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Caribbean Environmental Health Research: Needs and Proposals

PAHO — IDRC Consultations held in Hastings, Barbados, 23-25 March 1988

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IDRC-MR211e

CARIBBEAN ENVIRONMENTAL HEALTH RESEARCH

Needs and Proposals

PAHO-IDRC consultations held in Hastings, Barbados, 23-25 March 1988

Editors

Ronald Willians, Pan American Health Organization

Alex Redekopp, International Development Research Centre

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)

APPENDICES

1. PROGRAM OF WORKSHOP

2. LIST OF PARTICIPANTS

3. PRESENTATIONS (DAY 1)

4. WORK GROUP REPORTS (DAY 2)

   4.1 SESSION 1 - EH RESEARCH NEEDS, RANGE AND PRIORITIES

   - GROUP A
   - GROUP B

5. SUMMARIES OF PROPOSED PROJECTS (DAY 3)

1. INTRODUCTION

1.1 BACKGROUND

The need for research to be carried out in the Third World to solve outstanding environmental health problems has been pointed out by WHO Expert Committees since 1950, along with the following:

- The lack of highly trained staff in underdeveloped countries to cope with the research type of problem.

- The importance of developing countries not copying slavishly existing practices in developed countries, but investigating the possibility of new techniques more appropriate to local circumstances.

- The direct linkage between research, technical development and field application.

During these recent decades, PAHO and IDRC have increasingly promoted research in health, and governments in this hemisphere have responded with greater efforts in this field. However, the current economic crisis has had a negative effect on research and investigation activities. But this has led to new cost-benefit sensitivities and to a growing awareness of the value of technical cooperation among developing countries (TCDC) in various subregions like the Caribbean.

As is well known in health circles, environmental health services in the Caribbean experience the typical constraints of short-staffing, sub-professionalism, low budgets and generally inadequate resources and interest to provoke the investigation and research needed to fully explore specialist and general areas of environmental diagnosis and intervention.

PAHO's technical cooperation program in environmental health and IDRC's support for applied research conducted by national and/or regional organizations include five specific program areas:

- Drinking water supply, sewage/excreta disposal, solid waste management, housing sanitation, and environmental pollution control; supported by a sixth general component.

- Promotion and strengthening of the institutional capacity.

These are all areas in which research can be considered for promotion and development; and research projects can and should address both the hardware and the software aspects. But there is also a need to focus on the socio-cultural-economic dimension of appropriate technologies including operations and maintenance requirements, community acceptance, human resource development requirements, financial repayment services and income generation.

1.2 WORKSHOP

As a result of the paucity of effort in environmental health research in the Caribbean, representatives of PAHO and IDRC met in Barbados and later in Ottawa in 1987, and agreed to jointly sponsor Consultations on Caribbean Environmental Health Research Needs and Proposals as a first step, with the following objectives:

- To review the types and extent of environmental health research now carried out in the Caribbean, and the constraints being experienced.

- To consider the range and priorities of environmental health research needs in specific and general areas of interest to the Caribbean.

- To develop detailed recommendations for the sensitization of governments, institutions and relevant professionals on the need to carry out research work and pilot projects in the Caribbean in the field of environmental health.

- To provide technical information, group consideration and procedural requirements for selecting and proposing environmental health research activities at the national and sub-regional levels, including pilot/demonstration and training projects.

- To assist individuals with draft research proposals to review and finalize them so that may be submitted for donor agency consideration.

The 3-day Consultants were held at the Caribbee Hotel, Hastings, Barbados, on 23-25 March 1988. The program (See Appendix 1) included technical presentations, work group sessions and plenary sessions. Subject areas were: environmental health research considerations, experience and funding; research needs and proposals in the Caribbean; and finalization of priority research project summaries for consideration by donor agencies.

Fifteen participants took part in the Consultations (See Appendix 2), 12 of whom were from user and research institutions from the following 7 Caribbean countries:

Barbados (3)	Jamaica (2)
Grenada (1)	St. Kitts (1)
Guatemala (1)	Trinidad and Tobago (3)
Guyana (1)	

In addition, two were from PAHO offices in Barbados and Lima, Peru, and 1 from the Caribbean Environmental Health Institute of CARICOM in St. Lucia. Workshop coordination was shared between IDRC and PAHO onsite staff; and funding was largely provided by IDRC.

2. PROCEEDINGS - DAY 1

2.1 OPENING SESSION

The Opening Session of the Consultations was informally simple with the joint coordinators speaking on behalf of their agencies.

(a) Eng. Ronald A. Williams, Pan American Health Organization

Eng. Williams welcomed participants to the Consultations, especially the overseas visitors; and he presented the greetings of PAHO's Director in Washington (Dr. Carlyle de Macedo) and PAHO's Caribbean Programme Coordinator (Dr. Halmond C. Dyer) who is stationed in Barbados but away on duty travel.

He briefly reviewed the background to the Consultations, and thanked IDRC for their enthusiastic participation in its joint development and sponsorship. As a Caribbean man, Eng. Williams expressed the desire to see environmental health research undertaken in the area in an effort to develop more appropriate technology for use in waste management and water supply systems in CARICOM countries.

Eng. Williams briefly described the programme and objectives of the Consultations, and introduced Mr. Alex Redekopp of IDRC, the other joint Coordinator.

(b) Mr. Alex Redekopp, International Development Research Centre

Mr. Redekopp joined in the welcoming of participants and made a few opening remarks. IDRC, he said, was particularly pleased to be involved in this preliminary stage in the development of environmental health research in the Caribbean. And as a research organization, IDRC would be interested in considering any research project proposals that result from the Consultations.

Mr. Redekopp also referred to the programme and objectives of the meeting, and reminded participants that they were being consulted on the Caribbean environmental health research activities, needs and project proposals.

2.2 PRESENTATIONS

IDRC: Its Organization and Operation (Mr. A. Redekopp - (IDRC)

Mr. Redekopp described the organization and operation of the International Development Research Centre in Ottawa, Canada, with special reference to the Water Supply and Sanitation Unit in the Health Sciences Division. He also handed out promotional material on the Centre, which he referred to in his presentation, and he described a number of IDRC activities in different parts of the world.

CEPIS Research and Development Programmes (Dr. S. Foster - PAHO)

Dr. Foster started by describing CEPIS (PAHO's Pan American Center for Sanitary Engineering and Environmental Science). He then referred to the current principal areas of activity at CEPIS and its Research and Development Programs. The relevance of this work to the Caribbean was examined and its view of Caribbean research priorities was started. (See Appendix 3 for presentation).

Preliminary Considerations in Environmental Health Research (Eng. R. A. Williams - PAHO)

Eng. Williams introduced the subject with a reference to the Primary Health Care strategy of "appropriate technology", and to technology in the Caribbean and the role of research.

Environmental health programmes and possible research areas in the Caribbean were then examined, and he concluded with a review of the principle of TCDC (technical cooperation among developing countries) and a reference to the objectives of the PAHO regional programme in environmental health research. (See Appendix 3 for presentation)

CIDA's Caribbean Environmental Programme (Mr. P. Hoffman and Mr. T. Martin - CIDA)

The presentation commenced with a reference to policy changes in CIDA's programme with a new focus on the Environment and Human Resource Development, Caribbean activities being approached under two headings, as follows:

(a) Multilateral Support

- Project on degree-level and other training for environmental health officers (EHO) and provision of association assistance. Execution by the Caribbean Association of EHOs and the Canadian Public Health Association.

- Project on pesticide survey and management by the Caribbean Environmental Health Institute (St. Lucia) and Dalhousie University.

- Project on the natural environment (Caribbean Conservation Association)

- Assistance to the Centre for Environmental Resource Management Studies, UWI-Cave Hill.

- Project on environment and tourism, Negril, Jamaica.

- Caribbean study of the environmental impact of development.

- Continued sponsorship of Caribbean Basin Water Management Project (CBWMP), a water supply training project managed by a staff member of the Caribbean Development Bank.

(b) Bilateral Assistance

Assistance in Water Supply and Sewerage is now estimated at $Can 60-70 million, as follows:

- Anguilla	Water supply masterplan study.
- Dominica	Improve water utility organization etc.
	Renovate water distribution system
- Grenada	Marine outfall sewer etc. for St. George sewerage system improvement, and coastal pollution monitoring.

- Montserrat	Provision of steel reservoirs.
- St. Kitts	Water supply for hotels in south-east peninsular, and water wells.
	Sewerage system study for Frigate Bay area.
- St. Lucia	Roseau Dam study for major water supply increase, along with World Bank and CDB.

During the question-and answer period that followed, the following points were discussed:

- The lack of basic environmental (health) information in the area.

- CIDA's recent shift from water supply to environment.

- Need for coordination between international agencies (Eng. R. Williams referred to the inter-agency Water and Sanitation Decade Meeting which he convenes every quarter).

- The percentage of CIDA assistance to be spent on Canadian goods and services - 65% (overall Caribbean), 50% (Eastern Caribbean).

- The use of technical cooperation among developing countries (TCDC) in the Caribbean, and network development.

Dissemination of Dry Latrines in Guatemala (Dr. A. Caceres - CEMAT)

The presentation included the process of introduction, control and dissemination of a dry alkaline family fertilizer (DAFF) latrine in Guatemala as a sanitary and agricultural alternative that could improve the environment.

Local excreta disposal practices and conditions were studied, and an exhaustive review of literature was carried out before the DAFF latrine was selected and built on a pilot basis in various villages to replace the pit latrine. The DAFF latrine is a double vault above ground installation with urine excluded and ash added to form a dry compost in time.

The diffusion of the DAFF latrine was accompanied by promotion campaigns and staff training; and later on, national surveys indicated their social acceptance, sanitary quality and agricultural usefulness. Further studies were also encouraging, and the DAFF latrine is being increasingly utilized in rural areas in Guatemala. (See Appendix 3 for complete presentation).

Existing Caribbean Research in EH and Allied Matters (Participants)

Presentation on existing research were confined to the following five countries:

Barbados (W.Conliffe)

Eng. Conliffe referred to the underground nature of the water resources in Barbados mainly from two sources - the Belle source in the south-west (40M litres/day) and the Hampton source in the south-east (25M litres/day). In view of the subsurface soil disposal of raw sewage and septic tank effluent, a small project had been set up to monitor the quality of water in sampled wells near the sources. In the medium term the effectiveness of the zonal protection program would be proven if pollution is found to be minimal.

Guyana (M. Haniff)

Coastal Wetlands - Environmental survey of the coastal water-storage basins that provide irrigation and domestic water supplies to rural and urban areas.

Solid waste management in urban areas - surveys to determine suitable sites for sanitary landfills with special attention to the city of Georgetown.

Abary River Water Control Project - Survey of the Anthropod and Molluscan vectors of water-related diseases in the reservoirs and flood plain of the Abary River Basin.

Sewerage and Sanitation - Survey and on-going rehabilitation program of the sewerage system of Georgetown planned for completion in 1988.

Vector Control - Ongoing survey of mining areas and remote settlements in the hinterland of Guyana directed towards the eradication of malaria in collaboration with border countries and international organizations.

Jamaica (K. Bennett)

The water supply and sewerage problems of Kingston, Montigo Bay and elsewhere were briefly reviewed; and mention was made (by Dr.H. Silva) of two ongoing studies on the disposal of solid waste from hospital and other health care facilities; as well as on the mass production of pit latrines with urine and faeces separated. It was also mentioned (by Dr. N. Singh) that water quality monitoring of Blue Mountain water sources is being carried out by the University of the West Indies (Mona Campus).

St. Lucia (N. Singh)

Coastal water pollution monitoring (EEC standards) is being carried out by staff of the Caribbean Environmental Health Institute (CEHI); and feasibility studies (e.g. currents, depths etc.) are ongoing for marine outfall sewer location for the Castries area. Other studies on pesticide occurrence are due to start shortly.

Trinidad (H. Phelps/S. Laurent/R. Warren)

Prof. Phelps of the Engineering Faculty of the University of the West Indies, St. Augustine campus, discussed the proposed development of a new environmental engineering laboratory (1/2 years). The main ongoing research is the treatment of sewage from the Trincity Home Development by aeration lagoon - sedimentation tank - water hyacinth. Such treatment is being monitored and used as a field demonstration unit.

Ms. Laurent reviewed some of the work of the Caribbean Industrial Research Institute, such as: the development of criteria to evaluate research and development systems, microbiological activity on the breakdown of pollutants, and the evaluation of oil spill dispersants.

Mr. Warren referred to some of the research and development work carried out by the Trinidad and Tobago Solid Waste Management Company, such as the construction and utilization of a mini vacuum tank truck to service areas not accessible to standard vacuum-trucks.

Also discussed was the work of the Institute of Marine Affairs (environmental studies) and the Occupational Health and Safety medical adviser (pesticide exposure on man).

3. PROCEEDINGS - DAY 2

3.1 PRESENTATION

EH RESEARCH NEEDS IN CARIBBEAN (PARTICIPANTS)

Contributions on Research Needs were made by all participants, and are listed as follows:

Haniff

- Pesticide management project (wider Caribbean)
- Effects of pesticides on non-target organisms in rice and market areas (Guyana)
- Groundwater resources survey in coastal areas (Guyana).
- Utilization of incineration facility to accommodate industrial wastes/byproducts (Guyana).

Bennett

- Use of the Lemma process (Duck Weed) in sewage lagoon improvement (Jamaica).

Laurent

- More effective public education methods for improved community participation (e.g. litter prevention, water conservation etc.)

Phelps

- Water distribution system management improvement (e.g. leak/wastage control, conservation etc.)

- Computer mapping of water distribution (and sewer) systems.

- Inexpensive sewage treatment methods using natural systems (e.g. aquatic plants).

- Development of an appropriate package sewage treatment plant for coastal (hotels) use in Caribbean.

- Filtration of septic tank effluent and "grey water" by upflow and gravity filters.

- Water Quality variations in rivers in dry season.

- Health effects of solid waste disposal in open storm water drains.

Edwards

- Treatment and disposal of "grey water".

- Reduced land space for solid waste sanitary landfill

- Upstream pesticide pollution of upper catchment water supply sources.

Warren

- Development of a Caribbean environmental health information system (Eng. Williams reassured the meeting that this is planned for CEHI).

- Beneficial utilization of derelict motor vehicles (and tyres).

- Alternative disposal for animal wastes (e.g. poultry, pigs).

- Resource recovery from solid waste landfill disposal site, on an inter-country basis.

Hodge

- Low cost excreta disposal on rocky ground.

- Treatment and disposal of "grey water".

- More effective methods of community involvement in solid waste management.

Vlugman

- Septic tank emptier without human contact.

- Sanitary disposal of septic tank sludge.

- Sanitary disposal of septic tank effluent by drain field or evapotranspiration bed.

- Composting of septic tank sludge and sugar cane waste.

- Influent filter for roof catchment cisterns.

Tissa

- Treatment and disposal of "grey water"

- Sanitary disposal of animal waste.

- Collection methods for large solid waste items (e.g. derelict cars, old stoves etc.)

- Public education for effective source reduction in mosquito control.

- Inexpensive storm water drainage systems.

Silva

- Inexpensive storage of rainwater roof run-off (e.g. clay soil using anode/cathode).

- Water saving devices and practices (e.g. flow restrictor for reduced toilet flush).

- On-site sewage treatment and disposal systems for Caribbean conditions.

Caceres

- Integrated system of domestic waste recycling.

- Biogas digestion system for sewage/sludge treatment.

- Use of trench system for septic tank effluent disposal.

- (Hold Caribbean Workshop to consider alternative/appropriate approaches to excreta disposal and employ network approach).

Conliffe

- Appropriate methods for removal and disposal of "night soil". (from pail/pit latrines).

- Treatment and disposal of raw sewage from "suck wells".

- Disposal of septic tank effluent by upflow filter.

Singh

- Development of environmental health profiles of CARICOM countries.

- Comparison of demonstration exercises on alternative latrine installations.

- Agrochemical contamination of watershed areas.

- Determination of health impact of improvement of environmental health conditions.

- Development of more appropriate protective gear for pest control workers (e.g. sprayers).

- Resource recovery in solid waste disposal on a sub-regional basis.

- Survey and study of a little or no-waste technology.

3.2 WORK GROUP SESSION 1

For the first Work Group Session on "EH Research Needs, Range and Priority", the participants were divided into two groups. Membership and the summaries of the questions put to the groups, and their answers, are as follows: (See Appendix 4 for details):

GROUP A

1. Karl Bennett (Rapporteur)
2. Curtis Edwards
3. Stephen Foster
4. Mohammed Hanif
5. Michael King
6. H.O. Phelps (Chairman)
7. Tissa Wikramasuriya
8. Anton Vlugman

Group A discussions may be summarised as follows:

1. Low cost systems of water disinfection need to be evaluated.

2. Sanitary disposal of septic tank effluent needs to be investigated under Caribbean conditions.

3. The re-use of human excreta in rural populations does not appear to be a high priority in the Caribbean.

4. The accent should be placed on data collection to counter the weakness in the relationship between housing problems and family health.

