a home for millions and millions of living organisms, such as soil fungi, algae, bacteria, insects and worms, which work to provide just the right conditions for healthy plant growth. These organisms provide the plants with food in a form they can ingest, and improve the structure of the soil by breaking it up and allowing more air to circulate.

It is perhaps in the treatment of soil, more than anywhere, that organic gardening differs from other gardening methods. The very first principle of organic gardening is to nurture and encourage this subterranean life so that it can support a much larger plant population than nature ever intended.

Soil is formed over millions of years by the physical or chemical weathering of rock. Clay soils are formed by chemical weathering, where the mineral composition of the rock is changed, usually by the action of weak acids. Other types of soil are the result of physical weathering, which does not involve any change in the chemical content of the rock, but gradually erodes it mechanically. This physical weathering may happen within the rock or externally.

In hot climates, such as those which prevail in desert areas, the widely fluctuating temperatures of day and night cause rocks to expand and contract regularly. Over a period of time the stress caused by the continual expansion and contraction leads to the physical disintegration of the rock and the formation of soil particles.

In colder conditions, like those which affected much of the world during the last Ice Age, rocks are broken down by the action of water entering cracks in the rock and freezing. As it freezes, the water expands, forcing the rock to split open. The movement of giant glaciers was responsible for the formation of soil, as it wore away fragments of the rock below, and the action of streams and rivers also serves to wear away rocks to form soil.

The soil in your garden is a very complex structure and its cultivation depends on many different elements. There are several different soil types which all have advantages and disadvantages. For example, the soil

may be acid or alkaline; it may be heavy or light; it may drain well or badly; it may be very stony.

What you see in your garden is simply the surface of the soil. Soil is made up of three layers: topsoil, subsoil and the soil parent matter. Top-soil is formed over the years by the addition of organic matter that follows the decomposition of dead plants or animals. It is inhabited by a wide range of living organisms, and it is in this layer that the majority of the feeding roots of plants exist. Topsoils can be improved and deepened by the regular addition of organic matter.

The second layer is the subsoil, which is low in nutrients, generally contains few or no microorganisms, and is therefore inhospitable to roots. Thus, when digging deeply, it is advisable to bring to the surface only very small amounts of subsoil; these can be mixed with organic matter and will, eventually, turn into topsoil. Double digging breaks up subsoil, and improves drainage, without bringing the subsoil to the surface.

The nature of the subsoil has a profound effect on the water-holding capacity of the soil in general. If you have very sandy or rocky subsoil, which drains very freely, you will need to increase the bulky organic matter content, and thus the water-holding capacity, of the topsoil. On the other hand, heavy clay subsoil, which drains poorly, may necessitate the installation of an artificial drainage system.

The third layer - the parent material - is the original mineral from which the soil was formed. This layer is normally deep enough not to concern the gardener, but may, on high ground, be comparatively near the surface. If this is the case, try to increase the depth of the topsoil by adding organic matter to the top layer.

There are five main soil types - clay, sand, silt, limestone and peat - and it is the nature of the original rock and the size of the mineral fragments that determine the soil type. It is important to know what kind of soil you are dealing with in your garden because the way in which you manage it, the timing of cultivations and the plants you grow will depend to a large extent on the nature of the soil.

However, having said this, most soils contain a mixture of minerals. If a soil is referred to as, for example, "clay", then this indicates its major constituent. Soil mixtures are known as loams; for example, a soil made up of 50 per cent clay and silt and 50 per cent sand is a "medium loam". Similarly, a soil which contains a high proportion of sand might be described as a "sandy loam", while one which contains a relatively large amount of clay might be described as a "heavy loam".

Soils can also be heavy or light. A heavy soil contains a much higher proportion of clay. This type of soil has very small particles, which tend to pack together, preventing free passage of water. Heavy soil is often very difficult to work initially because it tends to be either very wet and sticky or very dry and hard. Eventually though, when it has been

ameliorated by the natural drainage afforded by plant roots and the addition of organic matter, heavy soil becomes an excellent moisture- and nutrient-retaining medium. Light soils, on the other hand, are easy to dig, and warm up quickly in the spring but allow very free drainage, which has its own problems. Water and nutrients disappear through the topsoil and into the subsoil and eventually the drainage system. Light soils require constant additions of organic matter to form a topsoil that retains moisture, and generally need more applications of fertilizers than heavy soils.

Soil may also contain lime, which will cause it to be either "acid" or "alkaline", depending on the amount. The lime content will make a considerable difference to the fertility of the soil, and will govern the range of plants you can grow, as it has the ability to make some nutrients unavailable to plants.

The proportion of stones or gravel in your soil does not influence its texture classification, but may affect its fertility and drainage. Stony soil has the advantages and disadvantages of a free-draining soil and it may need regular applications of bulky organic matter to improve water retention. If you are lucky enough to have a heavy topsoil and a very stony subsoil, you have the best of both worlds, with surface moisture and nutrient retention, plus good drainage of excess water.

## **Soil Management**



The ideal soil has a good crumbly structure, is rich in organic matter, drains well enough to prevent the topsoil becoming waterlogged in heavy rain, and is capable of providing the nutrients needed for healthy plant growth. The various soil types all have their own advantages and disadvantages. Each type is in fact a mixture of different particles in varying proportions, and a short period of observation and a test will soon establish which mineral predominates. You can then use one of the following management techniques to get the best from your particular soil.

## **CLAY**

While clay is beset with problems initially, a little work and sound management can produce excellent results. It is certainly true that, in the early stages of cultivation, clay is not nearly as convenient to work as a light soil such as sand. When it is wet, it rapidly becomes a soggy mess of mud and, when it dries out, it sets like concrete. Clay is a badly drained, cold and heavy soil because the spaces between each particle are too small to allow free passage of water and air, so the soil is always in danger of settling down to form a solid, airless mass. Improving the soil structure can take a few years, but a good clay soil is capable of growing far better crops than a sandy soil ever could.

## ***DIGGING***

It is best, if you can, to dig a clay soil during the autumn, either at a time when there has been a little rain to soften the hard-baked soil, or when it is drying out after being soaked, but before it is hard again. In temperate climates, these times are fairly frequent, but in drier climates it calls for good organization and rapid action when the weather changes.

When heavy soil gets wet and dries out again, it expands and contracts, causing the mass of soil to crack into innumerable small clods. If water then gets into these cracks and freezes, it will force them further apart, breaking the soil down to a sowable tilth. So dig clay soils over in the autumn, leaving the surface rough and uneven through the winter to expose the maximum amount of soil surface to the elements. At the same time, you can work the organic material into the upper levels.

### *DRAINAGE*

Because clay was broken down chemically, it's also possible to combine the particles chemically by a process known as "flocculation". If sufficient lime is added to the soil, the tiny particles of clay will bind together to form much larger crumbs, through which air, water and plant roots can freely pass. Check the requirements of the plants you wish to grow and use as much lime as you can without making conditions intolerable for them. In addition, if your soil is very heavy, dig coarse grit into the soil - approximately one to two bucketfuls every square meter/yard .

Raising a section of soil above its immediate surroundings will improve drainage quite considerably. To help the soil dry out and warm up: raise your ornamental beds slightly and grow your vegetables on the deep-bed system. The important thing with clay is that you should never tread on it when it is wet or you'll destroy years of work. If you have to walk on it, lay boards down first.

### *ORGANIC MATTER*

Adding plenty of bulky organic matter to a clay soil will hold the particles apart so that roots and water can pass through. After a few years, when the level of organic matter is satisfactory and the soil is filled with the roots of previous crops, clay becomes much easier to work. In fact, every plant you grow plays its part in improving the soil for the next plant generation.

### **SILT**

The main problem with a silt soil, as with clay, is one of drainage. Of all the soils formed by grinding, silt has the smallest particles. Only the particles of clay are smaller, but they were formed by chemical action.

The size of the particles means that they tend to pack together very closely when wet, preventing the free passage of water and air through the soil. So drainage is poor and there is a danger of the soil settling down to form an airless mass. However, if you never walk on the soil

when it is wet (use boards), and condition it as recommended here, silt is perfectly manageable and will produce quite satisfactory results.

### *DIGGING*

Silt soil should be cultivated only when it is dry enough not to stick to your boots. Conditions underfoot permitting, aim to dig silt during the autumn to take advantage of weather which will help break the soil down to a sowable tilth. Like clay, when silt gets wet and dries out again, it expands and contracts, causing the mass of soil to crack into small clods. If water then gets into these cracks and freezes, it will force them further apart, breaking the soil down even more. So by digging silt over in the autumn, you expose the maximum amount of the soil surface to the elements and work the organic material into the topsoil at the same time.

### *DRAINAGE*

In order to improve drainage, the soil particles have to be forced apart physically, to allow free passage of air, water and plant roots. Do this by digging one or two bucketfuls of coarse grit into the soil every square meter/yard when you dig in the organic matter. Raising your ornamental beds slightly and growing vegetables on the deep-bed system will improve drainage, thus helping the soil to dry out and warm up.

### *ORGANIC MATTER*

The structure of silt soils benefits greatly from the addition of liberal quantities of well-rotted compost or manure. Adding plenty of bulky organic matter to the soil will hold the particles apart so that roots and water can pass through more easily. If possible, keep the soil covered with a green-manure crop in order to add organic matter and remove surface water.

## **SAND**

A very light soil, sand tends to drain easily and can therefore be cultivated when other soils are lying sodden and quite unworkable. As it also warms up quickly, it is an ideal soil for raising early crops. However, sand is also hungry and very demanding. So the price of having an easy soil to work is the need to apply extra organic matter and plant food, in the form of fertilizers, because nutrients, as well as water, will drain away.

## *DIGGING*

When you cultivate sand is relatively unimportant. It is not necessary to leave a sandy soil rough during the winter months for the frost and rain to break down. The large particles make it very easy to cultivate to a fine tilth anyway, so it is best to dig it in the spring a short while before you intend to sow or plant. If you never venture on the soil when it is so wet that it sticks to your boots, you will not go far wrong.

### *DRAINAGE*

During the year, sandy soil will tend to lose water, both through surface evaporation and free-draining, and this could be detrimental to the plants. To reduce the problem, spread organic matter, or "mulch", over the beds between plants as often as you can . This lowers the evaporation rate and improves the soil structure.

