GROWING SWEET POTATO ON ORGANIC SOILS IN THE HIGHLANDS

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INTRODUCTION

In the article on pp. 71-76 of this issue of HARVEST it was shown that sweet potato grown on mineral soils will respond very well to applied fertilizer. In this article attention will be given to the situation on peat soils.

WHAT ARE PEAT SOILS?

Peat soils in the Highlands occur over thousands of hectares of swamp and back-up swamp areas. These large swamp areas are mainly in the Western Highlands Province (for example the Wahgi swamp) but occur elsewhere as well. They are usually recognized by the growth of pitpit grass and often other grasses as well, and always there is a layer of undecomposed (not rotted) peat in the soil profile.

ARE PEAT SOILS GOOD?

When large scale drainage works are carried out, these soils become very easy to cultivate and they are good for cropping. For example, tea has been very successfully grown on these drained swamps in the Western Highlands Province, and crops such as sweet potato, sorghum, maize, potatoes, peanuts and soybean have also given very high yields.

A close-up of a peat soil planted with sweet potato. The material on the surface is trash and peat.

Several years ago, when some of these swamp areas were being drained, people tried to grow sweet potato as a cash crop on the newly drained soils. Normally we would regard yields of around 20 000 kg/ha of marketable tubers as quite good, but when sweet potato was grown in these new soils, yields of over 50 000 kg/ha of marketable tubers were reported.

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YIELDS AND QUALITY GO DOWN

However, when sweet potato was replanted soon after the first crop was harvested, yields went right down. In addition, the quality of tubers was much lower. In the first crop, tubers were well shaped and bright in appearance, but in the second and third crops they became twisted, cracked and dull.

MINERAL SOILS AND NEWLY DRAINED PEAT SOILS BEHAVE DIFFERENTLY

In some ways these peat soils were behaving in much the same way as mineral soils. If one crop of sweet potato is planted too soon after another, yields go down, and quality goes down.

However, on some mineral soils it is possible to grow sweet potato continually, provided a fallow period is allowed between crops. Depending on how good the soil is, some soils can be replanted to sweet potato after only a six week fallow, while others need much longer. A good idea is to grow other crops in rotation with sweet potato (for example peanuts and maize). This is known to work very well on mineral soils.

The difference with peat soils, however, seemed to be the very high first crop yields and then a sudden fall in yields. One would expect that with the very high first crop yields, the second crop and even the third crop would still be good, but this was often not the case.

It is likely that at the newly drained stage when the first crop of sweet potato is grown, there is not too much free nitrogen available. This is because it is mostly tied up in the bodies of micro-organisms which are breaking down the peat.

By the time of the second and third crops of sweet potato, however, much of the peat is broken down and so have the bodies of micro-organisms. So the nitrogen from their bodies is now available for plant growth.

If this is the case, then it is quite likely that the amount of nitrogen now available to the sweet potato crop is too much for good tuber growth.

The plants produce more leaves instead of tubers. This is what seems to happen, because in second and third crops leaf growth is always dense and very healthy looking.

On a newly drained peat soil sweet potato tends to produce more leaves instead of tubers.

TWO DIFFERENT THINGS TRIED

In order to look at this problem, two different approaches were made. One was to try and restore yields by applying different kinds and rates of fertilizer, while the other was to see if a crop rotation would restore yields.

Briefly, applying fertilizer did not work, while using a crop rotation did.

THE FERTILIZER TRIALS - NO INCREASE IN YIELDS

It was thought that changing the nutrient balance might be a way of stopping this decline in sweet potato yields. The main part of the work was carried out at Kuk Research Station.

All of the elements which are most likely to affect sweet potato yields were used, at different rates and in all combinations, in two series of experiments. The elements were nitrogen, phosphorus, potassium, magnesium and calcium. When all combinations and rates were made, there were 45 different treatments in the two series of experiments.

The result was that though all these combinations gave different balances of nutrients, none of them gave any worthwhile increase in yield.

SUPPORTING WORK

It should be mentioned also that other fertilizer experiments were carried out, at Kuk and Aiyura, on similar soils. They supported the conclusion of the main work that fertilizing second and third crop sweet potato on these peat soils will not restore yields.

An extra element tried out was boron. It was thought that boron may be involved in both yield and quality, but this turned out to be not the case. Rates of lime application from nil to very heavy also failed to increase yields.

THE ROTATION TRIAL - BIG INCREASES IN YIELD

This also was carried out at Kuk Research Station. The soil was first cropped with several plantings of sweet potato until yields were low. The rotation treatments were then applied. These were as follows:

1. Sweet potato then sweet potato.
2. Cowpea (ploughed back in) then sweet potato.
3. Sorghum (ploughed back in) then sweet potato.

The figures in Table 1 show the results.

Rotation 1 is the situation with continuous sweet potato cropping. The final crop of sweet potato yielded only 10 800 kg/ha of marketable tubers and only 17 100 kg/ha total (marketable plus stock feed)

Rotations 2 and 3 did much better. While both were successful in restoring yields to a very good level, the third rotation, at 37 600 kg/ha of marketable tubers and 45 100 kg/ha total yield, is the best.

TABLE 1. YIELDS OF SWEET POTATO FROM ROTATION TRIAL (KG/HA)

	Marketable yield	Total yield
1. Sweet potato then sweet potato	10 800	17 100
2. Cowpea then sweet potato	27 400	34 600
3. Sorghum then sweet potato	37 600	45 100

A sorghum crop ready to be turned back in

A crop of maize, with food to harvest and plenty of trash to turn in, is ideal for rotation with sweet potato

ROTATIONS THE BEST WAY, BUT THE SITUATION COULD CHANGE

Experience by subsistence gardeners, commercial growers, and in experiments have all shown that sweet potato should not be cropped continuously on drained organic (peat) soils. If it is tried, top growth will remain very good, but yields and quality of tubers will go down quickly.

The experiments have shown that fertilizing will not restore yields to good levels. However, a simple rotation will. All that is needed in the rotation is a crop which will return a large amount of trash to the soil. In the early stages, it could be the more trash that can be returned, the better. Cowpea is okay, and sorghum is better.

Maize, although not tried here, would also work well. It has the advantage that a food crop can be harvested before the rest of the plant is returned to the soil. An important point is that the maize would have to be planted at mono-cropping density (that is by itself, not mixed with another crop) in order to get enough trash to return to the soil.

Although crop rotations as described here are the best way to keep sweet potato yields at a good level on newly drained soils, it could be that after a number of years fertilizer may begin to work. This is because these organic soils will be changing all the time and becoming more and more like mineral soils. After a while it may be necessary to do more fertilizer trials to test this out.

FURTHER INFORMATION

For further information or advice on cropping sweet potato on newly drained peat soils, just write to or telephone:

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