5. Research work is needed in the behaviour of people in specific target communities and their participation in environmental protection.

6. To educate and motivate the public in environmental health consideration should be given to using successful business marketing strategies.

7. (a) The role played by various Caribbean research-oriented institutions includes promoting, carrying out and coordinating research.

   (b) Only limited collaboration exists among research scientists in the region; and to improve this specialist technical committees may be established.

8. One way to avoid the introduction of inappropriate technology in environmental health is to screen it out through environmental impact studies.

GROUP B

1. Armando Caceres
2. Wilton Conliffe
3. James Hodge
4. Sharon Laurent
5. Homero Silva (Rapporteur)
6. Naresh Singh (Chairman)
7. Richard Warren
8. Alex Redekopp

Group B discussions may be summarized as follows:

1. (a) Rainwater catchment systems are only needed in those islands where surface sources do not exist and groundwater is brackish from salt water intrusion.

   (b) Research is needed into the use of local materials for rainwater storage.

2. There is a need to research and field test simple water quality test kits for Caribbean usage.

3. An innovative privy for use in the Caribbean should be researched.

4. The environmental standards in the new Caribbean Uniform Building Code should be promoted and enforced.

5. A survey of people's attitude towards public participation should be carried out.

6. There is a need for a model environmental health education program in all-age schools, but current efforts should be examined.

7. Some technical cooperation among developing countries (TCDC) is practised in the Caribbean, but special efforts should be made to further develop it.

8. For the easy transfer of technology among researchers and between researchers and users, there is a need for increased dialogue.

4. PROCEEDINGS - DAY 3

4.1 WORK GROUP SESSION 2

For the second Work Group Session on "EH Research Proposals for Caribbean" all participants formed one group, and the session was chaired by the joint PAHO/IDRC coordinators.

The first step was the nomination, discussion and acceptance of twenty environmental health subject areas as possible projects for the Caribbean. The second step was the classification of the twenty into first (6) and second priority (12) proposals; and the following criteria/guidelines were identified, examined and agreed upon for the prioritization task:

(a) Regional/sub-regional in relevance and application.

(b) National priority.

(c) Include socio-economic considerations (e.g. community education/participation).

(d) Number of people benefitting.

(e) Indigenous institutional capability/strengthening.

(f) National/sub-regional capability to follow-up.

All projects were give 0-3 pts. for each of the 6 guidelines (max. 18), and all 14 participants present allocated scores independently. These scores were then averaged, and the 8 subjects with scores between 14.1 and 16.9 were placed in the "first priority", while the 12 subjects with scores between 11.1 and 13 were placed in the "second priority". (See Appendix 4 for listing).

The following table summarizes and classifies the 20 project subjects by technical area:

TECHNICAL AREA	PRIORITY (0-18)	
	FIRST (14.1-16.9)	SECOND (11.1-13)
Water Supply	2	2
Sewage/Excreta Disposal	3	4
Solid Waste Management	-	3
Others	3	3
	8	12

Based on this this exercize and on the special interests of national personnel the following six research proposals (See Appendix 6) were selected for promotion to IDRC, PAHO and other interested agencies.

1. Evaluation of innovative approaches to environmental education for increased community participation

The aim is to evaluate the scope and effectiveness of existing environmental education activities in the Caribbean with a view to developing more innovative approaches for use in new and expanded activities in an effort to maximize community participation in environmental health programmes.

The proposal is for a 3-year project executed by UWI with PAHO assistance and with support from government agencies and non-government organizations (NGOs).

2. Comparison of alternative latrine designs for excreta disposal under Caribbean conditions

The technical design, manpower development and community participation of five different excreta disposal systems in five islands will be compared for social acceptance, technical performance, economic feasibility and possible benefits to agricultural production. The intent is to arrive at the most appropriate excreta disposal system for low income areas in the Caribbean to achieve improvements in environmental health conditions.

3. Evaluation of the applicability of Field Test Kits in the rapid assessment of water quality

The general objective of the project is to evaluate the usefulness of a new water testing field kit in the determination of the bacteriological quality of drinking water and coastal waters in small island states. It is also felt that such field determinations by public health or water inspectors may have a special place in national water quality control programmes.

4. Study of the disposal of septic tank effluent through upflow filters, trenching and evotranspiration beds.

The project aims to carry out research to develop standard designs and guidelines for the construction of advanced on-site sewage disposal systems which would reduce pollution of soil, water-courses and coastal waters. The accent will be on the disposal of septic tank effluent by three methods - upflow filters, soil absorption trenches and evapotranspiration beds.

5. Evaluation and field testing of simple, inexpensive disinfection facilities for rural water supplies

The project includes the installation of low cost, low maintenance, simple disinfection facilities in rural areas. Performance criteria will be established and the performance of the facilities will be assessed under various conditions, especially for raw water not otherwise treated (e.g. springs, roof water etc.). Special reference is made to a study by PAHO's Eng. Fred Reiff on "Disinfection with mixed Gas Oxidants Generated on Site (MOGGD)".

6. Determination of the potential and extent of pesticide pollution of surface and ground water resources in the Caribbean.

The project's objective is to determine the levels of the more toxic but commonly used pesticides in agriculture and public health as they occur in ground water resources and surface water resources in two different countries. The identification of residue levels would be the basis for corrective management action leading to improved water quality in all communities - inland and coastal.

4.2 PRESENTATIONS

Procedures for EH Research selection, Proposal and Support (Mr. Alex Redekopp - IDRC)

Mr. Redekopp handed out application forms and guidelines for use in seeking IDRC support of proposed projects, and then reviewed the standard procedures for submissions, including IDRC project development criteria as well as the criteria used for evaluating the relative merit of project grant requests.

Research Proposal Writing (Mr. A. Redekopp - IDRC)

Although it had been agreed that each of the six chosen research project proposals would be written up in a 2-page project data sheet from the International Drinking Water Supply and Sanitation Decade (1981-90), Mr. Redekopp coached the participants on the development and finishing of comprehensive proposals for research projects.

4.3 FINAL PLENARY SESSION

The final plenary session commenced with a review of the Consultations by Eng. R. Williams and an expression of his satisfaction over the active participation of all present. He then invited Alex Redekopp of IDRC and Dr. Halmond Dyer, PAHO's Caribbean Program Coordinator, to make their closing comments. Both speakers referred to the punctuality of participants' attendance and the seriousness of their contributions; and Dr. Dyer promised to pursue the funding of the proposed projects with IDRC and other agencies.

Prof. Phelps of UWI spoke on behalf of the participants and thanked PAHO and IDRC for holding the Consultations which he thought were somewhat overdue. He also expressed the belief that the proposed projects are essential and hoped that they would be funded and executed soon.

Appendix 1

CONSULTATIONS ON CARIBBEAN ENVIRONMENTAL HEALTH RESEARCH NEEDS/PROPOSALS

(Barbados, 23-25 March 1988)

PROGRAMME

TIME	Wednesday, 23 March	Thursday, 24 March	Friday, 25 March
8.30 am	1. OPENING SESSION - Welcoming Remarks (PAHO/IDRC)	7. Presentation on EH Research Needs in Caribbean by Participants	10. Work Group Session #2 on EH Research Proposals for Caribbean
9.00	2. Presentations on: - IDRC: Organization and Operation - CEPIS Research and Development	-do-	-do-
10.00	3. Presentation on Preliminary Considerations in EH Research	8. Work Group Session #1 on range and priorities of EH research needs in Caribbean	-do-
11.00	4. Presentation on CIDA's Caribbean EH Programme	-do-	11. Plenary Session on Work Group Report (Session #2)
12.30 - 1.30 pm	LUNCH	LUNCH	LUNCH
1.30	5. Presentation on Dissemination of Dry Latrines in Guatemala	-do-	12. Presentations on: - Procedures for EH Research Selection, Proposal,.etc. - Coaching on Research Proposal Writing
3.00	6. Presentation on Existing EH Research in Caribbean by Participants	9. Plenary Session on Work Group Reports (Session #1)	13. Plenary Session on Final Report and Recommendations of Consultations
4.30	ADJOURNMENT	ADJOURNMENT	14. CLOSING SESSION

APPENDIX 2

PAN AMERICAN HEALTH ORGANIZATION

Pan American Sanitary Bureau, Regional Office of the

WORLD HEALTH ORGANIZATION

OFFICE OF CARIBBEAN PROGRAM COORDINATION

CARIBBEAN ENVIRONMENTAL HEALTH RESEARCH NEEDS/PROPOSALS

BARBADOS 23-25 MARCH 1988

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Appendix 3

PRESENTATIONS (Day 1)

CEPIS RESEARCH AND DEVELOPMENT PROGRAMS - THEIR RELEVANCE TO THE CARIBBEAN

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What is CEPIS?

CEPIS - is the Spanish acronym for Pan American Center for Sanitary Engineering & Environmental Science, which is the PAHO regional center in these areas of competence, forms part of the PAHO - Environmental Health Program and operates throughout the Latin America - Caribbean Region.

It was founded in 1968 and now has a staff of more than 40 operating from a modern base in Lima, Peru, equipped with full library, laboratory, computing and printing facilities, together with an excellent conference-seminar suite. The scale of activity is augmented considerably through the presence of many Young Professionals from national institutions throughout the region, who spend 6-12 months at CEPIS and of longer term Resident Specialists funded by bilateral agencies.

In all technical areas, CEPIS' programs involve:

(a) preparation and dissemination of appropriate documents,

(b) education and training at various levels,

(c) research projects and

(d) direct consultancies on the request of national institutions.

CEPIS R & D Programs

Under the coordination of the Center's Director the main areas of environmental health have been sub-divided (Table 1) and within these subdivisions certain subjects have been developed into Regional Programs. These programs are managed by the corresponding PAHO Regional Adviser, five of whom are attached to CEPIS.

Each Regional Program is steered by a Technical Committee of specialists drawn from appropriate national institutions in 6-8 countries, which meets at least once per year to assign work priorities, to review program progress and to contribute national experience. Increasing attention is being given to the environmental health problems associated with rapid urbanisation and industrialisation characteristic of numerous Latin American cities. The products of the Regional Program take the form of a series of pamphlets, practical reports and manuals, seminars and workshops, and the promotion of national case studies.

TABLE 1: CURRENT PRINCIPAL AREAS OF ACTIVITY AT CEPIS

SURFACE WATER POLLUTION CONTROL[a]	. control of toxic substances [b c] . eutrophication of tropical lakes . design of submarine outfalls
GROUNDWATER USE & PROTECTION[a]	. evaluation-control of pollution risk[b] . urban groundwater processes-problems[c] . improving efficiency of supply development[c]
IMPROVEING WATER SUPPLY QUALITY	. alternative disinfection techniques . design-operation of filtration systems[c]
WATER-SUPPLY DISTRIBUTION MANAGEMENT[a]	. leak detection and control[b] . commercialisation of water undertakings
EXCRETA + WASTEWATER DISPOSAL[a]	. design-operation wastewater stabilisation lagoon . reuse of sewage effluents[c] . insitu excreta disposal techniques.
SOLID WASTE MANAGEMENT[a b]	. refuse collection systems . evaluation of waste disposal options . disposal of hazardous industrial wastes[c]
ENVIRONMENTAL LABORATORY	. analytical quality control[b] . introduction of new techniques[c]
INFORMATION SERVICE	. REPIDISCA technical information network[b] . public awareness material . audiovisual educational training aids

(a) PAHO Advisor resident at CEPIS

(b) CEPIS Regional Program

(c) major collaboration with bilateral agency.

Additionally, and of great importance, CEPIS acts as the coordinating center for REPIDISCA - the Pan American Network for Information and Documentation in Sanitary Engineering & Environmental Science. This system has now been in operation for numerous years, contains more than 25,000 works (of which more than 50% are in English) catalogued, classified and summarised in Spanish, and has some 450 cooperating institutions linked to the system and largely located in the Spanish and Portuguese-speaking nations of the region.

Moreover, the CEPIS environmental laboratory acts as a reference and training center in the key support area of water, effluent and residue examination, and is very active in promoting improved control of analytical quality and the introduction of new analytical techniques.

Relevance of CEPIS Programs to Caribbean

Examination of the list of current CEPIS activity (Table 1) reveals a large number of subjects of direct relevance to the English-speaking Caribbean nations. However, these nations have not, as yet, been directly involved with the development of the associated Regional Programs, because of linguistic problems, and Caribbean participation has been restricted to Cuba, Puerto Rico and the Dominican Republic. Nevertheless, much of the documentation of the programs is available in English version through the PAHO network.

CEPIS are aware that in certain instances, special geohydrologic conditions and wide socioeconomic diversity (with relatively high labour costs on some islands) in the English-speaking Caribbean nations may influence the solution to some environmental health problems.

CEPIS staff have long been active in the Caribbean subregion. For example, in recent months the following missions have been undertaken:

(a) June 1987: Dr. Eng. Stephen Foster: Barbados: pollution risk evaluation for major groundwater sources.

(b) July 1987: Eng. Francisco Zepeda: Cayman Islands consultancy on solid waste disposal.

(c) October 1987: Eng. Rodolfo Saenz: St. Lucia: lectured on Caribbean Course on Excreta and Sewage Disposal.

Additionally Dr. Eng. Stephen Foster will lecture at the CDB-PAHO workshop on Caribbean Water Source Protection scheduled for St. Lucia in May 1988.

At the meeting of the Caribbean Environmental Health Institute (CEHI) in St. Lucia in January 1988, CEPIS indicated its willingness to collaborate in the expansion and evolution of CEHI, subject only to time constraints on staff participation due to their extensive commitments throughout Latin America and to suitable financial arrangements for staff travel.

However, in subjects of especial significance in the Caribbean subregion, larger allocations of CEPIS staff time could be possible. These include groundwater source protection, in view of the relatively high dependence of some Caribbean nations on potable groundwater supplies and the relatively high pollution vulnerability of many Caribbean aquifers.

During 1978-80, REPIDISCA attempted to incorporate the English and French speaking nations of the Caribbean into this network. This attempt failed, not because of linguistic obstacles, but due to the apparent lack of organisations with adequate infrastructure to be integrated into the system.

CEPIS View of Caribbean Research Priorities

CEPIS consider that the highest priorities related to research and development in environmental health are:

(a) Establishment of a technical information system to make the large volume of existing published or research results be utilised by the numerous small nations of the Caribbean; this preferably to be coordinated by CEHI in collaboration with CEPIS-REPIDISCA.

(b) Consolidation of the subregional reference laboratory for environmental health at CEHI.

(c) Increase awareness and interest in environmental health issues at all levels in the general public through various educational and publicity campaigns.

Beyond this some CEPIS specialist staff felt unable to suggest research priorities pertinent to the Caribbean due to lack of recent firsthand experience of the subregion. They felt, however, that there could be considerable benefit if they were invited to review any research proposals relating to their area in relation to on-going work in Latin America, and also that they could usefully advise on project development.

Specific proposals were possible, however, in the areas of control of both surface water and groundwater pollution:

(a) evaluation of effect of on-site sanitation and effluent discharge on groundwater quality used for potable supply,

(b) assessment of impact of pesticide use in agricultural and public health on both surface water and groundwater supply catchments,

(c) establishment of representative monitoring networks for surface water and groundwater quality.

PAN AMERICAN HEALTH ORGANIZATION
Pan American Sanitary Bureau, Regional Office of the
WORLD HEALTH ORGANIZATION
OFFICE OF CARIBBEAN PROGRAM COORDINATION

PRELIMINARY CONSIDERATIONS IN ENVIRONMENTAL HEALTH RESEARCH*

by

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*A paper prepared for and presented at the Consultations on Caribbean Environmental Health Research Needs/Proposal, Barbados, 23-25 March, 1988.

PRELIMINARY CONSIDERATIONS IN ENVIRONMENTAL HEALTH RESEARCH

1. INTRODUCTION

It is generally agreed that the main route towards Health For All By Year 2000 is dependent upon the use of the Primary Health Care approach by the Health sector and the application of such strategies as:

- Managerial improvements (Information System and Programme Management).
- Community Education and participation
- Intersectoral Coordination
- Appropriate Technology

This brief presentation is about the strategy of using appropriate technology, and its role in environmental health in the Caribbean, with special reference to the field of research.

2. APPROPRIATE TECHNOLOGY

2.1 Definition and Meaning

"Appropriate technology" is a technology that is "technically sound, culturally acceptable, and financially feasible." Technology itself may be considered "an association of technical methods, techniques and equipment." Primary health care policy insists on encouraging its local development, disseminating information about it and promoting its widespread use.

