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Compost Latrines

A REVIEW OF EXISTING AND PROPOSED SYSTEMS

By Uno Winblad, IDRC Resident Advisor at the Tanzania National Scientific Research Council.

This report was abridged by the author to suit the IRCWD News requirements. The views expressed in this paper ar those of the author and do not necessarily reflect the views of IDRC (International Development Research Centre in Canada).

An interdisciplinary team at the Tanzania National Scientific Research Council is currently studying the problems of human and household waste disposal in villages and peri-urban squatter areas. The project, which began in 1975, is supported by the International Development Research Centre in Canada.

The director of the project is Professor W. Kilama of the Division of Social and Community Medicine, University of Dar es Salaam. Mr Uno Winblad, a Swedish architect/planner previously with the UNDP, is the IDRC Resident Advisor on the project.

A study by WINBLAD (1972) proposed that composting systems might offer some possibilities for solving problems of human and household waste disposal in Third World countries. The current project in Tanzania constitutes the first known comparative study of various household size composting systems under tropical conditions.

In Work Report No. 1 of the Alternative Waste Disposal Methods project WINBLAD (1975) reviews existing and proposed compost latrine systems from various parts of the world.

The first part of the report is a REVIEWof twenty-five different systems. Each one is described and illustrated. Some source references are given. The systems are classified as either **discontinuous, alternating, continuous,** or **compact with heating.**

Discontinuous types are those where a new latrine has to be built when the first one is full. The report describes:

1. Single-vault compost latrine
2. Reid's Odourless Earth Closet (R.O.E.C.)
3. The Arrhenius type
4. The Joansuu type
5. The Western Pacific type

Alternating types have two pits or vaults which are used alternately, each one normally for a period of 4–8 months. The report describes seven variations on this theme:

6. Double-vault latrine
7. The Gopuri type
8. The Vietnam open type
9. The Vietnam closed type
10. The Biopot
11. The Kern type
12. The Snurr-toa

Continuous types can be used without interruption, as the pile accumulating in the vault is periodically removed (as in types Nos. 13 and 14), moves by gravity along a sloping floor (Nos. 15–21) or falls down a series of grates (No. 22). Ten various types are described in the report:

13. The Kanagawa type
14. The Farallones type
15. The Clivus
16. The Humusdrum
17. The Södertälje type
18. The Toa-Throne
19. The CADU type A
20. The CADU type B
21. The Scanplan type
22. The Shore type

Compact types with heating consist of a small vault with electric heating of the compost pile. During the last few years, a large number of compact types with heating have appeared on the market, specially in Nordic countries. The differences between them are slight, and only three have been included in this report:

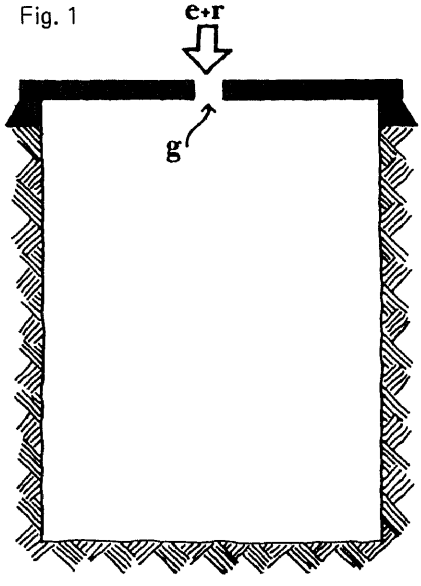
23. The Mullbänk
24. The Bioloo
25. The Biolett

The second part of the report is a DISCUSSION of the possible application of the systems in East Africa. The following is a slightly amended version of that chapter of the report.

Discontinuous Types

The **Single-vault** compost latrine (No. 1) described by WAGNER and LANOIX (1958) is, in reality, a pit privy of enlarged cross section into which grass, leaves, garbage, animal manure and straw is placed together with the human excrement that is deposited by users. While it has the advantage of low cost and simplicity there are a number of disadvantages attendant to its use. The composting process will be largely anaerobic and therefore slow and malodorous; the pit provides a site for fly and mosquito breeding; when the pit is full the slab and superstructure must be relocated over a new pit; there is a possibility of groundwater contamination from the pit leachate.

Fig. 1



Some of these disadvantages can apply also to other composting processes and the elimination of a disadvantage is often accompanied by increased cost and complexity.

KEY TO FIGURES

a	air	**r**	organic refuse
e	excreta	**u**	urine
g	gases	**w**	water (from shower and washbasin)

