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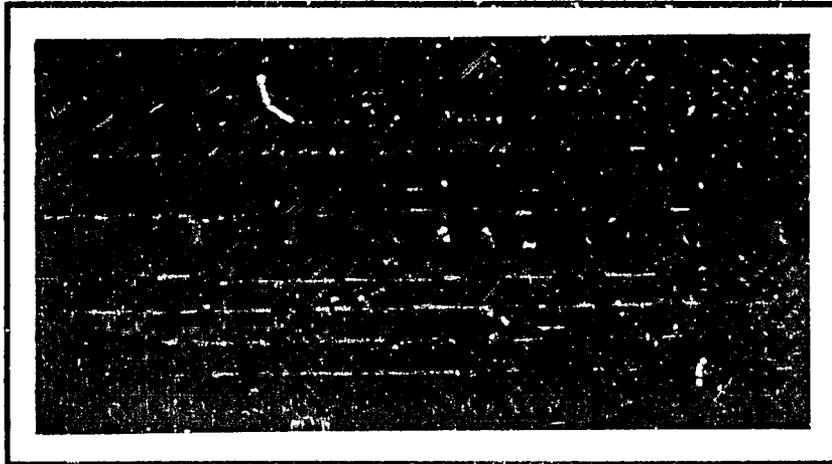
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STRATEGY AND GUIDELINES FOR
IMPROVEMENTS IN SANITATION AND WATER SUPPLY
IN SELECTED AREAS OF THAILAND

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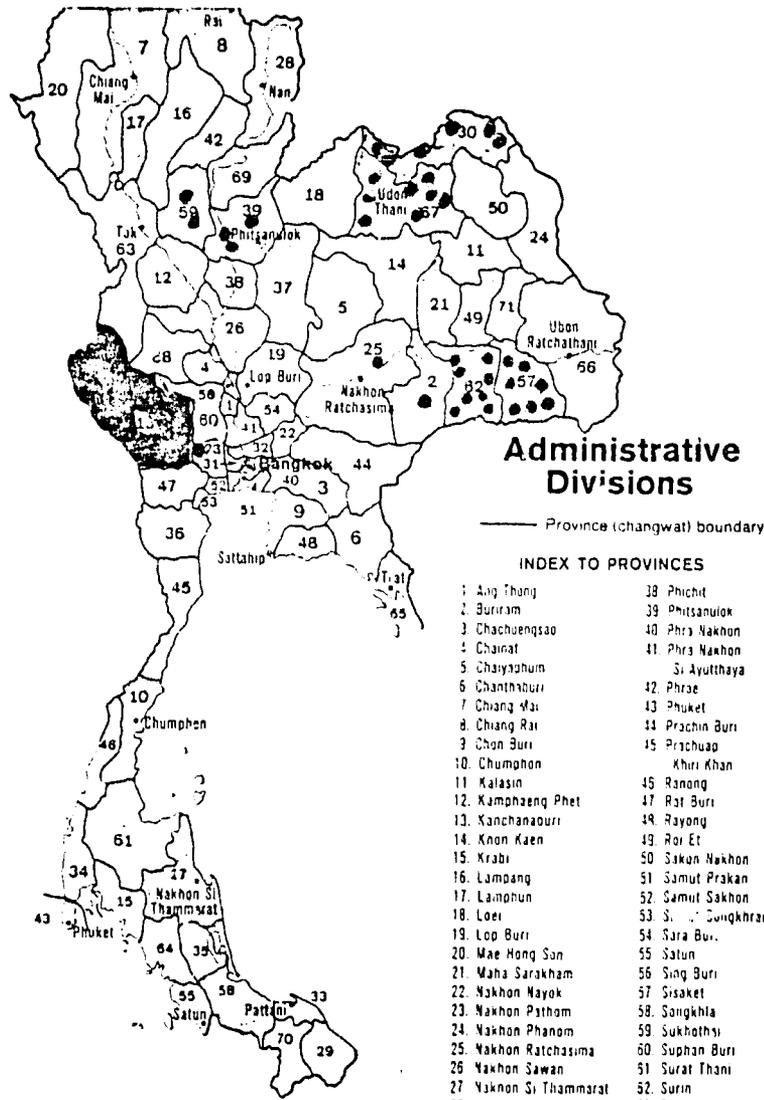
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PROVINCES INCLUDED IN PRIMARY HEALTH CARE PROGRAM



VILLAGES IN REPORT STUDY

Note: Provinces have the same names as their capitals, except Phra Nakhon whose capital is in Bangkok.

I. INTRODUCTION

Background

The United States Government has been interested in the social and economic development of Thailand for almost three decades. Since 1951 USAID has provided approximately \$50 million in health assistance; including the presently-approved but undisbursed funds flowing into the health sector, this sum may be closer to \$55 million, if USAID's contribution to the RIG Accelerated Family Planning and Health Care Project, malaria eradication and participation in the improvement of health-related facilities in refugee camps along the Thai-Cambodian border are also considered.

The Thai Government is using one USAID-funded project, the Lampang Health Development Project, as a model in the design and replication of other primary health care projects throughout Thailand.

Between 1960-1971, USAID/T funded several projects to increase the water supply and to improve sanitary conditions in Thailand's rural sector. These projects included, but were not limited to, the design of water-seal privies that can be constructed inexpensively on site in remote villages with limited outside material help. USAID also funded an extensive research and development program for the design of a pump suitable for use in rural Thailand. Various government agencies are now producing and distributing a limited number of Korat 602 pumps which are an improved version of the Korat 604.

The Ministry of Public Health's (MPH) recent report, reveals the scope of water and sanitation efforts under its aegis. As of September 30, 1978, 2,369,830 water-seal toilets had been built, 15,913 water distribution systems constructed, and 71,893 sanitary walls with pumps installed.

Although other international donors have shown widespread interest in ways to improve the quantity and, to a limited extent, the quality of water in rural Thailand, virtually none has expressed interest with the major exception of USAID, in other environmental sanitation problems.

Two current projects deal with both subjects. A WHO project, started in 1978, and a UNICEF project, scheduled for implementation in late 1979, address ways to increase water supply and improve sanitation in selected areas of Thailand. (Details on these projects are given in Chapter IV and Chapter V, respectively.)

Purpose of Assignment

For various social, economic, humanitarian and political reasons, the United States Government is interested in renewing and increasing its health-sector funds allocation to Thailand; in particular, by emphasizing the

increased quantity and improved quality of water in rural villages, as well as improved sanitary conditions, it hopes to affect positively health in rural areas. Continuing motivation and appropriate health education in the villages would stimulate community participation in the program. An American Public Health Association (APHA) team, with the close assistance and cooperation of a USAID/W direct hire, spent four and one-half weeks in Thailand assessing present sanitation and water supply conditions in the smallest and poorest villages in the country. Four major areas of interest were identified during USAID/W and USAID/T briefings.

- o Assessment of AID experience in water supply and sanitation in Thailand's rural areas. Since Daniel Dworkin, USAID/W/PCC, was conducting a detailed assessment of previous AID-funded water supply projects in villages with a population of over 2,000, the APHA team, under the guidance of USAID/T, limited its review of existing conditions to water supply and sanitation in the poorer villages with a population of less than 1,000; specifically those in the 20 provinces included in the Primary Health Care Project.
- Assessment of the basic levels of social and economic development affected by improvements in water supply and sanitation.
- Development of a rural water supply and sanitation strategy by identifying positive changes effected in the past and by making recommendations for future programs in those fields.
- Identification of targets for projects that can be considered for funding, with special emphasis on USAID participation in the International Drinking Water Supply and Sanitation Decade.

II. SUMMARY OF FINDINGS AND RECOMMENDATIONS

Findings

The following is a brief summary of the APHA team's findings on rural water supply and sanitation in Thailand. (See also Chapter III and tables accompanying Chapter IV.)

A. Strengths

Many factors in Thailand make favorable a rural water supply and sanitation program for villages with populations of less than 1,000. These include:

- The existence of the Rural Water Supply Division (RWSD) and the Sanitation Division of the Ministry of Public Health, (SD/MPH), organizations with many years of successful field experience. These divisions have an organizational structure reaching to smaller villages in the country; both require the community's participation in the projects they assist and each has staff trained in motivation and health education.
- The success of past and present AID-assisted programs that involve staff of the various divisions of the MPH.
- An ongoing Primary Health Care Program (carried out through MPH with AID assistance) which is training village health workers and communicators to work in their home villages. This program lacks the strong emphasis on environmental sanitation that a parallel rural water supply and sanitation program would provide.
- The existence of targets, established by Thailand to respond to emphasis on the 1980s as the Rural Water Supply and Sanitation Decade. Desire for a coordinated rural water supply and sanitation program is strong.
- The pressing need and desire of the people in the smaller villages for improved water supply and excreta disposal facilities, food handling, solid waste disposal and other elements of environmental sanitation. Basically clean, the villagers welcome an appropriate means to help maintain cleanliness.

B. Constraints

The constraints encountered are listed below in random order. They are lack of:

- Trained personnel for environmental sanitation activities;
- Transportation for personnel;

- Training focused on environmental sanitation;
- Continuing supervision at all levels;
- Adequate maintenance for even the simplest hand pump;
- A coordinated plan and program for rural water supply and sanitation activities;
- A data base to plan a coordinated program;
- Understanding of the personal preferences of rural people for drinking water sources; and,
- Sufficient funds to reach the ideal goals that are set.

C. Targets of Opportunity

The strengths and constraints listed above indicate a number of targets of opportunity that AID should help the RTG address. These are:

- Improving the water supply and excreta disposal facilities, as well as other environmental sanitation conditions, including food handling in the poorer, more remote villages with population of less than 1,000 that are not being reached by regular RTG programs and that are not included in other donors' proposed programs.
- Strengthening RWS and SD/MPH, an organization that has long been successful in this field and which has contributed substantially to improved rural water supply and sanitation.
- Extending the scope of the ongoing Primary Health Care Program by supplementing it with a program to improve environmental sanitation.
- Helping the RTG meet its rural water supply and sanitation goals for the 1980s.
- Furthering the objectives listed in the U.S. Congressional mandate for rural poor.
- Stimulating the in-country manufacture of hand pumps, household water treatment units, plastic pipe well screens and other equipment needed in quantity for water supply and sanitation purposes.
- Developing competency-based training programs for operation, maintenance, management personnel and others involved in a rural water supply and sanitation program.

D. Recommended Strategy

The various strategies suggested throughout this report are summarized below.

1. Develop a rural water supply and sanitation program to supplement the ongoing USAID/T-supported Primary Health Care Program. Implement the RWSS Program in the same 20 provinces included in the PHC program, beginning in six provinces and then expanding to seven more, before finally including all 20 provinces. Phase the RWSS Program over three successive three-year periods, and follow up with a one-year evaluation and analysis of physical and social results. Closely coordinate the RWSS and PHC programs and ensure cooperation efforts.
2. Build on the proven capability of the MPH and USAID/T to develop and carry out cooperative public health programs. Develop with the MPH a rural water supply and sanitation project that can be implemented through the Rural Water Supply and Sanitation divisions.
3. Strengthen the RWSS divisions by helping them strengthen their sanitarian corps. Help develop the supervisory staff needed to efficiently use the sanitarians. Provide transportation facilities so that sanitarians and supervisors can fulfill their responsibilities.
4. Provide training for newly-appointed sanitarians and refresher training for present sanitarian staff, as well as village health workers and communicators, that emphasizes environmental sanitation, health education, and community development and participation.
5. Help Rural Water Supply Division staff to facilitate completion of the piped water supply portion of the proposed program by providing necessary supervisory personnel and transportation equipment. Specific training should include not only staff, but also other personnel, including those needed at the village level, to successfully implement the program. Emphasis will be on full community participation before, during and after construction, and throughout the operation and maintenance phases.
6. Help reestablish the RWSS division's former maintenance responsibility and increase the staff needed to provide backup maintenance for the water supply systems it installs, including piped systems and those with hand pumps. This will require setting up provincial maintenance brigades outfitted with the equipment needed to inspect at least once every two

months the system for which each is responsible and to respond to emergency requests from village committees. These brigades should be charged with providing backup maintenance support for the systems and equipment installed by the Sanitation Division. This will take advantage of bi-monthly visits and avoid duplication of services.

7. Provide training for two professionals from the RWSS divisions, one each in the respective technical programs, and one each in management, supervision, organization and logistics.
8. Make available several options for both water supply and excret. disposal interventions to ensure that the villagers' desires, needs, and capabilities to participate in the programs are considered.

For estimating purposes, the project universe provides for an average of 100 villages in each of the 20 provinces, each with an average size of 100 households of six members each. Hence, the program will benefit 1.2 million people.

The water supply options are:

<u>Villages</u>	<u>Number of Villages</u>		
	<u>Alternate 1</u>	<u>Alternate 2</u>	<u>Alternate 3</u>
With Piped Water Supply Systems	1,200	1,400	1,400
With House Connections	600	700	1,000
With Public Hydrants	600	700	400
With Cisterns, Convertible to Piped Systems	800	600	600
10 cm. Water Cisterns for 2 Families	240	180	180
5 cm. Water Cisterns for 1 Family	560	420	420

The options for excretion disposal are:

Complete Coverage for 2,000 Villages	<u>Number Privies</u>		
	<u>Alternate 1</u>	<u>Alternate 2</u>	<u>Alternate 3</u>
Total Privies	200,000	200,000	200,000
Water-seal Privies	200,000	100,000	170,000
Pit Privies, Convertible to Water-seal Privies	0	100,000	32,000

Support the options with necessary equipment, supplies and materials.

9. Assist in a detailed study of water supply and sanitation in the 20 provinces participating in the PHC program, using as a pilot project the study of the first six provinces to be included in the RWSS program.
10. Provide four expatriates to help develop and implement the program. The expatriates should have several years' experience in developing countries on assignments similar to those of this project.
11. Arrange for the assignment of 20 Peace Corps Volunteers to help implement the program at provincial district and local levels.

III. METHODOLOGY AND WORK PLAN

The three-member APHA team arrived in Bangkok the first week of November, 1979, and were briefed by Mission personnel on present AID activities in the Health, Population and Nutrition Office. Before embarking on the first field trip, the team met with the division chiefs of water supply and sanitation of the Ministry of Health and with the WHO project director to discuss a pilot project in water supply and sanitation in four districts in four separate provinces.

The work plan, which was designed with the aid and cooperation of USAID/T/HPN personnel, initially called for visits to only six provinces in the northeast: Surin, Sisaket, Buriram, Udon, Nakorn Rachasima and Nong Kai. However, because the assignment was extended an additional 10 days, the team was able to visit villages in four other provinces -- Kanchanaburi and Nakhon Pathom in the central region and Phitsanuloke and Sukothai in the northern region. Forty villages were surveyed during the two weeks in the field. In addition to USAID personnel, national, provincial and district MPH technicians accompanied the team. The methodology evolved during initial informal interviews in the first four to six villages. Twenty-six specific areas of interest were identified by questioning the headman of a given village or, in his absence, a member of the village committee, an ex-village headman, the present village headman's wife or the school teacher. Additional questions pertinent to each specific interest area were asked to increase the team's understanding of village conditions. For example, after the team asked about the number of privies in the village and recorded the answer, it then asked when the last privy was installed and how many privies were installed in the last two to five years. The answers reflected the sanitation magnitude of recent activity in the given village. And, after asking whether a tambon sanitarian had been assigned to the area, the team inquired about the frequency of his visits to the muban. The team asked what the sanitarian specifically did in the muban once he arrived. The answers ranged from "only giving injections" to "also distributing medicines, and motivation work about keeping the village and houses clean and the need for and use of privies."

Chapters V and VI are analyses of the results of sanitation and water supply efforts. Chapter VII addresses some of the socioeconomic implications of water supply and sanitation conditions and attempts to quantify the resources associated with alternative interventions that USAID can consider while trying to help resolve water supply and sanitation problems in rural Thailand. The raw data of the 40 muban surveys conducted by the team are given in Appendix 5.

IV. ANALYSIS OF SURVEY FINDINGS

Villages Surveyed

The APHA team visited 40 villages in 10 provinces. The provinces constitute one-half of the 20 provinces in which AID, along with other donors and RIG, are participating in the Accelerated Primary Health Care Project. The 40 villages surveyed represent 0.23 percent of the 17,664 villages in the 20 provinces. The total number of villages in the 10 provinces was 9,179; thus, the 40 villages surveyed constituted a sample size of 0.42 percent.

The greatest number of villages surveyed in any given province was eight each in Surin and Nong Kai provinces. Only one village was surveyed in Buri Ram, Nakhon Ratchasima and Nakhon Pathom. Nearly every village surveyed had a village committee. Since this particular question was not asked in Sisaket and Buri Ram, no data on the existence of such committees in these villages are given; however, chances are that most, if not all, had village committees. Of the remaining 32 villages surveyed, only one, in Udon Thani, did not have an operating village committee. (See Table IV-1.)

In the 32 villages where the team asked about the existence of a village committee, it also inquired about the participation of women on the committee. Women served on committees in only three villages. Interestingly, in Nakhon Ratchasima Province in La Ngom village, eight of the 14 members of the village committee were women. Soon after the team's arrival, one of them joined the village headman and another village committee member and actively participated in discussions. In Nasing Sakhan village, Nong Kai Province, two women served on the nine-member village committee, and in Chong Dan Village, Kanchanaburi Province, one of the 10-member village committee was a woman.

Of the 40 villages surveyed, 13 had populations under 500, 20 between 500 and 1,000, and seven over 1,000.

As Table IV-2 shows, 11 of the 40 villages surveyed had fewer than 100 households; 13 villages, between 100 and 200 households; and 16 villages more than 200 households. The total number of households in the 40 villages surveyed was 5,056 and the total population 30,175, giving an average family size of 5.97 and an average population of 753 people. At the provincial level, the population of the villages surveyed ranged from a maximum of 1,440 persons per village in Kanchanaburi to a minimum of 351 persons in one village surveyed in Nakhon Pathom.

Water Supply

The following analysis is based on data presented in Tables IV-3 through IV-7. Of the 40 villages the APHA team visited, 13 had no deep wells. In Sisaket Province, five of seven villages surveyed had no deep wells. In Surin

Table IV-1

SUMMARY TABLE OF MUBAN WATER SUPPLY AND SANITATION

PROVINCE	Number of Mubans Surveyed	Number of Mubans with Village Committee	Mubans with Women in Village Committee	Mubans with Population under 500	Mubans with Population over 500 under 1000	Mubans with Population over 1000
10 PROVINCES	40	24	3	13	20	7
SURIN	8	1	-	2	5	1
SISAKET	7	*	*	4	1	2
BURI RUM	1	*	*	-	1	-
NAKORN RATSIRIMA	1	1	1	-	1	-
UDORN	7	6	-	3	4	-
NONG KAI	8	8	1	1	4	3
KANCHANABURI	2	2	1	1	-	1
NAKORN PATOM	1	1	-	1	-	-
PISANULOK	3	3	-	1	2	-
SUKOTHAI	2	2	-	-	2	-

* These two questions were not asked in villages in these two provinces

Table IV-2
SURVEY SUMMARY

Province	Mubans with Number of Households under 100	Mubans with Number of Households over 100 under 200	Mubans with Number of Households over 200	Total Number of Households in all Mubans Surveyed	Total Population in All Mubans Surveyed	Average Population of Mubans Surveyed
SURIN	3	3	2	1,011	6,443	805
SISAKET	4	1	2	814	5,119	731
BURI RUM	-	-	1	145	565	565
NAKORN RATSRI MA	-	-	1	168	980	980
NAKORN	-	1	6	591	3,622	517
NONG KAI	1	4	3	1,294	4,187	898
KARNCHANABURI	1	-	1	283	2,830	1,440
NAKORN PATOM	1	-	-	78	351	351
PISANULOK	1	2	-	342	1,660	533
SUKOTHAI	-	2	-	330	1,428	714
TOTAL	11	13	16	5,056	30,175	753

Table IV-3
SURVEY SUMMARY

Province	No of Mubans W/ no deep wells	% of Mubans w/no deep wells	No of Mubans w/only 1 deep well	No. of Murbans w/more than 1, less than 5 deep wells	No. of Mubans regularly drink deep well water
SURIN	2	2/8 25	III	III	0
SISAKET	5	5/7 71	I	I	0
BURI RUM	-		-	I	0
NAKORN PATSRIMM	-		-	-	0
UDORN	-		V	II	0
NONG KAI	1	1/8 13	IIII	III	0
KARNCHANABURI	1	1/2 50	I	-	0
NAKORN RATOM	1	1/1 100	-	-	0
PISANULOK	2	2/3 67	I	-	-
SUKOTHAI	1	1/2 50	-	I	I
TOTAL	13	13/40 33%	15	11	1

Table IV-4
SURVEY SUMMARY

Province	No. of Mubans with no dug well with pump	No. of Mubans with one dug well with pump	No. of Mubans with more than 1 less, than 5 dug well with pump	No of Mubans with more than 5 dug wells with pump
SURIN	IIII	-	-	-
SISAKET	III	II	II	-
BURI RUM	I	-	-	-
NAKORN RATSIRIM	-	-	I	-
UDORN	VII	-	-	-
NONG KAI	VI	-	I	I
KARNCHANABURI	I	-	-	-
NAKORN RATOM	-	-	-	I
PISANULOK	II	I	-	-
SUKOTHAI	I	-	-	-
Total	25	3	4	2

Table IV-5
SURVEY SUMMARY

Province	No. of Mubans w/ dug well as principal source	No. of Mubans with one dug well w/out pump	No. of Mubans w/more than 1, less than 5 dug wells w/out pump	No. of Mubans w/more than 5 dug wells w/out pump	No. of Mubans where dug wells dried in the summer
SURIN	II	I	III	-	II
SISAKET	-	-	I	IIII	-
BURI RUM	I	I	I	-	I
NAKORN RATSRIEM	-	-	-	-	-
UDORN	II	III	-	-	I
KONG KAI	-	-	II	-	-
KARNCHANABURI	I	-	-	-	-
NAKORN RATOM	I	-	-	-	-
PISANTULOK		-	II	I	II
SUKOTHAI	I	I	-	I	II

Table IV-6
SURVEY SUMMARY

Province	No. of Mubans w/rain cisterns	No. of Mubans w/out rain cisterns	No. of Mubans w/ rain cisterns as principal drinking source	No. of Mubans w/ ponds	No. of Mubans w/ ponds as principal drinking source
SURIN	III	IIIII	III	IIIII	III
SISAKET	I	VI	-	I	-
BURI RUM	-	I	-	-	-
NAKORN RATSRI	I	-	I	I	-
UDORN	I	VI	-	VI	IIII
NONG KAI	I	VII	-	IIII	
RIJCHANABIRI	-	II	-	II	II
NAKORN RATOM	-	I	-	-	-
PISANULOK	-	III	-	-	-
SUKOTHAI	-	II	-	I	I
Total	7	33	4	20	10

Table IV-7
SURVEY SUMMARY

Frequency of responses
expressing preferred
drinking source

Frequency of responses
expressing preferred
additional water source

Province	Rain	Dug Well	Pond	Deep Well	Rain Cistern	Dug Well	Pond	Deep Well	Piped Water	Water for Agri-Cultural Purposes	Unspecified Improvement for Better Clean Water Supply
SURIN	2	3	3	-	5	1	1	-	-	--	-
SISAKET	-	7	-	-	1	-	-	-	-	--	4
BURI RUM	-	1	-	-	-	-	-	-	-	-	1
NAKORN RATSRI MA	1	-	-	-	1	-	-	-	-	-	-
UDORN	-	3	4	-	1	-	1	-	1	-	4
NONG KAI	1	6	-	1	-	2	-	3	-	-	3
KARNCHANABURI	-	-	1	-	1	-	-	-	-	-	1
NAKORN RATOM	-	-	1	-	-	-	=	-	=	-	1
PISANULOK	1	2	-	-	-	-	-	1	1	1	-
SUKOTHAI	2	-	-	-	-	1	-	1	-	-	-
Total	8	23	8	1	9	5	2	5	2	1	13

Province and Phitsanouluk Province, respectively, two of eight and two of three villages did not have deep wells. In Nong Kai, Kanchanaburi, Nakhon Pathom and Sukhotai Provinces, one village each had no deep wells. In total, 33 percent of the villages surveyed had no deep wells.

One deep well existed in 15 of the 40 villages; Udon Thani led, with five of seven villages with one deep well, followed by Nong Kai and Surin. Of 11 villages surveyed, only one used the deep well as a regular drinking source. In each case where a deep well existed and water from the well was not used for drinking, the team asked why the village did not drink from that source. Invariably, the response was that the water from the deep well was "light," while that from the open dug well was "heavy." According to the villagers, water from the latter tasted better and was more filling. In some cases villagers cited the water's musty smell and high iron content as reasons for not drinking from the source. Thus, the 37 villages, including the single one that used the deep well as a regular drinking source, that had deep wells, used them primarily in the three dry months; while during the rest of the year water from the six lined dug wells was used.

