The Waste of Human Wastes. A Discussion of a Global Ongoing Loss of Nutrient Assets

R.E.S.Tanner

INTRODUCTION

It is more than obvious that human activities take more out of the environment either deliberately or by accident than they replace by varied forms of recycling which is at best a partial process with its own problems of method, reuse and transportation. From extraction to replacement there is a long series of translation from one bodily form to another; each of which has different costings and specific problems.

One form of human waste, bodily excreta, is constant in quantity with an overall regularity of depositing for both time and place. Of all the materials created by humans ,this would appear to be the easiest to recycle and the easiest to reuse. It is a conspicuous failure of environmental planning that this resource is not returned to the soil to counteract its impoverishment from over-exploitation.

The literature on human sewage and its use is sparse and what studies have been made concentrate overwhelmingly on the dangers of its reuse; the negative aspects of short-term epidemiology rather than on long-term soil recovery. One looks in vain for a proportional assessments of its benefits in restoring or at least retaining soil fertility particularly in areas where alternatives methods cannot be afforded.

Human wastes have rarely be seen as a commodity with value in the production of cereals, except in the contemporary production of wet rice and vegetables in China and Japan. Elsewhere it has been disregarded as an asset in the maintenance of their soils with an almost culpable negligence. The main point of their systems of disposal was to get urine and excreta out of smelling and sight distance.

It is indeed remarkable to note the extent to which the reuse of human wastes is ignored in discussing the reduced fertility of overworked soils. Even detailed studies on the soil providing the essential details of soil deterioration and the artificial maintenance of its fertility do not consider human wastes to be something worth serious consideration. 'Out of the Earth'.(Hillel,1992,131) has only one passing reference to the use of human wastes for introducing nitrogen into Asian wet rice cultivation;it is not even in the comprehensive index.

If we have an area containing a population of x people,then we know that at the end of each daily cycle that area will receive x times 0.5 kilos of human body waste whatever the weather. The only variations in these enormous tonnages might be between the harvests of subsistence farmers when their food intake is low,during periods of feasting or fasting but not Ramadan when the overall weight will be the same, and in famine areas.

At its minimum these human wastes which are concentrated both biologically and socially, could be placed on fields by people going out to cultivate who latter come back loaded. In terms of organisation and method, the whole problem of its use has the apparent simplicity which most planners would welcome as almost ideal.

What then are the difficulties which prevent human wastes from being used effectively for the betterment of the environment. Firstly human excreta is a taboo topic in most cultures about which little is known (Tanner, 1995) outside epidemiology. The reuse of excreta does not attract the researcher or get infusions of public money to finance research or pilot projects. Its social and medical toxicity is considered to be more important than its value for the soil.

Secondly the public health processes for the disposal of excreta have been developed in western societies with adequate public funds, small populations in comparison to most of Africa and Asia and above all with plentiful water. The model is inexorably western and not for overpopulated,poor and impoverished societies.

As soon as development allows, excreting is based on the house which is then connected to a centrally organised water supply system which is then used in unnessarilly large quantities to flush excreta out of the house. The drains are then connected to a central sewage disposal system in which at enormous expense it is recycled into water to the shortage of which its earlier wasteful use has contributed. Let us now look at these factors in turn.

THE PROBLEM

The problem of human waste disposal is multi-

dimensional involving almost every human issue from psychology to the recovery of ingested and then deposited chemicals.

There is a global shortage of water from a combination of global warming leading to long periodic droughts,the agricultural and industrial use of water and its overuse for human cleanliness. There is also the fact that more concentrations of population are in areas without adequate water supplies such as northern China.

As agriculture becomes more mechanised and industry more necessary for attaining higher standards of living, concentrations of people have taken up ever larger proportions of population for which there is neither the capital nor the revenue for adequate social services beyond the requirements of the small professional class in low density housing. In many cases the political choice is between this class and drains by which the former benefits.

Where human wastes are processed it is done at great cost in order to turn it into neutral substances rather than to reuse it on the land. . Even in economically developed countries such as Sweden the cost of the water used domestically is only about a third of the cost of its provision (Drangert, 1996).