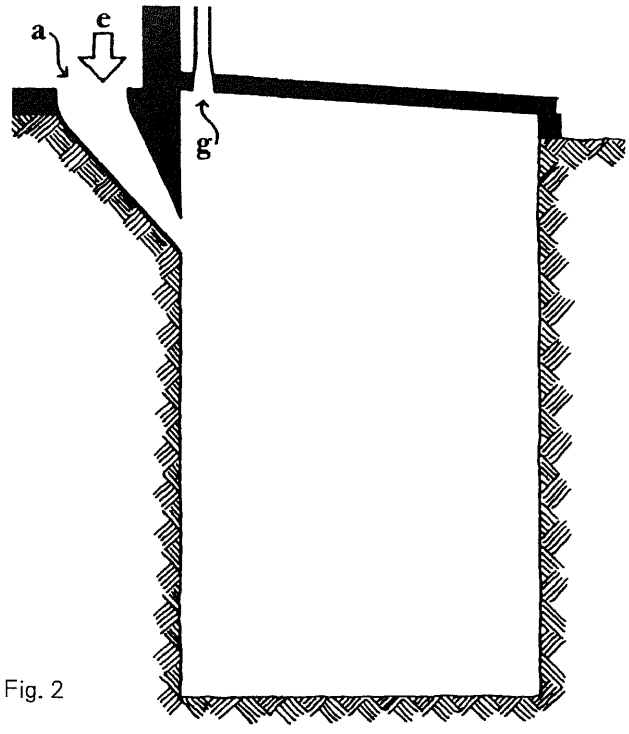


Fig. 2

The **R.O.E.C.** (No. 2) is not really a compost latrine as it takes excreta only and the humus is not retrieved. It has been included in the report because it demonstrates several ways in which the single-vault compost latrine could be improved. To put it another way, it may be possible to turn the R.O.E.C. into a compost latrine by feeding it with organic kitchen and garden refuse in addition to the excreta. The question is whether this could be done without losing its present advantage of long life. If addition of refuse makes it fill up too fast it may be possible to turn it into a continuous compost latrine by shaping the pit like the vault of Humusdrum (No. 16). The major disadvantage of the R.O.E.C. is the risk of groundwater pollution. How could the R.O.E.C. function if the pit were made water-tight?

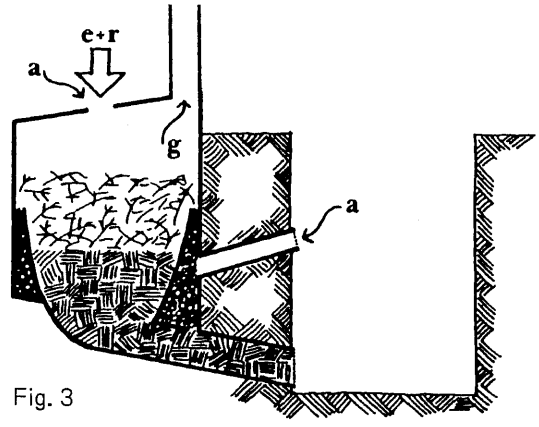


Fig. 3

The **Arrhenius-type** (No. 3) seems unnecessarily complex. The idea of using a bundle of twigs in the vault is interesting; the twigs would serve the same purpose as the inverted U-shaped conduits in Clivus (No. 15) and Humusdrum (No. 16).

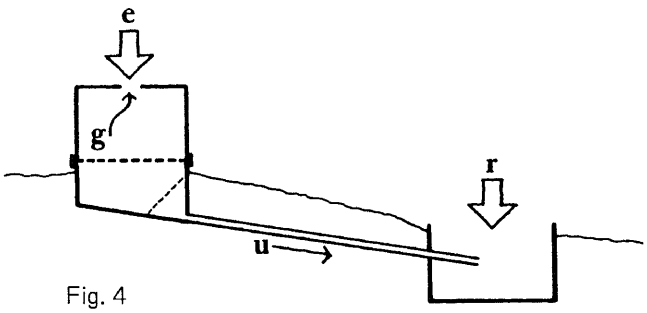


Fig. 4

The **Joansuu-type** (No. 4) and the **Western Pacific-type** (No. 5) are also too complex for our purpose since it is probably unnecessary to collect and remove the urine. Could it not be evaporated through the ventpipe?

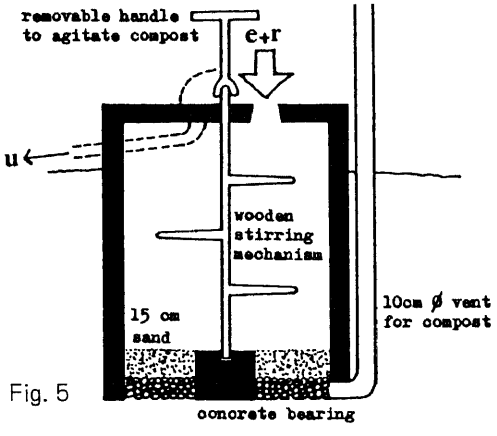
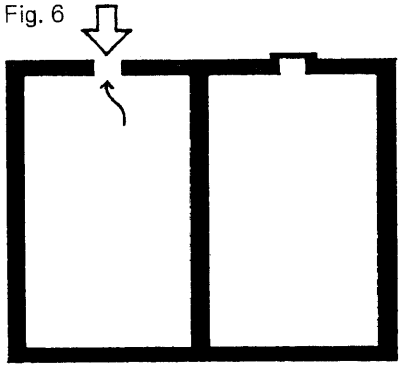


Fig. 5

Alternating Types

The **Double-vault** compost latrine (No. 6) obviates the need for periodically moving the superstructure and slab back and forth over two separate pits by constructing, in effect, two adjacent single-vault latrines with a common wall between adjacent pits and adjacent superstructures (WAGNER and LANOIX, 1958). This quite naturally increases construction cost and introduces the difficulty of both compartments being used simultaneously, thus defeating their purpose (**ibid,** p. 119). It should, however, be possible to design the squatting plate(s) or doors in such a way that this problem can be overcome as in Nos. 7 and 10. No ventilation of the vaults is provided. Referring to pit privies it is claimed (**ibid,** p. 67) that, "in tropical areas evidence seems to indicate that venting serves no useful purpose". Unfortunately no reference is given but this seems to be a point where further research is needed.