Yang An village actually had eight deep wells, all used for irrigation purposes. However, the one deep well closest to the village was used as a drinking source, especially during the dry season. Each of the eight deep wells in the village was privately owned, and other villagers were allowed to use the well water for drinking purposes. Interestingly, when Yang An's headman was asked about preferred drinking sources, he listed his preference as follows: rain water, dug wells, deep wells. However, when asked about perceived needs for additional water, his first priority was for more water from the canal for irrigation, and then more dug wells for drinking. Of the 40 villages surveyed, 25 had no dug wells with pumps, while nine had capped dug wells with hand pumps. Three villages did not have dug wells installed with a pump. Four villages had more than one but less than five dug wells with hand pumps. Two villages with more than five dug wells each had pumps installed. Six villages had no dug wells. Of the 40 villages surveyed, eight indicated that their primary source of drinking water was dug wells, while the rest had numerous sources, including ponds, rain water cisterns and the usual klong jars, noted in virtually every village. As for dug wells without pumps, six villages had only one such well, 10 had more than one but less than five and six had more than five dug wells without pumps. In eight villages all the dug wells dried during the summer, and drinking water either was carted from neighboring villages, or obtained from other newly dug wells. In some cases large cisterns of rain water carried families through the dry season, in others families had recourse to an irrigation canal or nearby pond.

Only seven of the 40 villages surveyed had rain cisterns in some of their households. Of these, four villages indicated that rain water from cisterns was their principal drinking source. Of the 20 villages that indicated the presence of ponds for purposes of general water consumption, 10 identified ponds as the principal drinking source. (Tables IV-3 through IV-7 present the data summarized briefly above. The raw data can be found in Appendix E. The basic data in Tables IV-7 are useful in drawing conclusions.) Of the 40 villages surveyed

eight indicated they definitely preferred rain water for drinking; 23, open dug wells; eight, ponds; one indicated a deep well as a last recourse. These statistics do not mean, however, that the 23 villages that preferred dug wells as a drinking source excluded categorically all the other possible drinking sources. Due to taste, the deep well was the only water source rejected outright.

A preference for dug well water for drinking did not exclude rain water as a drinking source. When asked about a preferred additional water supply source (the source was not specifically identified for drinking or general consumption uses) nine villages listed rain cisterns; five dug wells; two, more ponds; five more deep wells; two, a piped water supply; one, more water for agricultural purposes; and 12 unspecified improvements for a better and cleaner water supply.

Sanitation

The following analysis is based on data presented in Tables IV-8 through IV-13.

In 32 of the 40 villages surveyed, less than 50 percent of the households had water-seal privies. In six villages more than 50 percent of the households contained water-seal privies. Pit privies were found in two villages in water-scarce Sukhotai Province. In Yang An village, where 100 of 183 households had pit privies installed, not a single water-seal privy could be found in the entire village. In Saiyat Muban, Sukhotai Province, 50 of the 100 households were equipped with water-seal privies, and 60 houses had pit privies. When one team added the number of pit privies to the number of water-seal privies, it found that over 50 percent of the households in the village had sanitary excreta disposal facilities. Ten respondents indicated that a privy had been installed for convenience's sake. The villagers pointed out the inconvenience of using the bushes, especially at night and during the rainy season. In a few villages privies were installed because trees near the village had been cut down.

In those villages where water-seal privies existed, the team tried to determine when the last privies were installed by asking for the number of privies installed in the last two years. This statistic would reflect the villagers' motivation either with or without effort on the part of the tambon sanitarian. In only two villages did the team find where the villagers had expended a measurable effort during the past two years to install a water-seal privy. The team also tried to determine which privies had been installed at the incentive of the tambon sanitarian and which had been installed by the villagers themselves, without outside encouragement. The data were inconclusive and are not given in the summary tables.

When asked what they perceived to be their additional sanitation needs, five villages indicated a desire for more water; 18, more privies; and eight, more information on and instruction in sanitary food preparation.

To determine how much attention sanitarians and tambon midwives give to individual villages, the team asked the respondents how many annual visits these

Table IV-8
SUMMARY TABLE ON MUBANS WITH PRIVIES

Province	Number mubans Under 50% of Households		Number mubans Over 50% of Households		Frequency Responses Giving Reason for the Installation of Privies	
	Sealed Privies	Pit Privies	Water Sealed Privies	Pit Privies	Convenience	Health
Surin	6	-	2	-	-	-
Srisaket	7	-	-	-	-	-
Buri Kum	1	-	-	-	-	-
Nakorn Ratchasrima	-	-	1	-	-	-
Udorn	7	-	-	-	-	-
Nong Kai	5	-	3	-	1	-
Kanchanaburi	2	-	-	-	2	-
Nakorn Patom	1	-	-	-	-	-
Pitsanulok	3	-	-	-	-	-
Sukothai	-	-	-	2	2	-
TOTAL, 10 Provinces	32	-	6	2	5	-

Table IV-9

SUMMARY TABLE ON SANITARIAN VISITS PER MUBAN

Province	Number mubans in which Tambon Sanitarian visits More Than Once but Less Than 5 Times Per Year.	Number mubans where Tambon Sanitarian Visits Once a Month	Number of mubans Tambon Sanitarian Visits More Than Once a Month
Surin	3	1	-
Sisaket	-	1	-
Buri Rum	-	1	-
Nakorn Ratsrima	1	-	-
Udorn	-	4	3
Nong Kai	4	1	-
Kanchanaburi	1	-	1
Nakorn Patom	-	-	-
Pitsanulok	1	-	-
Sukotai	-	-	-
TOTAL, 10 Provinces	10	7	4

Table IV-10

Summary Table on Sanitarian Visits in
Relation to Perceived Sanitation Needs

Province	Frequency of responses perceived additional sanitation needs			Number mubans tambon sanitarian never visits	Number mubans tambon sanitarian visits once a year
	More water	More privies	Other		
SURIN	1	4	2	3	-
SISAKET	-	6	1	6	-
BURI RUM	-	-	1	1	-
NAKORN BATCHASRIMA	-	-	-	-	-
UDORN	-	4	1	-	-
NONG KAI	-	4	3	-	1
ARJANABURI	-	-	-	-	-
NAKORN PATOM	-	-	-	1	-
PITSANULOK	3	3	-	1	1
SUKOTHAI	1	1	1	2	-
TOTAL, 10 PROVINCES	5	18	8	14	2

TABLE IV-11

Summary Table on Tabon Midwife Visits Per Muban

Province	Never Visits	Visits Once a Year	Visits More Than Once But Less Than 5 Times a Year	Visits Once A Month	Visits More Than Once A Month
SURIN	8	-	-	-	-
SISAKET	4	-	2	1	-
BURI RUM	1	-	-	-	-
NAKORN RATCHARSRIMA	1	-	-	-	-
UDORN	3	-	-	-	4
NONG KAI	1	-	3	-	4
KANCHAMABURI	-	-	-	1	1
NAKORN PATOM	1	-	-	-	-
PITSANULOK	3	-	-	-	-
SUKOTHAI	-	1	1	-	-
TOTAL, 10 PROVINCES	22	1	6	2	9

Table IV-12
SURVEY SUMMARY

Province	Frequency of responses in identifying major diseases in all Mubans surveyed				
	Diarrhea	Malaria	Intestinal and Stomach Disorders	Worms	Common Colds
SURIN	7	-	3	-	2
SISAKET	5	-	2	-	1
BURI RUM	1	-	-	-	1
NAKORN RATCHASRIMA	1	-	-	-	-
UDORN	5	-	1	-	4
NONG KAI	5	3	4	-	4
KANCHANABURI	2	2	1	2	-
NAKORN PATOM	1	1	-	-	-
PITSANULOK	3	2	1	1	-
SUKOTHAI	2	2	-	2	2
Total	33	10	12	11	14

Table IV-13
SURVEY SUMMARY

Province	Frequency of responses on causes of the major diseases in all Mubans surveyed			
	Do not know Cause	Contaminated Water Supply	Contamination in Food Preparation	Returning from Forest with Disease
SURIN	-	4	4	-
SISAKET	-	3	4	-
BURI RUM	-	1	-	-
NAKORN RATCHASIRMA	1	-	-	-
UDORN	1	2	4	-
NONG KAI	4	-	4	-
KANCHANABURI	-	1	1	-
NAKORN PATOM	-	-	1	1
PITSANULOK	1	1	2	1
SUKOTHAI	1	1	-	1
Total	8	13	20	3

Table IV-14
Summary Table on Acreage Per
Muban Per Family Income

Province	Number mubans with 10 rai or less - farm size per family	Number mubans with more than 10 but 20 or less rai per family	Number mubans with 5,000 baht or less per year family income	Number mubans with more than 5,000 but less than 10,000 baht per year family income	Number mubans with more than 10,000 but less than 20,000 baht per year family income	Number mubans with more than 20,000 baht per year family income	Number mubans in which some of the labor force augments annual income seeking work outside the village
SURIN	-	-	6	2	-	-	-
SISAKET	1	-	5	1	1	-	-
BURERUM	-	1	1	-	-	-	-
NAKORN RATSIRIMA	-	-	-	-	1	-	-
UDORN	4	2	7	-	-	-	3
NONG KAI	2	1	2	5	-	1	-
KANCHANABURI	1	-	1	-	1	-	2
NAKORN PRATOM	1	-	-	-	1	-	-
PITSANULOK	1	2	2	1	-	-	3
SUKOTHAI	-	2	-	-	-	2	2
TOTAL, 10 PROVINCES	10	8	24	9	4	3	10

persons make. Fourteen villages stated that the tambon sanitarian never visited the village. In two villages the sanitarian came once a year; he visited 10 others more than once but less than five times in one year. The tambon sanitarian visited seven villages once a month, but to only four villages did he make more than one monthly visit. As far as midwives are concerned, the tambon midwife never visited 22 of the 40 villages surveyed. She made one yearly visit to one village but less than five yearly visits to six others. In two of the 40 villages only did the midwife arrive each month and she went to nine villages more than once a month. The team found that in every village visited, traditional midwives delivered most of the babies born there. Few pregnant village women traveled to the tambon health center for delivery and still fewer received prenatal and/or post-natal care.

To determine the villagers' awareness of the causes of prevalent diseases, the team asked questions about the major diseases and their causes. In 33 villages diarrhea was a frequent disorder; malaria often occurred in 10 villages; intestinal and stomach disorders in 12; worms in 11; and common colds in 14. Respondents in eight villages indicated they did not know what caused their diseases; in 13 villages contaminated water supply was mentioned as the principal cause and in 20 others contamination in food preparation. In three villages stricken with malaria, the respondents indicated that people had contracted it while working in the forest.

Village Economy

To measure the village economy and to gather data useful in preparing a strategy for and guidelines on future AID funding of sanitation and water supply projects, the team asked a limited number of questions on employment and income. (These data are given in Table IV-14.)

One basic measure of a village's economic potential was acreage per family. In 14 villages no information on acreage was collected; in 10 villages the family farm plot was 10 rai or less; in eight it was more than 10 but less than 20 rai; and in eight others 14 was more than 20 rai. The data reflects two weaknesses. First, the figures were given by either the village headman, his assistant, a village committee member or the village school teacher, and may be subject to a wide margin of error -- 50 to 100 percent or more may be the result of ignorance of actual numbers of rais or desire to conceal a more realistic estimate of acreage because of tax liabilities. Second, the data do not indicate the distribution of land size. Even if the given numbers approximate the truth, only a few individuals may have large tracts and a large number small to very small family plots. The question was asked primarily to determine annual cash income per family. Since in some cases, the family consumes a portion of the agricultural production, real income in almost all cases probably is much higher than the figures cited. How much higher, however, is questionable. A ball park "guestimate" may be obtained by doubling the cash income per family to account for ignorance or concealment of facts and then increasing this amount another 50 percent to account for autoconsumption. In villages where family cash income was given as 2,000 baht (20 Baht = 1 U.S. \$) per family per year,

total real income per family may be closer to 6,000 baht. The problem with land distribution also applies to income. Since income distribution may be skewed, the average figures cited are unreliable.

Of the 40 villages surveyed on 24 indicated average family incomes of 5,000 baht or less: nine villages cited more than five but less than 10,000 baht; four villages, more than 10,000 but less than 20,000 baht; and three villages, more than 20,000 baht. The team was told that in 10 villages approximately 10 percent of the population went outside the village, especially during the three-month dry season, to seek temporary work, and earned an average of 2,000 baht. (See Chapter VII for additional information on village economics.)

V. RURAL SANITATION IN THAILAND

Accomplishments To Date

This chapter covers all aspects of environmental sanitation, except domestic water supply. Although Thailand has accomplished much in rural sanitation, and particularly in sanitary excreta disposal, much remains to be done.

Approximately 43 percent of the households in the 20 rural PHCP provinces have a sanitary means of excretion disposal: either by water-seal privies or simple pit privies. Data on waste water and solid waste disposal are unavailable. However, in the 40 villages visited the only serious problem with disposal seemed to be poor drainage away from wells, both with and without hand pumps; water often stood in muddy pools and frequently drained back into inadequately protected wells.

Cleanliness in and around the homes was particularly noteworthy, and every privy in the small villages (all checked randomly) was spotlessly clean. This was not unfortunately, the case in larger village restaurants where the team stopped for noon meals. Privies were dirtier than village privies, flies were an obvious problem and food preparation and cleanup methods could be improved. (None of the team became sick because of food poisoning during field work.)

Village headmen in a number of villages said that dirty food caused diarrhea and intestinal disorders. Raw or inadequately cooked meat is conveyed to the mouth with unwashed hands. Water used for cooking and washing of utensils often comes from unprotected, highly polluted sources.

The use of water-seal privies, first introduced in 1960 following research on privy building techniques in Korat, Chiang Mai and India*, has been encouraged. The demand for water-seal bowls has become so great that they are now produced commercially in well-finished concrete and with a ceramic finish. Unfortunately, there has been little apparent emphasis on the use of the open-hole squat plate in water-scarce areas, and people are resorting to an insanitary wooden platform with a hole in the center.

The most recent data available were published in June, 1974; the Syncrisis, The Dynamics of Health, XII, Thailand. Summarized below, by region, they reflect the primary achievements of the Village Health Sanitation Project (VHS/CD).

*Wagner, E.G., Lanoix, J.N. Excreta Disposal for Rural Areas and Small Communities. (W.H.O. Monograph Series No. 39, Geneva, 1954).

Karlin, Barry. Thailand's Water-Seal Privy Program, A Procedural and Technical Review and Interim Terminal Report. (Thai-American Audiovisual Service No. 719, December 1961).

ACCOMPLISHMENTS, 1960 - MAY 1970							
<u>Region</u>	<u>VHS/CHD Village</u>	<u>Houses in VHS/CHD Villages</u>	<u>Sanitary Number</u>	<u>Privy Percent</u>	<u>Sanitary Number</u>	<u>Well Average</u>	<u>Water Supply</u>
North-east	7,885	845,025	293,540	35	4,134	0.92	829
South	2,331	263,679	63,182	24	2,098	0.90	724
North	3,668	547,809	310,651	57	5,811	1.58	1,396
Central	3,501	333,780	197,578	59	3,779	1.07	1,140
Total	17,385	1,990,293	864,951	43	15,822	0.92	4,088

Although the proportion of water-seal privies to simple squat plate is unknown, nearly all the privies seen in the northeast use water-seal, while those in the north and central provinces were wooden squat plates.

Where water seals were installed, anal cleaning after defecation was usually by water, although the use of narrow bamboo strips was common, as with squat plate pit privies. Rarely were leaves or paper used in the privies inspected.

Administrative Structure

The Sanitation Division (SD) of the Department of Health, Ministry of Public Health (MPH), is responsible for the various sanitation programs, including the installation of sanitary privies, carried out in Thailand. Junior Sanitarians provide motivation for the privy program.

Existing and Target Installations of Water Sealed Privies

In 1978, the total number of water-sealed privies in the 10 provinces included in the APHA survey was 291,787. Given the total number of households in these provinces, 1,098,494, only 35.7 percent of the households had water-sealed privies installed. Interestingly, by 1978 two of the 10 provinces visited had already met the 50 percent target of rural households with privies. Kanchanaburi Province, with 54.6 percent of rural households with water-sealed privies, had surpassed its target by 2,919 privies, and Nakhon Pathom Province, with 46,255 privies in 1978, had surpassed the 50 percent target by 10,060 privies. The other eight provinces ranged between 20.5 percent of rural house-

holds with privies (Buri Ram) to 46.9 percent (Nong Kai). When the team added required number of privies in eight of the provinces visited to reach the 50 percent target, it found that 170,442 privies must be installed by 1981 to fulfill the target indicated in Thailand's fourth social and economic plan.

Considering all 20 provinces, the total number of water-sealed privies installed by the end of 1978, according to MOH statistics, was 784,915, or 35.6 percent of the 2,200,968 households. It is important to note that in the second group of 10 provinces not visited by the APHA team, Lampun Province is farthest ahead in percentage of water-sealed privies installed. Undoubtedly, USAID resources allocated to improve health and sanitation in this province have contributed greatly to accomplishments made over the last decade.

In adding the number of privies needed to reach the 50 percent target of the eight provinces in the first group and the nine provinces in the second group, which has not reached the target, the team determined that 218,738 privies must be installed to reach the 50 percent target by 1981. There is no doubt that the Thai Government will be able to reach the targets established for some provinces, as it has already done in three instances. However, it also seems probable that in most of the provinces, this target will not be reached because resources available to the Thai Government are limited. There is, for example, a serious shortage of skilled tambon sanitarians. Given even the best assumptions, if the Thai Government were able to motivate the installation of half the number needed, i.e., 109,369 privies by 1981, a large number of rural households would still be without privies. Furthermore, those unaffected would probably be households in the most remote, least accessible and lowest income villages. Without an infusion of foreign assistance funds, the other 50 percent of rural villages will go without sanitary excreta disposal for another decade or two, and maybe even longer.

The situation in the 20 provinces may be slightly better than that described above, although data on the number of pit privies in use in the villages are unavailable. The team came upon a small number of villages using a combination of water-sealed and pit privies, but the majority either had water-sealed privies or no privies at all.

In the 1980's, one target goal that could be met, provided USAID funds were forthcoming, is the initial provision of assistance to install water-sealed privies in the remotest villages of the 20 provinces and pit privies where water scarcity and low income constrain improvement.

The Ministry of Public Health recommends the achievement of the following coverage targets by the end of the Five-Year Plan, in 1981. (See also Table V-1.)

	<u>Percent Access to Safe Water</u>	<u>Percent Sanitary Excreta Disposal</u>	<u>Percent Refuse Disposal</u>
Urban Population			
Bangkok	100%	100%	75%
Other Urban Areas	100%	60%	50%
Rural Population	25%	50%	50%

Table V-1
Existing and Target Installations of Water-Sealed Privies
in 20 Rural Thai Provinces

<u>PROVINCE</u>	<u>EXISTING NUMBER IN RURAL SECTOR</u>	<u>NUMBER TOTAL HOUSEHOLDS IN RURAL SECTOR</u>	<u>PERCENTAGE OF RURAL HOUSEHOLDS W/ PRIVIES AS OF 1978</u>	<u>NEEDED NUMBER OF PRIVIES TO REACH 50% TARGET FOR 1981</u>	<u>TARGET 50% FOR 1981</u>
PRACHINBURI	31,102	84,517	36.9	-11,156	42,258
BURI RAM	28,727	140,131	20.5	-41,339	70,066
SURIN	33,278	126,052	26.4	-29,748	63,026
SISAKET	32,389	160,340	20.7	-47,781	80,170
UDORN THANI	70,873	192,588	36.8	-25,422	96,295
NONG KAI	42,410	90,427	46.9	-2,804	45,214
PHITSANULOK	39,389	93,560	42.1	-7,391	46,780
SUKHOTAI	32,707	75,016	43.6	-4,801	37,508
KHANCHANABURI	34,657	63,475	54.6	+2,919	31,738
NAKHON PATHOM	46,255	72,387	63.9	+10,060	36,195
SUB TOTAL	391,787	1,098,494	10PAU=35.7	170,442(8P)*	549,250
ROIET	61,199	143,323	42.7	-10,463	71,662
MAHASARAKAM	34,549	108,304	31.9	-19,603	54,152
LALPOON	57,584	61,325	93.9	+26,921	30,663
KAMPHANG PHET	21,586	79,632	27.2	-18,230	39,816
NAKORN SAWAN	46,796	156,510	29.9	-31,459	78,255
PICHIT	20,298	71,976	28.2	-15,691	35,989
PETHABOON	44,705	117,531	25.5	-14,061	58,766
SUPHAN BURI	42,334	106,099	39.9	-10,711	53,045
NAKORN SRITAMARAT	42,415	158,857	26.7	-37,014	79,429
SONGKLA	21,662	98,915	21.9	-27,796	49,458
TOTAL	784,915	2,200,968	20PAV=35.6	185,028 (17P)*	1,100,485

* The subtotal and total number of privies to reach target are the sum of the figures with a minus in front.

Source: MOH/DH/DS, December 1979, Based on 1978 Data.

Sanitation Manpower Resources

One of the most important deficiencies in rural sanitation in Thailand is the shortage of skilled manpower to provide sorely needed sanitation services, to disseminate information and motivate village improvements in sanitation and environmental health. Table V-2, Sanitation Manpower Resources in Rural Thailand, indicates the discrepancy in the number of sanitarians actually working and those needed in the rural sector.

The number of sanitarians working in the provincial capital, the various districts in each province and the mubans within these districts have been distributed among the 20 provinces comprising the universe of the Primary Health Project. The shortage of sanitarians is most serious at the tambon level, in two provinces, Prachinburi and Buri Ram. Prachinburi and Buri Ram only have one tambon each, without a tambon sanitarian. In the other 18 provinces, Sisaket, with 74 Mubans without sanitarians, probably has between 700 and 800 villages that never receive the attention of a sanitarian; Kanchanaburi, however, has the least shortage of sanitarians, with eight tambons without a sanitarian.

The 20 provinces comprise 211 districts, each of which has a district health office headed by a district health officer who is a sanitarian. The total number of sanitarians working in provincial offices in all 20 provinces is 117. There are 1,733 tambons in the 20 provinces; this would seem to indicate a need for 1,733 tambon sanitarians to serve 17,664 villages. In fact, however, there are only 1,221 tambon sanitarians, which means that 521 tambons and approximately 5,000 villages in the 20 provinces lack the services of a sanitarian. A tambon sanitarian handles approximately 14 mubans. Given the number of additional tambon sanitarians needed, the number of mubans per sanitarian goes down to 10 mubans per sanitarian, which seems a more manageable number, if the sanitarians themselves are properly trained, motivated and supervised and also provided with the transportation and fuel needed to travel to the villages as often as necessary.

Table V-3, Sanitation Manpower Resources in Urban and Rural Areas of 20 Thai Provinces, also indicates the need for additional sanitarians, but from a different point of view, it shows the number of people receiving and needing services per sanitarian in the rural and urban areas of the 20 provinces. In Kampanget Province there is one sanitarian per 30,065 people in the rural area. When the total population of the province is considered, there is one sanitarian for every 20,777 persons. Sukhotai, with one sanitarian per 5,714 people in the rural sector and one sanitarian per 5,317 persons included in the total provincial population, has the lowest number of urban and rural persons serviced by one sanitarian.

