treatment is very positive and very clear to see. Overall, the spinach plants fed with diluted urine weighed 3.4 times more than spinach fed with only water (Figure 11-4).

Figure 11-3: Spinach crop trials

Figure 11-4: Spinach crop yields

11.1.3 Mint and passion fruit

Mint and passion fruit also respond very well to water and urine treatment (Figure 11-5 and Figure 11-6). A weekly application of a 5:1 mix produces a significant increase in growth. This can be stepped up to two applications a week. Normally 0.5 litres of the mix per container is sufficient.

Figure 11-5: Mint after urine treatment

Figure 11-6: Passion fruit after urine treatment

11.1.4 Onion

Some very good looking onions can be grown in cement basins with the help of a water and urine feed. Onion seeds are best planted early in the year, late January or February being good times, so they can be

transplanted into containers towards the end of the rains in April. This healthy onion (Figure 11-7) was harvested in early September after six months of water and urine treatment in a 10 litre cement basin. An amount of 0.5 litres of a 5:1 mix of water to urine was applied once a week during the six-month period together with intermediate watering. Such a result reveals the usefulness of urine as a plant food.

Figure 11-7: A prize specimen of onion

11.1.5 Maize

Urine can have a significant effect on maize growth. In the fields urine can be applied straight to soil before planting in beds. It can also be applied straight in hollows made near the growing plant.

Maize is rarely if ever grown in containers, but the effect of the growth of maize in containers when fed urine is stunning and well suited for demonstration. Maize plants are hungry feeders and like a lot of nitrogen. The application of a 3:1 mix of water and urine, once or twice or even three times a week on maize grown in 10 litre containers is particularly effective. Figure 11-8 shows the striking difference between a maize plant fed with a 3:1 mix of water and urine (0.5 litres) three times per week and maize irrigated with water only. Urine treatment also improves maize cob yield significantly. The total yield of cobs from maize planted in three 10 litre basins was dramatically different depending on how much diluted urine was used on the crop (Figure 11-9). Maize fed with 1750ml of urine per

plant over the 3.5 month growing period resulted in a crop of 954 grams, compared with 406 grams for maize fed with 750ml of urine per plant, and only 63 grams for the maize irrigated with water only. These rates of urine application are quite high, but are happily accepted by the maize plants in the containers, which were irrigated frequently with water to keep the maize plants healthy. For small scale maize or sweet corn production, this method may have an application. It is also a useful way of demonstrating the effect of converting the nutrients held in urine into vegetative growth of valuable plants.

Figure 11-8: Maize fed with water only (left-side) and diluted urine (right-side)

Figure 11-9: Maize cob yields

11.2 Effect of urine use on maize growth on poor sandy soils: A field trial in Epworth near Harare

Epworth is a large peri-urban settlement of about 200,000 people close to Harare. It was chosen as an experimental site to demonstrate the effectiveness of urine as an alternative to commercial fertiliser for maize production because it is characteristic of the conditions under which millions of people live both in peri-urban and rural areas in Southern Africa. Natural Epworth topsoil is sandy, porous, almost without nutrients and applied nutrients can easily be lost by leaching during heavy storms. Without commercial fertiliser or manure, maize and vegetable crops are generally very poor on soils of this type.

In the experiment, the field was dug and levelled beforehand and on planting day hundreds of small holes 30cm apart in rows 90cm apart were dug. A 20 litre drum of collected urine is shaken up and applied in 125ml amounts (Figure 11-10) to each hole. This was followed by a 500 gram

plug of toilet compost. Two seeds of maize were planted in the compost and covered over with topsoil (Figure 11-11). If seeds are in short supply then a single seed can be planted. Over 90% of registered maize seed will germinate. After germination 125ml of urine was applied at weekly intervals to each young maize plant (Figure 11-12). A crop of untreated maize shows the distinct difference in growth compared to the urine-treated maize (Figure 11-13).

Figure 11-10: Measuring urine

Figure 11-11: Maize seeds planted on 11 November 2004

Figure 11-12: Application of urine to a young maize plant

Figure 11-13: Comparison between urine-treated (right-side) and untreated (left-side) maize crops

Before applying urine to a maize plant, a small hole should be dug near to the plant (Figure 11-14). After applying the 125ml of urine in the small hole next to the plant (Figure 11-15), it is best to cover over with soil after application to slow down nitrogen loss. The total amount of urine added to each plant was 1000ml – eight doses of 125ml. After the initial dose, a dose was given weekly for five weeks followed by a dose every other week for

the final two doses. The 1000ml of urine is equivalent to around 5 grams nitrogen, about the same as the dose used with commercial fertilisers.

Figure 11-14: Digging a hole for urine application

Figure 11-15: Applying the urine

Figure 11-16: First sign of tassel from 17 January 2005

Figure 11-17: First sign of the cob from 17 January 2005

After just over two months of growth, the first signs of the maize tassel and cob appear (Figure 11-16 and Figure 11-17). After two-and-a-half months,

the growth of maize has been good and cobs are already forming. By comparison, maize planted at the same time but not treated with urine shows smaller and paler plants with little cob formation (Figure 11-18). Overall, the application of 1 litre of urine per plant doubled the grain yield of maize growing on poor sandy soil compared to unfed plants.

Figure 11-18: Maize crop on 31 January 2005 – comparison of urine-treated maize (right-side) with untreated maize (left-side)

11.3 Effect of urine treatment on trees

Once established many trees can gain great benefit from the regular addition of the nitrogen and other nutrients in urine. Trees like banana, mulberry, mango and avocado are good examples. The addition of wood ash also helps to provide extra potassium which fruit trees need. The trees can also be fed with compost, manure or other fertilisers as they grow and require extra feeding.

Urine can be applied to trees directly from a urine-diverting toilet (Figure 11-19) or slowly through a hole in a bucket (Figure 11-20). Alternatively a hole can be dug next to the tree for water and urine application (Figure 11-21). In this case two litres of urine is added first (Figure 11-22), followed by ten litres of water. The technique works well on banana plants. In Figure 11-23, the plant shown grew rapidly after the start of the rains and with the application of 2 litres of urine mixed with 10 litres water, twice per week. The bucket was fitted with a small pipe near the base to allow the

water and urine mix to escape slowly into the ground (Figure 11-23 and Figure 11-24). This can also be achieved by drilling a small hole in the base of the bucket. Phosphate sediment will be leftover in the bucket and this is poured on the soil after the bucket is empty.

Figure 11-19: Urine applied to a banana tree directly from the toilet

Figure 11-20: Urine applied to a banana tree through a bucket

Figure 11-21: Preparation for urine application in a hole near the tree

Figure 11-22: Application of the urine into the hole

Figure 11-23: Bucket fitted with small pipe to apply urine

Figure 11-24: Inside view of bucket with pipe to apply urine