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Anne U. White and Gilbert F. White

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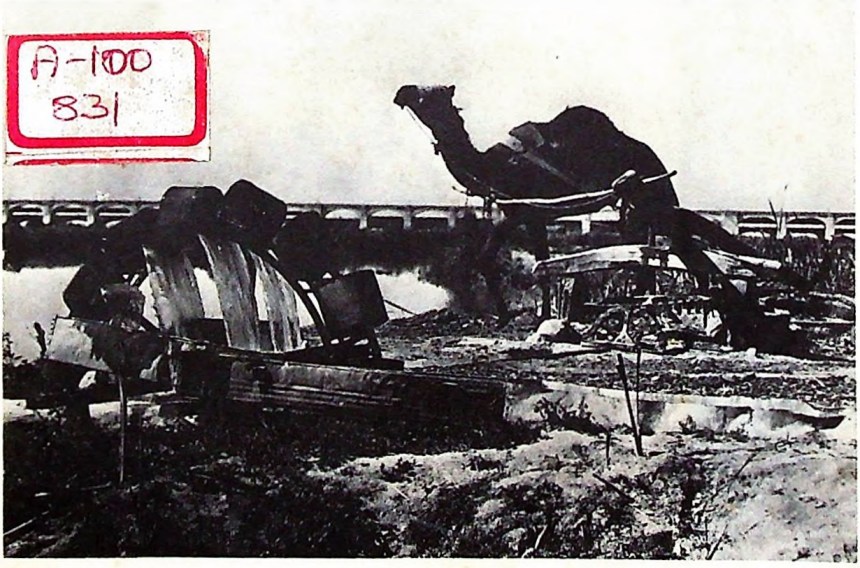

BEHAVIORAL FACTORS IN SELECTION OF TECHNOLOGIES

By Gilbert F. White[1] and Anne U. White[2]

INTRODUCTION

Where a well-known technology is provided to a population that has long been acquainted with its use, the problems of predicting patterns of social behavior are relatively simple. The difficulties arise when a new technology is introduced to a population which is not accustomed to it. It is in these circumstances that there are few if any local lessons from the past to apply, so that it becomes important to rely either on comparable experience elsewhere or analysis based on established relationships of human behavior, preference and motivation. In this paper we point out some of the all too abundant evidence that behavioral factors may be critical to the success of new water and sanitation installations and to their effects on public health, note those situations in which behavioral factors in fact are critical, suggest some of the circumstances which affect the development of new patterns of behavior, and indicate those situations in which a system of community participation may avoid unnecessary expense or failure.

WHEN BEHAVIOR IS IGNORED

Although there have been only a few systematic studies of the circumstances in which new projects have failed because of lack of receptivity by

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1. Professional Staff, Institute of Behavioral Science, University of Colorado at Boulder.

2. Research Associate, Institute of Behavioral Science, University of Colorado at Boulder.

the user community, the literature is replete with anectdotal evidence of those events: the standpipe in Ethiopia that is destroyed by people living immediately adjacent to it and objecting to noise (1); the new water tap in the Ryūkyū Islands which is accompanied by a towel on which all of the children in the community wipe their hands, thus spreading trachoma (2); the communal latrine in Nigeria that goes unused. There are also the aquaprivies that are first used and then abandoned, and the faucets which are ripped off of the pipes and the metal used to fashion ornaments. All of these are examples of misuse of facilities which had been installed with the intention of promoting health and well-being of the users. In each case something went wrong in the design or construction or operation and maintenance.

CRITICAL SITUATIONS

As noted at the outset, there are numerous situations in which attention to behavioral factors may be relatively perfunctory or routine. These are the situations where a population of known ethnic and economic composition is being presented with a new facility of exactly the same type as that which has been used enthusiastically by the same type of population elsewhere. In these circumstances the design engineer can replicate with confidence the design and administrative arrangements in the comparable place and assume that the community acceptance will be equivalent. This degree of confidence is warranted especially where the facilities which are being provided are the sole option open to the user as, for example, where a tap system is provided for a city population which has no other sources of water available from roof or ground. There the users have no choice of the source, although they may exercise some options as to how they misuse the equipment or waste the water.

other situations the major components of the design situation
.) the range of possible physical design, 2) the prevailing behavior
:s of the potential users, 3) the facilities provided for community
ppation and 4) the nature of educational and informational activities
rre carried out by the community authorities. The design includes
yy the physical facilities of supply, treatment, transportation and
ution, but the administrative design for means of construction and
ance, and the arrangement for pricing or other means of payment
cost of the improvement.

