Appropriate Technology for Water Supply and Sanitation, Volume 5: Sociocultural Aspects of Water Supply and Excreta Disposal

by: Mary Elmendorf and Patricia Buckles

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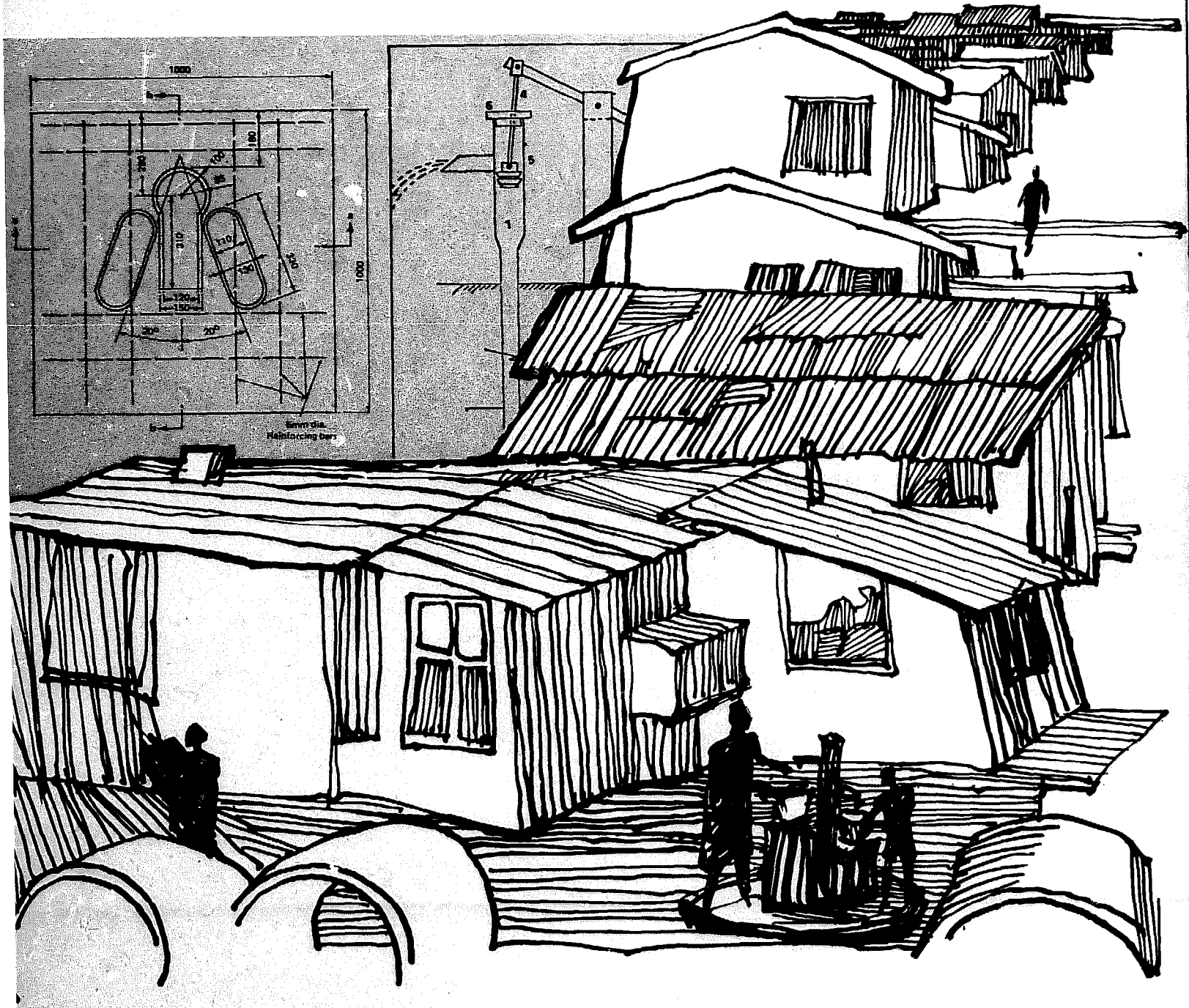

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Volume 5

APPROPIRATE TECHNOLOGY FOR WATER SUPPLY AND SANITATION

SOCIOCULTURAL ASPECTS OF WATER SUPPLY AND EXCRETA DISPOSAL

TRANSPORTATION, WATER AND TELECOMMUNICATIONS DEPARTMENT

The World Bank

December 1980

Central Projects Staff
Transportation, Water and Telecommunications Department

Abstract

Social and cultural factors influencing people's responses to water supply and excreta disposal technologies are investigated in seven case studies of communities in the rural and urban fringe areas of Latin America. Part 1 describes the methodology and questionnaire used to investigate how sanitation and water supply problems are perceived and to what extent people would be willing to participate in projects to improve their existing situation. Part 2 summarizes each case study, including the technologies introduced and community response to them. Part 3 presents the cross-community findings on perceptions, preferences, related practices, and the use of social science techniques to understand them. In Part 4, the report focuses on the implications of the findings and suggests an approach that can be used by planners to integrate social and cultural factors into project design to ensure the introduction of water supply and excreta disposal technologies that will be accepted, properly used, and maintained.

This report was prepared as part of the World Bank research project concerning appropriate technology for water supply and waste disposal. Complete reports on the seven case studies with more detailed description of the research methodology and identification of selected social science techniques appropriate for use in facilitating communication and community participation, are contained in Volume 8 of the Appropriate Technology for Water and Sanitation Series. A list of the series' titles is attached to this report as Annex C.

Prepared by: Mary Elmendorf and Patricia K. Buckles (consultants)

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The authors gratefully acknowledge the generous contributions by the people in the communities studied of their time and thoughts in order that others could learn from their struggles and problems, as well as from their achievements.

We thank the researchers who carried out the field work and provided original insights into sanitation problems from the community member's perspective, a crucial element in planning that we hope will contribute to more viable solutions to these problems in the future.

We are also grateful to DeAnne Julius, John Kalbermatten, and Richard Middleton of the Transportation, Water and Telecommunications Department of the World Bank, and Charles Gunnerson, consultant, for their patience, guidance, and critical commentary that assisted in developing from the research a more relevant and useful document.

TABLE OF CONTENTS

Children at a communal water faucet
WORLD BANK PHOTO by Edwin G. Huffman

SUMMARY

Using the case study method of the social sciences, an investigation was undertaken of the sociocultural dimension of the introduction of appropriate technologies for sanitation improvement in rural and urban fringe areas of Latin America. In order to analyze the choice, adoption, and diffusion of technological innovations for water supply and excreta disposal, the case studies describe selected hardware components of the technologies; primary emphasis, however, is on the software, the social science techniques and methodologies that facilitate technology transfer.

Individual households accept or reject a new technology based on personal criteria for evaluating its costs and benefits (both social and economic). Values of solidarity and progress for the community may be additional criteria used by individuals in evaluating alternatives. Potential users must be able to communicate their technology needs and limitations, and agencies must provide a structure through which to respond to community needs and to communicate alternative solutions. Therefore, this report includes recommendations both for community involvement and for institutional arrangements to encourage that involvement in environmental sanitation projects.

Commitment to building, using, and maintaining new facilities is best assured when communities actively participate in projects. Using a dialogue approach, agencies should encourage communities to play a major role in: (1) defining their existing situation, (2) choosing among technically feasible alternatives, (3) determining methods of implementation, (4) evaluating the form of community contributions, and (5) setting up social controls for continued use and maintenance.

A dialogue approach requires a significant amount of time-consuming consultation with the community; therefore, the optimum use of scarce technical resources will require that water supply and sanitation agencies coordinate their activities with other national entities such as health clinics, which already have trained (or trainable) promoters at the village and town levels. These promoters, or "facilitators," are usually experienced in promotion and extension, and they are the crucial link between the agency and the community.

The facilitator must be at least minimally trained in social science techniques in order to provide planners with information about community attitudes, perceptions, preferences, and doubts. At the same time, she or he must understand and be able to communicate the technical and economic aspects of available alternative technologies to permit communities to make appropriate choices. Such knowledge can be provided through on-the-job training, visits to an on-going project in other localities, and participation in demonstration projects at health centers or schools before active promotion of the technologies in the communities.

Identification of projects will require knowledge of where such personnel are available. Even with targeting, however, individual project selection criteria must be specific, and preliminary technical feasibility studies should be brief in order to adequately screen projects. In this way, the demand for services can be controlled and villager frustration avoided.

When social consultation and organization activities are continuous, many projects can be initiated simultaneously, and technically skilled personnel become engaged only when the community is fully prepared to begin design, construction, and maintenance training activities. Once construction is completed, facilitators and community leaders should continue health education and monitoring activities on a periodic basis.

The dialogue between communities and agencies can begin with exposure of community members to alternative technologies through visits to demonstration projects, slide presentations, discussions with leaders of communities that have successfully introduced appropriate technologies, construction of demonstration models, or the use of mass media devices such as the radio. A conscious effort must be made to establish multiple levels and types of involvement of participating populations. The involvement of only community leaders is not sufficient, since the women of each household will usually maintain or fail to maintain the new technology and, most importantly, incorporate the new behavior patterns into daily life and train their families in improved personal hygiene.

Recognition of local institutions around which participation can be mobilized and organized is essential if communities are to genuinely participate in identifying resources and methods for project implementation. Committees locally selected according to custom (not necessarily by a democratic vote) should be involved in planning and organizing community participation in project monitoring and periodic evaluation with the advisory assistance and encouragement of facilitators and/or agency social scientists.

Finally, it should be noted that commitment precedes action; thus, in order for communities to become involved in solving their sanitation problems, they must first be concerned about the problem and interested in seeking a solution to it. Sanitation problems are more likely to be recognized if they can be made as visible and tangible as their technological solutions. If disposal of human waste is not identified as a priority need--and it rarely is in rural areas--linkage to other felt needs such as clean water, health care, or home improvement should be well defined and clearly explained. For this reason, arrangements should be made at the agency level to coordinate sanitation activities with other aspects of community development.

INTRODUCTION

The present research developed out of concern for achieving effective diffusion and adoption of appropriate technologies for improving environmental sanitation in the rural and urban fringe areas of developing countries. Only 20 percent of these populations have reasonable access to safe water supplies; less than 10 percent have adequate facilities for excreta disposal.

Along with prohibitive costs, other major constraints which prevent the benefits of improved sanitation services from reaching marginal populations are lack of information, ineffective institutions, and the choice of inappropriate technical designs. Often the result is nonuse, misuse, and poor maintenance of existing facilities. To overcome these constraints, the operational recommendation generally made is to increase community participation in project planning as well as implementation in the hope that usage will be assured and community responsibility generated to sustain projects during the operation and maintenance stages.

Involving community members in project planning is difficult. While factors such as land availability, time restrictions, and political affiliation may militate against participation in project execution, lack of access to relevant information often inhibits effective community participation in the initiation and planning of projects. Although water is a basic and felt need, its use has important health implications that may go unrecognized. Where a germ theory explanation of disease is lacking or even rejected, motivation to change traditional water use practices may be nonexistent. Similarly, the taboo nature of human excreta may inhibit discussion of relevant cultural beliefs influencing traditional behavior; thus, agencies concerned with sanitation generally lack knowledge about cultural beliefs important for the selection of culturally acceptable and environmentally appropriate sanitation technologies.

This lack of communication between communities and agencies usually results in the rejection or misuse of technologies that cannot be adapted to existing local behavior and values. It is easier to change technologies than to change behavior, and it is more difficult to determine cultural acceptability than technical feasibility. The software problems of introducing new technologies are not underrated; Dr. David Bradley of the Ross Institute of Tropical Hygiene (London School of Hygiene and Tropical Medicine) has stated:

> No matter how much we have learned about the engineering details of alternative sanitation systems and the related health aspects, unless these findings can be translated to the target population in a way they can understand and accept, this is mostly an academic exercise. 1/

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1. The World Bank Seminar on Appropriate Technology, January 1978.

Thus, there is ample reason to postulate that the diffusion by which new ideas or innovative practices are disseminated from originator to ultimate users should be a controlling factor in the design of an institutional framework for sanitation project promotion and implementation. The purpose of this research is to focus on the social and cultural factors influencing this process and to formulate guidelines on how these factors may be taken into account in project design.

PART 1

RESEARCH DESIGN AND APPROACH

A. Background

Though the spread of any innovation is hard to predict (and thus influence), changing habits and the demand for potable water and excreta disposal facilities are likely to be particularly difficult because of the relative importance of different sets of persuasions, barriers, and social constraints that are only dimly perceived.

Although water is a basic and felt need, it use has health implications that may go unrecognized where a germ theory explanation of disease is lacking or even rejected. This phenomena was observed and reported by health workers in the field over twenty years ago. At that time, a state program of midwife training for Spanish Americans in New Mexico found that:

> ... women could be taught to scrub their hands before attending a delivery, but could not be made to understand that they should not run their fingers through their hair afterward; they learned to sterilize water by boiling it, but saw no reason why they should not then test its temperature by dipping their hands in it. 1/

In most cultures, sanitation practices are far older than the germ theory of disease; thus, norms affecting sanitation tend to have a functional, aesthetic, or ritual basis unrelated to disease control. For example, sullage and garbage or trash are not commonly found in and around the homes of low-income families in the rural Guatemalan highlands. Meat bought in the market is wrapped in papaya leaves, which are not only more available than paper, but also have a tenderizing effect on the meat. After corn is husked, the husks are used for making tamales and when discarded they are fed to mules. Used dishwater is used to water plants or settle dust on dirt patios; human excreta is eaten by unpenned pigs, chickens, and dogs.

A perceived need to adopt sanitation innovations may come about as a result of the introduction of new practices, such as the penning of pigs, that interfere with traditional waste reuse systems. An incentive for technology adoption may also be the result of factors such as a rapid increase in population, which would limit opportunities for privacy. The status value of an excreta disposal facility was clearly more important

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1. Sister M. Lucia van der Eerden (1948), as cited in Cultural Patterns and Technical Change, ed. Margaret Mead (New York: New American Library, 1955), p. 226.

than the functional value of the facility for a rural community in the United States studied by Belcher and Vazquez-Calcerrada in 1972. Even though individuals recently had toilets brought into their homes, many did not use them. The men, especially, continued to use the fields and the old privies that remained near their homes. Belcher explains:

> one man...said that he just did not feel comfortable responding to nature in the home. To him, this was an act that could not be satisfactorily carried on within the confines of a house because it was something that was rated as unclean and he felt compelled to get away from living quarters to carry out such functions. 1/

The identification of sociocultural factors relevant to sanitation is a difficult task not only due to the range of cultural variations, but also because of the taboo nature of the subject of human excreta, which hinders discussion of preferred methods of deposition, the dangers perceived to be associated with fecal contamination, and native beliefs about the relation between health and sanitation practices.

In Uganda in the late 1940s, it was found that people were afraid to use latrines because their fixed locations would provide sorcerers with easy access to the excreta for hostile purposes, and because the feces of another in contact with one's own could bring about contamination. 2/ Defecation at random in the bush was therefore considered the safer alternative. In dealing with the problem in its cultural context, the British medical services persuaded people to bore latrines of such a depth that the excreta would be out of the sorcerer's reach, and to cover the fecal matter after each defecation to prevent contamination. Thus, incorporating knowlege of cultural patterns of resistance and their basis into the program's presentation was found to be effective in introducing change without destroying important cultural beliefs.