### *ORGANIC MATTER*

It is very important to improve sandy soils by adding substantial amounts of bulky organic material each year. Because of the quick-draining nature of the soil, the organic matter will work down into the subsoil very quickly so, to save labor and to put it in the root zone, dig the organic matter into the top few inches or spread it over the surface.

Try to maintain a cover of vegetation over the surface more or less all the time, and certainly in the winter, when the "leaching" of nutrients is at its most rapid. In the vegetable garden, it is a good idea to grow a green-manure crop during the winter when the beds are empty and to dig it in during the spring. This will not only hold many of the nutrients in the soil during the winter, but will also add quite large quantities of organic matter.

### **ALKALINE SOILS**

There are two big disadvantages with these soils. Firstly, they are thin, dry and "hungry". This is because the particles are very large, like those in sandy soil, so water drains through rapidly, taking plant nutrients with it. Plant nutrients, in the form of organic fertilizers, will therefore need to be added to the soil. Secondly, perhaps even worse, they are so alkaline, they are unsuitable for many plants.

### *DIGGING*

Generally there is no need to worry too much about the timing of cultivations. Like sand, these soils are normally dry enough to work, even in the depths of winter. It is not necessary to leave alkaline soils rough over the winter months for the frost and rain to break down. Instead dig it in the spring a few weeks before sowing. Because the topsoil is usually not very deep, digging should be kept shallow and, if the area is fairly small, it could be worthwhile adding a layer of topsoil to the surface.

### *DRAINAGE*

Generally, drainage on these soils is good and the need is to retain water nutrients.

### *ORGANIC MATTER*

On these soils - limestone and other alkaline soils of the USA, and the chalk soils of Britain - it is important to try and keep the soil covered. Grow a crop of green manure during the winter and dig it in during the spring. During the growing season, it is even worth sowing a fast-growing green-manure crop between rows, just to keep the soil covered.

Mulching, or spreading organic material on top of the soil between rows, is also important during the growing season. You should use acid materials, such as peat, grass cuttings, compost or manure, in order to counteract the alkalinity of the soil.

## **PEAT**

If you are lucky enough to be growing on peaty soil, grow as intensively as you can, as it is always potentially very fertile and usually easy to work. You'll find it easy to produce bumper crops and beautiful flowers year after year. Properly managed, a peat soil is superb but, like other soils, it does have its problems. Most importantly, peat soils are liable to be acid and will therefore need generous applications of lime to restore the pH balance in the fruit and vegetable plots. In the ornamental garden, provided you choose the correct plants, this should not be necessary.

Furthermore, when they are drained, peat soils tend to dry out quite rapidly in hot weather. If they are allowed to dry out completely, they



will shrink and may be difficult to wet again. To prevent this, some reliable irrigation or hand watering may be necessary in dry weather.

### *DIGGING*

The timing of cultivation is not critical. It is not necessary to leave peat rough during the winter.

### *DRAINAGE*

Peat and the more decomposed muck are often badly drained so you may need to install a drainage system.

### *ORGANIC MATTER*

A major advantage of peat is that it is not normally necessary to add any humus-making materials. Peat, unlike the other soils, is largely made up of decomposed matter. It therefore has a low mineral content but contains an excess of organic matter. However, the soil is likely to be low in nutrients to start with so you may need to add fertilizers.

### **How to Improve Your Soil**

There are various cultivation techniques that you can employ to improve your particular soil.. All soil types will benefit from the addition of bulky organic matter in the form of compost or manure or some other soil conditioner. This is the key to soil fertility, and a healthy, fertile soil is the

basis of the organic approach to gardening. In fact it is the basis of good gardening, whether you are wedded to organic principles or not. Organic matter will improve the drainage or increase the water-holding capacity of your soil. It will also, over a period of time, increase the depth of usable topsoil.

There is no doubt at all that, if you put on sufficient well-rotted manure every year, your soil will remain fertile and your plants will prosper. But where is all the manure to come from, particularly if you live in a town? The days are long gone when you could follow the cart-horse with a shovel and bucket. And, if you live in the country, particularly if it is a corn-growing area, the farmer's children don't even know what cows look like.

So the gardener's alternative is compost. But is that being realistic? Certainly it looks good during the early summer when you start to fill your compost container with grass cuttings. After a couple of mowings, it fills up to overflowing and you have to start another. Yet by the time it has rotted down completely, it has shrunk to no more than a few bucketfuls.

In fact a normal-sized garden with a productive vegetable plot will simply not produce enough compost. You will have to buy in some form of organic matter, and be constantly on the look-out for suitable composting material. Naturally, the more you can gather the better,

because you will have to buy less. Even if you live in a city there are ways and means of doing this.

Unfortunately it is almost impossible to garden totally organically, because virtually everything that you might use is polluted with some chemical or other. Straw has been sprayed with weedkiller, fungicide and insecticide; the cows have been force-fed with growth-promoting hormones; even the leaves swept from the pavements are polluted with lead from gasoline. So, if you are a purist, you may feel safer if you compost all imported material for at least a year in the hope that the toxins will be leached out.

Plants need certain nutrients in specific proportions to be present in the soil. These nutrients will be supplied by the addition of sufficient compost or manure, but you may have to use organic fertilizers as well to achieve the required balance. The techniques of feeding and the type of fertilizer you use to feed the soil will vary depending on your soil type, where you are, and how much organic matter is available to you. In addition, the degree of acidity or alkalinity, or pH, of your soil will affect the availability of some of these nutrients. So, you may find that, having established the pH level and taken measures to adjust it if necessary, you release more nutrients, therefore increasing the fertility of your soil.

### **Soil Management Tips**

Soil management has four phases: the first phase is testing the soil; the second involves the general soil conditioning and replacement of nutrients with organic matter; phase three involves the application of fertilizer; the fourth phase covers more specialized application of fertilizers for specific plant needs.

If you have moved into an established garden which is obviously growing good crops, or if you have decided to convert to organic methods and there are no nutrient deficiencies showing up in your garden, start with the second phase. However, unless you know the acidity or alkalinity, or pH value, of your soil, you should test it before you start.

### *1. ANALYZING YOUR SOIL*

If you are starting out, especially on virgin soil, it is a good idea to have it tested at the outset so that you know where you stand. Soils that have been uncultivated for many years are often grossly deficient in one or other of the elements necessary for healthy plant growth. Chemical growers would then repeat this soil test every year using sophisticated equipment to ascertain the exact requirements of the next crop.

It is best to send a sample of your soil away for professional analysis. The kits for testing nutrient levels in soil that are available to amateur gardeners are not accurate enough to be worthwhile. Used regularly, they will indicate a trend but no more than that. There are plenty of reputable companies who do soil analysis. They will be able to tell you

the exact chemical make-up of your soil and, if there is a deficiency, exactly how much fertilizer you need to use to correct it. Remember, though, when you send the sample, to ask them to recommend organic fertilizers.

## *2. USING SOIL CONDITIONERS*

This stage deals with the general soil improvement and replacement of plant nutrients removed by previous crops. It is here that there will be variation because it depends on how much, and what type, of organic material you have available to you.

First of all, it should be understood that all organic material not actually taken for the kitchen is returned to the soil as compost, and that this should be supplemented by manure or some other bought-in soil conditioner, as necessary. Organic matter should be dug in during the autumn and spread over the soil as a mulch in the growing season. This will increase the water-holding capacity of light soils and open up very heavy soils, as well as supplying all the nutrients. If you can put sufficient organic matter on to the soil, there may be no need to add any concentrated fertilizers. However, it is difficult to define "sufficient" because the amount needed depends entirely on your soil, the weather, the plants you wish to grow and so on. You do need to have a great deal of compost and/or manure if you are going to avoid using concentrated fertilizers completely.

### *3. ADDING GENERAL FERTILIZER*

Not everyone can get sufficient supplies of manure or compost. This is, therefore, where concentrated fertilizers come in. If, for any reason, the manuring falls below the recommended levels, you will have to make up the nutrients "out of the bag". Use a general fertilizer such as blood, fish and bone meal. The application rates vary according to the soil and the plants you want to grow. In fact some crops, for example peas, can generally grow quite happily without the addition of fertilizer, so there is no need to apply it. Others, such as potatoes, will need extra. Most fruit trees and bushes will need fertilizer in the spring whether or not they are mulched with manure or compost, as will the ornamental garden.

Where any trace element deficiencies have occurred in the past, I recommend that you give the soil a light dressing of seaweed meal at the beginning of each season to make sure it does not happen again.

### *4. USING SPECIFIC FERTILIZERS*

Some crops always need special treatment even when the manure and fertilizer levels are sufficient to start with. If, for example, you are growing tomatoes in the greenhouse, they will benefit from extra feeding and a potash fertilizer to encourage flower and fruit formation. Leafy plants that remain in the ground for a long time, like spring cabbage, may need some extra nitrogen fertilizer towards the end of the winter. Plants such as raspberries are often prone to iron deficiencies

when grown in alkaline soil; this can be corrected by spraying and liquid feeding with seaweed fertilizer. It is a good idea to apply extra phosphorus, or phosphate, before planting trees or sowing to encourage root growth.

Your soil management regime should be:

- Test the soil pH and, if starting a new garden, have your soil tested. Make up deficiencies.
- Use heavy applications of manure or compost wherever possible.
- If organic matter is not available in sufficient quantities, feed with a concentrated general organic fertilizer.
- Give extra feeds for especially demanding plants or where specific deficiencies are noticed.

### **Soil Conditioners**

The best materials to use to condition your soil are manure and compost; they will improve drainage or water-holding capacity and provide nutrients, but you do need a great deal to maintain soil fertility levels. Well-rotted animal manure is the very best material to use but it can be difficult to obtain. Compost can be used as a substitute for manure but, if it is to be dug into the ground, it must be well-rotted. The

alternative soil conditioners, such as spent mushroom compost, peat and spent hops, while they are superb soil conditioners, they should not be looked upon as sources of plant nutrients.

Dig your compost or manure into the top layers of soil during the autumn and use it as a mulch during the growing season. If it is spread over the surface of the soil between growing plants in thick layers, it acts as a weed suppressant and will eventually be worked into the soil.

