FERTILIZER FOR SWEET POTATO

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Sweet potato is a crop that needs a lot of plant food from the soil to give really high yields. When an area has been used for gardens for a long time, there is not so much plant food in soil. When this happens farmers can still get good yields by using fertilizer. If used correctly, a small amount of fertilizer helps the crop to carry a lot more tubers.

Some soils are short of some plant foods even when they have not been gardened before. On these soils, fertilizer can also give large increases in the yield. Sweet potato is a high return crop, so a small amount of money spent on fertilizer gives a lot of money back to the farmer when he sells the extra tubers.

WHICH FERTILIZER SHOULD BE USED?

It is important that the correct fertilizers are used or a farmer will waste his money. The two plant foods that sweet potato needs most are nitrogen and potassium. Nitrogen makes the tops and tubers grow well and potassium helps the tubers. Sweet potato needs other foods like phosphorus, sulphur and magnesium, but it can usually get enough of these from the soil. Fertilizers such as urea and ammonium sulphate contain nitrogen. Potassium is obtained from the fertilizers called muriate of potash and potassium sulphate.

It is important that a farmer uses the correct fertilizer and that he does not use too much. If a farmer used only nitrogen when potassium is also needed; or if he uses too much nitrogen; or if he uses fertilizer on the wrong varieties, the fertilizer will make the vines and leaves grow really well, but there will be fewer tubers than if he did not use fertilizer. But if a farmer uses the correct fertilizer and the correct amount, he can make a lot more money from fertilizing sweet potato.

HOW MUCH FERTILIZER?

We have done a lot of experiments on the Gazelle Peninsula of New Britain, but not in other lowland areas. This recommendation is for the Gazelle but it should be suitable for areas with similar soils such as the Cape Hoskins-Talasea area of West New Britain or around Popondetta. It could be tried on an experimental basis in other parts of Papua New Guinea.

For grassland areas nitrogen should be used at 150 kg nitrogen/ha. A small fish tin (155 g) of urea would be enough for seven mounds if the sweet potato is planted in mounds about 50 cm across at

the base. This is the approximate size of mounds used in lowland areas. If it is planted in rows, a small fish tin is enough for 5 m of row.

In grassland areas that have been cropped with root crops such as sweet potato or yams for many years, potassium must be used with the nitrogen at a rate of 100 kg potassium/ha. Mix urea and muriate of potash in a ratio of 3:2 by volume or weight. So three coconut shells full of urea would be mixed with two coconut shells full of muriate of potash. A small fish tin of the mixture would be enough for four mounds or 3 m of row.

In areas on the Gazelle that used to be under forest before gardens were made, there is no need to use fertilizer until the ground has been used for several years. After perhaps five years of cropping, it is worthwhile putting on nitrogen fertilizer at up to 50 kg nitrogen/ha. So a small fish tin full of urea would be enough for 22 mounds or 15.5 m of ridge. A little bit of fertilizer goes a long way! After former forest areas have been cropped for a long time, potassium is needed at 100kg potassium/ha as well as nitrogen at 100 kg nitrogen/ha. Mix equal volumes of urea and muriate of potash. Then a small fish tin of the mixture is enough for six mounds or 4 m of row.

In areas where potassium is low in the soil, potassium fertilizer should always be used in the mixture and it should be used at a higher rate than the recommended rate for the Gazelle. Areas where soil is low or not available to crops include soils on limestone, such as the yellow-brown soils of New Ireland, and alluvial soils of the Papuan coast and Madang region.

Some fertilizers are sold as compounds. This means that they contain more than one plant food in them. An example is 12-12-17-2. This fertilizer has nitrogen, phosphorus, potassium and magnesium in it. A compound fertilizer is all right for fertilizing sweet potato if it contains nitrogen and potassium in about the right proportion for the situation. But if it contains other foods such as phosphate, the farmer is wasting his money buying this type because he is paying for nutrients that are already in the soil in adequate amounts.

HOW AND WHEN SHOULD THE FERTILIZER BE APPLIED?

Our trials have shown that larger responses to fertilizer occur on soils where yields are always low. The yield of other sweet potato crops in a garden gives an idea as to whether fertilizer is needed or not. If total tuber yields are over 20 tonne/ha, there is little to be gained from fertilizing. If sweet potato yields are less than 15 tonne/ha, fertilizer should give large yield increases with the right varieties.