The social scientist and technicians in the field are not always confronted with situations where change is rejected; often, an induced change that may have a pernicious long-term impact on a culture's integrity is uncritically or unwittingly accepted. As early as 1952, in Human Problems in Technological Change, E. H. Spicer noted that social science had accumulated enough experience to be of considerable help in facilitating

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1. John C. Belcher and Pablo B. Vazquez-Calcerrada, "Cross-Cultural Aspects of Sanitation Norms." Paper presented in the seminar "Community Development in a Sociological Perspective," at the Third World Congress of Rural Sociology, Baton Rouge, Louisiana, August 23-24, 1972, p. 4.

2. George Gillanders, "Rural Housing," Journal of the Royal Sanitary Institute, vol. 60, No. 6 (1940), pp. 230-40; also cited by Mead Cultural Patterns, p. 227.

the introduction of new technologies while pointing out the dangers--from a moral and an ethical standpoint as well as from consideration of the costs to traditional societies--of applying behavioral science methods to achieve this end. He observed:

> ...although the people of a society may want to be free of disease, they may have to be led to appreciate many subgoals, such as cleanliness in the house, which are not in their original perception related to the main problem. On the other hand, they may also have to be led away from ruthless adoption of western sanitary regulations, which would be far more disruptive to their way of life than any gain they could possibly derive. 1/

The conflict is more critical today with the rapid homogenization of status symbols through the mass media. The flush toilet is one such symbol of status and modernization that has gained additional exposure in developing countries through the tourist industry. Ironically, villagers' first experience with flush toilets may be through cleaning them; their appreciation, however, is no less enthusiastic.

Discussion of modern technology as a double-edged sword--introducing new human values while destroying others, offering freedom from monotonous labor while inflicting technological determinism--has brought increasing acceptance among planners of more appropriate technologies, with the advantages of control by local people, a human scale of operation, employment generation, and lesser dependency on outsiders. 2/ The benefits are valid but exceedingly difficult to communicate to populations and agencies concerned with immediate, short-term benefits.

In recognition that technology's impact is as much a product of the channel through which it is introduced as it is the result of innate qualities of the technology, the working hypothesis for this research is that the critical consciousness required to make the choice and opt for the more appropriate sanitation technology must be nurtured through active participation of populations in the planning, as well as in the implementation of projects, if diffusion of such technologies is to occur on a wide scale.

B. Objectives

The research attempts to: (1) identify social science techniques and methods that can be used to evaluate the community's sanitation perceptions and needs, thereby providing planners with the social understanding

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1. E.H. Spicer, Human Problems in Technological Change (New York: Russell Sage Foundation 1952), p. 11.

2. Denis Goulet, The Uncertain Promise: Value Conflicts in Technology Transfer (New York: IDOC/North America, 1977), p. 174.

necessary to design culturally acceptable technologies, and (2) formulate guidelines for the establishment of management and organizational systems that can adequately respond to community inputs and permit effective community participation in sanitation improvement projects. These two purposes are interrelated and mutually reinforcing in their effect on the success of a sanitation program.

Using a case-study approach, water supply and sanitation programs are analyzed at both the national and the community level in order to understand the reaction (acceptance, indifference, or rejection) of the ultimate users in the community. Differing in each program are the levels and types of popular participation in the selection, planning, construction, and maintenance of the technologies introduced.

Because of widely varying environmental conditions and the influences of diverse cultural beliefs and practices, sanitation related behavior is extremely site-specific. This particular study has been confined to selected communities in Latin America, and, therefore, the conclusions must be interprted with caution by those working in other areas of the world, or indeed, in other communities in Latin America. The methods of analysis and many of the procedural recommendations, however, are likely to have more widespread application. In addition, many of the specific technology-based findings suggest analogous hypotheses for testing with other technologies or in other cultures.

C. Community Selection

Four of the case studies describe water supply and sanitation technologies being used in traditional Mayan communities in Guatemala and Mexico. The other three case studies describe programs in urban slums and more traditional rural communities, El Salvador, Nicaragua, and Colombia.

The rural communities range in size from a dispersed settlement with a population of 200 to a concentrated settlement of nearly 5,000 people. Marginal and fringe areas are described in the urban studies. Although per capita gross national product ranges from US$590 in El Salvador to US$1,160 in Mexico, most of the familities in the study communities are living at or near subsistence levels with average incomes below US$400 per year for a family of six. The rural families cultivate corn, beans, or sorghum on small plots, either owned or rented. Most of the urban families are employed in service occupations. Both groups supplement their incomes by selling crafts or working as day laborers or domestics.

D. Consultant and Counterpart Selection

In order to obtain behavioral, attitudinal, and social organization data in a limited time (one month), social scientists with substantial experience and rapport in communities where various sanitation technologies are being or had been introduced were selected. In this way, input from an anthropological approach could be obtained to supplement the more quantitative findings from a household questionnaire.

Case studies I through IV were completed in one month. Two men and two women were principal investigators; coinvestigators of the opposite sex were combined in three cases. With a team approach, both male and female perceptions could be elicited. Of the seven researchers, four are from the United States and three are from Latin America. Five of the researchers are anthropologists, one is a sociologist, and one is a communicologist.

Case studies V and VI are based on shorter (three days to two weeks) Bank missions with only part of the time allotted to the field work. Case study VII is a trip report based on a short field visit made as part of the exploratory work for this research. All seven case studies are summarized in Part 2 of this report.

E. Methodology of Data Collection

An expanded questionnaire, a revision of the White, Bradley, and White instrument used in Drawers of Water (1972), was translated into Spanish and French. Each researcher pretested it, made linguistic adjustments, added additional topics to fit the local situation, and administered an average of thirty in each community. The basic questionnaire is attached as Annex A.

The questionnaire was designed to provide community input during the design stage of project implementation. Its purpose was to find out what community members think about their present methods of water supply and excreta disposal and how they would respond to an opportunity to change these methods.

The survey first attempted to find out how people perceive their environment. Do they think of it as a healthy place to live? What are their criteria for evaluating a good or healthy environment? Do they see a relationship between environmental sanitation and good health? Do they view environmental sanitation as a problem at all? If they do, why is it a problem and how important is it in relation to other perceived problems?

Secondly, the survey investigated existing practices related to water use and excreta disposal and preferences for improvements. What are the problems associated with obtaining water? What level of service is desirable and what is acceptable? What are perceived constraints in realizing the desired improvements?

The survey also sought to identify incentives for change. Are people aware of alternative sources of water supply and methods of excreta disposal? What are the perceived costs and benefits of the alternatives? Would community members be willing to collaborate with neighbors and/or contribute money, time, and effort to improve their existing water supply and sanitation facilities?

To supplement the survey, the researchers used various anthropological techniques, including direct observation of water-carrying tasks and water reuse practices, indirect observation of personal hygiene

and latrine use habits, interviews with local leaders and individuals involved in sanitation programs, informal conversations with local store owners and craftsmen, and observation of the daily life of the communities.

In addition to community-based data collection, the researchers were asked to include as much information as possible on the national and regional organizations involved in community water supply and waste disposal improvement. Both the successful and unsuccessful components of present and past programs were examined; the findings form the basis for the program recommendations presented in Part 4 of this report.

All of the researchers received permission for the studies from agencies involved at the national, regional, and local levels before beginning the investigations. At the local level care was taken to explain to community leaders the purpose of the field work and interviews in order not to raise false expectations or have the activity misinterpreted as an initiative to solve the water supply and excreta disposal problems of the communities.

PART 2

CASE STUDY SUMMARIES

The studies in the subsequent sections were completed in the following locations by the researchers listed below.

Case	Country	Communities	Researchers
I	Guatemala	San Pedro La Laguna,	Bertha Salinas Roberto Caceres
II	Guatemala	Chijtinimit and Chontalá, El Quiché	Patricia K. Buckles
III	Mexico	Yalcuc, Chiapas	Frank C. Miller Cynthia A. Cone
IV	El Salvador	Las Chacras, San Salvador	Isabel Nieves W. Timothy Farrell
V	Colombia	Villarrica, Cauca Valley	Rafael I. Rodriguez
VI	Nicaragua	La Fuente, Masaya, Las Mangas, Licoroy	Fafael I. Rodriquez Charles Pineo Mary Elmendorf
VII	Mexico	Chan Kom, Yucatan	Michael McGarry Mary Elmendorf

CASE I 1/ - SAN PEDRO LA LAGUNA, SOLOLA, GUATEMALA

Description

A pilot project for the introduction of anaerobic biogas latrines was initiated in the town of San Pedro la Laguna in 1977, with the assistance of the Guatemalan private voluntary organization CEMAT (Centro de Estudios Mesoamericanos sobre Technología Apropiada). San Pedro is a traditional Mayan community in the central western highlands of Guatemala. Sharing a common language, Tzutujil, and a common cultural tradition, the population is principally agrarian but is rapidly undergoing modernization.

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1. Bertha Salinas and Roberto Caceres, both on the staff of CEMAT, supervised the field work in San Pedro during November and December 1977. They worked closely with a Tzutujil-speaking promoter and health aides assisting in the town's health clinic.

Situated at 1,564 m above sea level on the shore of a volcanic lake, Lake Atitlán, the community is located 160 km by road (five hours by automobile) from the capital city. Forty kilometers of the road are nearly impassable during the rainy season from May to September. Average annual rainfall is 150-300 mm, and temperatures range from 4°C to 27°C, depending upon the hours of sunlight and the winds blowing from Lake Atitlan.

The population in 1976 was 4,872, with an annual growth rate of 2.4 percent. The crude birth rate is 33 per 1,000 women of child-bearing age, whereas the infant mortality rate is 116 per 1,000. Among the chief cause of death are gastrointestinal diseases related to contamination of the water supply and poor environmental and personal hygiene.

Population density is high, with 603.6 persons per km^2. The majority of the houses are concentrated in a small area in the town center. They are made of mud and stone and are traditionally built with only two rooms--one for cooking and the other for sleeping. The crowded conditions permit little space for latrines, and the rocky soil further discourages excavation of pit privies.

Commercial crops produced locally are coffee, onions, and avocados; most farms, however, are small and do not allow farmers to earn even a subsistence living. Half of the productive male population is employed seasonally on large plantations near the Pacific Coast where coffee or cotton is picked for a wage between US$0.90 and US$1.10 per day. The annual family income is approximately US$250.

Existing Water and Sanitation Practices and Technologies

The first improved water supply was introduced by the national government in 1952. A second source was tapped in 1970, as a result of local initiative. In the sample of the population interviewed, 35 percent reported having access to a private tap connection; the remainder use of public taps and the lake. Even though laboratory tests have demonstrated high contamination of the water sources with pathogenic organisms, most of the sample population interviewed believe water quality to be good if the water looks clean. Cleanliness of the water is not perceived to be a problem except when bathing and washing clothes in the lake.

Families are currently paying US$0.30 per month for their water and most do not believe this is too much. Proximity and abundance are the most important perceived advantages of the present water sources. The time and effort expended carrying water is considered to be reasonable and the majority of those interviewed reported no problems obtaining water from the piped system or the lake. Over half of those interviewed, however, are willing to spend a small amount of money and contribute labor to obtain a better quality or closer source of water.

An average of four to seven water carrying trips are made each day using jugs with an average capacity of 12 liters to carry from 37 to 72 liters of water for each family. The water is stored in earthenware jars in the home and is drawn for use in bowls. While the socializing associated with the water carrying task is given a positive value, 37.5 percent of those interviewed reported problems related to sharing the public tap, which results in crowding, loss of time, and quarrels with neighbors. Also, the majority of the women (72.5 percent prefer washing clothes alone, even though the current practice is to wash clothes in the company of other women at the lake.

Currently, 11.2 percent of the population has access to latrines; the rest of the population continues to defecate on the ground in the fields or among the coffee plants. The first program promoting latrines was carried out between 1930 and 1944, when the national government made latrine installation compulsory. Little cooperation was obtained, however, and in 1958 a second promotion was attempted with the support of local leaders. The second program had more success because the use of demonstration models were used in the homes of community leaders, and fifty to sixty latrines were built at a cost of US$8-10 to beneficiaries. Results were only achieved, however, as long as both human and material resources were available and promoters were engaged in promoting latrine installation. Involvement of the promoters in literacy and cooperative extension projects led to eventual abandonment of the latrine installation program. Many of the pit latrines constructed at this time were not relocated because of space limitations and the difficulty of excavating the rocky soil. A third attempt to introduce pit latrines in 1974 provided materials but no promotion; it failed completely.

In the sample population interviewed, latrines were cited as a priority need as often as fertilizer and second to money. Most would like individual latrines, but 32.5 percent are willing to use a public or shared facility. Reasons cited for not having already solved the sanitation problems are attributed by one-third of the responddents to lack of skills or initiative on the part of the community itself; another third of the respondents cited lack of cooperation among the people themselves; and some respondents cited a lack of space. The responses reflect observations of the anthropologist Benjamin Paul, who noted at the annual meeting of the Society for Applied Anthropology in Merida, Yucatan, Mexico in April 1980.

> The people of San Pedro are experts in conflicts and divisions of the religious and political type, among clans, etc. The present Development Committee wishes to unite the people in a single committee but there are a thousand divisions even though nothing seems to happen.

The Introduction of an Innovative Sanitation Technology

CMEAT's work in biogas litrines began with an inquiry into the basic needs of the rural and marginal urban populations in areas affected by the February 1976 earthquake in Guatemala. As reconstruction programs were developed, the need for constructing low-cost kitchen and sanitation facilities, in addition to minimum shelters, was recognized. In an analysis of failures in latrine construction programs, CEMAT found that conventional privies are unproductive, conflict with implicit fertilizer reuse practices of defecating in the fields, contaminate the surrounding areas in some sites, and cost considerable time and energy with no visible rewards. After investigation of available materials and needs, it was determined that the objective should be to develop a technology that would save energy while producing agriculturally useful by-products.

Since composting is becoming increasingly common in Guatemala and academic institutions are experimenting with anaerobic and aerobic processes, CEMAT determined that development of a compost-producing privy would be the most useful facility for excreta disposal in the rural areas. A study of different models through discussion with CETA (Centro de Experimentacion en Tecnologia Apropiada) and with the Low-Cost Housing Group of McGill University, Montreal, Canada suggested a prototype eventually used with modifications in San Pedro.

