

Table 1.6.4-1 Summary of groundwater Potential

District	Hydrogeological Unit		Area	Village No.	Borehole depth	Standard Yield (m ³ /hr)	Static water level (m)	Water quality		Successful Rate of borehole	Remarks	
	Aquifer system	Unit						Ec	pH			
Hanang	Volcanics	A-1	Foot of Mt. Hanang	--	150	1-10	30			70		
		A-2	Katesh, Muroro	13,14,17	100	2-10	20			75		
	Bubu Cataclasite (rift valley)	B-1	Masqaroda, Mara	21-25,28-33	80	5-20	0-15	140	8.3	80		
		B-2	Gissanberg,Sirop	15,16,18,26, 27	100	1-5	15			70		
	Cataclasite granite(plateau)	C-1	Mingenyi	19	100	1-2	25			70		
		C-2	Mulbadaw, Ishponga	1,3,4,5,20	100	1-2	25			70		
	Granite, Nyanzian (rift valley)	C-3	Gahata, Hibadaw	2,6,8-12	100	1-5	25			70		
		C-4	Basodesh	7	100	2-10	20	350	7.5	80		
	Singida	Granite	D	Balangidalelu	--							
			A-1	Ntinko, Makuro	51-65	80	2-5	20	125	8	75	
Granite, Nyanzian (plateau)		A-2	Ugandi,Irisya, Sepuka	66-72, 37-41,49,50	100	1-2	30	200	8	70		
		A-3		--	90	3-10	10	160	7	75		
Granite (rift valley)		B-1	Ikuhanoda, Miaghojoa	88, 92-102	80	1-5	5-35	120	8	75		
		B-2	Ilongero, Kinyeto, Merva, Iknanado	73-79, 80-85, 87-91, 92-97	80	2-7	5-15	100	7	80		
Granite (plateau)		B-3	Singida Town		80	5-15	10	120	7	80		
		B-4	Maghojoa, Kinyeto	86, 99,111	130	2-5	50	100	8	70		
Granite, Nyanzian (rift valley)		C	Mgori,Misughaa, Siivu	103-105, 118-122, 125	100	2-10	5-40	100	7	75		
		D	Mgori	106-109,112	100	1-3	20			70		

District	Hydrogeological Unit		Area	Village No.	Borehole depth	Standard Yield (m ³ /hr)	Static water level (m)	Water quality		Successful Rate of borehole	Remarks
	Aquifer system	Unit						Ec	pH		
Manyoni	Granite (rift valley & plateau)	E-1	Ikungi, Dung'anyi, Puma, Siyu, Mungaa	1-3, 5, 7, 12, 14, 15, 30-33, 35, 36, 113-117, 123, 124	80	3-7	5-15	80	7	70	
	Kilimatinde/Granite, Nyanzian (rift valley)	E-3	Nkuhi, Ihanja	4, 11, 20, 21, 23, 24, 34	100	5-10	40	80	7	80	
	(fault)	F-1	Issuna, Muhitiri	8, 22, 27-29	90	1-5	20			70	
	Wembere Basin	G	Mwaru, Igombwe	42-45	90	1-2	30	160	6.5	70	
	Kilimatinde/Granite (Bahi basin)	A-1	Kilimatinda, Sasajira	37, 67, 68, 71, 72	100	3-15	35-45	125	8	80	
	Kilimatinde/Granite (plateau)	A-3	Kininku, Makanda	33-35, 40-45	80	1-5	10-30	100	8	70	
	Kilimatinde/Granite (plateau)	B-1	Muhalala	4-5	110	3-10	55	100	7.5	80	
	Kilimatinde/Granite (plateau)	C-1	Manyoni	1-3, 6, 7	90	2-7	15-30	200	7	80	
	Kilimatinde/Granite (plateau)	C-3	Itigi, Aghondi, Saniaranda, Kiuraka	9, 10, 13, 14, 16, 18-20	100	2-10	20	150	7	75	

District	Hydrogeological Unit		Area	Village No.	Borehole depth	Standard Yield (m ³ /hr)	Static water level (m)	Water quality		Successful Rate of borehole	Remarks										
	Aquifer system	Unit						Ec	pH												
Igunga	Kilimaunde/Granite (plateau)	C-4	Kashangu, Doroto, Ipande	15,17,22-24	100	1-3	30	200	7	70											
												Granite (fault)	D-1	Chikola, Mpola	47,49,50,52, 54	100	1-5	25		75	
	Granite, Gneiss	E	Mgandu	25-29	100	1-3	10	70	6	70											
												Granite (plateau)	A-1	Rungya, Kitanula	30-32	100	2-5	10-30	100	8	70
		A-2	Ziba, Nkinga, Nyangekuya	11-22,38-40, 42,50	90	1-8	20	150	7.5	70											
													A-3	Itunduru, Moyufuko	7,24,32,34,35	100	1-3	30			70
		A-4	Ipande	22	100	1-3	30			75											
													B-1	Matinje, Ngulu, Chomachankola, Njibo	1,5,6,8,10,28,31,3 3,36,41,43	100	1-4	30	70	7.5	70
		B-2	Mwashinku, Kimungu	2-4, 9, 26-27	100	1-3	30			70											
													B-3	Igunga, Bukoko	30,37, 44-46	120	1-2	30	130	7	70
		C-1	Igurubi	23,25,29	150	24	24	283	8.2	80											
													C-2	Itumba	47,48	120	3-10	20			70
		C-3	Manonga Lake Beds, Granite(fault)	--	100	1-3	20														
														Manonga Lake Beds, Nyanzian	--	100	1-3	20			