An enormous city such as Shanghai producing 5 million tons of waste per day of which only 200,000 tons are recycled,dumps the untreated remainder in nearby rivers and the South China Sea (Zhungmin, 1985: 121). It is necessary not only to appreciate the problem of such massive quantities but the waste to agriculture of the human waste proportion of such tonnages.

More importantly there is the political and social ignorance of the fact that human waste can provide replacement nutrients to the soil roughly equivalent to the nutrients eaten from an equivalent area. Further that urine rather than excreta overwhelmingly provides the nutrients which are necessary to maintain an adequate level of soil fertility. Whilst this balance may vary with diet and soil,it is clear enough in Sweden (Table 1).

The scientific literature on this issue is dominated by short-term health considerations rather than the long-term need to maintain soil fertility. It is possible that China has been able to sustain its large and concentrated population by reusing human wastes in wet rice cultivation. The fact that perhaps one quarter of their deaths may be related to waterborne diseases might be seen abstractly as a balancing necessity for such an intensive and long-lasting civilisation.

Thus the problem is one of recognising the value of the nutrients in human wastes particularly urine if it can be separated from faeces and the related political, social and economic issues in low-level recy-cling.

Table 1: The need for fertilisers (Nitrate,Potassium and Phosphorus) to produce 250 kg of cereals and the content in Swedish faeces and urine.

Important nutrients	*Urine 500 Lt/year*	*Faeces 50 Lt/year*	*Total*	*Nutrient need for 250 kg cereals*
Nitrate(N)	5.6 kg	0.09 kg	5.7 kg*	5.6 kg
Phosphorus(P)	0.4 kg	0.19 kg	0.6 kg	0.7 kg
Potassium(K)	1.0 kg	0.17 kg	1.2 kg	1.2. kg
Total amount ie N+P+K	7.0 kg (94%)	0.45 kg (6%)	7.5 kg (100%).	7.5 kg

* Author recently suggested figure to be lowered to 4 kg.
Source: Wolgast, 1993,26

In political systems as in social and economic behaviour there is always a large measure of imitation in the models for individual and collective behaviour. Newly independent and post-colonial nations model their structures on Western patterns whilst forgetting that these patterns are based on the balancing of budgets and general financial rectitude. They can afford the public health systems which they have installed in environments which were not then short of water .

The new nations have expanded their institutions and their social and political ambitions basing their finances on loans. There would seem to be little chance of their revenues supporting their political and social ambitions.

In public health the model tends to be centralised water-borne sanitation in social situations of rapidly expanding urban populations for which there is neither the capital for installing such systems nor the revenue and administrative capacity to maintain them Further these states have administratively weak structures overburdened with economic corruption and political uncertainty. It is often a situation reminiscent of 18th century England where the political system was described by Charles James Fox as'an oligarchy mitigated by riot'., in which in these states today the urban masses are routinely ignored in favour of centralised prestige projects.

THE PAST

The millennea in which bipedal hominids have been excreting in their semi-permanent living sites,has produced a social programing of this process which has had nothing to do with health and everything to do with safety and convenience. Even little more than a century ago ill-health was not

generally associated with human wastes.

Few animals place their wastes in fixed localities and if they do,it is faeces rather than urine and they have discrete areas for defecating which provide both security and privacy. Even at at the end of the 19th century pilgrims going to Mecca on the Hajj by camel caravan across the desert from Syria,were told to excrete exactly where they slept for fear of being murdered by the waiting Bedu should they go off in search of privacy. The defecating human being is in an exposed position with Darwinian overtones.

Little is known about excreting practices. Anthropological studies attract explanations of what is to them are exotic activities but rarely if ever contain details of such practices. Epidemiological studies also contain little about such activities as they assume that they know all that is necessary to know.The few researchers (Cheesmond and Fenwick,1981; Kochar, 1977) who do carry out such systematic analysis receive little encouragement for their innovative work.

Most societies have inherited an almost universal inhibition against the use of human wastes as fertiliser and cover the whole process of excreting by the widespread use of euphemisms. Lavatories are disguised and in higher social classes lavatories are divided between en suite ones for the house owner,other units for family members and a third one for guests. Thus in situations of affluence there is a dislike of sharing waste disposal facilities.

Where authorities have provided public lavatories they have a poor reputation for cleanliness and various sexual perversions which may make them avoided whenever possible. In Malaysia they have become the location of malevolent spirits ready to pounce on female factory workers (Ong, 1985) who are finding the movement from village to urban cum factory life stressful.