Table V-2

SANITATION HUMANPOWER RESOURCES III 20 RURAL THAILAND PROVINCES

<u>Changwat</u>	<u>Number Amphoe</u>	<u>Number Tambon</u>	<u>Number Mubans</u>	<u>Number Sanitarians in Changwat-Actual Based on Total Changwat in t.qtrs. Changwat</u>		<u>Number Sanitarians in Amphoe-Actual</u>		<u>Number Sanitarians in Amphoe-Actual</u>		<u>Sanitarians Needed in Tambol</u>	<u>Number Mubans per Tambon Sanitarian</u>
Prachinburi	12	71	802	22	104	12	71	70	1	11	
Buriram	11	89	1,376	23	122	11	89	88	1	15	
Surin	12	99	1,390	1	72	12	99	59	39	23	
Sisaket	13	125	1,395	1	64	13	125	50	74	28	
Udon Thani	20	122	1,589	1	102	20	122	81	40	20	
Roi-et	14	128	1,561	1	100	14	128	85	42	18	
Nong Khai	9	62	695	1	52	9	62	42	19	17	
Maharakam	10	90	1,208	1	64	10	90	53	36	23	
Lamphun	6	42	343	1	23	6	42	16	25	21	
Pitsanuloke	9	72	684	55	136	9	72	72	-	9	
Kampangpet	7	42	410	1	24	7	42	16	25	26	
Nakorn Sawan	12	100	1,009	1	70	12	100	57	42	18	
Pichit	7	67	565	1	78	7	67	70	-	8	
Petchabun	8	78	319	1	52	8	78	43	34	7	
Sukothai	9	62	504	1	95	9	62	85	-	6	
Kanchanaburi	10	68	471	1	70	10	68	59	8	8	
Nakorn Pathom	6	95	775	1	82	6	95	75	19	10	
Suphan Buri	9	86	665	1	73	9	86	63	22	10	
Nakorn Sithamarat	16	126	1,012	1	94	16	126	77	46	13	
Songkhla	11	109	891	1	72	11	109	60	48	15	
Total, 20 Provinces	211	1,733	17,664	117	1,549	211	1,733	1,220	521	14	

TABLE V-3
SANITATION MANPOWER RESOURCES IN 20 URBAN AND RURAL THAI PROVINCES

Province	Urban Population ¹	Rural Population	Total Population	Number of Sanitarians in Rural Areas ²	Sanitarian per Rural Population	Total Sanitarian in Changwat	Sanitarian per Total Population
Prachinburi	19,462	544,457	568,919	70	1/7778	104	1/5422
Buriram	22,829	1,000,134	1,024,176	88	1/11379	122	1/8395
Surin	30,963	908,565	939,528	59	1/15399	72	1/13049
Sisaket	17,304	984,694	1,001,998	50	1/19694	64	1/15656
Udon Thani	75,095	1,255,560	1,330,655	81	1/15500	102	1/13045
Roi-et	26,736	979,995	1,006,731	85	1/11529	100	1/10067
Hong Khai	24,673	551,703	576,382	42	1/13135	52	1/11084
Maharakam	28,693	684,629	713,312	53	1/12917	64	1/11145
Lamphun	12,812	326,877	339,689	16	1/20429	23	1/14769
Pitsanuloke	72,078	603,068	675,146	72	1/8376	136	1/4964
Kampangpetch	17,605	481,053	498,658	16	1/30065	24	1/20777
Nakornsawan	55,177	879,999	935,176	57	1/15438	70	1/13359
Pichit	16,657	518,141	534,798	70	1/7402	78	1/6356
Petchabun	19,415	696,871	716,286	43	1/16206	52	1/13774
Sukothai	19,469	485,699	505,168	85	1/5714	95	1/5317
Kanchanaburi	24,621	423,058	447,679	59	1/7170	70	1/6132
Suphanburi	21,522	655,850	677,372	63	1/10410	73	1/9279
Nakorn	58616	1,105,918	1,164,534	77	1/14362	94	1/12388
Rachasima							
Songkhla	60,853	717,533	778,386	60	1/11958	72	1/10810
Nakorn Pathom	39,859	478,615	518,474	75	1/6381	82	1/6323

¹ Source: World Bank, Appraisal of Population Project, August, 1977. Population Figure as of September 1976.

² Based on the actual number of sanitarians employed by RTG as of 1979, unpublished data, MOH/RTG.

The sanitarians based at the provincial headquarters have little, if any, time to devote to villagers living in rural areas. The district health officers, though closer to the villages, also have little time, and their many responsibilities minimize their direct participation in village sanitation activities. Consequently, the major burden of providing sanitation services directly to village dwellers falls to the tambon sanitarian.

Assuming a 14 percent attrition rate during training and departures from the existing group of sanitarians working in tambons, a significant target area for USAID consideration would seem to be an accelerated, partially-funded training program for 600 junior sanitarians. The Thai Government is not able now to train and place a sufficient number of sanitarians in tambon positions, and there is no indication that other international donors are or will be involved in the near future in the accelerated training of sanitarians. The host country's urgent need for these sanitarians, a need not addressed by other donors but which meets AID criteria, would enable USAID to have a direct and beneficial impact on the poorest members of Thailand's rural population.

Another significant target of opportunity is the retraining of the 1,221 tambon sanitarians now working in the 20 provinces. The required training would not be exclusively technical. The sanitarians would have to be shown the value and importance of intensive work in every village in their charge. For the sanitarians to do a meaningful job in motivating villagers to improve their water supply and sanitary conditions, the sanitarians themselves would have to be motivated, first by their supervisors, and encouraged to understand the worth of their efforts and contributions to social and economic development in rural areas.

The APHA team believes the Peace Corps, in cooperation with USAID, can play an important role in Thailand in improving the quality of life in the poorest villages of the selected provinces by improving sanitary conditions and by increasing the quantity and improving the quality of drinking water. There are 211 districts in the 20 provinces; 20 Peace Corps volunteers (PCV) trained in rural health, sanitation and water supply could work out of model districts, traveling daily to the mubans within the district.

Considering the four stages of the proposed project, the participation of PCV's could be scheduled as follows:

					<u>Total</u>
1981-82	20 PCVs	6 Provinces			
1983-84	20 PCVs	6 Provinces	20 PCVs	7 Provinces	20
1985-86	20 PCVs	7 Provinces			40
1987-88	20 PCVs	7 Provinces	20 PCVs	7 Provinces	40
1989-90	20 PCVs	7 Provinces			20

The first stage of the project would be implemented in six provinces over three years. PCVs would work in these provinces over a four-year period (2 tours of duty). During the second stage of the project, in addition to the 20 PCVs in the six provinces, 20 PCVs would work in seven provinces for six years over two duty periods. In the third stage, in addition to the second group of 20 PCVs working in seven provinces while the project is being implemented, another 20 PCVs would work in the last group of seven provinces. Thus, approximately 120 PCVs would be involved over the projected 10-year project. Three PCVs, supported by a fourth, would be assigned to each province.

A PCV would spend one whole day in each village and be able to visit each project village at least once every four months. Some of the visits would be made with the tambon sanitarian and involve periodic training and motivation of the village health volunteer, village communicators, other village leaders and the general population. At other times the PCV would visit villages in the company of tambon midwives. During these visits additional training could be provided to traditional midwives and informative discussions held with groups of village women.

During a normal two-year tour of duty, the PCV would be able to visit each village at least six times. With proper supervision, logistical support, fuel, training materials, first aid and simple drugs, the Peace Corps could make a valuable contribution to ACTION's participation in Thailand's International Drinking Water and Sanitation Decade.

Constraints

A number of villages cited cost of privy installation, based on use of a water-sealed privy and installation of two vaults for composting excreta used as fertilizer, as one reason why most villages had not installed privies. The perceived need for a costly permanent privy of concrete or galvanized iron siding heightened the importance of the cost constraint to most of the people living in the poor villages. (See "Review of Technology", page 41.) A second constraint, particularly in areas where most water sources dried up in the dry season, was the lack of water required by water-seal privies. The installation of more privies was also hindered by the infrequent visits of the sanitarian, who could stimulate use of sanitary privies and explain the available alternatives, such as simple squat plate, water-seal privy, vaults lined with concrete rings, bamboo or other material, a privy building made of readily available local materials or of more permanent materials. Information on the causes of diarrheal and other filth diseases, worms, etc., as well as information on the benefits of potable water and sanitary excreta disposal, personal hygiene and food sanitation, was lacking.

The desire for privies for convenience was expressed frequently. Some headmen said that privies were needed because the woods and bushes that formerly surrounded the villages had been destroyed and privies were wanted for privacy. Those privies that were seen were used and clean, and more would probably be installed if some of the constraints could be overcome. There was no indication that privies had been cleaned in anticipation of the team's inspection, as virtually none of the villages were advised of a visit ahead of time.

Proposed Interventions

Information made available to the team before its assignment ended in Bangkok is presented in Table V-4. Although the data is slightly different from the data given in Tables V-2 and V-3, they are included here because they narrow down the recommended universe of rural water supply and sanitation projects. Of the total number of villages outside the municipal area, only a part has been included in the MOH health and sanitation project. The Thai Government chose to provide these villages with health and sanitation services on a priority basis. Since the selection criteria were not known when this report was written, the team cannot estimate the number of villages which would coincide with the proposed USAID intervention; that is, the coincidence of villages indicated in Table V-4 and those selected for assistance in the USAID-funded project cannot be determined.

A. Donor Projects

While other donors have provided much assistance on rural water supply projects, very little help has been provided for other sanitation efforts, including for sanitary excreta disposal. Even though sanitation is mentioned in many projects sponsored by other donors, assistance rarely extends beyond rural water supply. USAID programs have been the exception; one of the first cooperative programs, signed in January, 1960, included the installation and use by households of privies and the improvement of premise sanitation.

The UNDP initiated a project in January, 1979, with WHO as executing agency providing the following:¹

RTG 45,350,080
(in kind)

UNDP US\$1,841,900

¹ Derived from UNDP Project Document No. THA/76-004/A/01/14.

Table V-4

MOH VILLAGE HEALTH AND SANITATION PROJECT BASIC DATA

Name of Changwat	No. of Amphoe Subamphoe	No. of Tambon	Total No. of Sanitarian in Changwat	No. of Sanitarian Working on Sanitation	Percentage of Sanitarian Working in Sanitarian	No. of Villages Outside of Municipal Area	No. of Villages Outside Municipal Area which are Included in the Village Health+ Sanitation Project
PKACHINBURI	10/2	90	114	77	70.6	875	532
BURI RUM	11/1	99	149	96	64.4	1,455	799
SURIN	11/2	105	144	80	55.5	1,470	1,173
SISAKET	10/3	138	125	95	73.6	1,427	1,126
UDORN THANI	16/4	127	---	--	----	1,682	1,303
ROI-ET	13/2	129	200	92	46.0	1,606	1,582
HONG KAI	8/2	66	108	76	70.4	774	733
MAHASARAKAM	9/1	99	116	59	50.8	1,168	1,168
LUMPHOON	5/1	42	75	35	46.6	357	549
PITSANULOK	8/1	72	128	69	53.9	712	579
KAMPANGPET	5/2	44	76	27	35.5	443	316
NAKORN SWAN	12	100	140	94	67.1	927	458
PICHIT	6/1	68	117	83	70.9	558	328
PETCHABUN	8/1	71	97	71	73.2	694	385
SUKOTHAI	8/1	68	105	55	52.4	477	438
KANCHANABURI	10	72	126	78	61.9	506	382
SUPHUNBURI	8/1	89	155	89	57.4	685	441
NAKORHPATHOM	6	95	106	94	88.6	784	584
NAKORNSKRITUMMARAT	14/2	129	107	81	75.5	1,047	975
SONGKLA *	10/1	109	84	84	100.0	864	763

OVER ALL OUTCOMES OF VILLAGE HEALTH + SANITATION PROJECT BY CHANG WAT FROM COMMUNITY HEALTH DEVELOPMENT REPORT NO. 7 PERIOD ENDED IN MARCH 1979

* (EXCEPT CHANT WAT SONGKLA UP DECEMBER 1978)

Percentage of Non-Municipal Villages Included in VHSP	No. of household in the rural sector (non municipal area)	No. of household in the rural sector included in VHSP	Population in rural sector (non-municipal area)	Population included in VHSP	Number of privies in VHSP	Percentage of household included in the project with water seal privy	Percentage of total household in rural sector with water seal privy
59.7	84,509	73,922	563,055	435,504	31,169		
54.9	140,131	94,731	1,060,044	638,590	28,768	42.2	36.8
79.8	126,052	121,294	984,736	822,412	33,239	30.4	20.5
78.9	160,340	117,756	1,028,341	787,647	32,376	27.4	26.4
77.5	192,589	161,227	1,323,582	1,032,915	70,797	27.5	20.2
98.5	143,323	132,430	1,004,827	939,768	61,260	43.9	36.8
94.7	90,427	85,634	617,135	556,438	42,462	46.3	42.7
100.0	108,304	108,304	704,779	704,779	34,551	49.6	46.9
97.7	61,325	57,564	330,095	309,912	57,564	31.9	31.9
81.3	93,560	69,972	610,140	433,518	39,375	100.0	93.9
71.3	76,632	60,668	498,586	359,463	21,463	56.3	42.1
49.4	156,510	84,205	879,630	474,551	46,895	35.7	27.2
58.8	71,978	45,454	498,013	265,781	20,269	55.7	29.9
51.6	117,531	55,729	699,620	333,202	30,021	44.6	28.2
88.1	75,016	64,055	483,404	398,436	32,711	53.9	25.5
75.5	63,375	62,984	461,045	351,403	34,688	51.2	43.6
64.4	106,099	87,537	661,734	518,824	42,317	55.1	54.6
74.5	72,387	61,341	502,267	403,798	46,243	48.3	39.9
93.1	158,857	158,857	1,110,933	962,912	42,471	75.4	63.9
88.3	98,915	87,646	658,919	550,492	21,649	26.7	26.7
						24.7	21.9

Among other objectives, the purposes of the project are:

1. To develop methodologies to support primary health care by providing access to safe water, sanitary excreta disposal and food sanitation; these measures are to be implemented in four districts: Hang Chat, Chana, Pak Thong Chai and Samoeng.
2. To prepare a national rural water supply and sanitation plan for providing access to safe water and sanitary excreta disposal to all inhabitants of rural Thailand.
3. To prepare a rural water supply and sanitation program for implementation during the Fifth Five-Year Plan, 1982-1986.

UNICEF has an extensive rural water supply and sanitation project involving, among other items, water-seal latrines for 50 percent of the households in 90 villages in Sisaket, Roiet, Khon Kaen, Nakorn Ratchasima, Ubon Ratchathani and Nong Khai; school sanitation in 300 schools; food sanitation in 10 percent of the houses in the 90 target villages; and vector control through refuse disposal and drainage programs.² The estimated inputs for the rural water supply and sanitation component of the project are:

RTG: US\$ 1,950,000
UNICEF: US\$ 1,050,000 (increased to 1,130,500)

The World Bank is sponsoring a project which includes the provision of 4,000 wells in northeast Thailand at an estimated cost per well of \$2,500.

B. Strategy and Guidelines for Possible USAID Intervention

The two major constraints on the installation of sanitary privies in the 40 villages examined during APHA's visit are a lack of understanding of the benefits resulting from use of a sanitary privy and the privy installation costs.

The first constraint may be overcome through more effective use of the sanitarians responsible for motivating villagers and helping them install privies. This is one of many tasks required of sanitarians who can fulfill their duties by providing refresher courses that emphasize the importance of environmental sanitation and sanitary privies and by supervising those helping to stress the program.

The sanitarians must be provided with the necessary molds for making the concrete rings that line the privy vaults or pits and molds used to construct water-seal bowls made by the villagers. Small hand-operated mixers, shovels, tools, and a vehicle to transport the equipment from village to village should also be provided.

² From UNICEF Assisted Program Plan of Operations, Mid-1979 to Mid-1982, November, 1978, and Rural Water Supply and Environmental Sanitation UNICEF Assistance, undated.

In accordance with USAID and other donor precedents, the householder should provide the cement and local material, dig the pit, mix the concrete and build the protective shelter according to his own desires. For example, if the villager wants a prefabricated water-seal bowl, he will purchase the one he wants and is willing to pay for.

The cost constraint can be overcome by offering the householder several alternative approaches to obtaining a sanitary privy. The objective of a sanitary privy is to provide a convenient place for depositing urine and excreta where it cannot be carried by flies, vermin or humans and/or washed into a drinking-water (surface or sub-surface) source. The householder should have a variety of choices, ranging from the least expensive -- pit privy, with a simple squat-slab of concrete, a simple pit lined with bamboo and shelter made of local materials (bamboo or palm leaves) -- to much more expensive options -- ceramic water-seal bowl, two concrete lined pits or vaults to allow for easy composted, sophisticated protective shelter of concrete block or galvanized iron with a concrete water storage tank and ample concrete floor space so the building can be used as a bath house.

In the few instances where other donors have included sanitary privies in their projects, they have specified water-seal privies. These include a water-seal bowl which can be bought in the local market and which has two concrete-lined pits and a rather substantial shelter. Unfortunately, the cost of the unit discourages many householders, and few are encouraged to install a less expensive means of sanitary disposal. Specifying a water-seal unit also precludes use of the privy in water-scarce areas, where villagers have resorted to a rough wood platform over a pit. This only partially serves the purpose of sanitary excreta disposal, but it could be improved inexpensively with installation of concrete slab built by the individual householder with molds furnished by the project. The concrete slab can be made so that a water-seal bowl may be added later, when water becomes available and the householder can afford the improvement.

Several factors should be considered when selecting the villages to be included in the privy program. These are as follows:

1. The village should be in one of the 20 provinces included in the Primary Health Care Program, should have a population of less than 1,000 and preferably have the village health worker and communicator of program trained, in action and adequately supervised.
2. Health education and motivation programs should have been started in the village.
3. Between 70 percent and 80 percent of the households should be willing to help install their own privies, and be willing to use and maintain them.

The estimated costs for the various installations are given in Chapter VII.

Review of Technology

No attempt will be made to review all the various facilities devised for the sanitary disposal of excreta. The World Bank recently published an exhaustive compilation of appropriate technology for excreta disposal, from the simplest to most complicated devices. Several concern the composting of human excreta for use as fertilizer; because they require considerable extra capital, above the cost of a simple installation, it is doubtful that the resulting fertilizer is worth the price. Many villagers said that their single pit privy had never been cleaned out, even though it had been used for three to five years, principally because paper, leaves, bamboo splints and stones had not been thrown into the pit, but were buried in a separate hole in the ground.

The simplest sanitary privy consists of a pit about 2.5 meters deep and 0.8 meters in diameter, with a slab or platform (preferably concrete, but wood is sometimes used) placed over the pit at an elevation somewhat higher than the surrounding ground. The concrete slab may be built to accommodate a water-seal bowl at a later date. A hole of appropriate size and shape is left in the platform near its center so that human waste falls through the hole and into the privy. A wooden plug or cover is used to prevent flies from entering and leaving the pit. A protective shelter of easily available local material is constructed over the privy. One shelter seen during the field assessment had walls made of beautifully woven bamboo or reed matting. It was not only much cooler but more appropriate than a much more expensive wood, galvanized iron or concrete block shelter.

In some countries a black, five- or six-inch thin metal pipe is carried up outside the protective shelter from a hole in the concrete slab and extended slightly above the roof of the shelter. As an exhaust pipe from the pit, it alleviates odors.

In many areas of Thailand, the pit must be lined to prevent the earth, particularly when wet, from caving into it. The best lining is made of concrete rings with an inside diameter of 0.8 meters and a height of 0.5 meters. Molds should be available to householders so that they can make the rings. The rings are also available in the markets of many towns and can be purchased like the concrete slab. The pit may be lined with vertically placed bamboo and supported by bamboo rings. Bricks may be used whenever and wherever available.

A more sophisticated installation has two concrete-ring lined pits, one directly under the water-seal bowl on the platform and the other outside the protective shelter. These pits are connected to the first vault; the material at the bottom of the first vault is forced through a pipe near the bottom into the second vault. By the time the second vault is three-quarters full, the contents have composted and may be safely used for fertilizer. The protective shelter is usually of permanent construction. Where the ground-water level is high it may be necessary to use a concrete vault partially lowered in the ground; the pit must be cleaned out as liquified excreta will not seep away from it.

A well-constructed and maintained sanitary privy may be located near a house or even inside it. In one village, a household had located the water-seal privy in a partitioned corner of the main room of the house, which was built on wood stilts six feet above ground -- a common practice in Thailand. A length of pipe had been installed from the privy vertically down to a hole in the top of the concrete cover of the vault.

VI. RURAL WATER SUPPLY

Accomplishments to Date

A substantial amount of work has been done in many Thai villages to provide water for domestic use during much of the year. Pioneered by USAID as one of the international donors most interested in increasing rural water supplies in Thailand, similar efforts by other donors have been made in both the rural and urban sectors of the country.

In the last 15 years, the Thai Government has continued to provide resources to about a dozen agencies, mainly to increase quantities of water throughout the year. The APHA assessment team found, however, that the smallest and poorest rural villages, those located in inaccessible areas of the countryside, continue to have problems with the quantity and quality of their water. Within the next several decades, the Thai Government will have sufficient internal resources to help the smaller villages improve the quantity and quality of water available to them. With other international donors showing interest in the larger towns (population over 2,000), the Government may be able to reach these villages in less time.

The emphasis on improving the quantity and quality of water for drinking and general domestic purposes accommodates USAID policy in several ways. First, USAID was very active in a rural water supply project from 1960 to 1971, when it terminated all involvement in this activity. With renewed interest in providing loan assistance funds, the agency may once again become involved in rural water supply projects. Second, 1980 has been designated the "International Drinking Water and Sanitation Decade". The United States Government has decided to participate actively in this Decade by providing substantial resources to especially needy developing countries. Given its previous success with rural water supply projects, Thailand should benefit from AID's so-called "WASH" project. Third, the Congressional mandate to provide assistance to the poorest of urban and rural poor can be realized by defining the universe of the proposed project to the type of villages indicated earlier. Fourth, USAID is committed to intervention in those areas where neither the host government nor other international donors are directly or closely involved. Usually USAID does not wish to compete with other donors, preferring a pioneering, experimental approach, breaking ground so that other donors can follow. Because the United Nations designated the 1980's a special decade, a number of donors may become closely involved in efforts to provide assistance to improve water supply and sanitation conditions in rural areas. However, because the bankability of rural water supply and sanitation projects in the poorest and lowest income villages cannot be justified readily to some donors' satisfaction, the chances are that USAID resources would not compete with those of other donors.

APHA Survey on Water Supply and Sanitation

The results of the APHA survey on water supply and sanitation were described in detail in Chapter II. This section will be restricted to a limited discussion of the team's experience. The team's limited experience, based on visits to 40 remote villages, indicated that the presence of an interested tambon sanitarian, who visits villages frequently and has the ability to motivate and mobilize village resources, is an important factor in bringing about improvements in water supply and sanitation. When unavailable, his work may be taken up by a village headman or village committee interested in such improvements. The translation of interest into actual improvements is a function first of financial capability and second of the priority the villagers assign to such improvements, which may compete with ownership of televisions or use of electricity.

The team observed that where several government agencies have been active in providing different water sources without village participation, the village headman indicated that the village would not be willing or able to provide any resources, such as free labor, to increase water quantity and quality. However, this may be a situation unique to certain villages. In most, if not all cases, villagers that want a privy are willing to provide at least some, often all, of the resources needed to install a pit or water-sealed privy. Although there may be a significant regional difference in the percentage of resources villagers contribute, village contribution to water supply and sanitary excreta disposal installation efforts has been established in many areas.

The team also observed several bio-gas units using pig, sheep, water buffalo and cow dung to provide methane for cooking purposes -- part of a project sponsored by the Royal family. The team believed that its viability would increase over time as the cost of installations decreases. A design used in the People's Republic of China has been adapted for use in Thailand and further modifications may result in additional cost reductions.

Interestingly, the team found that taste preferences were not limited only to village dwellers. In provincial centers where piped water was made available to the houses of a number of the highest provincial-level sanitation professionals, 5- to 20-cubic meter cisterns were used to store drinking water. The sanitation officials themselves expressed a definite preference for rain water, though they knew piped water was safe and plentiful. Furthermore, during a number of interviews, sanitation officials commented that schools supplied originally with piped water as the sole drinking source requested cisterns to catch rain water for drinking. Again, this reflected an interesting and decided taste preference.

Administrative Structure

A. Responsible Agencies

No single agency in Thailand is now responsible for implementing the Rural Water Supply Project, although attempts are being made by the Rural Water Supply Planning Subcommittee of the National Economic and Social Development Board (NESDB) to coordinate the activities of the 11 agencies involved. (See Appendix D, which describes these agencies' functions and activities.) Table VI-1 lists the several agencies currently involved in the Rural Water Supply Project. It also

Table VI-1
Budget Allocated for the Provision
of Water Supplies (1956-1977)

Agency	Budget (Million Baht)	Percent- age	Rural Water Supply Activities by Agency
Department of Mineral Resources	669.80	33.12	Ground wells from 100 to 850 feet deep, average 185 feet, most with hand pumps
Department of Health	439.40		
Sanitation Division	101.70	5.04	Small water supply systems in schools, temples, health stations
Rural Water Supply Division	337.70	16.72	Piped water systems in communities or villages with 2,000-5,000 population
Office of Accelerated Rural Development (established 1966)	335.70	16.62	Shallow wells, ground wells, ponds, reservoirs in sensitive areas
Department of Public Works (budget for rural wells)	164.41	8.14	Piped water supply systems in municipalities and sanitary districts outside of Bangkok plus ground wells in rural areas
Department of Local Administration	312.48	15.47	Employs local contractors to provide water sources such as shallow and driven wells, 400 gallon metal tanks, 150 cubic meter concrete tanks, dredging ponds
Department of Community Development	12.35	0.61	Stimulates and furnishes funds for village self-help projects such as shallow wells, ponds, etc.
Royal Irrigation Department	42.42	2.29	Construction of standard ponds for irrigation and domestic use
Department of Public Welfare	18.64	0.92	Construction of shallow wells and ponds
Department of Land Development	3.28	0.16	
National Central Security Command	17.29	0.85	Sets up mobile teams responsible for digging shallow and ground wells for people in sensitive areas
TOTAL	2,019.80	100.00	

Table VI-2

Output of Rural Water Supply Projects
by Types of Projects (1956-1977)

Type	Output
Rural water supplies	539 projects (0.48%)
Schools, temples, village water supplies	12,048 projects (10.48%)
Ground wells (deep)	12,341 wells (11.15%)
Ground wells (shallow)	150 wells (0.13%)
Shallow wells	36,987 wells (33.38%) population
Tube wells (driven wells)	20,739 wells (18.72%) 22.9
Small standard ponds	899 projects (0.79%) million
Large standard ponds	700 projects (0.63%)
Dredging of ponds, swamps	5,293 projects (4.78%)
Metal tanks	19,915 tanks (18.0%)
Concrete tanks	653 tanks (0.59%)
Reservoirs, dykes, etc.	463 projects (0.42%)
Other	87 projects (0.08%)

shows the amount of funds allocated to the agencies between 1956 and 1977. Table VI-2 indicates the magnitude of the work carried out in Thailand between 1956 and 1977 to provide water for domestic use in rural areas.