The appearance of previous crops on the same area also indicates whether fertilization would be profitable. If top growth is only moderately vigorous and leaves are a yellow-green colour, then soil nitrogen is probably low and fertilization would be profitable. It is not a good idea to fertilize a crop if the rainfall

is too low, the plants are not able to use the fertilizer and the farmer would waste his money.

The easiest way to apply the fertilizer is to mix it first, then place it on the soil surface and build the mound or ridge over it. The fertilizer should be mixed in with the soil that forms the mound or ridge so the plant roots can reach it easily. If necessary, the fertilizer can be applied as a side dressing. However, nitrogen should be applied no later than a month after planting. If it is applied too late, it makes the tops grow very well, but reduces the tuber yield. Urea burns plants if it is placed on them, so it must be placed on the soil surface. Potassium can be applied up to two months after planting as most of the potassium is taken up by the plant in the third, fourth and fifth month for a five month crop.

WILL FERTILIZER HELP THE NEXT CROP?

Some fertilizer stays in the soil. So if another crop of sweet potato is planted, there will be some fertilizer in the soil that can increase the yield of this crop also. There will be very little nitrogen left, but potassium will remain in the soil longer. The yield increase in the second crop will be smaller than in the first.

DOES FERTILIZER INCREASE THE YIELD OF ALL SWEET POTATO VARIETIES?

The answer seems to be no. Some varieties which have a lot of leaves, even when the soil is poor, can have their yield reduced by nitrogen fertilizer. So fertilizer should not be applied to a large area of sweet potato unless it is known that the variety used responds to fertilizer. Varieties that do not have a lot of leaf when grown on poor soil are the best ones to grow and fertilize on poor soil. If no fertilizer is used, it is better to use varieties that have a lot of leaves on poor soil. The yield from these will not be as good as from other varieties with fertilizer.

DOES FERTILIZER HARM SWEET POTATO TUBERS?

Fertilizer has no bad effect on tubers. Experiments in the highlands have shown that nitrogen increased the protein a little bit, so fertilizer actually improves the food value of sweet potato. Some experiments at Keravat and in the United States of America have found that potassium lowers the starch content a little bit, but this only happened sometimes. Nitrogen fertilizer sometimes makes the weeds grow better as well as the sweet potato.

ECONOMICS OF FERTILIZER USE

Because sweet potato is a high yielding crop, returns from fertilizer use are generally very good. In some experiments at Keravat, fertilizer has increased yield as much as 360% (3½ times), although

increases are usually less than 100%.

For example, a farmer has one hectare of sweet potato in an area that was once under forest. The yield without fertilizer might be 14 tonne/ha. He puts on 100 kg nitrogen/ha and 100 kg potassium/ha. This would cost him about K72 for the fertilizer. If the crop yields 18 tonne/ha with fertilizer, he has gained an extra 4 tonne/ha from using fertilizer. This can be sold for K260 if he sells at the Government wholesale price of 6.5 toea/kg. So his outlay of K72 has given him 3½ times his money back. If he sells his sweet potato at a market in a town, his profit from using fertilizer will be higher because prices are higher than the Government wholesale price.

Appendix. How to work out how much fertilizer is needed from a recommendation

Fertilizer recommendations are given in kilograms of nutrient per hectare, for example 150 kg nitrogen/ha. But farmers cannot buy nitrogen. They must buy a fertilizer containing nitrogen such as urea or ammonium sulphate. The farmer must work out how much fertilizer is needed for his land from the recommendation. To do this he needs to know how big the garden is and the percentage of nutrient in the fertilizer he is using.

Example using urea :

urea..... 46% nitrogen

If a farmer's garden is 50 m long and 40 m wide, the area is 50 x 40 = 2000 m^2. If he wants to fertilize at 150 kg nitrogen/ha, he will need to use the following amount of urea:

$$150 \times \frac{2000}{10000} \times \frac{100}{46} \text{ kg urea}$$

= 65 kg urea.

In this demonstration fertilized sweet potato gave 1½ bags of tubers; without fertilizer the sweet potato gave 1 bag. Nitrogen and potassium are the two fertilizers that sweet potato needs to give the best yield