Yet infant cleanliness which has developed in correlation to permanent housing and household furnishings involves the regular handling of faeces by women. The care of the sick and the infirm has increasingly involved the handling of faeces by well regarded specialist handlers. Few families can have been without both of these experiences.

Thus the avoidance of human wastes while often regarded as universally avoided, seems to have been selective. Hindu India has culturally solved of human wastes by having sub-castes of Untouchables who traditionally clean lavatories and remove waste generally. This system may well have broken down with democratic institutions. Traditionally these cleaners in a village were socially segregated and integrated at the same time The irregular services of these people for the general disposal of unpleasant wastes was irregularly paid for by donations from those who benefitted from their services. With democracy and institutionalised village administrations these people became paid sanitary workers and the integration of the village dissolved with these efforts to formalise the informal;villages became dirtier places.

Overall the deliberate or accidental use of human wastes has taken many forms. Urinating in urban gardens is widespread and contributes some nutrients to their fertility. Generally subsistence farmers prefer to defaecate in their fields or in nearby uncultivated areas than in houses or compounds involving multi-facetted cleanliness and sharing problems.

Thus the use of human wastes in most countries in ways that contribute to food production is patchy and in some cases as in Israel involves some form of preparatory recycling and only more generally used in Asia (Cross, 1985). But it is only in China that human wastes have been deliberately and widely used over a wide geographical area for fish ponds,wet rice fields and vegetable growing. Historically there has been a symbiotic relationship in the use of human wastes between the city and the surrounding rural area supplying its food (Whitney, 1970,59).

THE PRESENT SITUATION

There can be no doubt atall that in an environmentaly endangered world millions of tons of valuable restorative nutrients are turned into neutral substances at great expense,deposited haphazardly or irrevocably lost by their untreated depositing in rivers and seas.

Most third world populations are expanding particularly in the ‘septic’ fringes of cities which have long lost the economic means, social capability and political will,to solve their public health problems, much less institute new measures for the revitalisation of its agricultural soil (Black, 1994).

Apart from the general problem of maintaining agricultural yields once new seed types have gone into general use, it is little recognised that 15 per cent of cereal food is grown within urban boundaries. The environs of Manila, Tokyo, London, Nairobi, Cairo and Beijing contain large areas of allotments as well as small-holder farms which grow substantial quantities of vegetables (Ceballos, 1997).

The cost of processing the enormous tonnages of human wastes into neutral substances is beyond the

fiscal capacity of most nations. The installation of democratic political systems in these states has meant that politicians whether they like it or not are regularly at the mercy of their electorates and there is no incentive to work for programmes which will not show some immediate returns for these impatient voters. The non-political adminstrators whose salaries have nearly always failed to keep pace with inflation are more concerned with providing for their families through private business, corruption or just farming their own land to put much effort into long-term schemes. Donor nations are similarly likely to put their money into schemes which will have immediate effect and gain some popularity with their own electorates.

Many of these societies have a surfeit of white collar administrators and managers and a mass proletariat stimulated with secular ambitions for improving their standards of living based on political rhetoric and Western mass media models of living. They lack a middle grade of workers, maintenance technicians,to keep the numerous machines of any centrally organised sanitation system working efficiently.

The public health world has known for years (Shuval, 1986a) that the use of raw human wastes are a potential health risk depending on the area's load of excreta and the degree of immunity of individuals in the recipient community. These pathogens (Feachem et al., 1983) can survive for varying periods. Viruses not more than 120 days but usually more than 50 days, bacteria between 30 and 60 days but usually between 10 and 30 days,protozoa possibly more than 30 days but usually more than 15 days. Only helminths can last many months as eggs.

The survival of bacteria in soil (Shuval at al., 1986b) depends on a number of factors; antagonisms in the soil,the greater survival time in moist soil and less time in sandy ones, larger amounts of organic matter, shorter survival times in acid as opposed to alkaline soils as well as in surface application and in high temperatures. So it was seen that the data is plentiful on reasons for cautiousness in the use of human wastes but little information is available on the benefits which might accrue from their use in raising cereal yields and maintaining soil fertility. A reluctance to think in terms of long-term balances.