Appropriateness of technology is typically a Third World phenomenon since the technology used in the Third World in the past tended to be technology which originated in the First World to satisfy similar needs, but under very different conditions.

2.2 Technology in the Caribbean

Conditions governing the application and use of technology generally include the following:

- Equipment not manufactured locally but imported with economic and other constraints. This applies to spare parts, operational expertise etc.

- General economic (and foreign exchange) constraints in technology application.

- Limitations in number of trained technicians.

- Weak approach to maintenance.

2.3 Role in Research

Research is investigation aimed at the discovery and interpretation of facts. And environmental health research is aimed at improving our understanding of available interventions for different environmental problems. Appropriateness in technology is perhaps the main reason for developing a research programme in the Caribbean so that its people could research and develop solutions to environmental health problems, such solutions being culturally acceptable and financially feasible, yet as technically sound as those solutions that are imported from abroad.

3. ENVIRONMENTAL HEALTH

3.1 Caribbean Environmental Health Programmes

3.1.1 Programme Description

Environmental health is considered to include all those technical areas listed in Appendix 1, while such programmes in the English-speaking Caribbean mainly comprise the following 6 sub-programmes:

- Water supply
- sewerage, sanitation and industrial waste disposal
- Solid waste management
- Building control
- Food sanitation
- Vector control

Basically, environmental health personnel carry out environmental surveillance and conduct public education. Water supply and solid waste management systems exist on a community basis, but sewage/excreta disposal is often on a house-to-house basis.

3.1.2 Examination of Conditions

Environmental health programmes are delivered in similar conditions from country to country with such common constraints as:

- Limited manpower, equipment and other resources
- Little environmental awareness among the public
- Modest political commitment to environmental health management.
- Society is not very industrially inclined.
- Weak enforcement of legislation and standards
- Imported environmental health hardware and software.
- Low level of intersectoral coordination.

In the absence of environmental health professionals in most countries and the resources to research and develop, it is expected that such a step will occur only on a sub-regional basis.

3.2 Possible Research Areas

Amongst research areas and needs, the following possibilities are worth suggesting:

(a) <u>Hardware</u>

- Simple built-in filter for roof-water cistern.
- Reliable but simpler water supply disinfection. equipment.
- Inexpensive and effective treatment/disposal facilities for septic tank effluent.

- Improved excreta disposal facilities (waterless) in rocky ground and high water table areas.

- Inexpensive solid waste containers made from indigenous material.

(b) Software

- Environmental (health) education programme in secondary schools

- Use of art and culture in public education programmes in environmental health.

4. ENVIRONMENTAL HEALTH RESEARCH CONSIDERATIONS

4.1 Appropriate Technology in Research

To develop the technology that is appropriate for use in the Caribbean it is necessary to collect and examine data about the man-environment relationship among low-income groups (e.g. poor schools, squatter settlements or slums, labouring environment); and to carry out the research to develop the technology to achieve maximum effect from minimum resources and investment.

In addition to water supply, sewerage and solid waste management hardware, research is needed in software development to assist in programme improvement:

- Development and use of appropriate forms and procedures.

- Training and utilization of environmental health personnel in the Caribbean.

- Content, methods and materials in community education for the greater participation of people in environmental health programmes.

4.2 Technical Cooperation Among Caribbean Countries

Technical cooperation among (developing) countries is the sharing of experience and skills between two or more countries. In the Caribbean, where historical and cultural factors are common, it involves reinforcing existing "bridges" of contact and communication among countries for a continuous process of mutual collaboration.

Technical cooperation among countries can take one of the following three forms:

(a) Reciprocity: This may involve bilateral cooperation where two or more countries assist each other in their areas of excellence.

(b) Exchange and sharing: This is based on a common endeavour to exchange information and technology within the context of a common program or project.

(c) Contribution: This implies a transfer of resources or technology from one country to another in the spirit of developing collective self-reliance.

It is generally felt that in areas like the Caribbean, research will be inspired by the need for appropriate technology, and will be supported by technical cooperation among the countries.

4.3 PAHO Programme

The PAHO programme in environmental health research in the region now includes the following:

- To promote and cooperate in the development of research in the fields of environmental and occupational health in order to optimize the available resources and expand the coverage.

- To promote and support research on utilization, accessibility, efficiency and effectiveness of environmental and occupational health services with a grant from PAHO/WHO and with other resources.

5. CONCLUSIONS

In recent years in the Caribbean, there has been an increasing awareness of the role and importance of the human and natural environments in the life of man, and in the growing realization that they must be properly managed. In such environmental management programmes there is hardware and there is software, both of which if developed in the Caribbean for local usage are likely to be more cost-effective than when borrowed from Africa and Asia, not to mention the metropolitan countries.

This clearly underlines the need for our own Caribbean research by our collaborating institutions on a TCDC basis (technical cooperation among developing countries).

3.3 Scope of environmental health

Environmental health is considered by the Committee to include or relate to the following :

(1) Water supplies, with special reference to the provision of adequate quantities of safe water that are readily accessible to the user, and to the planning, design, management, and sanitary surveillance of community water supplies, giving due consideration to other essential uses of water resources.

(2) Waste-water treatment and water-pollution control, including the collection, treatment, and disposal of domestic sewage and other water-borne wastes, and the control of the quality of surface water (including the sea) and ground water.

(3) Solid-waste management, including sanitary handling and disposal.

(4) Vector control, including the control of arthropods, molluscs, rodents, and other alternative hosts of disease.

(5) Prevention or control of soil pollution by human excreta and by substances detrimental to human, animal, or plant life.

(6) Food hygiene, including milk hygiene.

(7) Control of air pollution.

(8) Radiation control.

(9) Occupational health, in particular the control of physical, chemical, and biological hazards.

(10) Noise control.

(11) Housing and its immediate environment, in particular the public health aspects of residential, public, and institutional buildings.

(12) Urban and regional planning.

(13) Environmental health aspects of air, sea, or land transport.

(14) Accident prevention.

(15) Public recreation and tourism, in particular the environmental health aspects of public beaches, swimming pools, camping sites, etc.

(16) Sanitation measures associated with epidemics, emergencies, disasters, and migrations of populations.

(17) Preventive measures required to ensure that the general environment is free from risk to health.

All the items in this list are already included in various degrees and combinations in environmental health programmes in various parts of the world. The Committee also took note of the problems associated with the closed environmental systems used in space travel and in deep-sea exploration. At present few countries are engaged in such activities, and the number of individuals affected is small, but this field must be expected to expand and will eventually concern environmental health workers.

DISSEMINATION OF DRY LATRINES IN GUATEMALA

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This paper presents in an abstracted way the process of introduction, control and dissemination of a dry latrine in Guatemala. This technology was selected by CEMAT as a sanitary and agricultural alternative that could improve the environment and increase the productivity.

1. SELECTION OF THE TECHNOLOGY

Fecal contamination is a well known problem in developing countries, although significant solutions to overcome with this problems are scarce. In Guatemala and most of the region, the governmental institutions are promoting by official campaigns the construction of pit latrines for fecal matter disposal, but most of the time this is not a suitable solution. In 1978, CEMAT made a sanitary survey to detect the causes of failure of the conventional latrinization campaign around Atitlan lake and found several problems associated with this failure [1]. Table 1 describes the most importante problems detected.

Simultaneously, an exhaustive review was done in the available literature, selecting for a preliminary evaluation five prototypes which have had some success in other parts of the world [2-4]. These prototypes were: the anaerobic latrine for fertilizer production, the Clivus-Multrum latrine, the Farallones latrine, the "cat" latrine and the Vietnamese double vault latrine. This preliminary evaluation showed that the latrine most easily adaptable to the Guatemalan conditions was the Vietnamese latrine, adopting the name of dry alkaline family fertilizer (DAFF) latrine for better acceptance [5,6].

To be presented at the Caribbean Environmental Health Research Needs/ Proposal Workshop to be held in Bridgtown, Barbados in March 23-25, 1988 organized by PAHO/IDRC.

2. PILOT PHASE

After selection of the technology, some DAFF latrines were built to train promoters from villages around the Atitlan lake, and then a modest diffussion process took place in selected villages during 1980-81. On one side, a propagation from the experimental ones started in San Pedro La Laguna, and on the other, a pilot study was conducted in Santa Catarina Palopo, a rocky, highly inclined (35°) ground and densely populated village, where 31 latrines were installed; only 14 latrines were actually used by 62 person, from which six were working properly and eight showed humidity, fly larvae, insects and unpleasant odours. The main reason for this missuse showed to be the little training of the user and lack of ash added to the vault.

Later, some pilot latrines were introduced in other villages around the lake [7], as well as some other villages in the Western Highlands. Preliminary laboratory analyses showed a wide variation in the total coliform counts, helminth eggs counts and viability test, but some degree of remotion of pathogens was demonstrated (Table 2).

3. DIFFUSION PHASE

During 1981-85 some diffusion took place among the rural micro-enterprises supported by CEMAT with appropriate technologies, advice and some financing. As a consequence of the integral activities of the Bioenergy Program, about 200 DAFF latrines were installed by 20 microenterprices with loans provided by a revolving fund for bioenergy appropriation. Due to lack of specific financing, monitoring of these latrines was not as frequent as desired, but some follow-up was made and a preliminary users survey showed that the main advantage claimed to be acquired by using the latrine were: it produces a fertilizer, no digging is needed, it takes a little space, is comfortable and can be easily made with local materials (Figure 1). The disadvantages claimed by the user were: it has to be paid; while the seat and slab of the pit latrine is provided by the public health authorities, and lack of ash is determinant to the good operation of the DAFF latrine.

The sanitary evaluation methodology was selected and adapted in the pilot phase, and consisted of a standardized routine which includes micro-biological procedures such as: most probable number (MPN) of total coliform counts by the 3 x 3 tubes technique using lactose broth incubatd at 35°C; MPN of faecal coliform counts in bile brilliant green broth incubated at 45°C;

microscopic helminth egg counts in a 10% suspension; and, microscopic evaluation of the viability of *Ascaris lumbricoides* eggs.

In 1985, a review of five years of diffussion was made with the information from 240 DAFF latrines monitored by our technical personnel, who were trained in a semi-quantitative procedure specifically developed by CEMAT for field evaluation of DAFF latrines, based on the standardized observation of the latrine (Table 3) and the physical aspect of the sample in a closed glass container (Table 4). Table 5 summarizes the results from the monitoring of these latrines during 1979-85, and Table 6 the laboratory analyses of 318 in-use DAFF latrines adn 53 fertilizer samples.

4. TRANSFER AND DISSEMINATION

During 1982-86, CEMAT transferred the DAFF building technology to 10 national and international non governmental organizations and five public national institutions working in the field of sanitation and potable water supply. Through a specific theoretical and practical workshop, personnel from CARE, UNEPAR, Desarrollo de la Comunidad, FECOAR and INTA were trained in 1982, and further training was provided to other institutions later.

At the international level, the technology was transferred to Mexico in 1982 and to the Dominican Republic through the Workshop Azul organized by ENDA-Caribe, MUDE and CETAVIP in 1983. Further international transfer of technology took place in cooperation with the Interamerican Indigenist Institute from Mexico, organizing three international workshops on bioenergy systems for Mesoamerican leaders working with indigenous communities. This Workshops trained 43 leaders from seven countries from the region in the construction of Lorena stoves and DAFF latrines. A preliminary follow-up to this promoters indicate that some introduction of DAFF latrines has started in the region.

5. NATIONAL SURVEY

During 1986-87, CEMAT conducted a National Survey for evaluation of social acceptance, sanitary quality and agricultural use of a sample of DAFF latrines, with the financial support of IDRC from Canada. A multi-disciplinary team developed, tested and adapted a pre-codified questionnaire, obtaining a form with 103 questions as follows: Identification of the user

(9), characteristics of the user and the household (16), latrine use (16), general aspect and maintenance (18), construction and costs (15), acceptance and diffusion (12) and agricultural use of product (17).

The Survey was performed in 17 department of the country, with a sample of 318 regular users, 77 irregular users, 84 pit latrine users, and 24 families which don't used any disposal system for fecal matter. The Survey included an interview with the wife or husband, an evaluative observation by the technician and sampling of in-use and resting vaults and fertilizer. Samples were transported in ice and analyzed within one month for the routine procedures.

The analysis of the information from the interview reveled that the general knowledge about DAFF latrine is poor, mainly among the users from institutions which provided a little monitoring after installation of the latrine. The most relevant data on maintenance of the latrine showed that regular users were dedicating time and effort to keep the latrine clean and properly working, while irregular users and pit latrine users devoted little time to latrine maintenance (Table 7).

The sanitary control of the sampled latrines showed a marked reduction of fecal coliforms and viable *A. lumbricoides* eggs in the fertilizer, while variable results were obtained in the intermediate phases (Table 8). Physicochemical analysis showed that the characteristics of the three kind of samples are: alkalinity, dryness, insolubility, low content of carbon, organic matter and nitrogen, regular content of phosphorus and rich in potassium (Table 9).

The economical analysis of the DAFF latrines installed showed that the construction of the chambers, slab, seat and shack takes the 75.5% of the DAFF cost, while the labour only 16.2%. This prices were not consistent among the five microenterprises closely analyzed, which received a loan for construction of their DAFF latrines (Figure 2).

The agronomical application of the fertilizer is the real indicator that the DAFF latrine is being properly operated. In the National Survey only 14 users claimed to have experience in application of the fertilizer, these people were interviewed with a special questionnaire to inquire about their experiences and believes. In this group, the mean frequency of fertilizer extraction was four times, the average interval time was every seven months and the aproximate weight of each load was about 280 kg. The personal

opinion of each farmer is favorable to the use of DAFF fertilizer and their preliminary observations about the comparison with chemical fertilizer indicates that growing and foliage seems to be faster with the DAFF fertilizer (Table 10).

In June 1987, CEMAT organized two information exchange activities about DAFF latrines. The First National Workshop on DAFF Latrines took place with 12 users-trainers in order to discuss profundly about the benefits and limitations of the technology and the dissemination procedures. Then was organized the First National Seminar on DAFF Latrines with the collaboration of the Environment Sanitation Division from the General Direction for Health Services. In this seminar the preliminary data of the National Survey was presented to 130 participants from 30 governmental institutions and non-governmental organizations. Main conclusion about both activities are presented in a 144 pages Proceedings [8]. The most important conclusion of the Seminar are abstracted in Table 11.

6. DIE-OFF HISTORY STUDIES

An in-depth study of the pathogen die-off history in the DAFF latrine was conducted in 1986-87 with the financial support of IRCWD from Switzerland. A sample of 42 DAFF latrine users was studied longitudinally for one year. Social and economical parameters were evaluated with the same questionnaire used in the National Survey, follow-up interviews used a specifically design form. Each family was visited at least once a month, the head of family interviewed and several samples obtained. Due to difficulty in sampling at specific sites, six types of samples were taken: fecal samples ($n = 3$), superficial part of an in-use vault ($n = 284$), deep part of an in-use vault ($n = 57$), superficial part of resting vault ($n = 131$), deep part of resting vault ($n = 93$), and fertilizer ($n = 19$).

The filling rate was calculated by a linear regression of time and biomass height, which showed a very good correlation ($r^2 > 0.9$), as can be seen in Figure 3. The retention time for one vault didn't correlate perfectly, due to lack of continous use of latrine, agglomeration of contained biomass, variable vault sizes, and lack of precise date of starting date. From the 42 DAFF latrines studied, it is evident that filling and retention time are very variable parameters, with a minimum of 180 days to a maximum of 700 days, as well as the daily accumulation by an estimated user equivalent (Figure 4). Complementary analysis on the relation between humidity and ash (Figure 5)

and humidity versus ash by latrine (Figure 6) showed a poor correlation.

The total coliform counts were not affected by the ash added and the retention time (Figure 7), while the fecal coliform counts diminished with time (Figure 8). The helminth egg counts diminished in the in-use vaults, after an unexplainable increase in the resting vault, it also diminished to very little numbers in the final fertilizer (Figure 9); the Ascaris eggs viability also diminished dramatically (Figure 10). The physicochemical monitoring of the samples showed a decrease of water content (Figure 11) and an increase in the pH value (Figure 12).

7. PERSPECTIVES OF THE DAFF LATRINE

The encouraging results already obtained in Guatemala, the decrease of pathogens found in laboratory tests, the interest by local leaders and authorities, the preliminary dissemination to other countries, and the social acceptance that might be obtained when the latrines are properly operated, indicate that this technology might be a real breakthrough in the handling of human excreta by rural families and production of an innocous soil texturizer that could help in increasing the productivity of the poor farmers. It is evident that the pit latrine officially promoted by health authorities, although relatively simple to install has several disadvantages in comparison with the DAFF latrine (Table 12).

