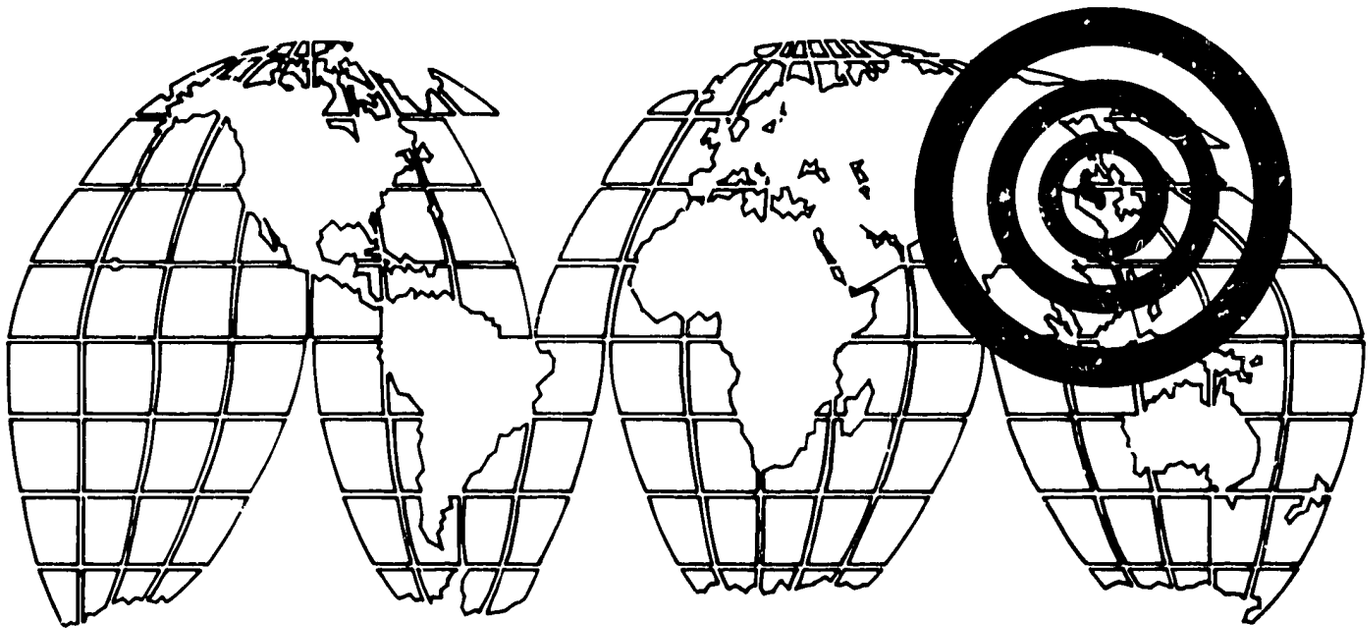
A.I.D. Project Impact Evaluation Report No. 20

Korean Potable Water System Project: Lessons from Experience



May 1981

U.S. Agency for International Development

PN AAJ 170

A.I.D. EVALUATION PUBLICATIONS

PROGRAM EVALUATION DISCUSSION PAPERS

No. 1: Reaching the Rural Poor: Indigenous Health Practitioners Are There Already (March 1979) PN-AAG-685
No. 2: New Directions Rural Roads (March 1979) PN-AAG-670
No. 3: Rural Electrification: Linkages and Justifications (April 1979) PN-AAG-671
No. 4: Policy Directions for Rural Water Supply in Developing Countries (April 1979) PN-AAG-691
No. 5: Study of Family Planning Program Effectiveness (April 1979) PN-AAG-672
No. 6: The Sociology of Pastoralism and African Livestock Development (May 1979) PN-AAG-922
No. 7: Socio-Economic and Environmental Impacts of Low-Volume Rural Roads--A Review of the Literature (February 1980) PN-AAJ-135
No. 8: Assessing the Impact of Development Projects on Women (May 1980) PN-AAH-725
No. 9: The Impact of Irrigation on Development: Issues for a Comprehensive Evaluation Study (October 1980)

EVALUATION REPORTS

PROGRAM EVALUATIONS

No. 1: Family Planning Program Effectiveness: Report of a Workshop (December 1979)
No. 2: A.I.D.'s Role in Indonesian Family Planning: A Case Study with General Lessons for Foreign Assistance (December 1979) PN-AAH-425
No. 3: Third Evaluation of the Thailand National Family Planning Program (February 1980) PN-AAH-006
No. 4: The Workshop on Pastoralism and African Livestock Development (June 1980) PN-AAH-238

PROJECT IMPACT EVALUATIONS

No. 1: Colombia: Small Farmer Market Access (December 1979) PN-AAH-768
No. 2: Kitale Maize: The Limits of Success (May 1980) PN-AAH-723
No. 3: The Potable Water Project in Rural Thailand (May 1980) PN-AAH-850
No. 4. Philippine Small Scale Irrigation (May 1980) PN-AAH-749
No. 5: Kenya Rural Water Supply: Program, Progress, Prospects (June 1980) PN-AAH-724
No. 6: Impact of Rural Roads in Liberia (June 1980) PN-AAH-750
No. 7: Effectiveness and Impact of the CARE/Sierra Leone Rural Penetration Roads Projects (June 1980) PN-AAH-751
No. 8: Morocco: Food Aid and Nutrition Education (August 1980) PN-AAH-851
No. 9: Senegal: The Sine Saloum Rural Health Care Project (October 1980) PN-AAJ-008

(continued inside back cover)

KOREA POTABLE WATER SYSTEM PROJECT:

LESSONS FROM EXPERIENCE

PROJECT IMPACT EVALUATION No.20

by

Eric Chetwynd, Jr., Team Leader
Bureau for Development Support

Daniel M. Dworkin
Bureau for Program and Policy Coordination

with a supplemental report by

Kim, Son Ung
Korea Development Institute

Agency for International Development

May 1981

TABLE OF CONTENTS

TABLE OF CONTENTS

FOREWORD

In October 1979, the Administrator of the Agency for International Development requested that, in preparation for an Agency-wide ex post evaluation system, between twenty and thirty projects be evaluated during the subsequent year, focusing on the impact of these projects in several representative sectors of the Agency's program. These impact evaluations are to be performed by Agency personnel and result in a series of studies which, by virtue of their comparability in scope, will ensure cumulative findings of use to the Agency and the larger development community. This study of the impact of the Korea Potable Water System Project was undertaken as part of this effort. A final evaluation report will summarize and analyze the results of all the studies in each sector, and relate them to program, policy and design requirements.

Preface

By 1982, the first year of the Water and Sanitation Decade, Korea will have provided water supplies to all people living in rural villages of over 20 households. Neglected in this outstanding record are the semi-urban communities of 5,000 to 10,000 persons. The CARE/AID project was funded to help meet the potable water needs of these communities.

We selected the CARE potable water project for evaluation because it was planned as a model for these larger rural communities. The lessons derived were to influence the building of similar water systems throughout Korea. These lessons are important for AID also because communities of this size are increasing in number in developing countries and traditional sources of water often cannot adequately supply their growing populations. Moreover, the concentration of people in these towns at times leads to pollution of the limited water that is available.

The evaluation team was composed of two AID staff persons from Washington and of the following Koreans: a sociologist who developed and directed a survey of households in two communities, an interpreter/rural sociologist with extensive experience in anthropological surveys and four graduate students of sociology who conducted the household surveys. The interpreter and two of the students were women. See Appendix B.

The authors are indebted to many Korean professionals, government officials, USAID employees and citizens who facilitated our work, provided valuable information and insights, and made us feel welcome wherever we travelled in Korea. Our interpreter, Mrs. Kim, Bong Young did an outstanding job and drew heavily on her considerable skills as a sociologist and anthropological field worker to help create a constructive climate for field interviews.

Mr. Lee, Sung Gun of the USAID Program Office provided timely assistance in helping to make initial contacts and arrange our field itinerary. Mrs. Cho, Yun Hi and Ms. Lee, Kyung Ai of the USAID staff continued to work through Korean holidays to help make possible our leaving a draft report in Korea. Our experienced driver, Mr. Kim, Jae Eul, moved us around the congested cities and remote villages of Korea with considerable ease and competence and added numerous insights of his own to our field work. We wish also to acknowledge the assistance of John Neave, USAID/Portugal, who read and commented on an earlier draft of this report.

Our acknowledgements would be incomplete without commenting on the excellent support we received from the entire USAID staff

during a sad and emotional period. The USAID Mission to Korea closed officially on September 30, 1980, after a long and successful partnership with the Korean government and people. The last of the Korean and American staff were terminated on October 3, 1980. The generous support we received during the period of our evaluation which encompassed these final days will not be forgotten.

We would like to thank in particular the AID Representative, Mr. William E. Paupe, his secretary, Ms. Rebecka Sheets, the USAID Controller, Mr. Woo, Doo Je, his assistant, Mr. Yoo, Choon Myung, and typist Mrs. Lee, Joo Ok. Our thanks go also to the Embassy General Services Office which gave us excellent transportation and administrative support.

Finally, we are grateful to the Bureau for Development Support's Office of Urban Development for its support in production of the report. Dr. William R. Miner, Director, and Mr. David A.A. Smith made useful suggestions on initial drafts of the report. Ms. Diannah McDaniel, with perseverance and a steady hand, saw the report through several drafts to completion and Ms. Mary Gilmartin typed Dr. Kim, Son Ung's report for inclusion in Annex E.

Any errors of omission, fact or interpretation, are the responsibility of the authors.

SUMMARY

In 1977 AID approved and funded a CARE program to help the Korean government establish potable water plants and distribution systems in towns of between 5,000 and 10,000 population. The purpose of the program was to improve health conditions in these towns and to develop water systems that could be used as models for water systems in Korean towns of this size. CARE noted that such towns had been neglected in Korea's otherwise impressive campaign to make piped potable water available throughout Korea. The CARE program proposed to help develop water systems in six communities with a combination of CARE and AID funding and to help build an additional eight systems without AID funds.

AID concluded that CARE had identified a serious problem and a reasonable approach to it. Many of these large villages or small towns had grown rapidly, but with little planning. Their traditional shallow wells were becoming unsuitable as a source of water. The density of housing and the proximity of pit privies to the shallow wells in household compounds increased the potential of disease transmission through contamination of the ground water table. If Korean potable water programs were not addressing this problem, a project to produce model systems appropriate for these towns made sense.

The project was not a success. The project was declared by CARE to have been completed in 1979, yet one of the six systems was incomplete and another still was in the pilot test stage at the time of this evaluation in October, 1980. The plants were supposed to be innovative models, yet they were nothing more than carbon copies of plants that already existed in Korea. No new technical improvements were introduced, and two of the four fully-operating plants were technically deficient, failing to treat the water sufficiently to deliver an acceptable product or to locate an adequate water source. The towns selected were supposed to be low-income towns, yet three of the six seemed to be of above average income. At least half of the serviceable population was to be connected to the system at the time of completion, yet this was true in only three cases, and in one other case the system was incapable of further expansion. Each town was supposed to have a water committee to oversee the management and operation of the water system, yet there was only one such committee functioning at the time of the evaluation. Finally, an education program was supposed to be integrated into each system to teach the relationship between water use and health, yet this program was poorly conceived, poorly organized and poorly managed. The few educational programs and lectures that did result covered material already available through school and public health programs.

Project studies to determine the impact of the piped water program on community health were inconclusive and of questionable professional quality. The evaluation team was unable to find any supportable evidence that the programs positively influenced health in the communities although most officials and some users felt there should be a positive association between piped potable water and improved health. It was interesting that,

despite this rather general acknowledgement, the majority of users surveyed boiled the piped water to eliminate the taste induced by chlorination. They were less inclined to boil water from natural sources.

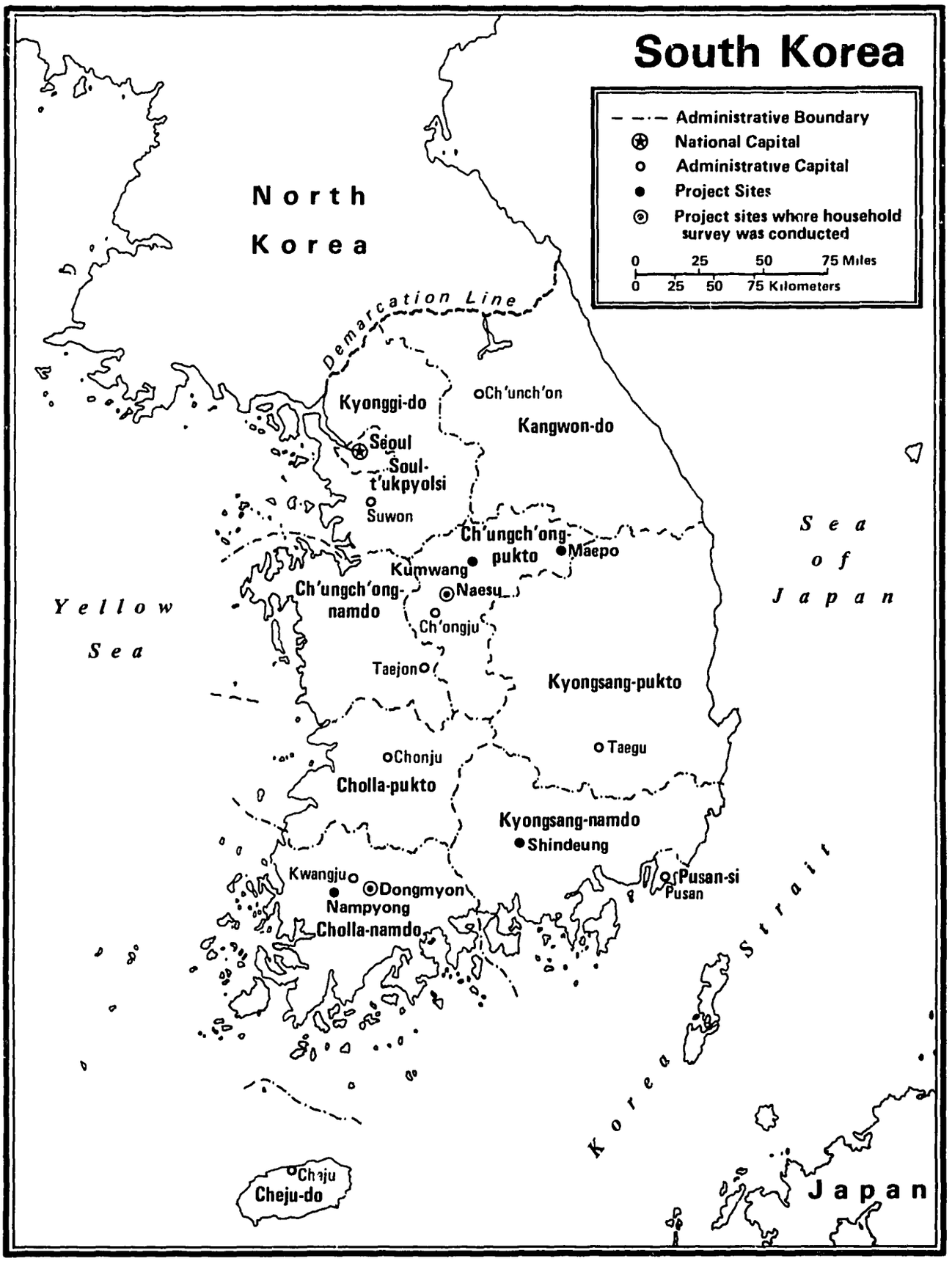
The project produced both positive and negative impacts. Most users felt that the piped water system saved time and made life easier. A few felt that it improved family health. Women, in particular, saw the system as providing more time for leisure or productive activities, and those with water taps in the kitchen could see the prospects of a modern kitchen in the future. Finally, the availability of fire hydrants in the towns was an obvious benefit to public safety.

On the negative side, the system was out of reach of a large number of the poor because households were required to pay for their own connections and meters. An unanticipated negative impact was caused by flush toilets, facilitated by the new piped water systems. Runoff from the flush toilet holding tanks is piped directly to open drains, creating a potential for transmission of water borne diseases.

Perhaps the major shortcoming of the project is its failure to have an impact throughout Korea. Its influence was limited to the six widely scattered communities in which systems were installed. The project was implemented entirely through local governments; therefore it lacked the national or regional focus which might have enhanced the chances for replication. But, more fundamentally, it contained no features that would "merit" model status. Small projects can have an impact on national policies and programs, but only if they are designed for maximum demonstration effect at the national and regional level.

It often is said that we learn best through our failures; this project produced valuable lessons which should serve to improve future rural potable water programs. Principal among these lessons are: (1) water projects must be engineered to produce a product of sufficient quality and quantity to satisfy the demand of users; (2) a health education program is not always a required adjunct to a good potable water project -- existing health programs, attitudes and practices may be quite adequate; (3) systems should be designed to preclude subsidization of operation and maintenance expenses while at the same time be accessible to the low income households in the community; (4) environmental assessments always should be conducted where piped water is introduced into urban or semi-urban communities.

We were fortunate in this project in several respects. First, the lessons learned were at relatively modest cost. Second, while it fell short of its overall goals and objectives, the project did provide a water system in six towns which were in need. Finally, the Korean government has been very receptive to the findings of this evaluation and plans to redress the specific and general problems it has uncovered and incorporate the recommendations in its future potable water programs.