In addition to government agencies, a number of PVOs assisted in the installation of rural water supply systems in Thailand. No data were obtained on these activities, but the efforts are believed to be minimal in comparison with those of regular government agencies.

Several agencies are engaged in the same type of program, providing water from deep or shallow wells or from ponds. Different agencies may provide water from different sources in the same village. Different agencies may have installed different types of hand pumps in the same village, as the team noted. A few of the agencies provide back-up maintenance for equipment they install. The Department of Mineral Resources (DMR) has one center in Khon Kaen charged with maintaining wells in the northeast and one in Saraburi for maintaining wells in other regions.

Charged with administering to local authorities, the Department of Local Administration (DLA) has authority over the many water supply installations it has helped rural people obtain; it is also responsible for their maintenance.

The Division of Rural Water Supply (MPH) assists in training plant operators for systems it helps install, sets operation specifications, follows up work in repairing damaged equipment, and provides technical advice. According to Dr. Dworking, the piped water supply systems installed, maintained, and operated by RWS Division were well operated and maintained. (The operation and maintenance functions of the RWS Division was recently transferred to another agency.) Because of its long and successful experience in designing and installing, with the community's help, smaller piped water supply systems in rural areas, and given its success in helping the local water committees to continue the efficient operation and maintenance of these systems, the APHA team has recommended that the piped water supply element of the program be implemented through the Division, which would also provide back-up maintenance services. Vitally important to the continued functioning of the systems, the condition should be made a precedent to the program.

B. General Accomplishments and Future Plans

For many years the Royal Government of Thailand (RGT) has recognized that the so-called "filth diseases" are the leading cause of illness and death among the predominantly rural population of the country, and it has allocated large sums of money to alleviate the conditions in rural areas, particularly in the northeast. Between 1956 and 1977, more than 2,000 million baht (100 million U.S. dollars) were allocated for the provision of water supplies alone. (See Table VI-1.) Of the 10 agencies listed in Table VI-1, the Department of Health, allocated nearly 22 percent of the funds, played a major role in providing water for the rural population and it has assisted in the construction of 22,340 wells for populations between 2,000 and 5,000, and in more than 12,000 projects for schools, temples and water supplies for smaller villages.

The RTG Department of Health initiated a cooperative groundwater program in 1952 in northeast Thailand; the program was extended in 1955 to include the Royal Irrigation Department and the Department of Mineral Resources. By 1963 all the well rigs had been transferred to the Department of Mineral Resources. Between 1957 and 1965, the Department of Mineral Resources and the Public Works Department installed 1,388 groundwells in the rural areas at a total cost of 143 million baht. In addition, approximately 1,300 shallow open wells were constructed by villagers under the guidance of the Community Development Department with a budgetary support of 1.5 million baht.

In 1964, the Cabinet approved a National Rural Water Supply Project, which since 1966, has been receiving an annual budget to support its activities.

In sum, approximately 110,000 installations providing water to more than 22 million people have been completed to date.

Characteristics of Supply Mechanisms

Rural water supply mechanisms can be differentiated in two ways: by level of participation of public and private financing in construction, and by use categories. As far as the provision of privies is concerned, this analysis is limited only to the participation of the two sectors mentioned above.

In the provision of water to rural areas, and especially to small, remote and relatively low income villages, the role of public fund participation is critical. Whether the water source is a pond, shallow or deep well, cistern or piped water, public funds (including international assistance funds) are important to the provision of funds, materials and technology for system installation and maintenance and to the provision of resources in health education, which results in the full use of the service installed. It is true that in the absence of any public funds, villagers will dig shallow wells and even small ponds to satisfy their minimal needs. However, beyond these minimal needs, the quantity of water may not improve unless public funds -- national and/or international -- are provided. For the type of project described in this report, substantial local participation is required unconditionally and is part of the selection criteria.

When an activity occurs in a rural setting where villagers have neither participated in the decision making process nor joined with outsiders to implement a solution using their own resources, two problems may arise. First, the villagers may use the installation for the purpose for which it was installed until it breaks down or becomes unuseable, and then expect the government or international assisting agency to fix it. For example: the Canadian International Development Agency in Ghana financed a project in which funds were used to install a large number of deep wells with pumps. No social and economic analysis was done beforehand and village assistance was not requested. When the pumps broke down, many villagers wanted either the Canadians to fix and maintain them continuously or the Ghanaian Government to undertake the responsibility, but at no cost to the villagers since these were Canadian wells. Had the villagers been asked

or required to participate in the study, design and implementation stages, they could have been expected to take responsibility for operating and maintaining the wells. Pride of ownership might also have made them more responsible.

The second problem is that an installation may not be used for its originally-intended purpose. This was observed in the field in Thailand, as well as in Ghana and Upper Volta. Use of a deep well with a pump may be rejected for drinking purposes not only because of perceived or real differences in the taste of the water, but also because of convenience factors, such as time and distance from the water source. When a government agency provides a water source without requesting the villagers to actively participate in its design and implementation, the villagers will reject it, citing previously unconsidered preferences for taste or location as reasons.

Water supply mechanisms may be categorized by water-use patterns, which can be differentiated by use and by time/distance factors.

A. Use Patterns

1. Drinking: A water source in the proximity of the village household may be used for drinking by humans and/or animals. The animals may range from small ruminants to cattle and buffalo, which drink either directly from the water source or from nearby receptacles provided by the village or an individual.
2. Washing: The location of the water source, depending on the scarcity and effort involved in fetching water, which determines the quantity used for washing the body, clothes, utensils, etc.
3. Sanitation: Water is used for water-sealed privies and anal cleaning. Sufficient quantities of water are needed to install new water-sealed privies or to convert existing pit privies to water-sealed privies. Also, anal cleaning may involve paper, bamboo stick and stones instead of water.
4. Horticulture: The water source may be used for raising fruit and vegetables either for family consumption or sale or barter.
5. Agriculture: Seldom is a water source near the village household used for both general consumption purposes and extensive irrigation. A source of irrigation water used primarily for agriculture may provide the village household with water for all other uses.

B. Time/Distance

The fetching of water in many rural areas has traditional and cultural aspects that cannot and should not be dismissed. In some societies the fetching of water is strictly the women's and children's responsibility. In others, the duty is shared. Although in most of the Thai villages it was viewed as the women's and children's responsibility (a number of women and children were observed drawing water from different kinds of sources), there was mention of the man of the house sharing in the activity. The team observed two such instances, where men drew and carried water for household purposes. The situation is most common when several drums of water must be carried by cart from one village to another during the dry season when water may be scarce. The carts are most often pushed, though they may be attached to a bicycle or motorized. In only two cases were trucks seen transporting water.

No matter who draws it, proximity and quantity determine its use. Proximity determines the amount of time and effort devoted to carrying water. If this is a long and arduous process, a new and closer source will be preferred, unless the new source is in a culturally restricted area, such as a burial ground, or specific preferences prohibit it. A family in a village in Upper Volta who lived closer to a pond than to a new deep well continued drinking and using the pond water after trying the deep well because they preferred the taste of the pond water, though they knew the water from the well was cleaner. They also believed the pond water was more accessible and more plentiful.

The increased quantity and improved quality of water in the smaller Thai villages should result in a number of benefits. The following are indicators of project success.

1. Increased quantities of water may save the water carriers time and effort that may be channeled toward more leisure or income-producing activities, such as the raising of small ruminants near the house or of fruit and vegetables for home use and/or sale, and in handicrafts such as weaving.
2. Water-borne diseases and other communicable diseases may be reduced substantially and the population's general health improved.
3. Since changes in diet may result from cleaner food preparation, there may be nutritional improvements as well.

Unmet Needs in Rural Water Supplies

The considerable unmet needs of Thailand's rural water supply situation include standardizing the equipment, tools, pumps and spare parts used in rural water supply; centralizing the construction capacity to select agencies with more resources; increasing manpower resources, their effectiveness and their ability to travel to villages; establishing village-level baseline data; improving the

maintenance capability for all types of water installations; improving the supervision of personnel; and improving communication between government officials and villagers. Improved village health education is required.

Given the number of dug wells in most of Thai villages, could those preferred by villagers as drinking sources be capped and installed with pumps? Although a viable solution, resulting in improved water supply, villagers stop drinking from shallow wells once they have been lined, capped and installed with a pump. Some villagers complain of the concrete taste, others of the metal taste contributed by the pump; still others believe the water's weight changed from "heavy" (preferred) to "light" (disliked). The upshot of it all is that villagers end up in digging other shallow wells for drinking, i.e., shallow wells which are unlined and unprotected. The same is true of deep wells with pumps.

Quality and Quantity Constraints

A. Technical, Financial and Manpower Constraints

There are few technical constraints on increasing the quantity of water for domestic use in rural areas, or on improving the quality of water. Appropriate techniques and methodologies have been in use for years.

One, the lack of funds needed to undertake an extensive rural water supply program is one of the most important constraints; it not only restricts the amount of construction and maintenance that can be carried out, but it also restricts the numbers and ability of the manpower needed to carry out a more ambitious and effective program and the provision of adequate numbers of vehicles and equipment. It also limits the amount of training that can be provided.

Two, the lack of potable water, particularly during the dry season in some parts of the country, is exacerbated by the preference many people have to using water from unprotected shallow wells, rain cisterns and ponds instead of from protected wells, even though the latter may provide water more accessibly and to a greater number of people.

Three, the rarely coordinated programs or efforts of the multiplicity of agencies working on rural water supply leads to duplicated effort, particularly when two or more agencies are working in the same small village. The lack of national long-range and short-range rural water supply plans, which could be used as a basis for programming the activities of the many agencies involved, contributes to the lack of coordination and results in ineffective and inefficient programs. The lack of baseline data needed to prepare such plans is one of the most serious constraints on increasing the quantity and improving the quality of the domestic water supply in rural areas.

Four, many of the agencies involved in the program are not particularly concerned about quality, taking as their objective the installation of a given number of wells or ponds per year. The MPH is definitely concerned about quality, but it has received very little, if any, offers from other agencies to assist in providing improved water.

Five, the lack of adequate supervision at all levels is an ever-present constraint. An insufficient number of staff is assigned and trained to handle supervisory responsibilities and most lack the transportation facilities they need to carry out their duties.

Six, although Dr. Dworkin found well-maintained piped water systems, hand pumps and installations were another matter. Equipment was seldom maintained properly at the village level and little back-up supervision and assistance were provided. Some of the agencies involved in the rural water supply program do provide sporadic back-up assistance on equipment they install, but there is no coordinated effort to assist in maintaining the similar equipment in a given area.

B. Social Constraints

Taste preference plays an important role in the type of water villagers will use for drinking purposes. It is difficult to justify the capping of a dug well and the installation of a hand pump to provide better quality water if villagers refuse to drink the water. Moreover, villagers will show less interest in maintaining a pump for which they perceive no need and will continue to drink water pulled from a simple dug well in a bucket on the end of a rope.

Another social constraint, mentioned by others but not observed by the team, is the preference of the women to gather at a convenient spot, such as the edge of a river or pond, to wash clothes and socialize. In some villages individuals were observed washing clothes on the concrete protective apron around the hand pump. In those cases where the concrete apron was broken, the wash water was draining back down the pump casing or into the hand-dug well on which the pump was mounted, thus polluting the drinking water.

C. General Accomplishments and Future Plans

The National Rural Water Supply Project administered by the Thai Government involves a dozen agencies charged with executing projects. Initially, the Minister of Interior directed the project and the Local Government Administration acted as project secretariat. The Prime Minister recently initiated changes which transferred, in October, 1979, responsibility for planning for all rural water supply projects to the National Social and Economic Board. The project director is officially the Secretary General of the NESDB; the Prime Minister has overall responsibility as Chairman of the Board. A new committee comprising representatives from each executing agency, plus the Office of the Budget, will hold its first meeting early in 1980 to establish planning guidelines.

NESDB personnel and officials of several executing agencies have expressed an urgent need for baseline information on the water supply situation in every Thai village. Such a study would be used to determine appropriate solutions to water supply problems.

In interviews with the AFHA team, various government officials mentioned the possibility of centralizing in one agency all rural water supply efforts. However, no such change has been effected and the dozen or so agencies involved in digging shallow and deep wells and in excavating new or enlarging existing ponds will continue their separate work. One change has occurred, however. Until recently, the Rural Water Supply Division of the Ministry of Health was responsible for the limited maintenance of all small piped water supply systems in the rural sector. There are approximately 600 such systems. That responsibility has been transferred to the Provincial Water Authority and the PAO, and the 600 files kept by the Rural Water Supply Division were transferred to PWA. Because RWSD is still carrying out the maintenance function, the team expects that implementation of the water supply component of the project will fall to the Division, and that the resources it needs to improve its construction and maintenance services will be provided.

Proposed Interventions USAID/MPH

A. Project Area and Approach

The project should combine and coordinate the rural water supply and sanitation activities with the necessary components of motivation, health education, training and maintenance. The project should be started in no more than six or seven provinces in one area where primary health care services and personnel are established and preferably in areas where other donors are not assisting or planning projects. The project should begin in the first six provinces with motivation health education and the installation of cisterns and sanitary privies. This work can begin without delay as no special studies, designs and special equipment will be needed. The RTG agencies charged with implementing the recommended USAID project are experienced in providing these services. The project will strengthen them even further and help them reach established RTG goals.

The planning, studies and design for installing the piped water systems should begin, and work initiated in the first six provinces as soon as designs are completed and material and equipment made available.

Once the first phase begun in the first six provinces and the methodology and techniques developed, the program should be expanded to another seven provinces and eventually to the last seven provinces participating in the Primary Health Care Program.

B. Alternative Solutions

The team has considered the alternative solutions to providing more deep wells equipped with pumps and/or installing hand pumps and capping the existing shallow wells used for drinking. Alternatives were rejected for the following reasons:

1. The lack of a standard pump which can be easily installed and repaired with readily available parts and service.
2. The absence of a strong maintenance program and the lack of organizational, financial, technical and transport resources to provide a nationwide back-up program for pump maintenance.
3. The strong preference for shallow well water and rain water. Though it may be possible to effect changes in preference, two problems are apparent. First, the amount of resources required for a massive health education program to effect a change in the preference for existing drinking sources may be prohibitive, and no donor may want to undertake the risk. Second, such a massive program may not be culturally acceptable. Even if the expected benefits were realized, certain unexpected negative side-effects could result.

The kinds of solutions recommended in the suggested program do address directly the issues raised above. By providing cisterns the villagers' expressed desires would be satisfied. By combining use of cisterns as storage tanks for public or private water supplies with appropriate health education programs, change could be effected through a vehicle already accepted by villagers. In a village using only water cisterns, a piped water supply service could be combined initially with use of the cisterns with rain water. Village health volunteers, village communicators, the village sanitarian aide, the village water supply operator, the tambon sanitarian and the tambon and traditional village midwives could then initiate and encourage efforts to increase the amount of piped water supplied to and used by the village.

The health education component of this recommended solution would cost substantially less and probably be more successful than a project emphasizing the use of deep wells and capped shallow wells with pumps.

Technology Available to Solve Potable Water Supply Problems

A. State-of-the-Art

Countless simple techniques and approaches have been developed worldwide to design and install facilities for providing potable water to rural villages. Many readily available publications, for example, the classic Wagner and Lanoix monograph, can be consulted for details.¹ What must be stressed is use of simple, easy to operate, maintainable equipment. Repair parts should be readily available and the use of motor-operated equipment should be avoided. Equipment that

¹ Water Supply for Rural and Small Communities, E.G. Wagner and J.N. Lanoix, 1959, WHO Monograph, Series No. 42.

will be out of service within a comparatively short period of time because of lack of fuel or simple replacement parts should not be installed.

Two innovative approaches based on the use of concrete cisterns for water storage for individual houses have been proposed. One approach makes use of a double-sized cistern with a vertical dividing partition. This cistern, a 2-meter diameter cistern with a 10-cubic meter capacity, would be less expensive than a cistern of half the capacity with the same height but a 1.5-meter diameter. The cistern could be used where two adjacent houses are fairly close together, and could be constructed on the property line of the two houses with labor from both households. Rain water from both houses would collect in the common cistern. Each vertical half of the cistern would be for the use of the adjacent household.

The second approach involves the use of an individual home cistern to store rain water until a piped water system is installed. Once the more convenient and more adequate piped water system is installed, the individual cisterns could be used as floating storage tanks. Water from the distribution system would be piped to the upper part of the cistern through a floating cut-off device which would stop the flow into the cistern when it is full. The connection could also be extended to the house so that water from the cistern would be available when none was in the distribution pipe. This would eliminate the need for large capacity water storage tanks, would also serve as a stepping stone from the use of rain water, which villagers prefer for drinking purposes, to the use of water pumped from a cased well.

B. Hand Pumps

For many years Thailand has been searching for a hand pump which will withstand constant daily use. The ideal pumps had yet to be developed, but improvements are being made continuously. Because the resulting pumps are manufactured in Thailand, spare parts are available in-country.

Foreign-made pumps are imported and are available in the market place. Unfortunately, spare parts are not always available; when replacements cannot be made locally, the pump stands idle until the broken pieces are replaced.

The United Nations is experimenting with a pump made of PVC pipe and fittings. The pump, which can be made in Thailand, is easy to install and repair, and is inexpensive, is being tested in the field by WHO. It seems to be standing up under actual-use conditions. Longer field tests are required to determine its merits. The merits of the INALSA pump of India and the AID/BATTELLE hand pump, which can be manufactured in Thailand, should be considered. It is hoped that a durable hand pump can be selected soon and adopted as a standard for hand-pump installations to eliminate the need for multiple spare parts. The International Reference Center, sponsored by WHO in the Hague, Holland, has recently published guidelines for testing hand pumps; these should be useful in selecting the standard pump to be used.

C. Rain Cisterns

The concrete cisterns used to store rain water are cast in place in steel molds or forms, using local labor for mixing and placing the concrete. Bamboo may be used as a vertical and horizontal circular reinforcement. Given the ease with which they can be cast, the cisterns are appropriate for self-help installation. The various cisterns used in the remote villages visited by the team were water tight and well constructed. (See Figures 1 and 2.)

D. Wind Mills

Wind mills may be used to advantage to pump water to an elevated storage tank in areas where the wind is fairly constant and continuous. They are for sale in Thailand but were not used in areas visited by the APHA team. In areas northeast, north and west of Bangkok, only two wind mills were seen in action, and those were in use at processing plants.

The preliminary investigations of the APHA team indicate that windmills are expensive to buy (between US\$ 2,000-3,000 installed) and require expert installation, maintenance and repair.

E. Solar Energy

Solar energy may power the pumps of the future but its use today is still experimental. Team members who saw such an installation operating in Upper Volta are enthusiastic about its possibilities but do not see its widespread use in rural water supply projects.

F. Other Appropriate Technologies

Other appropriate technologies such as use of plastic pipe well screens, robovalves, and individual household water purifiers using TRIOCIDE, a new antimicrobiological agent to purify the water, should be tested.

Strategy and Guidelines for Alternative Interventions

The strategy proposed in this chapter is based on the following considerations:

1. The rural water supply program will focus on villages with less than 1,000 people; with lower than average incomes; and with insufficient water for both drinking and other household uses. Eighty percent of the villagers must agree in writing that they will participate in kind and cash in the installation of sanitary privies and water supply facilities acceptable to the majority of villagers.

2. Many villages prefer rain water for drinking and will not accept pumped water for this purpose, even though the pump well is more accessible. Urban dwellers have expressed a like preference and still collect and use rain water rather than water from the piped system for drinking. A number of schools have had to supplement existing water supply installations, which provide water pumped from deep wells to elevated storage tanks, with rain water cisterns because teachers and pupils refused to drink the pumped water.
3. Agencies are reluctant to accept responsibility for maintaining either motor-operated pumps or hand pumps. The rural water supply Division of the Department of Health (MPH) did accept the task of maintaining the water supply equipment in 600 villages and was doing an excellent job (59 of the 60 systems Dr. Dworkin visited were operating efficiently), but that responsibility has been transferred to two other agencies. The desired long-term benefits will not be realized until water supply equipment and systems maintenance is assured and investments in the systems made. The APHA teams have recommended that USAID concentrate on water supply systems that require a minimal maintenance.
4. The Ministry of Public Department of Health (MPH) is concerned with improving the health of the population by preventive and curative methods. Divisions with long years of successful experience in rural water supply and sanitation activities exist within the Ministry. The following strategy for a USAID-assisted rural water supply program has been suggested.
 - Emphasize the installation of piped water supply systems similar to those previously installed with USAID assistance in villages where water is available in sufficient quantity and of a quality that is acceptable to the people for drinking and other domestic uses; a village committee exists; 80 percent of the villagers contract to participate in cash and kind in the cost of the installations of the system are willing to install simultaneously sanitary privies, and to contract to pay an agreed-upon monthly charge for the system's operation. USAID should require, as a condition precedent to assisting in the financing of a water supply project, assurance that systems will be efficiently operated and maintained by the villages and that back-up assistance and supervision by an organization adequately financed, equipped and supervised will be provided to ensure that equipment installed by the project is maintained.

- In villages where these conditions cannot now be met, a simpler system, which can be upgraded at a later date to provide the piped water services, should be adopted. This system should satisfy the villagers' expressed desire for rain water for drinking and avoid the introduction of equipment requiring continuing maintenance. Admittedly, the system will not be as convenient as a piped water system, nor will the quality of water be as great; however, it will provide a better quality of water than that now being taken from shallow unprotected wells or ponds.

The suggested system consists of a concrete cistern for each house to catch rain water collecting in gutters along the eaves. The first rain is wasted through a by-pass, after which water is collected in the cistern.

In villages where the houses are close together, a larger cistern may be installed for two houses using a central partition to catch the water. A 5-cubic meter cistern of 1.5-meter diameter costs 75 percent the price of a 10-cubic meter tank of the same height with a 2-meter diameter.

The cistern is constructed by the villagers using inside and outside molds supplied by the project. The self-help element is greater than that required by a piped water system.

Later, the cisterns can be converted into floating storage tanks by connecting the distribution pipe to the cistern and to a faucet in the house. Water from this type of installation may be more acceptable to the villagers for drinking since it evolves from the use of rain water only.

- The MPH should implement the program and be responsible for implementing the sanitation portion of the project. The Rural Water Supply Division will probably be responsible for the piped water supply systems, including their maintenance, and the Sanitation Division for the cistern program the installation of sanitary privies and other sanitary disposal installations.

Project planning, setting of standards and development of guidelines will be carried out at the national level. The provincial health organization, headed by the PCMO, will implement the plans with the assistance of the district offices.

Contact with the villages will be made through the sanitarians, junior sanitarians and village health workers and communicators of the Primary Health Care Project.

- The selected village should be in one of the 20 provinces included in the Primary Health Care Program, should have a population of less than 1,000, and preferably receive the assistance of a trained and adequately supervised Village Health Worker and Communicator. Health education and motivation programs should have been started in the village. There should be a local committee, selected in accordance with village customs, to assist the rural water supply agency in carrying out the water supply project. The committee should have the authority to contract for villages assistance in constructing the water supply system, and ensure the operation and maintenance, and monthly financing of the system. The village should be willing to furnish in cash and kind between 15 percent and 20 percent of the capital cost of the system. Seventy percent to 80 percent of the households should have installed their privies before receiving assistance with the water supply project.
5. A second condition precedent to developing a USAID-assisted rural water supply and sanitation project should be that the RTG will fit the vacant sanitarian positions in the districts where the project is to be implemented. The project should provide for training for newly-appointed sanitarians and for other sanitarians who will work on the project. The training should be specific to the duties for which the sanitarians will be held responsible. Continuous supervision at all levels should be guaranteed to ensure project success.
 6. The project should provide for training of the members of the village committees involved in the water supply project at the local level. This should include training for water supply operators, systems administrators and those responsible for collections, accounts and reports.
 7. The project should provide adequate transportation for the sanitarians helping to implement the project, as well as molds for the construction of the concrete materials, training materials and equipment, and materials and equipment for motivating the villagers.
 8. The project should examine the causes, real or perceived, which prompt many villagers to reject water for drinking that comes from pumps and lined wells; encourage the design

of economical partitioned cisterns of several capacities; and determine what size cistern is needed to store water for an average size family during the average dry season by gathering data in the various rainfall zones in the project area.