atever the technique followed for design of the system, once it is
ed people have four choices open to them: 1) they may use the
ies without any significant change in their current behavior
s as, for example, when a family begins using a private courtyard
in preference to a community facility on which it earlier had
d; 2) They may change their behavioral habits in order to make
the new facility, as when a family collects its excreta daily for
ion by a cart rather than depositing it in a nearby field (the
here is to take advantage of a daily collection system); 3) they
use the facility, as when they throw garbage into the latrines or
water from a community faucet run until the temporary supply is
ed; 4) they may utterly reject the facility, as when they refuse
onize a community latrine or go for water to a nearby stream in
nce to a new well facility.

ople who accept a new facility generally are required to make some
adjustment in their behavior pattern. This may involve their
s of charges for use of the facility or for amortization of the
ent. Their contribution may have been preceded by contributions
r before the project begins. They must either maintain or learn
tain the facility. They must learn to use it with care, and in

[redacted]

[redacted]y may be obliged to take action to assure that others do not facility. Any or all of these adaptations involve a change [redacted]r previous pattern but a change which contributes to the desired [redacted]he facility and to its continued upkeep. All such actions may be supportive responses.

[redacted]n contrast, there is an even larger range of destructive responses [redacted]ich some or all of the members of a community may engage. The most [redacted]ious is the complete rejection of the facility and the continued use whatever arrangements it was intended to replace. These usually have .ignificant implications for health, for expenditures of time and energy for drawing water or disposing of excreta and waste, and for settlement patterns.

Even more common is the user who takes advantage of the facility for some period of time but who refuses to pay for its construction and who either refuses entirely or slowly retreats from payment towards the cost of operation and maintenance. In this situation the system may fall into disrepair without any other overt acts by the users.

Oftentimes, however, the refusal to contribute to operation and maintenance is accompanied by other actions abusing the system. These include failure to maintain a pump, delinquency in providing fuel or chlorine, letting leaking faucets continue to run, breaking off faucets for other uses, and so forth. There may occasionally be overt destructive acts as when some individual or group within a community sabotages the system, or encourages others to do so.

These acts of adaptation for constructive or of delinquency and destructive use are easy to catalog and classify. It is more difficult to sort out the factors which account for these actions of support, misuse or rejection.

[redacted]tive studies of individual communi[redacted]
[redacted]World Bank Research Projects on Appropriate Technology
and Waste Disposal, from our own field studies, and by
[redacted]what is known about social behavior it is possible to
[redacted]ast half a dozen factors which affect the actions of users
[redacted]ions noted above. We shall note later on that it is a
[redacted]think that these can be assumed or defined for any community
[redacted]e careful investigation of that particular community, and it
recognized that a factor that may be highly important in one
[redacted]may have little or no significance in another. An example is the
[redacted]oad construction firm which had to delay work in an Arab country
[redacted]e toilet facilities for male and female employees had been built
to each other (3).

Individual desire for privacy clearly is a widespread and powerful motivation. People generally prefer to be alone while defecating but this is not always the case, as witness the women in Indian villages who prefer to go to the fields together for defecation so as to have some protection and privacy that might otherwise be interrupted. There is a long and widespread belief that women like to go to common water sources in villages because of the opportunities which the journey and waiting in line provide for them to talk with friends and neighbors. In our investigations we have found that this is largely a myth. Women, given a choice, would prefer to have their own individual source. This does not mean that they necessarily resent meeting others or that they do not gain much in the way of information and companionship from others at the watering place. It does mean that when given an opportunity they will prefer their own source, but then will be obliged to obtain companionship and

[redacted]

[redacted]mation through other meeting places and channels in the community. [redacted]ave found this not only in the individual interviews with water users [redacted] a variety of cultural and physical environments in East Africa but the responses from people questioned in a wide range of other cultures. [redacted]is is important to recognize because it represents a powerful motive for enlistment of community support for any project which provides some increment in the degree of individual or family privacy in water supply and sanitation facilities. It does not mean, however, that users will automatically adopt such facilities when proferred: they may object to the facilities because of other factors, some of which are ennumerated below.