Table-1.6.5-2 Consideration with the possible borehole yield to adopt L-2 System

District	No.	Village	Service Population		Possible capacity			Hydrogeo Unit	Distance	Existing BH				Remarks	
			2001	2016	Yield (m ³ /hr)	Depth	Yield (m ³ /h)			S. W. L (m)	No.	Depth	Yield		S. W. L
Hanang	6	Garawja	4320		6.0	70	6	25	C-3	1500	27/93	41.00	8.40	7.65	Test well
	30	Masakta	2472	6000	12.5	80	20	20	B-1	3150	60/88	93.00	24.00	15.80	OX with Lambo 4264
Singida	18	Mwau	4320		6.0	75	7	15	E-2	3500	124/72	31.00	13.60	12.00	OX with 16.17.6775
	20	Ihanja	3079	5040	7.5	100	7	20	E-3	1000	70/82	102.00	6.00	15.70	OX
	37	Misimi	3759		4.6	100	3	20	A-2	1000	209/74	84.00	6.00		OX
	58	Ikwu	3452		4.2	75	3	20	A-1	1500					
Manyoni	73	Madamiga	5040		7.0	80	7	5	B-2	2000	28/59	40.00	7.90	0.00	OX with Mframa 5356
	88	Mvac	3660		4.5	80	6	10	B-2	3900	64/74	153.00	5.80	9.00	OX 64/74 BH Merva
	97	Ngamu	3715		4.5	80	4	20	B-1	650					
	99	Mangida	3041		3.7	130	5	50	B-4						
Igunga	109	Ngumu	3626	4320	6.0	75	10	10	C	2150	108/73	153.00	16.50	5.00	OX
	111	Itaja	4320		6.0	130	6	50	B-4	2300	73/68	196.00	5.00	47.00	OX BH=Mangida
	2	Kipondoda	5040		7.0	80	7	30	C-1	1000	117/84	62.00	16.80	29.56	OX without WH 5176
	1-4	Manyoni+M uhalala	3854		4.7	130	7	50	B-1		159/77	120.40	13.40	64.61	OX SWL=deep L-2
Igunga	16	Kigi	5040		7.0	100	7	20	C-3	1000	37/73	132.00	9.10	16.00	OX
	14	Nderubezi	4320		6.0	100	6	20	A-4	2700					
	8	Chomachank oha	4320		6.0	100	6	30	B-1		111/70	117.40	6.00	40.20	OX
					0.0										

Village adopted with L-2 System at 2001

Table-1.6.6-1 Target villages supposed deep SWL

District	No.	Village	Service Population 2001	Service Population 2016	Expected Yield (m ³ /hr)	Possible Capacity		Hydrogeo Unit	Existing BH			Remarks		
						Depth	Yield (m ³ /h)		S. W. L (m)	No.	Depth (m ³ /hr)		S. W. L Situation	
Hanang	3	Dajamet	720		1.0	100	35	C-2						
	12	Gidika	1253		1.7	100	40	C-3						
	19	Mingenyi	2254		3.1	100	30	C-1						
	20	Ishponga	1389		1.9	100	30	C-1						
Singida	86	Mughamo	1594		2.2	130	50	B-4				Solar		
	99	Mangida	3041		4.2	130	50	B-4	73/68	196.00	5.00	47.00	Solar	
	100	Sefunga	2455		3.4	130	50	B-4					L-2 System	
	111	Itaja	3451		4.8	130	50	B-4					Handpump	
Manyoni	126	Nibutu	688		1.0	100	40	E-4						
	127	Niwa	499		0.7	100	40	E-4	63/73	159.00	8.65	70.00	OX	
	128	Mampando	0		0.0	100	40	E-4	8/96	19.10		4.00	OX	
	4	Muhala	501		0.7	110	65	B-1	159/77	120.00	13.40	64.61	OX	Existing L-2 System with Manyoni T
Solya	5	Mdurundu	1397		1.9	110	50	B-1						solar
	14	Mbugani	1489		2.1	100	25	C-3	190/85					HP
	15	Kashangu	707		1.0	100	35	C-4	111/85	62.50		30.48	OX	HP
	37	Mbwasia	811		1.1	100	35	A-1	82/74	127.40	6.91	34.75	OX	HP
Kilimatunde & Solya	64	Saranda	2271		3.2	100	30	C-2	29/69	141.00	3.90	23.00	OX	HP
	67	Kilimatunde	1023		1.4	100	15	A-1	199/73	118.80	15.00	30.00	OX	Existing L-2 system Kilimatunde & Solya
Sukamahela	68	Solya	52		0.1	100	35	A-1						
	69	Sukamahela	0		0.0	110	40	B-2	76/72	72.50	4.42	1.30	OX	
	71	Sasajira	834		1.2	100	45	A-1	11/66	116.40	4.60	15.00	OX	Solar
	72	Makisuku	846		1.2	100	45	A-1	19/64	123.70	2.40	70.00	XX	Solar