South Korea
Administrative Boundary
National Capital
Administrative Capital
Project Sites
Project sites where household survey was conducted
0 25 50 75 Miles
0 25 50 75 Kilometers
North Korea
Demarcation Line
Kyonggi-do
Ch'unch'on
Kangwon-do
Seoul
Soul-t'ukpyolsi
Suwon
Ch'ungch'ong-pukto
Maepo
Kumwang
Ch'ungch'ong-namdo
Naesu
Ch'ongju
Taejon
Kyongsang-pukto
Taegu
Chonju
Cholla-pukto
Kyongsang-namdo
Shindeung
Kwangju
Dongmyon
Nampyong
Cholla-namdo
Pusan-si
Pusan
Cheju
Cheju-do
Yellow Sea
Sea of Japan
Korea Strait
Japan

I. PROJECT IDENTIFICATION

A. BASIC PROJECT IDENTIFICATION DATA

1. Country: Republic of Korea
2. Project Title: Rural Potable Water Project
3. Project Number: 489-13-899-251

a.	First Project Agreement	FY 1976
b.	Final Obligation	FY 1979
c.	Final Input Delivery	
5.	Project Completion - Final Disbursement	FY 1979
6.	Project Funding	
a.	AID	$ 473,200*
b.	Other Donor	-
c.	Host Country	1,421,900
		$1,895,100

7. Mode of Implementation: OPG Grant to CARE - Korea
8. Evaluations: CARE - Korea: End of Project Evaluation June 1979
9. Responsible Mission officials during life of project:

a. Mission Director - Dennis Barrett
b. AID Representative - William E. Paupe
c. Program Officer - Neboysha R. Brashich
d. Acting Program Officer - Chestaples D. Crowley

*A total of $106,000 was deobligated as an unexpended balance, making AID's actual contribution $366,714.

I. PROJECT SETTING

A. The Problem

The Republic of Korea is conducting a campaign to supply simple piped water systems to all persons living in rural communities of more than 20 families by the end of 1982. This pr gram falls under the aegis of the New Community Movement (Saemaul Undong) which has helped to transform the Korean countryside so dramatically. The program is assisted by the World Food Program, the World Bank, the Asia Development Bank (ADB) and other donors. Presently it is well ahead of schedule.

CARE, in a proposal submitted to AID in 1975, noted that this program does not cover small towns and agglomerated villages which require a larger, more complex system than the simple piped water systems being installed under the New Community Movement. The traditional shallow wells are no longer suitable as a source of water for the urbanized areas of these towns. Often each home is served by a shallow well with a handpump and has its own pit privy. The housing density in many of these towns and the proximity of privies to the shallow wells increase the chance of disease transmission through contamination of the ground water table. CARE proposed a demonstration program to establish a model approach to supply treated piped water systems to communities of 5,000 to 10,000 people.

B. The Target Population

There are over 1000 communities in the Republic of Korea that have a population of between 5,000 and 10,000 persons. Towns of this size tend to be rural service centers or sites of a single large industry. CARE proposed to select low-income communities and build a water system large enough to serve the community for the next 20 years. It also stated that half of the community's population would be connected to the system at the outset although there was no stipulation that the poor in the community would be served.

The CARE Rural Potable Water projects were built in twelve towns. Six of these projects were assisted by AID. These six joint projects, the focus of this impact evaluation, were located in the towns of Kumwang, Naesu and Maepo in Chung Buk Province, Dongmyon and Nampyong in Cholla Nam Province and Shin Deung in Kyong Nam Province. Each town differs in its own way but their general character is rural and most of the people who live in them are farmers or own some farm land. We did conduct a survey of households in Naesu and Dongmyon and found that only 35 percent of the households in these two villages do not own farm land. The survey also showed that the people tend to be long-term residents. There was only a handful of recent migrants,

and, if anything, there was a tendency to migrate out of these towns to cities within the province, usually in search of a better job or educational opportunities for children.

Most of the residents of the two towns surveyed felt their town was lower than average in terms of national income and half felt that they were within the lower income strata of their own community. This subjective evaluation is supported by other survey data showing that more than 60 percent of the respondents possessed only one or no items on a list of amenities that included phonograph, camera, rice cooker, refrigerator and washing machine. Only six percent of the respondents considered themselves in the upper-income bracket.

The two communities that were surveyed did meet the criteria of lower income while three of the six appeared to be above average income. Later in the report we describe in more detail the socio-economic characteristics of the surveyed population and contrast households that paid for piped water connections with those not connected to the system.

C. The Administrative Structure

The potential for the CARE water projects to have wide or significant impacts was affected by CARE's choice of an administrative structure for implementing the program. It was carried out directly with government officials at the county level and, except for initial clearances, the central ministry structure was not involved.

There are four basic levels of government in the Republic of Korea: central, provincial, county, and local for townships, cities, and villages. There is close and efficient coordination from the central government down to the village level with each successive level subordinate to the level above. The entire structure is coordinated by the Ministry of Home Affairs, a primarily administrative agency.

The key to local government planning, administration and action is the county. The county chief is an appointed official of the Ministry of Home Affairs, is usually quite powerful locally and is in a position which has considerable respect in the Korean system. It is at this level that local development priorities are determined within the context of national policies and priorities.

At the county level there are functionaries of the various line ministries such as education, construction and health and social affairs. The CARE project was handled at this level principally by officials from the Ministry of Construction and the Ministry of Health and Social Affairs under the general

direction of the county chief. In the later sections of the evaluation we will show how this affected the operation of the individual systems and limited the impact of what was intended as a model program.

II. THE PROJECT

A. Strategy

In its request for project funding by AID, CARE listed four specific objectives that it would accomplish:

1. Construct six potable water systems in communities of 5,000 - 10,000 persons.

2. Form a potable water committee to supervise each of the village systems.

3. Conduct a sanitation education program in each of the villages.

4. Collect quantifiable health data as a baseline and in a subsequent survey, measure changes resulting from the project.

CARE would select villages after consultation with provincial and county level officials. They would then survey the area to ensure that there was an actual need and that there was funding available by the county government and the local participants to ensure that at least half the number of households in the water service area would be connected to the system at the time of construction. CARE was to take "every precaution... to prevent the exclusion of poorer villages over those that might be considered economically more desirable" (Project Proposal, p. 2).

Village committees, selected by the users, would administer the completed water project. CARE would assist in the formation of the water committee which was to be directly responsible for the day-to-day operation of the water system. The village committee would be responsible for receiving all complaints and suggestions from users and for screening these before advising the county and CARE of dissatisfaction with or malfunction of the system.

The county would construct and operate a water system in each of the villages that was selected. A system would consist of a pumping station, a filtration unit, an elevated storage tank and a distribution system. Households would pay the cost of connecting to the system, including the cost of a water meter. The water committee would collect fees for the water use that would be sufficient to reimburse the county for electricity, maintenance, and the salary of a full-time water system operator.

The water committee, in addition to the specific day-to-day responsibilities for operation of the system, was charged broadly with the support of the sanitation education effort. It was to coordinate the activities and to induce and encourage community participation in the educational aspects of the program. The health educator was to spread the gospel of household and environmental sanitation through 12 formal monthly meetings, discussions in the schools with the students and by practical home demonstrations. CARE would prepare a booklet that covered the major points of the education program and distribute it to all users.

The final objective of the program was to measure the impact of the systems. CARE was to conduct a survey prior to and 12 months after the completion of each system. The objective of the survey was to determine the changes in the knowledge, attitudes, and practices in the use of potable water among those who were connected to the system. In the next section we will outline what acutally happened in the six communities that CARE selected for partial funding of water system construction (see also Appendix F for a profile of the six projects).

B. Implementation

The project failed to meet the targets completely for any of the four objectives: five, not six systems were completed; only one functioning water committee is managing a system on a day-to-day basis; the health education campaign was not carried out as intended; and the impact evaluation did not document changes on the health of water users after a year of operation. In a later section we will make the argument that some of the objectives were not important so that failure to meet the targets in these cases was not a significant factor. We will argue also that documenting health changes one year after completion, as proposed, is not practical.

The most significant failure was in the construction of the water systems themselves. CARE had set out a number of guidelines for implementing the project. They were to: (1) select low-income communities of 5,000 to 10,000 persons; (2) ensure that they had a year-round available source of supply; (3) design systems that could meet the needs of the community for the next 15 to 20 years; and (4) serve at least half of the community with piped water upon completion of the system.

CARE deviated from its proposed selection criteria in a number of different ways. Not all of the six communities selected to receive water systems were low-income. While it was not possible to get income data, the opinion of county officials and the impressions of the team are that three of the communities had above average income levels . Kumwong is a relatively prosperous market town in a rural agricultural area. Maepo is an

industrial and farming community with two large cement plants where, according to county officials, one rationale for the piped water system was to satisfy the needs of management, engineering, and technical personnel who moved in from outside of the area to build and operate the three cement plants. Nampyong is an agricultural community that is rapidly becoming a bedroom community for Gwang Ju since the recent installation of a commuter bus line to that major city. Naesu was considerably smaller than the minimum target size and had tapped into a source of water supply that was inadequate for the present system and, as a result, has had alternate day service during dry periods for the past two years.

At Dongmyon, a coal mining community, a coagulation and sedimentation system that had been planned was eliminated from the system design because of costs.1/ As a result, the water that is delivered to the users has high levels of suspended solids. People often will not drink the water from the plant at Dongmyon because of the odor. The source of supply at Naesu has high organic content. As there is no removal process, the sand filters clog repeatedly and require frequent changes of sand. Maepo provides service to 479 users, only 40 percent of the community, and stopped accepting applicants last June, less than a year after the system was completed. The pump is operating at maximum capacity; even if it is changed the source may not provide the additional water during the dry periods of the year. TABLE I shows in tabular form the systems that did not meet the objectives set out by CARE in the selection of communities and design of systems.

The system design problems are especially serious since the basis for funding such a small number of systems was that they would serve as models for future water systems in the country. Since water systems are not always built to design specifications, the problem may have been that the system built did not conform to CARE suggestions. However, we were refused access to CARE records in New York and were unable to determine if this was a factor in the problem we uncovered.2/

1/ The nearby metropolitan city of Gwang Ju, which uses water from the same source of supply, does have a coagulation and sedimentation system. Indeed, it usually is inadvisable to use a rapid sand filter for surface water supplies unless water is pretreated.

2/ Daniel Dworkin made an appointment to visit the CARE offices in New York. The appointment was made more than a week in advance. When Dworkin arrived for his appointment, the CARE officials with whom he had discussed the project were not available, and he was denied access to the CARE files. He was furnished with marginally useful information; a health information booklet, some incorrect data on project sites, and a questionnaire, but was denied permission to copy the documents. A request to provide copies to AID Washington was not honored.

Care was sent a copy of the draft report, but did not furnish comments. All of this is in marked contrast to the usual cordial cooperation between CARE and AID.

There is no consistent pattern or rationale for the funding of the six systems. We were able to reconstruct the funding of the projects from USAID and Korean county level records and found that the total contribution of CARE to the six systems was ₩106,004,000. The least expensive system, costing ₩39,465,000, was built in one of the higher-income communities and received the highest contribution from CARE -- ₩26,565,000. Shindeung, one of the the poorest communities to be served, received ₩15,939,000 and requires an additional ₩35,000,000 for completion even though considerable labor was contributed on a voluntary basis by the community. It is difficult to understand why CARE has allowed a system to remain uncompleted while there was more than $100,000 unexpended in the grant. Less than $200,000 was expended for materials and equipment by CARE, although $329,600 was budgeted. Funding of each individual system was approximately half of the amount planned in the budget submitted with the OPG grant.

TABLE I

FAILURE TO MEET CARE LOCATION AND DESIGN OBJECTIVES BY COMMUNITY WATER SYSTEMS
(Based on Community Selection and System Construction)

	OBJECTIVE					
Community	Low Income	Technically Sound Design	5,000 - 10,000 Size	Adequate Source	Capable of Expansion	50 Percent Served
Kumwong	No					No
Naesu		No	No			
Maepo	No				No	
Dongmyon		No		No		
Nampyong	No					No
Shindeung						No*

*System not completed.

The other three objectives of the program also were generally unrealized. There is only one village that has a functioning water committee managing the system on a day-to-day basis, and the health education component was reduced from 12 to 6 sessions that were conducted for the most part prior to operation of the system rather than after, as proposed. In Shindeung, the education sessions were held even though the system never was completed and CARE officials were made well aware of the budgetary problem.

The CARE final evaluation was to be based on changes in health and in the knowledge attitude and practices of users over a one-year period. The changes were to be documented by pre- and post-project surveys. However, the post-project survey was conducted in 1977-1978 and could not have determined impacts of the project. The survey included only two AID-funded sites. One of these projects did not have a baseline survey and was not completed until September 1978 while the other was not finished until December of 1978. The CARE evaluation also failed to discuss any of the problems in the present status of the system. The only reference to the incomplete system at Shindeung is that the evaluation was not carried out in that community because of problems of scheduling.

III. PROJECT IMPACTS: FINDINGS AND ANALYSIS

The impacts of the project were restricted primarily to the small proportion (roughly 20 percent) of community households that were served by individual home connections. There were exceptions. Some people shared meters and the potential environmental effects we note included users and non-users as well as those within the watershed of the project. In addition the availability of fire hydrants produced a general benefit to the entire community.

A. The Users, The Uses and The Perceived Impacts

Two of the communities, Naesu and Dongmyon, were selected for more intensive study. In each of these communities we surveyed a sample of households to find out more about the users of the CARE piped water system; who they are, how they use the water, and what their perceptions are about and the impact of the system. Our sample of 67 users in Naesu broke down into 34 who had the piped water system and 33 who did not. In Dongmyon we surveyed 66 households and found that 53 had piped water.[3/] Several nearby villages, not included in the CARE piped water project, also were surveyed as a control.

3/ The sample in Dongmyon was distorted because there were two piped water systems; the one built with CARE assistance and the other system built by the coal mine company. Many homes were served by one or the other system and some by both.

In both Naesu and Dongmyon, the piped water system tended to serve the wealthy members of the community. In Dongmyon this tendency was offset somewhat because the coal company paid for connections to the miners' homes. Both of our measures of relative household wealth -- total income and an inventory of possessions -- confirmed that the system tends to serve the highest income groups (see Tables II and III below).

TABLE II

PERCENT OF HOUSEHOLDS WITH PIPED WATER BY HOUSEHOLD INCOME LEVEL
(for Naesu and Dongmyon)

	Naesu		Dongmyon	
Income	Percent with Piped Water	Total Households in Sample	Percent with Piped Water	Total Households in Sample
Less than ₩100,000	30	20	74	23
₩100,000 - ₩180,000	54	24	77	22
More than ₩180,000	65	23	91	21

TABLE III

PERCENT OF HOUSEHOLDS WITH PIPED WATER
BY HOUSEHOLD OWNERSHIP OF APPLIANCES
(For Naesu and Dongmyon)

	Naesu		Dongmyon	
Number of Appliances	Percent with Piped Water	Total Households in Sample	Percent with Piped Water	Total Households in Sample
0 - 1	33	30	77	43
2 - 3	63	35	86	21
4 +	100	2	100	2

The majority of those surveyed who were not connected to the system said they could not afford the installation cost. The figure in Naesu was 60 percent while in Dongmyon it was 70 percent. Only two persons in the survey cited the monthly fee as a reason for not using piped water (Table IV).

TABLE IV

REASONS FOR NOT CONNECTING TO PIPED WATER SYSTEM
(By Number of Respondents)

Reason	Number of Respondents
Can't afford cost of installation	29
Can't afford monthly fee	2
Have own well	12
Other (unspecified)	3

The Uses of Water

The users of piped water continued to have their previous sources available. In Naesu over 70 percent had been served by private wells while in Dongmyon 20 percent had their own well. In addition some of the households in Dongmyon had unmetered water furnished without charge from nearby communal taps. Rivers flowed through both communities.

The availability of multiple sources resulted in diverse behavior in the use of water. Most people, regardless of whether they had piped water or not, continued to do laundry in the river. Those who had piped water used it largely for bathing and household tasks. Well water was perceived as better than piped water for drinking. Moreover, most households treated piped water before drinking it, a practice that was much less prevalent for households drinking well water (see Table V).4/

4/ Household treatment of drinking water consists primarily of boiling or making a boiled tea with barley or other grains. The purpose was more for improving the taste of the water than for health reasons.

TABLE V

DRINKING WATER TREATMENT BY WATER SOURCE
(By Number of Respondents for both Naesu and Dongmyon -- CARE Sites Only)

Treatment / Source	Don't Treat	Treat
Piped Water	16	18
Well Water	20	6

Perceived Benefits

Three types of benefits were identified by users: improved sanitation and for women, an easier life and more time for productive work. Nearly 70 percent of users claimed more time for productive activities by women while 27 percent said that it made life easier. Less than five percent of our sample noted improved sanitation as a benefit, even though this is the stated goal of the program.

The perceived benefits were influenced by the previous source of supply. Those who had a private well were less likely to respond that the piped water saved time but saw it as a way of making life easier. On the other hand, most of those who relied on community wells thought that the time saved was the major benefit. See Table VI.

TABLE VI

PERCEIVED BENEFITS OF PIPED SUPPLY BASED ON PREVIOUS SOURCES OF SUPPLY
(By Number of Respondents for both Naesu and Dongmyon -- CARE Sites Only)

Previous Source / Benefit	Private Well	Community Well
Saves Time	20	51
Makes Life Easier	10	1
Improves Health	3	0

B. The Impact on Health

We were not able to reach definitive conclusions on the health impacts of this project, even though national and local government officials cited improved health as a major reason for installing a piped water system. CARE established the reduction in incidence of waterborne diseases as a project goal and local officials perceived this as a principal benefit.

No specific studies were done in this project that would offer clues to its impact on health. CARE did a very small pre- and post-project survey in a few villages but concluded that, due to small sample size and the intervening factors just noted, "it is not possible to draw conclusions." Our own experience in casual household interviews in each village was that, while people felt or had been told that treated piped water is safer than untreated water, they could point to no specific evidence that it improved the health conditions of their family.

As a number of previous attempts have shown, it is impossible to establish cause and effect relationships in piped water programs without a carefully controlled research design. Even when baseline data are carefully recorded and follow-up studies record and compare the incidence of disease after the system has been operating for some months, it is impossible to reach conclusions. Other factors, such as variation in rainfall or the incidence of a contagious disease, distort the sample "before" and "after" pictures. In addition, there are no simple survey methods that can establish the incidence of disease unequivocably.

Through our household survey we explored whether the CARE campaign had changed water use practices. For example, CARE had discouraged the use of H.T., an ecologically harmful detergent, and it also discouraged the unhealthy practice of storing water. The survey showed that, with respect to these two practices, there was no significant difference between those who attended the CARE program and those who did not attend.

