

## Improving Structure and pH Levels in Top End Soils for Horticulture

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### INTRODUCTION

In general, soils in the Top End are very poor. Not only do they lack sufficient plant nutrients to produce a good crop of vegetables, but the structure of the soils is also poor. This results in low moisture and nutrient holding capacity. Some of this is due to our climate. During the wet we have high rainfall over a few months, resulting in a high run-off which leaches nutrients from the soil down the creeks and rivers and out to sea or percolates them down through the soil by dissolving them and carrying them below the reach of most vegetable roots.

During the dry, we have fires which destroy all the grass and leaf litter from the trees, which is then blown away by the wind or washed away during the next wet. This continuous cycle over a long period of time has left us with soils which are low in plant nutrients and almost devoid of any organic matter, which is important in helping the soil to hold nutrients and moisture as well as to maintain a suitable environment for the useful micro-organisms which live in the soil and are essential for healthy plant development.

To improve soil structure, organic matter must be added to the soil. In home garden situations this can be achieved by mulching the area with lawn cuttings, leaf litter or hay. These can either be placed on top of the soil and kept moist and allowed to break down over time or can be dug into the soil which will speed up the breaking down process. A little nitrogen fertiliser such as urea will aid the organisms that break down plant material. During this period, the area should be rested as "nitrogen starvation" will occur in any plants grown while the organic matter is being broken down.



Animal manures can be used as a source of organic matter. However, weeds are often a problem associated with manures, especially horse or cattle manure. Chicken manure should never be used fresh as it will burn plant roots. It should be allowed to weather for a few months before being used. Manures should not be used as the sole source of nutrients for a vegetable crop, as they are not in a balanced form of plant nutrients, usually being too high in nitrogen, resulting in lush soft plant growth which can be susceptible to disease. As a guide, apply animal manures at the rate of 5-10 kg/m<sup>2</sup> at least a month before planting. This should only be used as a supplement to plant nutrition; chemical fertiliser should still be used, but only at half the recommended base rate.

Commercial growers can add organic matter to the soil by growing a green manure crop during the wet. The object of a green manure crop in the Top End is to get as much bulk into the soil as possible so legumes are not recommended, as although they supply nitrogen, they have very little bulk. Jumbo forage sorghum is preferred as a "green manure" crop, which produces bulk but does not produce seed, which could create a weed problem in future crops. It has the added advantage of being nematode-resistant. Therefore it is useful in areas where nematodes are a problem.

The green manure crop should be planted at the beginning of the wet and slashed when it reaches a height of 1.5-2 m. A light side dressing of urea after each cut will encourage regrowth. When cutting the green manure crops do not cut too close to the ground as you need the crop to regrow. Set the cutting height of the slasher at about 100 mm above ground level. Leave the cut crop in the paddock to break down. Usually two to three cuts are needed during the wet. At the end of the wet, when there are still a few storms around, work the whole crop and residue into the ground and allow it to break down for at least one month before planting commences. For more information see Green Manure Growing Note VG7

Improving the soil structure is a slow process and it may take three or more years before any significant improvement is noticed.

## **CORRECTING SOIL ACIDITY**

The pH of the soil is a measure of its acidity or alkalinity. A pH of 7 is neutral; readings above this indicate alkaline soils and readings below 7 indicate acid soils. Most Top End soils are acid, generally reading a pH 6 or lower. The ideal level for growing crops is pH 6.5. At this level all nutrients are available to the plant. At levels above or below, certain elements become tied up in the soil and are not available to plants. This is especially the case with trace elements.

### **Major causes of soil acidity are:**

1. Rain - water from tropical storms may have a pH of 3.0 which is quite strongly acid.
2. Decomposing organic matter which breaks down into organic acids.
3. Chemical fertilisers - most are acidic in their actions.

To raise the pH in acid soils (that is to make them less acid), it is necessary to lime the soil with dolomite or agricultural lime. Dolomite is preferred because it contains both calcium and magnesium in the approximate ratio of 3:1 which is desirable for optimum plant growth. Other forms of lime may only contain calcium and create an imbalance in the calcium to magnesium ratio in the soil, which can be difficult to rectify.

Most virgin Top End soils require an application of at least 2.5 tonnes of dolomite per hectare (250 g/m<sup>2</sup>) to raise the pH to the optimum level of 6.5.

To maintain the pH level at 6.5 in any soil where vegetables are grown on a regular basis requires an additional 0.5 to 1 tonne of dolomite per year (50-100 g/m<sup>2</sup>). This is best applied at the beginning of the wet and dug into the soil together with any organic matter at least a month before applying any nitrogen fertiliser.

### **Managing alkaline soils**

Alkalinity is generally not a problem in Top End soils but in some areas of low rainfall it can be an issue. Soils may be naturally alkaline or become such, due to prolonged irrigation with alkaline bore water.

If soils are too alkaline, that is above pH 7.5, they can be adjusted using acidic fertilisers such as ammonium and sulphate based fertilisers. The addition of organic matter reduces pH and improves soil structure, nutrient and water holding capacity and buffering. Trace elements made unavailable by alkaline soils should be applied as a foliar spray, especially zinc, iron and manganese.

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