Individual effacacy in handling facilities is another factor at work. If the individual cannot easily make the facility work, as in the case of the pump which requires priming to reach a lower water table, there is a tendency for people to prefer equipment over which they have an easy and complete control, for example, a bucket and rope. If they lack the skill and knowledge to repair the equipment or to make it run properly, they may let it fall into disrepair, not because they are opposed to its use but because they feel inadequate to its use.

Status in the community, and especially the extent of sharing of a prevailing practice with one's neighbors, may be a powerful motivational force. The individuals may be reluctant to experiment with a new device unless there is some support from others, particularly if there is indication of its acceptance by those who are known innovators in the community.

A sense of community well-being on doing what is expected of the individuals to maintain the wholeness of a community may be a strong motivation quite independent of the desire for maintenance of individual

privacy. The gua...

...e it has been accepted as the community goal by the ...

...e (4). Another example is the Spanish American community in ...o where a number of the members contribute to a water supply ...ecause they do not wish to offend neighbors who are deeply committed improvements (5). The obverse is the unwillingness of people to ...te in a project because there are objectionable persons or groups ...e identified with them. Such considerations often explain why a ...mity for no reason having to do with the project design or their own ...rences rejects an improvement.

A sense of individual health has been shown to be a primary motivation ... many users, but this urge always is mediated by the knowledge of the ...dividuals responding to it. They may object to an improved water source or means of excreta disposal because they feel it is unhealthy although the sanitary experts may know that to be the contrary (6). It is important to find out what they consider to be the criteria of health, as for example, finding out that members of a Filipino community regard intestinal worms as contributing to proper digestion of food.

Related to considerations of individual well-being is a sense of control over one's own activities, that is, the ability of individuals to exercise discrimination with respect to the quality of service which they will enjoy. From our experience, people when given the opportunity will exercise considerable discrimination in choosing water sources and means of excreta disposal. In Indonesia among the 1.3 million families who use community piped water supplies, at least 52 percent make the distinction between potable water for drinking and cooking purposes and unpotable water which they carry from rivers to use for washing and bathing purposes (7). This opportunity for discrimination may be affected by their prior experience with development activity in the community. In some communities

information through other meeting places and channels in the community. We have found this not only in the individual interviews with water users with a variety of cultural and physical environments in East Africa but in the responses from people questioned in a wide range of other cultures. This is important to recognize because it represents a powerful motive for enlistment of community support for any project which provides some increment in the degree of individual or family privacy in water supply and sanitation facilities. It does not mean, however, that users will automatically adopt such facilities when proferred: they may object to the facilities because of other factors, some of which are ennumerated below.

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health and privacy. The Guatemala community which acts to make an improvement because it has been accepted as the community goal by the leaders is one example (4). Another example is the Spanish American community in New Mexico where a number of the members contribute to a water supply system because they do not wish to offend neighbors who are deeply committed to such improvements (5). The obverse is the unwillingness of people to cooperate in a project because there are objectionable persons or groups who are identified with them. Such considerations often explain why a community for no reason having to do with the project design or their own preferences rejects an improvement.

A sense of individual health has been shown to be a primary motivation for many users, but this urge always is mediated by the knowledge of the individuals responding to it. They may object to an improved water source or means of excreta disposal because they feel it is unhealthy although the sanitary experts may know that to be the contrary (6). It is important to find out what they consider to be the criteria of health, as for example, finding out that members of a Filipino community regard intestinal worms as contributing to proper digestion of food.

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for example, efforts at sanitation improvement are closely identified with earlier colonial authorities, and participation in the new improvement along the same lines is regarded as some kind of a sacrifice of individual control in the face of forces of colonialism.

Finally, it is important to recognize that every individual family or community has its own sense of priorities as to what needs to be done and as to the acceptable ways of doing it. They may reject a contribution towards a sanitation improvement not because they are against the improvement but because they think they can use their resources to better advantage in building a road or providing an agricultural produce marketing facility. They may use the brass faucet for creating jewelry rather than for water supply because the sense of social status is overriding in those circumstances.

Other motivations and preferences might be noted, but this is sufficient to indicate their range and their power in influencing the degree of supportive and destructive response to a proposed innovation.

IGNORING COMMUNITY PREFERENCE

Our basic argument is that in most cases where new design facilities fail to gain community acceptance one or more of the factors ennumerated above is at work. It is possible to go into a community and assess why some facilities are abused and others rejected, but one would prefer not to be obliged to make this kind of retrospective appraisal. The effective tactic is to take preferences and motivations into account at the outset as an essential part of the design process. This involves some kind of community participation.