An improved source of water can have a positive impact on the health of the community, even though it is difficult to prove. However, there was a potential negative impact. We were surprised to find that the availability of a cheap and reliable source of water in the home is making the installation of flush toilets more attractive. Government codes already require flush toilets in new structures in cities (places of greater than 50,000 population) and encourage flush toilets in smaller towns, such as those in which the CARE piped water projects are located. Most of the villages already had some flush toilets; one had thirty flush toilets, all hooked into the new piped water system. Each flush toilet is connected to a holding tank that separates solids from liquid waste and provides some storage capacity. Overflow is piped

to the surface drainage system that carries all the storm water and waste water of the community.

Such a system provides a potential health hazard for transmission of waterborne disease. This was brought to our attention dramatically because of the cholera outbreak in the country. The outbreak and the response are detailed in Appendix G.

The environmental effect of introducing large quantities of water in a densely settled area properly would require an environmental assessment. Such an environmental assessment was requested for this project by the Asia Bureau, but there is no record of any assessment having been performed. The assessment would have anticipated the problems and recommended preventive or corrective measures.

C. Serving the Poor

There are two issues that we considered in assessing whether the systems met the obligation of the Agency to serve the poor: the issue of community selection and the issue of serving the poor within the communities selected.

CARE had stated it would select poor communities in which to build the water systems. It did not do this in three cases. We believe, however, that this is not a relevant criterion for selection of sites for piped water systems in the Republic of Korea. Poorer communities in the 5,000 to 10,000 population size range tend to be losing rather than gaining population and also are likely to prefer traditional water sources that are free to piped water which requires a commitment of income. Water availability, water pollution problems, and rapid urbanization probably are more relevant criteria for site selection than community poverty.

The issue of serving the poor within the community we believe is relevant and was not resolved satisfactorily. The piped water systems did exclude the poor in most of the communities because of the high costs for individual connections. The cost of an individual connection varied between ₩30,000 and ₩60,000 per household. In Dongmyon, low-income families living in coal mine housing were served because the mine paid for all connections.

D. Impact on Women

Women who had piped water liked the convenience. Nearly 60 percent of the respondents in our household survey, all of whom were women, perceived piped water as making their life easier or providing more time for productive activities.

Eighteen percent of the homes in our sample did have more than one tap and the most frequent location of a second tap was the kitchen. Where taps had been introduced into kitchens the response of the users was enthusiastic. In these cases we were frequently shown the inside tap which many considered as the first step toward having a modern kitchen.

Partially offsetting the positive impacts was the time spent in boiling water and preparing tea. This practice was more common in households with piped chlorinated water than in those with traditional supplies. People tended to boil the chlorinated water in this manner to eliminate the taste caused by the chlorine acting on impurities. In most cases, impurities that cause this taste problem can be eliminated with introduction of technologies appropriate for the water source.

E. Project Failures

There were a number of impacts that were anticipated but did not happen. The project was to serve as a model for other towns of 5,000 to 10,000 persons; the health education program was to increase the knowledge and change the attitudes and practices of the community towards water and sanitation; and finally, the baseline and subsequent surveys were to provide information on the health of rural communities and document health improvements based on new, rural water supplies.

The project never was innovative. The project paper claims that metering, fire hydrants, and 24-hour service were innovations may have been true in the past, but by the time this project was implemented there was nothing about the project design or implementation that could serve as a model for any future water system.

The technology and equipment were standard for the Republic of Korea; in most of the counties in which the project was undertaken, similar systems already had been built. This is not too surprising since all of the systems were designed by Korean engineering firms, and CARE's engineer on the project reportedly had no prior experience in developing countries. We were unable to find an instance in which he altered the design produced by the Korean firm.

Even if the project did have lessons for the country, the very method of implementation would have limited the extent of its impact. The six projects were spread across three provinces and no central ministry played an active role in the program. A small project of this type in Korea would have much more potential for impact if the projects had been concentrated in one model region and been part of an active compaign sponsored by the relevant central ministry.

The formation of a village committee to supervise the project was in itself an innovative idea that was compatible with the common Korean practice of forming committees to supervise community work. Such a committee would have been valuable if more participation of the community were required, but it was not. These and other similar systems were being managed adequately by the county government. A village committee is functioning in only one of the project communities.

The health education campaign did not appear to affect the knowledge, attitudes and practices of those we surveyed or informally questioned during the evaluation. Fewer than 20 percent of the respondents in the two towns surveyed attended even a single meeting. Some people remembered the program, but not what they learned from it, and in one instance the Myon Chief said the CARE education program probably induced some people to apply for water hookups. Our survey confirms that in one of the villages those who attended the CARE education program were most likely to have a piped water system. They also tended to be the wealthier members of the community and were more likely to have a water tap within the house. In no case, however, did county officials plan to use an education program in their own present or planned piped water systems.

Health education campaigns always should be based on the existing knowledge and practices of the community. This, too, in many respects, was not the case. The health effort was carried out in the schools and at meetings of women. According to teachers and school officials interviewed, the school lectures presented material that already was covered in the health and hygiene curriculum of the schools. The meetings of women in the community were poorly attended and, based on our survey, attendance has had no significant effect on water use practices. A handbook prepared for distribution to every household as part of the program was not distributed in one of the communities because too few copies were mailed. As a result none of the booklets was distributed.

The baseline survey had not been carried out in all of six sites nor was the final evaluation done for each. Consequently, there was only a single AID funded site that had a baseline survey and follow-up evaluation survey. The major deficiency, however, is not in the lack of coverage but in the superficial content of the survey. The results would not have been useful even if baseline data and follow-up evaluations had been completed. John Neave, an AID sanitary engineer, had commented on the deficiencies in the survey at the time of the project funding and had sent a copy of a more extensive survey undertaken in Thailand.

Analyses of Results

The Korean Potable Water project was in all respects a mediocre effort with limited positive impacts and a potentially

serious negative impact. We have tried to determine to what extent the problems were in the conception, the design, or the implementation. We concluded that the faults exist in each of these areas.

The idea that the project could be a model for water systems designed to serve a segment of the population that had been bypassed in national potable water programs was conceptually good, but the metering and 24-hour service that CARE considered to be pioneer efforts were no longer innovations in the country. Time had overtaken the segments of the program that earlier might have been considered as innovative.

One major fault in conception is the failure to link the increased availability of water to the potential environmental problems. Communities of 5,000 to 10,000 population will use substantial quantities of water, much of which will result in waste water runoff. Since some of this is in the form of waterborne sewerage discharged to open drains, a substantial potential for increase in waterborne disease is created.

There were other conceptual problems. No training was stipulated for water plant operators and none has had anything but informal, on-the-job training. The water committee CARE proposed to oversee the day-to-day operation of the system is impractical and is unnecessary. Finally, the belief that "quantifiable health data" could be collected by a simple questionnaire survey by untrained interviewers was naive and showed a lack of professional knowledge in this area.

The design of the project was inconsistent with the concept of model systems. The sanitary engineer in charge of the project reportedly had no developing country experience and, indeed, made no discernable impact on the design of a model system. This effort, although much smaller, should be compared with a water project in Thailand. In the Thai project, U.S. engineers designed standard models of compact treatment plants that have served as models in Thailand for the past 12 years.

The decision to deal directly with the counties rather than both the counties and the central ministries automatically limited the usefulness of the project as a model for national programs. It also limited the extent that the ministries could backstop the effort. The Ministry of Health, for example, did not realize that the system in Shindeung was incomplete.

Project implementation seemed to be capricious and further limited project usefulness. A wealthy community with the lowest cost system received the largest amount of funds, while the poorest community could not finish the system that was started because of lack of funds, even though CARE did not use all of the budget that was obligated. The Potable Water project may have been the victim of the rapid phaseout of CARE Korea. CARE ended its activities in Korea in June, 1979.

A Final Note

The CARE project has provided five communities with piped water. The sixth will be finished eventually and placed in service. We believe that the systems will improve and grow over time. We hope that the environmental problems caused by the plants will be contained, and a later evaluation may show that the projects were ultimately useful to the users and the country. At best, however, the project was an expensive method of producing limited budgetary support to the water sector in the Republic of Korea.

IV. LESSONS LEARNED AND POLICY IMPLICATIONS

A. In considering a potable water project it is important for AID to ensure that the project rationale is the right one. This project was represented as filling a niche -- i.e., water systems for small rural towns in the 5,000 to 10,000 size class. In fact, this niche did not exist. The Korean government had been installing systems at this level before the CARE project was started. These systems were inadequate in many ways, however, and CARE's project rationale should have been the betterment of systems at this level.

B. In attempting to influence national policy and practice in potable water programs, AID must design the program for maximum impact in the local national context. This project had no impact on national programs. As a small project, it should have been concentrated in one province and set up as a model program with high visibility in a few counties in one province. This would have been consistent with Korean practice. As it was, the project was too dispersed and made too small an input into each specific sub-project to draw any significant attention. This also made the project difficult to monitor, administer, and evaluate. Another alternative, of course, would have been to initiate a very large program which would draw attention by its size and importance in the national context. In this case, the program should have been carried out in close cooperation with a central government ministry.

C. In any water project AID chooses to fund, the Agency should have some assurance that the project is designed to meet the demands of the source of supply, and to produce a product of sufficient quality and quantity to meet the demands of users. This is especially important if the project is to serve as a "model." This project failed as a model. It was no different in design from the typical Korean piped water project for small towns and contained all of their deficiencies. This project missed an opportunity to add technological, design, and locational innovations that, in the long term, might have improved the quality and quantity of potable water for Koreans living in small towns.

D. Small towns need potable water, but priority should not necessarily be given to the poorest towns for reasons noted above. If AID cannot accept this condition it should not entertain such projects. Water projects should be based on relative need and demand, which may have nothing to do with the poverty level.

E. Nonetheless, in those communities in which AID chooses to fund piped water systems with individual home connections, the systems should be designed to reach the poor in each community. This could be done by assuring that the project includes a feasible way for the poor to be connected. In addition, rate structures should provide sufficient water to meet the basic needs of the household at low cost with increasing unit costs for larger quantities, sufficient to meet operating and maintenance expenditures.

F. A health education program is not always a prerequisite to a good potable water project. Existing health programs and practices should be studied carefully to determine whether a program is necessary and, if so, what type it should be. The CARE education program in this project was redundant and not well suited to the Korean institutional structure. It had little or no impact.

G. Environmental assessments always should be conducted where piped water is introduced into urban or semi-urban communities. The introduction of piped water into small towns and agglomerated villages creates potential environmental hazards. The design of the system should address the waste water removal and treatment program of the community.

H. Decisions by donor agency headquarters to terminate operations in a friendly host country should not be taken as a license to shortchange the last projects in the active portfolio. If anything, special consideration should be given to providing adequate staff to complete these projects with maximum effectiveness since these programs may be among those for which the agency is best remembered. This recommendation applies to AID as well as its grantees.

V. FINAL DEBRIEFING IN KOREA

During our very satisfactory final debriefing with the Ministry of Home Affairs and the Ministry of Health and Social Welfare, we were invited to make specific recommendations on ways in which existing and future piped water systems in Korea might be improved. We were most grateful for this invitation, particularly in light of the fact that the U.S. AID program to Korea has been terminated. Both ministries acknowledged that any follow-up responsibilities would be those of the host government. The specific recommendations of the team are set out in Appendix I.

APPENDIX A

METHODOLOGY

The evaluation team consisted of American and Korean professionals. The Americans included a development economist specializing in urban areas and a geographer active in evaluation of AID rural water programs from AID/Washington. Korean members included a senior sociologist from the Korean Development Institute, an interpreter who is a sociologist with extensive experience in anthropological surveys in Korea, and four household surveyors who are graduate students in sociology.

The project was small and this made it possible for the team to visit each of the six systems that were funded by AID. For each of the sites the team interviewed county officials, officials of the communities where the systems were installed, system operators and users. Village committee members also were interviewed in the one town with an active committee. A standardized interview schedule adapted from previous AID potable water evaluations was completed for each of the systems. This was supplemented by extensive open ended questioning of each member of the groups interviewed. The user interviews which took place in randomly selected households were quite informative and helpful because of the female interpreter who was completely conversant with local customs.

Two systems were surveyed more extensively through systematic household surveys. One location was selected in the northern grouping of systems and the other from the southern area of the country. The northern system, in the town of Naesu, was the site of a previous CARE survey; the southern system located in Dongmyon township was selected randomly.

The household survey was carried out under the direction of Kim, Son Ung of the Korean Development Institute. Questions covered in the survey were designed to gather data on who used the system, and the knowledge, attitudes and practices of users and their perception of the impact of the system and of the CARE education component. The methodology and questions used for the survey are included as Appendix E.

APPENDIX B

MEMBERS OF IMPACT EVALUATION TEAM

Eric Chetwynd, Jr., Ph.D., Team Leader, Deputy Director, Office of Urban Development, Bureau for Development Support, U.S. Agency for International Development (AID), Washington, D.C.

Daniel L. Dworkin, Ph.D., Geographer/Water Advisor Social Scientist, Studies Division, Office of Evaluation, Bureau for Program and Policy Coordination, U.S. Agency for International Development (AID), Washington, D.C.

Kim, Song Ung, Ph.D., Director of Household Survey and Consulting Sociologist, Senior Fellow, Korea Development Institute, Seoul, Korea.

Kim, Bong Young, Interpreter/Field Social Anthropologist, Private Consultant, Seoul, Korea.

Kim, Jae Eul, Driver, U.S. Embassy and Korea Model Driver, Seoul, Korea.

Kang, Sun Mi, Household Surveyor (Graduate Student in Sociology), Ewha Woman's University.

Chang, Young Pae, Household Surveyor (Graduate Student in Sociology), Seoul National University.

Lee, Jung Ok, Household Surveyor (Graduate Student in Sociology), Seoul National University.

Yu, Young Ho, Household Surveyor (Graduate Student in Sociology), Seoul National University.

APPENDIX C

WORK PROGRAM AND SCHEDULE OF EVALUATION TEAM FOR PROJECT OPG G-1198 (POTABLE WATER)

Sept. 8 (Monday)	Dr. Dworkin visit to CARE headquarters in New York enroute to Seoul, Korea
Sept. 10-15	Preparation in Seoul, Korea
Sept. 13 (Saturday)	Pilot field insepction trip to Kumwang, Eumsong Gun, Chung Buk Province
Sept. 16	Field inspection trip to Maepo, Tanyang Gun, Chung Buk Province
Sept. 17	Field inspection trip to Naesu, Cheongwon Gun, Chung Buk Province
Sept. 17-20	Household survey in Naesu, Cheongwon Gun, Chung Buk Province
Sept. 18	Field inspection trip to Kumwang, Eumsong Gun, and to Naesu, Choengwon Gun, Chung Buk Province
Sept. 19-20	Report writing in town of Suanbo, Chung Buk Province
Sept. 21 (Sunday)	Travel to the city of Gwang Ju, Cholla Nam Province to prepare Dongmyon household survey and commence visits to project sites
Sept. 22	Field inspection trip to Dongmyon, Hwasoon Gun, Cholla Nam Province
Sept. 22-27	Household survey in Dongmyon
Sept. 23 (Tuesday)	Chusok (major Korean holiday similar to American Thanksgiving holiday)
Sept. 24	Field inspection trip to Nampyong, Naju Gun, Cholla Nam Province
Sept. 25	Return field inspection trip to Dongmyon and travel to the city of Jinju, Kyong Nam Province to prepare for final field site visit
Sept. 26	Field inspection trip to Shindeung, Sanchong Gun, Kyong Nam Province and travel to city of Pusan

Sept. 27	Report writing in Pusan and travel to city of Kyungju, Kyong Nam Province
Sept. 28 (Sunday)	Report preparation in Kyungju, Kyong Nam Province
Sept. 29	Travel to Seoul
Sept. 29 - Oct. 5	Report writing, survey analysis, and debriefings in Seoul
Oct. 5 (Sunday)	Depart Korea for Washington.

APPENDIX D

PERSONS CONSULTED

Seoul

Republic of Korea Government

Ministry of Health and Social Affairs

Shin, Hoon-Shik, Director
Sanitation Control Division

Ministry of Home Affairs

Choi, In-Kee, Director-General
Bureau of Saemaul Unding (New Community Movement)

Lee, Man-Eui, Secretary-General
Office of Saemaul Undong

Other

Korea Development Institute

Kim, Son-Ung, Ph.D
Senior Fellow

Chung Buk Province

Eumsong Gun

Oh, Nam Seul, Gun Chief

Kwon, Young Kap, Director of Water System

Pan, No Pyung, Director of Saemaul Water and Housing Programs

Kumwang Eup

Lee, Hee Chang, Eup Chief

Kim, Kee Duk, Deputy Gun Ghief

Shin, Hyung Tak, Chief, Rural Land Section of Division of Construction

Maepo Myun

Kim, Soo Young, Chief of General Affairs Section

Cheonguon Gun

Pyun, Chae Tack, Assistant Civil Engineer

Pukil Myun

Kim, Kook Hyun, Myun Chief

Kim, Myung Hway, Assistant Myun Chief

Naesu Ri

Sung, Tal Young, Head of Water Committee

Pyun, Sang Kup, Operator, Water System

Kim, Yong Ha, Assistant, Doctor's Office

Oh, Hyun Kyun, Operator, Water System

Cholla Nam Province

Hwasun Gun

Yun, Chee Hyuk, Gun Su

Oh, Jae Yung, Chief of Construction Section

Cho, Yung Kyun, Sub-Section Chief of Construction and Housing

Dong Myun

Cho, Ki Chung, Myon Chief

Min, Kap Shik, Deputy Myon Chief

Yu, Chae Choon, Chief of Housing and Construction Sub-Section

Yu, Kil, Han, General Affairs Sub-Section

Cho, Sang Sool, Head of Teachers, Dang Myon Primary School

Chong, Yun Chul, Physical Education Instructor, Dang Myon Primary School

Lee, Moon Ok, Ri Jan, Myon So Ki

Naju Gun

Lee, Chong Ha, Gun Chief

Kim, Tae Up, Deputy Gun Chief

Kim, Sung Rak, Chief of Construction Section

Lee, Dong Sup, Chief City Planning Sub-Section

Nam Pyung Myon

Yun, Pyung Han, Chief of General Affairs Sub-Section

Choi, Too Suk, Operator. Water System

Kyong Nam Province

Sanchong Gun (Shin Deung Myon)

Ahn, Kang Shik, Gun Chief

Choi, Kwan Min, Deputy Gun Chief

Han, Sung Woo, Chief of Construction Section

Choi, Ill Sup, Chief of Sanitation Section

Ok, Soo Suk, Chief of Construction and Housing Section

Choi, Ill Boo, Engineer, Construction and Housing Section

USAID/Korea

William E. Paupe, AID Representative

Lee, Sung Gun, Program

U.S. Peace Corps, Korea

James E. H. Mayer, Director

World Food Programme (WFP), Korea

Robert H. Meyer, Deputy Representative

WFP Rural Potable Water Evaluation Team

Monique Forestier, Project Development Division, WFP, Rome

Dr. Jean-Pierre Dustin, World Health Organization

CARE Headquarter, New York, New York

Ellen Leiber

IBRD, Washington, D.C.