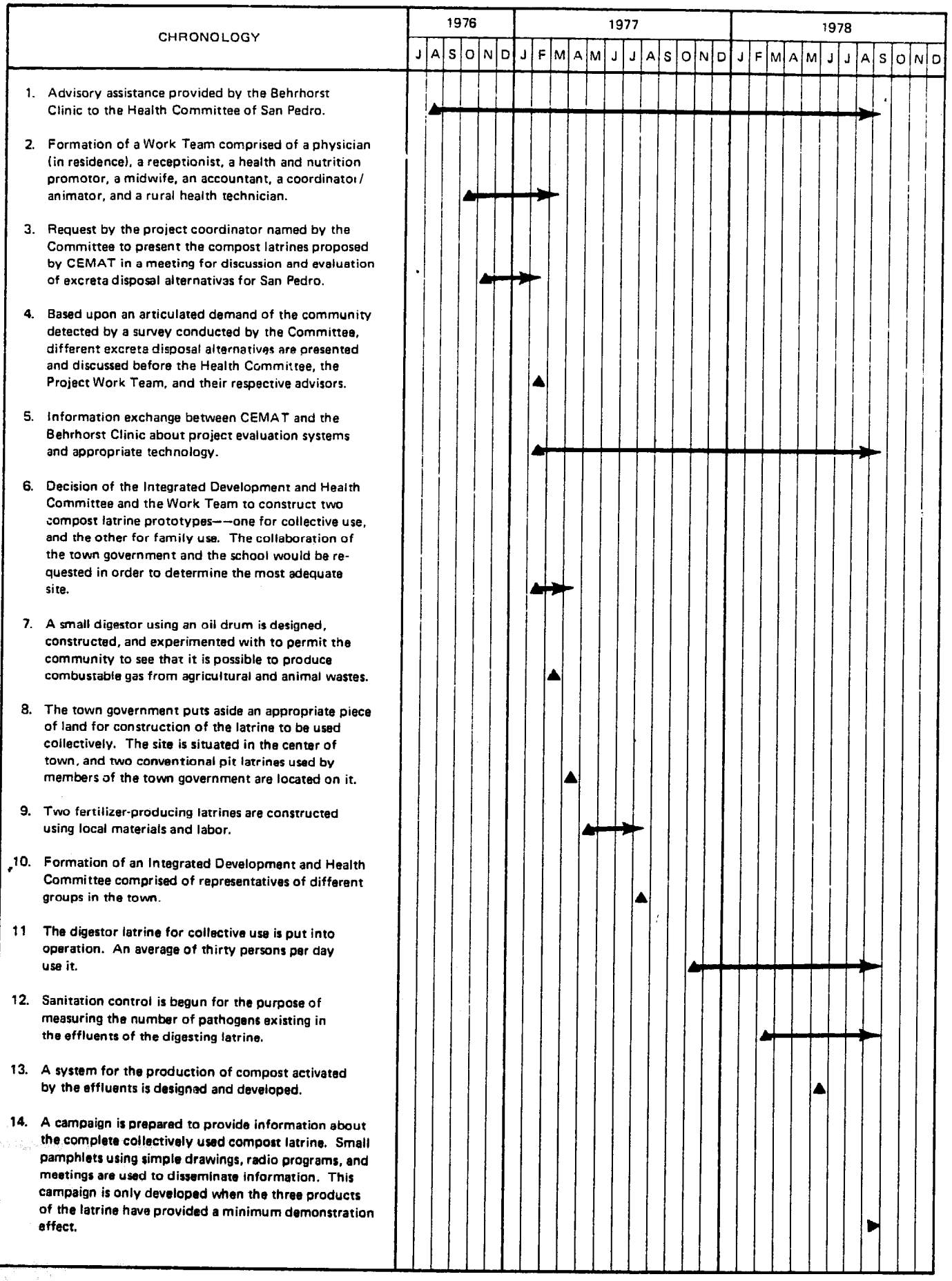
A prototype anaerobic biogas latrine was built in the town part of San Pedro under the auspices of the community leaders (Figure 1 on the following page lists the chronological order of events as the project developed). Materials cost US$600, skilled labor cost US$300, and construction was completed in approximately four months. Two young boys maintain the facility, and thirty persons per day use it at a cost of US$0.03 per person.

A major technical disappointment was the small amount of biogas produced, either because of a crack in the structure or the relatively low ambient temperature of the site. This had some effect on the population and on the Committee, which did not believe it possible that biogas could be produced from agricultural waste and human and animal excreta. For instructive and experimental purposes, a small digester was built of barrels and filled with animal dung and agricultural waste. It produced biogas after a month and played a useful part in convincing the inhabitants of San Pedro of the potential energy source available to them. The construction of this experimental prototype was considered crucial for its demonstration effect.

Conclusions

It is too early to say whether the CEMAT program is effective or not; nor can the diffusion rate be evaluated. It can be noted, however, that the request for technical assistance came from the people of San Pedro.

Figure 1. Introduction of Compost Latines into San Pedro



In responding, CEMAT has made a conscious effort to involve the people, through their leaders, in designing and implementing the program. Demonstrations and learning by doing were the key techniques, since as local masons and carpenters built the prototypes with indigenous materials. Failures such as the leaky tank were seen as part of the learning process. An important consideration when evaluating the technology for its potential rate of diffusion is that people had to see the innovation in operation before they would believe that it was capable of producing fertilizer or biogas.

CASE II 1/ -- CHIJTINIMIT AND CHONTALA, EL QUICHE, GUATEMALA

Description

Chijtinimit and Chontala are rural Mayan communities situated 2,000 m above sea level in the central western highlands of Guatemala. Both communities installed pit latrines and piped gravity-flow water supply systems through a rural potable water and latrine program that served 25,000 inhabitants in twenty-three communities in the Department of El Quiche during the period from 1975 through 1978. Four institutions (USAID, CARE, The Guatemalan Ministry of Health, Agua del Pueblo) collaborated in the program in an innovative attempt to decentralize administration and to coordinate water supply activities with the activities of personnel in local health clinics.

Chijtinimit is located 2 k from Chichicastenango, the township to which it pertains, and 146 k from Guatemala City. It is accessible by an asphalt road with the exception of the final 2 k. Chontala is a more isolated community. It is located 16 k from Chichicastenango and 136 k from Guatemala City. Access is by asphalt road up to the last 4 k.

The population in Chijtinimit was estimated in 1975 to be 555. In Chontala, the population is 1,181. Average density is 100 inhabitants per km^2. Both communities pertain to the Department and Health Area of El Quiche. Growth rate for the area is estimated at 2.9 percent, the birth rate averages 49 per 1,000, and the infant mortality rate is 81 per 1,000 live births. Diarrhea and intestinal parasites directly contribute to 28 percent of the deaths, second only to respiratory diseases as the major cause of death.

Both communities share many of the characteristics of other rural communities in the central western highlands. The terrain is mountainous and rugged. Deep ravines and high ridges create pockets that serve to isolate the many scattered dwellings. Homes are usually two-room adobe-trick structures with one or no windows. loors are hardpacked dirt, and roofs are either thatched or tiled. Since the 1976 earthquake, corrugated aluminum roofing is more prevalent. Communal services include corn mills privately owned and run by gasoline motors; several house-stores selling soft drinks, candies, cigarettes, and candles; and bread backeries. Neither community has a health center, municipal building, market, or electricity. Both communities have primary schools. Chontala's school was constructed as a community project in 1967; it has four grades above kindergarten, and 48 percent of the schools-age population attends. Sixty-two percent of Chijtinimit's school-age population attends classes in Chichicastenango or in the primary school constructed in 1976 after completion of the potable water and latrine project. The local school has two grades above kinder-garten.

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1. The field work for this case study was carried out by Patricia Buckles of Agua del Pueblo, in December 1977; it complements earlier field work (1975-77) accomplished during the author's service on the interdisciplinary team of the Quiche Potable Water and Latrine Program.

Corn, beans, and squach are cultivated, but the plots are tiny, infertile, and fail to produce enough for subsistence. Most households have been forced to seek wage-labor opportunities to supplement their incomes. In Chijtinimit, tradesmen and merchants earning approximately US$740 annually comprised about 20 percent of the sample population interviewed. This group includes weaving "factory" owners, tailors, carpenters, and bakers. The artisans they employ comprised about 58 percent of the sample population surveyed; they earn a yearly income of US$450. Farmers who also work as day-laborers cutting wood, carrying loads, and harvesting coffee on coastal plantations comprised the remaining 22 percent of the sample interviewed. Their average yearly income is estimated at US$325. In Chontala, the majority of the population (59 percent) is comprised of farmers and day-laborers. Artisans comprised about 24 percent of the sample interviewed, and merchants approximately 17 percent.

Introduction of the Technologies

In both Chijtinimit and Chontala, the idea of introducing water and latrines originated with one individual; in Chijtinimit it was the auxiliary mayor, and in Chontala it was the schoolteacher. Both innovators managed to gain the allegiance of a small group active in the community and capable of generating community support. The commitment of the rest of the community members was obtained in a gradual process of individual persuasion by core leaders.

The communities were offered a choice in level of water supply service. Public taps were provided at no cost to the recipients for installation. The taps serve groups of three-five houses and are situated no further than 150 m from any house. The household members within each group of houses served decided on the exact placement of the tap. Those who opted for private patio connections paid an average of US$56 per household for the additional costs of materials and labor to bring the water from the main line. The communities provided locally available materials such as rock, sand, and gravel, and each household contributed at least forty days of labor for construction. Households using public taps pay US$0.25 each month for maintenance, and those with private taps pay US$0.35 each month. The money remains in a community fund supervised by the committee organized to oversee project planning and implementation. The project was accepted by 89 percent of the households in Chijtinimit and 92 percent of the households in Chontala. PVC (polyvinyl chloride) plastic pipe distributes water from a mountain spring to fifty-one public taps in Chontala and to thirty-three public and twenty-seven private taps in Chijtinimit.

Customs and habits of water use have been shaped by conditions of water scarcity and inaccessibility. Before installation of the water systems, the sources of water for both communities were a river and several small water holes, most often located in ravines. The average distance walked to and from the water sources was 712 m (range:46 to 1,236 m) in Chontala and 733 m (range:131 to 1,477 m) in Chijtinimit. Presently, average distance walked for those with patio connections is 12 m (one way), the average distance from house to tap for public connections is 60 m in Chijtinimit and 48 m in Chontala.

Because of their large capacity, traditional clay jugs were used to carry the water. The long distance travelled in early morning darkness, the need to carry large volumes, and the use of heavier clay jugs were all factors that required that men participate in the task. With a reliable water supply located close to the home, the clay jug is no longer used. The introduction of plastic jugs has permitted the adaptation of the water-carrying task into the routine of the women and children.

Women are accustomed to having convenient access to water in the kitchen. Even in homes with patio connections, the practice of filling the large storage container continues. Dishwashing continues for almost everyone in the accustomed fashion of using a small amount of water in a plastic tub on the patio. Bathing customs remain the same: water is carried to the sweatbath, which is generally used twice a week.

For tasks that require carrying water to the house, water use tends to be limited according to storage vessel capacity. For this reason, many households would like to use hoses to fill large 100-gallon drums that could be located by the kitchen door. Many would like to use a hose and drum instead of heavy concrete washing sinks known as pilas. They are cheaper and do not require the effort of hauling a heavy load up steep hills. The use of hoses is discouraged by the committee in Chijtinimit but not in Chontala.

The one water-related task that has changed most profoundly as a result of the introduction of a piped water supply is clothes washing. In all households that paid to have patio connections installed, laundry is done at home rather than at the river. Reasons given for the preference are that laundering at the river requires leaving the home and the children are more difficult to care for. Those without private connections launder at the taps in Chijtinimit. In Chontala most use a hose to run the water from the public tap to an area bordering the patio (usually on the edge of the cornfield for drainage reasons) and a traditional scrub rock or board. Others use the hose with a wooden wash table at which they stand.

The majority of households did not have a means of excreta disposal before the introduction of their projects. They used the cornfields. At the time of the project in Chijtinimit (May 1976), 110 latrines had been installed. All but four families participating in the project installed latrines. For the entire village, the figure represents 76 percent of the households. Eighty to eighty-five latrines are being used. In Chontala, ninety-five percent of the community installed latrines, 10 percent of which do not regularly use them. For those who are not using their latrines, the committee in Chijtinimit continues to visit the homes and attempt to persuade them to use them. In Chontala, the committee is considering collecting a fine from those who refuse to use the latrines.

The sharing of facilities only occurs among related family members. A group of households related by marriage has collaborated in the purchase of a pila to connect with their public water tap. Where several related households live in a compound of houses situated close to each other, the kitchen is usually shared; the same families may choose to share latrines. Such

collaboration among unrelated households was not encountered in the research; most heads of household state that they are uninterested in sharing a pila because they believe that "perhaps the women would argue and there would be problems with the neighbors."

Conclusions

The achievements of the projects include the introduction of improved water supply and waste disposal facilities, the training of local personnel in use and maintenance of the facilities, and the development of community organizational infrastructures that have enabled the communities to initiate and implement subsequent community improvement projects. The program's accomplishments may be largely attributed to its appropriate administration structure which includes the following:

1. The use of a rural-based program office with decision-making authority, which allows immediate response to a community's articulated felt need for a water supply.

2. The linkage of excreta disposal services, which were not a felt need, with water supply improvement, which was a felt need.

3. The use an interdisciplinary program team to facilitate community participation and organization.

4. The integration of water supply and waste disposal service activities with local health center activities, which provides for continued motivation and promotion of the projects after inauguration.

5. The use of a methodology that permits substantial community participation and optimum resource allocation through simultaneous implementation of projects.

6. The organization of committees to facilitate project implementation and administration of the maintenance fund in the community.

The water systems successfully elicited community participation without the people understanding the relationship between health and disease vectors; the latrines were installed and used with the same lack of understanding. Only a few individuals were aware of the cleaniness of the water because they had seen the health educator test the water with a field testing kit. For most, the water supply was valued for providing a close, reliable source.

Behavioral changes in excreta disposal practices came about as the result of gaining the commitment of important community members who were willing to persistently address the issue on a daily basis within the community in a practical and persuasive manner. The commitment of community leaders was essentially derived from inclusion of the latrine program within the overall implementation of the water supply project.

The most important accomplishment of the education program was convincing the leaders that the two projects were interdependent. Committee members were willing to accept their leadership role in the latrine installation aspect of the program to the degree that they felt responsible for the success of the water supply aspect. When visiting neighbors to persuade them to install latrines, explanations were practical ones such as the suggestion that a latrine was needed "to avoid tracking excrement into the kitchen from the fields."

The projects were carried out in a period of approximately one year from initial contact to inauguration. The demonstration effect is significant: neighboring communities have petitioned to enter the program after hearing about or visiting communities where projects were completed.

CASE III 1/ -- YALCUC, CHIAPAS, MEXICO

Description

Latrines were first introduced into Yalcuc as a compound project twenty years ago. Yalcuc is a Tzotzil-speaking agrarian ejido 2/ inhabited by 235 Highland Mayans. It is situated on a gravel road 45 minutes east of San Cristobal de Las Casas, the administrative and commercial center of the region, which is located along the Pan American Highway about 1.287 km from Mexico City.

The community is comprised of forty-three households scattered along a ridge about 2,000 m above sea level. Average household size is 6.6. Homes are built of wood planks with roofs of split shingles held on by wooden pegs. All of the families earn their livelihood from cultivation of corn and beans on the 1,136 ha of ejido land supplemented by 72 ha in the lowlands, which was communally purchased seventeen years ago with money generated from the sale of village timber. Average yearly income is estimated at US$300 per family.

Water is scarce during the dry season from November to May. The single open well serving the village is inadequate during the driest months, and water must be brought from sources several kilometers away. Heavy 18-liter capacity earthenware jugs are used by the women to carry an average of 56 liters per family, or 8.5 liters each person per day. The mean in Yalcuc do not carry water except during droughts; with only two exceptions, those interviewed considered the distance and effort expended in carrying water to be normal. The two respondents who stated they would be willing to spend money to have water closer to the house are among the five wealthiest and most sophisticated haeds of household in the village. The wife and daughter of one of these men estimated they spent four and one-half hours a day carring water.

Twenty years ago Frank C. Miller settled in Yalcuc for the purpose of analyzing village response to modern medical and health practices. When latrines were introduced in 1957, Miller observed that instead of completely rejecting them, as did most neighboring villages, 88 percent of the Yalcuc households installed latrines and 65 percent used them. The acceptance rate was the highest in Chiapas and perhaps in all of rural Mexico at the time.

Miller returned with Cynthia A. Cone in 1977 to do a follow-up study on latrine maintenance and to analyze diffusion of the technology

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1. In present Mexican law, the ejido is a group of families with joint, and thus inalienable, tenure rights to land. The law was part of the agrarian reform following the Revolution.

2. Frank C. Miller and Cynthia A. Cone collected the information for this study in December 1977 in Yalcuc. The research complemented an earlier study completed by Miller in 1957.

to new households and nearby communities. The researchers found that 75 percent of the households with latrines in 1957 are still using them even though they have had to relocate them over new pits three or four times. Some households planted fruit trees in the old sites; others merely filled in the holes. The remaining 25 percent of households who were using the latrines in 1957 are not using them now because they have moved to new house sites or away from the community.