COMMUNITY PARTICIPATION

The appeal for community participation is widespread and frequently voiced, but there needs to be careful definition of what the term means and of specific modes of involving people in the design process. At base, it means providing an opportunity for users of a facility to have a voice in selecting the different elements in the facility. Giving them a voice implies providing for 1) a determination of their current preferences, 2) an estimate of their current ability to meet their perceived needs, 3) an estimate of their capacity to adapt to new facilities, and 4) their maintaining the system in the face of changing preferences over time. It should not be expected that preferences and motivations would remain uniformly the same: they may be expected to change. It is possible to anticipate some of this change by analogy with other communities that have gone through social change as well as by reference to underlying preferences that are strong but are not satisfied by existing community arrangements.

OPPORTUNITIES FOR COMMUNITY PARTICIPATION IN DECISION-MAKING

The artistically difficult and trying judgment to make is to determine at what time to involve citizens in community decision-making about the new facility. Ideally, the initiation of any preliminary exploration of improvements would come in response to community initiative, with the community leaders asking for technical assistance in achieving a need which they already have recognized and which they are determined to satisfy. This rarely is the case because communities may have difficulty

initially perceiving their needs, may place sanitation in very low priority at the outset, and may be unaware of steps which they could take to enlist technical assistance.

Figure 1 suggests the way in which various components of the decision situation may interrelate over time. In its condition of imposed design one sees community behavior patterns as remaining untapped by the engineers who proceed to make a preliminary and final design, then to construct the project and impose it on the community. Depending on the character of the prior studies or sheer luck the response may range from complete acceptance, to acceptance with a significant adaptation of behavior, to rejection. Many existing water supply systems fit into this pattern.

Where there is participation, the community may, as shown in the second case in Figure I, have a role in first deciding whether or not a project will be applied for, and then at three separate times in making its views known. Prospective users would have opportunity for a reaction to preliminary designs, for another reaction to final designs, and for participation in necessary preparation actions before the final design gets translated through construction into reality.

A third possibility is where the design is modified through community participation as above, but where the community comes to understand that it cannot achieve its ends within the limits of available funds and customary behavior. In this case the community decides that modifying its behavior patterns could allow it to achieve its ends, and that it is willing to make the necessary modifications.

An extreme example of behavior modification comes in the fourth case where a constructing authority, having designed a project, sounds out community preferences and in the light of this undertakes a program of community education to attempt to assure that the community will be prepared to modify its behavior so as to use the facility once constructed.

Components in dealing with behavioral factors:

Design: D_P – preliminary; D_F – final

Behavioral pattern: B_1 – original; B_2 – modified

Involvement: I_1 – community needs & promotion; I_2 – community preferences; I_3 community consultation; I_4 community education