Peter Whitford, Rural Infrastructure Project

Robert Morton, Rural Infrastructure Project

APPENDIX E

HOUSEHOLD SURVEY

The purpose of the household survey was first to obtain detailed data on the socio-economic condition of the villages served and within the villages the characteristics of the population that had opted to pay for individual metered connections and those who did not. Secondly, we wished to determine the attitudes, knowledge of water and health relationship and water practices of those who participated in the CARE education program and to compare it with those who did not.

Dr. Kim, Son Ung, a Korean sociologist from the Korean Development Institute, was responsible for all the activities undertaken to carry out the household survey. Actual data gathering was done by a team of four graduate students; two females and two males. The questionnaire used for the survey was developed by Dr. Kim after consultation with the AID/Washington team.

The questionnaire consists of four major parts: (1) socio-demographic information of each member of the sampled household; (2) general household characteristics; (3) series of questions on piped water use pattern and its effects; and (4) some items on social participation, attitudes on modernity and some on the Saemaul Campaign. Each item of the questionnaire was structured in terms of either a nominal or an ordinal scale of values. A list of the basic questions included in Dr. Kim's survey report is incorporated in this Appendix.

Sampling

A stratified random sample was used to select two survey communities and sample populations. One survey community, Naesu, was selected from the three project sites in the central region of Korea and the other, Dongmyon, was selected from the three project communities in the south. Within the communities the population living in the area served by the piped water system was divided into those who had individual piped water and those who did not. A sample of approximately 10 percent of users and non-users was selected on the basis of every tenth household in a listing of all the households in the area. For each household selected, the next name was chosen as an alternative.

The teams were instructed to finish the list of selected households, or alternates, and then to sample additional

alternate households not covered in the first selection. Ultimately, 190 households were sampled.

One hundred eighty-one valid questionnaires were completed and analyzed. In each household the female designated as the housewife was interviewed by a team member. The interview lasted approximately one hour.

Data was keypunched and verified and analyzed using the Statistical Package for the Social Sciences (SPSS). Frequencies and a number of cross-tabulations were calculated and are reported throughout the evaluation. Dr. Kim's final report on survey methodology and results follows.

THE CURRENT POTABLE WATER SITUATION AND HOME WATER USE PATTERN IN RURAL KOREA

by

Son-Ung Kim
Senior Fellow
Korea Development Institute
Seoul, Korea

December 1980

NOTE

This report was prepared by Dr. Kim independently of the main report. The data base used to prepare the main report and this appendix is the same and was developed through the household survey directed by Dr. Kim. However, the authors of the main report reached somewhat different conclusions from those of Dr. Kim on a few questions. This is due primarily to the fact that the data analysis performed for the main report separated out the Saemaul Undong piped water users from those in the CARE project areas.

TABLE OF CONTENTS

I. INTRODUCTION

Although the number of families served by individual piped water supplies have increased dramatically in Korea in recent years there still are a number of people who do not have piped water or are served by systems without adequate capacity. Most of the families who do not have a dependable supply of piped water live in urban areas. Those least well served are in cities of over 200,000 where a recent survey indicated only 28 percent of the families have access to an adequate source of piped water. In smaller urban areas 52 percent of the people are without access to suitable piped water systems. Rural families, in contrast, are much better off. As of mid 1980, approximately 80 percent of the families have individual piped water connections providing adequate amounts of water and the coverage is expanding rapidly. By 1982 at least 90 percent of rural households in villages of 20 or more families will have an individual piped water source (Han'guk Ilbo Sept. 20, 1980).

The inadequate supply of piped water in urban areas has resulted from the rapid migration to the cities. The success in the rural areas can be attributed to the Saemaul Undong.1/ Under this program the government has furnished material and advice to local villages. People in the villages provide all the labor and some locally available materials. The systems are simple and provide unfiltered chlorinated water through individual connections to all families in a village.

The Saemaul strategy for building piped water systems is not suitable for urban areas since the systems required there are larger and more sophisticated. In urban areas extensive public funding is required to build suitable systems. Planning Board (EPB) authorized on September 19, 1980, the amount of 9 billion (won) -- 4 billion won of local government funds -- for the development of water resources and expanding piped water systems in 30 small and medium cities during 1981-1983 (Han'guk Ilbo Sept. 20, 1980). Even in this latest budget the semi urban communities with populations

---

1/ The Saemaul Undong (New Village Movement) started in 1971 as a Korean style community development strategy initiated by the late president Park Chung Hee. However, the Saemaul Undong program is in principle based upon voluntary grass roots participation in cooperative activities under the broad guidance of the government. The major program components of the Saemaul Undong are (1) rural income increase, (2) improving the community living environment, and (3) spiritual campaign for modernization. The program emphasis in the area of environmental improvements has been on such projects as village road construction, building reservoirs and riverbanks, modernizing farmhouse structure, establishing simplified portable water systems, etc.

of 5,000 to 10,000 people are not covered. These villages are too large for the Saemaul approach and too small to participate in the national concern with serving the larger urban areas. It is these communities that CARE identified as a suitable target group.

Between 1976 and 1978, CARE initiated the Rural Korea Piped Water Systems Program by providing partial assistance to 14 lower income rural settlements with populations of 5,000 to 10,000 (CARE, 1980). In addition to partial support of the construction costs of the piped water systems, CARE provided a series of education classes on the value of piped water and household and environmental sanitation to the housewives at the project sites. AID assisted with partial funding of six of the systems.

The major objective of the present report is to examine the impact of piped water systems and the water usage pattern in rural Korea from the user's viewpoint, based on household surveys in two small towns served by CARE assisted water systems. In this regard, the present report will address the following issues: (1) who are the piped water users, (ii) what are the water usage habits in rural Korea, (iii) what has been the impact of piped water subscription, and (iv) what are preceived benefits from the user's viewpoint. Finally, lessons and recommendations will be discussed.

II. DATA and METHOD

1. Sampling and Data Collection Method

The survey used a mixed method of sampling in a multistage design. In the first stage, two rural settlements -- "Naesuri" in Cheongwon-gun, North Chungcheong Province, and "Dongmyon" in Hwasun-gun, South Cholla Province, were selected as household survey areas out of six areas coming under AID-funded piped water system programs. These two survey sites were selected simply because of the convenience of their location, rather than through a specific sampling method. Both "Naesuri" and "Dongmyon" are pseudonyms for rural settlements which are partially agricultural and partially non-agricultural in character. Naesuri is a typical Korean rural settlement situated in the hinterland of Cheongju City, the provincial capital of North Chungcheong. Dongmyon, on the other hand, is a coal mining settlement which also has an agricultural base, located about one hour's driving distance south of Kwangju City, the provincial capital of South Cholla.

In the second stage, the survey districts were defined as the villages (ri) with potable water systems among the villages of the two areas, and all households in the survey districts were stratified into piped water system subscribers and nonsubscribers. In Naesuri, 324 households out of a total of 673 households were found to be subscribers. In the final stage of sampling, the survey house-

holds were selected through a systematic random method based on a sampling rate of 10 percent. Consequently, in Naesuri 67 households were selected out of 673 households and all the selected households were successfully interviewed.

The sample size in Dongmyon is much larger than in Naesuri and the household selection method was somewhat different from that used in Naesuri. All the ri (villages) of Dong-myon were grouped into three catagories: (1) ri with a potable water system, (ii) ri with a simplified piped water supply built under the Saemaul program, and (iii) ri without any piped water supply system. A simple random method was employed in the final selection of household units in each of the three categories of villages. The total sample size is 120 household units: 70 in the villages with the piped water system, 25 from villages (Muri, Garori, Kyonghyun) with the Saemaul simplified piped water supply system, and 25 from the one village (Nongso) without any piped water facilities. The respondents in Dong-myon were less cooperative and six households refused to be interviewed, or were incompletely interviewed. Out of the 120 sample households, interviews were completed for 114 households.

2. The Nature of the Data and Method of Analysis

The household questionnaire consists of four broad groups of items: (i) socio-demographic information on each member of the sampled household, including age, sex, marital status, educational attainment level, and items relating to economic activity, (ii) questions on household water sources and usage habits; (iii) the effects of piped water supply and its perceived benefits; and (iv) some general information on social activities, attitudes toward modernity and the effectiveness of the Saemaul Undong. Each item of the questions was either nominally categorized or structured on an ordinal scale of values (see the question items in Appendix A).

Due to the nature of each variable, two type of methods are employed in the analysis of data: ordinary cross tabulation analysis and multiple classification analysis (MCA). Two or three way cross-tabulations are used for the descriptive analysis of data, and for the comparison of the socio-demographic characteristics of potable water users and non-users, and of patterns of water use between users and non-users. Multiple Classification Analysis (MCA) is used to examine the effects of designated explanatory variables on a dependent variable. MCA is in fact a sub-program of the Analysis of Variance (ANOVA). Ordinary ANOVA requires that all the variables in an equation have continuous values on the interval scale. Under the restriction that the dependent variable has interval scale values, however, MCA can be used to measure the effects of category variables on this dependent variable. Considering the nature of the data collected, MCA is an appropriate analytical method, particularly for the examination of the impacts of the piped water system.

III. SOCIO-ECONOMIC BACKGROUND OF SAMPLE HOUSEHOLDS

1. Respondents' Socio-Demographic Characteristics

Water collection and most water uses are the responsibility of women. We therefore interviewed mostly housewives. As Table I shows, more than two-thirds (65%) were more than 40 years of age. Like many Korean women of this age, the educational attainment level of the respondents is generally very low; more than one-third (37.0%) had no schooling, and 45.3 percent had only completed primary schooling. Middle and high school graduates among the respondents were only 14.4 and 3.3 percent, respectively.

The heads of the surveyed households were found to be slightly better educated than their spouses: 47 percent had primary schooling while about 22 percent had no schooling; in addition, 17 percent were middle school graduates, 12 percent were high school graduates and 3 percent were college graduates. Because the survey areas are in rural townships more than a half (51.4%) of the household heads are farmers while one-fourth (25%) are either blue collar workers or simple laborers. Only 9 percent engage in sales or services occupations and 6.6 percent have white collar jobs.

Table 1. Age distribution of Respondents (Housewives)

age	(N)	(%)	cum.(%)
19	2	1.1	1.1
20-29	21	11.6	12.7
30-39	37	20.4	33.1
40-49	69	38.1	71.3
50+	52	28.7	100.0
Total	181	100.0	-

About two-thirds (62.4%) of household members were born in and have lived continuously in the survey area, and one-third (32.6%) have lived in the same house since their birth. In terms of recency of residence, 19 families out of a total of 69 in-migrant households moved in during the last five years. Only five in-migrant households came from urban areas while 64 households had migrated from neighboring rural areas.

Concerning intentions for future migration, a majority of the resident households wanted to remain in their hometown. Only 52 households (28.7%) out of 181 sample households have considered moving elsewhere, while 71.3 percent indicated no intention to out-migrate. Among those who consider moving out, all wanted to go to urban areas: 44 (85%) out of 52 households with migration intentions wanted to move to provincial urban areas within the province and eight households (15%) wanted to go to Seoul. The major reasons given for migration are better job opportunities (57.7%) -- especially among the young families -- opportunities for children's higher education (36.5%) -- chiefly among older families.

The housing situation in rural towns is much better than in urban areas due both to the stability and length of residence, and continued rural out-migration. Among sample households 82 percent own their own homes and only 10.5 percent live in rented housing. In contrast there are serious housing shortages in urban areas, with an average of 57 percent of householding owning their residences. (Korea Municipal Yearbook, 1979). In the two survey areas, however, the home ownership rate in Dongmyon is much higher at 86 percent than the 76 percent in Naesuri.

2. Rural Household Structure

In traditional Korea of the past, the extended family was the predominant family system, and provided social security for the elderly. In the extended family system, old parents and grandparents live together with their married children, especially sons, and the most important social obligation of adults is to take good care of their parents and grandparents. Under such recent social changes as rapid industrialization and related urbanization, however, the Korean family has changed considerably in average size, composition and, thereby, in its socio-economic function.

According to the 1975 Census report, 67.6 percent of all Korean households are classified as nuclear families with unmarried children while 73.7 percent of urban households were classified as nuclear families (EPB, 1975 Census Report, 1977). Our survey found that about 40 percent of the sample households were extended households consisting of three generations living together -- the household head and spouse, children, and head's parents or in-laws. This may be compared to the 36 percent of all rural households which were considered to be extended families according to the 1975 Korean census.

Table 2 compares the distribution of households by number of family members for the whole nation all urban areas, and the survey areas. The households in the villages surveyed occupied a position that was between urban and rural ar. confirmed the designation as semi-urban communities. The average size of all Korean households

in 1975 was 5.04 persons and about 60 percent of households had less than six members. Urban households had an average of 4.81 members and 45 percent of urban households had four household members or less. According to the present survey, the average household size was 5.11 persons, slightly larger than the national average five years before. The family size distribution of the survey areas looks quite similar to that of the urban areas and the nation as a whole in 1975, except that the proportions of single person households and two-person households are slightly lower than in the urban sector and the nation as a whole in 1975.

Table 2

Household Distribution by Household Size,
National Urban Areas and Rural Survey Areas.

Household Size	All Korea			Urban Area			Survey Areas		
	(N)	(%)	(Cum.%)	(N)	(%)	(Cum.%)	(N)	(%)	(Cum.%)
1	281,007	4.2	4.2	150,660	4.5	4.5	5	2.8	2.8
2	552,767	8.3	12.5	301,345	9.0	13.5	9	5.0	7.7
3	814,575	12.3	24.8	450,284	13.5	27.0	24	13.3	21.0
4	1,072,873	16.1	40.9	596,515	17.9	44.7	30	16.6	37.6
5	1,218,097	18.3	59.2	647,742	17.5	54.4	38	21.0	58.6
6	1,103,237	16.6	75.8	533,103	16.0	80.4	31	17.1	75.7
7	779,473	11.7	87.5	335,449	10.1	90.5	27	14.7	90.6
8	511,017	7.7	95.2	202,802	6.1	96.6	10	5.5	96.1
9+	315,735	4.8	100.0	111,348	3.4	100.0	7	3.9	100.0
Total	6,647,778	100.0	-	3,331,248	100.0	-	181	100.0	-
Pop.		33,504,147			16,037,367			925	
Mean Household Size		5.04			4.81			5.11	

Source: Data for All Korea and Urban Areas are based on 1975 Census Report Vol. 1, EPB, 1977: Table 8.

Source: Urban Areas refer to Shi (city) units with a population of 50,000 and more.

Table 3 illustrates three different aspects of the composition of households: the sex ratio (ratio of males to females), dependency ratio, and economic activity ratio. The sex ratio distribution indicates that the number of households with a higher sex ratio, (1.5 and over) is almost double that of households with a lower sex ratio (less than 0.5). This and the average sex ratio suggests that more males live in rural areas and more females have migrated to urban areas.

Table 3

Composition Pattern of Household Members: Sex Ratio Dependency Ratio, and Economic Activity Ratio.

	Distribution of Composition Ratio Values								
Ratio Value		Sex Ratio[1]		Dependency Ratio[2]			Economic Activity Ratio[3]		
	(N)	(%)	(Cum.%)	(N)	(%)	(Cum.%)	(N)	(%)	(Cum.%)
0.5	28	15.5	15.5	33	18.2	18.2	98	54.1	54.1
0.5-1.0	52	28.7	44.2	60	33.1	51.3	53	29.3	83.4
1.0-1.5	49	27.1	71.3	18	9.9	61.2	22	12.2	95.6
1.5+	52	28.7	100.0	70	38.7	99.7	8	4.4	100.0
Total Average	181	100.0	-	181	100.0	-	181	100.0	-

1/ : Male/Female members

2/ : Ratio of ages groups (0-14) + (65+) / (15-64)

3/ : Ratio of all economically active members to members in (15-64) age group

In terms of the age composition of the surveyed families, almost 40 percent of the households show a dependency ratio of 1.5 or higher indicating that families have many young children or dependent members age 65 and older. However, a fairly large number of households (33.1%) have modest family dependency ratios, ranging between 0.5 and 1.0.

Another measure of the productive and non productive family members is the economic activity ratio. This is the proportion of working members among family members between 15 and 64 years of age. Table 3 indicates that the households in general have low economic activity ratios.

More than half of the sample households (54.1%) have economic activity ratios of less than 0.5 and 83.4 percent have ratios of 1.0 and below. However, 17 percent of the households have economic activity ratios above 1.0. This means that a considerable proportion of rural households include working family members who are either under age 15 or over age 65.

3. Economic Characteristics of Rural Households

Income and assets are important and objective indicators of the economic conditions of households. The survey asked respondents the amount of farm and non farm income for the family. No attempt was made to verify the data provided. According to the survey the average annual household income in the two communities was found to be 1,624,000 won compared to a national average of over 2,000,000 won in 1979 (see Appendix B). The two survey communities differed substantially in mean household income: i.e., 1,914,000 won for Naesuri and 1,454,000 won for Dongmyon (Table 4). Government statistics on regional income indicate that the household income level in South Cholla Province is lower than in North Chungcheong Province, which is about at the same level as the national average (see Appendix B). Household income was broken down into farm income and non-farm income are also observed between the two communities, as seen in panels, (B) and (C) of Table 4.