Fig. 6



The **Gopuri** latrine (No. 7) has a ventpipe. The larger part of the vaults is above ground which facilitates the removal of the humus. Why is the vault not in use covered with an iron sheet? If the sheet was exposed to the sun it would help to increase the temperature in the vault. If it were not exposed, a concrete slab would do equally well.

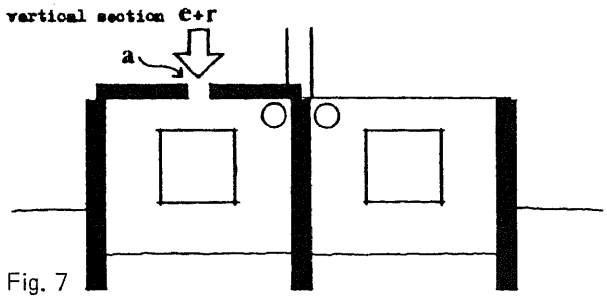


Fig. 7

The purpose of adding ashes as recommended for the Gopuri and the **Vietnam types** (No. 8 and 9) is to increase the pH-value and thereby to speed up the composting process. As the Gopuri latrine has no concrete floor there is a risk of soil and groundwater pollution. This also applies to the first **Vietnam type** (No. 8). How should they function with water-tight vaults? With some 85 % of the fertilizer value (in terms of nitrogen) of human excreta coming from urine (JALAL, 1969), it is desirable to avoid ground seepage also from this point of view.

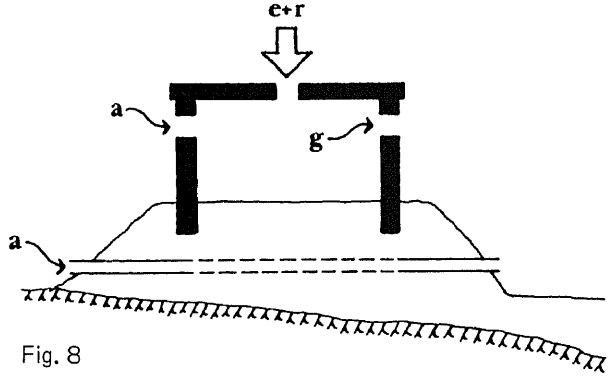
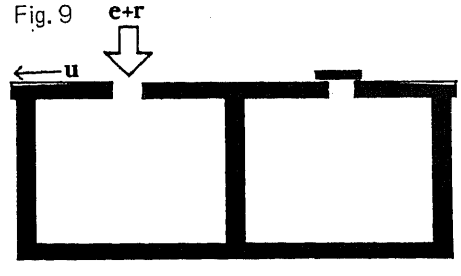


Fig. 8

This **Vietnamese type** (No. 9) consists of a water-tight concrete vault divided into two compartments. The urine is drained away through channels in the squatting slab.

Fig. 9



The **Biopot** (No. 10) is like the Gopuri latrine (No. 7) with the addition of a filter. The Biopot has never been tested in practice but it is likely that the building and maintenance of the filter is too complex an operation for people without basic training in biochemical engineering. Is a filter really necessary? Where direct infiltration of urine into the soil is unacceptable, evaporation rather than infiltration through filter seems to be the answer.

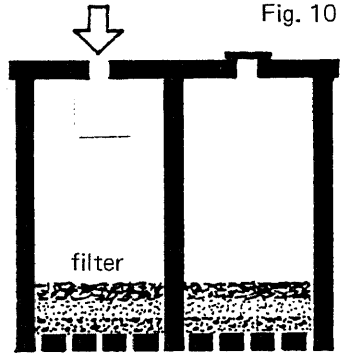


Fig. 10

The design of the **Kern** latrine (No. 11) is based on a level of technology not normally found in villages in East Africa. Although it is as double-vault latrine it has incorporated features from the continuous types (Nos. 15–21), viz. the sloping floor and the U-shaped conduits. The Kern latrine has a toilet bowl with a water seal and is flushed with one litre of water after each use. An interesting detail is the damper placed under the toilet-bowl.

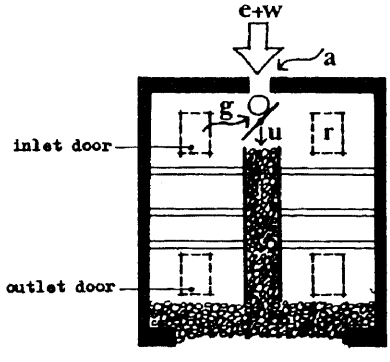


Fig. 11 vertical section

In the case of the **Snurr-toa** (No. 12) we are far away from village technology. It has been included here to illustrate one more way of switching from one compartment to another: in Nos. 6–10 the user moves himself, in No. 11 he pulls the baffle control level, in No. 12 the compartment is moved and in Nos. 13 and 14 he has to shift the compost pile himself using a pitch fork.

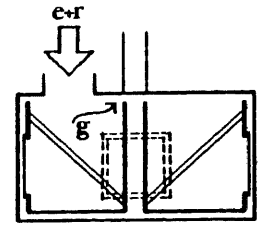


Fig. 12 vertical section

Continuous Types

When urine is separated from faeces as in the **Kanagawa type** (No. 13) there is a risk that the compost turns too dry. Experience from Scandinavian countries (No. 15–18) indicates that there is no need for such a separation when the vault is ventilated.