THE FUTURE OF HUMAN WASTE USE

There is an obvious need for systems of human waste reuse rather than disposal,which matches environmental needs and small scale economics involving a time and motion approach to subsistence farming. There can be no doubt at all that in an environmentally endangered world principally caused by a combination of population pressures needing food and politically maintained but unsustainable aims for much higher standards of living, millions of tons of valuable restorative nutrients are wasted.

These massive tonnages of nutrients are either ignored and become a peri-urban and urban pollutant, turned into neutral substances at great expense or let to flow irrevocably into streams, rivers and seas.

It would seem that only China has consistently used human wastes for agriculture and that this process has been successfully institutionalised and used over many centuries without any widespread scientific knowledge of its possible relationship to disease or the chemical contents of both the wastes and the soils to which it is applied.

However it may only be Japan that has allied the collection and use of human wastes for agriculture in ways that involve urban living and centralised technology. It has 1800 night soil treatment centres to which human wastes are delivered by vacuum powered trucks from households in much the same way that septic tanks are emptied in Britain. This is economically less costly than centralised treatment plants connected to water delivery and collection systems but in Japan the rising standards of living in cities has made this system less popular in comparison to being connected to water mains.(Matsui, 1997; Magara and Kawamura,1992). There is a similar process going on in China where Nanjiang used to put all its wastes into the Yangtse river and now has four sewage conversion plants; no human wastes are returned to the soil. .

Thus it would seem that in contemporary societies there has been a consistent and continuing rivalry between the public health elite to some extent detached from the practicalities of economic and social survival, but supported by their allies in politics in their pursuit of votes and in sustaining the Western ideology of the importance of the individual.

In contrast to them is the less powerful agricultural and environmental professionals,less detached from the practicalities of economic and social survival, who are often involved in farming, who deal with long-term issues and who are inclined to think in communal terms. They do not get the support of democratically elected governments and their supporters who would be penalised by changes

which would occur in their own lives and backyards.

Most of these health issues are shared between bacteria etc from human wastes and chemicals from industry because in most disposal systems there is no differentiation between the two types of waste. The first need is to separate the two so that possibly human wastes do not enter the arena of chemical poisoning and can be reused almost at once without any process of recycling. The industrial wastes are a different problem with which this paper does not deal.

Most health risks from human wastes distributed in irrigation rather than as dry manure, might well not survive the period between plantings in multicrop systems or in inter-crop dry season attrition. Only helminths are a persistent health hazard which can only be partially relieved by the wearing of shoes and the domestic purification of water. China has not seen these risks as a reason to take human wastes out of their agricultural production cycle.

Humans are not known to be particularly influenced by health advice which would lengthen their lives or reduces their disabilities. They might queue to be innoculated against a mass disease, but to avoid degenerative malfunctions by changing their daily pattern of behaviour has a dismal record of failures over alcohol, tobacco, sexual activities and petrol fumes. Only the mass epidemiologists can claim short-term successes.

Perhaps the way forward for the utilisation of human wastes is not to stress the health hazards but the economic gains. It would seem ridiculous to try and transport imported fertilisers to fields when in many cases farmers are producing their own nutrients on site. Most subsistence farmers have acute cost-benefit calculative minds; the Sukuma of Tanzania used human and animal wastes on their field when they lived close together for defensive purposes and ceased to do so when they lived spread out and the effort of transporting manure no longer paid-off.

Societies need to develop the means of collecting human wastes on a household basis for use on their fields or small scale allotments. It is less a question of inhibitions over cleanliness but one of economics;more particularly the need to turn recycling plants into factories producing reusable nutrients in massive tonnages in an easily transportable form. The excreta from 80 persons per hectare amounts to 20-30 tons annually which could be used to refertilise the same area (Schadewalot, 1983) The cost of recycling is not only an increasing economic liability but a misuse of available resources and a neglect of environmental needs for regeneration.

KEY WORDS Human Wastes. Nutrients. Recycling. Failure. Regeneration.

ABSTRACT Human Wastes with their high nutrient content are largely not used for soil regeneration. Their depositing in the sea,rivers or processing through expensive recycling is an irreparable loss to a degenerating global environment.

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Author's Address: **R.E.S. Tanner,** The Footprint, Padworth Common, Reading, Berks RG7 4QG, United Kingdom

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