A health promoter still supplies concrete slabs and seats for US$0.45 to any family wishing to install a latrine, but he does not actively promote them. Of the eighteen new households established since 1957, 44 percent have taken the initiative to install latrines and they are using them now. The researchers were unable to detect any pattern to be able to predict which newly established households would install latrines. Young adults who grew up in families using latrines did not choose to install latrines more often than young adults from families without latrines.

Introduction of the Technology

Latrines were accepted by the people of Yalcuc as part of a larger package of modern health practices. They were introduced by the INI (Instituto Nacional Indigenista), founded in 1952. The Institute was a pioneer in designing the regional approach to integrated development. Respect for cultural differences was a priority, and no projects were initiated without the permission--usually the request--of the people.

In 1937 a village leader in Yalcuc became a believer in modern medicine when he was successfully cured of a severe case of dysentery after visiting a health clinic. Thus, in 1954, when INI opened its clinic in a neighboring community, this community leader requested from INI a similar clinic for Yalcuc. The INI sanitary engineer suggested the idea of latrines as something the community might want to go along with the clinic. The village leader accepted the linkage and convinced other leaders to do the same. Miller notes that the decision to install latrines was made within the context of a community project; all the aura of the leadership and the pressures of social control were brought to bear on the villagers. Gradually, all the men in the community signed an agreement in a village meeting signifying their commitment to the collective decision to install the latrines. INI trained local people as promoters, and community participation in the project was high.

Miller believes that the decision to install latrines was as much a matter of community dynamics as of individual decisionmaking. Although installation was approved and financed in part by individual family heads, he observes, the choice was made in a public meeting. The proposal had been approved by the comisariado and presented to the men of the community with his recommendation. Those who wanted latrines were required to seal their commitment by signing their names. Miller and Cone suggest:

> ...if the diffusion of technology is to be considered a matter of individual decisionmakers minimizing their costs and maximizing their benefits, then a broad conception of costs and benefits is required. The costs (in money and time) of installing a latrine were perceived by many as minor compared to the costs (in social pressure, loss of good will, and deterioration of solidarity) of not installing one. Similarly, many perceived the primary benefits to be not cleanliness and sanitation, but community values such as unit and progress. 1/

Conclusions

Yalcuc's experience with the installation of latrines is an example of rapid diffusion and adoption of an innovation in a harmonious manner beneficial to the majority. The decision-making process is a classic example of consensus where the leadership tests opinion informally before ideas that are likely to be accepted are presented in the town meetings. Proposals are discussed thoroughly, and opposing opinions are heard respectfully. Discussion continues until the opposition is convinced or acquiesces. Never is a vote taken, and as a result, polarization of opinion is minimized. Miller observes: "The concern with solidarity is supported by a system of social pressure to comply with collective decisions and generally follows the norms of the community." 1/ This appears to be true even when the norms change, as with the adoption of latrines and modern medicines.

The diffusion rate through use of the traditional decision-making process eas rapid (six months); the adoption rate was high (88 percent); and continuous use (75 percent) over a twenty-year period was significant. There is no demonstration effect observable, however, in neighboring villages. Miller and Cone note that the lack of influence is understandable, considering that the people of Yalcuc accepted latrines as part of a larger package of modern health practices. In a rural area with a dispersed settlement pattern, where most houses have an adjacent cornfield, the necessity of latrines is not compelling.

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1. Frank C. Miller and Cynthia Cone. "A Behavioral Case Study: Yalcuc, Mexico, Twenty Years Later." In Eight Case Studies of Rural and Urban Fringe Areas in Latin America, Appropriate Technology in Water Supply and Waste Disposal Series, Vol. IX. (Washington, D.C.: World Bank, 1980), p. 105.

CASE IV 1/ -- LAS CHACRAS, SAN SALVADOR, EL SALVADOR

Description

Las Chacras is one of 110 squatter settlements or marginal communities varying in size from 200 to 6,000 inhabitants in the city of San Salvador, which is growing so rapidly that it is engulfing the semirural communities around it. With an average national density of 187 persons per km^2, and an annual growth rate of 3.1 percent, El Salvador's growing population presents serious problems for the capital city. Problems from crowding are further exacerbated by the lack of adequate water supply and waste disposal facilities.

San Salvador's marginal communities, including Las Chacras, are concentrated along the highways to the city and along gullies bordering three small rivers into which the city's sewage is emptied. During the rainy season, from May to October, the contaminated waters flood the houses and paths nearest the rivers.

Las Chacras, a community of approximately 750 residents, has lost about one-third of its population since mid-1976. Officially, these people were relocated to a low-cost housing project, but community residents think they were forcibly removed and not provided with alternative housing. The space they vacated will be used for the construction of a shopping mall.

Marginal and service occupations account for 84 percent of head of household employment; also, women and children frequently contribute to family incomes. The mean number of children under fifteen years in the sample interviewed was 3.45 per household. The mean number of household members over fifteen years was 3.84.

The Technologies

In a survey of thirty-five of the marginal communities in San Salvador in 1976, the distribution of facilities for excreta disposal by household was as follows:

1/ Isabel Nieves returned to El Salvador to do the Las Chacras study in January of 1978 and, with the collaboration of Timothy Farrell, prepared the case study. This work complements her earlier study in which Las Chacras was one of thirty-five urban slums investigated during a 1976 assessment of the nutritional status of marginal urban communities.

Facility	Number of households	Percent
Private latrine	120	45.6
Communal latrine	37	14.0
Private toilet with connection	18	6.7
Communal toilet with connection	34	12.9
No facilities	54	20.8
Totals	263	100.0

In the sample interviewed in Las Chacras, the majority (51.6 percent) have no means of excreta disposal; they use nearby fields and open areas vacated by neighbors. One-quarter of the population has recently installed latrines. Some are using full latrines for lack of space to build another. Two households share latrines with adjoining households. Usually such sharing occurs only after the precedent has already been set for cooperation through the sharing of household tasks such as child care and food preparation. A few individuals interviewed have flush toilets that empty directly into the river.

Latrines may be obtained through credit from a government agency at a cost of US$4; the program, however, has not been actively promoted or accompanied by educational or instructional materials. Many households do not have space for latrines, and they are left with few alternatives to the open air.

Greywater is disposed of through shallow, makeshift canals constructed by individual households to the end of their property. As a result of complaints of stagnant water and slippery paths, some canals have been built communally to channel water into the river. Despite their widespread use, 67.7 percent of the sample population were observed to have puddles of water near their homes.

In 1976 public water taps were available in only twenty-two marginal communities. Las Chacras is unusual in that it has free water for everyone from two public standpipes that were installed as a political favor by the previous municipal government. The change in administration has meant that many communities must now pay for their water, an issue of considerable concern for the residents of Las Chacras, who fear they will imminently be affected by the policy change.

Households generally store water in big metal drums, cans, and plastic containers, which are rarely kept covered. Quality of water is not an issue; people believe that unless visibly dirty, the water is clean. Some believe the water is healthy because it has no bad smell or taste. The major complaint about the present water supply is the constant problems with neighbors arising from the need to share the public taps. Those closest to the taps are monopolizing them with hoses, causing others to wait impatiently in long lines. For this reason, all would like water piped directly to the house or more taps at shorter distances.

Conclusions

Of the thirty-one households interviewed, 74.2 percent believes their environment is not conducive to good health. Those who believe the environment is healthy are all over the age of forty-five. The majority of heads of household interviewed (83.9 percent) had participated in community-based efforts to improve the quality of their environment, and 74.2 percent were willing to worker with others on such projects in the future. Those who were not willing to do so had been disenchanted with previous experiences in community collaboration. Almost all would be willing to work voluntarily but were unable to stipulate how much money they would be able to contribute towards any project, since even the smallest cash outlay represents quite a sacrifice to them. Nieves and Farrell conclude that it is important for planners to stipulate how much money is needed before projects that require community contributions in cash are begun.

There is a clear indication of a high level of diffusion of technological information; 93.5 percent of those interviewed believe there is a better way to dispose of excreta than the methods presently used. A majority of the respondents feel that flush toilets or latrines with septic tanks would be best. Of this group, the majority favored private rather than public installations.

The researchers conclude that the decision to work towards the introduction of pit latrines and water taps carries more risks and disadvantages than benefits for the people of Las Chacras. The major constraints appear to be fear of eviction from the land, the unavailability of accurate ifnormation, fear that in improved water system would cost money, and a widening credibility gap with the government agencies involved in water supply and excreta disposal activities.

CASE V 1/ -- VILLARRICA, CAUCA, COLOMBIA

Description

The uniqueness of the CIMDER (Center for Multidisplinary Investigations in Rural Development) approach to rural development and the technologies developed during its research were reasons for selecting the program for study. Villarrica is located in the pilot area for the CIMDER program; results will be replicated in an experimental area covering four townships with a combined population of 37,000 inhabitants. The experimental area covers 110,000 ha and is located in the sourthern part of Colombia in the Department of Cauca, some 50 km south of the city of Cali and 1,000 m above sea level. A paved highway connects the area with Cali, and good roads form a network of internal communication among the several townships.

Agriculture is the major source of income for the region. In recent years, coffee, plaintain, and especially sugarcane have replaced cocoa in the local economy. These crops are cultivated on large plantations occupying 70 percent of the available land. In the remaining 30 percent of land, small farmers grow a combination of crops: soy (33 percent), corn (33 percent), beans (15 percent), sugarcane (13 percent), and others (6 percent). Average income is US$25 per month, most of which is spent on food. For economic reasons, small farmers often either sell or rent their farms to large plantation owners. The aggressive expansion of the commercial agricultural sector threatens to contribute to the destruction of the rural economy in the region.

CIMDER is the result of coordination among five Colombia agencies and institutions involved in expanding the participation of the small farmer in rural development through a strategy that calls for the use of the rural health services system as an entry point for the introduction of new forms of community organization. The program has four major components: (a) personal health services; (b) basic sanitation services; (c) health education; and (d) increasing income through employment generation programs and profit-sharing schemes involving food production and small industry enterprises.

CIMDER's staff includes fourteen professionals: one medical doctor, one odontologist, two agricultural engineers, two sanitary engineers, one agricultural economist, one systems analyst, one psychologist, one sociologist, one statistician, and three nurses. One of the staff members related an example of the difficulties even an interdissiplinary team has in grasping local needs and priorities. The anthropologist took numerous photographs in the villages during her field trips as a part of her documentation. During her discussions she used these photographs with the families and community leaders. She asked four of the village people to sort the photographs into

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1. The summary is comprised of excerpts from the case study prepared by Rafael Rodriquez, World Bank staff, from program documentation provided by CIMDER and a week-long visit to the experimental site in Colombia.

categories of needs or problems and then to list them in order of priority. The midwife, the mayor, and other leaders in the community sorted the pictures a bit differently, but their priorities were very similar. When the same task was assigned to the professionals, they generally sorted the photo graphs into categories according to their particular disciplines for the misunderstandings of the priority needs of the village, however, were quite different from those of the village people. The comparison of the two interpretations proved to be a valuable tool for self-analysis on the part of the staff.

In organizing the communities, CIMDER has introduced an Associative Organization System (Sistema de Organizacion Asociativa--SOA), which incorporates ideas borrowed from cooperatives and communal enterprises. It consists of a number of community well-being associations (Associaciones de Bienestar Comunitario--ABCs), each one devoted to a productive activity according to the expertise and interests of its members. The activity may be agricultural, as in the case of community farms; service oriented, as with the family health unions, or devoted to the production of manufactured goods (basic furniture, bricks, and the like).

To date, CIMDER has been very successful in developing an infrastructure in the agricultural sector. A number of community farms have been formed where production per lot has more than tripled. Chicken raising farms--also owned by the community--have increased the income of owners. Marketing cooperatives have made it possible to acquire seeds and hardware in large quantities and at lower prices, as well as to sell the surplus of the farms to better markets. A portion of the profits (30 percent) is always set aside to finance the health and environmental requirements or any other need of the families that belong to the ABC.

Under the Rural Health Project, basic health units are designed according to the area that a rural health promoter can cover (usually a radius of 2 km). Families residing in the area are grouped into Family Health Unions (FHUs). Each FHU has about twenty to thirty members (one representative of each family), whose functions are to promote and organize activities that will generate funds to be invested in improving the overall health of the FHU.

The rural health promoter (RHP) is provided with basic and inexpensive instruments that have given him a great deal of prestige and credibility in the community. The instruments include a three-color nutritional band. It has served to assess the prevalence of malnutrition in children under six years of age, to provide mothers with an objective guide to control the nutritional level of their children, and to induce the formation of FHUs by informing the community of the findings obtained with the band.

Other simple but practical and useful tools are a microlaboratory, which allows the promoter to make simple tests and basic analyses of urine and blood with reactive bands, and a micro-health center, which is installed in the residence of the RHP and consists of a 1 m^3 wooden box containing the basic instruments and drugs that rural health centers in Colombia have to provide health care. In addition, there is a set of seven cards intended to compile basic information on each family health unit and to produce a clinical history of each member of the FHUs.

Introduction of the Technology

Prior to CIMDER's work in the area, 8 percent of the families (624) disposed of their excreta in flush toilets, 39.1 percent (2,737) had latrines, and the remaining 52 percent (3,640) of the families did not have any service. The latrines had been built by the homeowners on their own initiative, disregarding important safety factors such as the location with respect to the water supply. Thus, instead of the latrines being a health improvement, they constituted a focus of disease producing diarrhea and other related problems. CIMDER introduced several improvements in the design of the dry latrine, developed a water-seal latrine, and is experimenting with an incinerator latrine.

Dry Latrine

In those areas where water is scarce, a dry latrine is constructed. It consists of: (a) a pit lined with bricks with open joints to allow for infiltration of the liquids; (b) a pitcurb-brocal which provides more capacity to the latrine, thus reducing the depth of the pit; (c) a concrete slab reinforced with wire mesh; (d) a concrete seat and a wood lid to cover it, both painted before delivery to make them more attractive to the users; (e) housing constructed of brick, wood, or bamboo, depending on availability and user preference; and (f) a tile roof high enough to permit air circulation. The latrines have a useful life of five years for an average family of 5.3 members.

Water-Seal Latrine

CIMDER developed an improved version of the water-seal latrine in use in the Philippines. A vitrified porcelain basin, similar to a conventional flush toilet, is currently being installed in those areas where water is available to the householders within a reasonable distance. The latrine flushes with three liters of water that runs off to an absorption pit located either directly underneath the basin or at some distance from it. About 1,000 of these have been installed. Three hundred were installed to replace old dry latrines, and 700 have gone to families who did not have any service before.

Water Supply

Most households in the Villarrica area are either served by the city's water supply system or they have their own well. Water from the water supply system, however, is considered unfit for drinking and clothes washing purposes because of the high mineral content, which lends an unpleasant taste and stains the clothes. There are in the region a number of "prestige wells" from which the residents obtain drinking water. CIMDER has fostered the improvement of these wells in those communities where 70 percent of the households have excreta disposal facilities. The improvements are manual pumps or a low-cost water chlorinator made with a perforated plastic jar.

In the sociocultural survey, which was administered to a sample selected from seven communities in the experimental area, all of the respondents believed that the environment they lived in was a healthy one. The most common reason to support this answer was the absence of disease and their closeness to the main highway, which permitted easy access to medical facilities in the city "in case anything went wrong." Only three respondents doubted the healthiness of the water they drank, based on the knowledge that it was contaminated by the nearby latrines. The remaining twenty-one families were satisfied with the water, mainly because it was chlorinated, or it was boiled before they drank it.