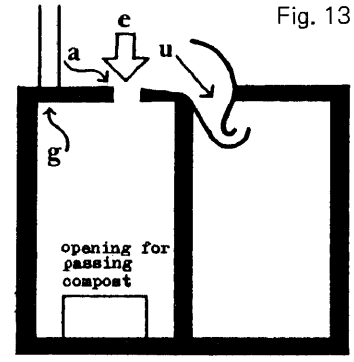


Fig. 13 vertical section

The **Farallones** latrine (No. 14) is based on the age-old method of turning the compost to aerate the pile. The method is simple and should work well but unfortunately it involves handling of fresh excreta and is therefore unacceptable for health reasons.

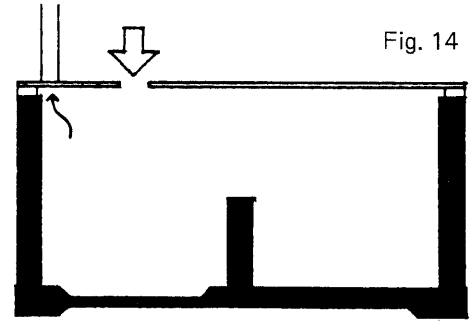


Fig. 14

One of the main problems in designing compost latrines is to avoid this handling. In latrine types Nos. 15–21 the problem is solved with a sloping floor along which the contents of the vault slowly slide from the upper end with its fresh deposits down to the lower end from where the stabilized compost is eventually collected.

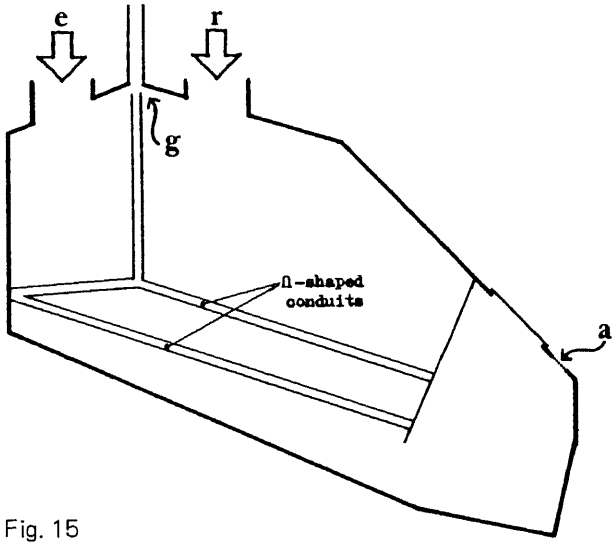


Fig. 15

The idea of a sloping floor was developed by Mr R. Lindström of Tyresö, Sweden, who eventually patented his device. It has been sold since 1965 under the name **Clivus** (No. 15) in Scandinavia and is now also available in North America. The Clivus is probably the best of the compost latrines marketed at present. Its main drawback is its size and its price of over $ 1000 (RYBCZYNSKI, 1973).

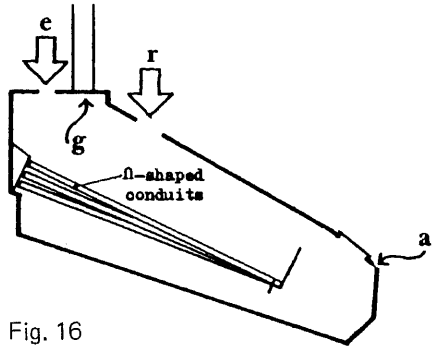


Fig. 16

The **Humusdrum** (No. 16) is smaller and therefore considerably cheaper although the basic features are the same. Its volume is only 1200 litres compared to the 3600 litres of the Clivus. The prototype of the Humusdrum, the **Södertälje type** (No. 17), was first built in 1957. It was developed by Mr T. Lysell, Chief Health Inspector of Södertälje, Sweden. Since then his department has been distributing drawings to do-it-yourself builders, and he estimates that up to now some 400–500 units have been built in Södertälje, mainly for weekend and summer houses at the outskirts of the municipal area. A similar number has been built in other parts of Sweden over the past 18 years.

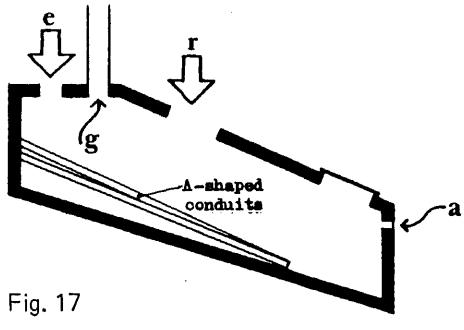


Fig. 17

Toa-Throne (No. 18) is the most recent addition to this type of latrine. Its size is similar to that of the Humusdrum. The main difference is that here the air enters the vault through slots in the floor.

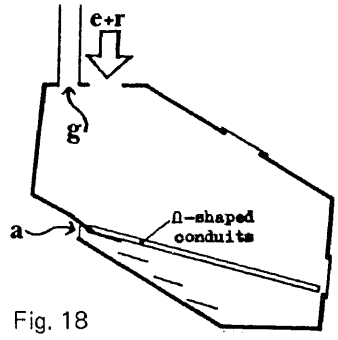


Fig. 18

CADU A (No. 19) is an even more simplified version of Clivus proposed for a Swedish sponsored agricultural development project in Ethiopia. No reports on how it works have been received so far. From drawings made available (private communication) it seems as if the ventilation of the storage chamber and the lower part of the vault may be poor. The Clivus originator (LINDSTRÖM, 1965, pp 31–32) recommends that the storage chamber should have a relatively shallow depth and large surface area exposed to the air.