□ : Village supposed SWL is more than 45 m

Table-1.6.6-2 Numbers of Water Samples

District	Number					Total
	Borehole	Dug well	Water hole	House holed	Test and Rehabilitated borehole	
HANANG	2	7	31	30	3	73
SINGIDA	23	76	125	103	3	330
MANYONI	38	16	52	87	2	195
IGUNGA	7	11	55	62	1	136
Total	70	110	263	282	9	734

Table-1.6.6-3 Number of Water Quality Test

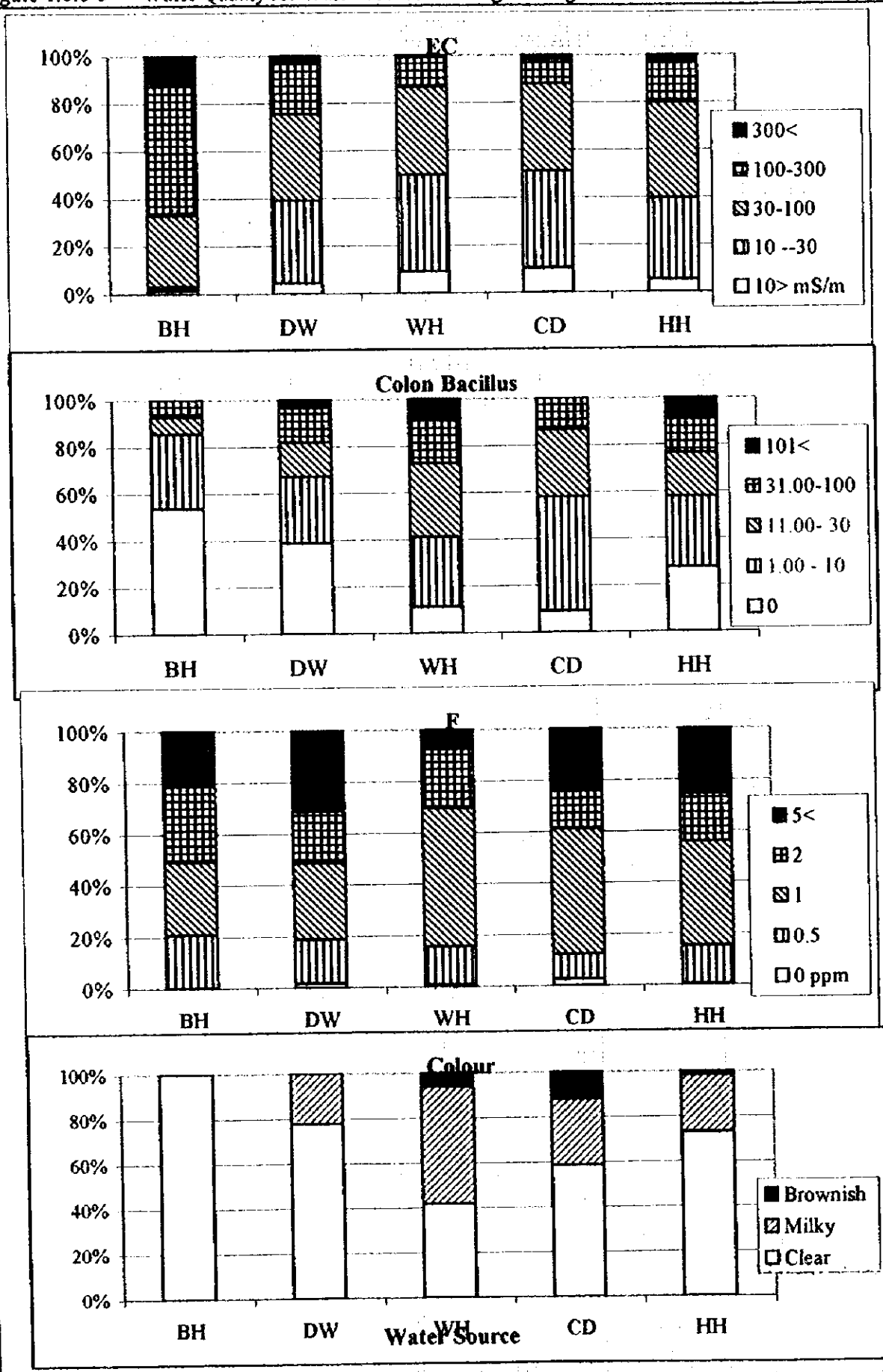
Item	Method	Number					Total
		Borehole	Dug well	Water hole	House hold	Test Borehole	
Colour		63	103	249	283	9	707
Muddiness		63	103	249	283	9	707
Smell		63	103	249	283	9	707
Temperature	EC meter	70	118	274	292	9	763
pH	pH meter	70	118	274	292	9	763
EC	EC meter	70	118	274	292	9	763
F	Package test	53	64	190	269	7	583
NO3	Package test	13	18	26	35	4	96
NO2	Package test	25	17	29	26	6	103
NH4	Package test	13	17	26	33	6	95
Colon Bacillus	Package test	54	100	187	235	4	580
Colon Bacillus Water sampler	Water sampler	15	16	48	53	3	135