Table 4 illustrates income distribution of the sample residents in each community. For instance, the average non-farm income of Dongmyon residents is only three-fourths that of Naesuri. In the income distribution of each community's residents, Dongmyon has a larger proportion of households in the lowest (41%) income group. This is 11 percentage points greater than the 30% in Naesuri. However, the pattern of farm income distribution between the two communities is the opposite of the pattern of both total household income and non-farm income. In other words, with respect to farm income, the proportion in the bottom group in Naesuri is 46.3 percent -- 13 percentage points greater than the 33.3 percent for Dongmyon. This is primarily due to differences in the distribution of landholdings between the two areas. The proportion of smallest landholders -- including both landless households and those with less than 1 majigi (660 sq. meters) -- is 45 percent in Naesuri and about 30 percent in Dongmyon.

Both survey districts are principally agricultural areas but 35 percent (63 households) out of 181 sample households are classified as rural non-farm households without agricultural landholdings. With the small size of landholdings and the changing structure of rural economic activities, agricultural activities are no longer the major income source of the rural households in Korean small towns. In the case of all sample households in the survey, the average agri-

Table 4

Profile of Household Economic Characteristics

A. Percent Distribution of Total Annual Household Income and Mean Income by Survey District.

Income Category 1/	Both towns (%)	(N)	Naesuri (%)	(N)	Dongmyon (%)	(N)
1,000	37.0	(67)	29.9	(20)	41.2	(47)
1,000 - 1,800	33.2	(60)	35.8	(24)	31.6	(36)
1,800+	29.8	(54)	34.3	(23)	27.2	(31)
Mean	1,624		1,914		1,454	
Total	100.0	(181)	100.0	(67)	100.0	(114)

1/ Unit: 1,000 won

B. Annual Household Farm Income.

Income Category 1/	Both towns (%)	(N)	Naesuri (%)	(N)	Dongmyon (%)	(N)
100	38.1	(69)	46.3	(31)	33.3	(38)
100 - 690	31.0	(56)	19.4	(13)	37.7	(43)
690+	30.9	(56)	34.3	(23)	29.0	(33)
Mean	538		630		485	
Total	100.0	(181)	100.0	(67)	100.0	(114)

1/ Unit: 1,000 won

C. Annual Household Non-farm Income [1/]

Income Category [2/]	Both towns (%)	(N)	Naesuri (%)	(N)	Dongmyon (%)	(N)
400	28.2	(51)	23.9	(16)	30.7	(35)
400 - 1,400	39.8	(72)	35.8	(24)	42.1	(48)
1,400+	32.0	(58)	40.3	(27)	27.2	(31)
Mean	1,086		1,285		969	
Total	100.0	(181)	100.0	(67)	100.0	(114)

1/ The figure in ( ) indicate the frequency of households.

2/ Unit: 1,000 won

cultural income was 538,000 won, half of the 1,086,000 won, average for non-farm income. This suggests that a majority of the survey households are engaged in some non-farming activities.

As a supplementary characteristic of economic status respondents were asked to indicate whether they considered themselves as being wealthy, poor, as average in comparison to others in the town. Table 5-A illustrates the distribution of class membership self evaluation among the respondents in the two survey districts. About half of the respondents evaluated themselves as poor and among the lower income strata in their community, while only 6 percent considered themselves as members of the upper income group. The proprotion in the upper income group is very small and about the same in both communities. However, the proportions in both the lower and middle income classes differed slightly between the two areas. A larger proportion (53.6%) of Dongmyon respondents felt poorer compared to their neighbors than was the case (43.4%) among Naesuri respondents. The distribution of class identification agrees with the household income distribution between the two regions.

Life-style is also an indirect measure of the socioeconomic status of households. Ownership of a specific list of six household appliances was selected as a proxy measure for life-style in the survey. The household appliances included TV, phonograph, refreigerator, washing machine, camera, and electric rice cooker. According to our findings, TV is the most popular appliance, and is owned by four out of every five surveyed households. The other items still are not widely owned. For both towns taken together, the households had an average of 1.4 of the designated items: averaging 1.4, 1.8 items in Naesuri, and 1.2 items in Dongmyon.

In conclusion, Korea has been experiencing radical social changes, shifting from an agrarian to an industrial society and from a rural to an urban society as a result of the unprecedently rapid rate of industrialization and concomitant urbanization of recent years. In comparison with the big cities, small towns and rural areas have been thought to be more traditional in nature and somewhat stagnant. According to the empirical findings of the present survey, however, the Korean rural society also appears to have changed significantly in various aspects.

The traditional family system among rural households has changed considerably in both structure and function. Size and family composition of the rural family also have changed. The average family size is smaller than before due to gradual fertility reduction and the continuing out-migration of family members. Rural households are in a transition from the extended family to nuclear families consisting of older couples with unmarried children, because increasing proportions of married children have left for industrial urban areas or because the young couples have preferred to seek an independent living in non-farm occupations.

Table 5. The Percent Distribution of the Self Evaluation of Class Membership and the Distribution of Household Items.

A. Subjective Class Membership Evaluation

Class	Both towns (N)	(%)	Naesuri (N)	(%)	Dongmyon (N)	(%)
Upper	(11)	6.2	(4)	6.0	(7)	6.3
Middle	(79)	44.1	(34)	50.7	(45)	40.2
Lower	(89)	49.7	(29)	43.3	(60)	53.6
Total	(179)	100.0	(67)	100.0	(112)	100.0

1/ Sample includes households from Saemaul Undong, control community and CARE sites.

B. Household Items 1/

No. of Items Owned	Both towns (N)	(%)	Naesuri (N)	(%)	Dongmyon (N)	(%)
1	(612)	61.9	(30)	44.8	(82)	71.9
2 - 3	(65)	35.9	(35)	52.2	(30)	26.3
4+	(4)	2.2	(2)	3.0	(2)	1.8
Mean	1.43		1.79		1.21	
Total	(181)	100.0	(67)	100.0	(114)	100.0

1/ See text for items covered. Sample includes households from Saemaul, Undong, control community and CARE sites.

Both industrial structure and living conditions also have changed significantly in rural areas. Not only has the proportion of non-agricultural workers increased substantially among the rural population but a majority of farm households in rural towns also have been engaging in non-farming activities. Thus, the share of non-farm income is on the average double that of farm income in total household income in the rural towns surveyed. Rural household income gradually increased until 1979 though it has again come to lag behind the income of urban non-farm household (see Appendix C). Moreover, ownership of modern household appliances is no longer a strictly urban characteristic and rural residents have begun to enjoy increasing ownership of such modern items. There also has been considerable improvement of living conditions in the rural areas, with the extension of electrification and the more extensive coverage of rural families with piped water systems. The following sections will analyze the characteristics of the piped water users, the behavioral patterns of water use, and the socio-economic impacts of piped water supply in rural Korea.

IV. USERS VS. NON-USERS of PIPED WATER SYSTEMS

Korea has sufficient water resources for both domestic consumption and agricultural use with around 50 inches of rainfall per year. The major source of drinking water in Korea used to be underground water obtained from shallow wells both with and without pumps. Natural streams and springs were used in mountain areas. With the extensive industrialization and urban expansion of recent years, rivers and underground water in many urban areas have become seriously polluted and are no longer either safe or adequate for supplying individual households without treatment. Thus, piped water systems are the only feasible source of drinking water in urban areas.

As indicated earlier, municipal systems do not have the necessary capacity and therefore water shortage is a common problem in most medium and big cities due to increased urban population and increased per capita water use. Rural areas have fared better. In the past few years, construction of piped water supply system has been one of the major community development programs in rural areas. Piped water is presently available in most rural villages and many small towns. Towns generally have somewhat more sophisticated potable water systems while isolated rural villages are mainly served by a simply piped water system established under the so-called Saemaul program.

In the communities with systems built by CARE a majority of the residents have not yet subscribed to these systems. Since the use of the piped water system can be considered an indicator of innovation acceptance and practice in Korean rural society, we were interested in a socio-economic profile of users and non-users.

1. The Relationship with Farm Households

Among the 181 sample households in both survey areas, 88 households (48.6%) were users of piped water systems. The number of households subscribing to the system in Naesuri was 34 (50.7%) out of total 67 sample households, while 53 households (47.4%) were piped water users among the 114 sample households in Dongmyon were users. Table 6 shows the relationship of piped water use to farm land ownership.

There is a significant negative statistical association between piped water use and farmland ownership ($p = .000$). Of the 88 households with the potable water subscription, non-farm households comprised 52.3 percent. Only 35.6 percent of the farm households used the water system while 73 percent of the non-farm households were subscribers (Table 6). This suggests that among rural people the non-farm families are more receptive to modern innovation and are more urban-oriented than farmers who own their own land.

Table 6. Relationship of the Piped Water Users with Farm Ownership.

Farm Ownership	Non-User		User		Row Total	
	(N)	(%)	(N)	(%)	(N)	(%)
None	27.0	(17)	73.0	(46)	100.0	(63)
		18.3		52.3		34.8
Yes	64.4	(76)	35.6	(42)	100.0	(118)
		81.7		47.7		65.2
Column Total	51.4	(93)	48.6	(88)	100.0	(118)
	100.0		100.0		100.0	

Note: Chi - sq. = 21.55 (1d.f. at 0.000).

2. Relationship with Household's Economic Characteristics

In urban areas, the rate of piped water use among the residents is not a function of the household's economic status, but is rather directly related to the capacity of the water system to serve the population. In rural areas with small populations, however, the

piped water system usage rate is not generally decided by the system capacity but is largely dependent on the residents' attitude toward the system and the economic status of households, especially in low income rural areas. The survey found that, in terms of proportions, 73 percent of those who identified with the upper class in their community were piped water users while only 44 percent of those who felt poorer than their neighbors were system subscribers.

Table 7 presents the relationship of piped water subscription to total household income, farm income, and non-farm income. The rate of use increases proportionally with the household income level. The distribution of piped water users is positively related to income level while that of non-users is in a roughly inverse relation with income level.

Although income is a key determinant of the decision to subscribe to the water system, the source of income is equally important. Farmers are less likely to pay for individual connections and the higher the level of farm income, the less likely they are to pay for a private tap. In contrast, those with high levels of non farm income are more likely to subscribe to the piped water system. The relationships between source and amount of income and use of piped water are highly significant ($p = < .001$). Among those who chose not to pay for a private connection, the reasons were predominantly the initial investment costs rather than the monthly fee. Over 60 percent of the non-users stated that they could not afford the cost of installation compared to five percent who said they could not afford the monthly fee. Twenty-five percent did not choose to connect to the system because they had their own well. Less than 10 percent gave a number of other reasons for non subscription.

In conclusion, the above analysis of the economic characteristics of the piped water users suggests that non farm household income has been an important determinant of piped water subscription in rural towns. Moreover, the non-farm income fraction of total household income is positively related to piped water subscription while the level of farm income has an inverse relation to the subscription rate. This implies the following: first, low income rural populations are sensitive to the economic costs of piped water, primarily the original installment cost. Second, the acceptance and use of modern innovations such as piped water systems is affected by the degree of change among the rural people from traditional attitudes on the part of the farmers to the urban attitudes of those who are not farmers.

3. The Relationship of Piped Water Use to the Social Characteristics of Household Heads

In the preceding sections, the relationship of piped water subscription to farmland ownership and household income level has been discussed. Although household income, which indicates ability to afford the service, is found to be an important factor in piped water subscription in low income rural areas, non economic factors are also believed to play a significant role in the decision to adopt such a modern innovation. In this regard, both the level of educational attainment and the occupation of household head may be considered to be non-economic factors which affect attitudes toward piped water use.

The level of education is one of the most important factors in forming general attitudes and directing social behavior. Table 8 presents the relationship between piped water subscription and the educational attainment level of the household head. The statistical association between the two variables is highly significant ($p = < .001$). The subscription rate increases as the household head's educational level goes up from no schooling to higher education.

While education is a major factor in the attitude toward changes and in determining occupational mobility, in everyday life, one's life-style is closely associated with occupation due to occupation-specific income differentials. Table 9 illustrates the relationship between the household head's occupation and subscription to piped water among the sample households. Occupations were grouped into four broad categories; white collar jobs, farmers, blue collar workers, and those of sales and services. The subscription rate among white collar workers was 92 percent (11 out of 13 households). As noted previously farmers showed the lowest rate of subscription among all the occupation groups.

Considering the relationships of piped water subscription to the other factors discussed, multiple classification analysis, (MCA) was employed to analyze the effect of each variable on subscription to the piped water system among the sample households. The equation employs piped water use (V201) as the dependent variable and five independent variables including: frequency of attendance at CARE education program (V214), migration status (V102), total household income (V135), respondent's (i.e., housewives) educational attainment level (V702), and respondent's age (V701). The analysis controls for regional difference (V007N), and home ownership status (V105). In the equation, the five independent variables explain 42.5 percent of the total variance of the dependent variables, i.e., subscription to the piped water system among the sample households.

Table 8. Relationship of P.W. Subscription to Educational Level of Household Head

Educational Level	User (N)	User (%)	Non-User (N)	Non-User (%)	Row Total (N)	Row Total (%)
No Schooling	47.6	(10)	52.4	(11)	100.0	(21)
Primary	60.3	(38)	39.7	(25)	100.0	(63)
Middle	64.0	(16)	36.0	(9)	100.0	(25)
High or Above	95.8	(23)	4.2	(1)	100.0	(24)
Column Total	57.9	(77)	42.1	(46)	100.0	(133)

1/ 48 missing cases with no responses in the variables of either P.W. user of schooling.
Note: chi - sq. = 13.84 (3.d.f. at 0.000).

Table 9. Relationship of P.W. Users with Household Head's Occupation

Occupation	User (N)	User (%)	Non-User (N)	Non-User (%)	Row Total (N)	Row Total (%)
White Collar	19.7	(11)	8.3	(1)	100.0	(12)
Farmer	49.2	(31)	50.8	(32)	100.0	(63)
Blue Collar	78.4	(29)	21.6	(8)	100.0	(37)
Sales & Services	84.6	(11)	15.4	(2)	100.0	(13)
Column Total	65.6	(82)	34.3	(43)	100.0	(125)

1/ 56 missing cases with no response to either P.W. use or occupation.
Note: chi - sq. = 14.87 (3.d.f. at 0.000).

After having started to construct the piped water systems, CARE provided the resident housewives in both survey districts with a series of education programs on the utility and benefits of the piped water system. The results in the two towns were completely different. In Naesuri only 12 persons attended one or more CARE educational meetings and of these seven subscribed to the piped water system. There was no statistically significant effect of the education campaign in the village. In Dongmyon on the other hand all except one of the 22 persons who attended at least one of the CARE meetings did subscribe to the piped water system. The experience of attending the CARE program has a statistical association with piped water subscription at an Eta value (equivalent to the correlation ratio) of 0.33. The overall mean proportion of piped water subscription is 49 percent among all the sample households, but CARE program attendance makes significant difference in the subscription rate. The subscription rate difference between, regular participants in the CARE program and non-participants is 44 percent age points. The subscription rates are 41.0%, 80.0%, and 85.0%, respectively, for the group without CARE program participation, irregular participation, and participation in more than three sessions of the program series.

Migration status is correlated with piped water subscription at an Eta value of 0.30. None of the in-migrant households from neighboring urban areas subscribe to the system, although 68 percent of rural in-migrants do, compared to 41 percent among the non-movers in the sample. Non-subscription among the five migrant households from neighboring urban areas is mainly due to the fact that all of these migrant households are very poor. This can be partially inferred from the fact that the subscription rate among urban migrant households increased from zero to 24 percent when house ownership was controlled for.

As discussed earlier, household income is positively correlated to the subscription rate with a correlation ratio of 0.25. Subscription rates differ by 20 percentage points between households with annual incomes of less than one million won and those with incomes of more than 1.8 million won. The subscription rates are 35%, 50%, and 85% for the bottom, middle, and upper income groups, respectively.

Both the respondent's educational level and age also have some relationship with piped water subscription in rural areas. As far as the respondent's education is concerned, the less educated tend to have lower subscription rates than those with high educational attainment. The subscription rates for those with no schooling and with primary education are 45% and 44%, while the rates are 70% and 67% for the housewives with middle school or high school education.

When the effects of the three other factors (CARE program attendance, migration status, and household income level) are removed,

the difference in subscription rates between housewives of differing levels of education narrows considerably. Compared with the unadjusted deviation, the rate increases from 45% to 54% among housewives with no schooling, but it decreases slightly from 44% to 42% for those with primary education. The rates for the groups with higher educational attainment show a decline when these other influences are removed: from 70% to 58% for middle school graduates and from 67% to 46% for housewives with a high school education. Education alone, therefore, does not appear to have a clear-cut relationship to piped water use.

The subscription rates are also different for each age group of housewives. The rate for the middle age housewives 29-44 years old is 58 percent, while the rates are 48 percent and 41 percent for the young housewives under 30 years old and the older housewives age 45 years old and over.

In summary, the present chapter has attempted to examine the characteristics of piped water users in comparison with non-users. While the subscription rate in urban areas is determined largely by the accessibility and capacity of piped water systems, the rate in rural areas appears to be determined by factors other than the system characteristics, namely, the resident's characteristics and attitudes. Among these, economic factors, including household income, has been one of the most important determinants of piped water subscription, particularly in the small towns of low-income rural areas.

Subscription to piped water systems may be considered in general terms a behavioral expression of the acceptance of modern innovation in the traditional context of rural Korea. Besides the effect of economic factors on subscription to piped water, the respondent's attitudes seem to influence decision-making in this regard. From a behavioral perspective, the respondent's attitude toward piped water is formed by his or her sociodemographic as well as economic characteristics. In addition to the influence of both the economic and non-economic characteristics of the residents, the analysis indicates that the education program (CARE) has had a significant impact on the rate of subscription to the piped water systems in one of the towns.

V. WATER USE PATTERNS AND THE EFFECTS OF PIPED WATER IN RURAL KOREA

1. Water use patterns among rural Koreans

Before the establishment of piped water systems, water for drinking and domestic use in rural towns came primarily from shallow wells. In the survey areas, almost half (48.7%) of the respondent households subscribing to piped water had used community wells before

the establishment of the piped water systems. Of the piped water users, 30.1 percent had used private wells or hand-pumps and 21.2 percent had used privately installed electric motor pumps.