Application decision: A

Construction decision: C

Inter–action points

Before applying for project

Design of project – Preliminary

Response to preliminary design

Design – Final

Response to final design

Response to construction

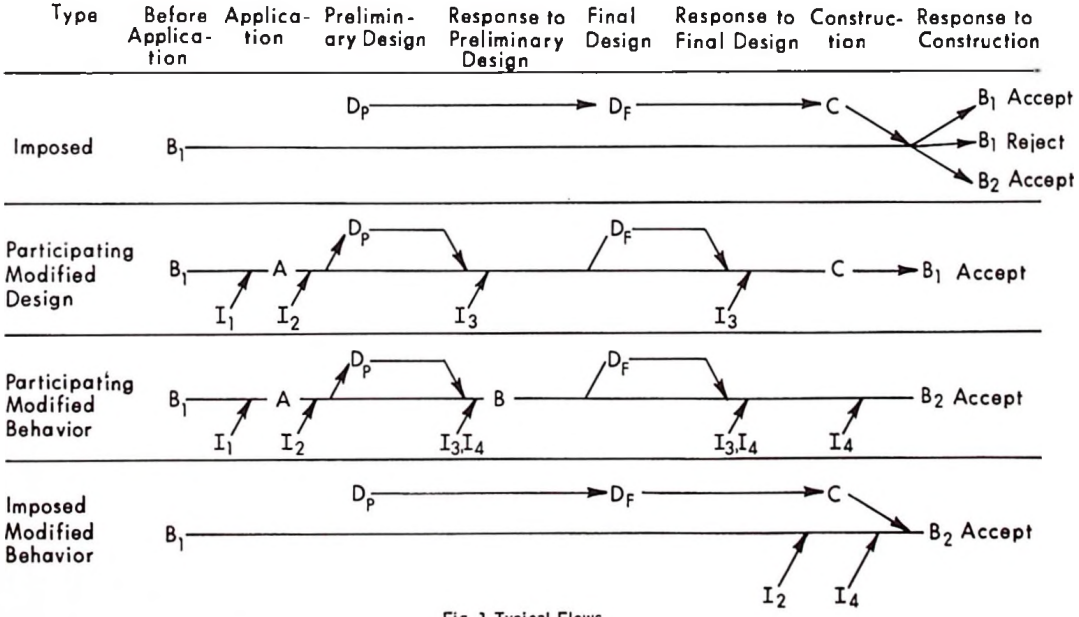

Fig. 1 Typical Flows

Health centers, or special programs like vaccination, have often taken this approach.

In brief, there are five major points at which local people can have a significant role in decision-making with respect to a new project. First, they may join in deciding whether or not to apply for a project and thereby to make at least a preliminary canvass of their own sense of priorities about the needs of the project and their own judgment as to their capacity to marshall the money, labor and local management facilities to carry it out.

Second, they may participate in the selection of technologies in relation to their preferences subject always to the constraints of available money and labor to carry out the undertaking.

Third, they may influence the pricing policies, including the provisions that are made for funding operation and maintenance. There has been a good deal of evidence that demand is relatively price-inelastic for such facilities, but also that any drastic change in prices is likely to arouse substantial resistance over the short term. Local people can indicate what kinds of pricing schedules appeal to them, what modes of billing and payment are best adapted to their income flows and means of handling money or other contributions of labor are most acceptable to them.

Fourth, the local management policies may be most effective if adjusted at the outset to the modes of action within the community, including their formal governmental structure as well as the community networks through which information is transmitted and people join in arriving at judgments about priorities.

Finally, local people can be of assistance in monitoring the construction and operation and maintenance of a project and thereby influence the degree to which it ultimately meets its stated aims.

DEVICES FOR ASSURING COMMUNITY PARTICIPATION

In another paper (8), we have discussed some of the tools that can be employed in carrying out a project so as to assure effective community participation at the points noted above. Here we recapitulate in capsule form what seem to be the chief devices that are readily available to engineers who are interested in avoiding failure or inefficiency in use. These involve chiefly two types of community survey, community consultation, and provision for continued monitoring.

The most informal sort of community survey is one in which an individual or team enters a community and carries on a series of informal discussions, with selected members of the community and its official leaders and with people who are well acquainted with the community. This can yield preliminary judgments as to how the community views its own health needs and how it places these in priorities among other community needs, as to its facility for mobilizing some kind of community action, and as to the assortment of existing networks of communication and power. The informal survey may lead to the judgment that the time is not right for further action, it may suggest that a substantial amount of community education and promotional work may be necessary before further action can be taken, or it may suggest that the time is right for a more intensive kind of community survey looking to assistance in the design of a project.

Always related to the preliminary inquiry is the assembly of whatever information of a statistical or anectdotal type is available about the community from people who have worked in it. Oftentimes a story or chance conversation may give insight as to forces which are at work in the community, but they never should be accepted as fully descriptive of the community situation. That can only be determined with any great confidence by a more careful sample of the total population.

It is not necessary to carry out an elaborate census of members of the community. A carefully selected sample stratified according to differences in income and in social groups may reveal a good deal about the range of motivations and preferences within the community and about the significant social networks.

From the results of the survey of as few as 30 families in a large village it is possible to compose a relatively accurate profile of the community preferences as the type shown in Figures 2 and 3. This indicates that the two communities illustrated, one in Haiti and one in the Sudan, have major differences in their views of their health conditions, the need for improvements, and their willingness to participate.

The survey may also reveal significant relationships between social factors and likely participation in the project. Thus, one finds that in community A there is strong preference for using an individual source of water supply whereas community B is less concerned about this factor. One might also learn that it is the people without latrines and of the middle and upper income groups who are most likely to support an improvement for excreta disposal in community C.

The results of such community survey can be invaluable to the designer in understanding the current practices and information level of the community, its preferences regarding services, and how these might be met by design or how they would require modification through education and consultation if an effective design is to be accepted.