Table-1.6.6-5

Water quality of Each Water Source

		Borehole	Dug Well	Water Hole	Charco Dam	Household
Colour	Clear	63	80	85	24	202
	Milky	0	23	107	12	70
	Brownish	0	0	12	5	5
	Total	63	103	204	41	277
Colon Bacillus	0	37	45	21	4	79
	1.00 - 10	22	33	57	22	87
	11.00- 30	5	17	60	13	54
	31.00-100	5	17	36	6	45
	101<	0	4	16	0	23
	Total	69	116	190	45	288
F	0 ppm	0	1	1	1	1
	0.5	11	11	22	4	40
	1	15	19	80	20	109
	2	16	13	34	6	50
	5<	11	20	11	10	69
	Total	53	64	149	41	269
EC	10> mS/m	1	5	20	5	15
	11 - 30	1	41	91	20	100
	31-100	21	43	83	18	117
	101-300	39	26	28	5	53
	301<	8	3	2	1	6
	Total	70	118	224	49	291
No2	0.05 > ppm	17	13	16	1	7
	0.1	1	3	4	0	1
	0.2	0	0	5	0	6
	0.5	5	0	3	0	11
	1 <	2	1	0	0	1
	Total	25	17	28	1	26
No3	2 >ppm	2	5	9	1	7
	5.0	0	3	3	0	1
	10	1	4	4	0	6
	20	5	3	6	0	11
	45 <	5	3	3	0	10
	Total	13	18	25	1	35
NH4		BH	DW	WH	CD	HH
	0 pmm	5	5	6	0	11
	0.1-0.5	7	12	17	0	20
	1	1	0	2	0	2
	2	0	0	1	0	0
	5 <	0	0	0	0	0
Total	13	17	26	0	33	