The majority of the houses receiving piped water in rural towns have only one water tap. In the survey areas, four out of every five piped water users have only one water tap, while 14.4 percent have two water taps and 3.6 percent have three taps and more. Among the users, 70.3 percent have an outdoor water tap and the rest have installed water taps both indoor and outdoor, including 16.2 percent with kitchen installments.

It has been common in Korea for housewives to store drinking water in containers. In the survey, 34 households out of 88 piped water subscribers still store water for drinking and domestic use even after having subscribed to piped water. Reasons given for storage are: 44.1 percent (15 households) of the 34 respondents store water for emergency use when water supply is irregular, and 26.5 percent store water in order to get rid of the chlorinated odor and the bubbles. Another 17.6 percent store water as a customary convenience and 11.8 percent stated the reason as economizing on water consumption and reducing water costs.2/ There is a substantial difference between the two towns in water storing practices: about 52.6 percent of the respondents in Dongmyon of South Cholla Province store water, while only 17.6 percent of subscribers in Naesuri, North Chungcheong Province, do so. This accurately reflects the reliabilities of the respective systems. In Dongmyon, water is turned off on alternate days during the summer months.

Although there are some seasonal variations in water drinking habits, the findings indicate that a majority of Koreans drink water treated by boiling or by making tea (rice water tea or barley tea). Only 25.6 percent among 172 respondents indicated that they drink untreated water.

In addition to the piped water system and community wells, about one-third of the 103 respondent households have wells or pumps as alternative private water sources: 24.3 percent of these have wells with conventional hand-pumps, 6 percent have wells without pumps and another 6 percent have installed electric pumps in their wells. According to Table 11, most subscribers (88 households) use the piped water for both kitchen use and for personal sanitation. In rural areas, however, many housewives, even those receiving piped water, still follow the traditional custom of doing their wash in a nearby stream.

2/ There is a widespread belief that water can be withdrawn in a trickle from a metered connection without causing the meters to register.

Table 11. Water Use Pattern by Water Source

Water Source	Kitchen Use (N)	(%)	Personal Sanitation (N)	(%)	Household Laundry (N)	(%)
Piped Water	48.3	(87)	47.8	(86)	33.3	(60)
Well or Pump	48.9	(88)	48.3	(87)	35.6	(64)
Natural	2.8	(5)	3.9	(7)	31.1	(56)
Total	100.0	(180)	100.0	(180)	100.0	(180)

2. The Effects of the CARE education Program

The CARE education program has had little effect on the way in which people use water for drinking. In Naesuri, 60 percent of the people drink the water without further treatment, while 40 percent boil it or make tea. In Dongmyon, less than 10 percent drink the water without treatment. The method of treatment is independent of attendance at CARE education programs (Table 12).

Table 12. Relationship between Attendance of CARE Education Program and Treatment of Drinking Water: Naesuri and Dongmyon

Town	Naesuri		Dongmyon	
Attended Care Program	No Treatment	Boil or Make Tea	No Treatment	Boil or Make Tea
No	31	19	3	40
Yes	6	5	2	19

3. Factors Affecting Change in Water Use Facilities

Korean society has been experiencing a drastic change through rapid industrialization and related urbanization in recent years. Though the scope of change and its tempo are in general more pervasive and rapid in urban areas than in rural areas, rural Korea is also undergoing considerable social change in various aspects including behavioral, social, structural, and physical changes. In other words, rural society is no longer stagnant; with recent economic development, it has been drawn into the modernization process.

In conjunction with the recent establishment of potable water systems in rural areas of Korea, there have been some changes in the daily home life of rural households. Like many other aspects of social change, such changes can be attributed to various factors. In this section the patterns of effects of various factors on changes in water use facilities are analyzed from three selected aspects: changes in kitchen facilities, changes in personal sanitation, and changes in drainage.

Food preparation and cooking is one of the most basic home activities and every home has kitchen facilities. With recent changes in eating habits, there also has been a considerable change in kitchen facilities. To explore this phenomenon, five variables were examined.3/ All five variables explain 55.3 percent of the total variance of the change in kitchen facilities. Among the five selected independent variables, the use or non-use of piped water accounts for 0.93 points of difference in a total 3.0 points scale for change in kitchen facilities, with an Eta value of 0.51 (equivalent to the simple correlation ratio).

Among 71 households, in other words, 25 households which do not use piped water averaged 1.20 points on the three point scale for change in the kitchen facilities while 46 households using piped water averaged 2.13 points.

3/ The variables examined through analysis of variance are as follows:

	V223	Kitchen Facilities
BY	V135	Total House Income
	V131	Total Items
	V314	Saemaul Effect on Household Level
	V214	# of Attendance at CARE Sessions
	V201	Use of Piped Water
WITH	V007	P.W. Water Site
	V105	House Ownership

The attendance experience of CARE education program appears to have exercised the second most important influence on kitchen facility change, with an ETA value of 0.49. Those who attended the education program more than twice averaged a 2.64 point change score while non-participants got 1.57 points and those who attended the program once or twice averaged 1.80 points. Even when the compound effects of other causal factors are controlled for CARE education program attendance continues to show a fairly steady correlation with kitchen facility change. Thus, the effect of the education program seems to persist regardless of the compound influence of other factors such as household income level, piped water use, house ownership, regional difference, and the like.4/

Change in kitchen facilities is shown to have a significant relationship with the number of modern household items possessed, as well as with household income. Among 71 households only two households possessed more than three modern items (including TV, refrigerator, washing maching, rice cooker, and camera) and these two households also changed their kitchen facility substantially with a full 3.0 point change score. Though the number of modern items possessed does not show a consistent pattern with kitchen facility change, those households having fewer modern items generally have a lower change score: the point score for kitchen facility change averages 1.86 for households with none or one item, and 1.52 for those with two or three items. There is no clear explanation for this, but it may be due in part to preferences for modern items over facility change among the lower and middle income groups. This pattern of kitchen facility change is somewhat consistent with the level of household income.

The effect of each variable on the change in personal sanitation habits and related facilities also was analyzed. Among the five selected independent variables, the use of piped water shows the highest correlation ratio (Eta = 0.31) with changes in personal sanitation.5/ When the effects of both regional

---

4/ The authors of main report question the usefulness of this conclusion because of the small sample size. Only four women attended more than two sessions.

5/ The variables examined through analysis of variance are as follows:

	V224	Personal Sanitation
BY	V135	Total House Income
	V131	Total Items
	V314	Saemaul Effect on Household Level
	V214	# of Attendance at CARE Session
	V201	Use Of Piped Water
WITH	V007	P.W. Water Site
	V105	House Ownership

differences and home ownership are controlled for, however, personal sanitation facilities do not change at all regardless of piped water use. Thus, the use of piped water did affect the change in personal sanitation facilities among those families owning their own homes.

Three variables (level of household income, the number of modern household items, and attendance at the CARE education program) have the same degree of statistical association. (Eta = 0.29) with change in personal sanitation. The use of piped water accounts for a difference of 0.68 points in the score for changes in personal sanitation facilities -- 1.76 points for piped water users versus 1.08 points for non-users.

The degree of change in personal sanitation facilities varies with the number of modern household items. Among 71 respondent households, two households owned more than 3 items and built newly personal sanitation facilities for a full change score of 3.0. As in the case of change in kitchen facilities, the households with two or three modern items had a 1.21 point score while those with none or only one item had 1.58 point score for changes in personal sanitation facilities. However, the level of household income does not appear to have the expected correlation with changes in personal sanitation facilities. The lower income households have a higher average change point score at 1.88 than do the middle income households (1.17 points) and 1.48 or even the upper income households (1.48 points).

The above discussion examined and compared, by means of the multiple classification analysis (MCA) method, some causal effects of five selected factors on changes in the habits and facilities of home water use in Korean rural towns. The MCA models include five independent variables, controlling for two other variables -- regional variation in the survey sites and housing ownership. In the MCA analysis of both changes in kitchen facilities and personal sanitation facilities, no statistically significant effect of the Saemaul campaign was uncovered. However, the other four independent variables (including household income level, the number of modern household items, CARE education program attendance, and the use of piped water) were shown to have significantly affected changes in the daily household practices. As far as home water use is concerned, both the establishment of the piped water system and education programs in water use are shown to have brought about considerable changes in the home water facilities.

4. Some Perceived Benefits of the Piped Water Users

The benefits from the establishment of a piped water system may be considered at two levels; the community level and the individual receipient level. First of all, the establishment of piped

water systems contributes to the improvement of public health at the community level. With continued improvement in general living standards, public health in Korea has steadily improved in recent years. Accordingly, the incidence rates of communicable epidemic diseases have rapidly decreased over the last two decades, as has also the rate of parasite infection (see Appendix D).

Table 14. Perceived Benefits Among Receipients of Piped Water

Area	Perceived Benefits							
	Convenient		Effort & Time Saving		Clean & Hygienic		Row Total	
	(%)	(N)	(%)	(N)	(%)	(N)	(N)	(%)
Naesuri	(38.2)	13	(52.9)	18	(8.8)	3	(100.0)	34
Dongmyon	(31.5)	17	(63.0)	34	(5.6)	3	(100.0)	54
Column Total	(34.1)	30	(59.1)	52	(6.8)	6	(100.0)	88

While the recent decreases in the incidence of epidemic diseases may be attributed to many related factors, including improvements in public health and personal hygiene, piped water use and changes in eating and cooking habits have undoubtedly contributed to the reduction in the incidence of water borne epidemic diseases in particular.

In addition to improvements in public health, the piped water systems have brought about substantial changes in the daily water-use patterns and household water use facilities. As a result, many rural housewives expressed appreciation of the piped water service in a positive evaluation of piped water use. The majority (about 60 percent) of piped water subscribers indicated that it saved much of housewive's effort and time by eliminating the need to carry water by hand. About one-third of the housewives felt that the piped water supply made their home-life much more convenient and easier with the concomitant changes in kitchen facilities. Only a small proportion of the respondents indicated sanitation benefits from the installation of the piped water system.

In summary, the establishment of piped water systems has brought about a wide range of impacts on both the community as a whole and on individual residents. With the recent improvement in

rural living standards in general, the installation of piped water service at the household level has made a considerable change in daily home lifestyle through concomitant changes in water use facilities and the elimination of the time and effort previously required of housewives to bear water by hand.

VI. CONCLUSIONS AND RECOMMENDATIONS

1. Summary and Conclusion

As pointed out in the beginning, the piped water supply rate currently is much higher in rural areas than in urban areas -- particularly in rapidly growing small and medium sized cities. The low piped water supply rates in urban areas are due mainly to the inability of water supply system expansion to match the rapid increase in water demand. The capacities of the existing water supply systems are inadequate to the needs of the current population in most urban areas.

In many cases, existing urban piped water systems have deteriorated with age, resulting in a considerable amount of water loss which further aggravates their undercapacity. The rapid increase in water demand in Korean cities is attributable not only to rapid population increase but also to per capita increases in water consumption paralleling the rising standard of living in recent years.

While the piped water supply rates in urban areas are chiefly determined by supply side constraints, the rates in rural areas have been largely determined by demand-side factors, particularly the characteristics of rural residents. In urban areas, access to the piped water supply system has become an essential necessity of life because of both the limited availability of alternative water sources and the worsening pollution of these sources. Unlike in urban areas, the use of piped water in rural areas still is largely a matter of preference than of necessity. Industrial pollution has not yet so widely and deeply permeated the existing ground water sources in the rural survey areas, and this remains sufficient to serve current demand and to continue to be of generally good quality. In other rural areas, however, pollution of ground and surface water by industrial wastes, fertilizer, herbicides, and biological contaminants already is a serious problem.

For these reasons, the piped water supply rates in the rural areas generally are determined by the socio-economic characteristics of rural households and their preferences. The average piped water subscription rates differ among household income groups, between farm and non-farm rural households, by the educational level of the housewife, and between households with and without private water sources, etc. The survey findings indicate that the sub-

scription rate is higher for the upper income household group than for the lower income groups; higher for non-farm households than for farm households; higher for households where the housewife enjoys a higher level of education than where her education is more limited, and so on.

The establishment of piped water systems in tradition-oriented rural areas has brought about concomitant impacts at the individual household level as well as at the community level. On the one hand, the piped water systems have considerably improved public health through a substantial reduction in the incidence of illness and death due to water-borne diseases among community residents. On the other hand, at the individual level the rural population has benefited directly from improved personal hygiene, and the saving of effort and time formerly required to carry water, etc. The rural residents also have benefited indirectly from changes in home life style that have followed upon the installation of piped water systems.

In conclusion, from the general perspective of modernization, the construction of piped water systems may be viewed as the introduction of a modern innovation into tradition-oriented rural areas, and the gradual increase in piped water use in rural areas may similarly be regarded as the adoption of a modern innovation by rural people. In this regard, changes in social values and individual attitudes must be promoted to accelerate behavioral changes among the target population in the context of specific development programs such as the rural potable water program. It is noteworthy that the CARE education program proved to have affected the piped water subscription rates in one town and consequent changes in water use facilities and water use habits.

2. Policy and Program Recommendations

A. General Policy Recommendations

1. Regarding site selection for piped water sytems, first priority should be given to the urban industrial areas and those rural areas where existing water sources are polluted, with lower priority given to rural areas where existing water sources meet acceptable sanitary standards. With the construction of piped water systems, emphasis should be put on the expansion and maintenance of the existing water distribution systems.

2. The rural potable water program should be carried out as an integral part of a rural community development plan rather than as a separate independent program. In this regard, the rural potable water program can be suitably integrated into the Saemaul Undong as has been done in some rural areas.

3. Policy emphasis in the future must be put on water conservation measures which insure water quality as well as quantity. In the absence of such measures water source areas have frequently become contaminated by industrial and biological pollution.

4. The piped water supply program should encompass not only system construction but also its maintenance and management. In the system management process, policy priorities must turn on public health criteria. It is important that service be extended to the low income strata within existing service areas and that unpolluted water be made available to the most underprivileged communities.

B. Program Specific Recommendations

1. The piped water system program, particularly in the low-income rural communities, should first seek to meet minimal acceptable system standards in all communities, rather than advanced modern standards in a few communities. Thereafter, the system scale should be developed step by step in terms of the management capabilities and needs of the community. In considering both the quality and quantity of water supplies, the system should not be so sophisticated as to price the service beyond the reach of the target population. The simplified water supply system of so-called "Saemaul style" may be more practical and desirable than sophisticated systems in rural areas where chemical or organic pollution has not yet affected the water sources.

2. The piped water supply program, as integrated with the rural community development plan, should involve the popular participation of community residents in system design, construction, and maintenance. The community residents' participation, however, should be flexible, through monetary support, contribution of materials, or provision of labor, according to the resident's capacities and preferences.

3. Particularly in rural areas, it is recommended that the potable water supply program be accompanied by education in sanitary water-use habits and an information campaign on the benefits of using piped water.

REFERENCES

CARE/ROK, USAID
1979 Evaluation Report of the Korea Potable Water System Project, Seoul; CARE-KOREA

Cairncross, Sandy et. al.
1980 Evaluation for Village Water Supply Planning, John Wiley & Sons

Dworkin, Daniel M. et. al.
1980 The Potable Water Project in Rural Thailand, Washington, D.C.; Agency for International Development

Republic of Korea, Economic Planning Board
1961-1979 Korea Statistical Yearbook Seoul: EPB

Republic of Korea, Ministry of Health and Social Affairs
1967-1978 Statistical Yearbook of Health and Social Affairs, Seoul: MHSA

Appendix A

Components of Survey Questionnairs by Variable Specification Used in the Analysis

Variable Codes	Variable Labels	Value Specification
V 104	Duration of Residence	Users
V 105	House	1) own house 2) rent 3) other
V 107	Subjective evaluation of Socio-economic status	1) upper level 2) middle level 3) lower level
V 128	Out-migration motivation	1) economic or occupational reason 2) education for children 3) other 4) N.A.
V 129	Expected destination	1) rural area 2) cities within province 3) Seoul 4) not applicable
V 131	Modern household items (TV, refrigerator, washing machine, rice cooker, camera, phonograph	1) 0 - 1 2) 2 - 3 3) 4+
V 132	Total farming area (sq. m.)	1) 660 2) 660 - 5950 3) 5950+
V 133	Total farm income (in 1,000 Won)	1) < 100 2) 100 - 670 3) 690+
V 134	Total non-farm income (in 1,000 Won)	1) < 400 2) 400 - 140 3) 140+

V 135	Total Household income (in 1,000 Won)	1) <1,000 2) 1,000 3) 1,800+
V 201	Use of piped water	0) non-user 1) user
V 205	# of water taps (faucets)	
V 206	Locations of water faucets	1) in kitchen 2) outdoor 3) (1) + (2) 9) N.A.
V 210	Water storage	0) no 1) yes
V 211	Reason for storing water	1) irregularity of water supply 2) for convenience 3) getting rid of trapped air 4) to save fee 9) N.A.
V 214	# of attendance of CARE education program	0) none 1) 1 - 2 2) 3 - 4 3) 4+
V 215	In-house water sources	0) none 1) well 2) pump 3) electric pump
V 216	Sources of drinking water	1) poped water 2) well or pump 3) natural water 4) (1) + (2) 9) other
V 217	Water sources for kitchen (See V 216)	
V 218	Water sources for personal sanitation (See V 216)	

V 219	Water sources for laundry & household sanitation (See V 216)	
V 222	Treatment of drinking water	1) raw water 2) boiling 3) making tea 9) N.A.
V 223	Change in kitchen	0) none 1) a little 2) considerable 3) reconstruction
V 224	Change in personal Sanitation facilities (See V 223)	
V 228	Perceived benefits from piped water	1) convenient 2) saving time & effort 3) hygienic 9) N.A.
V 314	Saemaul effect on household level	1) positive 2) no effect 3) negative
V 601	Household size	(no. of household members)
V 602	Family type	1) nuclear 2) extended
V 603	No. of residential family members	(no. of family members who actually stay together)
V 604	Household sex ratio (males/females)	1) 0.4 2) 0.5 - 0.9 3) 1.0 - 1.4 5) 1.5+
V 605	Household dependency ratio	1) 0.4 2) 0.5 - 0.9 3) 1.0 - 1.4 4) 1.5+
V 606	Proportion of working family members	1) 0.4 2) 0.5 - 0.9 3) 1.0 - 1.4 4) 1.5+

V 701	Respondent's age distribution (years)	1) 19 2) 20 - 29 3) 30 - 39 4) 40 - 49 5) 50+
V 702	Respondent's educational level	1) no schooling 2) elementary school 3) middle school 4) high school
V 711	Household head's education (See V 702)	
V 714	Household head's occupation	1) white collar 2) farmer 3) blue collar 4) sales & services 9) N.A.