The amounts of organic matter required, and the method by which it is applied - either digging in or mulching - will vary slightly depending on your soil, the time of year and the plants you want to grow. Ideally, you will need to use at least two 9-liter (2-gallon) buckets of well-rotted compost or animal manure for every square meter/yard of soil in the vegetable garden. Use one bucket per square meter/yard as a mulch around trees and shrubs, or in the ornamental borders; this should also be sufficient for fruit trees and bushes.

The quantities suggested are only a guide, if you can afford to use more, do not be afraid to do so. And you can always supplement your compost or manure with green-manure crops whenever the beds are empty for any length of time. If you are unable to apply organic matter in sufficient quantities, you may have to use fertilizers as well.



### 3. Introduction to Fertilizers

The use of concentrated fertilizer is probably one of the most controversial areas in organic gardening. Opinions vary: some gardeners claim that additional fertilizer is unnecessary if the correct cultivation methods are observed, whereas others employ methods that appear to be identical to the chemical grower except that the products used are organic in origin.

Chemical growers assess the nutrient needs of each plant every year and supply those needs in the form of a fertilizer that is immediately available to the plants. They simply use the soil to hold the plant nutrients. But the result of using fertilizer as an alternative to organic matter is that the soil becomes an inert medium, devoid of life, and the lost nutrients have to be replaced every year.

The principle of organic gardening is to feed the soil rather than the plants growing in it. If high soil-fertility levels are maintained by regular additions of organic matter, the plants can simply draw on the material as it is required. There is no danger of an overdose and a steady supply is ensured by the activity of all the various organisms in the soil.

For many crops, quite acceptable yields can be obtained without the addition of fertilizers, but you have to be realistic. Fertilizers are normally required for several reasons. Firstly, you may not be able to

supply your soil with all the manure or compost needed to provide the necessary nutrients. Secondly, you may find that your soil is grossly deficient in one or more of the essential nutrients. To correct this by adding bulky organic material can take several years. It is more realistic to add concentrated organic fertilizer as well as the organic material. Thirdly, many gardeners wish to make much higher demands on their soil than even the hardest-working colony of bacteria and fungi could provide in the time.

So there are always occasions when fertilizers are required. What you must do is ensure that they are compatible with the requirements not only of the plants but also of the organisms in the soil. The beauty of organic gardening is that, provided you supply nature with the tools of her trade, she will do the rest.

## **pH**

Before deciding on a soil-feeding regime, you must first discover whether the soil is acid or alkaline. This will have a major effect not only on your cultivation technique but also on the plants you choose to grow.

Acidity or alkalinity of soil is determined by its lime content. So it is obvious that you must ascertain this before you do anything else. This can be measured in units using a pH test. Suffice it to say pH is measured in units on a scale of 1 to 14: neutral soil has a pH of 7; anything above

that is alkaline and anything below it, acid. Testing the lime content of your soil is very simple and can be done at home.

In the ornamental garden it is best to grow plants that thrive in the soil you have, rather than trying to change the pH level. There is a wide range of lime-loving plants, as well as those that prefer acid soil and many that tolerate both. In the vegetable garden, however, most plants thrive in a pH of about 6.5, so you may have to take steps to alter the lime content.

It is easier to make an acid soil more alkaline by adding lime than the other way round. Lime has other advantages too. Adding it to heavy clay soils, for example, will help bind the particles together. However, too much lime can chemically "lock up" some of the plant nutrients, particularly trace elements, so that they are unavailable to the plant roots. This will result in nutrient deficiencies.

### **Organic Fertilizers**

The scientists will tell you that there is no evidence to suggest that yields will be significantly heavier or that fruit and vegetables will actually taste any better if the plants are fed with organic nutrients instead of inorganic ones. And of course, they are quite right.

Plants will take their nutrients in the form of the same chemical elements whether they are organically or inorganically derived. Organic

gardeners do not suggest that plants actually take up different chemicals if they are grown naturally. What is true is that the chemicals in organic fertilizers will not harm the soil or its many inhabitants; the inorganic ones will. Indeed, organic feeding actually benefits soil micro-organisms as well as plants.

There are several compound fertilizers that are described as "semi-organic" or "organically based". These may be more powerful than the completely inorganic equivalent but they are not the real thing. The main difference is generally in the potash content, which, in "semi-organic" fertilizers is sometimes supplemented with potassium sulphate.

#### *BLOOD, FISH AND BONE MEAL*

A general compound fertilizer. Regular dressings should maintain nutrient levels in all soils. The nitrogen contained in this fertilizer, however, is fairly quickly released so blood, fish and bone meal should not be spread more than two weeks before the crops are sown or planted.

#### *SEAWEED MEAL*

An alternative to blood, fish and bone meal but more expensive. It is, however, better balanced and its nutrients are in a slow-release form. It contains 60 to 70 different chemical elements including the complete range of trace elements. It can be raked into the soil before sowing or

planting but its cost means that it is generally used as a compost activator and to supply trace elements. Seaweed meal can be applied at any time, but it is best used when the soil is warm to enable the bacteria to break it down, making the nutrients available to plants.

#### *HOOF AND HORN*

One of the best sources of slow-release nitrogen. The ground hooves and horns are heated to 60°C (140°F) before being packed so it is quite safe to use. It has to be broken down by bacteria before it becomes available to plant roots, so it must be applied a good two weeks before its effect is needed. Thereafter it will remain in the soil for some time.

Use hoof and horn fertilizer for a quick boost to overwintered plants, such as cabbages, in the spring or for any plants that appear to have stopped growing. Other fertilizers which are high in nitrogen include sewage sludge and cottonseed meal.

#### *DRIED BLOOD*

A very fast-acting nitrogen fertilizer. Use it where a rapid nitrogen "tonic" is required, but not later than the end of the summer or it will be washed into the subsoil. If you get frosts in your garden, do not apply dried blood later than mid-summer to avoid encouraging soft foliage that would be damaged by frost.

### *FISH MEAL*

A useful fertilizer that contains nitrogen and phosphate (phosphorus). Some manufacturers add potash inorganically, hence it can be sold as "semi-organic".

### *BONE MEAL*

This popular phosphate fertilizer is used for activating root growth. Buy bone meal that is clearly marked "steamed". In its raw form it can carry anthrax - but it is safe if steam treated. Even so, many gardeners wear gloves when spreading it as a precaution.

### *DRIED ANIMAL MANURES*

These contain only small amounts of the major nutrients but are rich in trace elements. Mix them with peat or mushroom compost if you cannot get bulky manures.

## **How to Apply Fertilizers**

The application of organic fertilizers does not need to be quite as precise as the application of inorganic compounds. Most release their nutrients slowly so there is little chance of them scorching young plants, although you must keep granular fertilizers off the foliage.

It is impossible to give precise instructions as to how much fertilizer to apply because so much depends on your soil, the weather and the plants you wish to grow. The only way to find out is to use the "rule-of-thumb" method of simply adding general fertilizer if growth is unsatisfactory and specific fertilizers if deficiencies show up on the plants.

### *GRANULAR FERTILIZERS*

Granular fertilizers should always be used to provide general nutrients as a supplement to compost and manure. It is usually applied in the spring or before planting. Sprinkle the fertilizer over the soil as recommended, being very careful to avoid it touching the foliage, then rake it into the soil:

The application of granular fertilizers is normally recommended in "handfuls per square meter/yard". If the recommendation is to spread the fertilizer down a row of fruit or vegetables, you will need to convert the square meter/yard measurement to a linear one. This is not difficult: if the rows are 30cm (12in) apart, spread the amount of fertilizer recommended for a square meter/yard along 3m (9ft) of the row. If they are 15cm (6in) apart, it is 6m (18ft) along the row and so on. In this way, the correct distribution of fertilizer can be maintained.

### *LIQUID FERTILIZERS*

These are easy to put on. Dilute the liquid according to the manufacturer's instructions and simply pour it on. But the golden rule when liquid feeding is never to do so when the soil is bone dry - you may scorch the roots. Water with clear water first and let it drain away, then add the liquid fertilizer.

If you are feeding plants growing in pots, simply fill up to the rim of the pot. If they are growing in soil, water the fertilizer on generously in a fairly wide area around the plants, until the top of the soil is saturated. For plants, such as greenhouse tomatoes, that are regularly fed in this way, it is a good idea to bury a flower pot in the soil near the plant and fill that. If you use this method, the fertilizer gets deeper into the soil and you also know exactly how much you are giving the plant every time.

The advantage of liquid feeding is that, since plants can only take up nutrients in liquid form, the nutrients are available immediately; granular fertilizer has to be dissolved first. The disadvantage is that liquid fertilizer does not remain effective for as long as granular fertilizer and is leached into the subsoil fairly quickly. Liquid feeding is used to supply short-term nutrients to hungry plants and to correct deficiencies; it should not be considered as an alternative to solid feeding.

#### *FOLIAR FEEDING*

This method involves spraying the leaves of the plant. It is faster acting but shorter lived than other methods so is really only of value for rapid



remedial action when deficiencies are seen. Liquid seaweed sprayed on to leaves, for example, is something of a "miracle cure" for trace element deficiencies. However, it should always be supplemented by feeding the soil with seaweed meal fertilizer as well.

## 4. Dangers

Over the last fifty years or so, gardening practices have closely followed those of the commercial grower and even the farmer. New methods of cultivation which improve yields or which reduce losses from pests and diseases have been discovered, and these have been translated into gardening terms. A great deal of research has also been directed at finding new methods of growing plants commercially. There is no doubt that much of the information that has come from this research has benefited the gardener, but it would be a mistake to fall into the trap of following the commercial grower automatically. Nowhere has the mimicry of the professional been more evident than in the field of pest and disease control. Just as soon as a new chemical has been produced for commercial use, so a slightly diluted version of the chemical appears in the garden shops and centers, accompanied by seductive claims that it has proved to be more effective than its competitors.