Figure 1.6.6-5 Water Quality for Water Sources of Target Villages



BH=Borehole, DW=Dug well, WH=Water hole, CD=Charco dam, HH=Household container

Figure-1.6.6-6

NO₂, NO₃ and NH₄ of Each Water Source

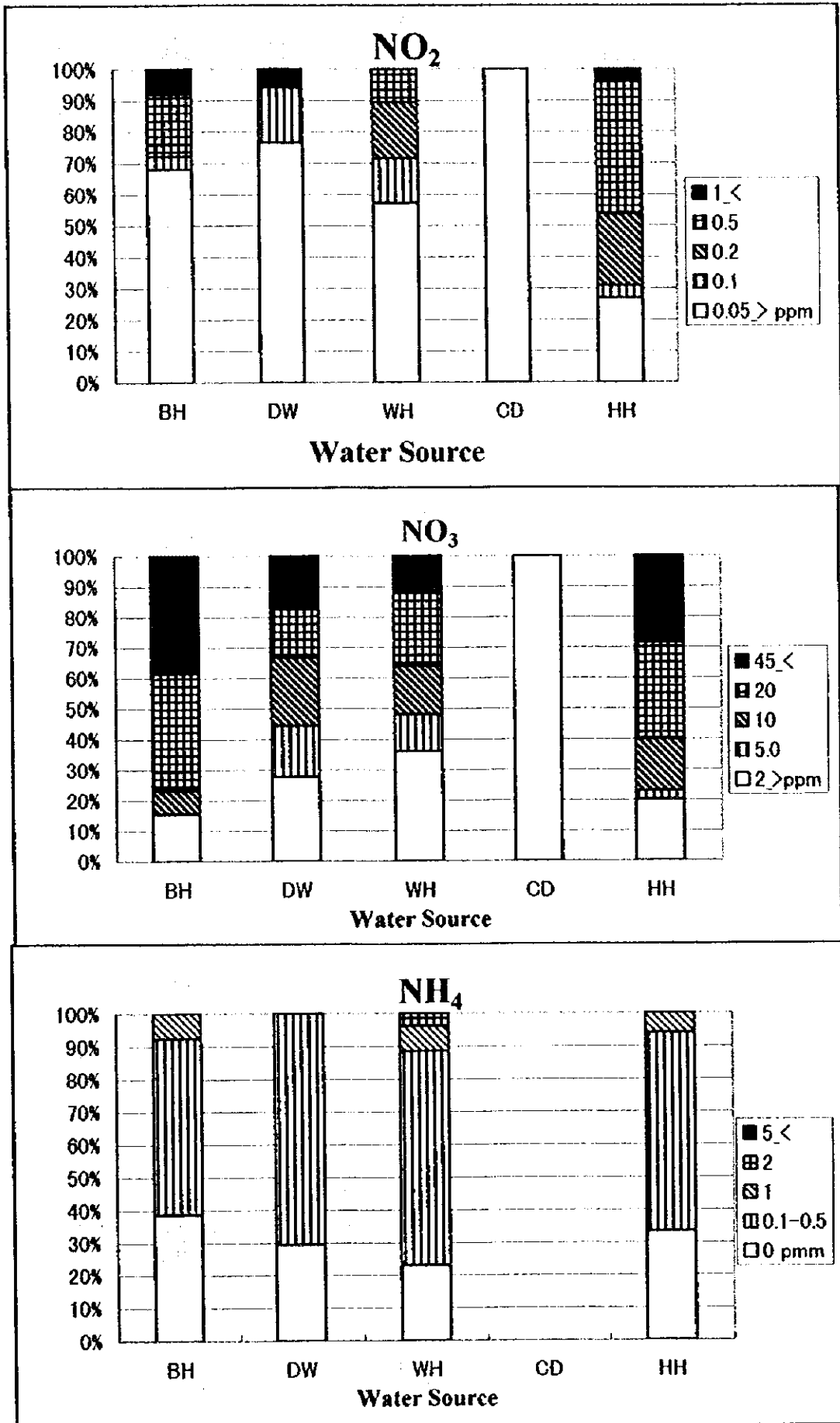


Figure-1.6.6-7 EC and pH of Borehole of 4 districts

		Hanang	Singida	Manyoni	Igunga	Total
pH	5>	0	0	1	0	1
	5.01-6.49	0	8	23	0	31
	6.50-8.00	0	40	33	6	79
	8.01-9.20	0	4	1	0	5
	9.21<	0	0	0	0	0
	Total	0	52	58	6	116
EC	10>mS/m	0	1	0	0	1
	10 --30	0	1	0	0	1
	30-100	1	6	13	1	21
	100-300	1	15	18	5	39
	300<	0	1	7	0	8
	Total	2	24	38	6	70

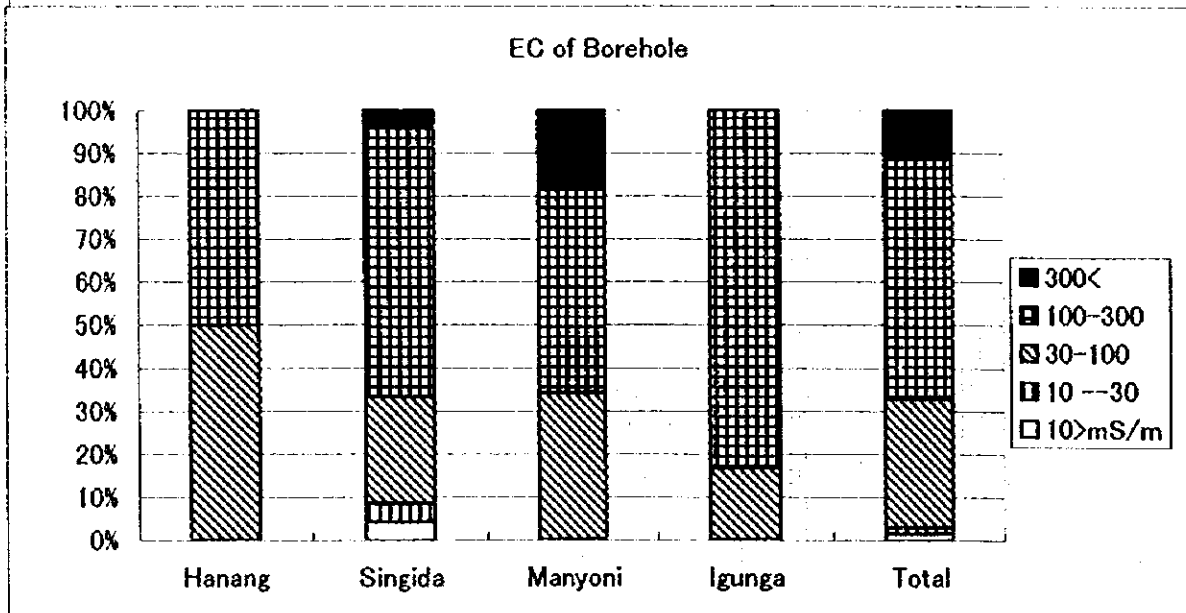
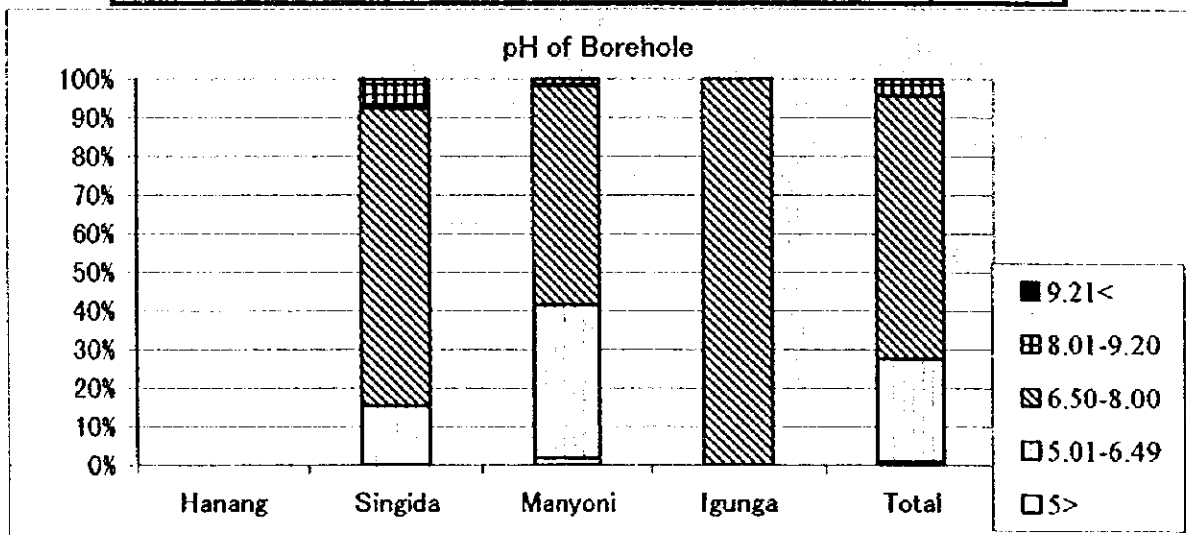