9. A detailed village-by-village study of the water supply situation should be made. Factors such as present water supply, water condition, water supply needs, possible water sources, etc. should be covered. The pilot study should be carried out first in the proposed project areas, and then in the 20 provinces of the Primary Health Project. Later it should be extended throughout the country.

Work on the water supply and sanitation project need not depend on the results of the study, although the information obtained can be used for planning later phases of the project.

The Rural Water Supply Planning Subcommittee of the NESDB needs such a study to plan future projects in the rural water supply sector.

10. An evaluation of progress during implementation and at the end of the project should be made. Once the project is completed, an evaluation should be made every five years. These evaluations should provide information on the numbers of facilities installed and people served and on changes resulting from the installation of facilities. They should describe water supply and sanitation conditions, receptivity of changes in health conditions by the target group and accrual of benefits.
11. Villager contribution to the capital costs of installing water supply and sanitation facilities should be ensured local labor and materials used wherever possible.

VII. SOCIOECONOMIC ASPECTS AND COST IMPLICATIONS OF
ALTERNATIVE INTERVENTIONS IN WATER SUPPLY AND SANITATION

Socioeconomic Aspects of Rural Water Supply and Sanitation

Improved rural water supply and sanitation are important components of a package of goods and services designed to improve the standard of living and general welfare of village residents. This does not mean that water supply and sanitation are more or less important than activities that increase the income of villagers; nor that other needs, such as road, power or education, are lower priority activities in village-level planning and project implementation.

As Carruthers points out, "improved rural amenities may reduce urban-rural income disparities, promote economic development in the countryside and help stem the flow of migrants to the cities (it is also conceivable that improved rural amenities will promote rural-urban migration.)"¹ During their brief assignment in Thailand, observers indicated that improvements in village-level water supply and sanitation in the smaller, remotest, and lowest income villages will not only substantially improve the health conditions of the rural population but also increase the population's economic potentials. This improvement is perceived not only in terms of fewer sick days per population and a possibly longer life expectancy but also in terms of enabling the rural population to use time spent fetching water for income-producing activities and for expanding the options for increasing rural incomes. Having abundant quantities of water near a residence may allow, in fact encourage, family members to seek income-producing activities, such as raising small ruminants and growing vegetables for family consumption and/or sale.

Despite very low income per capita in some villages, the APHA team cited a number of impressive characteristics. For example:

1. Most of the villages visited were clean. Both the interior and the exterior of the houses, including common areas, were free of debris and garbage. This may reflect a religious (Buddhist) importance given to cleanliness.
2. Almost all the privies inspected, both water-sealed and pit privies, were clean and without flies. Either water, newspapers or bamboo sticks were used for anal cleaning.

¹ I.D. Carruthers, Impact and Economics of Community Water Supply: A Study of Rural Water Investment in Kenya, Agrarian Developments Studies Report No. 6, Wye College (University of London), 1973, p 1.

3. All villages visited had established preferences for the type and source of water used for specific needs. In most cases, while the majority of water sources were for general consumption purposes, except drinking, the designed drinking water source was a specific well or pond for which villagers defined preferences of taste and mineral content.
4. Two critical factors were identified in the wider use of privies. The first was the level of motivation for and information possessed by the village resident and transmitted to him by outside agents, such as the tambon sanitarian, tambon midwife, village health volunteers.² The second factor was the cost of installing a privy.
5. Three critical factors were identified as affecting the existing condition of water. The first was the need for additional quantities of water, both for general purposes and drinking. The second was the need to improve the quality of existing and future drinking water sources, taking into consideration the specific preferences of the villagers for rain water and shallow well water. Two components of this factor must be addressed before attempting to implement any solutions. The first is technical. The villagers complained of high mineral content, especially iron, in water drawn from deep wells. Chemical test would identify the level of minerals and other material that cause the villagers to reject the water for drinking. The second component is social and cultural. The preference for shallow well water, which is "heavy," "more filling" and more "tasty," has to be more carefully defined to determine what it would take to change this preference, or devise a solution that does not drastically alter it. The team felt that capping an existing shallow well used for drinking purposes and installing a pump is not a solution, since villagers indicated a negative attitude to the taste changes they attribute to the cement lining or the pump itself.

The third critical factor in rural water supply is the cost of improvements, the willingness of the villagers to express their needs and exert pressure to satisfy them, financial capability, and willingness to contribute

²The term "motivation" is here used to mean two things: first, motivation of the villager to increase his awareness of the health aspects of water supply and sanitation in a process similar to "concientizacao a la freire" and second, reference to the existence and ability of the change agent, in this case the tambon sanitarian.

to the cost of improvements. Since in the past the Thai Government has undertaken the expansion of water sources in many villages, with no or little participation by villagers, it may be difficult to get villagers to contribute labor and materials for either improvements in water supply or the installation of privies.

Summary of Socioeconomic Indicators Surveyed

A brief analysis of the data collected from the 40 villages surveyed was presented in Chapter IV. In this section, some of the possible relationships between the various categories of data are described.

A visual review of the data collected indicates that at the PID state, it may be worthwhile to apply multiple correlation analysis, considering family income and family farm size in relation to the number of privies and the numbers of deep wells. Field observation and a review of data collected indicate that high income does not necessarily assure a large number of privies in a given village. The annual frequency of sanitarian visits may have something to do with the number of privies.

However, a problem arises when an effective sanitarian is replaced by a sanitarian who comes only once a year. It is difficult to measure the cumulative effect of service and interruptions in the quality of service provided to a village over time. Also, there are instances where low income villages receiving minimal attention have a relatively large number of privies. This again may be due to the knowledge and personality of an existing or past village headman, village leaders or an outside agent who cannot be identified readily.

Although it is not borne out by this survey at the level of analysis used, it would be safe to assume that an increase in income over time in the poorest villages does not necessarily lead to improvements in water supply and sanitation over the short term, unless the need for water is critical. Observation in the field indicates that a number of villages apparently have experienced income growth recently, despite televisions, radios and motorcycles. This may be because villagers regard the privy as a convenience and not as a health-improving asset. This leads one to believe that well-conceived programs implemented by tambon sanitarians, village health volunteers and village health communicators (including the village water supply operators and village sanitarian aides) can alter perceptions of and attitudes toward such devices.

The existence of relatively high income per family and the absence of privies in a small village can only be explained by identifying the consumption priorities of villagers and the expenditure of marginal income over time.

Since it is difficult to estimate changes in income and the monetary benefits of a project, alternatives should be identified and a cost-effectiveness analysis made. At the design state, an analysis should be made to determine what would happen if there was no project.

Cost Implications of Target Opportunities and
Alternative Interventions

A target opportunity exists for improving water supply and sanitary conditions in the small low income and remotest villages of Thailand. Neither Thai Government resources nor assistance funds from other international donors are expected to reach these areas.

USAID interventions have been separated into three categories to facilitate the presentation here. These categories are technical assistance-expatriate manpower resources, commodities and loan assistance funds.

A. Technical Assistance-Expatriate Manpower Resources

Interviews with government officials (at all levels) directly involved in water supply and sanitation projects in rural areas have identified four priorities of the first order. The first is the undertaking of a thorough village-level survey to determine, with some exactitude, existing water supply and sanitation conditions. The data from all villages in a given province would be used by the National Social and Economic Development Board to prepare long- and medium-term (10- and 5-year plans) for rural water supply and sanitation. The same data, along with the policy guidelines and long-term plans provided by the NESDB, would be used by the Provincial Health Planning Committee, already in existence, to prepare annual operational plans. The Thai Government is expected to identify within the next few months the single agency charged with implementing rural drinking water supply projects throughout Thailand.

The target opportunity in this category of resources is the employment for two years of an expert to assist the NESDB in making studies useful in preparing long- and medium-term planning exercises in rural water supply and sanitation. A second expert would work primarily with the directors of the Sanitation and Rural Water Supply Division (DOH/MPH) in planning and implementing the project. In addition, he would help individual provinces to establish the required methodologies and undertake village-level surveys to determine existing conditions of water supply and sanitation, organize the data and train provincial health professionals to use this data to prepare province-level planning exercises.

A third expatriate would supervise all training activities involving provincial-level health planners and sanitarians, tambon sanitarians, village health volunteers and village health communicators, one of whom would be designated the water supply operator for each village. Another communicator, designated the village sanitarian aide would work closely with the tambon sanitarians.

The training activities for this project can be summarized as follows:

- Training newly-appointed sanitarians for all tambons lacking one when the project began.

- Retraining all existing tambon sanitarians in the project area to increase their effectiveness. These will assume temporary responsibility for those neighboring tambons that do not have sanitarians and will be replaced as quickly as new sanitarians are trained.
- Training provincial health planning personnel to design annual operational plans in health, water supply and sanitation.
- Training village health volunteers and village health communicators to operate and maintain water supply facilities and motivate in cooperation with tambon sanitarians, improved sanitary conditions.
- Training and supervising Peace Corps volunteers who would work exclusively with the villages within the project area in each district.

A fourth expatriate expert, based in Bangkok but free to travel extensively in rural areas, would combine the most appropriate technology in water supply and sanitation for Thailand with efforts to standardize all required designs, equipment and materials.

These four specialists would probably be contract personnel. Given the extensive and complex nature of the project(s) and considering the existing load carried by Mission personnel, USAID should consider assigning a direct hire, in addition to the contract personnel, as project manager to assure maximum impact, coordinate work with RTG agencies and supervise work of the expatriate specialists.

B. Commodities

Since it is not possible to present an exhaustive list of the commodities that may be required, only the most important items are noted. They are:

Transport: Trucks for hauling cement, molds, mixers and tools. Motorcycles to provide mobility to tambon sanitarians and Peace Corps volunteers. Sufficient fuel to undertake the required travel.

Equipment: Molds for privy casings and rain cisterns, manual concrete mixers, shovels and picks. Audiovisual equipment and other training equipment for training purposes. Simple projectors for use by the village health volunteers; film strips on health, water supply and sanitation; and a limited number of 8mm sound projection equipment to be rotated among villages with the films to be shown by the Peace Corps volunteer.

C. Loan Assistance Funds

It is difficult to estimate the number of dollars required to undertake projects designed to exploit the target opportunities identified by the APHA team. Nevertheless the several alternatives are outlined below.

Alternative One	
APPROXIMATE COST DETAIL	
1. 7 person-years of Expatriate Technical Assistance @\$100,000/year	\$ 700,000
2. 20 medium size trucks, one per province plus 4 spares @\$15,000 each	300,000
300 motorcycles for tambon sanitarians and PCVs @\$500 each	150,000
Transportation maintenance cost and fuel over 10 years	750,000
3. 1250 manual concrete mixers, 5000 shovels 6000 picks and similar basic building tools	500,000
4. 5000 casing molds for cisterns @\$200 ea. 900 - 10m ³ 4100 - 50m ³	1,000,000
5000 casing molds for privies @\$75 ea. slab molds and bowls molds	375,000
5. Audiovisual equipment	100,000
6. Training 600 newly Appointed Sanitarians for one year @\$2,000 per sanitarian per year	1,200,000
7. Retraining 1400 Existing Tambon Sanitarians for 5 months @\$100/sanitarian/month	700,000
8. Training for 2000 Village Health Volunteers 2 weeks/year for 3 years @\$10/VHC/week	120,000
9. Training 20,000 Village Health Communicators 1 week/year for 3 years @\$10/VHC/week includes intensive training for village water supply operator and village sanitarian aide	600,000
10. 1200 Piped Water Supply Systems in 1200 villages averaging 100 household each total cost	14,400,000
11. 12,000 10 Cubic Meter Cisterns @\$425 each Total Cost \$5,100,000 Local Contribution 30% USAID Contribution 70% =	3,570,000
12. 56,000 5 Cubic Meter Cisterns @\$325 ea. Total Cost \$18,200 Local Contribution 30% USAID Contribution	12,740,000

TOTAL estimated cost	\$37,205,000
Inflation 20%	7,441,000
Contingency 20%	7,441,000
GRANT TOTAL	\$52,887,000

Alternative Two
APPROXIMATE COST DETAIL

1. 7 person/Years of Expatriate Technical Assistance @\$100,000/Year	\$ 700,000
2. 24 Medium Size Trucks, One Per Province Plus 4 Spares @\$15,000 ea.	300,000
315 Motorcycles for Tambon Sanitarians and PCVs @\$500 each (including spares)	150,000
Transportation Maintenance Cost and Fuel Over 10 Years	750,000
3. 1250 Manual Concrete Mixers, 5000 Shovels 6000 Picks and Similar Basic Building Tools	500,000
4. 5000 Casing Molds for Cisterns @\$200 ea.	1,000,000
900 - 10m ³ 4000 - 50m ³	
5000 Casing Molds for Privies @\$75 ea. Slab Molds and Bowl Molds	375,000
5. Audiovisual Equipment	100,000
6. Training 600 Newly Appointed Sanitarians for One Year @\$2000 Per Sanitarian Per Year	1,200,000
7. Retraining 1400 Existing Tambon Sanitarians for 5 months @\$100/Sanitarians/Month	700,000
8. Training for 2,000 Village Health Volunteers 2 Weeks/Year for 3 Years @\$10 VHV/Week	120,000
9. Training 20,000 Village Health Communicators 1 Week/Year for 3 Years @\$10/VHVWeek	600,000
10. 1400 Piped Water Supply Systems in 1400 Villages Averaging 100 Household Each Total Cost \$15,000 Local Contribution 20% = 3000 94 \$5/Capita USAID Contribution = 12,000/System X 1400 Villages	16,800,000
11. 9000 10 Cubic Meter Cisterns @\$425 ea. Total Cost \$3,825,000 Local Contribution 30% USAID Contribution 70% =	2,677,000

12. 42,000 5 Cubic Meter Cisterns @\$325 ea.		9,555,000
Total Cost \$13,650 Local Contribution 70%		
USAID Contribution		
TOTAL Estimated Cost	\$35,503,000	35,503,000
Difference Between Alternative One		37,205,000
and Alternative Two		35,503,000

Alternative Water Supply Installations

A. Alternative One

The basic output of this alternative would be 1200 piped water systems in the same number of villages with an average population of 100 households, 1200 10-cubic meter and 56,000 5-cubic meter cisterns. In addition, training for existing and new sanitarians, VHVs and VHCs would be provided. The total cost is estimated at slightly over \$37 million. Since the project is expected to run over 10 years a 20 percent inflation rate and a 20 percent contingency rate would bring the total to just above \$52 million.

B. Alternative Two

Considering the preferences and financial capabilities of the lowest income villages to be served, it might be preferable to alter the mix of piped water systems and cisterns. Consideration could be given to 1,400 piped water systems, which would increase the cost of this component from 14.4 million to 16.8 million. The number of 10-cubic meter cisterns would be reduced to 9000 and the cost to \$2.677 million; the number of 5-cubic meter cisterns would also be reduced to 42,000 (from the 56,000 in Alternative One), with a cost reduction to \$9.555 million. Although the total savings are only \$1.7 million, this alternative may be preferable to the first because more villages would be at a more advanced state of water utilization.

C. Alternative Three

This is a variation of Alternative Two which changes the composition of the piped water supply systems while leaving the total number of both piped water systems and cisterns unchanged. Of the 1,400 villages selected for piped water systems, 1,000 would have house connections and 400 community taps. This would introduce a flexibility, which may also have cost implications for some of the villages where settlements are dispersed rather than clustered.

The changes in costs of this particular alternative have not been calculated since it would require too many assumptions about distance from water source to community tap and house connections as well. These may be calculated at the PID state.

The basic components of the three alternatives are summarized below; alternative cost estimates for 5-cubic meter and 10-cubic meter cisterns are included. Rough designs follow the appendices.

20% piped water house tap
40,000 households
400 villages

30% cisterns
60,000 households
600 villages

30% w/10m³ cisterns
18,000 households
180 villages

70% w/5m³ cisterns
42,000 households
420 villages

3. TRAINING:

- A. 600 new sanitarians
- B. 1400 existing sanitarians
- C. 2000 village health volunteers
- D. 2000 village health communicators
1400 village water operators
for piped water system
600 village water operators for cisterns
2000 village sanitarian aides for 2000 villages
- E. 20 Peace Corps volunteers (Training cost not included)

4. COMMODITIES:

Trucks
Motorcycles
Manual concrete Mixer
Shovels, Picks etc.
Casing Molds - Cisterns
Casing Molds - Privies
Slab Molds - Privies
Bowl Molds - privies

Training Equipment
Projectors
Film strips and Sound films
Printed matter
Video-Tape equipment
Spare parts for equipment

SUMMARY OF ALTERNATIVE IN WATER SUPPLY

1. UNIVERSE: 20 Provinces
 100 village per province
 2000 villages
 100 households per village
 200,000 households
 6 People per household
 1,200,000 beneficiaries
2. SERVICES
PROVIDED:
- Alternative 1: 60% piped water
 120,000 households
 1200 villages
- 40% cisterns
 80,000 households
 800 villages
 30% w/10m³cisterns
 24,000 households
 12,000 cisterns
- 70% w/5m³cisterns
 56,000 households
 56,000 cisterns
- Alternative 2: 70% piped water
 140,000 households
 1400 villages
- 30% Cisterns
 60,000 households
 60 villages
 30% w/10m³ cisterns
 18,000 households
 180 villages
- 70% w/5m³ cisterns
 42,000 households
 422 villages
- Alternative 3: 50% piped water house connection
 100,000 households
 1000 villages

Alternative Sanitary Installations

Improved sanitary conditions in the smallest and most remote villages with low family incomes, are definite target opportunity areas; neither the Thai Government nor other donor funds are expected to be allocated in the short or the long run.

The three alternatives presented below provide guidelines on project preparation. Some problems are identified.

A. Alternative One

Assuming the availability of water in sufficient quantity and given the financial capability and preference of the villagers, the installation of a water-seal privy in every household of the universe of 2,000 villages can be assumed. Some of the villages that fulfill these criteria may already have some privies, even a substantial percentage of water-sealed and pit privies. However, for the simplicity of the analysis, all the villages in the project are assumed to have no privies at all.

B. Alternative Two

It is possible that in a certain percentage of the villages in the project, there may be a shortage of water at the time installation is considered. This and the financial capability and preferences of villages may require a less expensive solution, pit privies. In half the villages it is assumed that pit privies will be installed. It is conceivable that in a given village, hydrogeological conditions may require use of water-sealed privies right away, while in others pit privies may be a better temporary solution. All the pit privies installed should be easily convertible to water-sealed privies.

No cost differentiation is presented because given foreign fund flow, there will not be a difference between a pit privy and a water-sealed privy. That is, the additional cost of the water-seal bowl is assumed to be borne by the villager as part of his contribution to the project. In fact, it does not make a difference for USAID whether a pit or water-sealed privy is involved, since the infrastructure will be exactly the same. The villager will be responsible for digging the hole, putting the casings in, using the molds provided by the project, building an above-ground structure (preferably of bamboo walls and adobe roof). A number of privies seen in the field had both zinc roofs and walls that lacked ventilation and had a high inside temperature. Bamboo walls and adobe roofs are cheaper and provide adequate ventilation. Nevertheless, for the sake of sensitivity to local customs and preferences, zinc structures should not be discouraged since they may represent status, or the need for more privacy. The decision should be left to the households.

Data Needs for Planning and Implementation

Since this project involves a relatively large sum of loan assistance funds and especially since it accommodates the areas in which USAID wishes to make a substantial and positive impact, some consideration should be given to data needs before, during and after project life.

First, serious consideration should be given to gathering baseline data in all the villages or a stratified random sample before the project begins. This effort would provide valuable information for the proper planning and scheduling of activities and for the mid-point and end-of-project evaluations. Furthermore, since this project falls within the activities USAID plans to undertake as part of the international Drinking Water and Sanitation Decade, resources should be allocated for a thorough one-year end of project evaluation. The recommended scheduling of the project is six provinces for the first three years, seven provinces for the second three years and another seven provinces for three years. The tenth year of project life would be devoted to an evaluation of all the activities of the previous nine years. Assuming the project starts on November 1, 1980, the evaluation would take place in 1989-1990. The Mission may consider requesting funds for an evaluation five years after project life, i.e., in 1995 to determine socioeconomic changes and changes in system use.

Expatriate and National Manpower Resources

Funds and commodities do not contribute to the success of a project nearly as much as the attitude of the people directly involved in the implementation of village- and province-level activities. All expatriate personnel should be fluent in Thai and knowledgeable about the country, and have the credentials in sanitation, water resources engineering, planning and training. They should also be able to work well with Thais of different social and economic levels in urban and rural settings. Ex-Peace Corps volunteers may be the best source. Ideally, to mobilize resources to the maximum, the Peace Corps volunteer in each tambon could contribute substantially to the project. Because the number of tambons involved in this project ranges from 100 to 1,000, it would be unrealistic to assume the presence of this many PCVs in Thailand. Placing a PCV in each district would be the next logical step but the number may still be too high. Consequently, one Peace Corps volunteer should be placed in each of the 20 provinces for a regular tour of duty (two years). Over the 10-year life of the project, 100 Peace Corps volunteers contributing to the effort should not strain ACTION resources in Thailand.

The success of a project often depends on the presence of host country personnel of the front lines to deal with villagers. Their work directly reflects the support and supervision they receive from above. The Mission, in close cooperation with the Ministry of Public Health, should try to assure that a maximum number of tambon-level sanitarians, especially the new ones trained under this project, are able and willing to devote most of their time to the villagers.

Commodity Procurement

One of the problems constraining AID projects is delay in the arrival of commodities to the host country, and consequent pilfering or missing parts. The Mission may wish to consider the most expedient way to obtain the commodities for example, avoidance of procurement through the General Services Administration. If a contractor should be involved in the implementation of this project, the Mission might request that the contractor provide a procurement specialist, who would arrive in Thailand at the start of the project to set up a smoothly operating delivery system.

Issues and Studies

A two-pronged study to determine the reasons for villagers' drinking water preference is required. A technical study would examine the chemical properties of the water from deep and shallow wells, while a sociological-anthropological study would assess the strengths and reasons for preferences and what it would take to change them.

Despite the use of honest and well-trained and supervised interviewers, household surveys do not provide as much and as detailed information as a resident observer. In gathering baseline data for the periodic end-of-project evaluation, resident observers -- Thai graduate students of sociology and anthropology -- should be used.

One of the basic problems, a bottleneck really in providing improved sanitary services is the quantity and quality of sanitarians available for tambon-level positions. The Mission may want to assess the present and future needs for tambon-level sanitarians and ways of introducing accelerated courses and selection methods to assure that candidates express proper attitudes before being trained.

Although the project is being considered for loan assistance funds and will be implemented by the Thai government, expatriate supervision should be provided both by contractors and direct hires, if contractors are used. The size of the project requires that additional personnel be used.

Concluding Remarks

This final draft report was written by C. Pineo and R. Barokas with the assistance of RTG/MPH officials, who provided data and logistics support during the field trips; M. Batavia, USAID, participated in the first two-thirds of the assignment and agreed in principle with the conclusions of the team.

Special thanks are due to Mr. Sala of MPH/SD for his untiring efforts to provide translations in the field, gather data and calculate estimated costs.

Thanks are also due to D. Cohen; V. Scott; H. Merrill; D. Ooot; KunKarun and KunSurin for the assistance and support they gave the APHA team.

The APHA team presented its findings to the Mission in a meeting held at USAID/T offices on December 6, 1979. The meeting was attended by D. Cohen, Mission Director; B. Odell, Program Officer; V. Scott, HPN; and H. Merrill, HPN.

During the 90-minute meeting, the team and the Mission thoroughly discussed strategies, guidelines and recommendations for an AID-financed sanitation and rural water supply project. At the end of the meeting, the Mission director requested HPN to prepare a PID that considers both the findings and guidelines outlined in this report.