You have to remember that your requirements are very different. The farmer or commercial grower is constantly on the look-out for higher yielding, larger and therefore more profitable varieties of plants, while you are after fruit and vegetables with flavor, that are not contaminated with chemicals. In addition, he or she may have many acres of, for example, cabbages, that are infested with caterpillars, and so have no alternative but to spray them. If you have only one or two rows of cabbages, you do not need to cover them with chemicals. Instead, walk

down the rows two or three evenings a week, pick off the offending creatures and drop them into a jar of kerosene. Likewise, a few well-directed squirts of soapy water will wash any aphids off your couple of dozen rose bushes in next to no time.

The plain fact is that, by cultivating a natural organic garden, you simply will not come across the pest and disease problems that can face the mono-culture grower. Where large acreages of one crop are grown year after year, a rapid build-up of pests and diseases can easily occur. They have a plentiful supply of food and virtually no competition. In the organic garden where there is a great diversity of planting, you will attract the complete spectrum of wildlife - insects, birds and small mammals - that will create a natural balance. The result is that the hover-flies and ladybirds eat the aphids, and the birds eat the caterpillars and so on no insect pest, fungus disease or bacterium will ever have it all its own way, so there will never be an unnatural build-up of one species. But, if you start to think that all the insects are friendly and all the fungi benign, be warned that pests and diseases will rear their heads just as surely as they will anywhere else. Prevention is the best approach and there are many physical ways of doing this. Although it would be a foolish over-reaction to think that you can do without pesticides completely, you should only resort to the few organic pesticides available when all else fails.

### **Things to Do**

Start by growing strong, healthy plants that will have the ability to resist attacks from pests and diseases. Always plant into fertile soil and make sure the plants never go short of water and food. Rely as much as you can on physical methods of pest and disease prevention and control and constant vigilance, and you will cut down the need for chemicals. Nature will do the rest for you.

Nature has worked out the most complex "balance of power" that makes modern international politics look like a nursery game. Build up as diverse a collection of plants as you can, including as many native flowers, trees and shrubs as possible, especially those that grow in your own locality, and provide a small area of water. By doing this you will build up a varied colony of useful insects and birds and thus keep problems to a minimum.

### **The Healthy Garden**

The very first rule is to adopt good cultivation practices. The organic approach to gardening - feeding the soil instead of the plant - produces much stronger growth that is, firstly, not so attractive to pests and diseases as the soft lush-ness of a force-fed plant and, secondly, able to cope with an attack if it does occur.

Keep the garden as clean and tidy as possible. Never leave rubbish lying around. If you've been weeding, put the waste on the compost heap straight away. If you've been thinning seedlings, this is even more

important because insect pests are often attracted by the smell of the bruised stems.

Put on healthy plant waste on the compost heap. Destroy any plants that show any signs of disease. Much the same rule applies to prunings from the fruit trees. They are quite likely to be infected with diseases, so are best destroyed. You can use the ash as a fertilizer.

Use only pots and seed trays that have been thoroughly cleaned and, if possible, sterilized with boiling water or steam. Keep your greenhouse clean too and, if you do see a sign of a pest or a fungus on a leaf, pick it off straight away and get rid of it in the garbage can.

Make a habit, especially in the summer, when pests and diseases are most likely to appear, of walking round the garden at least once a day. Take a hoe and a plastic bag with you. Remove any errant weeds with the hoe, but above all, keep an eye open for the first signs of attack from pests and diseases. If you see signs of mildew or you find a caterpillar - pick it off immediately, put it into the plastic bag and then the garbage can. The first attack of aphids can often be removed by simply rubbing them stem of the attacked plants with your finger to squash them.

It is of vital importance to ensure that your plants are healthy when you first buy them. It is only too easy to buy in a load of trouble in the form of virus or fungus diseases or even pests or their eggs. Some plants are covered by a certificate of health from the Government. In many

countries it is possible to ask for a certification number to show that the plant you are buying is free from disease. Many fruit trees and seed potatoes come within such schemes.

Check ornamental trees, shrubs, herbaceous perennials and even annuals carefully before buying them; reject anything that shows the slightest sign of disease or pest attack, or of physical damage.

Examine bulbs, corms and tubers closely. They should be firm all over and the skins should be fairly well intact. A loose skin can often mean that the bulb has become shrivelled.

In some cases you should consider replacing your stock with new plants after a few years. Strawberries, for example, will lose their vigor after a while. This is often a sign that they have become infected with virus diseases and anything you propagate from them will also be infected. Potatoes too can become infected with virus diseases spread by aphids. The seed potatoes you buy are generally grown in areas where aphid attack is rare, so they are likely to be free from virus. So, unless you can be quite sure that your crop has not been attacked by aphids, it is worthwhile buying in new potato tubers every year.

Different varieties of the same plants may have varying degrees of resistance to pests and disease. Some varieties of potato, for example, are less susceptible to slug damage, while others show resistance to

potato eelworm. There is quite a distinct variation in resistance to fungus diseases.

Plant breeders are constantly trying to breed pest- and disease-resistant plants, so it is worthwhile checking the current position on new varieties before buying anything that is notoriously disease-prone. There are, for example, several varieties of snapdragon that have been bred specifically to resist rust fungus, there are eelworm-resistant Phlox and virus-resistant varieties of many plants including potatoes, strawberries and tomatoes.

Where it is difficult to breed-in resistance, it is sometimes possible to have the best of both worlds by grafting the required variety on to a resistant rootstock.

Of course, you should also employ the same safeguards with plants you have raised yourself, though here it's much more difficult to be ruthless about weeding out the weaklings. But bear in mind that a young plant that has been infected with a disease or attacked by a pest is at a disadvantage right from the start. Throw it away to avoid infecting other plants.

Keep your greenhouse scrupulously clean. Use plastic seed trays and pots for raising seeds and pot plants because they are easier to sterilize; wooden seed trays and clay pots are porous so can harbor pests.

Time your spring sowing so that plants do not have to remain in the greenhouse getting leggy and pot-bound because the weather is too cold for them to be planted out. The real secret is to get young plants growing away and then to keep them growing steadily. In some cases, this is all you need to control even the most virulent and damaging of diseases.

One final point to bear in mind when buying or raising plants from seed is that F1 hybrid varieties have much more vigor than those raised from open-pollinated seed. An F1 hybrid is the result of a first-generation cross between two selected parents. These first generations always have much more vigor, which will help to carry them over an early attack.

#### *COMPANION PLANTING*

This is a technique practiced by many organic gardeners. The theory behind companion planting is that plants have specific likes and dislikes concerning their close companions in the garden and will do better if planted in close proximity to the correct plant. Similarly, by planting a particular species in the garden you can reduce the number of weeds or attract certain pest predators.

Many of the recommendations for companion planting are based on folklore and, as with many of these tales, there is some truth in them. There is a well-known theory that, because carrot-fly are attracted by smell, they can be prevented by planting carrots between rows of



onions, so the smell of the carrots is disguised. On the other hand, the cabbage white butterfly is attracted to its host plant by smell and it can be fooled by planting the highly aromatic French marigold (*Tagetes*) between the rows of cabbages. Many scientifically controlled trials have been conducted which indicate a reduction in attack when this was done. Many gardeners have also reported similar results with eelworms, soil pests that attack potatoes in particular, where French marigolds are grown. Scientific research has confirmed that this is indeed due to a secretion from the roots of the marigolds. French marigolds are also said to help kill weeds, in particular couch grass.

There is absolutely no doubt that marigolds (*Tagetes* and *Calendula*), planted near tomatoes or roses, for example, greatly reduce the frequency of attack by aphids - the most persistent of all garden pests. This is simply because they attract hover-flies whose larvae devour aphids by the thousand. Hover-flies are the most valuable pest predators in the garden and there are different species all over the world. Before laying her eggs, the female needs protein, which she gets from pollen. She then lays individual eggs on colonies of aphids so that the larvae have a readily available source of food when they hatch. The hover-fly has a short feeding tube so needs to feed from an open-structured flower where the pollen is easily accessible. Therefore by planting marigolds (*Tagetes* and *Calendula*), poppies (*Papaver* sp.), nasturtiums (*Tropaeolum*) or dwarf morning glory (*Convolvulus tricolor*) between plants, you minimize aphid attack.

It is more difficult to attract some of the other predators because they do not necessarily feed on flowers. Some, such as ladybugs, lacewings and several species of wasps that feed on and lay their eggs inside aphids and other soft-bellied pests including caterpillars, can be encouraged by providing as varied a collection of plant life as possible.

It has also been found that some pests are attracted to their host plants by sight. By mixing ornamental plants and vegetables in an ornamental border, you can camouflage the host plants which deters the pests. There is also evidence that vegetable plots that are left weed-infested suffer less than clean ones. However, the yields are also lower because the weeds compete for the same light, nutrients and water.

By careful consideration of which plants are cultivated together, you can promote healthy growth and utilize a completely natural form of pest control.

## **Animals**

The most destructive pests in gardens are the larger ones - birds, deer, rabbits, moles, mice and so on. There is no doubt that the most effective control for this type of pest is to prevent them reaching the crops by physical means.

## **BIRDS**

There is no really effective bird deterrent available. Scarecrows are reasonably effective for a day or two but, after a short while, the birds get used to them and take no notice. This is even so with the more elaborate electric scarecrows that have waving arms, flashing lights and screaming sirens or blazing shot-guns. If moved around constantly, they have some effect but, in the end, they are more likely to frighten your neighbors than the birds! If a scarecrow is combined with regular shooting it will be more effective, but you will also disturb the natural balance and that is biting the hand that feeds you.

#### *THE PRODUCTIVE GARDEN*

The only really effective control for birds is netting and that is not nearly as expensive as it may seem. Plastic netting is relatively cheap and will last a very long time if it is used carefully.

The ideal is to build yourself a fruit cage to cover the entire productive garden. Support the netting on strong posts and wires and secure it at the edges with short wire staples.

If you do not wish to go to that kind of extreme, cover only the rows of vulnerable crops. You can place a row of small wire hoops along the beds of low plants and drape nets over the top. Alternatively, with crops such as strawberries or rows of fruit bushes, you can simply drape the netting over the row. If there is a danger of plants growing through the netting, as with peas for example, it is better to support the net on stakes so that

it is higher than the plants. Otherwise you will damage the plant when you remove the netting.