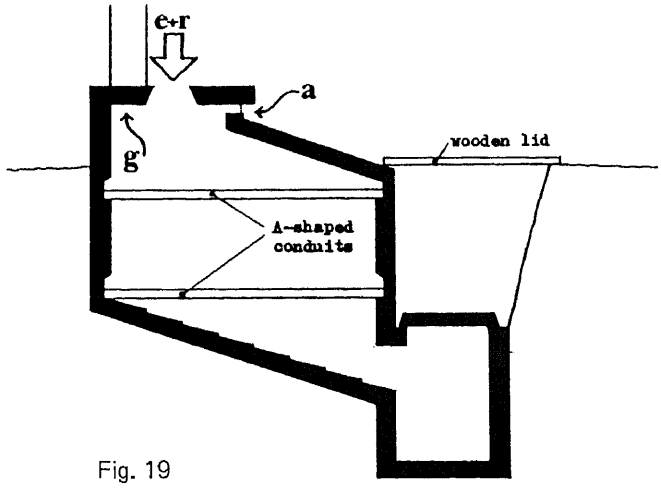


Fig. 19

CADU B (No. 20) is a simplified version of CADU A but not yet built. It could be simplified even more by excluding the sheet of corrugated perforated plastic, the red ashes and the plastic film at the bottom. A plastic film would in any case not prevent ground seepage for very long as it would be eaten by ants and rodents. The sloping floor could be cast in concrete and should be inclined more than the corrugated plastic in the original proposal.

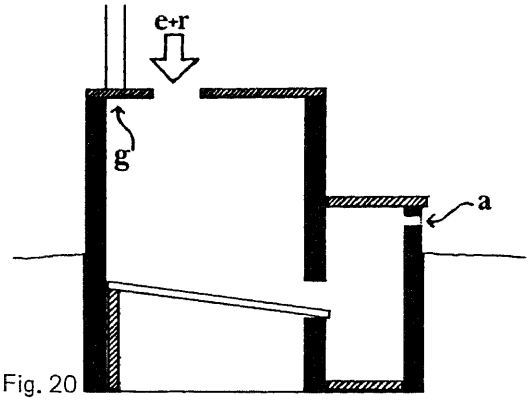


Fig. 20

The **Scanplan type** (No. 21) is probably too small to work satisfactorily. Besides, there is nothing to prevent fresh excreta from moving directly down to the lowest part of the vault.

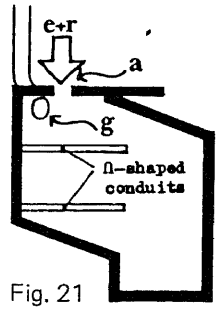


Fig. 21

Although the **Shore type** (No. 22) has been built I have not seen reports on how it works. There might be a risk that the piles on the successive layers of grills will be too dry for the decomposition process. The piles, especially the upper one, would then not disintegrate fast enough and the volume would build up, eventually preventing the air flow.

Most of the continuous types have inverted U- or V-shaped conduits to bring air into the lower part of the pile. Are such conduits really necessary? In East African villages where bamboo ist not available it would be difficult to find a suitable material. Perhaps the same effect of aeration could be achieved by placing a bundle of twigs in the converter from time to time.

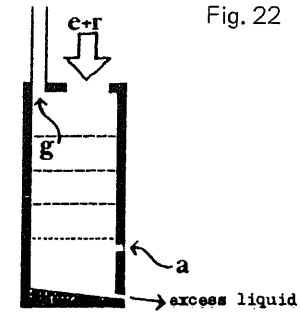


Fig. 22

Compact Types with Heating

The first of the compact compost toilets is the **Mullbänk** (No. 23) marketed in 1971. Commercially it was a success, and after a couple of years the annual production reached 20,000 units. Initial claims by the manufacturers that the end product was odour-free and harmless were soon refuted, however. The Swedish National Board of Consumers now recommends that the output of a compact toilet should be post-composted for six months before being used as a fertilizer in the garden (KONSUMENTVERKET, 1975a).

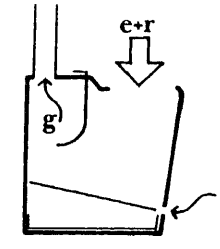


Fig. 23

The **390 Bioloo** (No. 24) by-passes the need for post-composting by sterilizing the output before it is removed.

The **Biolett** (No. 25) is larger than the other compact types: the vault is supposed to be placed in the basement or underground. The urine ist separated from the faeces and passes through two filters.

There are many compact units on the market now, specially in Sweden and Norway where they are used mainly in weekend and summer houses. Most of the units take only excreta — they are too small to handle kitchen refuse. All of them are based on electric heating either of the compost pile directly (Nos. 23, 24 and 25) or on heating the incoming air ("Humus-Toilet").