Appendix B

Annual Household Income by Provinces, 1978.

Region	No. of Farm Households (1,000)	Value Added Farm Income 1978 Current Price (million won)	Average Farm Income	
			1978 Current Price	1979 Current Price
Whole Country	2,223.8	3,782,473	1,700.9	2,049.3
Seoul	4.9	10,545	2,153.4	2,594.6
Pusan	6.6	5,582	843.5	1,016.3
Kyonggi	245.1	506,569	2,066.7	2,490.1
Kangwon	123.5	179,339	1,452.5	1,750.1
Chungbuk	155.3	265,071	1,706.8	2,056.5
Chunbnam	284.0	488,027	1,718.4	2,070.4
Jeonbuk	254.4	411,379	1,616.8	1,948.1
Jeonnam	413.3	607,261	1,469.2	1,770.2
Kyongbuk	382.5	699,130	1,828.0	2,202.5
Kyongnam	300.3	523,493	1,743.1	2,100.2
Jeju	53.9	80,071	1,486.6	1,791.1

Sources: Korea Statistical Yearbook, EPB, 1979.
Annual Household Income Report, Ministry of Home Affairs, 1979.

Appendix C

Income of Farm Households and Urban Non-farm Households.

Year	Farm Households		Urban Non-farm		(A)/(B) X 100
	Amount (A)	Index (1975=100)	Amount (B)	Index (1975=100)	
1962	67,885	7.8	96,600	11.2	70.3
1963	93,179	10.7	80,160	9.3	116.2
1964	125,692	14.4	97,300	11.3	129.2
1965	112,201	12.9	112,560	13.1	99.7
1966	130,176	14.9	161,520	18.8	80.6
1967	149,470	17.1	248,640	28.9	60.1
1968	178,959	20.5	285,960	33.3	62.6
1969	217,874	25.0	333,600	38.8	65.3
1970	255,804	29.3	381,240	44.4	67.1
1971	356,382	40.8	451,920	52.6	78.9
1972	429,394	49.2	517,400	60.2	83.0
1973	480,711	55.1	550,200	64.0	87.4
1974	674,451	77.3	644,520	75.0	104.6
1975	872,933	100.0	859,320	100.0	101.6
1976	1,156,254	132.5	1,151,760	134.0	100.4
1977	1,432,809	164.1	1,405,080	163.5	102.0
1978	1,884,200	215.8	1,916,280	223.0	98.3
1979	2,049,300 1/	234.8	2,629,596	306.0	77.9

Source: EPB, Major Statistics of Korean Economy, 1980 Nominal income in current: p. 59 Price
1/ Ministry of Home Affairs, Annual Report of Household Income, 1979.

Appendix D

Incidence Rates of Water-borne Epidemic Diseases and Parasites

Year	Class I[1/] (per 100,000)	Water-borne[2/] (per 100,000)	Parasites[3/] (%)
1967	27.6	14.9	-
1968	19.8	13.9	-
1969	25.8[4/]	21.9	-
1970	20.2[5/]	18.1	63.5
1971	12.3	11.0	70.8
1972	8.9	6.9	67.9
1973	4.8	2.8	67.2
1974	3.7	2.2	56.3
1975	2.8	1.5	51.9
1976	3.4	1.9	46.2
1977	1.6	0.8	41.7
1978	1.7	1.2	32.9
1979	1.5	1.0	23.6

Sources: Ministry of Health & Social Affairs, Statistical Yearbook of Health and Social Affairs.

1/ includes all the commucable diseases under class I including both water-borne and air contagious incidence per 100,000 persons.

2/ includes cholera, dysentery, typhoid fever, and paraphoid incidence per 100,000 persons.

3/ the rate refers to the percentage of the carriers of all kind parasites to the persons involved in the medical examination.

4/, 5/ epidemic incidence rates of cholera were 5.3 in 1969 and 017 in 1970.

INTENTIONALLY
LEFT
BLANK

APPENDIX F

PROFILE OF SIX PROJECTS
WATER SYSTEM BASIC INFORMATION

Province	Chung Buk	Chung Buk	Chung Buk	Cholla Nam	Cholla Nam	Kyong Nam
Gun	Eumsong	Tanyang	Cheongwon	Hwasoon	Naju	Sanchong
Community	Kumwong	Maepo	Naesu	Dong Myon	Nompyong	Shindeung
Date Started	10/77	2/77	10/77	10/77	10/77	/78
Date Completed	11/78	10/78	9/78	5/78	7/79	Not Completed
Cost (1000's)₩	126,984	39,465	55,000	137,000	68,190	Unfinished 42,627
CARE	15,000	26,565	20,000	15,000	14,490	15,939
Government	111,894	12,500	35,000	122,000	53,700	26,668
Individual Connection (Average)	65	125	58	50	90	NA
Population of Community	6,098	7,000	3,446	5,027		6,554
Number of Household	1,300	1,200	673	1,512	2,780	1,300
Number Served	237	479	320	595	28	--
Percent	18	40	48		1	-
Fire Hydrants	2	7	(500 T of Service) 10	5	5	-
Hours of Service	24	24	24	24	24	-

Community	Kumwong	Maepo	Naesu	Dong Myon	Nompyong	Shindeung
Metered	Yes	Yes	Yes	Yes	Yes	-
Education Visits	3	4	6	24	8	3
When (Before or After System Completion)	Before & After	Before	After	Before & After	Before & After	Before
Responsibility for System	County	County	Village Committee	County	County	
Responsibility for Maintenance	County	County	Village Committee	County	County	-
Village Committee Active	No	No	Yes	Formed not Active	No	Yes
Number of Operators	2	6	2	9	1½	-
Training	None	None	None	None	None	-
Pay (Average) Month	90,000	77,000	50,000	130,000		-
Water Source	River	Spring	River	River	River (Pipeline)	River
Treatments Filtration	Rapid Sand	Pressure Sand Filter	Rapid Sand Filter	Rapid Sand	Rapid Sand	Rapid Sand
Coagulation and Sedimentation	No	No	No	No	No	No
Chlorination	Yes	Yes	Yes	Yes	Yes	Yes

APPENDIX G

OBSERVATIONS ON THE CHOLERA OUTBREAK 1/

The Republic of Korea had its first reported outbreak of cholera in the past ten years while the evaluation team was in the country. The team was interested for a number of reasons: cholera is a disease commonly transmitted by fecal pollution of water supplies; we were travelling in the area of the outbreak and the Korean team members had not had innoculations; and finally the actions to control the spread provided a measure of the effectiveness and interest of the government in matters of public health.

Cholera is an acute intestinal disease caused by a bacterial organism, Ubrio Cholerae. There are two basic types, the classical and the more recently identified El Tor strain. The classic cholera originated in Bengal and the Ganges Valley. The El Tor type was identified in 1905 in the Sinai and was first responsible for a pandemic outbreak between 1961 and 1963. During this episode it affected Korea, Taiwan, the Philippines, Pakistan, the Middle East, Europe, and Africa.

Cholera affects only humans and requires a human host as a reservoir. In classic cholera the affected person was either dead or completely cured in a few days. The El Tor strain is less virulent and persons affected may not have clinical symptoms but may become carriers of the disease.

Cholera is spread either by person to person contact or though contaminated food and water. It is primarily a disease that affects lower socio-economic groups, especially those living alongside streams that are subject to fecal pollution.

Cholera control can be achieved by either preventing the spread of fecal material or by disinfection of the supply of water. In the Philippines, pit latrines and water sealed privies were responsible for a 68 percent reduction in rates of cholera from the rates in a control community. Improved water supply resulted in over 72 percent reduction while when both sanitation and water supply were improved cholera rates were over 76 percent less than in control communities.

1/ Background information is derived from Health Aspects of Excretio and Wastewater Management, Part II, Chapter 10, IBRD, Washington, D.C., 1978.

The CARE/AID project is responsible for increasing the potential of cholera because the availability of adequate low cost source of water is encouraging the use of flush toilets. The waste water from the toilet goes to a holding tank where the overflow liquid is discharged to surface drains and without further treatment, to rivers or streams. Survival times of the bacteria responsible for cholera can be as long as 14 days.

The flush toilets for the most part replace pit privies. The custom was to empty the privies by barrel and to apply the wastes to the fields. In many cases the users had two privies and the wastes were allowed to age prior to emptying, thus eliminating the danger from pathogens. Where wastes were removed that contained cholera organisms there was a possiblity of disease transmission directly by handling the wastes or through contamination of foods or water by runoff, but the potential for spread of the disease was less than through discharge directly to the surface drains.

Korea has had a long history of Cholera. Prior to the 1960's the disease was caused by the classic type strain and the fatality rate was usually close to 65 percent of those infected. In 1946 over 15,000 cases were reported and 10,000 deaths resulted. Since that time the El Tor strain has been responsible for the Cholera incident and the fatality rate has been 10 percent or less. TABLE I shows the number of cases and rates of fatality in cholera outbreaks from 1926 to 1970.

TABLE I

CHOLERA HISTORY 1926 - 1970

YEAR	NUMBER OF CASES	NUMBER OF DEATHS	FATALITY RATE (PERCENT)
1926	252	159	63
1932	70	38	54
1938	50	2	64
1946	15,644	10,182	65
1963	414	36	9
1964	20	2	10
1969	1,538	137	9
1970	206	12	6

The first public information that there was reported cases of cholera appeared in the newspapers early in the week of September 15. A WHO team told us that the disease had been confirmed some days earlier. September 23 was Chusak, a holiday during which Koreans swamp the available public and private transportation facilities to travel to their ancentoral graves.

The government reacted swiftly. It appropriated ₩12 billion for halting the spread of cholera and treating those affected. The money was used to supply 9.5 million people with cholera innoculations and to provide treatment for 1,000 victims. (We were unable to determine how many were actually innoculated or the final number of those who contracted the disease.)

None of the Korean members of our team had had cholera innoculations and so we were participants in the government effort. The local government official set up innoculation stations on the roads leading into each city and within the cities at strategic locations. Each station was manned by two or more health people who administered the injections. A common needle was used that was disinfected after each use by wiping with a moist swab. The disinfection seemed perfunctory. Each person who was innoculated received a slip that then permitted them to enter or leave a city on public transportation. Buses were stopped on entering the city to confirm that everyone had received the vaccine. See Appendix J for photos.

The government also took other measures. Chlorination level of piped water supplies were increased; some areas of the coast were closed to fishing; students in public schools were required to carry their own drinking water, three million information pamphlets were distributed that gave information on prevention and recognition of symptons; and the media provided the same information; restaurants and tea rooms in Seoul were ordered to boil their water, sterilize all napkins, towels and utensils and to serve only cooked food.

We were not able to obtain final figures on the number of reported cases, but only two deaths had been reported while we were in the country. In retrospect the actions of the government, especially in the vaccination effort seem unwarranted. The vaccine itself is considered only 60-70 percent effective and the potential benefits are probably offset by the spread of serum hepatitis by the use of the common needle.

Whatever the effect of the effort, the fact that it could be implemented in such a short period of time is impressive. It provides a contrast with the halting health education compaign by CARE that reached so few people. If a clear message relating to water and health had been formulated by CARE the Ministry of Public Health should have been the Agency to bring it to the public.

APPENDIX H

NOTES ON THE KOREAN NEW VILLAGE MOVEMENT (SAEMAUL UNDONG)

This Annex is not intended as a formal description, analysis or evaluation of the Saemaul Undong program. It is intended as a record of our encounters with the program as we went about our potable water evaluation assignment which carried us throughout three provinces and into a half dozen small rural towns.

We did have the benefit of the Ministry of Interior's Saemaul Undong briefing prior to our field work and one of our team members had served in Korea with USAID from 1965-1968, giving us some historical perspective. However, our observations are not scientific or analytical; they are based on random, unstructured contacts, always in the presence of Korean government local officials.[1/] We report here what we feel are our more significant observations.

Historical Perspective. Moving about rural Korea we could not help but be impressed by the dramatic changes in the landscape over the past twelve years. Thatched roofs were replaced by brightly colored tile roofs, old earth brick houses were replaced by sturdy cement, tile and brick houses more typical of those found in Spain, Italy and some other parts of rural Europe

1/ The one exception to this approach was our household survey of two villages in which a question on the Saemaul movement was included under the section on "Attitudes Towards Modernity." Respondents were asked whether they felt the movement was helpful or not helpful and 72 percent responded in the affirmative. It was interesting to note that most of the respondents who did not think the Saemaul movement was helpful did not have piped water (see table below). That is, they probably were among the lower income or the more conservative households in the two communities.

ATTITUDES OF HOUSEHOLDS TOWARD SAEMAUL UNDONG
(Number of Respondents by Water Source)

Perception / Water Source	Helpful	Not Helpful
Piped Water	72	10
Without Piped Water	60	27

than the traditional Korean house. Major highways, formerly non-existent or in poor repair, formed a high quality road network and farm-to-market roads were much more in evidence and in far better condition than they were just twelve years ago. Nearly barren, de-forested hills and mountains, once a hallmark of Korea are today verdent green. (Korea's reforestation program is a story in itself, which we will not attempt to cover in this report.) In the past twelve years many streams and rivers were channeled, bridges, wiers, and dams built and lakes for irrigation, power or flood control established at frequent intervals across the landscape. Most of these changes were brought about with contributions of one kind or another from the Saemaul movement. Indeed, almost every village had its Saemaul headquarters bedecked with the movement's flag and one could not travel far without encountering a Saemaul crew at work on a project.

The five-fold increase in rural incomes in the past ten years, which has brought farm household incomes into parity with urban household incomes, is attributed by officials, in large part, to the Saemaul movement. This is too simple a story to account for the dramatic changes just reported, but it is clear that the movement has made an enormous difference in rural life in Korea and almost every village is involved to some degree.

A Saemaul Village. We visited one village which had recently completed a simplified Saemaul piped water system and found the community heavily involved in the movement. We were given the opportunity to discuss the village program at length with the local Saemaul leaders and found that life in this village had been changed dramatically through the movement. Many new houses had been built and numerous others had been given the new tile roofs. None of the functional houses had the traditional thatch roofs. Other completed projects included a village compost heap, walls around houses, a piped water system, new vented pit toilets for each house, increases in rice production (accomplished also through other government programs), a straightened road linking the village to the main town road, a cooperative village buying and marketing scheme for women, and increased participation in the family planning program. 2/

Plans for Saemaul projects in this village are not made far in advance. A project is decided upon at a village meeting and the village Saemaul leaders take the plan to township and county officials for approval and commitment of whatever government resources or technical assistance are required. This project then becomes the short-term village objective. We had the impression that the village focused upon one project at a time.

2/ We were told that pregnancies, which normally averaged about seven or eight at any given time, now stood at one. It should be noted that this also could be a function of changing age structure.

Plans, schedules and work crews are coordinated by one or more of the three Saemaul leaders.

One of the leaders was a woman whose responsibilities were principally woman's Saemaul activities. For example, the marketing scheme is her project. She appeared to be a very self-possessed and solid leader and was not afraid to tell her story in front of her male colleagues. Asked if there were any problems with or resistance to the Saemaul movement in her village, the woman leader responsed that the only real problem she recalled was the dispute over whose property was to be encroached upon in the project to straighten the village access road. It was not clear exactly how this was resolved but she indicated that a solution was reached amicably. Asked why the village had not been able to make all of these improvements before the Saemaul movement, she answered that before the movement villagers lacked access to government officials and officials were not inclined to help the villagers in any event. Government largess went to the privileged and the powerful. Villagers did not perceive change as a possibility. The Saemaul movement created a two-way cooperative link with the government that overcame this atmosphere.

This struck us as an important insight. It was consistent with our own observations, through many visits with local government officials, that the Saemaul movement is a top government priority and is highly politicized. Local officials are expected to perform and produce on its behalf.

How Two Saemaul Programs Worked. There are many facets to the Saemaul programs, but the two we looked at most closely were simple piped water and housing. Most villages that we encountered and could see from a distance had been touched by both. The photo section of this report (Annex J) portrays some of these programs.

The simple piped water systems consisted basically of the following: a source of water, usually a mountain stream or spring, but sometimes a shallow well; an elevated location near the village for water storage; a water storage tank; a device for chlorination; and a distribution system carrying the gravity-fed water to individual households. The systems we looked at were, for the most part, technically sound and were experiencing relatively few problems. Perhaps because "natural" water sources tend to be fairly pure in the first place, people seemed to have less trouble drinking the water from the Saemaul systems than from the larger and more sophisticated systems installed by

CARE which tended to use rivers or other substantial water sources. 3/

The average system costs in the neighborhood of ₩3,500,000, 60 percent of which is the imputed cost of labor provided by the villagers while the remaining 40 percent is for the pipes, rebar, cement, pump motors (if needed), and technical assistance from the County government. The village chief, the Saemaul leaders and possibly a few other people are given training by the County government in operation and maintenance of the system (although most of the villagers, soon thereafter, learn the system). Villagers are assessed a pro-rated monthly fee for electricity, chlorine, and other costs. Water quality is checked periodically by the county or provincial government.

It was our impression, from limited contacts, that the simple piped water systems are popular and are regarded by the villagers as improving living conditions. By 1981, according to the Saemaul Undong briefing, the government plans to have helped install these systems in 80 percent of Korea's villages, or, all the villages that have the physical conditions necessary to support such a system.

The Saemaul Undong housing program is even more in evidence than the piped water systems. More than any other program, it has altered the nature of the rural "built" environment.