Unlike most of the insect pests, birds generally cause most damage during the winter, when there is little else around for them to eat. They will attack the fattening buds of fruit - particularly blackcurrants. The cabbage (Cruciferae) family are also greatly at risk, especially when it snows, because they are often the only edible plants visible, so will attract all the birds in the area. The answer is to drive in a few short posts along the row, put a jam-jar on the top of each post and drape the netting over the top. This can be a nuisance when you want to cut a cabbage from the middle of the row, but at least you will have some left to harvest! Ensure that the netting is firmly fixed at ground level or birds may still get under the netting and could be injured trying to get out.

#### *THE ORNAMENTAL GARDEN*

This is rather more difficult because plastic netting will do nothing for the appearance of the flower borders. And some birds are particularly keen to remove buds from all kinds of plants, particularly burgeoning crocuses in the spring. It's odd that, with crocuses, they seem to go mainly for the yellow ones so they are to be avoided if birds are a problem. The rest can be protected by stringing black cotton over the top. The birds do not see the cotton strands and, if they touch them, they will panic and fly off.

New grass seed is extremely vulnerable to attack by birds. Obviously it is impossible to rake in all the seed, so the birds are immediately attracted. Again, they can be deterred by black cotton, but this is not practical over large areas. A more effective method is to cover the seeded area with lightweight plastic or even netting. It can be removed as soon as the grass germinates. Plastic has the great advantage that it not only keeps the birds away but it also encourages germination of the grass seed by warming the soil.

### **OTHER ANIMALS**

Animals such as hedgehogs, frogs and toads should be encouraged in any garden because they feed on garden pests. However, others such as deer, rabbits, moles or mice, must be kept out of the garden because they either feed on the plants or undermine them. Good fencing will deter deer and rabbits, but the only solution to mice and moles is to trap them.

#### *DEER*

If you live in the country near woodland, deer can be quite a problem because they eat most vegetation and strip bark from trees in winter.

Deer can jump a 3m (10ft) fence, so building one tall enough to keep them out is expensive. An alternative is to use an electric fence powered by a car battery or through a transformer run from your mains

electricity. It is important to get an expert to install this type of fencing, so seek the advice of an agricultural merchant.

### *RABBITS*

Rabbits are a problem in many rural gardens because they eat almost anything.

There is only one way to control them effectively. No amount of shooting, trapping or ferreting will keep their numbers down; they have to be fenced out with wire netting. It is important to use 2.5cm (1in) mesh netting and to bury it at least 15cm (6in) in the ground, with 75cm (2ft 6in) above the ground.

### *MICE*

Mice are not usually a serious problem, although in some regions pine mice (voles), as well as the common Field mice, can be very destructive. They eat everything from tulip and lily bulbs to carrots and rose and holly roots.

To prevent them, you can either trap them with a conventional mousetrap or buy a cat.

### *MOLES*

These animals can be a particular problem because not only do they damage plant roots when they burrow underground - sometimes even leaving the roots suspended in mid-air-but they also eat large numbers of worms. They undermine lawns and borders as well, leaving large mounds of earth and uneven soil sinkage.

If all else fails, the only reasonably effective method is to trap them, though it goes against the grain because they are very attractive creatures indeed and do destroy harmful grubs.

Barrel traps are the most effective and the moles are at least killed instantly. These are set in the main runs and covered with a small amount of loose soil to keep the light out of the run. Mark the position of the barrel traps with a stock or colored marker so that you do not forget where they are and dig them up daily.

## 5. Weeds

There is no such thing as an organic weedkiller, and whatever may be claimed about the safety of chemical weedkillers, there is always danger in their use. If there wasn't, there would be no need for the elaborate testing and strict controls enforced by governments. Chemical manufacturers have, however, tried to persuade us that we must follow the commercial grower in soaking our plants and our soil with poisons when there are very few advantages and many dangers in doing so. The commercial grower's problem is just not the same as ours, and there is no doubt that prolonged use of chemicals has a very damaging effect on soil organisms. It may seem attractive to use a chemical to kill everything in a new garden so that you can start clean and stay on top of the weeds. It is certainly an easier way out, but it is done at the risk of killing the beneficial inhabitants of the soil and even harming yourself. At a horticultural research station in England a few years ago, during a quite unconnected experiment on soils, it was noticed that in the soil on land that had been regularly treated with a paraquat/diquat mixture there were no earthworms. Subsequent examination revealed that most other beneficial soil organisms were either reduced in numbers or not present.

Whether you are trying to clear a new garden of weeds, or deal with their habitual menace in an established one, there are many physical methods of weed control. The basic principles to remember all the time



are as follows:

- All green plants must have access to sunshine to survive. There are a variety of light-deprivation measures that can be used by the organic gardener to control weeds.
- Constant vigilance is very important; remove weeds as soon as you see them. Regular hoeing will deny persistent weeds a foothold.
- Never let weeds flower or seed. Cutting them down and digging out the roots takes a moment, while coping with the hundreds of seedlings they may disperse is a time-consuming job.

### **Uncultivated Ground**

If you are starting a brand new garden, taking over a weed-infested one or incorporating a new area, the first stage in weed control is to make the ground as clean as possible right from the start. First, clear the ground completely by digging it, removing weeds as you progress. Then cover the ground; sow the lawn area and plant a "cleaning crop" in the borders.

Begin by digging over the whole site and removing as much as you possibly can. If the ground is infested with one of the more pernicious weeds, like couch grass (*Agropyron repens*) or ground elder

(*Aegopodium podagraria*), you should not expect to win first time as any tiny piece of root that is left in the soil may multiply to form a massive root again.

Annual weeds can then be put on to the compost heap provided they have not been allowed to seed. Roots of other perennial weeds, those that continue year after year, such as dandelions (*Taraxacum officinale*), and docks (*Rumex* sp.) should be removed and destroyed. Never put any perennial weeds on the compost heap because they will only be transplanted again when you spread the compost.

If you plan to lay a lawn, the area can be sown straight away after digging. Even if the weeds do come through again, regular use of a mower will eventually eradicate all but the "rosetted" types like dandelions and daisies which grow close to the ground. They are easy to control afterwards by simply dropping a pinch of table salt into the center of the rosette or by digging them out of the lawn with a penknife. You may have to repeat the process a few times but they will disappear.

Areas planned for ornamental borders or vegetable and fruit plots, in fact any bare soil, should be planted for the first year with a "cleaning crop". There is none better than potatoes, which will not only help clean the soil of weeds but will pay for themselves into the bargain. Potatoes have two great virtues as a cleaning crop. First of all their cultivation entails turning over the soil three times in the year - once when they are planted, a second time when they are earthed up and finally at harvest

time. Secondly, they grow a dense canopy of leaves which excludes the light from any weeds that may be bold enough to try to compete. Together, starvation of light and not being allowed a foothold encourage most weeds to give up the ghost.

Nonetheless, some weeds still survive. Plants that climb by twining round their competitors, such as bindweed (*Convolvulus arvensis*), will not be crowded out so easily. Their climbing habit enables them to reach the sunlight even through a dense canopy of leaves, so they can always make enough food to store in their labyrinthine root system. So, in the second year, you will still have problems. But, on a small scale, they are not difficult to overcome.

### **Hoeing**

The hoe is the most effective tool in your armory, and it should be used regularly, preferably during dry weather. By pulling it through the top layer of soil you can uproot any weeds that appear.

If you are waging war against persistent weeds like bindweed (*Convolvulus arvensis*), horsetail (*Equisetum arvense*), or couch grass (*Agropyron repens*), you should never allow them to reach that stage. The rule here is to hoe before you see any weeds at all on the surface. If you do that you will cut off the growing tips while they are still beneath the surface and before they have had a chance to benefit from the sun.

It is fairly easy to cope with weeds in the vegetable plot because they are easily seen, but in the borders they have a habit of hiding under foliage. So, when you take your evening walk round the garden in spring and summer, take a Dutch hoe with you and make a point of tickling between a few plants with it. Naturally, if you see so much as a glimpse of a weed, you must remove it immediately.

It must be stressed that hoeing will only kill persistent perennial weeds if you prevent them from getting above the soil surface. If you allow such weeds to do this, and you then turn them in or, even worse, chop them up with a power tiller, you will simply propagate them and make matters much worse.

For weeding, a Dutch hoe is probably best. It should be used walking backwards to avoid treading on the weeds once they are uprooted. If you walk forwards you will probably push them back into the soil and effectively transplant them, while walking backwards leaves any weeds sitting on the soil surface, a prey to drying winds and the heat of the sun.

I would never be without a wheel hoe, particularly in the vegetable garden. This is a hand-pushed tool with a single wheel at the front and a cutting blade behind it. It may seem that there would be very little advantage in this over the conventional Dutch hoe but it is, in fact, very much quicker. Once you have hoed between the rows a couple of times to create a soft layer of soil on the top of the path, it is no trouble to push the hoe along at a slow walking pace.

If you do decide to invest in one, it is a good idea to adjust the distance between the rows when planting to suit the width of the hoe. If this makes the rows too close together so that plants are in danger of competing with one another or too far apart so that land is being wasted, simply adjust the planting width in the row. So, if you would normally plant, say, onions with 23cm (9in) between the rows and 15cm (6in) between each onion in the row, make the rows 30cm (12in) apart to suit the hoe width and allow 7cm (3in) between the plants in the row. This will save you a lot of time.

## **Mulching**

An effective way to exclude light and prevent weeds appearing is by mulching (covering the soil surface with a layer of one of several materials). Some mulching materials are not very attractive to look at, so you will want to use different materials in the vegetable and fruit garden to those used in the ornamental borders. Bear in mind, though, that the most effective and attractive method of keeping weeds out of the ornamental borders is to provide competition in the form of plants that create a canopy over the soil. Ground-cover plants are useful in this respect.

### *BLACK PLASTIC*

One of the most effective mulches for eradicating perennial weeds is black plastic. When the plastic is laid over the soil, no light at all can reach the leaves and the weeds will die. They will try to work their way to the sides of the mulch and appear there, so keep a special lookout at the edges of the sheeting and be ready with the hoe. The sheeting must be anchored securely or high winds will get underneath and tear it or even blow it away.