Community consultation may be expected to follow whenever there is a preliminary design for review with community leaders. Here it is important to recognize that the designated or elected leaders of a community are not always those who are most sensitive to or acquainted with the wishes or capacities of its people. Indeed, it may happen that a particular person or cadre of people in a community are so unpopular that associating

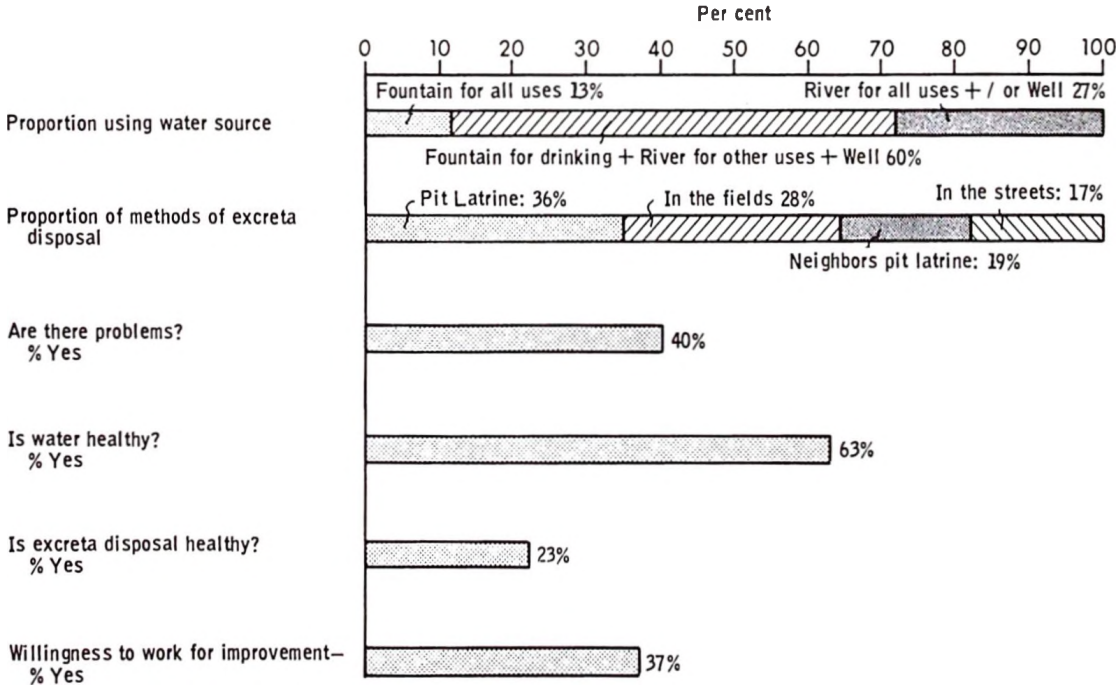

Fig. 2 Example of profile based upon community survey: Haiti, village with unpiped water. N = 30.