Appendix A
PLACES VISITED

<u>Date</u>	<u>Province</u>	<u>District</u>	<u>Village</u>
Nov. 12, 1979	Surin	Chompra	Nong Lek Dara Wang Na Glang
Nov. 13, 1979		Prasat	Nong Yai Ban Palat
Nov. 14, 1979		Muang	Chan Rom Cha Neang Huay Lad
Nov. 15, 1979	Sisaket	Khun Han	Kun Ott Kla Chow Lak Hin Ta Sat Tum Nak Sai Sam Roun Sam Ban Dai
Nov. 15, 1979	Buriram	Muang	Nong Bot
Nov. 16, 1979	Nakorn Ratchasima	Muang	La-Ngom
Nov. 17, 1979	Udon Thani	Sriboonruang	Na-Kok Wang Hai
		Nong Bua Lam Phoo	Sri Sook Nan Sam Ran
Nov. 18, 1979		Muang Nong Han Tung Fon	Nong Luk Non Tat Tat Noi
Nov. 19, 1979	Nong Khai	Phon Pisai Ta Bho	Ban Thon Ban Tum Kong Nang
Nov. 20, 1979		Bung Kan Phorn Charoen Bung Kan	Pan Lam Na Singh Kok Udom Nasingh Sakan
Nov. 20, 1979	Nong Khai	Phorn Charoen	Nong Rad

<u>Date</u>	<u>Province</u>	<u>District</u>	<u>Village</u>
Nov. 24, 1979	Kanchanaburi	Bo Phoi	Nong Dong Chong Dan
	Nakorn Pathom	Kam Pang San	Song Hong
Nov. 29, 1979	Phitsanuloke	Wang Tong	Wang Tad Hin Pra Kai Nong Prue
Nov. 30, 1979	Sukhothai	Muang	Yang An Sai Yat

Appendix B

PEOPLE INTERVIEWED

<u>Date</u>	<u>Title</u>	<u>Person's Name</u>	<u>Location of Interview</u>
Nov. 9, 1979	Director of Rural Water Supply Division Dept. of Health	Mr. Chetpan	Bangkok
Nov. 9, 1979	WHO Bangkok	Dr. Kukilka	Bangkok
Nov. 12, 1979	Deputy of PCMO Surin Province	Dr. Ruengrit Kasemsub	Surin
	Chief of Sanita- tion Section Surin Province	Mr. Prayoon Srimuang	Surin
Nov. 13, 1979	District Health Officer Prasart District Surin Province	Mr. Niphon Ssriroong	Prasart District, Surin
Nov. 14, 1979	Deputy of PCMO Sisakat Province	Dr. Muangthai Wongyai	Sisakat
	Chief of Sanita- tion Section Surin Province	Mr. Kasem Supradit	Sisakat
Nov. 15, 1979	Community Develop- ment Surin Province	Mrs. Chumnankul	Surin
Nov. 17, 1979	PCMO Udonthani Pro- vince	Dr. Taharn Punpoo	Udonthani
Nov. 16, 1979	Director of Sani- tation Center Region 3 Nakhonrachasima Province	Mr. Pisal Prigsang	Surin and Nakhonrachasima
Nov. 17, 1979	Director of Sani- tation Center Region 4 Khonkaen Province	Mr. Suchin Yoosawatdi	Udonthani
Nov. 19, 1979	PCMO Nongkai Province	Dr. Boonsom Pholdee	Nongkai

<u>Date</u>	<u>Title</u>	<u>Person's Name</u>	<u>Location of Interview</u>
Nov. 24, 1979	Chief of Sanitation Section Kanchanaburi Province	Mr. Tawad Kittinun	Kanchanaburi
Nov. 26, 1979	Director of Sanitation Division Dept. of Health	Mr. Chit Chaiwong	Bangkok
Nov. 28, 1979	Accelerated Rural Development Office	Mr. Vijit	Bangkok
	Director of Ground Water Division Dept. of Mineral Resource	Mr. Charoen Phean-Charoen	Bangkok
Nov. 29, 1979	PCMO Pitsanulok Province	Dr. Amnouy Utungkon	Pitsanulok
	Chief of Planning and Evaluation Section	Mr. Niphut Thongburi	Pitsanulok
	Chief of Technical Support Sanitation Center Region 6 Pitsanulok Province	Mr. Sermpan Tipprapa	Pitsanulok
Nov. 30, 1979	PCMO Sukhothai Province	Dr. Phongchai Sukontavayak	Sukhothai
	Deputy of PCMO District Health Officer Muang District District Health Officer Kongkailat District	Dr. Suchat Phongpinit Mr. Tavit Chomseob	Sukhothai
		Mr. Vichit Katkum	Sukhothai
Nov. 23, 1979	UNICEF Bangkok	Mrs. Deks	Bangkok

Appendix C

GLOSSARY OF THAI WORDS

Changwat.....Province

Amphoe.....District

Tambon.....Group of villages around a town

Muban.....Village

2.5 Rai.....1 Acre

20 Baht.....US \$1

Appendix D

AGENCIES INVOLVED IN THE RURAL WATER SUPPLY PROJECT¹

Principal Agencies

The Ground Water Division, Department of Mineral Resources, deals with the construction of ground wells ranging in depth from medium to very deep (from 100 to 850 feet, averaging 185 feet). This agency has been drilling ground wells since 1952 and has drilled a higher number of ground wells than any other agency. By the end of 1977, the Ground Water Division completed drilling 7,798 wells at a total cost of 670 million baht. Of the total number of deep drilled wells constructed under the Rural Water Supply Project, about 63% were drilled by The Ground Water Division. The average age of the wells is approximately five and a half years, and about 89% of the existing wells are still usable. Most of the ground wells are of the hand pump type and about 7.7% are operated by mechanical pumps. About 6,200 ground wells (about 80% of the total drilled) operated by the Department of Mineral Resources are in the Northeast Region.

In 1977, the Department of Mineral Resources had 34 large sized drilling rigs. Of these, 32 rigs are of the rotary type and 2 are of the percussion type. For fiscal year 1978, the Department has received a budget allocation for the procurement of six additional rigs.

Apart from the development of water resources, the Ground Water Division also makes geological, hydrological, and geophysical surveys of potential sources of ground water in order to assess in general terms both the total supply and quality of water and to select sites where drilling will be effective. The results of these analyses are made available to various government agencies in the form of underground water sources maps.

The Mineral Resources Department has 73 officers (with 31 additional positions approved in 1978) and 662 regular employees (with 91 additional positions).

The Ground Water Division has regional operating centers in the following forms:

- Khon Kaen Centre serving as headquarters for the maintenance of wells in the Northeast;
- Nakorn Rajsima Centre serving as headquarters for well drilling in the Northeast; and
- Saraburi Centre responsible for maintenance and well drilling for regions other than the Northeast.

¹UNICEF, Evaluation of Rural Water Supply Projects in Thailand, Final Report, National Institute of Development Administration, September, 1978.

In addition, there are also centres for the storage of supplies for the Well Drilling Section situated at Udorn Thane, Ubon Rajthane, Mahasarakam and Haad Yai. The first three are sub-centres of the Nakorn Rajsima Centre, and the Haad Yai subcentre is under the Saraburi Centre.

On the exploration of potential ground water sources, the Ground Water Division has three operating centres located at Ayudhya, Nakorn Pathom, and Nakorn Sri Thammaraj.

The Rural Water Supply Division, Department of Health, constructs piped water supplies in communities or groups of villages with a total population of between 2,000-5,000 persons. The construction of these water supplies is financed by the central government and supplemented by funds raised from public donations or the local government. (The funds may be borrowed by the local government for this purpose.) Various kinds of technical assistance are given by the Rural Water Supply Division such as surveys of water sources, feasibility studies, engineering designs of the systems, and supervision of the construction (which is undertaken by contractors). After completion, the management of the water supply is transferred to the local government. However, the Division still gives assistance in training plant operators, establishing operation specifications, following up work, repairing damaged equipment and giving technical advice. Agencies which are given responsibility in the management of water supplies may be Sanitary Districts (if the systems are situated in sanitary districts), Provincial Administrative Organizations or the committees organized at the village level.

By the end of fiscal year 1977, the Rural Water Supply Division already completed 539 water work systems, of which 38% are in the Northeast. A total budget of 337.7 million baht was spent. This amount includes the administrative expenses of the Division. The total allocation for construction amounted to 214.4 million baht (averaging 0.39 million baht per unit). About 108.6 million baht was supplemented by public donations or the budget of the Provincial Administrative Organization which equalled 32.2% of the total construction cost.

Ground water is the source for almost half the water supply system with surface water the source for the other half.

As another means of supporting the National Water Supply Project, since 1977 the Rural Water Supply Division has extended its work to the drilling of tube wells. The wells constructed by the Department of Health are of medium depth in which small and inexpensive drilling rigs are used. At present, the Department of Health has seven drilling rigs, consisting of two percussion type, two rotary type, and three jet percussion type. The depth of shallow wells drilled by jet percussion rigs is about 100 feet, and those drilled by rotary or percussion rigs can be as deep as 500 feet.

The Rural Water Supply Division has nine Rural Water Supply Centres located at Saraburi, Cholburi, Nakorn Rajsima, Khon Kaen, Lampang, Pitsanuloke, Rajburi, Nakorn Sri Thammarat, and Songkla. Each centre is staffed with its own civil engineers, surveyors, and mechanics who carry out the work on surveys and designs and supervision of construction. (There are about 35 government officers and employees in each centre). At the Rural Water Supply Division level, the

total staff consists of 199 government officers, 153 regular employees and 36 temporary employees.

The Sanitation Division, Department of Health, is concerned in the Rural Water Supply Project with the construction of small water supply systems comprised of water tanks that are supplied with hand pumps or power pumps. About 72% of the small water supply systems are installed in schools and 17% in temples with the remaining in places such as health stations, nutrition centres, etc. In this type of system the water source may be surface water, underground water or rainwater.

The provision of water supplies is one of 19 responsibilities of the Sanitation Division related to the promotion of public health. The Sanitation Division furnishes funds of 10,000 baht for part of the construction cost at each site. It also helps in designing and giving advisory services on construction. If the subsidy given is not sufficient, the remaining cost must be borne by the people of the community. On the average the local contribution accounted for about 50% of the total construction costs.

The Sanitation Division has 22 small, inexpensive drilling rigs. These rigs can drill shallow wells for schools and temples. However, they are mostly used for demonstration purposes. Between 1972 and 1977, the Sanitation Division completed the construction of 150 shallow tube wells.

In addition, the Sanitation Division also designs rain storage tanks of simple standard specifications for households and gives advice on construction methods.

The Office of Accelerated Rural Development, because of the seriousness of the water shortage in the Northeast, established a Ground Water Drilling Centre at Khon Kaen in 1969. This Centre is well equipped with various types of machinery and qualified technicians in various fields and is thus an important operating unit of the Rural Water Supply Project.

The Centre is capable of developing water sources of five major types: shallow wells, ground wells, standard ponds, and dredged ponds, and the construction and maintenance of reservoirs and dykes.

The Ground Water Drilling Centre has since been renamed "Centre for Accelerated Rural Development in the Upper Northeast". Its scope of work has been further extended to support provincial ARD officers in engineering work, development of water sources, economic and social development, and the promotion of occupations for rural people, as well as the training of officers working in ARD projects. However, the Centre still concentrates mostly on the development and construction of water sources in the 53 provinces under its responsibility. The Centre's activities have been designated areas for ARD operations, as part of the accelerated integrated activities implemented in sensitive areas of communist infiltration.

The ARD Centre at Khon Kaen has a total of 537 personnel consisting of 54 government officers, 135 regular employees, and 348 temporary employees

(including employees attached to the IBRD loan projects). The Centre is equipped with the following machinery: 15 drilling rigs (nine of the large percussion type, two of the large rotary type, and two of the small rotary type). In addition, there are also two large mud cats for dredging ponds and swamps.

In 1976, the ARD received an IBRD loan for the acceleration of well drilling in 4,600 northeast villages short of water (about 24% of the total number of villages in the northeast). The target of this high priority is to drill 3,500 additional ground wells and 520 shallow wells between 1976 and 1981. To achieve this target, 26 additional medium rigs and two sets of bucket augurs will be procured through a loan of 2.86 million U.S. dollars.

Between 1966 (the year ARD was established) and the end of fiscal year 1977, ARD work related to rural water supplies can be summarized as follows:

<u>Source</u>	<u>Number of Installations</u>
Ground Wells	2,376
Shallow Wells	1,891
Standard Ponds (2828 cubic meters)	869
Standard Ponds (10,000 cubic meters)	110
Dredged Ponds and Swamps	227
Reservoirs and Dykes	195

These water sources are located in 53 provinces designated as ARD areas. More than 80% of the installations are in the Northeast.

By the end of 1977, the total budget allocated for all ARD projects was approximately 335.7 million baht. The budget allocated to ARD for the provision of water supplies in rural areas has increased steadily from only 23 million baht during the Second Plan (1967-1971) to 215 million baht during the Third Plan. The total budget will increase further to 520 million baht in the Fourth Plan which includes additional counterpart funds for an IBRD loan.

The Provincial Water Supply Division, Department of Public Works, is mainly responsible for the survey/design, construction and operation of piped water systems in municipalities and certain sanitary districts outside Bangkok. However, a Section in this Division takes part in the drilling of ground wells in rural areas. By the end of 1977, about 1,791 wells were drilled with a total budget cost of approximately 164.4 million baht. At present, the budget has been allocated to this Division for the drilling of 250 wells annually.

All ground wells drilled by the Provincial Water Supply Division are outside the Northeast region. The depth of most wells ranges from medium to very deep, averaging about 232 feet. The Provincial Water Supply Division has 14 large drilling rigs.

There are about 5,000 government officers and employees working in the Provincial Water Supply Division. Most of these are employees working in water supply activities. The Ground Water Drilling Section in particular has 334 workers consisting of 117 government officers, 140 regular employees and 87 temporary employees.

The Department of Local Administration, which is responsible for welfare of rural people also participates in many ways in the Rural Water Supply Project:

.. Providing and developing water sources for public consumption. These water sources consist of shallow wells, driven wells, 400-gallon metal tanks and 150-cubic meter concrete tanks. The local authorities also promote the dredging of natural ponds and swamps.

The Department has no technical staff working on the project. However, it allocates a budget to provinces for the employment of local contractors to do this kind of work.*

2. Usually, upon the completion of construction, the installation is transferred to the local authorities, sometimes down to the village level. As the agency in charge of administering to local authorities, the Department of Local Administration in fact has authority over these many installations and is supposed to take charge of their maintenance.

By the end of the fiscal year 1977, the Department of Local Administration had already commissioned the digging of 29,150 shallow wells in the villages, supplied 19,849 400-gallon metal tanks and 643 concrete tanks, and developed 4,935 other natural water sources. In 1977, 2,560 shallow wells were experimentally upgraded by the installation of concrete covers and hand pumps. In addition, in accordance with the Government's policy of providing at least one tube well for each village in the Northeast region, in 1976 a budget of 13 million baht was set aside for drilling 3,260 ground wells, and in 1977, 69 million baht for 17,360 ground wells. At the end of 1977, the Department of Local Administration disbursed a total of 312.5 million baht for the installation and improvement of water sources of various types.

The Department of Local Administration has no technical staff working on the exploration of water sources. The Director General of the Department of Local Administration is the Secretary of the "National Rural Water Supply Project Executive Committee" with the Director of Provincial Administration Division and 23 subordinate officers as assistant secretaries. These officers do not work directly in the Rural Water Supply Project.

*A section has been deleted which dealt with an activity of the Department of Local Administration (which no longer exists). Up to 1978, DLA served--some-what ineffectively--as the secretariat of the National Water Supply Project Executive Committee which was presided over by the Minister of the Interior who presumably was the Director of the National Rural Water Supply Project. Last year, the Prime Minister transferred these functions to the ENESDB reporting directly to him.

At the district (amphoe) level, the compilation and appraisal of requests for water supplies are the responsibility of the Assistant District Governor on Planning and Development, who undertakes the survey of local conditions and submits his recommendations to the Department of Local Administration through the District Chiefs and provincial authorities. Once the district's programs are approved and budgeted, the Assistant District Governor on Planning and Development is in charge of finding contractors.

Other Agencies

Apart from the six agencies previously mentioned, other agencies involved in the Rural Water Supply projects include:

- The Department of Community Development which encourages public participation in construction and development of water resources through its community development workers. It also furnishes funds for village self-help projects to supplement funds from local sources. By the end of the fiscal year 1977, about 6,275 projects classified as shallow wells, dredging ponds, etc., were completed by the Department of Community Development.
- The Public Welfare Department provides water supplies to the public through various methods, such as the construction of shallow wells and dredging ponds. As of 1977, the work accomplished numbers approximately 446 projects.
- The National Security Command sets up mobile teams responsible for digging shallow wells and ground wells for the people living in sensitive areas. Between 1972 and 1973, about 200 projects were reported completed.
- The Royal Irrigation Department units involved in the construction of standard ponds and water distribution canals for agricultural purposes. Water supplies for consumption are by-products of these efforts.
- The National Economic and Social Development Board is a central planning agency which plays an important role in initiating and formulating policies on rural water supplies as well as in monitoring and evaluating the progress of work. Officers of NESDB's infrastructure Projects Division serve as the secretariat of the Sub-committee on Rural Water Supply Project Planning.

Appendix E

DATA FROM FIELD STUDIES

Village Organization

<u>No.</u>	<u>Chanqwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Populaton</u>	<u>No. of Household</u>
1	Surin	Chom Pra	1	Hon Lek				764	106

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
2 wells, 8-12 metres deep	-	5	None	None	Water from dug wells because it tasted better.	Since some of the dug wells went dry in the summer, the villagers wanted more wells.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
106	100%	4 visits/yr.	No information	Colds Flu	Change in weather. The village chief said no dysentery, diaherrea because all homes had water seal privies.	None

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
No information	Rice Farming, Vegetables Silk Weaving (some households).	6,000 baht/vr.	None	This muban is a demonstration Muban.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Presence of Village</u>		<u>Total No. of</u> <u>Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>	<u>Committee</u>			<u>Population</u>	<u>No. of Household</u>
2	Surin	Chom Pra		Dara Wannø				2,500	300

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
None	None	2	Some houses had rain cisterns.	4	Rain water cisterns.	Shortage of water in dry season. Wanted rain water collection cisterns.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
750	30%	-	-	Dysentery Stomach Aches.	Lack of privies, dirty food. Water quality not good.	Desire additional privies.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Rice farming	5,000 baht/vr.	-	Village willing to participate to obtain cisterns and privies.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Presence of Village</u>		<u>Total No. of</u> <u>Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>	<u>Committee</u>			<u>Populaton</u>	<u>No. of Household</u>
3	Surin	Chom Pra		Na Giang				700	110

Water Supply

<u>Deep Wells</u>	<u>Dug Wells</u> <u>w/Pump</u>	<u>Dug Wells</u> <u>w/o Pump</u>	<u>Rain</u> <u>Cistern</u>	<u>Ponds</u>	<u>Preferred</u> <u>Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
One deep well	-	One dug well	None	None	Dug well water preferred for	Desired additional quantity and quality. Willing to participate.

Sanitation

<u>Households</u> <u>w/Privies</u>	<u>% Household w/Privies</u> <u>(Target - 50% by 1981)</u>	<u>Annual Frequency of Visits</u> <u>Sanitarian</u>	<u>Visits</u> <u>Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as</u> <u>Perceived by Villagers</u>	<u>Perceived Needs</u> <u>for Add'l San</u>
22	20%	-	-	Dysentery	Due to lack of sanitary latrines and clean water.	Desire additional latrines.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Rice farming	4,000 baht/yr.	-	Deep well water used mainly for washing.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Presence of Village</u>		<u>Total No. of</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>	<u>Committee</u>			<u>Populaton</u>	<u>No. of Household</u>
4	Surin	Prasat		Hong Yai	-	-	-	766	204

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
None	None	4 wells	-	-	Dug well	Desire clean water. Also in summer, shortage of water.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Annual Frequency of Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
20	10%	2 visits	-	Diaherrea, stomach troubles etc.	Not enough privies	Desire more however unable to afford them.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Rice farming	3,000 baht/yr.	-	Sensitive border district. Willing to offer free labor to obtain more privies.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>			<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>				<u>Populaton</u>	<u>No. of Household</u>
5	Surin	Prasat		Ban Palat	Yes	15	None	600	100

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
1 well	-	-	Some household have cisterns.	2	Ponds since taste from sanitary wells not good.	Desire rain water cisterns for drinking water.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
None	0%	-	-	Diaherrea, dysentery etc.	Lack of sanitation and clean water	Village committee assistance to build rain water cisterns and privies.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Rice farming	3,000 baht/yr.	-	Committee willing to participate to build latrines and cisterns.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>			<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>				<u>Population</u>	<u>No. of Househol</u>
5	Surin	Muang			Chan Rom			700	74

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
19 wells	-	-	20 homes have cisterns.	2	Ponds as water from well not good for drinking.	Rain water cisterns.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
44	60%	4 visits per year	-	Stomach disorders, some dysentery	Pond water not clean.	-

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Rice farming	6,000 baht/vr.	-	Willing to participate to obtain better quality water.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Populaton</u>	<u>No. of Household</u>
7	Surin	Muang		Cha Neang			-	370	74

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/ Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
1 2311	-	-	Small jars in homes.	2	Rain water cisterns.	Additional cisterns.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
10	15%	1 visit per month	-	Diaherrea	Dirty food, dirty water.	More latrines desired.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Rice farming	3,000 baht/yr.	-	Buy medicines from drug stores because of radio advertisements.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Population</u>	<u>No. of Household</u>
8	Surin	Muang		Huay Lad	-		-	280	43

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
3 wells 30 metres deep.	-	-	None	2	Ponds as taste from deep well not good.	Desire cleaner water, however they do not want deep well water for drinking purpose.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
7	15%	None		Dysentery Diaherrea flu, etc.	Lack of sanitation facilities	Additional privies

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Rice farming	3,000 baht/yr.	-	Willing to offer their labor to improve sanitation and water supply.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>			<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>				<u>Population</u>	<u>No. of Household</u>
9	Srisaket	Khun Han	Klawan	Kun Oott	-	-	670	104	

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
One deep well with hand pump. 40 metres deep. Hand pump broken down several times. 2-4 weeks to fix it.	-	12 dug wells	None	None	Dug well	Cleaner water supply.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>of Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
15	16%	None	Quite often	Diaherrea etc.	Poor water supply dirty food.	Additional privies

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Rice farming	2,000 baht/yr.	-	Midwife tell them that diaherrea due to lack of privies. Willing to cooperate for obtaining privies and water supply.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>			<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>				<u>Population</u>	<u>No. of Household</u>
10	Srisaket	Khun Han	Non Soong	Kia Chon			433	64	

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
None	3 wells with pumps. All 3 pumps not working.	12 wells 6 metres deep.	None	None	dug wells	Improve quality of water by having cisterns.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
0	0	-	-	Dysentery Diaherrea Flu etc.	Lack of sanitation facilities.	Desire privies, however cannot afford them.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Rice farming	2,000 baht/yr.		Japanese make hand pumps.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>			<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>				<u>Population</u>	<u>No. of Household</u>
11	Srisaket	Khun Han	Bukdong	Lak Hin	-	-	1,196	215	

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
-	1 dug well with pump	-	Some	1 pond	Dug well pond.	Desire additional quantity and quality of water.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
12	5%	-	-	Diarherrea Stomach troubles.	No sanitation facilities.	Build more privies

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Rice farming	2,000 Baht/yr.	-	Will offer free labor to to build more privies and wells.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Huban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Population</u>	<u>No. of Household</u>
12	Srisaket	Khun Han	Bukdong	Ta Sat	-	-	-	380	53

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
None	2 dug wells	8 dug wells	None	None	Dug wells	Additional water desired.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Frequency of Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
3	5%	None	-	Diaherrrea Dysentry	Poor sanitation	Additional privies

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
8 acres per family	Rice farming	5,000 baht/yr.	-	No response from District Administrator's Office to fix pumps.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Presence of Village</u>		<u>Total No. of</u> <u>Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>	<u>Committee</u>			<u>Populaton</u>	<u>No. of Household</u>
13	Srisaket	Khun Han	Bukdong	Tom Nak Sai				460	80

Water Supply

<u>Deep Wells</u>	<u>Dug Wells</u> <u>w/Pump</u>	<u>Dug Wells</u> <u>w/o Pump</u>	<u>Rai.</u> <u>Cistern</u>	<u>Ponds</u>	<u>Preferred</u> <u>Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
None	1 well with pump. Broken down.	2 hand dug wells.	Some	None	Dug wells	Better quality water desired.

Sanitation

<u>Households</u> <u>w/Privies</u>	<u>% Household w/Privies</u> <u>(Target - 50% by 1981)</u>	<u>Annual Frequency of Visits</u> <u>Sanitarian</u>	<u>of Visits</u> <u>Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as</u> <u>Perceived by Villagers</u>	<u>Perceived Needs</u> <u>for Add'l San</u>
0	0%	None	Once per month.	Fever Dysentry etc.	Lack of privies.	More privies.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Corn	18,000 baht/yr.	-	-

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Presence of Village</u>		<u>Total No. of</u> <u>Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>	<u>Committee</u>			<u>Population</u>	<u>No. of Household</u>
14	Srisaket	Khun Han	Bukdong	Sam Roun	-	-	-	1,800	265

Water Supply

<u>Deep Wells</u>	<u>Dug Wells</u> <u>w/Pump</u>	<u>Dug Wells</u> <u>w/o Pump</u>	<u>Rain</u> <u>Cistern</u>	<u>Ponds</u>	<u>Preferred</u> <u>Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
None	None	30 shallow dug wells	1 cistern in school	None	dug wells	Desire better quality water.