Black plastic is an ideal method in the vegetable garden or between rows of fruit. Before laying the sheeting, cultivate the soil between the rows and mound it slightly in the center so that the rain will run off the sheet towards the base of the plants.

Another method is to lay a wide sheet across the entire bed and plant through it by cutting small cross slits. This is ideal for strawberries and potatoes and there is no reason why it should not be used for any other long-term crops like cabbages, cauliflowers and Brussels sprouts. This is particularly useful for potatoes because they will not need to be earthed up.

The advantage with a wide strip is that a much bigger area can be kept weed free with no chance of weeds sprouting out between the edges of the sheeting. The disadvantage is that it is very difficult to water. The best way is to lay a seep-hose underneath the sheeting and leave it there for the season. This will seep water along its whole length, so all you need to do is attach a hose to it at intervals to give the soil a good

soaking. There will be little water loss through surface evaporation so less water will be required than normal.

Naturally, plastic is not attractive enough to be used on its own on the borders. It can, on the other hand, be covered with gravel or even a thin layer of soil to enhance the appearance.

### *PAPER*

Of the biodegradable materials available, use tough brown paper rather than the biodegradable plastic. The latter is supposed to avoid the necessity of removing the mulch when the crop has been harvested but, in fact, the plastic deteriorates into strips which blow about all over the garden. The tough brown paper is used in exactly the same way as plastic - simply roll it out onto cultivated and leveled soil, anchor the edges by burying them in a shallow trench, and then plant through pre-cut slits. After the crops have been harvested, it is either dug or rototilled into the soil, where it will rot down. This is ideal for use on deep beds. Paper can also be used in the ornamental garden without a covering of gravel since it is much less obtrusive than polythene.

### *NEWSPAPER*

A cheaper, but more time-consuming, alternative is to use newspaper. Lay about six sheets on top of one another, and again, anchor the edges

by burying them. The paper tends to get quite hard and will certainly not rot for quite some time or until it is dug into the soil after harvesting.

### *COMPOST*

A much more attractive mulch can be achieved using a 3-in (7-cm) layer of a loose material such as garden compost. This is a fairly inert material and therefore inhospitable to weed seedlings, but it needs to be at least 3 in (7 cm) or more deep. It won't prevent all weed seedlings from germinating but will reduce numbers and make them easier to pull out. Animal manure can also be used as a mulch, but again, it should be well-rotted. Apply in a thick layer, like compost. Fresh manure can damage plants by scorching young shoots.

### *BARK MULCHES*

The most effective material in the ornamental borders is either shredded or chipped bark. It is available in various grades of coarseness and it does not seem to make much difference which one is used. They should all go on at about 3 in (7 cm) thick, which should be sufficient to control all annual weeds and many perennials, too.

The big disadvantage with bark of all types is the price. It is very expensive, although one application will last several years. A cheaper alternative is to invest in a brush chipper and make your own wood chips, even though it does take some time to make enough.



### *GRASS CUTTINGS*

If they are applied thickly enough straight from the mower bag, grass cuttings are effective as a mulch for weed control. However, they must be at least 6 in (15 cm) deep, and this can lead to problems. If the layer is too thick, no air will reach the bottom, and if rotted down anaerobically the grass cuttings become a smelly, slimy mass and are not only unpleasant but also quite useless as a soil conditioner.

### **Do You Know Them?**

Of course, not all weeds are to be despised and the organic gardener who gets rid of them all is wasting a valuable natural asset. Many weeds will attract insect predators, some also provide food for birds and butterflies and others, like the clovers (*Trifolium* sp.), can be used to fix nitrogen in the soil. So, before making an indiscriminate onslaught on native plants, pause for thought. Indeed, I recommend growing cultivated plants in the ornamental garden that are close to their original wild species because they will attract the same insect life.

However, I am not suggesting that you allow nature to take over, as your cultivated "foreigners" will be at the mercy of some pretty tough "locals", who will give scant regard to "entente cordiale". Most weeds must be rigorously controlled, but there are a few that should be allowed to stay if you have room.

## *BAD WEEDS*

The underground creepers should never be allowed to flourish or they will take over in next to no time. Amongst these be particularly ruthless with ground elder (*Aegopodium podagraria*), bindweed (*Convolvulus arvensis*), couch grass (*Agropyron repens*), Canada thistle (*Cirsium arvense*), rosebay willow-herb (*Epilobium angusti-folium*) and Japanese knotweed (*Polygonum cuspidatum*). The surface creepers like creeping buttercup (*Ranunculus repens*), ground ivy (*Glech-oma hederacea*) and cinquefoil (*Potentilla* sp.) are slightly easier to control, but be diligent.

Weeds that spread by seed are not difficult to control, provided they are pulled out or cut down before they have a chance to seed. Keep an eye out for bull thistle (*Cirsium vulgare*) and broad-leaved willow-herb (*Epilobium montanum*).

Plants with tap roots (long, thick, fleshy roots that go straight down into the soil) like docks (*Rumex* sp.) and cow parsley (*Anthriscus sylvestris*) should be dug out.

Storage roots (tubers, corms, bulbs or rhizomes) often break off in the soil when the plant is pulled up and this can be a means of propagation. The worst of the lot is oxalis, which must be dealt with as soon as it shows even an exploratory leaf! Constant hoeing is the only answer, unless you can leave a sheet of black plastic in place for at least a year.

### *GOOD WEEDS*

Having made sure that the real villains are banished forever, try to give room to some of the less invasive plants. As gardeners, our interest lies in the cultivation of plants for beauty and interest and for the purpose of feeding our families. How far you allow nature to take over is a matter of judgement and will depend largely on the size of your garden, and the range of wild plants you can grow will depend upon the soil, site and location. The pretty yellow snapdragon flowers of toadflax (*Linaria vulgaris*) and the pure white clusters of white campion (*Lychnis alba*) or red campion (*Lychnis dioica*) are always allowed to remain. In the borders where these "weeds" have access to artificially fertile soil, they really thrive and produce flowers that rival any cultivated hybrid.

It has been said that if the dandelion (*Taraxacum officinale*) only grew in Tibet, we would be sending plant hunters to collect it and we would pay huge sums of money to nurserymen to propagate it. It may be common, but it is an undeniably pretty flower. Do not let it seed, however, or it will outstay its welcome.

The stinging nettle (*Urtica dioica*) is an antisocial plant, but do allow some to remain if you can because it is an extremely important food for butterflies.

The corn poppy (*Papaver rhoeas*) used to be a common sight before chemical weedkillers made it virtually extinct in cornfields. It is a favorite with finches when it seeds, so it is certainly worth growing.

Groundsel (*Senecio vulgaris*) and herb robert (*Geranium robertianum*) are valuable nectar plants for butterflies and bees, but can be a nuisance if allowed to seed.

If you have an old tree stump in the garden, you can make an attractive feature of it by covering it with ivy (*Hedera helix*). Many birds and insects use ivy as a home and a food plant.

Allow chickweed (*Stellaria media*) to grow in winter to help prevent the ground becoming waterlogged. It will rot down after digging in, supplementing compost and manure. Do not let it grow in summer as, once it gets a hold, it can be particularly troublesome.

The teasel (*Dipsacus fullonum*) is a tall, stately plant with large seed heads which attract goldfinches, who will travel far for the seeds. The flowers attract butterflies and other insects.

Another insect attractor is lamb's quarters (*Chenopodium album*), which was a favorite vegetable in the Middle Ages.

Finally, there are the leguminous plants that will fix nitrogen and release it into the soil once they are dug in. For example, the medicks (*Medicago* sp.) and clovers (*Trifolium* sp.) can be allowed to remain in winter.

## 6. Cultivation Tips

If you have difficult soil, either in a new garden or in your existing plot, and poor drainage seems to be responsible, then there is much you can do to alleviate the problem. You can bring about dramatic improvements in the condition of your soil by adopting the correct cultivation techniques and by the addition of plenty of organic matter and free-draining material.

### Drainage

Badly drained soil can be a problem. But a distinct lack of realism persists in relation to the subject of drainage. There is a great deal you can do to improve the soil drainage by digging and incorporating organic matter and grit. In some areas it is also possible to install a drainage system. However, there is no point in digging out and laying an elaborate system of drainage pipes unless you have somewhere to drain the water to. It is sometimes suggested that you dig a soakaway in one corner of the garden. This is a hole filled with gravel or other drainage material that will, in theory, absorb excess water from your land. In fact, a soakaway can only take so much water and, once it is full, you are back to square one again.

The only possible way that a drainage system can be effective is if you are lucky enough to have a drainage ditch near the garden into which

water can be drained and subsequently removed. It is sometimes possible to obtain local authority permission to run your drainage system into the public storm drains, but make sure you enquire before you start laying your drains.

If you have an outlet for the water, a herringbone system of drains is ideal. The distance between the "arms" of the system will vary according to the soil - constantly wet soil needs the arms closer together than soil that has only a mild problem. On average, 2.5-3m (8-10ft) between arms is ideal.

Fill the arms with twiggy material or, better still, earthenware or perforated plastic pipes, available from agricultural merchants, then cover them with soil. Plastic pipes are no cheaper than the earthenware ones, but they are much easier to lay-just roll them out into the trenches. On land that lies very wet, this kind of effort will be amply rewarded. However, in reality, it is rarely necessary to go to these lengths.

The most common reason for badly drained land is that there is an impervious layer of compacted soil beneath the surface. This is often caused during the building of a house. Immediately after construction, the builder covers compacted soil with extra soil, unfortunately often subsoil, which is guaranteed to cause wet conditions. You can usually solve the problem by digging to break up the compacted layer.

Sometimes the impervious layer is caused by constant ploughing to the same depth, so if you have a new house built on land that was farmed, dig deeply to investigate any hard layer of soil that might be present.

If, however, the problem is simply one of heavy soil, you can generally overcome this simply by using the correct cultivation methods without resorting to complicated drainage systems. Dig deeply, incorporating gravel and lots of organic matter, to raise the areas that will be cultivated. It is difficult to be precise because each piece of land requires slightly different amounts, but one or two bucketfuls each of gravel and organic matter per square meter/ yard should be sufficient. Improvement will take some time to bring about, but just growing plants on heavy soil helps improve drainage by opening up the soil.