Effort will be made to obtain the necessary funds and resources for organizing an efficient National Commission for DAFF Latrines Dissemination, so that dry latrines are officially promoted, and most of the DAFF latrines already installed in the country are monitored for proper working. Demands from other national and international institutions will help in speading the information and will facilitate the transfer of the technology to interested groups and countries.

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Table 1. PROBLEMS ASSOCIATED WITH THE PIT LATRINE

- Difficulty of construction on rocky ground or high water table locations;
- Short average period for latrine fill-up (3-5 years);
- Flooding of latrines during the rainy season;
- Risks of cave-in due to pit erosion;
- Unacceptable odors leading to the proliferation of flies;
- Difficulty of dissemination in densely populated areas; and
- Loss of organic matter which could be used as a soil conditioner..

Table 2. PRELIMINARY RESULTS ON DAFF LATRINE MATERIAL

LATRINE	A	B	C	D
C-1	210	8,500	6.0	8.46
C-2	5	0	0.0	10.00
C-3	2,400	1,750	30.0	6.61
C-4	40	1,000	5.0	8.45
C-9	1,200	250	0.0	9.37
P-1	110	2,800	14.3	8.60
P-2	40	0	0.0	9.40
T-4	3,800	5,000	15.0	8.50
AVERAGE	976	2,413	8.8	8.67

A = Total coliforms (most probable number/gram); **B** = Helminth egg counts/gram;
C = Percent of Ascaris eggs viability; **D** = pH

Table 3. EVALUATORY OBSERVATION OF DAFF LATRINES

PARAMETER	3	2	1
General aspect	Well	Regular	Bad
Shack cleanliness (floor and paper basket)	Clean, dry and close	Clean, wet and open	Dirty, wet and absent
Ash	Abundant	Regular	Little
Urine (channel and container)	Fluid and close	Fluid and open	Close, no container
Flies	Absent	Inside	Inside and outside
Odour	Absent	Inside	Inside and outside
Fertilizer	Dry and used	Dry but not used	Wet and dirty

Table 4. POINTING SYSTEM FOR SHAKING TEST

VALUE	DESCRIPTION
5	Dry material, fine and noisy
4	Semi-dry, agglomerated and muffled sound
3	Humid, sticky and muffled sound
2	Very humid, pasty and soundless
1	Liquid, adhering to the flask and soundless

Table 5. FIELD EVALUATION OF DAFF LATRINES INSTALLED IN GUATEMALA DURING 1979-85

DEPARTMENT	A	B	C	D	E	F	G	H	I	J
Sololá	510/85	81	2-7	2.0	2.0	2.0	2.1	2.1	2.1	1.5
Totonicapán	29/7	13	3-7	2.1	0.9	1.9	1.5	2.3	2.4	1.5
Chimaltenago	65/14	7	3-5	3.0	3.0	3.0	1.5	2.0	2.0	2.0
Quezaltenango	23/6	4	3-7	2.2	2.0	2.0	1.5	3.0	3.0	
Santa Rosa	221/44	31	3-5	2.2	2.2	2.2	2.0	2.4	2.6	3.0
Huehuetenango	130/27	23	1-4	2.1	1.0	2.3	2.2	2.0	2.0	2.0
Baja Verapaz	23/3	4	3-4	2.6	3.0	3.0	2.5	1.5	1.5	
Izabal	70/14	17	3-4	2.1	2.8	2.8	2.8	2.8	2.8	
Zacapa	28/23	6	4	2.0	2.5	2.6	2.6	2.6	2.6	2.0
Guatemala	7/1	1	3	3.0	3.0	3.0	3.0	3.0	3.0	3.0
El Progreso	60/13	9	2-3	3.0	2.5	2.3	2.1	2.4	2.0	
San Marcos	15/5	1	2-4	3.0	3.0	3.0	3.0	3.0	3.0	
Sacatepéquez	13/6	1	1	2.0	2.0	3.0	2.0	1.0	1.0	
Escuintla	7/1	1	3	3.0	3.0					
TOTAL	1,210/249	199								
Average				2.4	2.4	2.5	2.2	2.3	2.3	2.3
Standard deviation				0.6	0.6	0.5	0.5	0.6	0.6	0.6

A = Numer of users/Latrines; **B** = Evaluation visits in 5 years; **C** = Years of use; **D** = General observation; **E** = Latrine shack; **F** = Ash application; **G** = Urine disposal; **H** = Flies observation; **I** = Odour nuisance; **J** = Fertilizer utilization

Table 6. LABORATORY ANALYSIS OF DAFF LATRINES DURING 1978-85

GENERAL ASPECTS	DAFF IN-USE ANALYSES				FERTILIZER ANALYSES			
Year Department (groups)	n	A	B	C	n	A	B	C
1978 Solola (8)	194	15,182	7,565	33	43	5,908	3,930	15
1978 Totonicapan (1)	19	5,412	4,545	16	1	2,100	750	5
1979 Chimaltenango (4)	10	13,997	2,208	50	1	2	375	12
1979 Quetzaltenango (1)	9	9,960	125	0				
1981 Santa Rosa (6)	27	22,889	423	15	2	1,330	0	0
1981 Huehuetenango (1)	7	19,884	100	50				
1981 Baja Verapaz (1)	6	1,696	1,667	8				
1981 Izabal (2)	14	14,212	1,229	20	3	313	417	0
1982 Zacapa (4)	10	9,525	3,554	67	1	24,430	3,750	50
1982 Guatemala (1)	1	48,000	0	0				
1982 El Progrso (3)	14	20,238	250	16				
1982 San Marcos (1)	5	11,448	700	8				
1983 Sacatepequez (2)	1	48,000	0	0	1	860	0	0
AVERAGE	318	17,536	1,597	20.2	53	4,475	1,152	10.3
SD		14,851	2,231	21.7		8,274	1,680	17.1
Reduction (%)						74.5	37.9	51.0

A = MPN of total coliforms/g; **B** = Helminth egg counts/g; **C** = Percent of viable Ascaris eggs

Table 7. MAINTENANCE PARAMETERS IN THE NATIONAL SURVEY*

Characterisitcs of the seat	Regular	Irregular	Pit Latrine	
Clean/closed/fluid	48.7	58.4	Clean/closed	30.9
Clean/fluid	30.8	31.2	Clean/open	31.0
Closed/fluid	13.2	2.6	Dirty/closed	19.1
Fluid channels	6.0	7.8	Dirty/open	14.3
Absent	1.3		Absent	4.8
Proliferation of Insects				
Absent	35.2	26.0	8.3	
Few flies	18.9	9.1	15.5	
Few flies but some larvae	15.8	31.2	4.8	
Many flies and larvae	30.2	33.8	71.4	
Unpleasant Odour				
Absent	39.6	20.8	2.6	
Tolerable	27.0	18.2	6.0	
Bothering	17.0	23.4	11.4	
Offensive	16.4	37.7	79.8	
Ash Deposit				
Absent	29.2	37.7		
Scarce	24.5	29.9		
Sufficient	23.9	18.2		
Regular	22.3	14.3		
Ash Substitute				
Not needed	42.1	58.4		
Not look for	19.5	18.2		
Earth and/or lime	30.4	18.2		
Sand/earth/wastes	5.3	0.0		
Other	2.7	5.2		
Who cleans the latrine?				
Wife	63.5	63.6	69.0	
Whole family	18.6	7.8	7.1	
Some members of the family		17.0	22.1	9.6
Nobody	0.9	6.5	14.3	
Cleaning frecuency				
Average days	6.67	9.04	10.65	
Standard deviation	7.32	9.68	11.48	
Range	(1-30)	(1-60)	(1-60)	

* percentage of answers among 476 latrine users

Table 8. SANITARY EVALUATION OF LATRINE SAMPLES (1987)

PARAMETER		PIT	IN USE	RESTING	PRODUCT
Number analyzed		32	390	3	20
Total coliforms	μ	2,189.94	1,291.69	2,400.00	672.35
(MPN/g)	SD	653.74	1,032.08	0.00	928.74
Fecal coliforms	μ	1,884.22	815.47	12.33	158.05
(MPN/g)	SD	920.97	1,046.35	11.26	525.27
Helminth egg	μ	1,300.78	728.01		50.00
(eggs/g)	SD	2,692.02	2,331.19		127.47
Ascaris viability	μ	22.26	9.86		0.00
(%)	SD	31.91	25.34		0.00
Viable Ascaris	μ	289.50	71.80		0.00
(eggs/g)	SD	859.00	590.70		0.00

Table 9. PHYSICOCHEMICAL ANALYSIS OF LATRINE SAMPLES

PARAMETER		PIT	IN USE	RESTING	PRODUCT
Numer analyzed		71	390	3	20
pH	μ	6.45	8.73	7.83	9.16
	SD	0.62	1.15	0.85	1.27
Ash (%)	μ	40.89	75.16	78.40	88.00
	SD	16.15	24.34	5.51	3.65
Insoluble solids (%)	μ	71.52	71.62	69.65	73.01
	SD	8.05	4.96	3.18	3.70
Humidity (%)	μ	87.17	52.34	44.02	18.12
	SD	6.88	15.10	7.28	11.57
Carbon (%)	μ	13.49	5.84	4.07	2.22
	SD	3.62	4.21	1.16	0.90
Organic matter (%)	μ	29.61	10.04	6.95	4.49
	SD	6.11	7.22	1.98	2.02
Nitogen (%)	μ			0.50	
	SD			0.14	
Phosphorus (%)	μ			0.84	
Potassium (%)	μ			7.53	

Table 10. EMPYRICAL EVALUATION OF DAFF FERTILIZER

Question to user: What did you observed when you compared DAFF fertilizer with chemical fertilizer?

FACTOR	FASTER	SAME	SLOWER	NOT OBSERVED
Growing	10	2	2	0
Foliage	12	2	0	0

	MORE INTENSE	SAME	LESS INTENSE	NOT OBSERVED
Color of the leaves	10	2	0	2
Color of the fruits	4	8	0	2

	MORE	SAME	LESS	NOT OBERVED
Size of the fruit	4	10	0	0
Aparent quality	6	8	0	0
Attack by plagues	0	8	4	2
Attack by diseases	0	10	2	2

Table 11. CONCLUSIONS OF THE I NATIONAL SEMINAR ON DAFF LATRINES HELD IN GUATEMALA IN JUNE 22-26, 1987

1. The task of the Decade of Water and Sanitation is enormous, but available resources are very scarce, suggesting that this should be increased five times in the public and private sectors resposible for this work.

2. It is widly accepted that the DAFF latrine have several advantages from sanitary, agronomical and economical points of view, although it is feared that its simplicity might limit the dissemination and retard the dissemination, due to poor appropriation of the technology.

3. Presented data show that the DAFF latrine could efficiently participate in improving the domestic environment and contributing in the integral development of rural communities.

4. It is suggested that agrochemical and agronomical research on DAFF fertilizer be increased, since available literature on this topic is very limited.

5. A National Commission of DAFF Latrines is nominated to interact with the on-going sanitation and agricultural programs, responsible for the following activities:

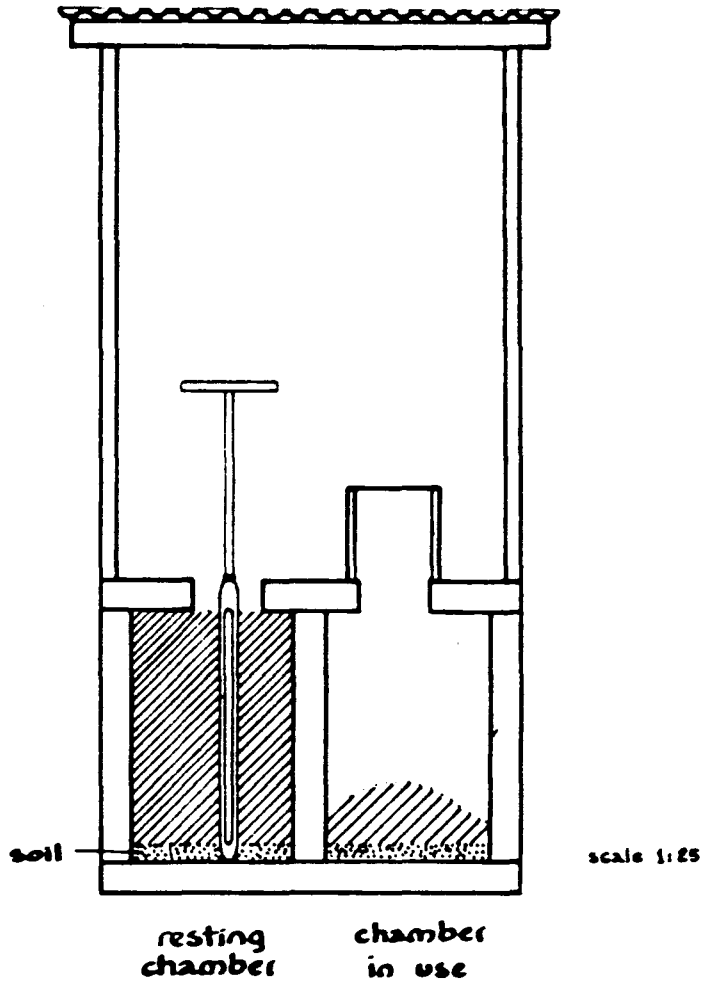
   - Coordination on interinstitutional efforts for dry letrinization
   - Training of institutional personnel on construction and evaluation
   - Training of users in maintenance and agricultural application
   - Constant evaluation and monitoring activities among projects
   - Identification of institutional technology transfer on DAFF latrines
   - Creation of a specialized information center
   - Information to all kind of public about fecal contamination and alternative sanitation.

Table 12. COMPARISON BETWEEN DAFF AND PIT LATRINES

DAFF LATRINE	PIT LATRINE
Advantages - Contamination control - Close to the household - Avoid flies and microorganisms - Easy contruction - Construction above ground - It produces fertilizer	Advantages - Well known - No maintenance needed - Utilization is easy - Flies could be avoided if pits are very deep
Disadvantages - Is expensive for poor people - Maintenance is needed - Ash is essential for proper use - Poorly operated latrine has flies and odours	Disadvantages - Proliferation of flies and odours - Diggind the pit is needed - Dangerous for children - Polutes water ans soil - Its use is not hygienic - It takes a larger space - Construction might be difficult - Biofertilizer is wasted

FIGURE # 1

A


soil
scale 1:25
resting chamber
chamber in use

B

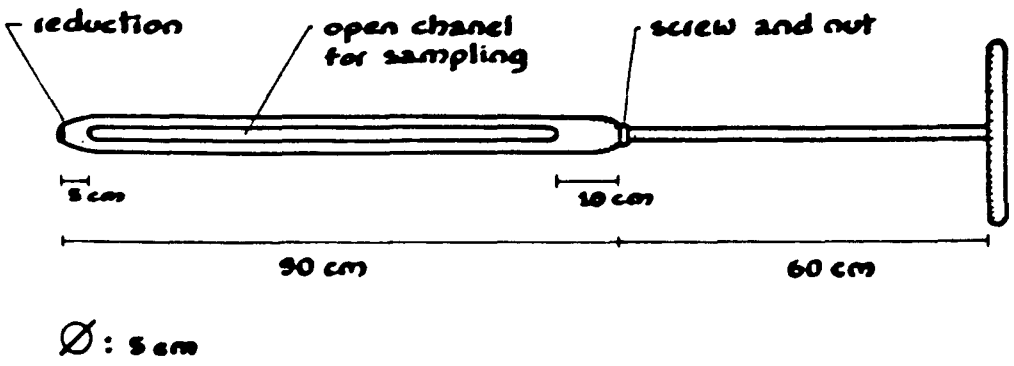
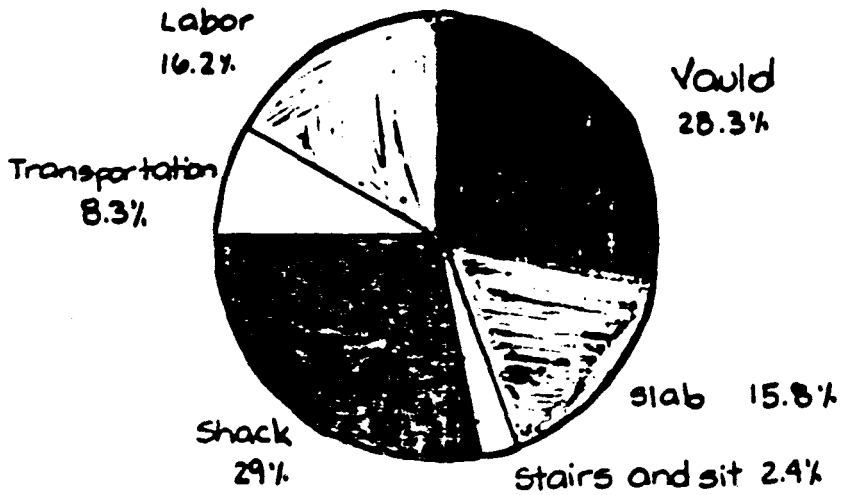

reduction
open chanel for sampling
screw and nut
5 cm
10 cm
90 cm
60 cm
Ø: 5 cm

FIGURE # 2

DISTRIBUTION OF DAFF COST.



