Experiences

Human urine has been used as fertilizer in small-scale gardening for a long time in many places around the world, though its use is mostly not documented (Figure 5).

Figure 5. Gooseberries, blackcurrants and roses fertilized with urine in a garden in Uppsala, Sweden. Photo: Håkan Jönsson, SLU.

Urine has been tested as a fertilizer on greenhouse-grown lettuce in Mexico (Guadarrama et al., 2002). There were treatments comparing urine with compost, a urine-compost mixture and no fertilizer at all. The application rate was 150 kg of total N per hectare in all treatments, except for the unfertilized one. Urine gave the best yield of lettuce, due to its high availability of N. Similar results are reported for other vegetable crops.

Urine was tested as a fertilizer on barley in Sweden during 1997-1999 (Johanssson et al., 2001; Richert Stintzing et al., 2001; Rodhe et al., 2004). Results showed that the N effect of urine corresponded to about 90% of that of equal amounts of ammonium nitrate mineral fertilizers.

In field trials on organic farms during 1997-1999, human urine was tested as a fertilizer on spring grain and winter wheat (Lundström & Lindén, 2001). For winter wheat, applications were made in spring in the growing crop. A comparison with dried chicken manure and meat + bone meal was made. Human urine corresponding to 40, 80 and 120 kg N/ha increased the grain yields of winter wheat by, on average 750, 1500 and 2000 kg/ha, respectively. Dried chicken manure gave yield increases of, on average, about 600, 1100 and 1500 kg/ha, respectively. Dried meat + bone meal gave the smallest yield increase: about 400, 800 and 1200 kg/ha,

respectively. On average for all three N fertilization levels, the increase of the winter wheat yields was 18 kg grain per kg N for human urine, 14 kg for dried chicken manure and 10 kg for meat + bone meal. These data show that the plant availability of N in urine is higher than in chicken manure and meat + bone meal, which is to be expected since chicken manure and meat + bone meal all have a higher fraction of organically bound N. For spring wheat, yield increases and N utilization were lower, probably due to high levels of plant-available N in the soil at the start of the cultivation period.

Figure 6. Spreading of urine before sowing of barley, as well as urine-fertilized barley at an early stage. Photo: Mats Johansson, VERNA.

Urine has been tested as a fertilizer on barley and ley in both greenhouse and field trials in Germany (Simons & Clemens, 2004). The urine in some treatments was acidified in order to reduce ammonia emissions and microbial contamination. The results from field trials showed that the fertilizing effect of urine was higher than that of mineral fertilizer in production of barley. There was no difference in yield between plots fertilized with acidified urine and untreated urine.

Urine has been tested as a fertilizer on Swiss chard in Ethiopia (Sundin, 1999). The yields of the fertilized plots were up to four times that of those unfertilized. Urine has also been tested as a fertilizer on cotton and sorghum in Mali (Dembele, pers. comm.). Results are promising and the trials continue during 2004.

Urine has been tested as a fertilizer on amaranth in Mexico (Clark, pers. comm.). Results show that a combination of urine and poultry manure gave the highest yield, 2,350 kg/ha. Chicken manure alone gave a yield of 1,900 kg/ha. Human urine alone gave a yield of 1,500 kg/ha and the unfertilized control gave a yield of 875 kg/ha. The amount of N applied was 150 kg N/ha for the three treatments. Soil sampling showed no differences between treatments regarding physical or chemical characteristics.

In a field trial in Sweden in 2002, different application strategies for urine as a fertilizer on leeks were tested (Båth, 2003). Fertilizing with urine gave a three-fold yield increase. Neither yield nor nutrient uptake was significantly affected by whether the same total amount of urine was applied in two doses or whether it was divided into smaller doses applied every 14 days. The N efficiency (i.e. N yield – (N yield in unfertilized plots)/added N), when using human

urine was high, ranging from 47% to 66%. This is on the same level as when mineral fertilizers are used. N efficiency for most other organic fertilizers, e.g. compost, is normally between 5 and 30%.

Table 7. Results of a field trial using human urine as a fertilizer for leeks. There was no statistically significant difference between treatments A, B and C (after Båth, 2003)

Treatment	N rate kg/ha**	Yield ton ha*	N yield kg/ha**
A Urine every 14 days	150	54	111
B Urine twice	150	51	110
C Urine every 14 days + extra potassium	150	55	115
D Unfertilized	0	17	24

* ton/ha= kg/10 m^2
** kg/ha= gram/10 m^2

Figure 7. Field trials using urine as fertilizer to leeks. Photo: Anna Richert Stintzing, VERNA.

Plant trials with urine have been carried out with various vegetables in Zimbabwe (Morgan, 2003). Plants were grown in 10-litre cement basins and fed with 0.5 litres of a 3:1 water/urine mix three times per week. Unfertilized plants were cultivated as a comparison. The increase in production was large but no statistical analysis was performed.

Figure 8. The spinach to the left is untertilized. The spinach to the right is tertilized with urine diluted with three parts of water to one part of urine applied two times per week. Photo: Peter Morgan, Aquamor.

Table 8. Average yields (grams fresh weight) in plant trials with urine as a fertilizer to vegetables in Zimbabwe (Morgan, 2003)

Plant, growth period and number of repetitions n	Unfertilized plants g	Fertilized, 3:1 water/urine application 3x per week g	Relative yield fertilized to unfertilized
Lettuce, 30 days (n = 3)	230	500	2.2
Lettuce, 33 days (n = 3)	120	345	2.9
Spinach, 30 days (n = 3)	52	350	6.7
Covo, 8 weeks (n = 3)	135	545	4.0
Tomato, 4 months (n = 9)	1680	6084	3.6