In the ornamental garden, if you raise the flower borders, your lawn will be at risk of constant dampness. To counter this, put down a 15cm (6in) layer of ash or gravel below the top-soil before sowing or turfing a new lawn.

### **Digging**

Hand digging is the main method of cultivating the soil: it breaks up compacted land, introduces air and allows water to drain away and roots to penetrate. It also enables you to work organic matter into the lower levels, increasing the depth of the topsoil. Prepare all new ground by



double digging, then single dig every year in autumn for heavy soils and in spring for light soils.

It is best if you dig heavy soils in the autumn, before the worst of the winter rains makes cultivation difficult. Choose your moment carefully, when the soil is neither too dry and hard nor too wet and sticky. If necessary, cover an area of soil with polyethylene to keep it dry.

When digging heavy soils in winter, throw the spadefuls forwards, leaving them rough and unbroken for the winter. This leaves the maximum amount of soil surface exposed to the drying winds and to the frosts. By the spring, the weather will have broken the surface down to a fine tilth that you will only have to rake to make suitable for sowing. Leaving the soil rough over winter also allows heavy rains and frost to kill weeds and pests, as well as making them more accessible to birds and other predators.

Sandy and limy soils will crumble to a fine tilth more readily than heavy soils. The problem with light soils is that they drain easily, causing leaching of the nutrients. To minimize this, keep the ground covered for the winter by sowing a green-manure crop in autumn and digging it in a short time before sowing.

Digging can cause severe back strain or it can be a healthy, invigorating and enjoyable exercise - it all depends on using your common sense.

- Never dig when the soil is wet enough to stick to your boots - you risk spoiling its structure.
- Start by using a spade and fork that are the correct size for you. You gain nothing by using oversized tools, which simply tire you quickly and slow you down.
- Never take spadefuls that are too big to handle comfortably. By taking smaller amounts, and not straining yourself, you can dig more for longer.
- Always take your time: there is no point in rushing. Adopt a rhythmic and methodical approach to digging, being conscious all the time of avoiding strain. As soon as you feel you have had enough or you begin to find it difficult to straighten up - stop! It is at this stage that you are likely to do damage to yourself. Above all, don't try to do all the digging at once. Leave plenty of time so that you can do it in stages.
- Finally, keep your tools in good, clean condition. Carry a scraper in your pocket and use it regularly to clean soil from your tools. When you finish, clean the tools thoroughly and rub them over with an oily cloth to prevent rust.

Whenever you are digging, you should put any perennial weeds in a pail and then burn them or throw them away. Annual weeds can go in the bottom of the trenches to add to the organic content of the soil. It is sometimes suggested that you can scrape annual weeds off the soil surface with a spade before starting to dig. In my experience, however, there are always a few perennials mixed with them and they can be difficult to recognize without their foliage. Thus, it is best to remove them by hand as you dig.

### **Raking**

The soil must be raked level before you can start sowing. This is a technique that can be learned only through experience. There are a few basic rules. First, choose a rake that suits your body size; a large-headed rake in the hands of a small person will be difficult to control.

Second, try not to lunge forward with the rake, pulling back soil from some way away; it will result in a wavy, uneven surface. Instead, reach forward no more than about 12 in (30 cm) and keep the head of the rake nearly parallel to the surface of the soil.

Finally, take time to step back now and then, squat down, and squint across the soil surface, looking for any high and low spots in the soil.

### **Hoeing**

This is the principal organic method of weed control. There really is no need to resort to chemicals to keep your garden weed-free.

Always hoe before it is necessary to do so. If you have perennial weeds, for example, cutting off their shoots below ground level, so depriving them of light, eventually starves them into submission. Annual weeds are not so much of a problem. Hoe them out when they are quite small—no larger than about 1/2 in (13 mm)—and certainly don't let them flower or seed.

Choose a hot, sunny day for hoeing. That way the weeds will lie on the surface, where their roots will soon become dried out and die, returning their organic matter to the soil. If hot days are too infrequent, try to rake off as much of the weed as you can, then use a Dutch hoe to lift the root. Walk backward to avoid stepping on the hoed weeds and effectively transplanting them.

### **Mulching**

This is a technique that involves covering the surface of the soil—either with organic matter to condition the soil, or with polythene or paper to inhibit weed growth. Mulching with well-rotted manure or compost in the spring is more important than most people realize. In an organic garden, the regular addition of bulky organic matter is essential. A 2-3-in (5-7.5-cm) layer helps to retain moisture in the soil by preventing evaporation, and it can also help to control weeds. The compost or

manure adds vital nutrients and will eventually be incorporated into the soil by the action of the weather and soil organisms. In addition, it will help to prevent "capping"—the formation of a crust on the soil surface that stops rain from entering and restricts the natural air flow.

You can use any organic material. Manure is ideal, but it must be well rotted or it can scorch young shoots; even well-rotted manure should be kept away from direct contact with foliage.

Coir can be used as a soil conditioner, but is quite expensive, while composted bark is even more costly. Grass cuttings are the most convenient, but look rather conspicuous until they have rotted down to a dark brown color. Never put grass cuttings on too thickly or they will rot down into a slimy mass.

Peat has often been used soil conditioner, but should not be the organic gardener's first choice due to the environmental damage caused by extracting it.

Polythene mulches add nothing to the soil and paper only a very small amount. They are, however, perfect weed controllers and minimize water loss through evaporation. They have the added advantage of keeping low-growing fruits clean by preventing soil splashing.

Either lay these materials between rows of crops, holding them down at the edges with stones or with piles of soil, or cover the ground

completely, burying the edges in a shallow trench, and plant through slits in the material. Areas more than about 4 ft (1.2 m) wide must have provision for watering; so lay a length of drip hose on the ground before laying the polythene.

In the ornamental garden, you could consider a permanent mulch of gravel. It will have excellent water retention and inhibit weed growth and, in the right setting, it looks extremely attractive. It adds nothing to the soil and you should not use it where regular surface dressing with organic matter is needed.

### **Watering**

All plants require adequate supplies of water and there are always occasions when it is necessary to water artificially. However, watering is not simply a matter of pouring water on to the soil. This can, in fact, do more harm than good.

First, never add water in small amounts. It is essential to apply enough to get right down to the root zone where it is needed. Otherwise, roots will come to the surface in search of the water, and there they will be even more vulnerable to the effects of heat and lack of moisture.

Second, although large quantities of water are required, you must apply it carefully. Water applied in the form of large droplets or with great force will cause the soil "crumbs" to break down and form a hard surface

crust. This prevents further water entering the soil and it also inhibits the free interchange of air and gases, with disastrous effects. On a seed bed, this crust can actually stop the tender young seedlings from pushing through the soil to the surface. To prevent this occurring, apply water through a sprinkler with a fine spray pattern of small droplets. When watering seed trays, use a can fitted with a fine nozzle. Pour the water to one side of the tray or pot, then pass the can over the seedlings, keeping the angle of the nozzle constant throughout. When you have finished, do not raise the can until it is clear of the tray or pot.

The size of droplets is not as important where the soil is covered with grass, so lawn sprinklers are not generally made with such attention to optimum droplet size. Consequently, if you want to buy one sprinkler only, buy one with a fine spray; it will be perfectly suitable for the lawn as well as the seed beds.

It is not necessary to keep the soil moist all the time - water when the soil is dry, but before the plants begin to suffer - and, provided you use a fine sprinkler, you can water at any time of day. However, timing is important. For example, watering when fruits or vegetables are swelling will greatly increase their overall weight. Once fruits, in particular, begin to color, though, extra water could invite a fungus attack, especially from botrytis.

It is, of course, not difficult to overwater, especially with plants in pots. Try to strike a balance between an aerated soil or medium and one with

sufficient moisture. A cold, wet, airless medium will not do anything to encourage plant growth. If you are watering in the ornamental or vegetable garden, leave the sprinkler on for at least an hour each time.

When you have just planted a plant, encourage it to search for water, thus increasing its root system. Water it thoroughly immediately after planting, then leave it to its own devices for a while, almost allowing the soil to dry out, before watering the plant again.

### **Supporting**

Plants need supporting for a variety of reasons. New trees and shrubs, for example, must have their roots firmly anchored to stop them moving in the soil and breaking young roots. Trained fruit trees must be tied in at regular intervals, and so you need a framework to fix them to. Some naturally climbing plants need an artificial support or can be allowed to grow through trees and shrubs, while climbing vegetables must be provided with a framework. Tall herbaceous plants may also need support to stop them flopping over in the borders.

#### *TREE STAKES*

Newly planted young trees must be supported with a stake no more than one-third the length of the stem. If the tree is bare-rooted, a single stake driven into the planting hole before planting is enough. Make sure that the stake is thicker than the tree and that you drive it into the soil to a



depth of at least 45cm (18in). Container-grown trees are best supported with a stake either side of the root ball, with a crossbar nailed to them.

As the stakes will not be permanent, there is no need to treat them with preservative and they should be left in the ground until they rot. In both cases, fix the tree to the stake with a plastic tree-tie, nailed to the stake to prevent slipping.

### *TRAINED TREES*

Trained fruit trees and bushes - cordons, fans and espaliers - will need support throughout their lives. Because the support is permanent, use pressure-treated timber or metal stakes. Use 2.5m (8ft) stakes, 7.5cm (3in) in diameter, or 5cm (2in) angle irons, and drive them at least 45cm (18in) into the ground, about 3m (10ft) apart. The end stakes need angled struts secured to the lower half. Galvanized wires are then fixed horizontally between the posts at various intervals; the distance depends on the method of training.

Start by straining the top wire and work downwards, since there is more leverage at the top of the stake. If you work the other way round, you will slacken the wires already in place. If you have a lot to do, it is worth hiring a special wire-strainer. Fix the wires to the stakes with staples or simply twist them round. Trees should not be tied directly to the wires because the wires will rub against the bark. Instead, tie canes to the

wires and the plants to the canes. It is also possible to train fruit trees along wires against a wall or fence.

### *HERBACEOUS PLANTS*

Many herbaceous plants, such as poppies, have weak stems and need to be supported. The best technique is to install the support before the plant starts to grow too tall and allow it to grow through. There are special wire frames for this purpose or you could use old wide-mesh wire netting or even thin twigs bent over at the top. Tall herbaceous plants, such as delphiniums and dahlias, will need the support of single canes or posts. Tie them in regularly with soft string as they grow.