DISTRIBUTION CONSTRUCTION COST BY ENTERPRISE

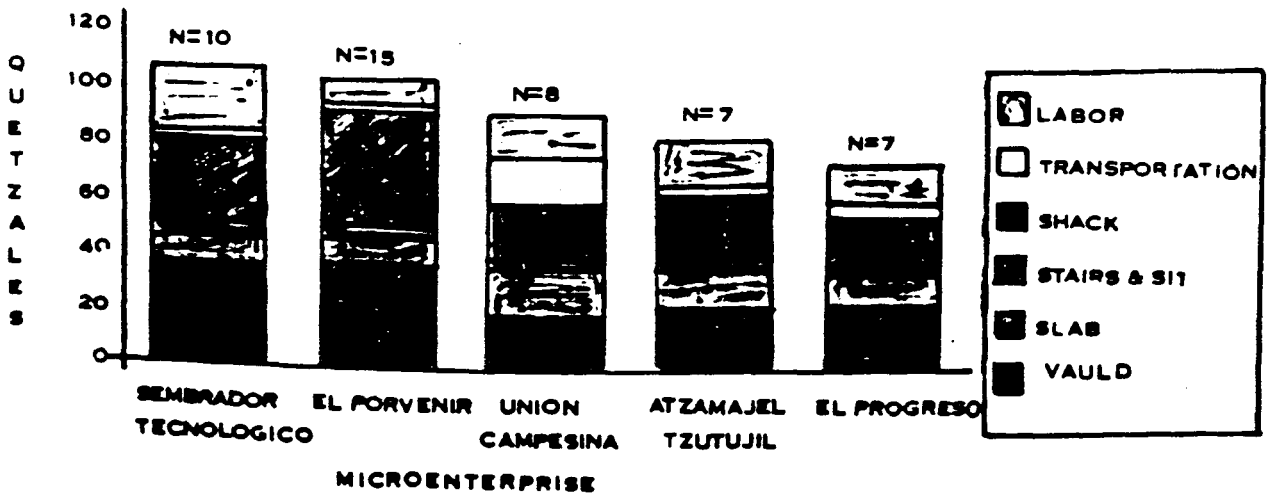


FIGURE # 3

RELATION BETWEEN FILLING AN RETENTION TIME

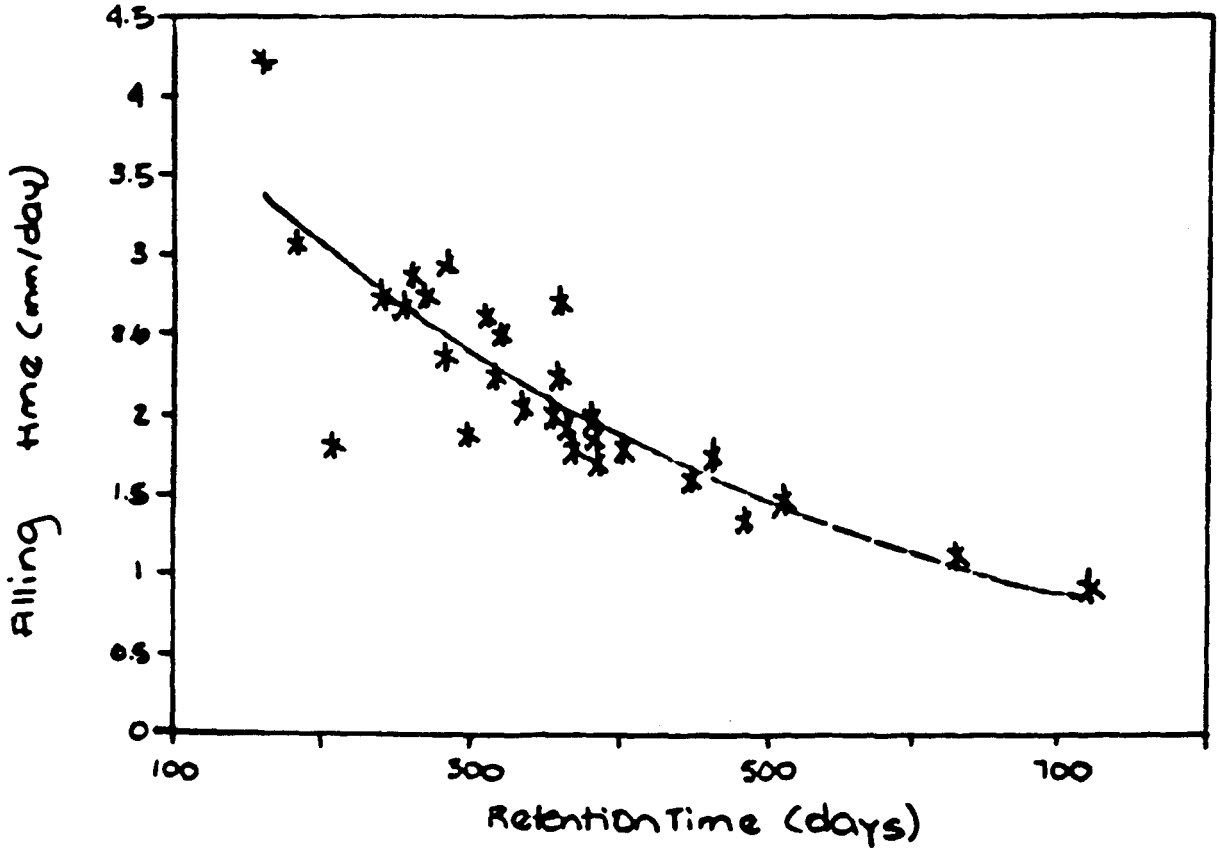
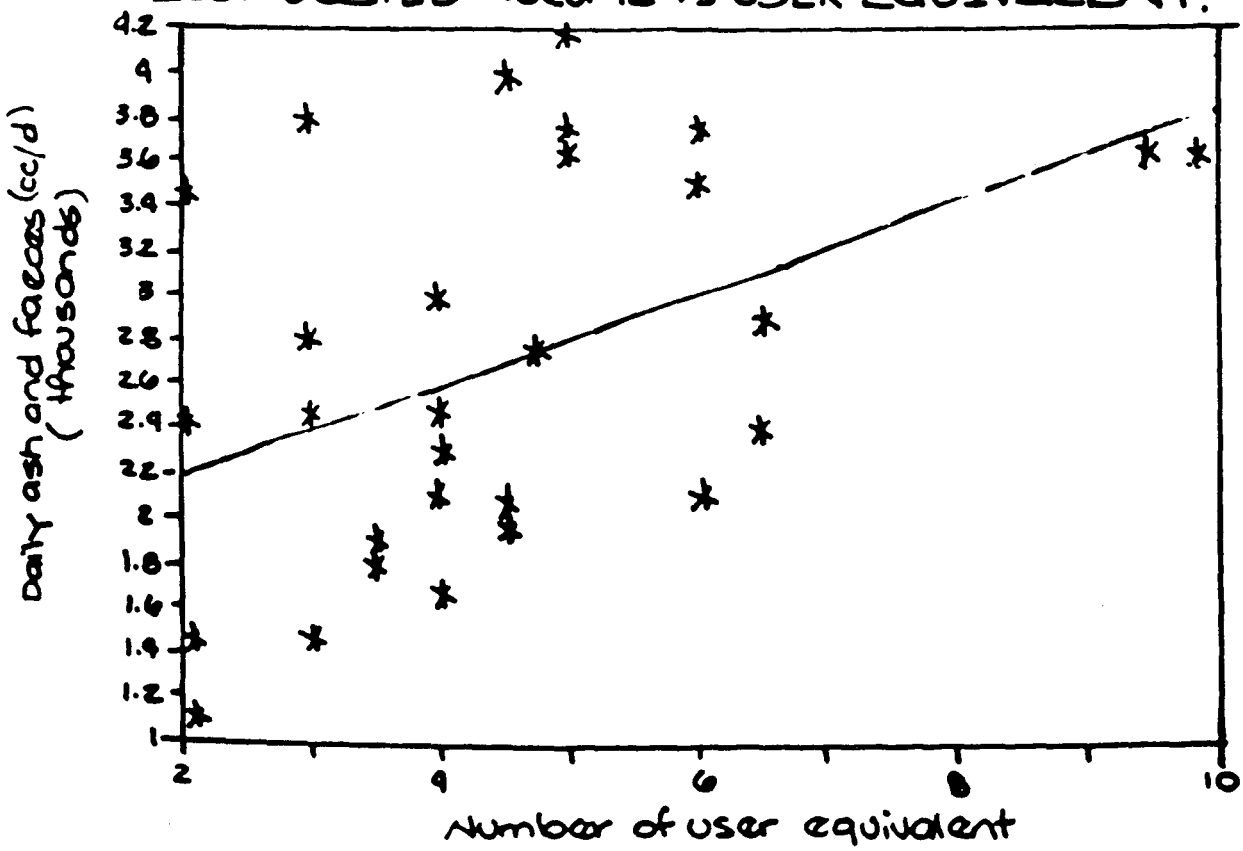


FIGURE # 4

ACUMULATED VOLUME vs USER EQUIVALENT.



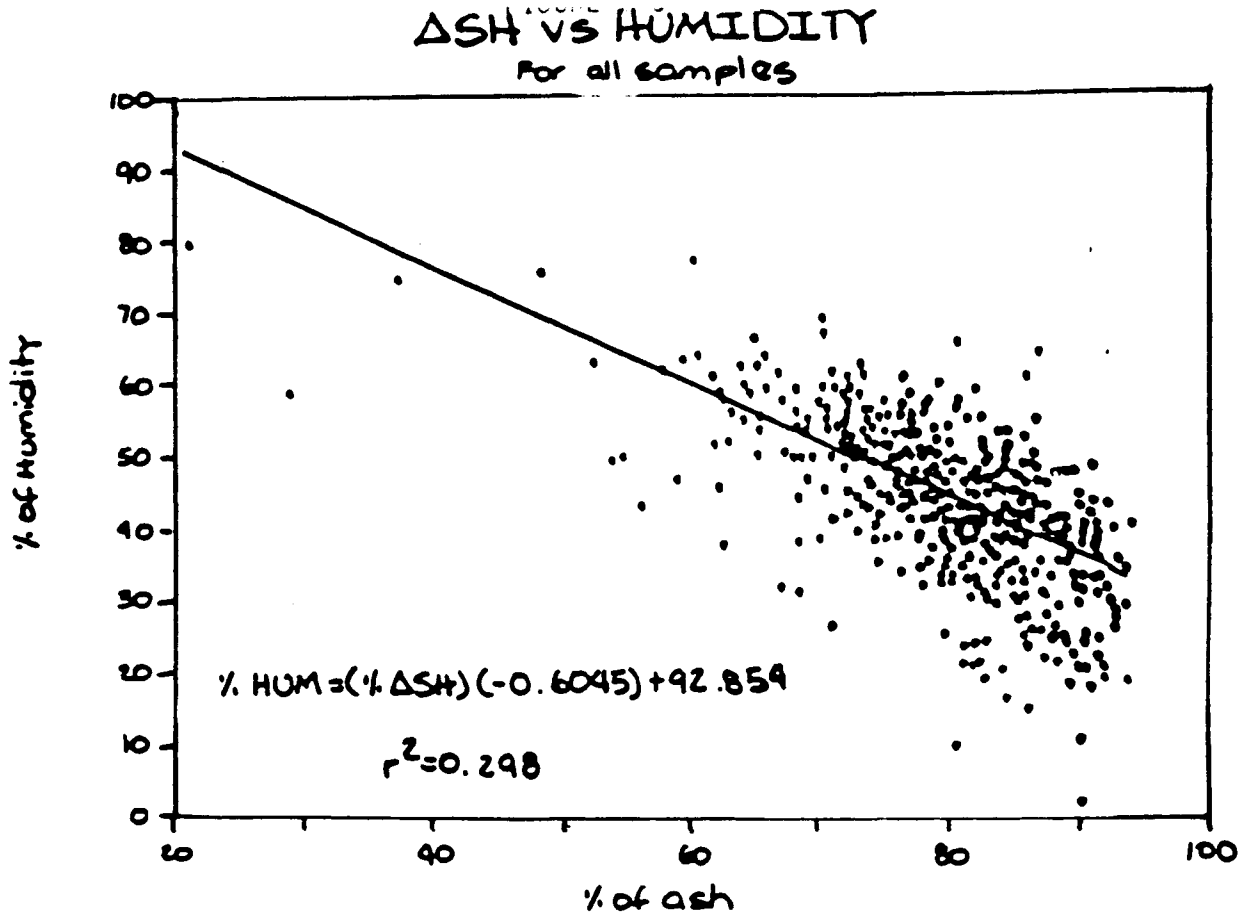

ΔSH VS HUMIDITY
For all samples
% of Humidity
% of ash
% HUM = (% ΔSH) (-0.6045) + 92.859
r² = 0.298
100
90
80
70
60
50
40
30
20
10
0
20
40
60
80
100

FIGURE # 6

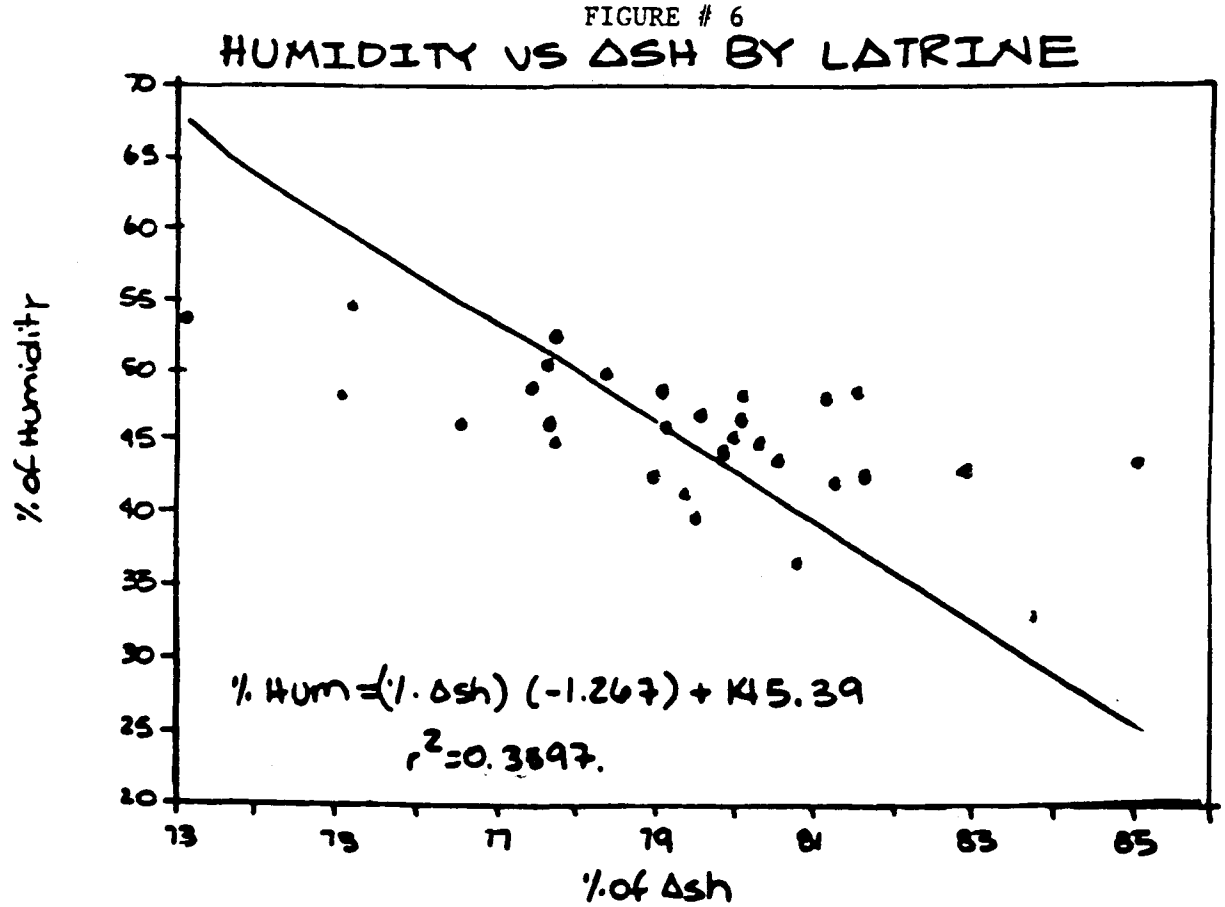

HUMIDITY VS ΔSH BY LATRINE
% of Humidity
% of Δsh
% Hum = (% Δsh) (-1.267) + 145.39
r² = 0.3897.
70
65
60
55
50
45
40
35
30
25
20
73
75
77
79
81
83
85