Conclusions

The integrated approach to rural development, the technological developments achieved, the experience gathered by CIMLER's team during the past four years of research, and the exposure to new forms of organization and technology that Villarricans have had have created a successful example of technology diffusion. The costs in skiled manpower, however, have been high.

The most important contribution of the Villarrica experience has been the integration of sociological and educational techniques into the development process to reach the desired goals. This has been done without disturbing or drastically changing inherent cultural values, but, rather, through reinforcing them. The introduction of new ideas such as the cooperative schemes has been achieved by directing them towards the accomplishment of the overall well-being of the community. The diffusion of the new technologies and their acceptance is related to the involvement of the communities in the planning as well as implementation of the projects.

The use of local people as promoters and the use of simple tools such as the nutritionband, the microlaboratory, and the micro-health center have all provided important stimulation to solve community health problems. The sanitation problem has been placed within the context of broader environmental sanitation issues, such as the provision of a safe water supply, and community members have been given a significant role in developing and maintaining the technologies chosen for installation; therefore, participation is enthusiastic and continuous.

CASE VI 1/ -- LA FUENTE, MASAYA, LAS MANGAS, AND LICOROY, NICARAGUA

Description

Nicaragua, with an area of 139,000 km^2, is the largest country in Central America and the Antilles, but only eighth in population. The average population density is 17.6 inhabitants km^2, the lowest in Central America. The heart of Nicaragua is the Pacific Region, where 57 percent of the population lives in seven of the sixteen provinces; the area has a population density of approximately 100 people km^2. Population is increasing at more than 3 percent annually, and growth for the period from 1975 to 1985 is projected at 3.3 percent annually.

Nearly 70 percent of Nicaragua's economically active population is engaged in agriculture. Sixty-five percent of all farms are less than 7 ha each, and combined they account for only 3.4 percent of the total cultivated land. To supplement their inadequate income, 40 percent of the rural work force hire out their labor (often assisted by their wives and children) to work the cotton, coffee, and sugarcane harvests. Approximately 68 percent of the unemployed of the nation are in the farming regions. It is estimated that 77 percent of the farm families live on less than US$0.28 per day per person.

The crude fertility rate for Nicaragua is 48.9 per 1,000. The percentage of deaths among children one to four years of age from enteritis and other diarrheal diseases is the highest in Latin America (37 percent). In 1975 only five countries in Latin America had lower percentages (14 percent of rural population with reasonable access to water. The percentage of rural population served by latrines is somewhat better (24 percent).

Existing Technologies

Aside from conventional waterborne sewerage systems serving small sectors of the population in the six largest cities, only two other waste disposal schemes are used in urban Nicaragua: (a) the conventional pit latrines, of which a wide variety of models exists, depending on the materials used for the housing and the seats, and (b) the flush toilet connected to a pit (the sumidero), which is an intermediate step in the disposal o excreta until a waterborne sewerage system is installed.

Besides the city's water supply system, two other alternatives to obtain water are available: (a) buying the water, usually at a high premium, from a private vendor or from the public outlet, and (b) having individual wells. The vendor is usually a neighbor within a distance of not more than 200 who have been able to connect to the system. People buy their water daily and store it in unprotected 60-gallon barrels. Wooden push carts, wheelbarrels, and bicycles are used to transport the water.

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1. Information for this study was collected by Dr. Mary Elmendorf, anthropologist, Charles Pineo, sanitary engineer, and Rafael Rodriguez, Energy, Water and Telecommunications Department of The World Bank, in September 1977.

Water Supply and Sanitation Improvement Programs

In December of 1977, The World Bank announced the extension of two new loans to improve Nicaragua's water supply and sanitation situation. The first, a US$10.1 million loan to Empresa Aguadora de Managua (EAM), will finance the Third Managua Water Supply Program. The second loan, US$3 million, will extend the PLANSAR Rural Sanitation Program beyond regions currently aided by USAID (U.S. Agency for International Development) assistance.

Empresa Aguadora de Managua (EAM)

The Ministry of Public Works has de jure authority over EAM. The agency supplied 95.8 percent of Managua's population of 469,140 inhabitants with potable water in 1976. It is currently coordinating its efforts with the Departamento Nacional de Agua Potable y Alcantarillado (DENACAL) in a USAID supported project to provide twenty-eight low-income communities (32,000 inhabitants) with water and sanitation facilities. The program plans to provide 5,300 families with at least a flush toilet (laundry and shower facilities are optional) at a cost varying from US$400 to US$543, depending on the combination of facilities desired.

Among communities already served by the program, the cost of water for residents, who were paying up to C$2.0 for each 189 liters at the public outlets, has been substantially reduced. When connected to the city water supply, the tariff became C$10 per 18,925 liters for those living in the low zones and C$32 for those in the high zones.

National Plan for Environmental Sanitation in Rural Areas (PLANSAR)

In rural areas, the US$3 million loan represents the first World Bank involvement in Nicaragua in a project designed to provide basic sanitation and health-related services exclusively to the lowest-income rural population living in small villages (median population is seventy-five inhabitants). The population to be reached is among the poorest in Nicaragua, with annual per capita incomes below US$150.

The program seeks to improve basic sanitation services to the rural areas by providing an integrated program of water supply, latrines, sanitary house improvements, health education, and immunization of children against measles, polio, and other diseases. Program objectives are:

1. Design and carry out a system for self help with community participation.

2. Provide minimum environmental services through the installation of sanitary latrines and the imporvement of the homes in the same communities.

3. Carry out a massive vaccination campaign (DPT, polio, measles, small pox, DT, and BOG) to protect a population of 13,600 under five years of age.

4. Provide water supply services for domestic use through simple systems and wells, either hand dug or drilled, for a population of 110,000 living in 340 communities in a period of no more than four years.

5. Extend preventive medical services and health education to the same population.

6. Prepare the people needed to carry out the projects and to ensure the maintenance and operation of the installation in the future.

Even before the PLANSAR program was started, training of the health educators and selection and training of the local health workers (rural health collaborators--CRS) had been started. The program, called PRACS (Programa Rural de Accion Comunitaria en Salud) trains health educators during a course consisting of eight months in the classroom interspersed with four months of field practice.

The health educators, employees of the MPH, supervise and guide the activities of the CRSs, who have been selected by the communities and the local health or water committees. The CRSs receive no salary but are authorized to retain a small percentage of the amount of money collected for medicines provided and injections administered. They are the local contact and extension of the Ministry of Public Health services. They are responsible for organizing and stimulating the local committee and community toward public health oriented projects such as the sanitary latrine program and the introduction of a community well.

For environmental sanitation projects, the efforts of the CRS are supplemented by the health educators and the engineers and technicians from PLANSAR. The CRS helps the community to understand the need for a protected water source and then shows the community how to obtain a well with PLANSAR assistance. The well is located by PLANSAR engineers, and a mason is furnished to supervise the villagers in digging and constructing a protective covering for the well. The village furnishes sand, gravel, and labor.

Pit privies valued at US$90 are installed with community participation. The concrete slab and riser is manufactured in a privy plant in Managua and transported to the villages, where the homeowners install them over pits they have excavated. The protective shelter is erected by the homeowners also, using wood for the frame and zinc sheets for the sides and roof, both provided by PLANSAR.

The Survey

La Fuente (a barrio of Managua), Las Mangas, and Licoroy were the urban and rural communities selected for carrying out the survey, with the following results:

A. La Fuente (urban)

1. Eighty percent had water piped into their houses and 20 percent obtained it from neighbors five to 100 m away.

2. Cleanliness, fresh air, and running water were among the reasons cited by 57 percent of the respondents for believing they lived in a healthy environment; 33 percent referred to pollution as a major health hazard in the barrio, and 10 percent did not express any view.

3. Ninety-three percent of the households approved of the water, mainly because it was supplied by EAM. The price paid for the water was considered "high" by 47 percent and "normal" by 47 percent. The remaining 6 percent said it was low. The large majority (83 percent), however, was not willing to pay more for a better quality of water. Water charges represent between 1.5 and 2.6 percent of the total household monthly income.

4. Forty-three percent had sewerage service with flush toilets. The remaining 47 percent disposed of the used waters on the streets, in the backyards, or in a ditch. Those not connected to the city sewers expressed their urgent need for such service.

5. Although the residents had not worked in community projects, 83 percent were willing to work in association with others to improve their well being.

B. Masaya (urban)

1. Only one of the thirty households surveyed did not have running water. One-third of the houses had more than one faucet.

2. Sixty percent of the respondents believed they lived in a healthy environment. Among the reasons cited for this were: no record of sickness, fresh air, and good climate. The remaining 40 percent believed the environment was unhealthy because of the close proximity of solid waste dumping sites and the presence of greywater in the streets.

3. Fifty-three percent were satisfied with the water because it had not made them sick. Twenty-six percent believed the water to be of bad quality but did not state why. The remaining 21 percent did not answer. 93 percent expressed willingness to pay more to obtain better quality water. (Water charges averaged approximately 2.5 percent of the monthly household income.)

4. Only 17 percent of the households were connected to the city sewers 1/; 57 percent disposed of used water on the ground, 17 percent threw it on the streets, and the remainder used drainage channels. Of the six houses connected to the city sewers (of the thirty interviewed), only two had flush toilets. The sumidero and the pit latrine were more common means of excreta disposal. (Twelve and fourteen households respectively). 2/ Twenty-seven (90 percent) of the households expressed a preference for flush toilets and regarded them as more hygienic.

5. Eighty-seven percent were willing to work with others to improve their sanitary living conditions.

C. Las Mangas (rural)

1. Besides quite a few private wells serving some of the small farms, most of the population obtains water from the community deep well, which is equipped with a Batelle pump.

2. Eighty-four percent of the respondents felt their homes were situated in a healthy area, primarily because of a low incidence of disease and good air.

3. Taste, color, and odor were the main reasons cited in 93% of the interviews for approving the quality of the drinking water. Three respondents pointed out that water could cause illness. Twenty-five respondents estimated "normal" the time and energy to obtain water, while eleven said it was "little," and five felt it was "too much."

4. Ninety percent (forty households) disposed of their used water on the ground, three households threw the water on the street, and one household stated they used wastewater for watering plants.

5. Latrines were available to twenty-six of the households (60 percent) and the remaining 40 percent used the fields. Seventy-four percent observed that latrines were a more sanitary means of disposing of excreta; 15 percent said flush toilets would be preferable.

6. The majority of the respondents (70 percent) had worked and were willing to work cooperatively with others as volunteers, 20 percent would work for exchange, and 5 percent would work for pay to improve their environmental sanitation conditions.

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1. It was found that the systems had capacity for about 70 percent of the households, but high connection fees had prevented people from connecting to it.

2. Not every sumidero was connected to the city sewerage system.

D. Licoroy (rural)

1. A community well with a Batelle pump is the only source of water in Licoroy, except for one private well and a stream. Seventy percent of the households use the pump; the remaining households use the nearby stream.

2. Lack of disease is the main reason that 71 percent of the respondents had for believing that their environment was healthy; the remaining 29 percent (four households) stated the environment was unhealthy due to the unavailability of drinking water and latrines.

3. Of those using water from the well, satisfaction was expressed; but the families that had to use the stream said that the water had a stench to it because it contained dead animals.

4. The ground is the most common place for wastewater disposal; one family stated that they threw it into the streets. Only 30 percent of the families had latrines; the remainder used the fields. Most believed that latrines are a more sanitary means for solving the excreta disposal problem.

5. Willingness to work on community projects on a volunteer basis was expressed by everyone interviewed, especially if it was to improve their living conditions. No one asked to be paid.

Conclusions

The Nicaraguan experience provides an important example of the different approaches needed to address water supply and sanitation needs in rural and urban communities. The urban project provides more elaborate facilities (flush toilet, laundry and bathing facilities), which are likely to satisfy consumers expected to pay a portion of the cost. The rural program relies on community participation in construction activities and depends upon a local health promoter to coordinate activities. Coordination with other agencies provides important training inputs and ensures the promoters are adequately informed on both extension and health education aspects of the program.

Field data in the rural areas revealed the importance of the health educators and local health promoters to explain the new technologies so that local participation is not merely drafted later without understanding or changed behavior.

In addition, the national government's coordination of international institutions in planning and funding activities have permitted the integration of complementary components likely to have a significant impact on long-range health goals. The USAID has provided technical assistance in designing the initial pilot project, and World Bank funding will enable the government to continue with an expanded version of the program.

CASE VII 1/ -- CHAN KOM, YUCATAN, MEXICO

Description

Chan Kom, an agrarian community of approximately 550 Mayans in Eastern Yucatan, is known as the "Village That Chose Progress" in Robert Redfield's classic studies of modernization in The Folk Culture of Yucatan. 2/ It is situated 9 km from the main highway, two hours from the capital city of Merida, and four hours from the tourist center of Can Cun.

All of the eighty-one households, except for the bus driver's, are members of the ejido, whose basic livelihood is subsistence agriculture using planting sticks and other slash and burn techniques for cultivation of corn and beans. Average family income in 1971 was estimated at US$385. The incomes have risen in recent years as villagers have found employment as masons, maids, or cooks in the tourist areas, and as they have become involved in new profit generating enterprises such as bee-keeping or cattle raising.

The new sources of livelihood are among the new developments that followed the opening of the feeder road to the highway in November of 1971. Other changes have been the introduction of potable water, electricity, a cooperative store, and a health clinic.

Traditional Mayan customs, practices, and beliefs persist in Chan Kom along with an openness to new ideas and a willingness to change. All of the families continue to cook on three stones in the traditional thatched hut; 46 percent of the families, however, have constructed at least one masonry room, which is considered a symbol of modernization.

Existing Technologies

In a survey in 1976, except for the road, the potable water supply is considered by the village as the most important single change, more significant than the introduction of electricity or irrigation. In 1971 water had to be drawn from deep wells or the cenote (water deposits in broken limestone). Now, with a drilled well and tank, sixteen families have piped water to standpipes on their property from which they run hoses to fill traditional earthern jars kept in the kitchen and used for storing drinking and cooking water. A few families have installed laundry troughs near the outside faucet, but no one has running water in the house. Sixty-four percent of the families continue to use well water either because it is closer than the four public standpipes, or because they can't afford the monthly maintenance charge of 10 pesos (US$0.45) collected for use of the piped water system.

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1. Information for this report was collected by Mary Elmendorf and Michael McGarry on a brief trip to the community in February 1978. The data is complemented with findings from earlier research by Mary Elmendorf and Deborah Merrill, 1977.

2. Redfield, Robert. "The Village that Chose Progress." In The Folk Cultures of Yucatan. (Chicago: University of Chicago Press; 1941).

According to size of the family, and ages of family members, water needs vary. Most families use approximately forty pails of water a day for household, garden, and stockwater needs. The estimated 30 to 40 liters each capita per day is higher than in many areas because of the custom of daily baths and change of clothing. Women and children--mostly the girls--carry the water.

In 1976 the piped water system's operation was temporarily suspended for three weeks because the bearings of the pump had burned out. This was the first breakdown since the system was inaugurated in 1972. Both women and men commented repeatedly on the inconvenience. By the third week, people were noting an increase in illnesses, particularly diarrhea, and blaming it on the lack of safe drinking water. The women also complained of aches, pains, and extra fatique from hauling and carrying water.

Chan Kom, like many other communities in the Yucatan Peninsula, had no sanitary facilities until flush toilets were installed in the village boarding school for high school students. For everyone, the bush was the appropriate technology for excreta disposal.

In January of 1978, Dr. Mary Elmendorf, an anthropologist who had done field work in the community, revisted the village. She conversed with the mayor and others about her current research in appropriate technologies for water supply and waste disposal. Once the subject of alternatives to the customary use of the bush for excreta disposal was raised, interest increased rapidly.