Fig. 24

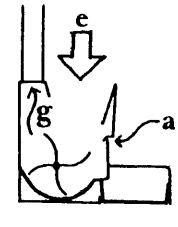
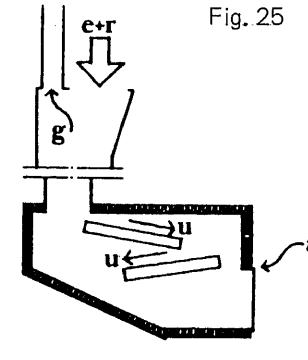


Fig. 25



The compact types are all factory made and range in cost from just under $ 400 up to over $ 700. The electricity cost based on a kWh rate of $ 0.035 would be $2–$3 per month, (US $ equivalent to the price in Sweden in April 1975, including VAT.) Experience in Sweden (KONSUMENTVERKET, 1975a) indicates that the risk of overloading and surplus liquid is especially great for the smaller models. Fly breeding can be a problem.

Ready made compost latrines and toilets, especially the compact ones, are often sold together with a "specially prepared soil". Available evidence (GOLUEKE, 1975, pp 18–21) indicates that the addition of inocula serves no useful purpose.

The CONCLUSION consists of a number of questions to be pursued in the research project. The project is now (April 1977) more than half-way through, and the final report is expected in January 1978.

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Sanitära anläggningar i tropikerna
(Sanitary units in tropical countries)
Compendium at the Extra Rural Dept. of the University of Gothenburg (mimeo).

VISSER, A.S., 1965
Decomposition of organic materials in the tropics
Compost Science, Vol. 5, No. 3, pp 27–29.

News from WHO

New WHO publications

Rough determination of the cost-benefit balance point of sanitation programmes *
by B. Cvjetanović[1] & B. Grab[2]. Bulletin of the World Health Organization, Vol. 54, 1976, pp 207–215.

Resources for sanitation programmes in developing countries are limited and therefore must be used judiciously to obtain the best possible effect. Cost-benefit analysis is a tool that permits the better utilization of available resources. A simple method for rough determination of the cost-benefit balance point has been devised which requires little computation. To reduce the computations to a minimum, nomograms have been constructed which require little or no mathematical skill for their use. While the method falls short of perfection, its simplicity makes it useful for a rough evaluation of the benefits from sanitation programmes aimed at disease control in countries whose resources are not available for more sophisticated analysis.

World Health Statistics Report, Vol. 29, No. 10, 1976. Bilingual: English and French; price: Sw. fr. 17.—; available from WHO sales agents.

This special issue on "Water and Sanitation" reviews the progress of community water supply and excreta disposal services in the developing countries in the period 1970 to 1975, furnishes estimates of investments required to meet the WHO targets for 1980 and outlines courses of action to meet these goals.

In addition, WHO has devoted the January 1977 issue of the *World Health* magazine to the subject of water, marking the occasion of the UN Water Conference that took place in Mar del Plata, Argentina, 14 to 25 March 1977.

Health aspects of human settlements. A review based on the Technical Discussions held during the Twenty-ninth World Health Assembly, 1976, edited by A.E. Martin. Geneva, 1977, 57 pages (Public Health Papers, No. 66). Price: Sw.fr. 8.—. French, Russian and Spanish editions in preparation. Available through WHO sales agents.

Whether dealing with a remote mountain village in the tropics, a nomadic community in the desert, or rapidly expanding cities anywhere, the questions of human settlements and the health of the people living in them are intimately interrelated, for without health most other aspects of the so-called "quality of life" become meaningless.

In an effort to define health within the broader context of human settlements of all types and to determine how the health sector could best contribute to improving the quality of life within these settlements, 255 delegates to the Twenty-ninth World Health Assembly, held in Geneva in May 1976, participated in Technical Discussions on the subject. They agreed on the need to ensure that health, in its broadest sense, is accepted as an integral part of the planning and development of human settlements. This involves clarifying health policies so that they can encompass far more than the narrowly curative approach so often used in the past and identifying techniques, manpower and organizational patterns that will make the health sector a genuine partner in national policy and decision-making in regard to human settlements.

Beyond defining the priority health needs in human settlements as an adequate state of nutrition, adequate water supply and waste disposal services, and a system of health care available to all, the Technical Discussions provided a forum for the exchange of ideas and practical experience to assist participants in dealing with the health and social problems in their own countries. The material in this book provides a useful starting point for anyone concerned with human settlements and will enable him to see local and national priorities and capabilities in a more realistic perspective.

Guide to sanitation in tourist establishments, by Joseph A. Salvato, Jr. World Health Organization, Geneva, 1976, 141 pages. French and Spanish editions in preparation, Price: Sw.fr. 24.—. Available through WHO sales agents.

This guide is intended for operators of camping sites, caravan camps, motels, youth hostels, ski resorts, chalet colonies, and picnic areas. Its main purpose is to provide them with background information on health and sanitation criteria, which will help them to cooperate more effectively with public health professionals and tourist agencies in upgrading their facilities. It serves also as a comprehensive handbook on the planning, setting up, and running of a tourist establishment. Health professionals themselves may find much of the material useful.

After a chapter on the selection and planning of the site, the author shows how a safe water supply can be developed and how sewage can be disposed of in a sanitary manner. The provision of proper buildings and accommodation is described in some detail, with separate chapters on safe plumbing arrangements and the handling and disposal of refuse. Methods of controlling insects and rodents are fully explained, and there is a large section on the important subject of food sanitation. The author then deals with specific problems such as the precautions to be taken in the operation of swimming pools, the detailed planning of caravan (travel trailer) camps, and the sanitary arrangements for mass gatherings. The book ends with an account of medical and first-aid services and a chapter on such topics as fire protection, fuel storage, picnic areas, and marine sanitation. Annexes are provided on the evaluation of facilities, emergency water treatment, and soil percolation testing.