FIGURE # 7

TOTAL COLIFORM ACCORDING TO SAMPLE

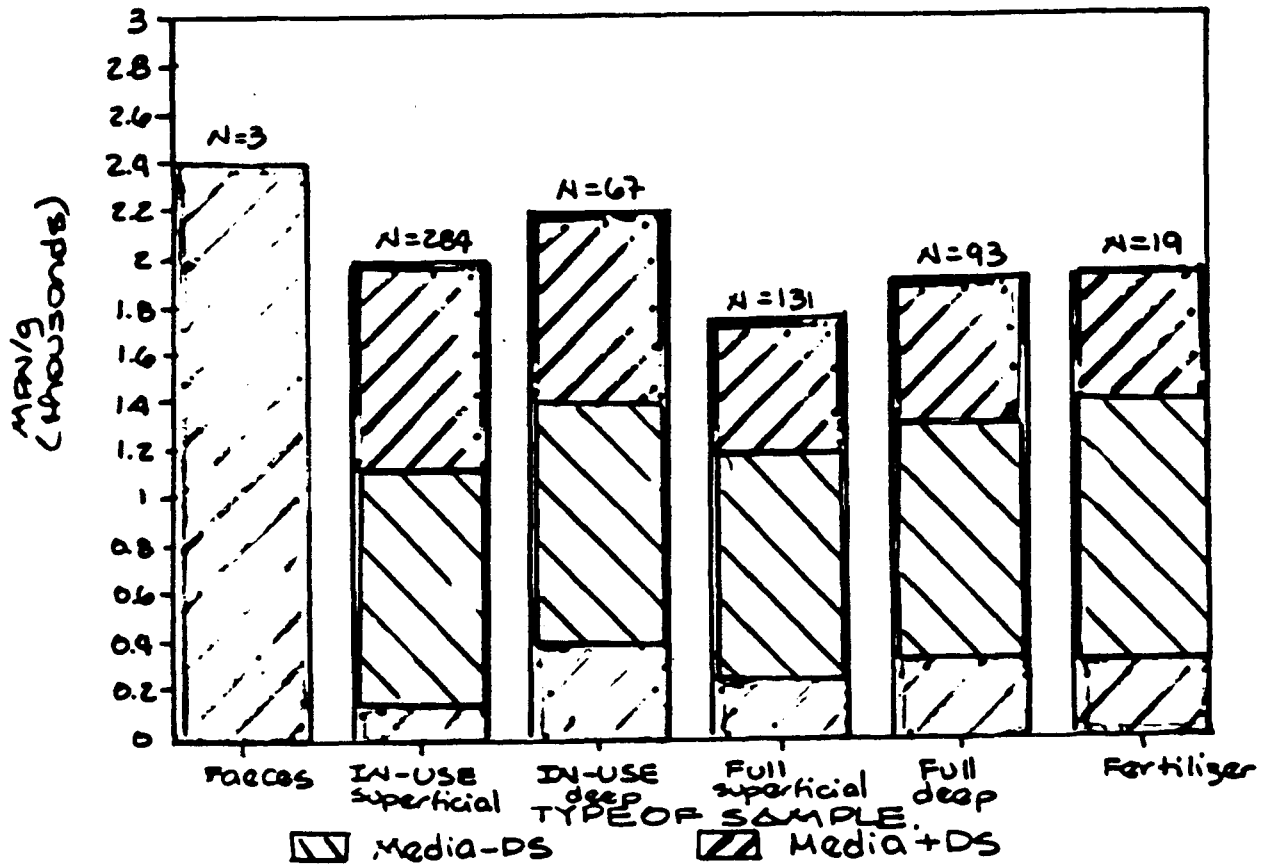


FIGURE # 8

FAECAL COLIFORMS ACCORDING TO SAMPLE.