Eight years ago, observes Elmendorf, this was a completely taboo subject even among women. But now there is a new awareness in the village of modern technologies, and villagers have knowledge of the 5-gallon flush toilet, which they have observed in the bus stations, the boarding school, and the tourist hotel. The idea that other cultures--the Chinese, the Japanese, among others--had designed other systems intrigued the Mayans. Excreta disposal became a problem to solve and was linked immediately in conversation and planning discussions with a pending home improvement project.

Pamphlets with simple drawings were distributed by Elmendorf, but no one could read them or understand the designs. During a return visit the following month, Elmendorf was accompanied by Mike McGarry, an engineer working with appropriate sanitation technologies at the IDRC (International Development Researcher Center, Ottawa, Canada). They found that work had started on the pits and the superstructures for latrines, but the appropriate technology was still unclear, and McGarry was flooded with questions. The people did not have the confidence to initiate construction using only the drawings and without the presence of an "expert" such as an engineer.

Dr. Gilberto Balan, a medical doctor and director of the National Indian Institute's Coordinating Center in Valladolid, was extremely interested in the various types of latrines and asked for more concrete information in order that visible, working models suitable for village alternatives to the

flush version used in the tourist areas and bus stations could be constructed. He offered to assign a master mason to work out the molds to help with construction. After an evening of discussion and planning, an appropriate design and paper and plasticine models of a toilet and adjoining washroom were left in the village, and the director of the Institute supplied dynamite to begin blasting pits in the rocky limestone earth.

A random sample of the wives in thirty families by two young women working in Chan Kom indicated strong interest in starting construction of a latrine/bath house in sixteen of the households visited. Most of these women want a bathroom, not just a toilet; all wanted a seat, not a squat plate. All wanted a flush toilet or something like it. Most mentioned a washbasin, and two expressed interest in having showers. Three of the women specified red floors for their bathroom and one wanted aqua. Another specifically favored yellow (the color of an egg yolk) as the color of the floor she would like. The one man who joined his wife at the interview felt that the toilet should be separate from the bathing area. It was clear that the vision of a "white toilet bowl," as seen by these masons, maids cooks and dishwashers in Can Cun, Merida, and Cozumel could not be satisfied by a wooden seat or a squat plate in "The Village that Chose Progress."

Conclusions

Chan Kom is an example of a village in the Yucatan where people are willing to discuss alternatives. The alternative presented was not found to be an adequate solution. The brief visit of the engineer did not allow time for feedback or discussion with the community, nor was there audio-visual material available to share. In the meantime, the village people are investing time, energy, money, and dynamite to blast holes in the rocky ground with the hope that technical advice and orientation will eventually be available on alternatives to pit latrines or modified flush toilets. Diffusion of the idea of improving sanitation has been rapid; a scarcity of skilled technical personnel, however, prevents the idea from becoming a reality.

PART 3

RESEARCH RESULTS

A. General Findings

The findings presented below are generalized from seven case studies summarized in the preceding section. They are grouped into household findings and community findings. Numerals in parentheses represent the most important case studies from which the finding was drawn.

The household-level findings represent results of a questionnaire and observations made during interviews with a random sample of thirty households in each community studied. The community-level findings are generalizations from results obtained through the use of informal methods of information collection such as direct and indirect observation, interviews with community leaders and persons involved in past and present sanitation programs, and documentation of those program efforts.

While each case study provides many useful and original insights into a wide range of issues pertinent to the environmental sanitation problem, the generalizations presented below represent the more pervasive findings and provide planners with some indication of the type and quality of information that can be collected prior to a project's initiation.

(1) Household Level

(a) Perceptions

1. For the majority, the environment is perceived to be healthy for reasons unrelated to sanitation. Most cite the absence of disease or sickness (II, IV, V, VI). Many believe their environment is healthy because it provides fresh air, good air, good climate, or accessibility ("close to the highway in case anything goes wrong"). In crowded, concentrated settlements, a healthy environment is viewed as one that allows for privacy and is characterized by good relations with one's neighbors (I, IV).

   It is significant that all of the reasons cited above are indicators verifiable by observation within the respondent's immediate surroundings. A healthy environment is not associated with abstract theories on disease vectors or with contamination through contact with nonvisible pathogens in water or waste.

2. On the other hand, those who do not perceive their environment as healthy most frequently cite reasons related to poor sanitation (IV, VI). Individuals in this category are a small minority in rural communities and a significant majority only in some urban fringe communities. Again, observation of visible contaminating sources such as dead animals in the water source were often included in explanations of why a water source was "bad."

3. Most believe water quality is good if the water looks clean (I, II, IV, VI). Color, taste, and smell are important criteria (IV, VI). Where improved supplies have been introduced, the water may be considered of good quality because it is piped or "covered" (II), or introduced by a government health institution (VI). A small minority believe the water is good because they boil it (I, V), it does not cause sickness (IV, VI), everyone drinks the same (I), it has been treated (IV, V), or they saw it tested with a field laboratory (II).

4. An understanding of the relationship between water and health may occur when consumers are suddenly deprived of their utilities after an extended period of use. When their piped water system broke down and they were forced to use an unprotected well once again, the women of Chan Kom observed an increase in diarrhea incidence among themselves and their children (VII).

(b) Preferences and Practices

5. Abundance and proximity are the two primary qualities appreciated in a water supply (I, II, IV). Color and taste are also important (VI).

6. Two of the most objectionable factors associated with an improved water supply are cost, if the water is paid for (VI), and the crowding, quarrels, and problems with neighbors that result from many households sharing the same public tap (I, IV). Consequently, in many cases the opportunity for socializing while drawing water is not considered a benefit and may even have a negative value (IV).

7. Similarly, the opportunities for socializing associated with washing clothes in public places are not always highly valued. In San Pedro, 72 percent of the women prefer to wash clothes alone (I). With the introduction of public taps shared by three to four households in El Quiche, women have chosen to wash clothes at the tap or in the home rather than at the river (II). In Chan Kom women have always washed clothes at home. The idea of public laundering was shocking to them (VII).

8. In communities where public taps have been introduced, most households desire greater accessibility through the placement of more taps at shorter distances (IV, VI, VII) or the provision of private connections (II, IV, V). Where public taps are close and a private connection involves additional cost, many prefer as a cheaper alternative the use of a hose to fill large drums placed next to the house (II, IV).

9. An aesthetically attractive excreta disposal facility with a shiny porcelain seat or a brightly painted cement floor and/or stool is preferred over cheaper, less attractive alternatives (V, VII).

10. Although people use a squatting position when defecating in the fields, they prefer a latrine with a seat (I, II, VII).

11. Where lack of space or rocky soil are constraints on household latrine installation, there is an expressed and sometimes observed willingness to use a public facility or share with neighbors (I, IV). People usually share latrines only with close friends, relatives, or good neighbors (IV).

12. Once latrines are filled, many households continue to use the superstructure by transferring it to a new site (III). Most people, however, perceive a need for technical assistance when initially installing latrines (I), and without continuous or at least periodic promotion -- even in communities where initial acceptance is high -- new families do not usually take the initiative to install a latrine (III, IV).

(c) <u>Incentives</u>

13. Reasons for which people can be successfully motivated to install excreta disposal facilities include the following:

    a. There is a desire to acquire the benefits of another service such as a health clinic (III) or an improved water supply (II, IV, VII).

    b. Population pressures result in crowding and a need for privacy (I, IV, VII).

    c. There is interest in acquiring "modern" conveniences in the village (VII) or what are regarded as status symbols (either by definition of village leaders, II, III; or by diffusion of U.S. models through the tourist industry, VII).

    d. There exists social pressure to comply with a collective village decision arrived at through consensus of opinion among leaders and household heads (III).

14. In almost all of the communities studied, the people offer some suggestions for improving the existing water supplies and/or sanitation facilities. While lack of economic resources is often indicated as a reason for not having implemented ideas for improvement (I, II, III, VI), lack of leadership and lack of technical knowledge are cited almost as frequently in some communities and more often in others (I, II). When asked why they though their suggestions had not been implemented in San Pedro, respondents cited the lack of cooperation among neighbors as a chief reason (I). The same reason is cited, although less often, in Nicaragua (VI).

15. People are more willing to give time working to improve their sanitation facilities than to pay more than a very small amount of cash for improvements (I, II, III, IV, V, VI).

16. Urban or concentrated settlements tend to specify with whom they would be willing to work, e.g., with experienced people (I), with friends and neighbors (V), or with groups such as health center personnel (VI). Rural populations express willingness to work with anyone or everyone in the community (II, III, VI) without specification.

17. Those unwilling to collaborate with others to improve water supplies are a small minority and cite reasons of previous bad experiences (IV), poverty (I, III, VI, VII), or that the present supply is good or close enough (I, III, VI).

(2) Community Level

1. The need for different or improved excreta disposal facilities is rarely given priority among community felt needs, except when the community has become crowded, houses are concentrated, and the lack of privacy becomes a problem (I, VII).

2. As a result of linkage with a need perceived to be of higher priority such as health services (III), water supply improvements (II, V, VI), or income generating projects introduced through integrated community development programs (V), the installation of latrines or other means of excreta disposal can receive substantial community support and acceptance.

3. Community values of unity and progress may be considered more important benefits than cleanliness and sanitation in communally approved projects for installing excreta disposal facilities. The costs (in money and time) of installing a latrine may be perceived as minor compared to the costs (in social pressure, loss of good will, and deterioration of solidarity) of not installing one (III).

4. In marginal squatter communities, a major constraint to investing to improve sanitation conditions may be the fear of eviction (IV).

5. Where some water supply services--however limited--are available at no cost, there may exist the fear that with improvements a fee would be collected (IV).

6. Although women play important roles in water procurement and waste disposal, as well as training children in personal hygiene and sanitation practices, they are often not involved in the planning and promotional stages of water supply and waste disposal projects (I, II). This is caused by both the traditional exclusion of women from decision-making roles at the community level and the principal use of male promoters in health education and promotion activities (II).

7. The extent of community involvement in environmental sanitation projects is directly related to opportunities for frequent contact and information exchange with technically informed individuals (I, II, V, VII).

8. When the facilitators or promoters presenting projects are socially and culturally similar to the population with whom they are working, communication is likely to be more effective (II, III).

9. A general philosophy that nothing should be wasted was evident in most of the communities studied, particularly the rural ones (I, II, VII). Water from laundry is stored for later use to settle dust and clean floors (VI). Water to wash dishes, soak corn, or clean vegetables is saved; with food scraps, it is fed to chickens, pigs, and other small domestic animals (VI, VII).

10. Reuse of human excreta is an understood technology and is practiced traditionally in a less advanced and systematic form than in Asia. Reuse is informal--often not verbalized because of the taboo nature of the subject--and it takes place primarily in the individual households. Defecation in cornfields (II) or among coffee plants (I) is considered to have a fertilizing function. Similarly, fruit trees are purposely planted over old, filled latrine pits (III). In some areas, human excreta deposited near the house is consumed by pigs, an aid to maintaining sanitation (VII). This last practice is sometimes formalized when penned pigs are released periodically to clean areas designated for depositing human waste. Native pigs are sometimes even preferred over bigger new stock because they carry out this important function and can be fed corn and scraps instead of commercial concentrates (VII).

11. Behavior patterns incorporating excreta reuse as a principle can provide the basis for uneducated people to understand composting and biogas where the new technologies are adequately explained (I, VII).

12. When there exists a credibility gap between external agencies and communities caused by experience with abortive attempts to introduce innovations or compulsory programs, people are less willing to collaborate until materials or technical assistance are actually seen or made available (I, II, IV).

13. When communities are legally authorized to maintain the water supply maintenance fund in the community (II), or when economic resources for sanitation are made available through income-generating projects (V), local people take the initiative in defining as well as solving their own problems, and popular participation is more pervasive (II, V).

B. Effective Social Science Techniques

The selection of appropriate research methods is influenced by field conditions, time constraints, and the availability of manpower and trained research assistance. All of the case studies both structured and unstructured methods and combined the three approaches of asking questions, observing, and listening.

Use of a structured questionnaire in an interview situation was useful in obtaining information on environmental characteristics such as the location and distance of water sources and the presence of excreta disposal facilities. The key methodological finding, however, is the importance of supplementing the household questionnaire with additional social science techniques which would yield the qualitative data needed to place the quantitative findings in proper perspective.

For example, in El Quiche (II) information on how much water was carried to the home did not provide accurate consumer demand data for designing similar systems, since it did not take into account water used in washing clothes, which with the installation of public taps is now often done at the public tap rather than at the river. Similarly, discovering that separate households shared latrines in El Salvador (IV) could have mislead planners to assume that public facilities would be acceptable in the community at large; they would not have understood that latrine sharing in these households is based on precedents of sharing certain household chores such as food preparation and child care among households that have developed strong friendship ties.

The researchers in San Pedro (I) observe that respondents were reluctant to answer various questions in the questionnaire. Hypothesized reasons include: lack of knowledge on the part of the respondent; reluctance to become involved because a response would be interpreted as a commitment

even though the question was hypothetical; the nature of the questions that refer to delicate matters of family life; and possibly because the community has recently been the subject of similar studies by several institutions and North Americans who have come to research their dissertations, hence, people have been saturated with traditional prestructured surveys.

The main problems were posed by questions that: (1) attempted to identify how people learned of the existence of water sources that have long been used by the community, such as the lake; and (2) questions that attempted to ascertain attitudes toward future or imaginary situations.

The conditional phrasing of the questions was also a shortcoming identified by the researchers in El Salvador (IV). Specifically, there were problems with the question on the amount of money people would be willing to spend to improve the quality of the water. People's responses were invariably expressions of their lack of money after subsistence needs were met. A frequent answer was, "we give what we can," and the implication was that giving any amount was a great sacrifice. On the other hand, another common answer was to say that even if they gave the most they could, it would always be too little. When the interviewer attempted to press the respondent into giving an answer in terms of "a little" or "a lot," the answer always came qualified by such phrases as "as much as circumstances would permit," or, "whatever is in our possibilities." The researchers conclude that in planning programs for community improvement where capital, labor, or time allocations by the community are necessary, questions seeking reliable responses on potential household contributions should be specific about how much of what is being asked.

Interview questions attempting to estimate potential support for sanitation improvement projects were reluctanty answered, or not answered at all, by women in El Quiche (II), since the subject matter falls traditionally within the man's domain of decisionmaking. Thus, the information was difficult to obtain unless the man of the house was present. The researcher's dilemma, however, was that if the man was present, women usually deferred all questions to him, even those about which he was only vaguely aware such as how frequently clothes were washed, children were bathed, or water was drawn. Both men and women need to be interviewed--preferably separately by people of their same sex.

In determining practices and behavior, the questionnaire was inadequate. Additional information had to be obtained through direct and indirect observation. Knowledge of water use habits within the home was gained through direct observation of dishwashing, clothes washing, and food preparation activities. Latrine use was verified through indirect observation. Researchers noted if paths to latrines were well beaten or overgrown with vegetation, if recently used hygiene material was present, or if an odor was absent.

It was found that potential users of technologies make decisions based on what seems logical to them, including their perceptions of benefits and costs, which may be quite different from the perceptions of outsiders. The social science techniques most useful in determining existing attitudes, practices, and preferences were those that involved local people in some way.

The use of photograph sorting with community members and with agency members in Colombia (V) dramatically contrasted differences between the two groups in the ordering of community priority needs. The oral history method was found to be useful in understanding decisionmaking in the initiation and implementation of past and current water supply and sanitation programs in Guatemala (I, II). The method involves the interviewing of selected participants and leaders responsible for initiating and implementing the programs in order to understand their perspective on the course of events.