The Saemaul housing system runs on a combination of government loan resources, household equity, community labor and country technical assistance. Houses are designed by county level technicians or by contractors. Basic construction work is carried out by the villagers with county supervision, as needed, and the more technical steps such as plumbing, heating, wiring and fine carpentry are done by contractors. The skilled work and materials are paid for by government loans. Terms of the loans presently are 15 years to pay including three years of grace and an interest rate of 15 percent. The homeowner must make a down payment of 30 percent of the cost.

The system for selecting those within a village who will have access to the Saemaul loans is interesting although there is no question that the poorest households can't afford the down payment. One interviewer estimated that 30-40 percent of the rural population can't afford the program, although this must vary considerably from one area to the next. Among those households which can qualify financially, the oldest houses get

---

3/ The chlorine taste in treated water is not chlorine but chloromines -- the by-product of chlorine acting upon organic matter in the water. The lower the organic content, the less taste will be produced by addition of chlorine. Chlorine, by itself, tends to be odorless and tasteless.

priority on resources. New roofs are installed on old houses only if the structure will bear the weight. Otherwise, new houses are recommended.

There seem to be both pressures and incentives to "spruce-up" a village by converting to the Saemaul type of housing. Each county and township is allocated a budget for Saemaul activities and there is pressure to find Saemaul projects since the money cannot be used for other purposes. One village to which we were taken to see the piped water system had a particularly impressive housing program. Of the 28 houses in the village, 14 were being replaced this year and seven next year while three were considered in good condition. Apparently four households could not qualify for the program.

The new houses are built on farmland or other buildable village property. When the houses are completed, the owners move in and their old house is destroyed and the land converted to farming. At the time of our arrival in this village, new houses were being prepared for occupancy by the traditional Korean "house warming" ceremony. These houses were quite substantial and cost ₩7,000,000 each (roughly $11,000).

What Makes Saemaul Work? The woman Saemaul leader who identified access to county officials and changed attitudes of the county officials as a key to the changes in rural Korea had put her finger on two very important points. We mentioned them to a county official who said the program cuts the other way too. The new Saemaul constructed or improved access roads make it easier for county officials to get to the villages and the many Saemaul projects give them a purpose for visiting. He knows all of the village leaders in his area and makes hundreds of village visits in a year. Prior to the Saemaul movement, he rarely visited the villages and knew very few local leaders.

This phenomenon may have been a key to unlocking the Saemaul dynamic, but at least four other factors also were necessary ingredients.

First, there is the traditional cultural base of the country that was effectively harnessed by the movement. The village historically has been at the center of Korean life and cooperation among villagers was not uncommon. Also, there is a certain unity of spirit in Korea which is important to the Saemaul movement. This derives from Korea being a small, mountainous country with few natural resources, a temporate climate, and a homogeneous language and culture. People had to work hard to survive and had a good cultural basis for cooperative effort.

A second consideration, one which adds to the Korean sense of national unity is the constant economic competition with North Korea and Japan which is promoted actively by the government. The government even fosters competition among villages. Three classes of Saemaul villages have been established -- developed, developing and underdeveloped. Highest priority in allocation of Saemaul resources goes to developed villages. These are the best performers under the program. Villages can move up the rating scale based on government evaluation of their performance or achievement under Saemaul programs. Obviously, the availability of greater resources for village improvement creates an incentive to perform and places internal and external pressure on village leaders to produce.

A third factor which obviously is a necessary ingredient to the Saemaul movement, is the willingness of the people to follow the government. The Confucian ethic, which historically has been a powerful influence in Korean life, teaches obedience to authority and the Korean people always have tended to look to government at all levels for strong leadership. The Saemaul movement draws on this characteristic; because it is basically a positive force, it probably has strengthened this relationship.

Finally, budget and technical resources are significant ingredients in the success of these programs. One need only look at the housing and simple piped water programs just reported to see the importance of country level engineers and technicians, county budget support, bank loan funds and local contractors. Multiply these contributions across the entire country and the thousands of participating villages and it is easy to imagine the magnitude of government and local resources that have gone into the Saemaul movement. Even the Korean army has played a role. The draft is compulsory and the last six months of military duty for all recruits is laced heavily with teaching of vocational and civil engineering skills.

All of this is to say that there is no "magic" to the Korean Saemaul movement. It is based upon national ingredients and circumstances that may not be shared by many other countries. Those countries looking to Saemaul Undong as a solution to their own problems will have to look even more carefully inward to find the elements of a similar movement.4/

4/ More than ninety countries have inquired about the Saemaul program and the Ministry of Home Affairs has given thousands of briefings to interested foreign visitors. A modern briefing theater has been created just for this purpose.

APPENDIX I

RECOMMENDATIONS FOR THE GOVERNMENT OF THE REPUBLIC OF KOREA

On the invitation of the Ministry of Home Affairs and the Ministry of Health and Social Affairs, the AID Impact Evaluation Team made recommendations for improving potable water systems in the Republic of Korea. Recommendations one through four apply specifically to water systems visited during the course of the evaluation while recommendations five through seven are applicable also to the government's future programs for installing potable water systems in small towns. The recommendations follow:

1. The holding tank and connecting pipeline for the unfinished plant at Shindeung, Sanchong County, Kyong Nam Province, should be completed so that the people of Shindeung can have the piped water for which they have planned and worked eagerly. The budget required for completion of the system is ₩35,000,000. (See Annex F for further detail.)

2. A chemical coagulator and settling tank should be added to the system at Dongmyon, Hwasoon County, Cholla Nam Province, to eliminate the bad taste from the water which discourages its use as drinking water.

3. The services at Dongmyon should be extended to the three contiguous villages within a short distance of the system which have a ground water pollution problem. This will require approximately 2600 meters of PVC pipe plus household connections. The cost was estimated at ₩15,000,000.

4. A chemical coagulator should be installed in the system at Naesu, Cheongwon County, Chung Buk Province, to eliminate the particular problem which is creating maintenance problems.

5. Due to meter and household connection costs, the poor tend to be excluded from piped water systems. To extend the systems to the poor and to create a user base large enough to eliminate present subsidies to maintenance and operation, meters and connections should be included as part of the overall system with installation costs assumed by the county governments.

6. Rate schedules should be revised. The present minimum monthly payment provides ten cubic meters of water and most users are well within this level of consumption. A step of five cubic meters or less should be provided at low cost with appropriate rate increases for each additional step. This would mean that those with low incomes could afford piped water for basic needs,

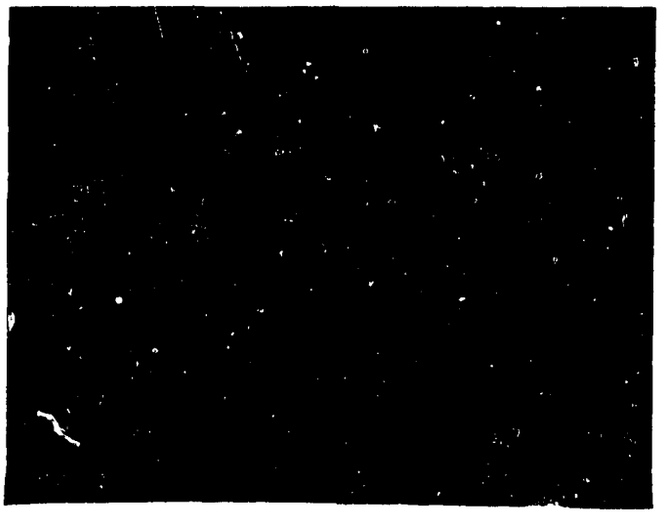
while those who could afford more extensive usage would pay a substantially larger proportion of the water system's operation and maintenance costs than presently is the case.

7. Provision of piped water to towns of 5,000 to 10,000 population introduces the potential for health hazards in the absence of waste water treatment facilities, particularly as the number of flush toilets increase. Until waste water treatment can be provided in these towns, flush toilets without adequate septic leaching fields should be prohibited.

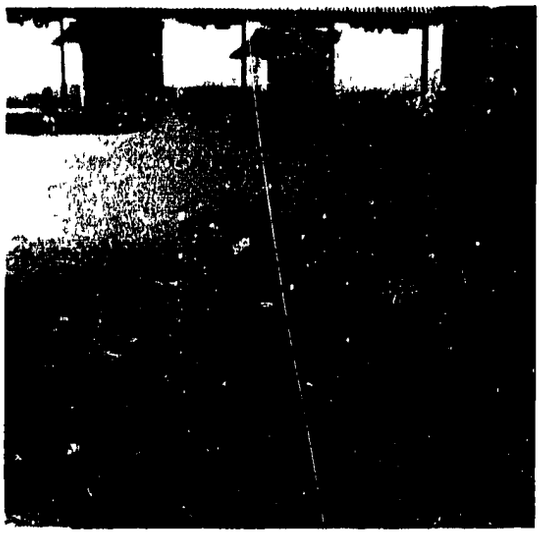
APPENDIX J
PHOTOS

Korean villagers like this old gentleman have seen dramatic improvements in living conditions in recent decades. Among these improvements is piped potable water which has been introduced widely in rural areas during the 1970's. The villagers tend to regard the piped water as convenient and as a way of saving time. However, it is indicative of Korea's continuing strong ties with tradition that, while the piped water is safer, villagers often prefer shallow well water for drinking because it "tastes better."

By 1982, Korea will have provided piped water to over 90 percent of all communities with over 20 households. Neglected in this progress have been the cities with populations of five to ten thousand — the focus of the CARE water project.



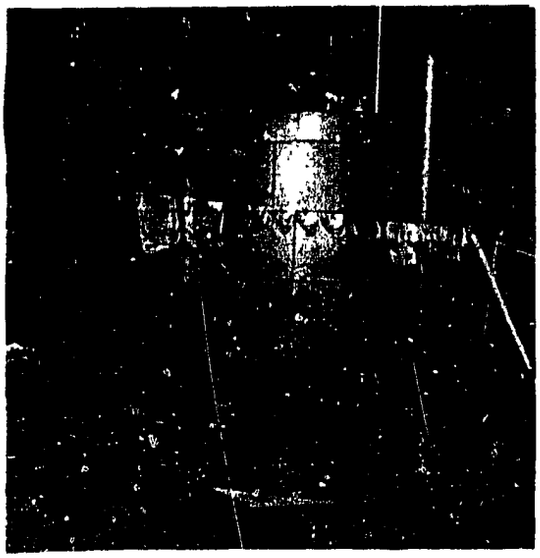
The three communities shown clockwise from bottom left are served by CARE systems: some of these small cities are satellites of major cities; others are manufacturing or rural service centers. Shown in contrast at bottom right is a smaller community served by a Saemaul Undong (New Village Movement) system. The Saemaul water storage and treatment facility, constructed by villagers with help from the county can be seen on the hill in the right foreground.

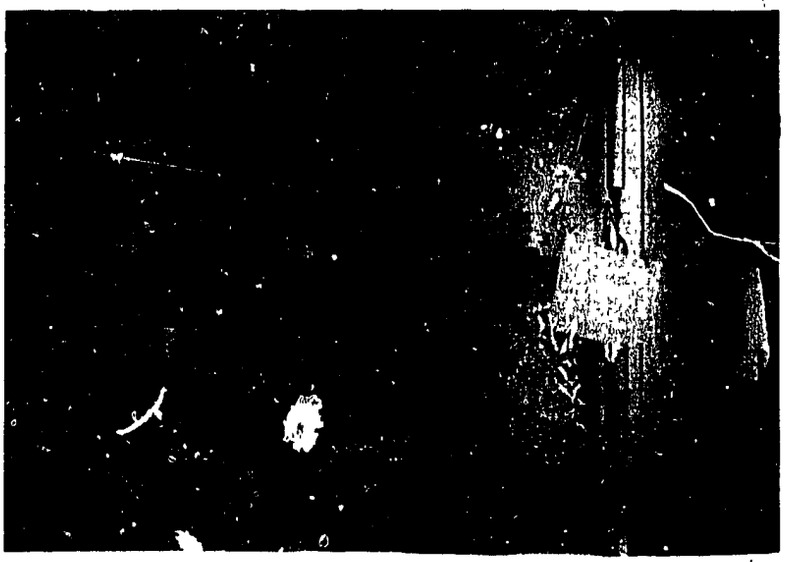


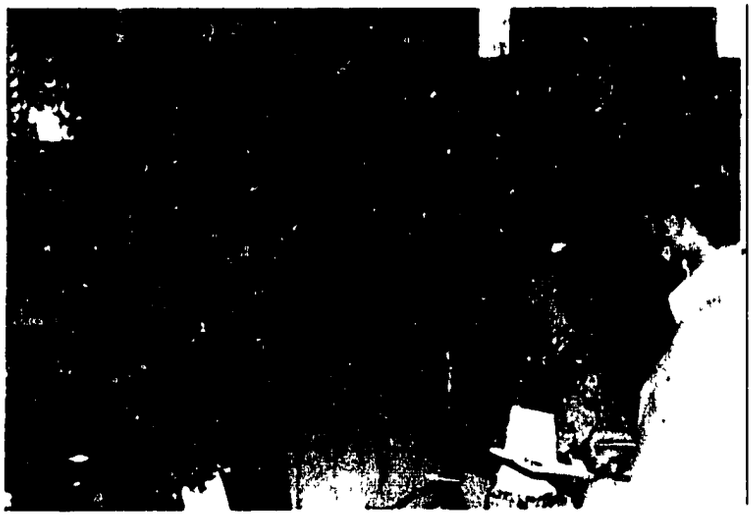
Overall, the systems were not "models," as planned; nor were they failures. Mediocrity was the norm.

CARE did not monitor adequately the progress of the systems. Although systems were generally in working order, one was never completed and another had been in operation for only a few days when the team arrived. The pictured puddle (center) is the result of a leak in the supply line. Above, installation of equipment in the pump-house was not done carefully. Note the pipes supported by wooden props and the water leaking from the Y connection in the picture on the right and in detail on left. Cloth is to protect motor winding from leaky water.

The CARE project tended to employ technologies already well established in Korea, as in the case of the two rapid sand filters pictured below. Frequently, this type of filter was not the appropriate technology for treatment of the local water source. Note also the clothesline attached to the filters.

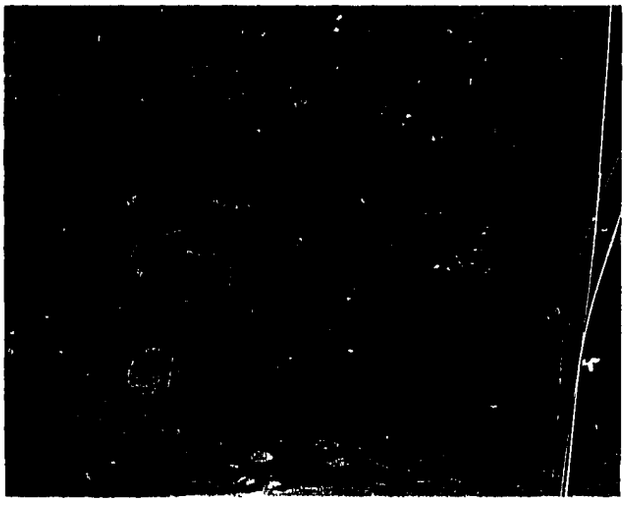






The team found that the few women in the CARE system who have a tap in the kitchen see this as a first step towards modernization of the kitchen — important for the busy Korean woman like the one shown above left. Homemakers in Saemaul villages prided themselves on their new kitchens with inside taps (above right). In a substantial number of homes the new piped systems were supplements to existing systems (center), although in some, piped water has displaced the shallow well and handpump. At the community level, the CARE system may be one of several water systems or may provide the only alternative to the shallow well.

Regardless of how many modern sources of water there are, if a river or stream is handy, most women prefer it for dishes and laundry (below). Children often help in this chore.



The evaluation was conducted during a cholera epidemic. Ironically, people continued to drink water from shallow wells and open springs, using common vessels (above left and center), while innoculations for cholera were being administered in a dramatic public campaign (left). Team interpreter-social anthropologist, Kim, Bong Young, is shown at public well in center with Dolly Dworkin. Above, open drains carry waste water and surface drainage. Overflow from flush toilets is piped to these drains.

Local officials were extremely cooperative and helpful in assisting the evaluation team with site visits, interviews, review of records and plans, and authorizing household surveys. Authors Chetwynd and Dworkin are shown above with officials from Sanchon County, Kyong Nam Province.

Considerable information from community residents was gained on the CARE projects through the in-depth household surveys conducted at two of the project sites. Above, Lee, Jung Ok, a member of the four person household survey team, is shown interviewing a housewife at one of nearly two hundred households included in the surveys. It is a tribute to Korean progress and efficiency that the survey could be organized and conducted and results coded and computer analyzed during the four week period the evaluation team stayed in Korea.

No. 10: Tunisia: Care Water Projects (October 1980)
No. 11: Jamaica Feeder Roads: An Evaluation (November 1980)
No. 12: Korean Irrigation (December 1980)
No. 13: Rural Roads in Thailand (December 1980) PN-AAH-970
No. 14: Central America: Small Farmer Cropping Systems (December 1980) PN-AAH-977
No. 15: The Philippines: Rural Electrification (December 1980) PN-AAH-976
No. 16: Bolivia: Rural Electrification (December 1980) PN-AAH-978
No. 17: Honduras Rural Roads: Old Directions and New (January 1981) PN-AAH-971
No. 18: Philippines Rural Roads I and II (March 1981) PN-AAH-973
No. 19: U.S. Aid to Education in Nepal: A 20-Year Beginning (May 1981) PN-AAJ-168
No. 20: Korean Potable Water System Project: Lessons from Experience (May 1981) PN-AAJ-170

SPECIAL STUDIES

No. 1: The Socio-Economic Context of Fuelwood Use in Small Rural Communities (August 1980) PN-AAH-747
No. 2: Water Supply and Diarrhea: Guatemala Revisited (August 1980) PN-AAJ-007
No. 3: Rural Water Projects in Tanzania: Technical, Social, and Administrative Issues (November 1980) PN-AAH-974

PROGRAM DESIGN AND EVALUATION METHODS

Manager's Guide to Data Collection (November 1979) PN-AAH-434

Those documents with an identfication code (e.g., PN-AAG-585) may be ordered in microfiche and paper copy. Please direct inquiries regarding orders to:

Editor of ARDA
Bureau for Development Support
Agency for International Development
Washington, D.C. 20523