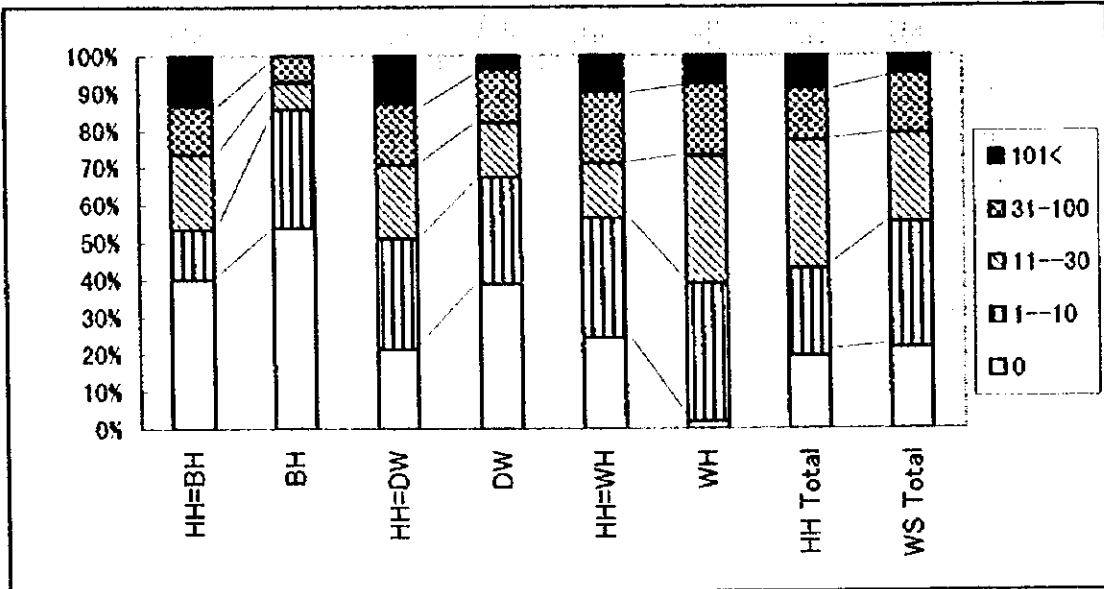
Table 1.6.6-6 The Tanzanian Temporary Standard of Physical and Chemical Quality of Portable Water

Water classification and substances	Units	Tanzanian Guideline	WHO	
			Acceptable	Allowable
pH		6.5 - 9.2	7.0 - 8.5	6.5 - 9.2
EC	micro-S/cm	2000	less than 2000	2000
Fluoride (F)	mg/litter	8	n.m	1.5
Nitrate (NO ₃)	mg/litter	100	n.m	30
Chloride (Cl)	mg/litter	600	200	400
Turbidity	mg SiO ₂ /litter	800	200	600
Colour	mgPt/litter	30	5	25
Iron (Fe)	mg/litter	50	5	50
Ammonia (NH ₃)	mg/litter	1.0	0.3	1.0
Manganese (Mn)	mg/litter	0.5	0.1	0.5
Total Hardness (as CaCO ₃)	mg/litter	600	--	--

Figure 1.6.6-8

Comparison Household & Original source (Colon Bacillus)