Local people, leaders, and students were active participants in identifying community problems through structured and unstructured interviewing, observing, and listening in Chan Kom (VII). The researcher accompanied sixth-grade students under the supervision of their teacher in a household survey of the village, which resulted in a map indicating homes with and without water and sanitation services. The map continues to be used as a basis for planning by the mayor, the teacher, and outside agencies as well. Through the use of such a technique, the "researched" became "researchers." When this kind of problem-solving approach accompanies the introduction of a technology, a dialogue is established between the potential users of the technology and the agency facilitators or social scientists involved in project promotion. Community participation becomes an active concept in which instead of being "targets" of a delivery system, people take part in the change process.

Communities vary in their organizational capabilities; some take longer than others to elicit collaboration and participation. The community must make decisions on a variety of levels, and language and cultural differences may inhibit the articulation of desires. Furthermore, factors such as work migration patterns can seriously delay the generation of feedback necessary for project development.

For the reasons cited above, program resources in terms of personnel and equipment can be most efficiently employed with the simultaneous implementation of a number of projects. With the employment of a modified line of balance technique, various projects can be monitored simultaneously as they pass through the stages of selection, preparation, design, construction, and maintenance at their own rates. In this way, community participation is not by-passed because of program time and personnel constraints, and program resources are optimally utilized.

PART 4

DISCUSSION AND CONCLUSIONS

A. The Sociocultural Dimension in Planning Environmental Sanitation Improvements

That social and cultural factors influence the acceptance and use of water supply and sanitation facilities is a truism for planners. The need for a health education component in projects to ensure and promote use and thus maximize health benefits has long been recognized. Human behavior, however, is no longer viewed only as something to be modified to suit the technology. Instead, human behavior is now considered an important problem variable that must be taken into account during technology design in order to ensure user participation in system operation and maintenance. Consequently, planners who formerly concentrated only on the technical aspects of system design to esnure efficient provision of services are increasingly concerned with understanding user expectations and preferences. The hope is that with designs that are socially as well as environmentally appropriate, there will be more rapid acceptance and diffusion of sanitation technologies among populations in need of them.

The case studies summarized in this report suggest that socially appropriate technical designs may encourage users to choose a technology. Socially appropriate methodologies for introducing the technologies are needed, however, to ensure widespread user adoption, and socially appropriate organization and management system within responsible agencies are needed for rapid diffusion of the technologies.

For example, the simple composting latrine in San Pedro (I) required considerable explanation and demonstration of its operation before users understood the process involved in its proper use and maintenance. In contrast, the popular and complex flush toilet does not need to be understood mechanicallY in order to be used; its utility is appreciated without lengthy demonstration, and it does not require the user to adopt a routine of additional maiintenance activities, as is required with a compost latrine.

The introduction of a piped gravity-flow water system in El Quiche (II) also required a substantial amount of community involvement for its installation. This technology was chosen over the excavation of a well and the installation of a diesel pump, which would have required less of an input into community organization activities.

Other technologies could have been more rapidly installed and would have been as acceptable to users as the compost latrine and the piped gravity-flow water system. The trade-offs that justified the substantial investment of time to gain community support and participation for these technologies were the ready availability of manpower resources compared to the lack of machinery, and the capability of users to repair and maintain

the technologies given the limitations imposed by a rural environment (i.e., a lack of spare parts, a lack of mechanical knowledge, and limited cash incomes). In an urban situation characterized by different environmental constraints, restricted community participation possibilities, and greater accessibility to responsible agencies for maintenance assistance, different technologies would have been selected.

Social considerations, then, must enter into an analysis of options not only in the design of the technology, but also in the creation of an appropriate administrative structure for managing the introduction of the technology and during the design of the methodological approach for involving users in the project. Figure 2 indicates where human and behavioral factors should be taken into account in these three important decision areas of project design.

Which technical, administrative, and social components are developed in project design will depend both on the goals and the priorities of responsible agencies offering assistance and the available resources of time, money, and personnel for accomplishing the goals. Once goals have been established and a target area has been selected, a range of technologies can be developed by considering cultural and environmental feasibility constraints. The extent of community participation required will vary with the nature of the target area (urban or rural), the type of technology that can be feasibly introduced, and the existence of adequate administrative mechanisms and an efficient implementation methodology. Trade-offs in inputs can be cost valued for each technology in the range selected to obtain optimal combinations for a variety of situations.

B. Social Science Inputs In Project Design

Some of the limitations of the use of the survey to provide planners with an understanding of the human and behavioral factors that influence whether potential users will accept, properly use, and maintain the services provided became obvious as a result of the research. One problem is the high cost time and trained personnel needed to analyze a survey administered in every community to be served. The objective of incorporating social science techniques should not be to provide a few with custom-made latrines, but to provide many with an acceptable one that they are able to understand and maintain.

Another problem with surveys is the difficulty of obtaining reliable data on which to base decisions unless questions are specific. When asked if they would be willing to contribute towards projects, people must know how much of what they are being asked to contribute and for what.

An additional problem with surveys is the reluctance of people to respond when given a choice situation expressed in a hypothetical manner. Residents of poor communities are reluctant to express preference for alternatives not only because they may not understand the choices, but also because they fear an expression of preference will be interpreted as a commitment with the risk of a future financial debt.

Figure 2. The Sociocultural Dimension of Sanitation Project Design: Contributions of Social Science

Design of Technology: Research of Selected Area	Means for the Diffusion of Technology: Evaluation of Existing Institutions and Programs	Motivation for the Adoption of Technology: Consultations and Community Organization
The innovation:	Channels and systems exist for:	The communities have input to:
• is technically feasible	• responsive administration	• project initiation
• is cost efficient	• promotion of activities and health education	• design (choice of level of service, location and the like)
• can be understood by users	• efficient delivery of service	• scheduling labor-intensive activities
• fulfills users' needs and expectations	• instruction on operation	• instruction on operation
• is affordable	• training in maintenance	• training in maintenance
• can be maintained by users	• effective delegation of authority	• fee collection (frequency of and mechanism for)
	• periodic monitoring	• authority to enforce sanctions (for tardy fee payments, noncompliance in maintenance, and the like)

Source: Montgomery, John. Technology and Civic Life: Making and Implementing Development Decisions. Boston: Massachusetts Institute of Technology, 1974.

Finally, a preproject survey risks unintentionally misleading respondents into believing that an effort is being made to solve their particular sanitation problems. Raising false expectations has contributed greatly to the credibility gap that presently exists between marginal communities and outsiders. Past experience with unfulfilled promises have created an unwillingness of people to become involved in self-help projects until they actually see materials or a similar demonstration of commitment on the part of agencies offering assistance.

The limitations of surveys in predicting user preferences and willingness to pay has important implications for planning. The case studies suggest that surveys are most productive when used in a discriminating fashion and when complemented with other research techniques at particular points in project design.

(1) Technology Design

Insights into user reactions must be found in the study of communities where technologies have already been introduced and accepted (or rejected). The communities studied should be as culturally and environmentally similar as possible to the area or region targeted in national plans for environmental sanitation improvement. Through a preliminary analysis of agency records, it can be found how much the consumers promised to contribute and how much they are actually contributing to maintenance. The research will indicate the willingness of future beneficiaries to support maintenance through monetary contributions.

Observations of how facilities are being used or misused will suggest how designs may be modified to meet the needs of users. Whether users will share facilities, or how close facilities must be situated to be used in preference to traditional ones can be ascertained through such observations.

Interviews with involved personnel at the community level and at the agency level can be used to pinpoint problems encountered during project implementation (delays in materials delivery, insufficient supervision of construction, and the like). The information will provide some indication of methodologies for service delivery that can be adapted or that should be avoided.

On the basis of findings from this preliminary research, technical and administrative packages can be developed for field testing in communities environmentally and culturally similar to the target area. In this way, when the range of alternative technologies is made available to consumers in the target area, promoters can be as specific as possible about expected community contributions and responsibilities.

(2) Means for Diffusion

The case studies suggest that there is a need for coordination among government agencies such that sanitation promotion, health education, and promoter training activities can be effectively integrated into water supply and sanitation project implementation from the earliest stages of planning. Also, because of the low priority given to sanitation needs in rural villages, planning at the national level should link human waste disposal with other services given higher priority by the communities (for example, water supply and health clinic construction and staffing).

In the rural areas, community involvement in planning water supply and sanitation projects usually requires the creation of an agency branch office conveniently accessible to consumers and with decisionmaking power in project selection and development in line with policies and priorities established at the central office level.

For community liaison purposes, the agency responsible for water supply and sanitation should rely on facilitators or promoters assigned to health clinics. If this type of personnel does not exist, teachers or agricultural extentionists should be requested to assist in technical tasks (measuring spring flows, mapping, census taking, and the like), community organization, and health education activities. The facilitators should be natives of the rural areas; they should have experience working in the rural areas, and they should share the cultural perspective of the people with whom they are working. An effort should be made to recruit women as well as men so that information on improved hygiene practices related to water supply and sanitation can be more effectively communicated to rural women. The facilitators should receive intensive training in the technical aspects of the technology and its promotion and they should be provided with adequate transportation and visual aid materials support if they are responsible for promoting the technology in a number of communities.

When an appropriate structure does not already exist at the community level, project participants should be expected to organize a locally selected committee or cooperative to organize and oversee the community's contributions to the project. The case studies suggest that committees are capable of assuming a wide range of responsibilities when provided proper activity and guidance. In the introduction of gravity-flow piped water supplies and pit latrines in El Quiche (II), committees competently assumed the following responsibilities:

a. They called and conducted meetings to inform community members about project status and to elicit the cooperation and support of every head of household.

b. They organized the voluntary labor force and maintained records of individual time and labor contributions. They also arranged for other community members to take part in activities such as census taking, health education, and evaluation.

c. They petitioned the country and state civil authorities to collect a maintenance fee and to obtain all necessary legal authorizations for the project (rights of way, land purchase, and the like).

d. They selected the community members to be trained in facilities' maintenance and supervision.

e. They collected the maintenance fee, kept accounting ledgers, and filed periodic reports to the responsible authority at the town and state government levels concerning the results of these activities.

Largely due to their recognition as a legitimate authority by other community members, the committees have been effective in collecting the maintenance fee. Several families, however, are delinquent on their payments, and the committees have no authority to enforce sanctions. Some procedure must be established by local governments to provide the committees with a standard procedure for handling the situation and enforcing sanctions agreed upon by the Community.

When the promotion of a project at the community level is the responsibility of an individual or institution involved in other activities, initial participation may be high. Continued promotion, however, is not usually a priority because energies must be dedicated to competing activities that have the incentive of producng an income (selling medicines, giving injections, and so forth). For this reason, agencies and supervisors should be committed enough to project goals to place priority on the promotion of the facilities, their maintenance, and their improvement in the community. Promotion should continue on a periodic (promoter campaign) or continuous (radio) basis long after projects are initially completed.

(3) Motivation for Adoption

The findings from the case studies of Latin American communities indicate that the development of a methodology for technology introduction should take into account the following behavioral factors:

(a) Project Initiation. Since urban or concentrated rural settlements consider sanitation a problem more often than rural dispersed settlements, initial efforts to introduce sanitation technologies will not require the investment of personnel and resources to create a demand for services. The existence of conflicting factions and the fear of eviction (in squatter communities), however, may mean that monetary or labor contributions would be more difficult to obtain in these communities.

In the rural areas, sanitation can be effectively linked with a request for an improved water supply, which is more often the felt need. If the projects are implemented simultaneously, they are more likely to be

viewed as related, and the need for maintaining both is encouraged. Linking sanitation to water supply improvements has been demonstrated to have the following advantages: (1) water and sanitation are complementary in maintaining communal and personal hygiene; (2) an improved water supply project offers demonstrable, immediate results for communal efforts, and thus, time, labor, and money are more enthusiastically contributed to the project; and (3) the community organizational system devised for water supply project implementation, operation, and maintenance can be adapted for sanitation facility installation and inspection when the leadership accepts responsibility for both improvements as a single project.

When the technology is understood by the population, there is no need to build demonstration models to promote it. If it is not understood, the use of slides or other visual media and visits to prototypes may be a more rapid means of gaining the support of community leaders than the building of demonstration models in each community. When adequate visual examples are not available, however, demonstration models will usually be necessary. With any project, once the agency and the community have come to an agreement to undertake the work, expected contributions and responsibilities should be formally committed before project initiation. Annex B describes a hypothetical model for involving rural communities in environmental sanitation improvement effort.

(b) Project Implementation. For most efficient planning, communities should have some input into scheduling installation or construction activities according to seasonal migration patterns, planting and harvesting seasons, and climatic cycles. Decisions about location of water distribution outlets, colors (if latrines are painted), when maintenance fees should be collected (monthly, bimonthly, etc.), and options for levels of service should be allocated to consumers whenever possible so that community initiative in decisions affecting the care and maintenance of the facilities is encouraged. Community leaders and project participants should also be encouraged to establish criteria by which individuals not participating in the project may later be included in the project.

(c) Project Operation and Maintenance. To ensure adequate maintenance of facilities, local residents should be trained in simple procedures and the reporting of major malfunctions to responsible authorities. Fees are more likely to be collected if they are maintained by an appropriately authorized community organization such as a water supply improvement committee. While the local group should be required to maintain records and file periodic reports on its collections and expenditures, it should also be provided with appropriate authority to impose sanctions against those who fail in their committed payments.

A system for periodic project monitoring should be established. A monthly visit by the local sanitary inspector or some other authority from the responsible agency can be an effective motivation tool when carried out in a culturally sensitive manner. Any problems that have arisen with use of the facilities can be discussed with local leaders and joint solutions provided. The visits will not only motivate communities to care for the facilities, but they will also provide agencies with important feedback on changes in water use and sanitation practices resulting from the introduction of new technologies.

(d) Project Evaluation. Project evaluation is of primary importance for assessing both goal accomplishments and service delivery problems. The incorporation of social parameters, such as changes in water use and excreta disposal patterns, hygiene habits, villager response to system breakdowns, and attempts at system improvement and expansion, provides information to planners that can be used both to modify project designs and to establish better community selection criteria.

For evaluation to provide feedback, it is necessary that administrative mechanisms be established for periodic information collection analysis, and its efficient dissemination through managerial channels so policy makers can effectively respond to the results. Involvement of local committees, schools, and individual households in evaluation will result in valuable data and provide for continuing participation.

A young boy and a woman at communal water faucet
WORLD BANK PHOTO by Edwin G. Huffman

ANNEX A

WORLD BANK RESEARCH PROJECT 671-46

SOCIOLOGICAL QUESTIONNAIRE ON WATER SUPPLY, WASTEWATER AND EXCRETA DISPOSAL

The main purpose of these questions is to find out how people think about their present method of water supply and excreta disposal, as a means to estimate future response to proposed changes and to enable them to take part in the decisionmaking concerning those changes. It is necessary to find out what they think about their prsent environment, whether it is a healthy place to live, and whether they would be willing to work with others to make improvements in their present methods.

The questions must make sense to the person being interviewed. Therefore the interviewer must be able to speak the local language, understand the kind of information needed, and adapt the language to the understanding of the person interviewed.

Preferably the questions should be addressed to women, since they are generally more knowledgeable about water use in their family unit. Whenever possible, use direct observations such as: "show me where you and your family dispose of fecal materials," or, "show me where you obtain your water." In most cases, women interviewers will be more successful than men in obtaining answers from women. Some questions should be asked of the man of the house, for example, "would you be willing to work with others in order to improve your water supply."