Sanitation

<u>Households</u> <u>w/Privies</u>	<u>% Household w/Privies</u> <u>(Target - 50% by 1981)</u>	<u>Annual Frequency of Visits</u> <u>Sanitarian</u>	<u>Frequency of Visits</u> <u>Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as</u> <u>Perceived by Villagers</u>	<u>Perceived Need</u> <u>for Add'l San</u>
20	6%	None	Quite often	Diaherra Fever	Due to poor water, food not clean, lack of privies.	More privies.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Rice farming	4,000 baht/yr.	-	One village volunteer supervised by mid-wife.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Presence of Village</u>		<u>Total No. of</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>	<u>Committee</u>			<u>Members</u>	<u>Populaton</u>	No. of Household
15	Srisaket	Khun Han	Bukdong	Sum Ban Dai	-	-	-	180	28

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
8 deep wells 199 feet deep. Paid by villagers themselves.	None	None	-	None	Deep wells	-

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
10	32%	Once per month	-	Many cases of dysentery in rainy season.	Dirty food. Lack of privies.	-

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Corn	18,000 baht/yr.	-	-

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>			<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>				<u>Population</u>	<u>No. of Household</u>
16	Buriram	Muang	Nong Bot	Non Bot	-	-	-	565	145

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
3 wells with pumps	-	3 dug wells	None	None	Dug wells	In dry season, dug wells go dry.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
30	20%	None	None	Fever Dysentery	Poor quality water.	No health volunteer

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
20 rai per family	Rice	3,000 baht/yr.		Deep wells for washing only 3 years old.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Population</u>	<u>No. of Household</u>
1/	Nakorn Ratchasima	Muang	Kok Soong	La Noom	Yes	14	8	980	168

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
-	3 wells with pumps.	-	Some households	2	Ponds as water from wells is salty.	Desire rain water cisterns.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>of Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
140	80%	Quite often	-	Very few cases of dysentery.	-	-

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Rice farming	15,000 baht/yr.	-	Demonstration village.

Village Organization

<u>No.</u>	<u>Chanqwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Populaton</u>	<u>No. of Household</u>
18	Udonthani	Sri Boon	Nakok	Nakok	Yes	5	None	1,000	200

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
9 wells with pumps	-	-	10	5	Ponds used for drinking	Desire more rain water cisterns.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
100	50%	3 times per month	Twice per month	Fever, some dysentery.	-	-

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
10 rai per family	Rice farming	5,000 baht/yr.	-	Deep wells for washing only

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>			<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>				<u>Population</u>	<u>No. of Household</u>
19	Udonrathani	Sri Boon Reung	Nakok	Wang Hai	Yes	6	None	643	90

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
1 deep well	-	-	0	1	Ponds	Desire better quality water.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Sanitarian</u>	<u>of Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
4	3%	Once a month	Twice per month	Stomach disorders, diaherrea	Lack of sanitation facilities.	More privies.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
20 rai per family	Rice farming	2,000 baht/yr.	-	Deep well built by Mineral Resources Department. Taste not good. Willing to cooperate for obtaining more privies.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>			<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>				<u>Population</u>	<u>No. of Household</u>
20	Udonthani	Nong Bua	Ban Phrow	Sri Sook	Yes	9	None	800	120

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
1	-	-	None	2	Well water taste good.	None

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Frequency of Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
5	4%	Twice per year	Twice per year	Fever Dysentry	No sanitation facilities.	Desire more privies.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
30 rai per family	Rice	3,000 baht/yr.	1,000 baht/yr.	Deep well built by Mineral Resources. Pump broken twice in 5 years. Fixed each time within 2 weeks.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Population</u>	<u>No. of Household</u>
21	Udonthani	Nong Bua Lum Phoo	Ban Phrow	Non Sam Ran	Yes	3	None	150	26

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
1 deep well with pump	-	1 dug well	None	1	Pond and dug well for drinking.	

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
1	4%	1 visit per month	none	Diaherrea Fever	Lack of sanitation facilities	Motivation by sanitarian not helpful as villagers very poor. They want privies, but cannot afford them.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
10 rai per family	Rice	2,000 baht/yr.	-	Deep well installed 1979.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Population</u>	<u>No. of Household</u>
22	Udonthani	Muang	Nikom Songkoa	Hong Luk	Yes	9	None	250	43

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
i deep well well pump for washing.	-	1 dug well	None	None	Dug well as it taste better than deep well water.	Desire better quality water.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
9	20%	Once per month	-	Diaherrea in summer	Lack of privies	9 privies installed due to motivaition by sanitarian.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
10 rai per family	Rice, fishing	5,000 baht/vr	-	Deep well built by Mineral resources Department.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Populaton</u>	<u>No. of Household</u>
23	Udonthani	Hong Han	Ban Ya	Non Tat	-	-	-	200	23

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
1 deep well with pump for washing and cooking.	-	-	None	2	Pond water taste better.	3 villages share pond water. Pond built by villages.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>of Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
3	14%	Twice per month	Twice per month	Fever Diaherrea in summer	Dirty food	Cost of privy - 300 baht.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
10 rai per family	Rice	5,000 baht/yr.	1,000 baht/yr.	Pump borken 3 times. Fix themselves. Privies installed because no bushes near houses.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Huban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Population</u>	<u>No. of Household</u>
24	Udonthani	Tung Fon	Tung Fon	Tat Noi	Yes	9	None	579	89

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
5 wells with pumps	-	1 dug well	None	1 pond	Dug well	Desire piped water supply. Also rain water cisterns.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Frequency of Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
20	16%	Once per	None	Fever Hepatitis Diaherrea	Lack of privies	Last privy built 5 years ago.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
20 rai per family	Rice	2,000 baht/yr.	1,000 baht/yr.	Pumps broken often. Fix themselves. Desire piped water supply. Electricity in some homes.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Populaton</u>	<u>No. of Household</u>
25	Nongkai	Phon Pisai	Wat Luang	Ban Thon	Yes	8	None	330	55

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
5 wells 3J metres deep	-	3 dug wells	None	1 pond	Dug wells because better taste.	-

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
15	26%	Once every 3 months	None	Fever Stomach ache Diaherrea in summer	Dirty food	Motivation by sanitarian helped in 15 privies. Others cannot afford.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
13 rai per family	Rice, vegetables	3,000 bant/yr.	1,500 baht/yr.	Hand pump broken often. Fix themselves.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>			<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>				<u>Population</u>	<u>No. of Household</u>
26	Nongkai	Ia Bho	Nam Mong	Ban Tum	Yes	9	None	800	133

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
2 wells with pumps	2 dug wells with pumps	-	2 cisterns	2 ponds	Dug wells as deep wells have too much iron.	-

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>of Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
80	60%	twice per month	Twice per year	Stomach aches Fever	Dirty food	Motivation by sanitarian, hence 80 privies.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Hume</u>	<u>Other Income</u>	<u>Miscellaneous</u>
-	Rice	8,000 baht/vr.	2,000 baht/yr.	Want to improve dug wells.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>			<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>				<u>Population</u>	<u>No. of Household</u>
27	Nangkai	Ta Bho	Nong Nang	Kong Nang	Yes	10	None	650	117

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
1 deep well with electric pump.	None	None	None	None	This village has piped water with elevated storage tank paid by Ministry of Health.	

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Sanitarian</u>	<u>of Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
110	95%	Once per month	Once per month	Fever Colds	-	-

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
100 rai per family	Rice	30,000 baht/yr.	-	Village paid 25% cost of water system. One tap per house.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Population</u>	<u>No. of Household</u>
28	Hongkai	Bung Kan	Bung Kan	Pan Lam	Yes	12	None	875	132

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
1 deep well built by Mineral Resources Dept. 5 years ago.	-	3 dug wells for drinking when deep well not functioning.	None	None	deep well	Another deep well.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Sanitarian</u>	<u>of Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
132	100%	1hrice per month	For developed only - infrequently.	Fever Some Diaherrea	Dirty Food Diaherrea only in summer.	-

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
10 rai per family	Rice, Casava	10,000 baht/vr.	-	5 years to clean out privy. 4 to 5 houses clean by suction. When san wells water used for drinking it is left one day to settle they want more sanitarians and more deep wells.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Population</u>	<u>No. of Household</u>
29	Nongkai	Bung Kan	Chom Pu	Na Singh	Yes	3	None	1,200	300

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
1 well built by Mineral Resources Dept. 35 metres deep. Built in 1978, not broken since. Village Head man in charge.	-	4 dug wells 5 metres deep	None Large Kong Jars observed.	2 pounds for washing	Dug well as water taste. Sanitary well has iron and tastes musty, but houses near deep well drink from it.	Another well, no village constructed for washing deep well. All hand dug wells dry in dry season and new ones are dug in the fields.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
80 The last privy was built 7 years ago. Some from Health Center.	25%	Twice per month. Presumably he motivates to build privies and give shots.	4 times per year	Fever Stomach ache Malaria Worms	10 to 12 still births Per year. Some months die at birth.	Privies are more convenient than than going into the forest.

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
Minimum 8 Maximum 60 rai per family	Rice	Minimum 2,000 Maximum 10,000/family	-	Privately owned dug well will pump from available to other villagers used hadn auger, no machines. Not for drinking 21 metres deep 3 years old. Pumps break often but fixed by 14 year old son of owner. Cost 1,000 baht.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Populaton</u>	<u>ffc. of Household</u>
30	Nongkai	Phron Chareon	Phron Chareon	Kok Udom	Yes	-	-	1,500	250

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
None	2 cp., pm 1 private	12 common	None Prefer rain water for drinking stored in small jars.	None	Rain water	Need deep wells for washing and general use but not for drinking. Villagers do not want to participate in cost of labor or desired installments.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Sanitarian</u>	<u>of Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
No privies	0%	Once a year gives medicine health center 2 kms. away.	She never comes unless requested for drink, one traditional mid-wife in village.	Malaria Diaherrrea	Causes are not pro-vides.	Privies

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
Minimum 8 Maximum 60 rai per family.	Rice	Minimum 2,000 Maximum 10,000/family		Privately owned dug well will pump freely available to other villagers used hand auger, no machines, not for drinking 21 metres deep 3 years old, pump breaks often but fixed by 14 yr. old son of owner, cost 1,000 baht.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Populaton</u>	<u>No. of Household</u>
31	Nongkai	Bunq Kan	Sunchom Phu Phon	Nasing Sakain	Yes	9	2	1,200	202

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
2 deep wells with pumps 30 metres deep. Pumps not broken often. 2 days to fix. Built by Mineral Resources Dept.	-	3 dug wells 8 metres deep	None	1 Pond	Dug well	During dry season, dug wells dry. Wish to cooperate for more water.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Sanitarian</u>	<u>of Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
101	50%	3 times per month	Not often	Malaria Stomach aches	Dirty food	Cost per privy 400 baht. About 50% built privies to prevent diseases

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
5-60 rai range	Rice farming	3,000 baht/yr.	-	Water from sanitary well not consumed for drinking because of pipe giving

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>		<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>					<u>Population</u>	<u>No. of Household</u>
32	Nongkai	Poin Charoen	Don Ya Nang	Nong Lad	Yes	8	None	632	105

Water Supply

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>
1 deep well in wat. 12 metres deep. Mineral Resources staff visits approx. every 6 months to check pump.	-	5 dug wells 6 metres deep	-	None	Dug well water for drinking.	Desire one more sanitary well.

Sanitation

<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Visits Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
30	29% Owners built them for convenience. Cost per privy is 30 baht.	Often	Often	Cold Malnutrition Stomach ache		

Village Economy

<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
30 rai	Rice, Casava	8,000 baht/yr.		Casing in deep well spoil taste water - according to village chief.

No.	Changwat	Location			Village Organization		Total No. of Members	No. of Women	Social Indicators	
		Amphoe	Tambon	Muban	Presence of Village Committee	Population			No. of Household	
33	Kanchanaburi	Bo Phroi	NonKung	Nong Dang	7 members	No Village Health Committee	None	None	480	60

Deep Wells	Water Supply		Ponds	Preferred Drinking Source	Perceived Needs for Add'l W.S.
	Dug Wells w/Pump	Dug Wells w/o Pump				Rain Cistern
One being dug by Mineral Resources. Village Headman requested by MRD/MOI 1 year ago to dig well. No participation by Muban in deep well construction	None	None	None	Rain Water not available year around so they take water from elev. pond water, Kong tank 1 km. away located*	They want more ponds maybe deep well not good for drinking. They did not dig more ponds because they have no time due to having to work outside.

Households w/Privies	% Household w/Privies (Target - 50% by 1981)	Sanitation		Major Disease	Causes of Disease as Perceived by Villagers	Perceived Needs for Add'l San
		Annual Frequency of Sanitarian	Visits Midwife			
3 houses with water soil privies built 4 years ago. Convenient for ex-village head and his guests. Assistance of privy due to lack of water. If sufficient aid available.**		6-7 times/month. He distributes medicine and provides treatment.	Comes often.	Malaria A few diarrhoea cases Stomach ache Intestinal disorders Worm	Stomach ache due to dirty food and too much gas in stomach.	Cleaning the village. They spend 1,500 baht/year/family on health expenses. They buy medicines from market and health center.

Acreage	Principal Crops	Village Economy Cash Income Per Home	Other Income	Miscellaneous
9 rai per family	Rice, cassava, they have some onion, corn and pigs. for consumption not for sale.	5,000 baht/family	฿25/day outside income should be 35/day this year in 3 months they made 2,000 baht last year.	They have had electricity for one month since October 1979 40 houses have electricity, available all day. ฿2,500 for connection charges financed from savings. They keep savings in local bank.

*in school in another Muban. No pay, carry by cart, twice a day. Those without cart borrow. Water hauling shared borrow wife and husband. One pond first villagers dug nong then got money from local Govt. Dept./MOI for rice and sugar cane. ฿50/cu³ more than km³/day.
 ** They would build privies according to the funds they have available. His estimate ฿500 for a privy.

No.	Changwat	Location			Muban	Village Organization Presence of Village Committee	Total No. of Members	No. of Women	Social Indicators	
		Amphoe	Tambon						Population	No. of Household
34	Kanchanaburi	Bo Phroi	Bo Phori		Chong Dann	Yes 10 members Village Health Committee. No health volunteer.		One woman member	2,400	223

Deep Wells	Dug Wells w/Pump	Dug Wells w/o Pump	Water Supply			Preferred Drinking Source	Perceived Needs for Add'l W.S.
			Rain Cistern	Ponds			
No deep wells	-	40 dug wells with- out hand pumps. 365 diesel pumps. They dug their own pumps, installed them themselves the apron and castings.*	No rain cistern. Don't store rain water.	3 ponds all day in the dry season. they drink pond water when available.		Dug well is first choice and only choice.	He wants to build a reservoir to dam water for irrigation.

Households w/Privies	% Household w/Privies (Target - 50% by 1981)	Sanitation		Major Disease	Causes of Disease as Perceived by Villagers	Perceived Needs for Add'l San
		Annual Frequency of Sanitarian	Frequency of Visits Midwife			
50 houses. First one installed long time ago. Last one Oct. 1979. They build privies because there is no forest left. They build it all themselves.		Once a month. Gives modern motivation for privies. 30 privies built in last two years.	Once a month motivate on family plng. and gives midwife.	Common cold Malaria FEver A few diaherrea cases.	Disorders regard to water and to work in the feilds.	Sanitation prob- lems regard to availability of water. Need water for irrigation.

Acreage	Principal Crops	Village Economy Cash Income Per Home	Other Income	Miscellaneous
50 rai per family	Sugar cane and rice	20,00 baht	After cutting sugar cane they go to bangkok to work or mine for gems in the neighboring provirces. Average income from out- side sources (borrow/ 1,200/month). They work 4 months and earn approx. 5,000 baht.	6 DS expenses for one month is 1,000 baht/month. This is a dispersed village. Houses next to compound - individ- ual families.

*Construction cost 3,300 baht
Diesel Pump 5,000 baht
Neon Dry - completed over 7 years.

<u>No.</u>	<u>Changwat</u>	<u>Location</u>			<u>village Organization</u>		<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>	<u>Presence of Village Committee</u>	<u>Population</u>			<u>No. of Household</u>	
35	Nakhon Pratom	Kampang San	Huey Kuank	Song Hong	Yes, tambon health Committee in the tambon of 20 members - one living in this muban.	5 members	None	351	79	
<u>Water Supply</u>										
<u>Deep Wells</u>		<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>			
None. When they tried to deepen hand dug work they hit salty water.			15 2311s dug without pump, they dig themselves 2 metres deep, unlined. They run water from irrigation, canal to dug well by gravity. Irrig. water all thru the year.	None But have Kong jars.	None	Taste of irrigation water good, not forbidden. Same taste as rain water. Greater profile.	No additional water needs.			
<u>Sanitation</u>										
<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>				
50 houses. Last one Oct. 1979 built in the last two years, now forest disappearing due to expansion sugar cane cost 2,000 baht/privy 2 vaults, cleaned*		Never visits the village.	No Gov't. tambon midwife. No traditional midwife. The use provincial hospital. No family planning.	Diaherrea Flus Fever, Malaria	Doesn't know the reason of malaria, they go to forest come back sick. Stomach ache use to dirty food.	They want electricity. No plans for additional sanitation.				
<u>Village Economy</u>										
<u>Acreage</u>	<u>Principal Crops</u>	<u>Cash Income Per Home</u>		<u>Other Income</u>	<u>Miscellaneous</u>					
10-15 rai/family for 7 rice for 3 sugar cane. 3-5 rais vegetable garden. The sure the produce.	Rice, sugar cane, chilli peppers, onion. Rice 2 acres per year. Sugar mill picks up cane at farm gate. Sugar cane more profitable.	฿15,000 baht		No outside income	5 houses have television sets, operating by one commercial in each house. More than 1,000 baht/family 4/yer health expenses.					

*in 2 years because water pour too high. 1.6 in deep tanks warn out vaults with suction for 200 baht a cleaning.

No.	Changwat	Location			Village Organization		Total No. of Members	No. of Women	Social Indicators	
		Amphoe	Tambon	Muban	Presence of Village Committee	Yes - No			Health Committee.	Population	No. of Household
36	Pitsanulok	Wang Tang	Wan Nok An	Wang Tad	Yes	No	12 members	None	300	60-70 households 204 Headmen in school services. 5 Muban in area.

Deep Wells	Dug Wells w/Pump	Dug Wells w/o Pump	Water Supply		Ponds	Preferred Drinking Source	Perceived Needs for Add'l W.S.
			Rain	Cistern			
None	None	2 lined wells 2-3 metres deep Villagers dug it last year. 6 unlined wells. 2-3 metres deep. Due long time.*	None except 1 in school. 400 gallons =1.5m ³ 4 tanks only for children. 4 months cistern dry.**	None. There is a stream used for cattle & washing. They have an infiltration well 10.***	Rain water lined dug well.	They want dep wells for drinking. Village headman took the request to Distric Health Officer every year for 5 years. The would be willing to provide free labor. Village poor can't afford materials and money, village built school!	

Households w/Privies	% Household w/Privies (Target - 50% by 1981)	Sanitation	Sanitation Frequency of Visits		Major Disease	Causes of Disease as Perceived by Villagers	Perceived Needs for Add'l San
			Sanitarian	Midwife			
None - only the school has 4 privies than use the forest. Privies for education. Use water bambo and newspaper.	No plan to install privies.	Sanitarian never visits malaria worker twice a year to spray DDT.	Never comes	2 trad'n midwives.	Malaria Intestinal Disorder, Diaherrea Worms	Eat dirty food. Go to forest come back sick. One death from malaria last year. People un-available as to the reasons of disease. Do not realize the well for privies.	Water, privies. Kids taught personal hygiene-bursh teeth, how to use privy. Village women prra practice family planning-using pills.

Acreage	Principal Crops	Village Economy		Other Income	Miscellaneous
		Cash Income Per Home			
20 rai per family	The cut wood to make lumber and charcoal. From Govt. land. Mostly illegally. Corn and beans for sale very little rice.	5,000 baht per family per year.		Some go to provincial capital to work for about 4 months. Earn about 3,000 baht.	Instruction school teacher, 8 years in this village. Total 8 teachers in school, 3 women.

*ago all wells dry 2 mos./yr. 1 hour wait for 1 bucket.
 **School closed 1 mo. dry season.
 ***metres from Klong. 2-3 metres deep 9 mos. water available use for drinking and other uses, many wells like this.

No.	Changwat.	Location			Village Organization		Total No. of Members	No. of Women	Social Indicators	
		Amphoe	Tambon	Muban	Presence of Village Committee	Population			No. of Household	
37	Phitsanulok	Wang Tank	Bang Klang	Heen Kai	Pra Kai	Yes-No health	15 members	None	700	154 houses

Deep Wells	Dug Wells w/Pump	Dug Wells w/o Pump	Water Supply		Preferred Drinking Source	Perceived Needs for Add'l W.S.
			Rain Cistern	Ponds		
None	None	5 lined dug wells built by local Gov't. Dept. 5 private unlined wells shared with/ TH others. 6 mos. deep. Some years 2 wells dry 2 mos.	No rain Cistern No jars. No rain water for drinking. Steel drums. Ask* 8 wells wait for water - 1-2 hours.	None	Prefer rain water. Second preference dug well. Only 3 mos. rainy season big problem no rain.	they would like to build a dam both for irrigation and to have water in the wells mean the canal and also have fish.
Households w/Privies	% Household w/Privies (Target - 50% by 1981)	Annual Frequency of Sanitarian	Frequency of Visits Midwife	Major Disease	Causes of Disease as Perceived by Villagers	Perceived Needs for Add'l San
None-Two privies in school built with Ministry of Interior funds. Two pit privies.	No plans to install privies.	11 Once a year. To give vaccinations.	None 2 trad. Min. Traditional midwives.	Skin Disease Missels Diaherrea	Not aware of causes of disorders. They use bamboo sticks for anal cleaning.	Water is first priority, they need more shallow wells.

Acreage	Principal Crops	Village Economy Cash Income Per Home	Other Income	Miscellaneous
20 rai/family.	Corn, beans main crops	8,00 baht	Sell charcoal 6 lumbers they make 2,000 baht.	Instruction village headman.

*DHO - Amphoe. No fund 1-2 years ago.

No.	Changwat	Location		Muban	Village Organization	Total No. of Members	No. of Women	Social Indicators	
		Amphoe	Tambon		Presence of Village Committee			Population	No. of Household
38	Phitsanulok	Wanglang	Bang Klang	Nong Pruh	Yes-5 Village Health volunteers, 10 houses/volunteer distribute midwife blood sampling for malaria. All village health volunteers are men.	8 members	None	600	118
		<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>	
		1 in the Wat by MKD/MOI 2 years ago. 20 metres deep never dry not for drinking water. Iron content only for cooking and washing. All costs paid by Gov't. Households w/Privies	1 lined w/pump village headman's brother paid all expenses for privies use only. They drink the water never dry. Household w/Privies (Target - 50% by 1981)	10 total 2 lined 8 unlined 6 metres deep Drinking and cooking.	None - Cong jars.	3 ponds Raise fish for consumption 6 not for sale. Built privately.	Dug wells drink from both types but tastes is different. Dug well with privy water is lighter. Never dry prefer shallow well without pump for drinking.	Want piped water supply. Village headman said village can pay for it and thinks the village can afford it. There is no electricity in Muban and they want it.	
		<u>Households w/Privies</u>	<u>Household w/Privies</u>	<u>Sanitation</u>	<u>Annual Frequency of Visits</u>	<u>Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>
		20% of 24 houses have privies. Instead 5 this year. DHO motivated them to build privies.	20%. They have planned to build privies in every house in 5 years.	DHU comes 2/yr. Sanitarian never comes	-	-	Diaherrea Malaria	Privy water and food.	Water, privies. They need sanitarian to educate and motivate the people.

<u>Acreeage</u>	<u>Principal Crops</u>	<u>Village Economy</u>	<u>Other Income</u>	<u>Miscellaneous</u>
10 rais/family 5 Rice 5 Corn	Corn, beans, rice	<u>Cash Income Per Home</u> 2,500 baht/family	10% villagers go out of the village to find work for 3 months a year outside employment income 2,000 baht.	Inconvenienced village headman who owns a rice mill and 19 pigs nest to his house.

Village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>			<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>				<u>Populaton</u>	<u>No. of Household</u>
39	Sukhothai	Muang	ia Atiat	Yang An	Yes-No Village Health Committee. No Health Volunteer. Meechai volunteer comes.	20	None	800	183

<u>Deep Wells</u>	<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Water Supply</u>			<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W S.</u>
			<u>Rain Cistern</u>	<u>Ponds</u>	<u>Sanitation</u>		
None for consumption 8 deep wells with gaso-line pumps only for irrigation. They use the largest wells for drinking during the 3 dry mos. All 8 private wells but snow well are drinking. 24 metres* w/Privies	None	There are people expert in digging wells in the vil-lage using the hand auger which they borrow from another village. 6 lined dug wells**	None. But all the houses have jars.	None	Sanitarian	Rain water dug wells Deep wells. The taste of deep well water is light and sounds musty.	Needs more water from the canal for irrigation. Need more dug wells for drinking.
No water sealed privies. 100 houses have pit privies for convenience. Diffi-cult to go to the forest at night. Wants to keep dirt in hole.	% Household w/Privies (Target - 50% by 1981)	No sanitarian in this Tambon never had visits.	Annual Frequency of Visits	Midwife	Major Disease	Causes of Disease as Perceived by Villagers	Perceived Needs for Add'l San
			Once a year for immuniza-tions. 1 Trad. midwife.		Colas Worms Diaherrae especially in children Malaria	Not assure of diseases.	Water and privies

<u>Acreage</u>	<u>Principal Crops</u>	<u>Village Economy</u> <u>Cash Income Per Home</u>	<u>Other Income</u>	<u>Miscellaneous</u>
20 rai 15 Rice 5 Beans 1 Chilli pepper	Rice, soya beans, red pepper.	30,000 baht	10% of people go out looking for work for 3 months. Daily wage 20 baht/day about 2,000 other income.	Inconvenienced Village Headman.

