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<b>Title</b>	<b>Guidelines on use of urine and faeces in crop production</b>
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### Guidelines on use of urine and faeces in crop production

Recommendations for agricultural use of excreta are based on knowledge of the nutrient content of the excreta, the amounts excreted, the composition and plant availability of the fertiliser and the treatment of the excreta, which influences their properties. Relationships and data that can form a basis for adapting the guidelines to local conditions are presented in the text. Urine and faeces are each a complete fertiliser of high quality and with low levels of contaminants such as heavy metals. Urine is rich in nitrogen, while faeces are rich in phosphorous, potassium and organic matter. The amount of nutrients excreted depends on the amounts in the food consumed, and equations are presented for calculation of nitrogen and phosphorus in excreta based on easily available statistics on the supply of food protein.

Excreta should be handled and treated according to the hygiene guidelines (Schönning & Stenström, 2004) before use in cultivation. Specific local recommendations for use of urine and faeces in cultivation should be based on local recommendations for fertilisation of crops. Application rates for commercial mineral nitrogen fertilisers (urea or ammonium if available) can be used as a basis for recommendations on the use of urine. Before translating such recommendations to urine, its nitrogen (N) concentration should preferably be analysed. Otherwise, it can be estimated at 3-7 g N per litre. If no local recommendations can be obtained, a rule of thumb is to apply the urine collected from one person during one day (24 hours) to one square metre of land and growing season. If all urine is collected, it will suffice to fertilise 300-400 m<sup>2</sup> of crop per person and year with N at a reasonable rate. For most crops, the maximum application rate, before risking toxic effects, is at least 4 times this dosage. Urine also contains lots of phosphorus, and it will suffice to fertilise up to 600 m<sup>2</sup> of crop per person and growing season, if the application rate is chosen to replace the phosphorus removed, as for faeces below.

Urine can be applied neat or diluted. However, its application rate should always be based on the desired nutrient application rate and any potential need for supplementary water should be met with plain water, not diluted urine. To avoid smells, loss of ammonia and foliar burns urine should be applied close to the soil and incorporated as soon as possible.

Urine is a quick-acting fertiliser whose nutrients are best utilised if the urine is applied from prior to sowing up until two-thirds of the period between sowing and the harvest. The best fertilising effect is achieved if urine and faeces are used in combination with each other, but not necessarily in the same year on the same area. The amount of urine to be spread can be applied in one large dose or in several smaller doses, and under most circumstances the total yield is the same for the same total application rate.

For faeces, the application rate can be based on the local recommendation for the use of phosphorous-based fertilisers. This gives a low application rate, and the improvement due to the added organic matter is hard to distinguish. However, faeces are often applied at much higher rates, at which the structure and water-holding capacity of the soil are also visibly improved as an effect of its increased organic matter. Both organic matter and ash are often added to the faeces and they improve the buffering capacity and the pH of the soil, which is especially important on soils with low pH. Thus, depending on the application strategy, the faeces from one person will suffice to fertilise 1.5-300 m<sup>2</sup>, depending on whether they are applied according to their content of organic matter or phosphorus. Faeces should be applied and mixed into the soil before cultivation starts. Local application, in holes or furrows close to the planned plants, is one way of economising on this valuable asset.

The guidelines have been developed within the framework of EcoSanRes, an international network of ecological sanitation expertise funded by Sida, the Swedish International Development Cooperation. The full guidelines are published as EcoSanRes Report 2004-2 and are available at [www.ecosanres.org](http://www.ecosanres.org).