DATE _____ COUNTRY _____

STATE/DEPARTMENT _____ LOCALITY _____

NAME OF INTERVIEWER _____ ORGANIZATION _____

COMMENTS _____

_____

_____

_____

Questions 1 and 2. Objective: Determine who carries the water, what are the water sources and how are they used. Investigative whatever it is considered good or bad to the interviewed person concerning water supply.

Answers to following questions will be written in Tables I, II, and III.

Question 1. a) From where do you obtain most of your water during summer?

b) During winter?

(for the main source of water write 1 in parenthesis and 2 for the source next in importance.)

c) Who brings water to the house? In what container? How many trips per day must this person make in order to obtain water?

(Fill in Table I according to answers obtained.)

TABLE I

Family member	Container used for carrying water	Estimated capacity	Daily trips for water Summer	Winter

d) Approximate distance from house to water source.

e) How long does it take round trip to get water?

f) When did you start to use this water source?

g) For what purpose do you use this water?

h) How did you find out that this water source existed?

i) Why do you get your water from this place?

(Once you have completed the first water source, ask if they obtain water from another place as well. Mention uses and water sources you think are available.)

(After completing Table II, fill out Table III. First determine from where they obtain their drinking water, then ask:)

Question 2. a) Why do you prefer this water for _____ (use)?

b) What do you dislike about the water from this source?

(Repeat the same for other uses given on Table III.)

Questions 3,4,5,6,7 and 8. Objective: To find out if the interviewed associates water use with health and if he would be willing to spend more money or work harder in order to obtain improvements.

Question 3. Do you have any problems obtaining water from these sources?

Yes ( ) No ( )

(If the answer is yes, ask in which place and what is the problem.)

Place	Problem

Question 4. Do you think your house is located in a healthy place?

Yes ( ) No ( ) Don't know ( )

Why: _____

_____

(If the answer is "don't know," try to find out what the interviewed believes is a healthy place and then repeat the question.)

Question 5. Do you believe the water you drink is healthy for you and your family?

Yes ( ) No ( ) Don't know ( )

Why: _____

_____

TABLE II

Source	Summer	Winter	Distance to house	Time spent to and from source	Years using this method	USES						How did you find out about this place?	What made you decide to obtain water from this source?
						Drinking	Cooking	Bathing	Laundry	Animals	Plants		
( ) Spring													
( ) Shallow well													
( ) Deep well													
( ) Public fountain													
( ) Faucet inside house													
( ) Faucet in patio													
( ) Faucet at neighbors'													
( ) Rain													
( ) Creek													
( ) Puddle													
( ) Other (specify)													

TABLE III

	Source	Why do you prefer the water from this source?								What is it you don't like about this water?						
		Color	Taste	Smell	Free	Inexpensive	Close	No problems with others	Other Reasons	Color	Taste	Smell	Too far	Expensive	Problems with others	Other Reasons
Drinking	1															
	2															
	3															
Cooking	1															
	2															
	3															
Bathing	1															
	2															
	3															
Laundry	1															
	2															
	3															
Drinking water for animals	1															
	2															
	3															

Question 6. Do you believe that the time and effort employed in obtaining water is:

Too much ( ) Normal ( ) Little ( )

If the answer is "too much," ask: If you would be able to spend less time in obtaining water, in what activity would you use the time saved?

_____

Ask only those who pay for water.

Do you think the cost of water is: High ( ) Normal ( ) Low ( )

Question 7.

a) Would you be willing to spend more money in order to obtain a better quality of water for drinking and other purposes?

no ( ) Yes ( )

If answer is no, ask why? _____

_____

If answer is yes, ask: Little more ( ) Much more ( )

b) Would you be willing to spend more money in order to obtain a closer source of water for drinking and other purposes?

No ( ) Yes ( )

If answer is no, ask why?

If answer is yes, ask: Little More ( ) Much more ( )

c) Would you be willing to spend more money in order to have water at a distance of 30 feet from your house?

If answer is no, ask why?

If answer is yes, ask: Little More ( ) Much more ( )

Question 8. For those who carry water only:

a) Do you meet and talk with other people on your way to and from obtaining water?

Yes ( ) Sometimes ( ) No ( )

b) Do you think this is good? Yes ( ) No ( ) Why? _____

_____

Question 9. For those who pay for water:

How much do you pay for your water supply? _____

How much do you and your family earn per month? _____

Question 10. Do you have any idea of what could be done in order to help you obtain a better quality of water?

Yes ( ) No ( ) If answer is yes, what is your idea? _____

_____

Question 11. Why do you think this hasn't been done before? _____

_____

Question 12 and 13. Objective: To determine if the wastewater disposal method is harmful for health.

Question 12. How do you dispose of wastewater?

( ) throw it on the street

( ) throw it on the ground

( ) throw in into drainage ditch

( ) use it for the animals

( ) sewerage system

( ) other (specify) _____

Question 13. Does wastewater remain close to your house? Yes ( ) No ( )

Questions 14 and 15. Objective: To find out about excreta disposal and if the interviewed observe any relationship between the disposal method and health.

Question 14. What system do you use to dispose of excreta (use local name)?

( ) latrine

( ) vault with collection

( ) bucket night soil collection

( ) leave it on the ground

( ) leave it for the animals

( ) septic tank with flush toilet

( ) other (specify) _____

Question 15. Do you think this is the healthiest and best method of disposal?

Yes ( ) No ( ) Don't Know ( ). If answer is yes, ask why?

Questions 16 and 17. Objective: To find out if they are used to working with other people and if there is a community organization that they can use in order to improve their methods of water supply and waste disposal.

Question 16. Do you sometimes work with other people in things such as:

( ) Building houses

( ) Building roads

( ) Agricultural work

( ) Marketing crops or goods

( ) Other (specify) _____

Question 17. Do you think you could work with other people to improve water supply or excreta disposal?

Yes ( ) Perhaps ( ) No ( )

If answer is yes or perhaps, ask:

With whom would you be willing to work? _____

Under what conditions? Voluntary work ( ) Exchange work ( ) Paid work ( )

Questions 18, 19, 20 and 21. Objective: To use the information for correlation with other information from different social and economic groups.

Question 18. Age ( ) 15 to 24
( ) 25 to 34
( ) 35 to 44
( ) above 45

Question 19. Occupation of head of household _____

Question 20. Number of persons in family 15 years old or older (include the interviewed)

Question 21. Number of persons in family less than 15 years old _____

A HYPOTHETICAL METHODOLOGY TO INVOLVE COMMIUNITIES IN PROJECTS

BASICS

A problem-solving approach can be effectively used to involve communities in selecting appropriate technologies for water supply and waste disposal. Through the application of various social science techniques described in Part 2 of this report, the responsible agency can obtain information on community needs and limitations, and the community can gain insights into its own situation as well as an awareness of opportunities for change. The problem-solving approach requires a substantial amount of communication between agency and community in the initial stages through local facilitators, which in turn promotes effective community participation in choosing a technology assured of being adopted and properly maintained.

Once adequate institutional and organizational arrangements have been made, a methodology for project implementation must be developed. If the community has already recognized sanitation as a problem and requested assistance, steps one through seven (numbers refer to steps indicated on the diagram) may be omitted.

1. The "contact" with communities may occur in the field when facilitators engage in discussions of environmental sanitation with health promoters and/or with leaders in the communities; or the contact may occur in the agency branch office when community leaders and health promoters inquire about sanitation improvement possibilities when visiting the sanitation program office. (They may be aware of the existence of the program office from radio announcements, word of mouth communication, or from having seen or heard about projects completed by the office.)

2. Whether the contact is made in the community or in the regional program office, and whether the community members or agency personnel are initiating the discussion, there is still a need for investigating the extent of perceived need for sanitation improvement on a community-wide basis. The investigation should ideally be carried out with the participation of both community leaders and agency personnel. Facilitators under the guidance of the program team's community organization specialist would be expected to have a primary role. They are most aware of available external resources and can be expected to be most familiar with the community's social and geologic conditions, as well as with previous community experiences in community organization and development projects.

3. The "baseline study" of community needs (perceived and observed) and resources should be planned with community leaders and would involve their contribution of time to carry out interviews and discussions with other community members. This dialogue or problem-solving approach is essential for the success of the project to identify needs, problems, and possible solutions.

4. Structured surveys developed by the program team can be used to collect information on existing water sources, health conditions, available local

materials and geologic conditions. Information on previous experience in community participation in projects such as school building, road construction, and health clinic establishment are examples of data valuable for interpreting the community's potential for participation in a sanitation project. Information on attitudes, beliefs, and preferences must involve open-ended interviewing with a significant portion of heads of households (15 percent), midwives, pharmacists, schoolteachers, and health promoters.

5. The analysis of the results of the joint investigation by agency personnel and community leaders should be carried out in an informal gathering, preferably in the community, where leaders would feel more comfortable in contributing to the discussion with original and personal insights.

6. Expected outputs of the analysis are: a) information that would be important for agency evaluation of alternative technologies and community capacity and willingness to participate; b) community insight into the environmental sanitation situation and health implications, as well as increased confidence in the intentions of program personnel; and c) quantitative data for later evaluation of the program's methodology and project impact.

7. The findings should be presented to the community by leaders in a meeting of all community members. Program personnel (community organization specialist and facilitator) should be present. The presence of the program engineer would not be crucial, but it would provide legitimacy to the results and it would provide more adequate answers to the questions of community members concerning technical components and alternatives. Suggestions of community members could also provide information to the engineer for altering design parameters.

   The meeting should provide a clear consensus of the community's aspirations and realistic expectations. A priority ranking of needs would indicate if sanitation is viewed as a problem at all by the majority and whether the community is willing to begin a project to improve sanitation. If sanitation is not a high priority, it may be "linked" with something that is a priority and for which external resources may be available through other national agencies. The facilitator would be responsible for making the contacts with other agencies.

8. Once sanitation is defined as a problem, the community as a whole should select a committee (if one does not exist already, and not necessarily by democratic vote but by whatever tradition and custom dictates) to organize activities and call meetings for discussion of the project.

9. A few days after the general meeting, when informal discussions among individuals would have had time to allow any misconceptions or doubts to be articulated, a meeting between the facilitator and the community leaders to discuss options would allow for planning a visit by the

technical component of the program team to assess the feasibility of the option selected (wells, gravity systems, public or private water tap connections, composting latriles, or conventional pit latrines, private and/or public facidities) by community leaders. Visits by community leaders to projects in process or completed may provide tangible visual aids for explaining different options.

10. A visit by technically skilled program personnel to determine the technical feasibility of the option selected by the community should be thorough and accurate. The delineation of expected community costs is of primary irportance. A positive response of feasibility and the inclusion of costs can be expected to be interpreted by community members as a commitment on the part of the agency to provide resources for project implementation. The agency should not commit itself unless implementation can begin almost immediately or within a reasonably acceptable time period agreed upon with community leaders.

11. At the first assembly, the entire community should be present for a presentation of slides, prototype demonstration, or guest appearances by leaders from communities that have already participated in the program. The meeting should include a thorough discussion and repetition of expected community contributions and agency contributions.

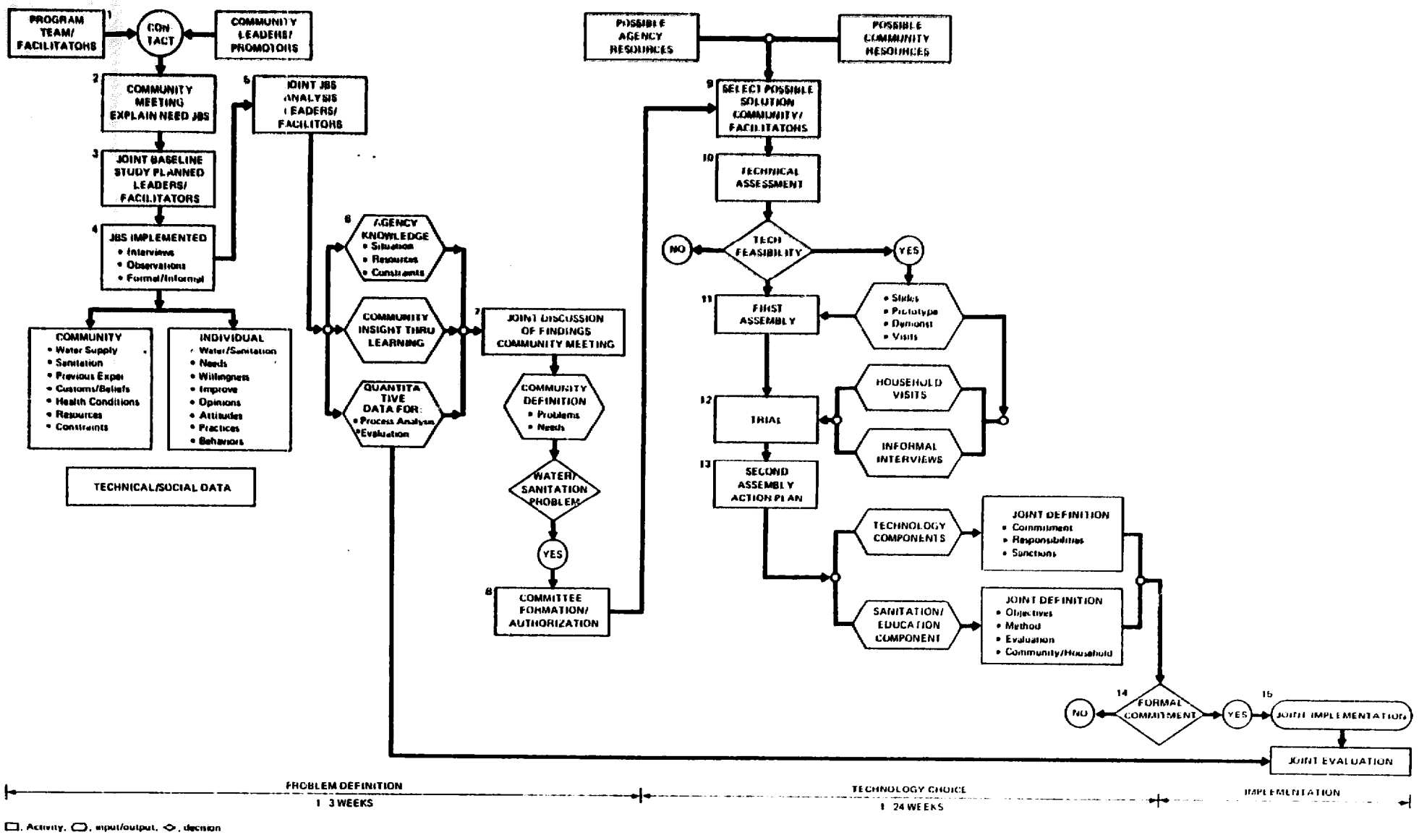
12. If the community is unsure or unfamiliar with the technology, project implementation should require first the construction of a prototype in the school, the health center, a central gathering place, or in the home of a community leader for use on a trial basis. If the technology is already understood by the community members, this is not necessary.

13. The second assembly of the entire community provides a forum for discussion of the technology and its extension throughout the community. Members of the program's technical and social team should be present. A plan should be developed for organizing community contributions and participation in health education as well as construction activities. The plan should include an estimate of expected time, money, and material contributions (already agreed upon) and an expected timetable for completion.

14. A formal commitment to the agreed upon plan should be submitted in writing to the agency with indication of agreetment by a significant majority of the community (80 percent suggested).

15. Implementation should only proceed after the formal agreement has been submitted to the agency's branch office.

Diagram 1. Methodology for Introduction and Adoption of Appropriate Technologies in Fanitation



APPROPRIATE TECHNOLOGY FOR WATER SUPPLY AND SANITATION

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