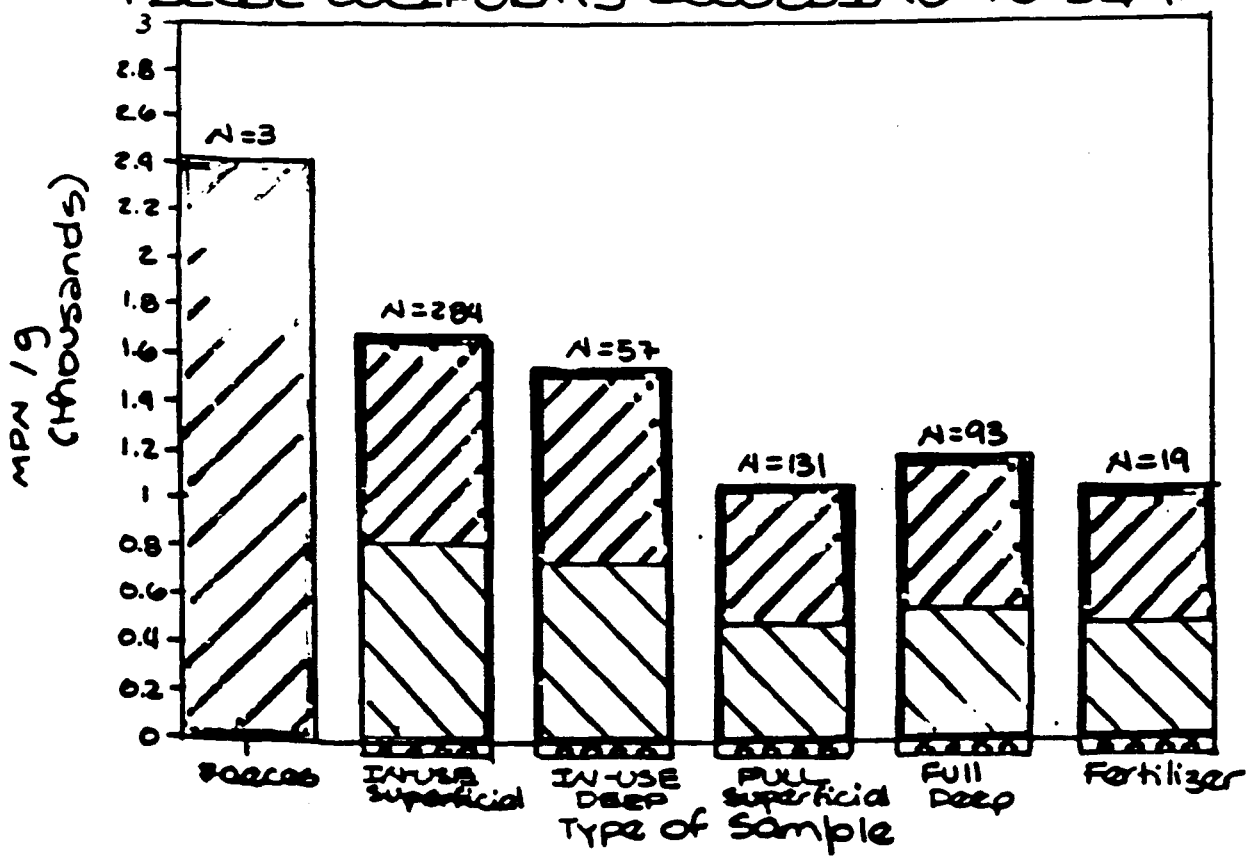


FIGURE # 9

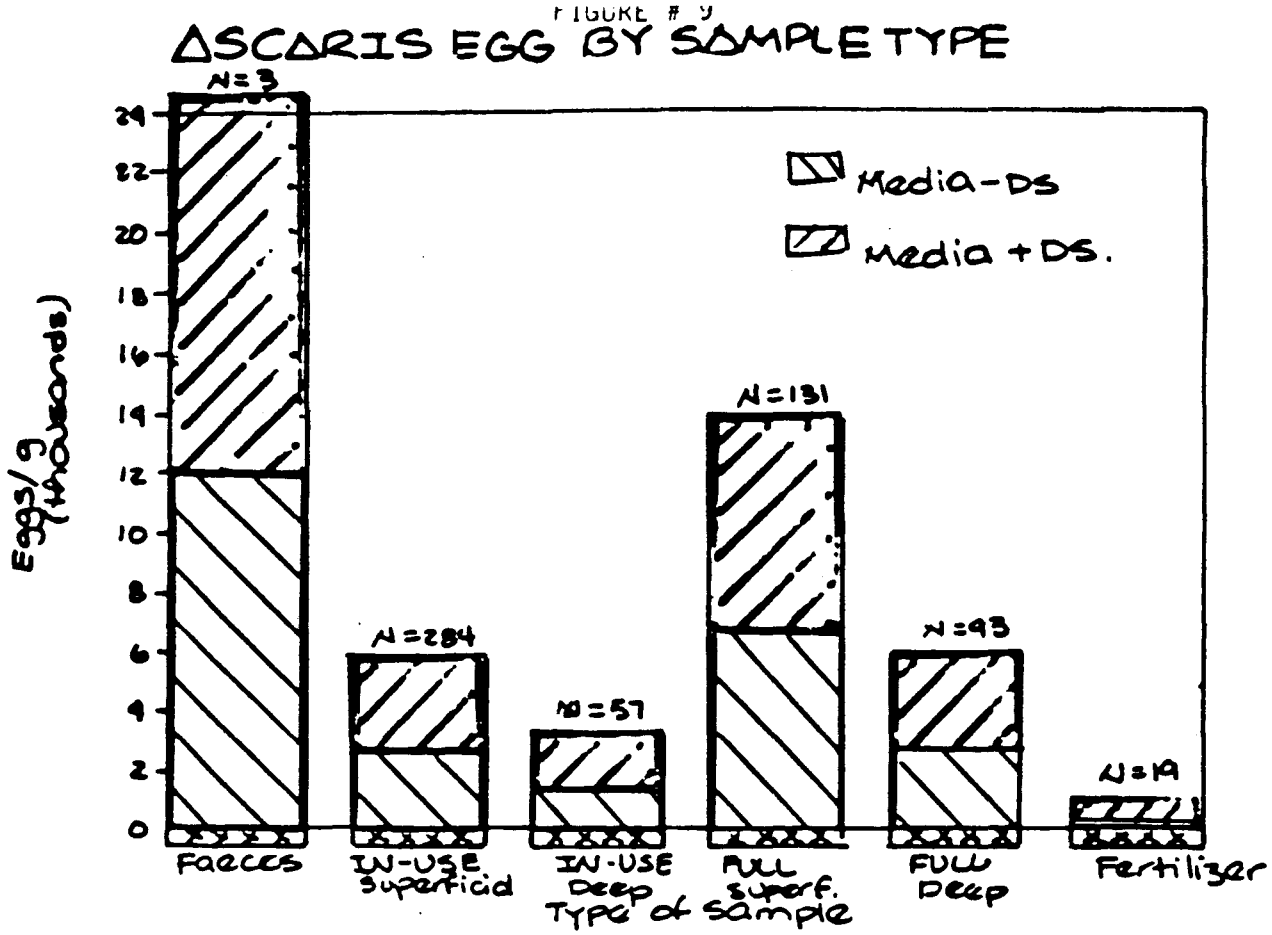


FIGURE # 10

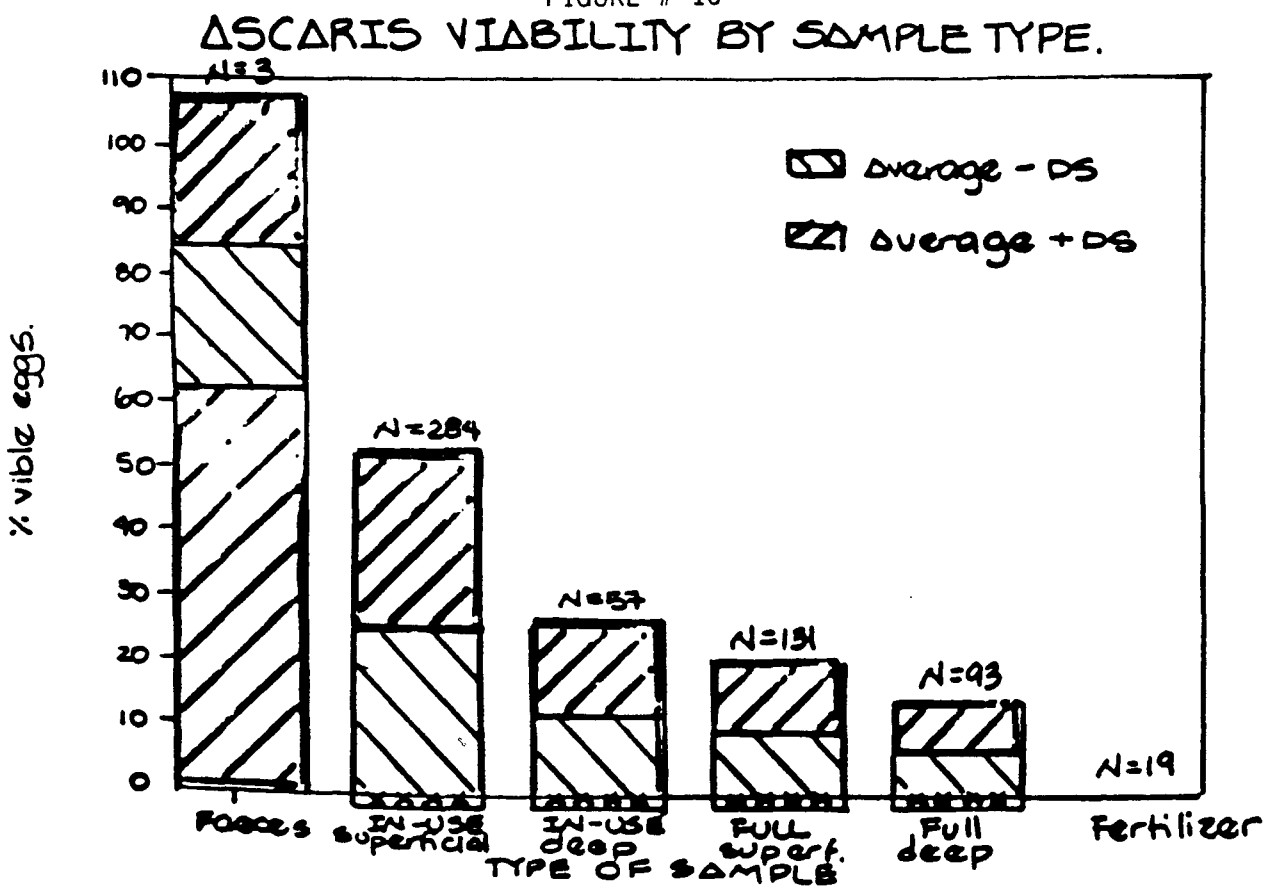


FIGURE # 11

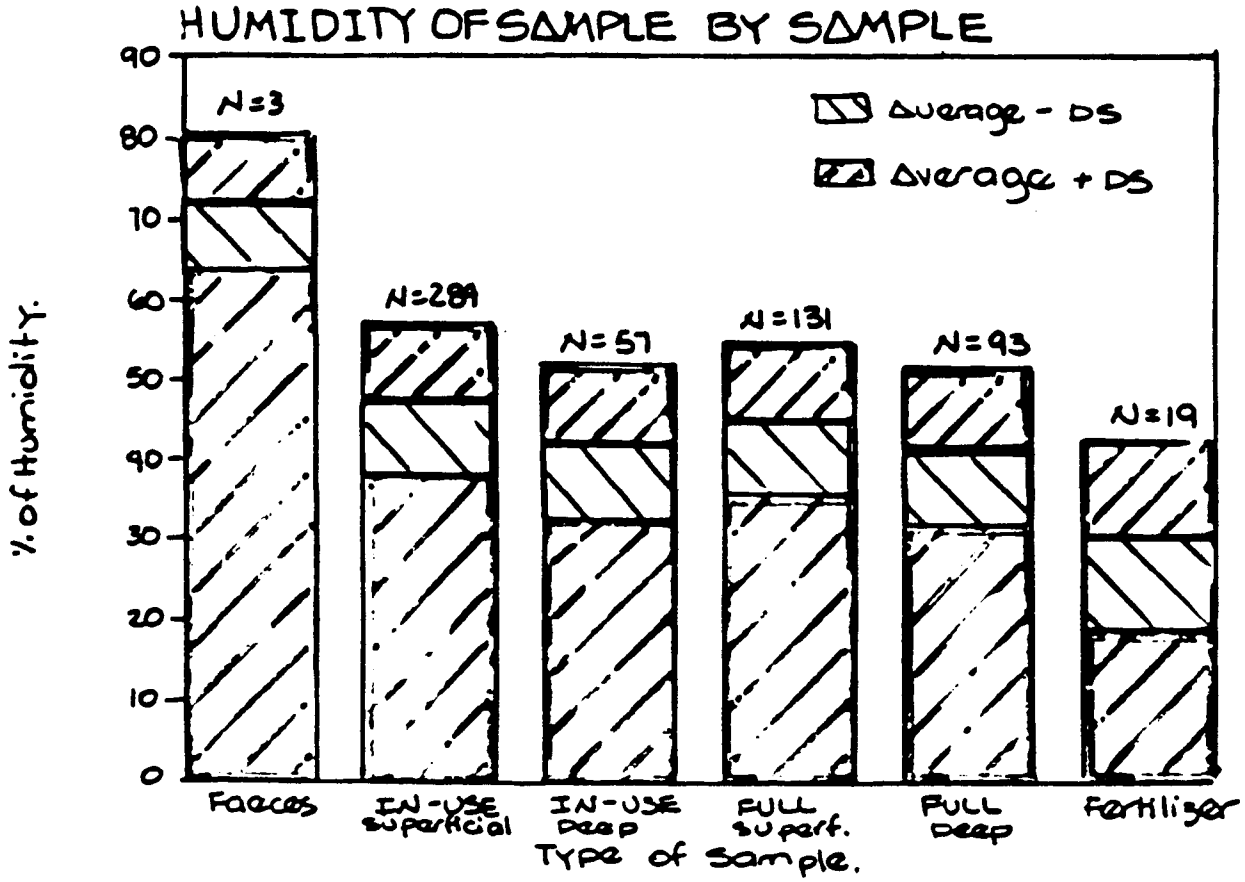
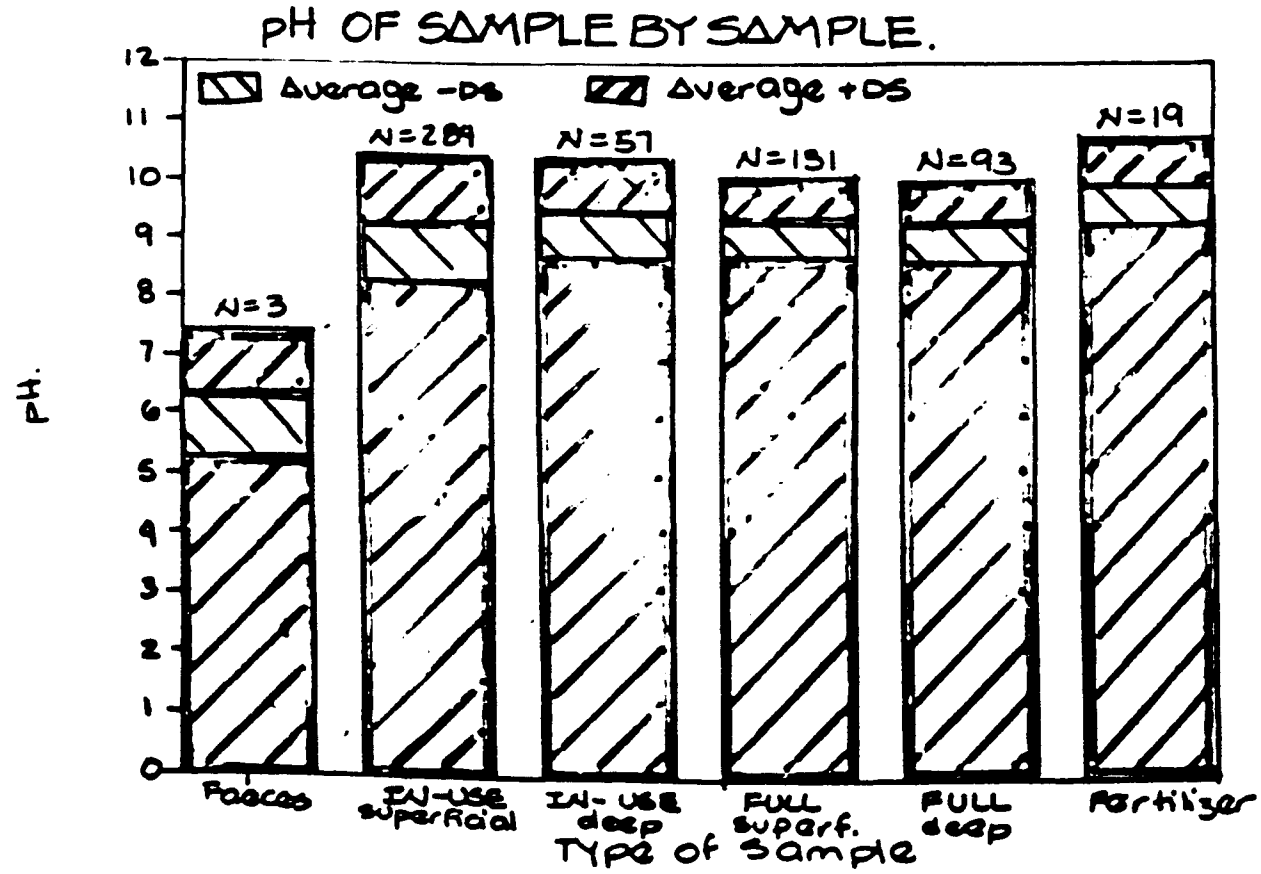


FIGURE # 12.



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Appendix 4

WORK GROUP REPORTS (Day 2)

GROUP A - EH RESEARCH NEEDS

(1) Is there a need to develop, test and evaluate low cost, easily operated and maintained drinking water disinfection equipment for small rural water supplies in Caribbean countries?

(2) The septic tank is popularly used where homes enjoy pipebourne water supply, but soil and groundwater pollution by its effluent can be a serious problem. Do you agree that this problem of the sanitary disposal of septic tank effluent deserves research attention? Explain.

(3) How useful would it be to develop low cost, easily maintainable technologies for the re-use of human excreta by rural populations? If so, explain the socio-cultural and the public health aspects that would need to be carefully examined.

(4) One of the weaknesses in the relationship between housing problems and family health is reportedly the lack of quantifiable evidence. How would you design a research project to counter this weakness and produce a clear understanding?

(5) Is it generally agreed that a major weakness in Caribbean societies is the lack of environmental awareness among people at all levels. To what extent do we need research work to quantify the value of people participation in contributing towards the success of environmental health program implementation?

(6) What are unique methods for educating and motivating the public in environmental health (e.g. use of art and culture)? And how can research be used to develop an effective programme based on such methods and techniques?

(7) (a) What is the role played by various existing Caribbean research-oriented institutions (e.g. UWI, CEHI, CARIRI, Research Councils, etc.)?

(b) What collaboration exists among research scientists; and how could increased collaboration be promoted and effected?

(8) How would you avoid the design and introduction of inappropriate technology in environmental health, with all its obvious limitations; and what role do you see for the user of such technology in the field?

GROUP A: ENVIRONMENTAL HEALTH RESEARCH NEEDS

1. We accept that there are known cases in the region where drinking water is obtained from untreated sources such as irrigation canals, springs, roof catchment etc. One needs to evaluate all the possible low cost systems of disinfection with emphasis on systems that do not need special assistance for use. Three techniques that are known are:

   - electrolytic process generating mixed gas oxidants.

     sodium hypochlorite dozing.

     slow sand filtration.

2. Sanitary disposal of septic tank effluent needs to be investigated as very little is known or no measure available of the effluent characteristics and its effects on ground water sources. A profile of the pollutants from cesspool leachates, dry latrines and septic tanks need to be done. It appears that separating grey water from sewage is desirable as proper treatment of this will produce effluent of acceptable quality, therefore eliminating another possible contaminant source.

3. The reuse of human excreta in rural populations does not appear to be a high priority in general considering the high socio-cultural barriers, practices and customs but this is possible in areas where there are no on-site disposal systems. The reuse potential of faecal waste for agricultural practices does exist in these cases. The case in point is Barbuda where this was readily acceptable.

4. There is a weakness in the relationship between housing problems and family health. Firstly an index of health and pollution ought to be established. In order to make the data collection meaningful a strategy which uses suitably educated and instructed public health inspectors and medical social workers ought to be employed.

5. There is a general lack of awareness and appreciation for the environment among Caribbean societies. Research work ought to be done in the following areas:

- Water supply in rural areas.

- Solid waste disposal - this is really of aesthetic value as there appears to be some link between the presence of litter and the psychological impact on an individual manifested by the way one feels about oneself.

- Dispensing of pesticides.

- Casual disposal of petroleum product waste.

- Source reduction with reference to the proper disposal of receptacles in which mosquitoes can breed.

In order to be effective one ought to target specific communities.

6. In order to educate and motivate the public in environmental health one ought to consider replicating successful marketing strategies. These consist of: developing a comic character, a theme, a jingle, essay competition, posters, etc. utilising proper labelling with appropriate warnings. However, prior to any wholesale adoption of the above techniques there is a need for some evaluation of their effectiveness. Market testing ought to be done.

7. (a) Role played by various Caribbean Research oriented institutions:

UWI: - Primary research, social research and develop techniques and standards.

CEHI: - To provide technical and advisory services to member states in all areas of environmental management.

- To prepare and keep inventories of:

(i) Education and training programmes especially those in related disciplines

(ii) Regional experts and other manpower resource.

(c) To promote and collaborate in the planning and programming of symposia workshops and on-the-job training in Member States.

(d) To conduct courses, seminars, symposia and other workshops at either the Institute or other selected regional institutions.

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(c) To promote and collaborate in the planning and programming of symposia workshops and on-the-job training in Member States.

(d) To conduct courses, seminars, symposia and other workshops at either the Institute or other selected regional institutions.

(e) To arrange and accept grants for financing scholarships and fellowships to facilitate the training of nationals of Member States.

(f) To act as:

(i) A regional reference center for the collection and dissemination of technical and scientific information.

(ii) A focal point for various environmental monitoring networks for the collection and dissemination of environmental data, especially health-related, in the Caribbean Region.

(g) (i) To promote and coordinate applied research relevant to the environmental problems of the Caribbean Region as identified by Member States.

(ii) To promote unifiormity in professional practices, design standards and technical methods in programmes formulated for the improvement of environmental health and environmental health management.

CARIRI: - concerned primarily with industry activity as it affects safety and waste products.

Research Councils:

- should sort research proposals and make choices for funding

- isolated cases, use funds to advance research projects to the stage where prototypes are developed.

7(b) Only limited collaboration exists among research Scientists in the region. This needs to be greatly improved.

One way of fostering this cooperation is through the establishment of specialist technical committees to work on common problems. Membership should be drawn from technical and interested groups in the region, especially from regional professional associations.

8. The question of how to avoid the design and introduction of inappropriate technology in environmental health poses a great challenge to all of us. It is generally felt that an environmental impact study ought to be done on all major projects in the region. This study should be presented to the technical committee for evaluation prior to implementation. An integral part of this study should include a realistic cost estimate for the environmental impact. With several examples of disasters in the region and the availability of actual costs for correcting these problems, it is now possible to apportion costs that are credible.

The users of this technology have a duty to become aware of the dangers. However, the optimum solution would emanate once the public participates in the decision making process. This of course, requires an educated and aware public.

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GROUP B - EH RESEARCH NEEDS

1. (a) To what extent are rainwater catchment systems (e.g. cisterns) needed for individual homes in the Caribbean?

   (b) And what technical and social factors would influence the design of any research project on the subject?

2. (a) Is it necessary to develop rapid, inexpensive, technically simple water quality tests for use in the field in the Caribbean?

   (b) Would it then be desirable to develop a locally made field kit to use the new testing procedures?

3. The pit privy is used in varying degrees in the Caribbean, but it is problematic where rocky ground exists and the water table is high. Is there not a need for the research, testing and introduction of an innovative privy for use in such difficult conditions?

4. Despite the obvious influence of the home environment on family health, it is felt by some that not enough attention is paid by the Health and Housing sectors (or Ministries) to the environmental health aspects of housing. How can a research project be used to promote this relationship?

(5) In solid waste management there is a vital role for people participation, especially payment for services rendered. What need is there to conduct demographic, socio-economic and technical surveys, and collect data on the community's willingness and ability to participate from solid waste collection to disposal, including the payment of direct fees?

(6) A model environmental health education program in all-age schools in the Caribbean would comprise: environmental studies, environmental health management in the school, and environmental health action in the neighbouring community.
Is the development of such a program (by research) one of the priority needs in Caribbean countries? Explain.

7. (a) To what extent is technical cooperation among developing countries (TCDC) practised in the Caribbean
   - in environmental health?
   - in research?

   (b) And what can be done to overcome the constraints and further develop such cooperation?

8. (a) What are the mechanics for the easy transfer of technology from research centres to its application in Caribbean countries?

   (b) And what are potential linkages in the Caribbean between research (and its results) and the adoption/implementation of its findings?

SESSION #1 - EH RESEARCH NEEDS: RANGE AND PRIORITIES

GROUP B

Armando Caceres

Wilton Conliffe

James Hodge

Sharon Laurent

Homero Silva (Rapporteur)

Naresh Singh (Chairman)

Richard Warren

Alex Redekopp

WORKSHOP ON CARIBBEAN ENVIRONMENTAL HEALTH

RESEARCH NEEDS

GROUP B - EH RESEARCH NEEDS

1.(a) This need varies from island to island. For example in Turks and Caicos this system is needed in almost every house, in Jamaica it is needed in some rural areas, in Trinidad only few rural areas, in St. Kitts no need, in Nevis, there is a big need, People store water in 1 or 2 45 gallon drums and when they run out of water they need to walk long distances to get water. In Anguilla - it is very dry, most of the houses are built with a cistern. The dry period lasts 8-9 months. In the Eastern Caribbean metal dum containers are used mainly in rural areas.

(a) Research in quality of water obtained from these systems is needed. Drawings are available for the construction of storage facilities. We need research for alternative materials such as Ferro-cement, Bamboo, etc. We need to do a survey to find out needs in each island. However some results are already available from the CARICOM Environmental Health Strategy Report. There are some important social factors for example in Trinidad people do not accept water from drums if chemical treatment for vector control has been applied.
Finally, we feel that education for individual homes is needed for quality protection.

2. (a) We need to see what is available and field test it. Particularly for microbiological and organic chemicals.

   (b) This question should be answered once we get results from the first question.

3. Yes, there is a need for considering privy technologies. A feasibility study - technical and social - of what is already available should be done.

4. There exists a Caribbean Uniform Building Code with an Environmental Section. There is a need for promotion and enforcement of these guidelines

5. A survey should be done to determine the wi. and attitudes of people.

6. There is a need for such a program, we need to know what is currently done. We should review what was done by UNESCO. Contact should be established with the consortium for Sciences Education Research. They have done some curriculum work at primary and secondary level, however, there is a need for this work at tertiary level.

7. (a) It has been done but through international agencies, but not enough.
Research transfer has been done - medical plant, bio gas FAO network, in the area of Bio-technology, CHI network of collaborating institutions (about 17) including CARIRI, IMA.

(b) 1. Cheaper communication means for example, UWIDITE - Dist. technical experiment,

2. Improve established networks.

8. (a) Carefully structured workshops
- Direct involvement of the research centres and the final users.

(b) Strengthening of CEHI and other Env. Health Institutions.
Development of a Regional EH Newsletter through CEHI.

GENERAL COMMENT:

Constraints to implement research results are manpower and economic resources, due to the low priority that is given to the environmental health sector.

PROJECT SELECTION GUIDELINES

(a) Regional/sub-regional in relevance and application.
(b) National priority
(c) Include socio-economic considerations (e.g. Com. Ed./Part)
(d) Number of people benefitting.
(e) Indigenous institutional capability/strengthening.
(f) National/sub-regional capability to follow up.

All projects were given 0-3 pts. for each of the 6 guidelines (max. 18) and were selected with the following priority listing:

FIRST PRIORITY

1. More effective public education methods for community participation in environmental health works and services (e.g. watershed management, water conservation, litter/dumping prevention, wastewater disposal).

2. Alternative privy/latrine designs for excreta disposal under special conditions, including rocky and high water table areas.

3. Field-testing of simple, inexpensive water quality monitoring kits.

4. Development and adoption of sub-regional environmental quality standards, starting with water/wastewater standards.

5. Effect of on-site sanitation practices (sewage/excreta disposal) on groundwater sources with a view to developing pollution control measures.