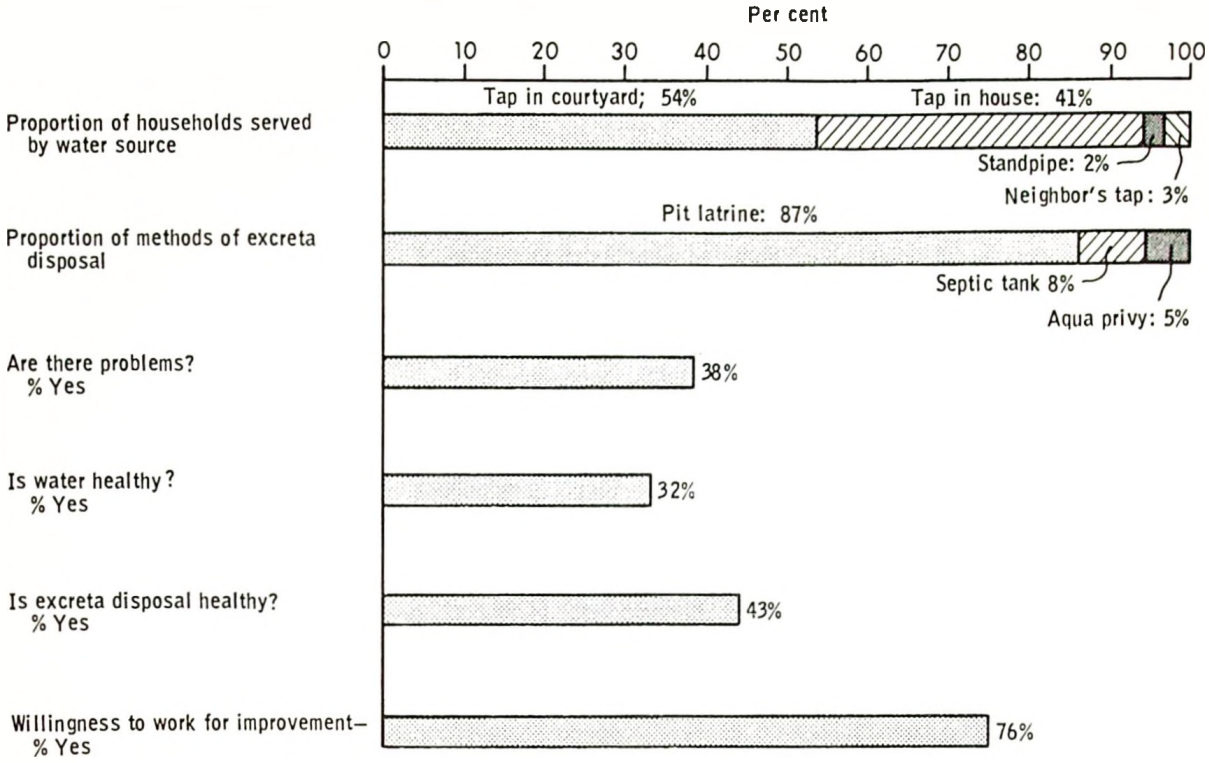

Fig. 3 Example of profile based upon community survey: Sudan, village with piped and unpiped water. N = 37.

a project with them is assurance of failure at the outset. It is important to determine who are the significant people in the community in terms of passing on information and deriving community judgments. From this information which will have been learned in the community survey it is possible to see to it that representatives of those groups are drawn into consultation about the preliminary design and subsequently, consultation about the final design.

It usually is desirable to present two or more but not more than five alternative choices to the community. It will be practicable to know what kinds of information will be significant for the people in terms of their previously expressed preferences and their indications of how much they would be willing to pay or contribute and with what groups they would be willing to work. The people need to be drawn into the system of consultation if they are to regard those representatives selected as having responsibility. It is essential to learn what kinds of concrete evidence they would like about the alternatives available: what it is that they need to see or touch or have more details about before they can make any judgment about it. It also is important for them to be entirely cognizant of what the costs will be in terms of time, money, or labor.

One of the cautions, beyond those noted above, which needs to be in the minds of those who participate in community consultation is that where there seems to be an important discrepancy between preferences and design it is wise to be cautious about the extent to which the gap can be bridged by information or educational activities. Oftentimes an easy solution is to suggest that materials will be distributed or a motion picture show will be shown or that community leaders will be informed about reasons for a design feature which is out of harmony with the community preferences. Such educational programs sometimes work, but often they do not, and it is desirable to be skeptical about the extent

to which they will be effective in a particular community. Suggestions of the care and continuity needed to make such programs effective can be found in some manuals such as those for rural health education in Kenya (9), or for the promotion of rural water projects in Columbia (10).

There is no sure panacea or set of dos and don'ts for taking into account these factors affecting behavioral patterns. Unwillingness to make the effort no doubt is the most common cause of failure of community water supply and sanitation improvements. Rarely would one encounter a situation in which all of the factors noted above would be significant or in which all of the steps noted above would be required in order to achieve a thoroughly effective community plan of improvement. The essential feature of the approach is to assume at the outset that factors affecting behavioral patterns need to be taken into account, that community participation can assist in determining them, and that such effort will generate greater assurance that the completed project will serve its intended aims.

ABSTRACT: Behavioral factors such as motivation and preference may be critical to the success of new water supply and sanitation projects and their effect on public health. Once the facilities are installed, the users have the options of adopting the new facilities without significant change in behavior patterns, changing behavior patterns to use the facilities, misusing the facilities, or rejecting their use entirely. If it is assumed at the onset of a project that behavioral factors should be taken into account, community participation can assist in determining these. Local people can have a significant role in decision-making at five points in the development of a new project: the decision to apply for assistance in terms of their own priorities, the selection of technologies within the constraints of available money and labor, the selection of pricing policies adapted to their needs, the incorporation of local modes of action into management policies and information transfer activities, and in monitoring methods. Tools for community participation include two types of surveys, community consultation, and provisions for continuing monitoring.

KEY WORDS: Water supply, public health, sanitation, community participation, decision-making, technology, choice.

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