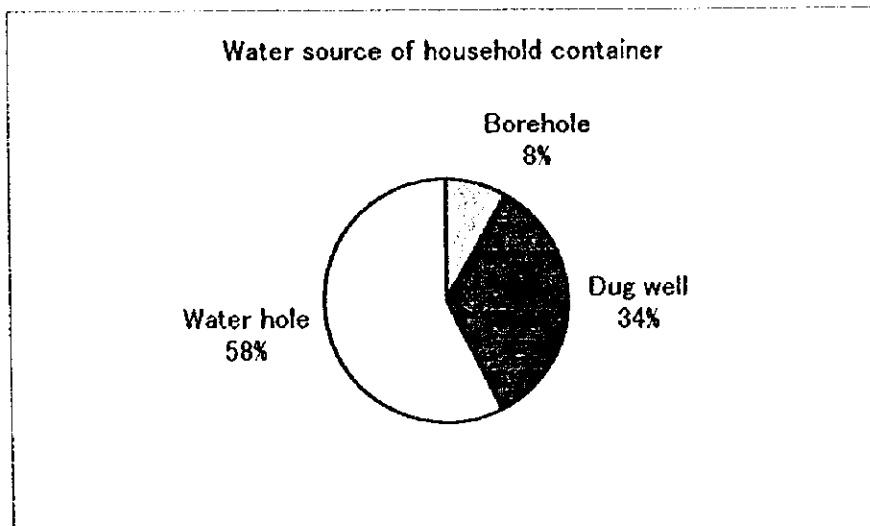
		0	1-10	11-30	31-100	101<	Total
Borehole	HH=BH	12	4	6	4	4	30
	BH	37	22	5	5	0	69
Dug well	HH=DW	26	36	24	20	16	122
	DW	45	33	17	17	4	116
Water hole	HH=WH	50	66	30	40	20	206
	WH	4	79	73	42	16	214
Total	HH Total	88	106	155	64	40	453
	WS Total	86	134	95	64	20	399



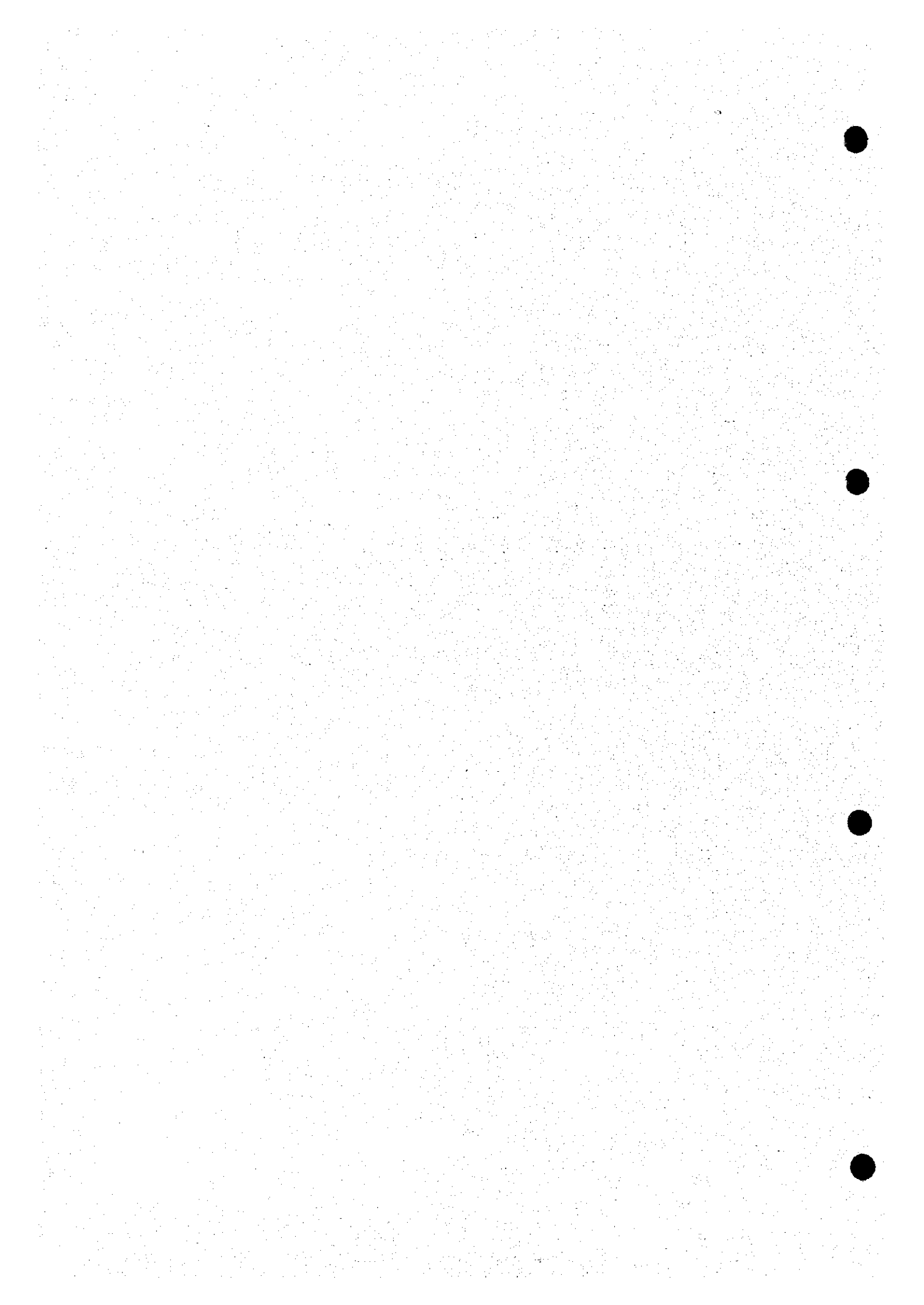
HH-BH : Household container drawn from Borehole

