The large leaves and stems provide a great deal of green material which makes valuable humus for the soil, and if grown on land that has been cropped many times or for a number of years, the top is cut off twice a year and the crop allowed to re-establish again. By cutting back, more green material is made available for humus.

*Pueraria* and *Mimosa* are the two best non-annual, creeping green-manure crops and soil improvers that can be grown.

*Centrosema pubescens.*—This is a creeping legume with small, dark-green leaves, thin wire-like stems, large boat-shaped purplish flowers, and long, slender, narrow, flat seed-pods containing fairly large, roundish seeds, which are a dark, streaky colour.

*Centrosema* can be grown from seed or cuttings, and if cuttings are used then the same care must be taken when planting as with *Pueraria*. *Centrosema* is also used as a cover crop in coco-nuts. It will not grow on such a variety of soils as *Pueraria,* and needs a soil that is well drained and fairly fertile. It will, however, withstand long dry periods.

*Desmodium scorpiurus.*—This is a creeping legume which is a native of New Guinea. The leaves are roundish and light-green in colour, the stems are soft and fairly hairy, the flowers very small, and seed is rarely produced. *Desmodium* is generally grown from cuttings, and it grows quickly and easily. It is not as good as *Mimosa* or *Pueraria* as a green manure or for the control of grass and weeds, but is excellent ground cover for crops such as *cacao* and coffee which require a low, ground-cover crop.

*Calopogonium mucunoides.*—This is a creeping legume, which, on first appearance, looks like *Pueraria,* but the leaves are only half as large, the stems are much smaller, the flowers are very small, the seed-pod is short, flat and covered with tiny hairs, and the seed is square-shaped and yellow in colour.

*Calopogonium* seeds freely and is grown from seeds or cuttings. It grows quickly, but will not stand dry weather and every year or eighteen months dies off.

Often *Calopogonium* is planted with *Pueraria* or *Centrosema*, the *Calopogonium* growing quicker than these two crops, forms a quick cover. By the time the *Calopogonium* has died back the *Pueraria* or *Centrosema* has become established and provides the ground cover and green manure.

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## METHOD AND TIME OF APPLICATION OF FERTILIZERS.

The value of fertilizers for promoting vigorous and abundant crops is largely determined by the time and method of their application. Applied at the right time and in the proper manner, fertilizers stimulate the growth of the crop from the start and result in heavy yields. On the other hand, premature, late or faulty distribution all militate against good results, because, thereby, the fertilizer is prevented from exerting its full influence and consequently its effects are uncertain.

There are various methods of applying fertilizers to the soil, some of which have certain advantages over others, depending on the nature of the crop and the conditions obtaining on the plantation. In applying fertilizers, two things must always be kept in mind, firstly, the necessity for even distribution, and secondly, the necessity for thoroughly incorporating the fertilizer with the soil. The fulfilling of these two conditions is essential to the success of the manuring.

The reason is obvious, for, where the fertilizer is unevenly distributed, some areas receive abundant plant food, while others receive little, or, possibly, none. The plants, therefore, in the former areas receive more than enough for their requirements, while those in the latter soon fail from deficiency of available plant food. The result is that the yield is decreased more or less considerably. With even distribution, however, each plant is provided with a sufficiency of food and a uniformly vigorous growth and good yield are obtained and no manure is wasted.

The thorough working-in of the fertilizer is equally important, as it ensures the fixing and rendering available of the contained plant food by the soil and the placing of it at a depth where the roots of the crop plants will easily reach it. Moreover, the working-in of the fertilizer improves the physical condition and the water-holding capacity of the soil and also helps to prepare a good seed-bed for the coming crop. A good seed-bed is, of course, necessary, as the fine texture of the soil promotes the development of capillary roots, which enable the plant to avail itself quickly and more fully of the plant food in the soil.

One method of distributing fertilizers and a method which may be adopted under most conditions, is the broadcasting of the fertilizer over the surface of the soil and subsequently working it under with the hoe, harrow or plough. In districts where labour is cheap, broadcasting may be done by hand, an even distribution being easily effected by skilled coolies. The use of fertilizer distributing machines, where available, may possibly be a cheaper method, especially as the employment of skilled labour is not necessary. In broadcasting, in order to ensure even distribution, it is usual to traverse the field first lengthways and then across.

If the fertilizer is applied in the drills, we may obviate any loss such as might occur in broadcasting, but this method has its disadvantages, as presence of a high concentration of plant food might have a toxic action on the seed and impede its germination. This is a risk which is hardly compensated by saving the very small amount of fertilizer which might be wasted during broadcasting.

In fertilizing permanent crops, such as tea and fruit crops, it has been the custom in some places to restrict the application of the fertilizer to a comparatively small area round the plant, usually that area shaded by the branches. In the case of young trees, the lateral roots of which are not sufficiently developed, the application of the manure to a restricted area round the stem is advisable, since the area over which the plants feed is small. In later stages of development, however, the root system of these plants occupies a considerably larger area than that covered by its branches, and therefore the restriction of manuring to this area results in the nourishing of only about one-half of the roots, the outermost having to depend on the store of plant food provided by nature. As this is usually insufficient to maintain vigorous growth, the efficiency of this part of the root system is impaired and the area on which the plant draws for its food is gradually diminished.

A better method of manuring these crops is to extend the area round the plant every time fertilizers are applied, in order to encourage the development of a wide-flung root system. This will enable the plant to avail itself more fully of the plant food and moisture in the soil and also to resist better the effects of drought.

As already stated, the application of fertilizers at the right time is most essential. The time of application depends on the nature of the fertilizer and of the crop. For most crops there are certain general rules as to the time of applying fertilizers.

Potash manures should be broadcast and worked into the soil some time before planting, in order that the potash may be dissolved in the soil and be available when required by the crop-plant.

Phosphates, especially the less soluble forms, should be applied some months before sowing or planting, in order that they may be rendered soluble and readily assimilable by the time they will be required by the plant. On light soils superphosphate may be applied just before planting.

Nitrogenous fertilizers, especially nitrates, may be applied during growth as a top-dressing, the application taking place just before rain is expected or where irrigation is employed, immediately before watering. In using sulphate of ammonia or nitrate of soda as a top-dressing, care must be taken not to apply them when the plants are wet, as the fertilizers falling on the wet leaves are apt to burn them.

When the less soluble nitrogenous manures are employed, application must take place earlier, the manure being worked in some months before planting. This enables nitrification to take place, so that the contained nitrogen will be in a readily available form when required by the plant.

In the case of perennial crops, manuring should take place during the resting period, for instance, at or towards the end of the rainy season. The fertilizers are then washed in to the soil, where they are rendered available for the crop when its new period of growth commences. With crops such as oranges, &c., which bloom in spring, it must be remembered that the flowers are produced on wood matured in the preceding season, and thus the bloom and young fruit are dependent for their development on food assimilated during the previous season, and the manuring programme should be arranged accordingly.

With crops such as oranges, tea, &c., better results will be obtained if fertilizers be applied over a long period, rather than all at once. To young plants the fertilizer should be given in two instalments, whereas with older crops, application in four dressings may give better results.—(*Jacob and Coyle.*)

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## NEW DEVELOPMENT OF POTASH PRODUCTION.

To replace essential supplies of potash formerly obtained from Germany and Palestine, the Western Australian Government, in co-operation with the Commonwealth Department of Supply and Development, the Commonwealth Council for Scientific and Industrial Research, and commercial interests are making preparations with a view to producing potash from alunite deposits in the bed of Lake Campion, Western Australia, 250 miles from Perth. Many agricultural industries, especially sugar-growing, depend on a continuous supply of potash for fertilizers.