Surveillance of drinking-water quality, World Health Organization, Geneva, (Monograph Series No. 63). 136 pages. Price: Sw.fr. 29.—. French, Russian and Spanish editions in preparation. Available through WHO sales agents.

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In view of efforts now being made, especially in the developing countries, to provide safe and reliable supplies of drinking water for rapidly growing urban populations and small rural communities, some basic guidelines on water quality surveillance are essential.

Detailed surveillance requirements and procedures are set out in a recent WHO monograph, which has been prepared from information obtained through on-site surveys in eight countries, with Professor F.E. McJunkin of the University of North Carolina, United States of America as principal investigator, from correspondence and interviews with health and water supply officials and others, from comments and suggestions made by a panel of expert reviewers, and from reviews of the technical and scientific literature, including WHO reports and unpublished documents.

Abstracts

The following abstracts have been taken from our documentation on solid wastes which contains over 2800 publications.

Van Veldhuijsen, L.: Compost against erosion (Dutch), 1974, 18, No. 6, 41, Land Water (Amst.).

New shoulders and slopes by the side of highways are often covered with a layer of topsoil and sown with a mixture of grasses. However, a considerable problem exists with the slow growth of some of the better grasses and the erosion caused by rain. In 1968, a work group was set up to study this problem. The group performed a large number of tests, and came to the conclusions that topsoil can profitably be replaced by municipal refuse compost. This compost is resistant to erosion and is very effective in promoting grass growth. A report is presented of a test done near Alkmaar, The Netherlands, using this compost. It was found that the best method of application is by means of a special spraying machine called a hydroseeder. A cost breakdown is given which shows the process to be highly economical. The article concludes with remarks about the best grass seed mixtures and their growth patterns.

Gysi, Ch., Koblet, W.: Use of composted refuse in vine culture, 1975, No. 86, 8 p, Mitt. Eidg. Forsch. Anst. Obst. Weinbau.

The use of composted refuse on steep vine slopes prevents erosion, improves soil stability and acts as a soil improver, according to tests made on steep slopes in Eglisau, Switzerland.
Different types of composted refuse are distinguished dependent on the degree of decomposition and type of treatment given. Composted refuse quality varies considerably and minimal requirements for vine cultures include: not more than 45% water, at least 10% organic material, and maximum 1.5% (weight on 8 mm sieve) extraneous substances such as glass, metals or plastics. In addition, the authors discuss when to apply composted refuse, where and how much, as well as a number of possible methods of application. Finally, compost use is compared with more traditional methods of soil improvement (manuring).

Kispert, R.G., Sadek, S.E., Wise, D.L.: An economic analysis of fuel gas production from solid waste, 1975, 1, No. 1, 95–109, Resource Recovery Conservat.

An engineering analysis was carried out to establish the economics of methane production by anaerobic digestion of municipal solid waste. A plant processing 907,000 kg/day (1000 tons/day) and serving a metropolitan area of about 500,000 population was specified on the basis of known characteristics of waste handling, rates of gas generation, and specific equipment costs. A quantitative description of the process was formulated to account for the broadest possible scope of relevant factors, including capital costs based on engineering selection of equipment, credits and penalties associated with waste consumption and residue disposal, realistic financing and operating charges, and the most complete description of operating characteristics available. Representative values of operating and cost parameters were selected and utilized to establish a base line process description. Confidence in the values selected was attained by conferring with recognized researchers, engineers, equipment manufacturers, and engineering design firms to verify and document the information and selections. The cost of gas produced by the base line process was then calculated. A sensitivity study was conducted in order to determine the effect of variations from base line conditions on gas cost. The effect on gas cost of the financing options available in government or private ownership were investigated. Through computer aided

optimization of the calculated cost of a privately owned plant, it was found that methane can be produced at a base line cost of $ 0.074 per cubic meter ($ 2.09/Mcf). This cost is economically acceptable when compared with projected costs of natural or synthetic gas. Operating energy requirements of the process consume the equivalent of only 37.5% of the gas produced, and the community obtains a storable fuel of versatile applicability.

Robertson, J., Toussaint, C.R., Jorque, M.: Organic compounds entering ground water from a landfill, September 1974, 44 p, U.S. Environm. Protect. Agency Report No. EPA-660/2-74-077.

Organic compounds leached into ground water from a landfill containing refuse deposited below or near the water table were investigated. Ground water from wells within or near the landfill and a control well was sampled by modified low-flow carbon adsorption procedures incorporating all glass-teflon systems to preclude introduction of extraneous organics. Column chromatography, solubility separation, and gas chromatography-mass spectrometry were employed for separation, identification, and quantitation of individual compounds in organic extracts. The ground water was shown to contain low levels of many undesirable organic chemicals leached from the landfill. Of those compounds identified (over 40), most were chemicals commonly employed in industry for manufacturing many domestic and commercial products. The source of these compounds was apparently manufactured products discarded in the landfill, since it had not received appreciable wastes from industrial operations. Because the age of the refuse in the area studied was at least three years, the compounds identified were believed to be substances leached very slowly from the refuse and/or transported away from the landfill very slowly because of adsorption on aquifer solids. Potential long-term pollution of ground water by industrial organic chemicals from landfills may be indicated by this work.