Alternatively, you can support climbers on a wooden archway, or "pergola", or on a single pillar of stout, pressure-treated timber. You must drive the stakes at least 45cm (18in) into the ground, so buy timber of an adequate length. Tie the plants to the uprights loosely, using soft string.

### *VEGETABLES*

In the vegetable garden, the main methods of support are canes, strings and netting.

The best way to support beans is with a double row of 2.5m (8ft) bamboo canes pushed about 30cm (12in) into the ground. Set them

30cm (12in) apart in the row, making two rows with 60cm (2ft) between them. Tie the canes so that they meet in the middle of the row and tie a cross cane in the V at the top to provide support and rigidity. A cheaper way is to set two strong 5 x 5cm (2 x 2in) posts about 2.5m (8ft) tall at least 45cm (18in) into the ground, one at each end of the row. Then run a wire or strong nylon twine from post to post at the top and another about 30cm (12in) from the ground. Next, tie vertical strands of nylon twine at 30cm (12in) intervals from wire to wire.

You can also train beans, cucumbers and melons on to "cane" wigwams. You need four 2.5m (8ft) canes. Put them in the ground to form a 90cm (36in) square and then tie them together at the top. Plant at the base of the canes and tie in cucumbers or melons at regular intervals; beans will wind themselves around the canes naturally.

## 7. About Propagation

The modern trend is towards "convenience gardening", and a whole industry has developed to service this market. Instead of raising plants from seed and cuttings, for example, we are generally encouraged to buy young plants from the garden center or nursery - all we have to do is plant them.

For the organic gardener, however, there are some very sound reasons why this "convenience" method is not good enough. First and foremost, if you are interested enough to adopt an organic approach to gardening, you are likely to want to do the whole thing from start to finish. Second, it can be difficult to find plants that have been raised organically - very few commercial growers can guarantee that their produce has been raised in organic soil without the "benefit" of chemical sprays or fertilizers. So, as an organic gardener you have no alternative but to raise all your plants yourself.

By following a few simple rules and taking sensible precautions, your success rate with home-raised seed, even using the minimum of equipment, will be gratifying; and by using other methods of propagation, such as division, cuttings, layering, budding and grafting, you can make sure of a constant and inexpensive supply of organically raised plants for the entire garden.

## **From Seed**

The best way to ensure that everything in your garden has been cultivated organically is to grow as much as possible from seed. Either sow directly into your garden, or start seeds in the greenhouse or under fluorescent lights. Prepare the soil well for sowing outside and use a good mixture if sowing in containers.

## **OUTSIDE**

The cheapest method of raising plants is by sowing seeds directly into prepared soil. This is the method you should adopt for most vegetables, hardy annuals and many herbaceous perennials. You can raise some trees this way but, since you need only a few, it is better to sow them in pots or boxes and plant out later.

Normal, organic methods of soil preparation will produce a good, workable structure. Rake the soil down to make it level and then sprinkle fertilizer over the top at the recommended rate. A firm bed is usually required so, if your soil has been recently cultivated, compress it by walking over the surface with your weight on your heels.

Next, rake the soil down to a fine tilth. Never do this when the soil is wet enough to stick to your boots; you risk destroying the soil structure.

On deep beds, this consolidation is unnecessary and, indeed, you should never tread on the beds. Instead, leave them for three or four weeks after digging so the soil has a chance to settle.

### *WHEN TO SOW*

The correct time to sow seeds varies from one plant to another and is normally shown on the back of the seed packet. There is no point in sowing too early. As a general rule, seeds sown in soil with a temperature below 7°C (45°F) will not germinate until the soil warms up. Seeds sown in mid spring will often germinate at the same time as, or even before, seeds sown in cold, wet soil. There are, of course, exceptions to this rule. Some alpine seeds, for example, and some trees require a period of freezing weather before they will germinate.

By sowing seeds under cloches you can start sowing outside in early spring. Place the cloches in position two weeks or so before sowing in order to warm the soil up.

Some seeds have extremely hard coats. They germinate more successfully if you soak them overnight in water. Very hard seeds can first be filed with a nail file to assist the entry of the water into the seed coat.

Other seeds, such as beets, have a natural germination inhibitor within the seed coat to ensure premature germination does not take place. To

speed up germination, remove the inhibitor by washing the seeds under the cold tap or by soaking them in water overnight.

### *DEPTH AND DISTANCE*

There is no doubt that the main cause of seeds failing to germinate is that they are sown too deeply. Seeds have a reserve of food which will enable the shoot to reach the surface and find the light. Until it does this, it cannot manufacture any more food. So, if the seed's reserve runs out before the shoot reaches the surface, the seedling will never appear. Of course, it is nonsense to suggest sowing seeds 6mm (1/4in) deep or less, since it is impossible to be that accurate when working with soil.

It is also important to space the seeds and drills correctly to avoid overcrowding. Some seeds can be thinned and transplanted later, others, such as those of root crops, will "fork" if transplanted.

### *TECHNIQUES*

Always aim to sow seed thinly. With the vast majority of seed varieties, between 60 and 90 per cent of your seeds will germinate and, if they come up too thickly, they tend to compete for the available light, becoming thin and straggly in the process. Some gardeners become adept at sowing straight from the packet, but I find it much more accurate to hold the seeds in the palm of my hand and sow a pinch at a time.

Some seeds are large enough to sow singly or in "stations" (placing groups of two or three seeds at the required distances, then thinning if more than one seed germinates at any station). With deep beds you should adopt a block-sowing technique.

**Sowing in dry soil:** If your soil is very dry, water the drills before sowing. Use a can, more or less fill up the drill, allow the water to drain, then sow as directed. Never sow and then water afterwards, since this leads to "capping", where the soil forms a crust on top that can prevent the entry of further water or even prevent young seedlings breaking through to the light. **Covering after sowing** Cover all seeds by running the back of your rake down the center of the row. Then, lightly tap down the soil with the back of the rake to ensure that the seed is in close contact with the soil.

**Labelling rows of seeds:** Always use a proprietary plant label to mark the row clearly with the name of the plants. It is not good enough just to stick the seed packet on to a cane, as it always seems to blow away or becomes unreadable after heavy rain.

**Pre-germinating seeds:** Sometimes it is an advantage to pre-germinate seeds inside and sow them outside only after they have started to grow. Examples of plants that benefit from this are parsnips, which take so long to germinate in the early spring that they often rot in the soil, and



lettuce, which will not germinate in soil temperatures over 20°C (68°F), a temperature often reached in summer even in colder areas.

Sow the seeds on to a piece of moistened tissue in the bottom of a plastic container. If the seeds need heat to germinate, place the container in a warm place, such as the airing cupboard, until the first roots show through, and then sow as soon as possible. Do not let the roots grow longer than about 3mm (1/8in). If you cannot sow the seeds immediately, put the container in the refrigerator (not in the freezer compartment), where they can be kept for a few days.

You must sow the seeds without damaging the fragile roots. With large seeds this is not too difficult, since you can pick up each individual seed with tweezers. With small seeds, however, you need to fluid sow them. Suspend them in a special alginate gel or wallpaper paste and "sow" the mixture in a seed drill. If your soil is dry, break the normal rule and water over the top immediately after sowing; otherwise the gel may set too hard and trap the seeds under the soil.

### **Inside**

By sowing seeds in trays or pots inside you can start much earlier in the year. Vegetables can be sown in mid winter and planted out under cloches in early spring. This way, you will have your first crop in late spring. A greenhouse is ideal for this purpose but you could put them on a windowsill indoors or, for reliable light, place them under fluorescent

tubes. Check the recommended sowing temperature before you begin and ensure that you can provide it by starting the seeds off either in a heated propagator in the greenhouse or the airing cupboard or under lights.

Fill a pot or tray with moist seed mixture and firm it lightly. Peat-based mixtures require very little firming, so don't overdo it; merely push your fingers into the mixture. Then level the top of the mixture and firm the soil, with a firming board if you are using a tray, or with the bottom of another pot.

When you are sowing in containers it is very important to wet the mixture thoroughly before sowing. Spread some mixture on to your work bench, make a well in the center and pour some water into it. Gradually work the water into the mixture by rubbing it through your hands. Fill the container, then water again, since watering after sowing tends to wash the seeds into one spot, or even right out of the pot! Allow the mixture to drain for a few minutes and then sow the seeds

Cover all except very small seeds, such as those of begonias or lobelias, with their own depth of vermiculite. Then cover the pot or tray with a piece of opaque plastic and put it in a warm place. The airing cupboard is useful, but check the temperature first to ensure that it is suitable for the seeds you are sowing. The gentle heat of fluorescent tubes is ideal for seeds. Check the seeds every day and, as soon as the first one germinates and pushes to the surface, remove the whole container to a

light place. Do not put the container in direct sunlight, and cover the seedlings with a sheet of newspaper if there is any chance of the sun scorching the delicate leaves.

If you are growing your seedlings on the windowsill, the fact that the light always comes from one direction only may make them long and spindly. You can reduce this effect to a minimum by making a "light box" out of an orange box, lined with kitchen foil to reflect available light all around the plants. If you use the light box in winter, you should bring it into the warmth of the center of the room at night. You can cover the box with plastic at night, but remember to remove the cover in the morning, since it will greatly reduce the amount of light reaching your seedlings.

## 8. Final Words

Gardening is far from an exact science, and the gardener who makes rules, and sticks rigidly to them, will not succeed. Different climatic conditions, soil types, parts of the country, and seasons all have an effect on plant growth and therefore the timing of gardening operations.

If you are a complete beginner to gardening, although you can learn a great deal from other gardeners, you need some sort of guide to help you plan the garden year.

Of course, conditions vary depending on the height of a garden above sea level and how exposed it is, so you will have to learn by experience and also by taking advice from experienced local gardeners.

In recent years there has been growing concern about the effects of global warming, accelerated by the presence of higher levels of carbon dioxide in the atmosphere. As a result, we are experiencing significant changes in our weather, which is warmer but often with very unsettled periods. This will inevitably change the way we garden.