*deep average some deepen.
 **themselves. Bought consort pills in malaria. They all dry for 3 months a year. Dug 7 years ago cost 2,600 baht each.
 Funds collection according to ability to pay. Rich pay more than poor. 18 metres deep.

village Organization

<u>No.</u>	<u>Changwat</u>	<u>Location</u>			<u>Presence of Village Committee</u>	<u>Total No. of Members</u>	<u>No. of Women</u>	<u>Social Indicators</u>	
		<u>Amphoe</u>	<u>Tambon</u>	<u>Muban</u>				<u>Populaton</u>	<u>No. of Household</u>
40	Sukhothai	Muang	Muang Kao	Saiyat	Yes- they also have a Village Health Committee. No health volunteer. Meechai volunteer comes 1 month.	9	None	628	150
<u>Deep Wells</u>		<u>Dug Wells w/Pump</u>	<u>Dug Wells w/o Pump</u>	<u>Rain Cistern</u>	<u>Ponds</u>	<u>Preferred Drinking Source</u>	<u>Perceived Needs for Add'l W.S.</u>		
No deep well			1 dug well lined, 8 metres deep. Bought casings from market cost 560 baht, 8 yrs. old. Before used water from river well dries*	None - But have medium size jars.	1 pond dug by bulldozer by owner -village headman used**	Rain water 1 month reserve. In dry season pond water preferred.	Needs deep well for drinking and washing, willing to give free labor.		
<u>Households w/Privies</u>	<u>% Household w/Privies (Target - 50% by 1981)</u>	<u>Sanitation</u>	<u>Annual Frequency of Visits Sanitarian</u>	<u>Midwife</u>	<u>Major Disease</u>	<u>Causes of Disease as Perceived by Villagers</u>	<u>Perceived Needs for Add'l San</u>		
50 water sound privies, 60 pit privies convenient instead of doing it in the forest.		No sanitarian in Tambon from mover Tambon one comes 2/64.		1 Tambon midwife 2/month.	Colds Malaria Diaherria Worms	Diaherria from water. Malaria from forest. Cause of worms unknown.	Need sanitarian in this Tambon to motivate them.		
<u>Acreage</u>	<u>Principal Crops</u>	<u>Village Economy</u>		<u>Other Income</u>	<u>Miscellaneous</u>				
30 rai	Rice for sale. Chilli pepper for consumption.	Cash Income Per Home 20,000 baht		10% of people, 60 out for 3 months make about known 2,000 baht.					

*3 months carry water from other villages 3 kms away twice a day.
**for drinking 1 rai - dry 3 months. Share with all the other villagers.

1/ Family Planning Volunteer named after Thai entrepreneur who popularized family planning practices in Thailand emphasizing condoms.

Appendix F

1979 COST OF RAIN WATER STORAGE CISTERNS

1979 COST OF RAIN WATER STORAGE CISTERN WITH FIVE-CUBIC METER CAPACITY:

1.	Cement	.....17 sacks @B55	.....935
2.	Sand	.....1.5 cubic meters@200	.....300
3.	Fine sand	.....2.5 cubic meters@150	.....375
4.	No. 2 Gravel	.....2.0 Cubic meters@160	.....320
5.	No. 4 Gravel	.....2.0 cubic meters@150	.....300
6.	Steel rod 6mm X 10m	.....19 @25	.....475
7.	White cement	.....4.5 kg..@B1/kg	..... 4.5
8.	Wire	.....1. kg..@15	.....15
9.	Wood piles 3"x3m	...160..@B30	.....480
10.	Iron pipe 3"/4"	.....1m @B35	..... 35
11.	Plug 3/4"	.....1@b20	..... 20
12.	Spout 3/4"	.....1@35B	..... 35

TOTAL COST OF MATERIALS 3294.5

13. 15 days labor X 4 men@30Baht/man/day. 1800

TOTAL COST5,094.5 Baht
U.S.\$ 255

1979 COST OF RAIN WATER STORAGE CISTERN WITH TEN-CUBIC METER CAPACITY:

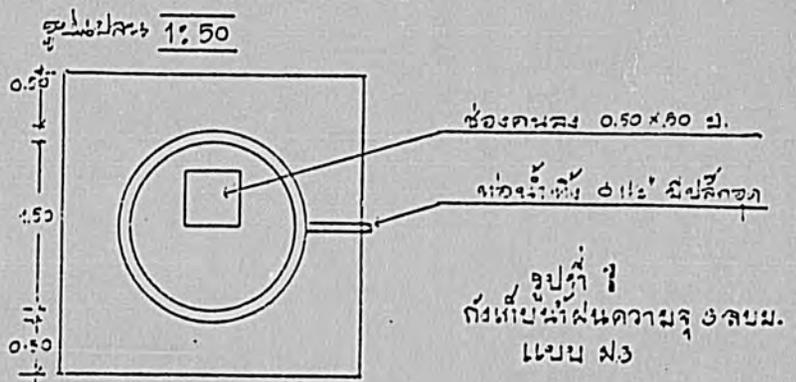
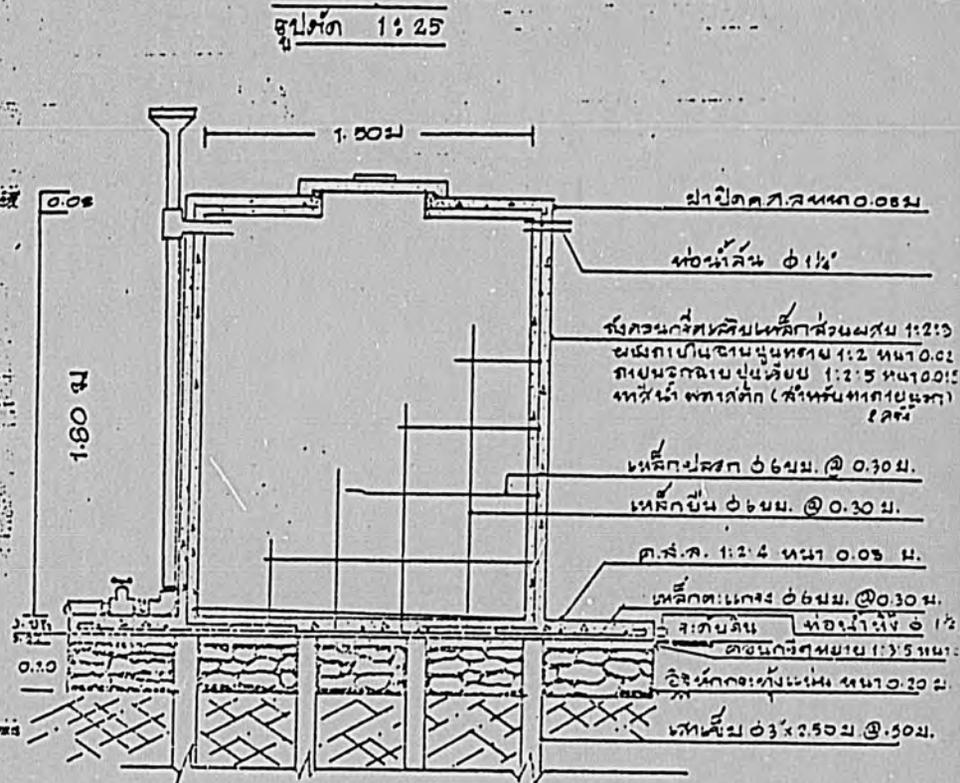
1.	Cement	1650
2.	Sand	400
3.	Fine sand	150
4.	No. 2 Gravel	400
5.	No. 4 Gravel	300
6.	White cement	10
7.	Wood piles	480
8.	Steel rod	950
9.	Wire	15
10.	Iron Pipe	50
11.	Plug	15
12.	Spout	45

TOTAL COST OF MATERIALS 4465

13.15 days X 4 men @30Baht per/man/day 1800

TOTAL COST6265 Baht
U.S.\$313.25

Figure 1
 DESIGN OF 3m³ CISTERN

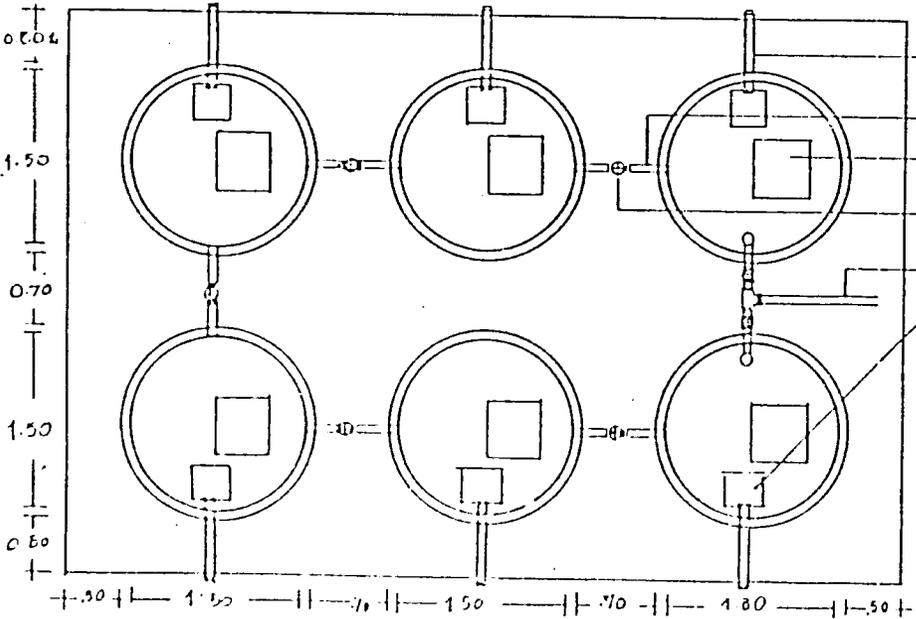
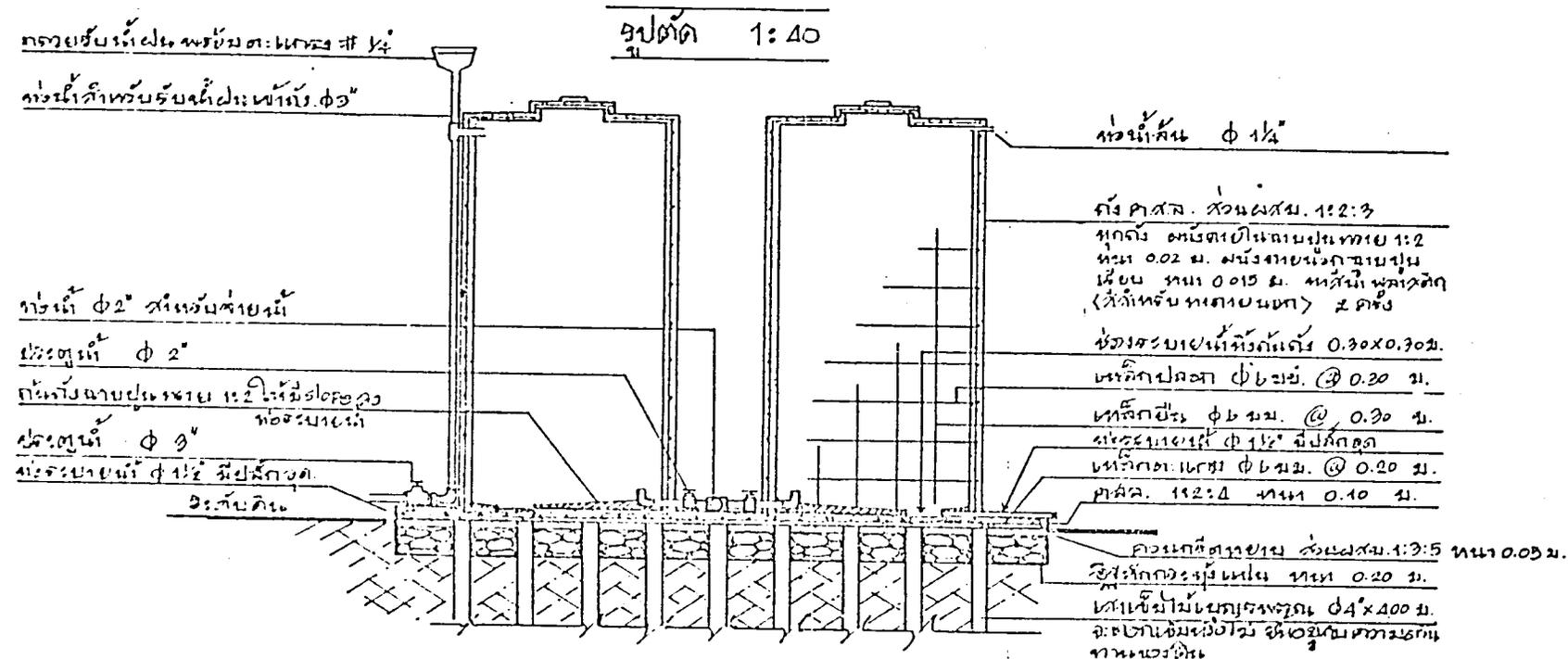


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501

Figure 2

DESIGN OF 6 TANK CISTERN

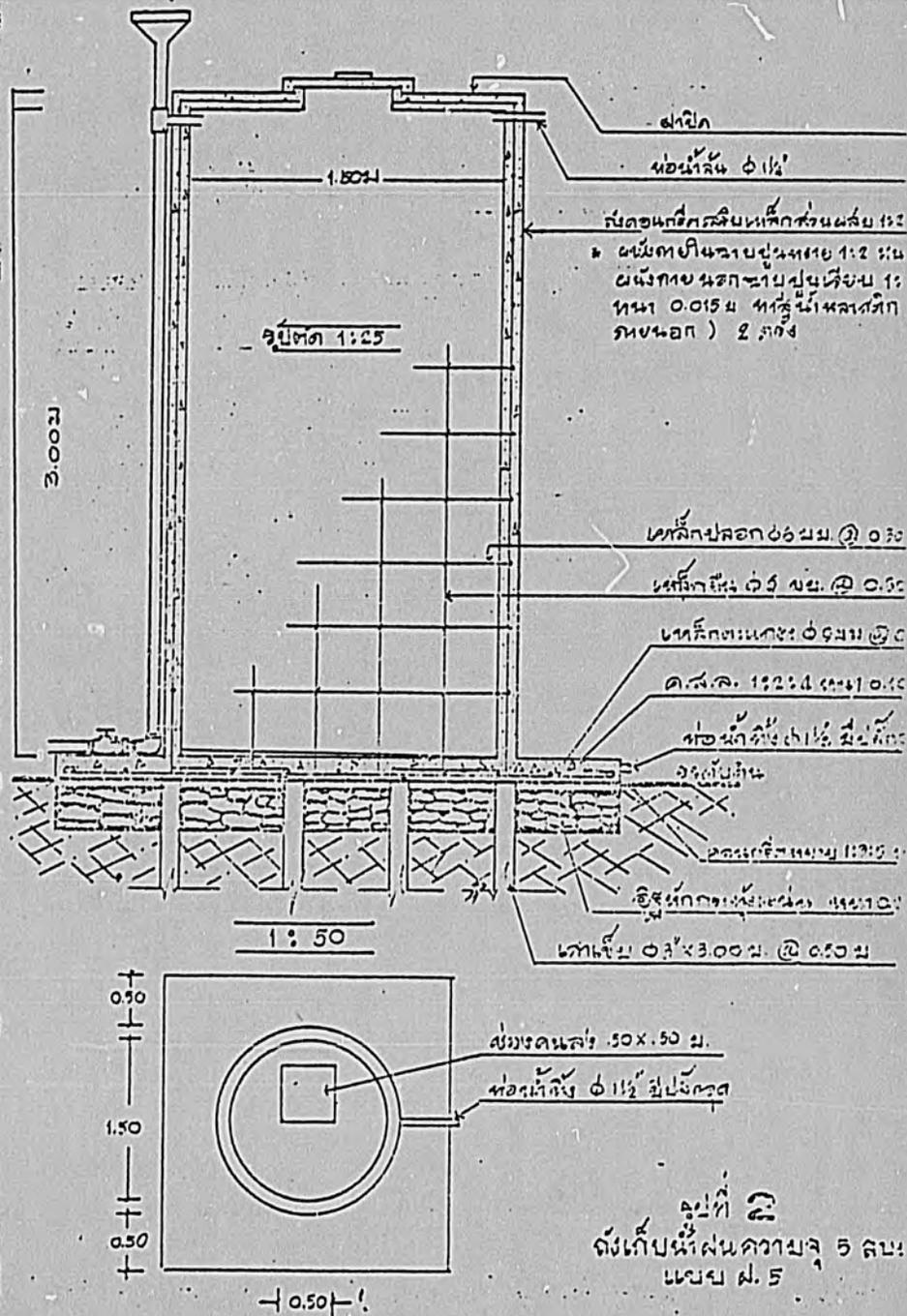


- ท่อระบายน้ำทิ้ง $\phi 1\frac{1}{2}"$
- ท่อเชื่อมระหว่างถัง $\phi 2"$
- ช่องคนทก 0.50×0.50 ม.
- ปลั๊กท่อ $\phi 2"$
- ท่อน้ำ $\phi 2"$ สำหรับจ่ายน้ำ
- ช่องระบายน้ำที่ถังน้ำ 0.30×0.30 ม.

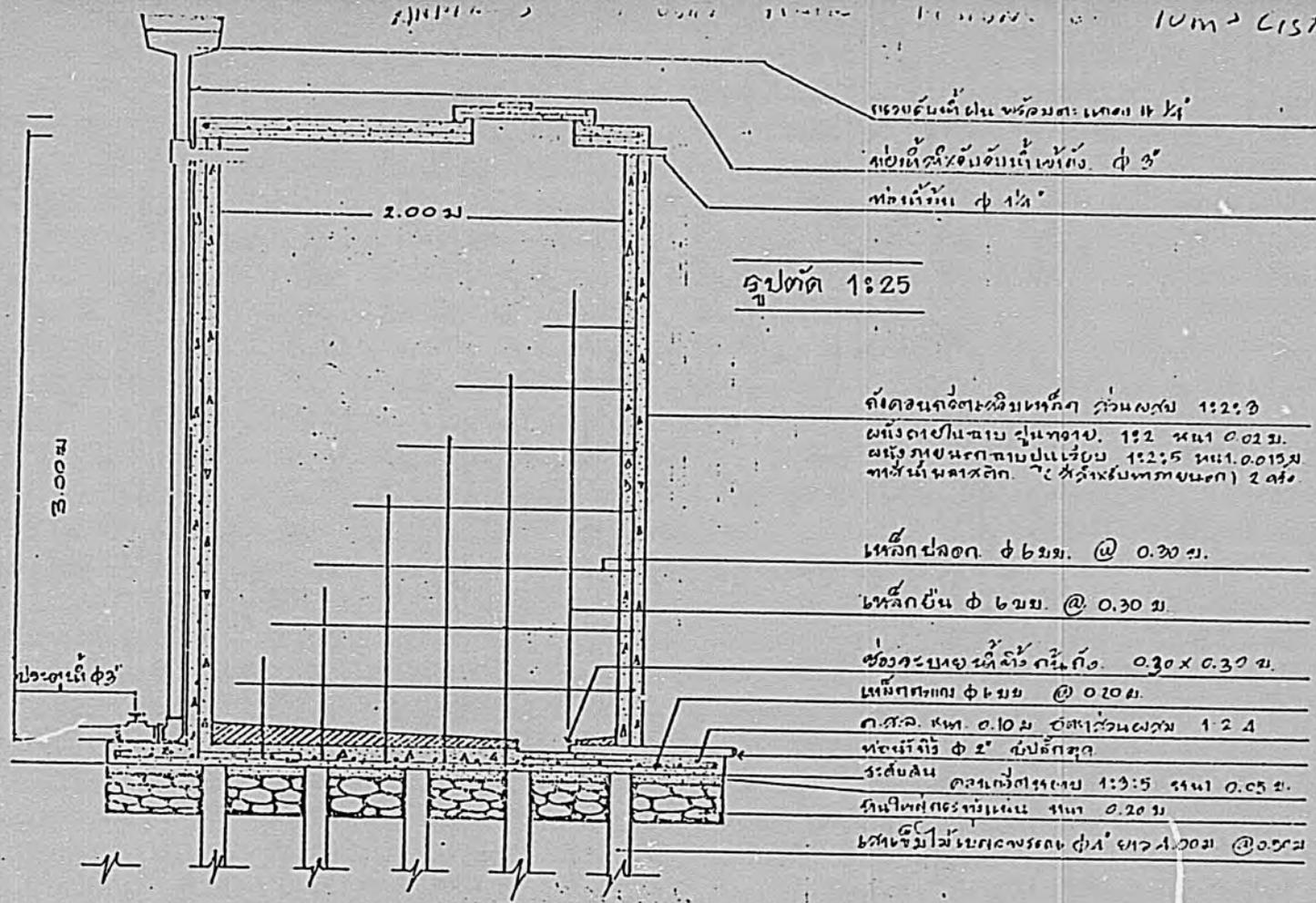
รูปที่ 4
ถังเก็บน้ำฝนขนาดความจุ 30 ลบ.ม.
แบบ ผ. 30

แปลน 1:50

Figure 3
 DESIGN OF 5.3m³ CISTERN



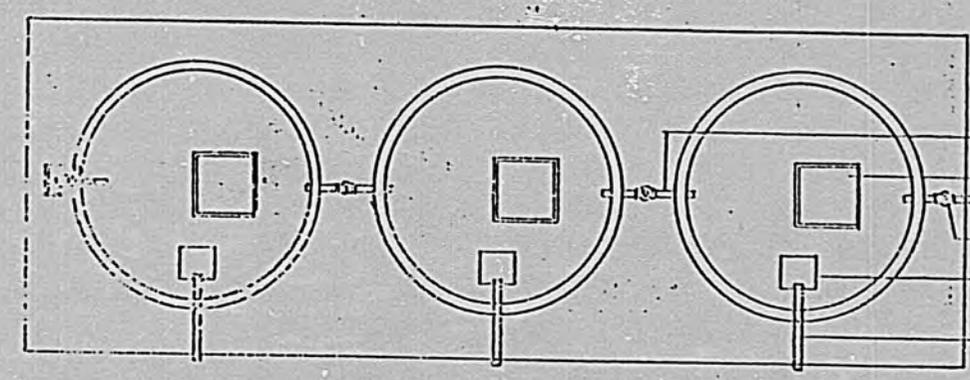
hal



รูปตัด 1:25

- ถังคอนกรีตเสริมเหล็ก กว้างสูง 1:2:3
- ผนังภายในตาม ศูนย์ทาบ. 1:2 มม. 0.02 ม.
- ผนังภายนอกตามป็นเรียว 1:2:5 มม. 0.015 ม.
- ท่อน้ำเข้าขนาด 2 นิ้ว
- เหล็กปลอก ϕ 6 มม. @ 0.30 ม.
- เหล็กชั้น ϕ 6 มม. @ 0.30 ม.
- ช่องระบายน้ำทิ้ง กว้างสูง 0.30 x 0.30 ม.
- เหล็กทาบ ϕ 6 มม @ 0.20 ม.
- ค.ส.ล. ทบ 0.10 ม. ยึดส่วนผนัง 1:2:4
- ท่อระบายน้ำ ϕ 2" สังกะสี
- ระดับดิน ตอนก่อสร้าง 1:3:5 มม. 0.05 ม.
- ดินถมที่กระทำแน่น มม. 0.20 ม.
- บันไดขึ้นน้ำแบบถาวร ϕ 1" ยาว 1.00 ม. @ 0.50 ม.

Figure 4
9.43m³/Tank



แปลน 1:50

- ท่อน้ำเข้าขนาด ϕ 2"
- ช่องระบาย 0.50 x 0.50 ม.
- ท่อระบายน้ำ ϕ 2"
- ช่องระบายน้ำทิ้ง กว้างสูง 0.30 x 0.30 ม.
- ท่อระบายน้ำทิ้ง ϕ 2" สังกะสี

รูปที่ 5
ถังเก็บน้ำฝนความจุ 3
แบบ น.33.