Von Hirschheydt, A.: Composting of refuse in France, 1975, 7, No. 7, 196–204, Müll und Abfall.

In contrast with the development in Germany, Switzerland and The Netherlands, the composting of refuse in France is still growing. The present report describes the distribution of composting works over France, the compost qualities produced there, the application of composts, the composting procedures and the organization of the sale of composts, and draws a comparison with the composting in Switzerland. Generally, the French composts are coarser, richer in foreign substances and lower in water than the Swiss ones. Among the composting systems used in France, there are several which could not yet be studied in other countries, particularly variants of a system involving prepulverization and static predecomposition (i.e. predecomposition allowing development of fungi in the material) and variants of a system with static predecomposition but without prepulverization. The first system seems superior to other systems with respect to the evaporation capacity. Combined composting of refuse and purification sludge is almost unknown in France. The fields of application of composts include vines, agriculture, mushroom cultivation and horticulture. In contrast to the situation in Switzerland, French plants for refuse disposal are frequently operated by the compost supplying firms themselves.

Cross, J.A., Park, W.R.: The role of plastics in resource recovery, May 23, 1973, 4 p, Manufacturing Chemists Association.

This report discusses the role of plastics in resource recovery techniques, primarily as they relate to mixed municipal solid wastes. Plastics are now a minor factor in solid wastes, but their amount is increasing, and some concern has been voiced as to their effect on resource recovery. The present study examines several methods through which value may be recovered from plastics solid waste. A brief review of plastics production and consumption is provided, along with an overview of the characteristics of the solid waste stream. For both, forecasts are made through the year 1990. The resource recovery section deals briefly with materials recovery, then focuses primarily on recovery of energy values. A review and forecast of U.S. energy requirements are included.

Anonymous: Solid waste management guidelines, Jan. 15, 1976, No. 10, 2359–2363, The Fed. Reg.

The Federal Register proposes rules in the area of recovery systems. These proposed guidelines are intended to provide requirements and recommended procedures for the establishment and utilization by Federal agencies of facilities to recover resources from residential, commercial, and institutional solid waste, and to recommend the establishment and utilization of these facilities to State, interstate, regional, and local governments. Utilization of these resource recovery facilities will result in conservation of resources and in a reduction in the amount of solid waste that requires disposal.

These guidelines are applicable to the recovery of resources from residential, commercial, and institutional solid waste. Explicitly excluded are mining, agricultural and industrial solid wastes; hazardous wastes, sludges, construction and demolition waste, and infectious wastes.

A Federal facility that generates, collects, or disposes of 100 tons or more per day of residential, commercial,

or institutional solid waste shall establish and/or utilize resource recovery facilities to separate and recover materials or energy or both from this solid waste.

At a minimum, markets and technologies relative to the following potential products from resource recovery systems should be evaluated: 1) market products: i) ferrous metals, ii) glass, iii) non-ferrous metals, iv) paper fiber; 2) energy products: i) steam, ii) solid fuel, iii) pyrolytic gas, iv) pyrolytic oil, v) methane, vi) electricity.

Anonymous: Disposal of hazardous wastes, Manual on hazardous substances in special wastes, October 1976, No. 55, N. Atl. Treaty Org., Committee on the Challenges of Modern Society.

The manual originates from a work of the Stanford Research Institute commissioned and financed by the Federal Minister of Interior in 1973/74. Taking into account various national and international efforts in the field of hazardous waste the Federal Environmental Agency (Berlin-West) has revised the draft prepared by the Stanford Research Institute and brought it into line with German conditions. The manual "Hazardous Substances in Special-Wastes" contains a selection of pure chemical substances relevant to waste. By selecting appropriate criteria, it is designed to illustrate part of the danger potential of these substances, at the same time providing pointers as to the possible effects of waste that contains these substances (special-waste). The remarks are complemented by information on the formation and disposal of such waste. The manual is thus aimed primarily at those involved with the problem of special-waste within waste management. It is, however, also of significance as a source of data for the field of "environmental chemicals and biocides". The present edition is only a first start and is designed primarily to illustrate the overall conception of a more extensive and detailed manual to be prepared in the next years; it does not claim to be complete. This applies in particular to the number of substances selected. The reader is, therefore, emphatically recommended to read the following section entitled "Introduction and Explanations". This section also provides a general view of further chapters still being planned and which, together with other substances are to be included in the manual as it is continued and updated.

Anonymous: Long Island town builds with refuse, 1974, 105, No. 9, 104–105, Publ. Wks.

In about fifteen years, the town of Brookhaven, New York (Long Island) will have completed the construction of two hills, 150 and 250 feet high, for use as a 10 run ski bowl. The hills will be built with refuse, as a portion of 400 acres of recreational sites. In the process, they will accommodate between four and 20 times more refuse per acre of site than an ordinary landfill and eliminate the runoff of untreated leachate. A waterproof floor of plastic will hold the leachate, with a collection system consisting of perforated concrete pipe draining it off to a holding tank. From there it may be pumped to evaporation ponds located at the top of the fill or it may be upgraded by treatment to standards of quality for discharge. This paper briefly discusses some techniques of building with refuse, and details costs of construction, which are under the $ 5 ton average for ordinary landfills in the area.

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