6. Study of the disposal of septic tank effluent through upflow filters, trenching and evapotranspiration beds.

7. Development of simple, inexpensive disinfection facilities for rural water supplies.

8. A study of the utilization of pesticides and their pollutive effects on surface and groundwater resources.

SECOND PRIORITY

1. Survey of collection, treatment and disposal of grey water in built-up areas, and a recommendation of new sanitary methods.

2. Water distribution system management through wastage reduction computer mapping, etc.

3. Establishment of the methodology for developing environmental health profiles of Caribbean countries.

4. Study to determine the health impact of improved environmental health conditions in a community.

5. Study of the methods of removal, transportation and sanitary disposal of septage and night soil.

6. Development of mini-tankers and collection vehicles for use in special conditions (e.g. poor access) in solid waste management.

7. Study of solid waste resource recovery (sub-region) at landfill sites in the Caribbean.

8. Design and operation of waste stabilization ponds with effluent treatment by aquatic plants before waterbody disposal.

9. Local design and manufacture of a simple package sewage treatment plant for use for coastal hotels and small communities.

10. Study of alternative methods of treating and disposing of animal wastes (e.g. from piggeries, poultry farms etc.)

11. Survey and study of roof water systems (e.g. cisterns) in the Caribbean with an emphasis on design, capacity, usage, water quality, etc.

12. Development of sanitary and economical methods of disposal of derelict vehicles and tyres.

Appendix 5

SUMMARIES OF PROPOSED PROJECTS (Day 3)

PROJECT DATA SHEET

1. COUNTRIES

Saint Lucia, Grenada, St. Vincent, Tortola (BVI)

3. TITLE

Evaluation of the applicability of Field Test Kits in the Rapid Assessment of Water Quality.

4. TYPE AND SCOPE OF PROJECT

This project is designed to assess the usefulness of a recently developed microbiologial water resting field kit in terms of savings in time expense and the need for trained trechnicians.

5. BACKGROUND AND OBJECTIVE

Many developing countries in the Caribbean region ideally aim to provide water which is safe, adequate and accessible to all. Little attention has been paid to the protection and maintenance of water quality. The general objective will be to evaluate the usefulness of a new field kit in the determination of bacteriological quality if drinking water and coastal water in small island states.

6. RESPONSIBLE GOVERNMENT AGENCY

Caribbean Environmental Health Institute, Saint Lucia

7. INSTITUTIONAL SUPPORT

Ministries of Public Health in the islands
Water Supply and Sewerage Authorities responsible for water quality monitoring.

8. DURTION - 2 years

9. STARTING DATE - November 1988

FUNDING - IDRC

PROJECT SUMMARY

1. COUNTRY

English Speaking Caribbean Countries (Jamaica)

2. NO.

3. TITLE:

Comparison of Alternative Latrine Designs for Excreta Disposal Under Caribbean Conditions

4. TYPE AND SCOPE OF PROJECT:

Technical design, manpower development and community participation of five excreta disposal systems will be compared for social acceptance, technical performances, economic feasibility and possible benefits to agricultural production. Five demonstrative systems of each kind will be installed in five selected islands, i.e. Jamaica, Trinidad, Grenada, Saint Lucia and St. Kitts.

5. BACKGROUND AND OBJECTIVE:

The majority (about 70%) of low-income people in the English-speaking Caribbean islands depend on pit latrines and open defecation for human excreta disposal. The conventional latrine has odour and flies problems which prevent the full use and acceptance of latrines leading to open defecation and its consequent problems. Besides, conveitional latrines are not suitable in many areas because of shallow groundwater levels, Rocky soils and high probability of flooding. In conclusion what is needed is a low-cost, safe and easy to maintain system for the disposal of human excreta.

OBJECTIVE

The general objective is to improve the excreta disposal practices in peri-urban and rural areas of the Caribbean islands through the introduction of low-cost, safe and easy to maintain latrine technologies supported by an education program that ensures the long viability and sustainability of the proejct.

6. RESPONSIBLE GOVERNMENT AGENCY:

Ministries of Health in each of the islands listed above.

7. INSTITUTIONAL SUPPORT:

Governments will provide professional staff, transportation and some local materials. The administration of the project will be provided by the Jamaica Government.

8. SUMMARY OF ESTIMATED PROEJCT COSTS:

Foreign	Local	Total
Can $ 99,400	Can $ 91,160	Can $ 190,560

11. TENTATIVE FINANCING PLAN

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12. FINANCIAL STRATEGY:

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13. STRATEGY DEVELOPMENT PERFORMANCE:

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14. OUTPUTS:

- One hundred alternative latrines installation in the five countries
- 10 technical personnel trained in construction and monitoring of these systems.
- 1 report of social survey related to sanitation
- Economic analysis of implemented systems.
- Manual for design, construction, O & M of implemented systems.

15. GOVERNMENT PRIORITY AND COMMITMENT:

Some Governments have already included latrinization programs in their developmetn plans, however the technologies considered in this study have not been included. Governments selected for the demonstration project have expressed their desire for a full implementation of a latrine program if this project results in a success.

16. EXPECTED BENEFITS:

- Transfer of suitable excreta disposal technologies to the English speaking Caribbean islands
- Dissemination of Technologies among environmental health staff and users
- Creation of a manual for design, construction, O & M of suitable excreta disposal technologies.
- Improvement of environmental health conditions in low-income areas.

17. PREPARED BY:

Dr. Armando Caceres

Dr. Homero Silva

Date: 25 March 1988

PAHO/IDRC CONSULTATIONS ON CARIBBEAN ENVIRONMENTAL HEALTH RESEARCH NEEDS/PROPOSALS (Barbados, 23-25 March, 1988)

1. COUNTRIES

Guyana, Barbados, St. Vincent, St. Lucia

2. TITLE

Determination of the potential and extent of pesticide pollution of surface and ground water resources in the Caribbean

3. TYPE AND SCOPE OF PROJECT

Water quality surveillance and control in selected CARICOM States.

(i) Background and Objective

Because of wide spread use and reuse of pesticides in public health and agriculture in the Caribbean region, there exists a very real potential for pesticide pollution of the vital water sources. Several cases of carcinomas, morbidity and chronic ailments have been recorded in patients but the lack of diagnostic capability have not permitted the exact cause of the ailment or death to be determined. However physicians in the region suspect pesticide residues in water as one of the most probable causes.

The project's objective would be to determine the levels of the more toxic but commonly used pesticides in public health and agriculture. Determination of these levels would be carried out in two countries having ground water as their major water resources and two with surface water as their major water resources. The identification of residue levels would be the basis for corrective management action leading to improved water quality, better health of the community and increased productivity of the labour force.

(ii) The project would benefit from and contribute to the findings of the following

- Barbados Ground Water Eveluation Project
  Started: November 1987
  Status: Ongoing
  Funded by: PAHO, British Geological Surveys and Government of barbados

- Water quality studies in St. Vincent
  Started: September 1987
  Status: Ongoing
  Funded by: Organisation of Eastern Caribbean States Natural Resources Management Project

(iii) Farmers in agriculture areas and the community at large will be involved to ensure controls, obtain circumstantial data and design final management plans.

(iv) Existing relevant studies include:

(a) Physico-chemical Studies on Selected Pesticides
Ph.D. Thesis: Naresh C. Singh 1985 (UWI Mona)
Parts presented to the Meetings of the American Chemical Society Division of Pesticide Chemistry 1984-1986

(b) Pesticide residues in water in the blue Mountains, Jamaica
UWI and SRC Jamaica 1986

(c) St. Vincent Water Quality Studies - Part 1
OECS - NRMP Working Papers (1987)

6. Caribbean Environmental Health Institute
   Box 1111, Castries, Saint Lucia

7. (i) CEHI - Saint Lucia, Government Analyst - Barbados and Institute of Applied Sciences and Technology, Guyana have basic gas-chromatographic instrumentation and required for pesticide residues determination.

   (ii) Recurrent costs will be met by institutions involved and regional governments.

   (iii) Government and inter-governmental organisations will be responsible for the project management

8. DURATION
   18 months

9. STARTING DATE
   October 1988

10. Estimated total costs US$170,000

PAHO/IDRC CONSULTATIONS ON CARIBBEAN ENVIRONMENTAL HEALTH RESEARCH NEEDS/PROPOSALS (Barbados, 23-25 March, 1988)

1. SUB-REGIONAL (English-speaking Caribbean Countries)

2. NUMBER:

3. TITLE

Evaluation of innovative approaches to environmental education for increased community participation

4. TYPE OF PROJECT AND SCOPE

Research and development leading to the introduction of more innovative methods and techniques in educating the community for increased participation in all phases of environmental health programmes.

Project Scope includes:

- Collect primary, secondary and tertiary (tutor training college) school curricula and evaluate environmental education content and effectiveness.

- Review nonformal (government and NGO) environmental education of the public for programme effectiveness.

- Examine other environmental education possibilities with a view to establishing their appropriateness in the Caribbean

- Select and pilot test potential environmental education methods.

- Hold a meeting of relevant Caribbean Officials to review results.

- Report findings etc.

5. BACKGROUND AND OBJECTIVE

- National development includes residential industrial and tourist development in most Caribbean islands, with the potential of adverse environmental impact.

- Imperative that individuals and groups play an active role in environmental management from decision-making to operation and maintenance of facilities and services.

- At present Caribbean governments do support a variety of environment and education programmes (formal and non-formal) which should be evaluated for scope and effectiveness prior to the initiation of new and expanded activities.

6. RESPONSIBLE GOVERNMENT AGENCY

UWI/PAHO with support from all Ministries responsible for Education and Environment.

7. INSTITUTIONAL SUPPORT

UWI - Facilities of Education, Social Science, Engineering

Government - Conservation Council, T & T SWM Coy, Metropolitan Parks and Markets

NGOs - CCA and local national environmental groups

UN - UNESCO, UNEP, PAHO

8. DURATION

3 years

9. STARTING DATE

1 January 1989

10. SUMMARY OF ESTIMATED PROJECT COSTS

Foreign	Local	Total
80%	20%	100%

11. TENTATIVE FINANCING PLAN

12. FINANCIAL STRATEGY

13. SECTOR DEVEOPMENT PERFORMANCE

Related env. projects:

- Water Supply) WASA
- Sewerage)

Govts.

- Solid Waste Management) Authority) Min of Health

14. OUTPUTS

- Better understanding of effectiveness/appropriateness of environmental education programmes.
- Recommendations for development of more effective and cost beneficial environmental education program.

15. GOVERNMENT PRIORITY AND COMMITMENT

Environmental considerations in national development have high government priroity

16. EXPECTED BENEFITS

- Total population (school and adult public) will benefit
- All members of the public, including special-interest groups, health management, and such programmes will be more appropriate

17. PREPARED BY

- Eng. Ronald A. Williams, PAHO
- Ms. Sharon Laurent, CARIRI

PAHO/IDRC CONSULTATIONS ON CARIBBEAN ENVIRONMENTAL HEALTH RESEARCH NEEDS/PROPOSALS (Barbados, 23-25 March, 1988)

PROJECT SUMMARY

1. COUNTRIES

Jamaica, Grenada, Guyana, Trinidad

2. No:

3. TITLE

Evaluation and field testing of simple, inexperience disinfection facilities for rural water supplies

4. TYPE AND SCOPE OF PROJECT

Quality surveillance and control
The scope of this project includes the installation of low cost, low maintenance simple disinfection facilities in rural water supplies in Jamaica and other countries in the region with the specific purpose of assessing their performance. Performance criteria will be established prior to the installation of these facilities by which each facility will be judged.

5. BACKGROUND AND OBJECTIVE

(i) The topography, population density and economics mitigates against most countries in the region being able to supply pipeborne water from a central facility. However with the presence of water from untreated sources such as springs, roof drains etc., we foresee a continuation of supplies

from these sources. The problem lies in the potability of the water that is used. Hence the need to assess and field test these units. The project indirectly reduces the demand on the healthcare delivery system by reducing the probability of water-borne illnesses.

(ii) This project complents on-going projects. This varies from country to country.
Start of fiscal year 1988

(iii) By the nature of the assessment undertaken it is necessary to have participation of the consumers in order to determine the ease of operation, effectiveness of disinfection provided and the simplicity of the required maintenance.

(iv) Studies done include "Disinfection with mixed Gas Oxidants Generated on site (MOGGD)" by Fred M. Reiff P.E., PAHO/WHO Washington, D.C.

6. RESPONSIBLE GOVERNMENT AGENCY

Trinidad: Ministry of Health,
Water and Sewage Authority
University of the West Indies

Grenada: Ministry of Health
Water and Sewage Authority

Jamaica: National Water Commission
Environmental Control Division, Min. of Health

Guyana: Guyana Water Authority
Ministry of Health
Institute of Applied Science and Technology

7. INSTITUTIONAL SUPPORT

Jamaica:

1. Provide human resources, funds for operation combined with anticipated funds from CDB to upgrade catchment tank program islandwide.

2. Cost effective to the extent that it reduces the demand on the health budget.

3. Existing water commission staff

8. DURATION

Two years

9. STARTING DATE

September 1988

10. PROJECT COSTS (very approximate)

	Foreign	Local	Total
Travel:	15,000	24,000 - staff	
Consultations:	15,000	10,000 - transport	
Equipment:	100,000	3,000 - telex etc.	
Vehicles:	60,000	5,000 - misc.	
	190,000	42,000	US$232,000

PAHO/IDRC CONSULTATIONS ON CARIBBEAN ENVIRONMENTAL HEALTH RESEARCH NEEDS/PROPOSALS (Barbados, 23-25 March, 1988)

PROJECT SUMMARY

1. COUNTRIES

The countries invloved are:

Grenada, St. Kitts, St. Lucia and Trinidad and Tobago

2. NUMBER

3. TITLE

A Study of the Disposal of Septic Tank Effluent through Upflow Filters, Trenching and Evapotranspiration Beds.

4. TYPE AND SCOPE OF PROJECT

This project is in the area of wastewater treatment and disposal, particularly when such treatment and disposal take place where the wastewater is generated, for example households, schools, hotels. The motivation for this project arises from the widespread separation of waterborne human waste (faecal and urine) from other waterborne wastes: kitchen, bath and laundry. The latter are discharged to open water drainage systems and watercourses. Rsearch will be carried out to develop standard designs and guidelines for construction of modified on-site disposal systems which would reduce pollution of watercourses and hazards to health.

5. BACKGROUND AND OBJECTIVE

At present environmental health is under risk because untreated wastewater ("grey" water) is discharged into stormwater drainage systems, natural watercourses and coastal areas used for tourism and recreation. Furthermore such water is frequently used as a source of irrigation water for the growing of vegetables in the dry season. The risk to health by these practices is obvious. There is, therefore, a very substantial potential for health improvement if this wastewater could either be disposed of separately or else treated to the extent that its quality is acceptable.

Present practice which now has the strength of tradition has developed because in most areas due to low soil permebility, the closeness of rock formations to the ground surface, high water-table and limited area available for soakaways, it is impracticable to discharge all household wastewater to the on-site disposal system. On-site disposal using the septic tank soakaway system is standard in all countries where, in the absence of a central sewer system, a pipe-borne water supply is available to the household. Only a very small percentage of the population is sewered by a central sewer system.

The project will involve community participation and involvement.

6. RESPONSIBLE GOVERNMENT AGENCY/AGENCIES

The following agencies will be involved:

Grenada - Ministry of Health

St. Kitts - Ministry of Health

St. Lucia - Ministry of Health, Caribbean En. Health Institute

Trinidad & Tobago - Ministry of Health, University of West Indies

7 INSTITUTIONAL SUPPORT

Officials of the above-mentioned agencies (at 6) and members of the communities (householders, hotel workers,.etc.) will cooperate in the execution of the project. Professional, technical and unskilled manpower will be available from the institutions/agencies mentioned.

8. DURATION

It is anticipated that the project could be completed in two(2) years.

9. STARTING DATE

September 1988

10. PROJECT COSTS

Estimates will be prepared and be ready by the end of May.

Personnel

Professional and technical personnel with backgrounds in engineering and health will be available. It is anticipated that there will be two(2) key personnel per country.

Equipment and Supplies

Laboratory facilities at the Water and Sewerage Authority, the University (UWI) and CEHI will be available. In addition, all the agencies involved will supply some of the labour and materials required.

Funds

Salaries of personnel involved principally.

Foreign Inputs

IDRC funding

11. TENTATIVE FINANCING PLAN

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12. FINANCIAL STRATEGY

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13. SECTOR DEVELOPMENT PERFORMANCE

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14. OUTPUTS

- o Standard designs with improved performance
- o Improved effluent quality
- o Performance data for standard designs

15. GOVERNMENT PRIORITY AND COMMITMENT

Substantial; especially for low income housing developments.

16. EXPECTED BENEFITS

All sections of populations with on-site disposal of wastewater.

Substantial reduction of health hazards expected.

H. O. Phelps
TRINIDAD & TOBAGO