HH-DW : Household container drawn from Dug well

HH-WH : Household container drawn from Water hole and Charco dam



CHAPTER TWO: ENVIRONMENTAL CONSIDERATIONS



CHAPTER TWO: ENVIRONMENTAL CONSIDERATIONS

2.1 Environmental Evaluation

2.1.1 Environmental Setup

(1) Legislative and Institutional Setup

The laws and regulations concerning the environment are not enacted in Tanzania. Especially, those related to the environmental impact assessment (EIA) are also include in any regulations administrated by any regional governments and sectorial agencies. The regulations pertaining to environment for the Study are as follows :

- Wildlife Conservation Act No 12 of 1974 (plus amendment if any)
- Forest Ordinance 384 of 1954
- Fisheries Act No 16 of 1970
- Grassfire Ordinance
- The Range Development and Management Ordinance

Responsible ministry and agencies for environmental management are the National Environment Management Council created by the National Environmental Management Act 1983 in purpose of acting as an advisory body to the Government on all matters relating to the environment and Division of Environment created in 1991 in of the Ministry of Tourism, Natural Resources and Environment.

The Government intends to enact law and regulations to enforce environmental management including Environmental Impact Assessment.

(2) National Conventions

International conventions on environment to which The Government is a party are:

- Convention on Biological Diversity
- Basel Convention
- Convention on International Trade in Endangered Species

(3) Game Reserve and Forest Reserve

There are three forest reserves, one game and forest reserve and three game reserves in the Study area. Out of 284 target villages, nine villages are located in the above reserve areas: three villages in Duamghanga game and forest reserve, three villages in Minyuge proposed forest reserve and three villages in Rungwa game reserve (refer to location map in Figure 2.1.1(3)-(4)).

1. Hanang district
 - Hanang Forest Reserve
2. Singida Rural district
 - Duamghanga Game & Forest Reserve
 - Mgori Forest Reserve
 - Minyuge proposed Forest Reserve
3. Manyoni district
 - Muhesi Game Reserve
 - Kizigo Game Reserve
 - Rungwa Game Reserve
4. Igunga district
 - Uyambia Forest Reserve

2.1.2 Initial Environmental Examination (IEE)

Social and natural environmental impacts related to the implementation of the Project were assessed according to initial environmental examination (IEE) of standard of JICA (refer to Appendix-2). As a result of Screening and Scoping by standard of JICA for environmental changes caused by implementation of the project, following two environmental items, negative environmental impacts are evaluated category "C" on which any impact is unclear at present, and a further examination required (refer to Table 2.1.1, 2.1.2, 2.1.3 and 2.1.4).

- Unknown impact factor on vested water right of dug wells for drawing down of water level and/or decreasing by drilling of new boreholes; and
- Change of quantity and quality of existing boreholes by drilling of new boreholes.

2.1.3 Environmental Impact Assessment

The EIA was made on the following two items clarified by IEE; (1) vested water right of existing dug wells and (2) the change of groundwater quantity and quality for existing boreholes.

(1) Vested Water Right

Some 474 dug wells are distributed in the study area, of which 199 dug wells are equipped with handpump (refer to location map of Figure 2.1.2(1)-(4)). Dug wells are usually dug manually into the superficial soft layers of weathered hard rock and riverbed sediment. The maximum depths of the well do not, in general exceed 20 m, and the well wall is protected by concrete rings. Some of them are dry during dry season influenced by fluctuation of groundwater level appeared in superficial aquifers. A borehole extracts water normally from deep aquifers and not from shallow aquifers. However, a borehole, which is constructed nearby a dug well and not properly designed and/or constructed, might give water level influence to the dug well.

The following measures are recommended to avoid water level affection in dug well.

- to confirm location and aquifer of dug wells.
- to design appropriate borehole structure to avoid extract water from aquifer of dug well such as installation of blank casing more than 30 m and cement grouting of 6 m below ground surface.

(2) Influence for Existing Borehole

In case that a new borehole(s) is proposed to be constructed in a village where a borehole(s) is already existing, the influence of the construction works on the existing borehole(s) should be eliminated in term of water quantity and water quality of the existing borehole(s).

At some 39 villages, more new borehole(s) will be constructed additionally (refer to Table 2.1.5). The extent of influence for existing boreholes was evaluated taking the number of new boreholes and hydrogeological condition. At 16 villages, any influence for the existing boreholes will be nil or very small because number the number of new boreholes is small in comparison with yield and drawdown of groundwater level. At 14 villages in which three to five boreholes will be newly constructed, any influence will be avoided keeping enough distance between the existing and new boreholes. At 9 villages in which large number of borehole (6 to

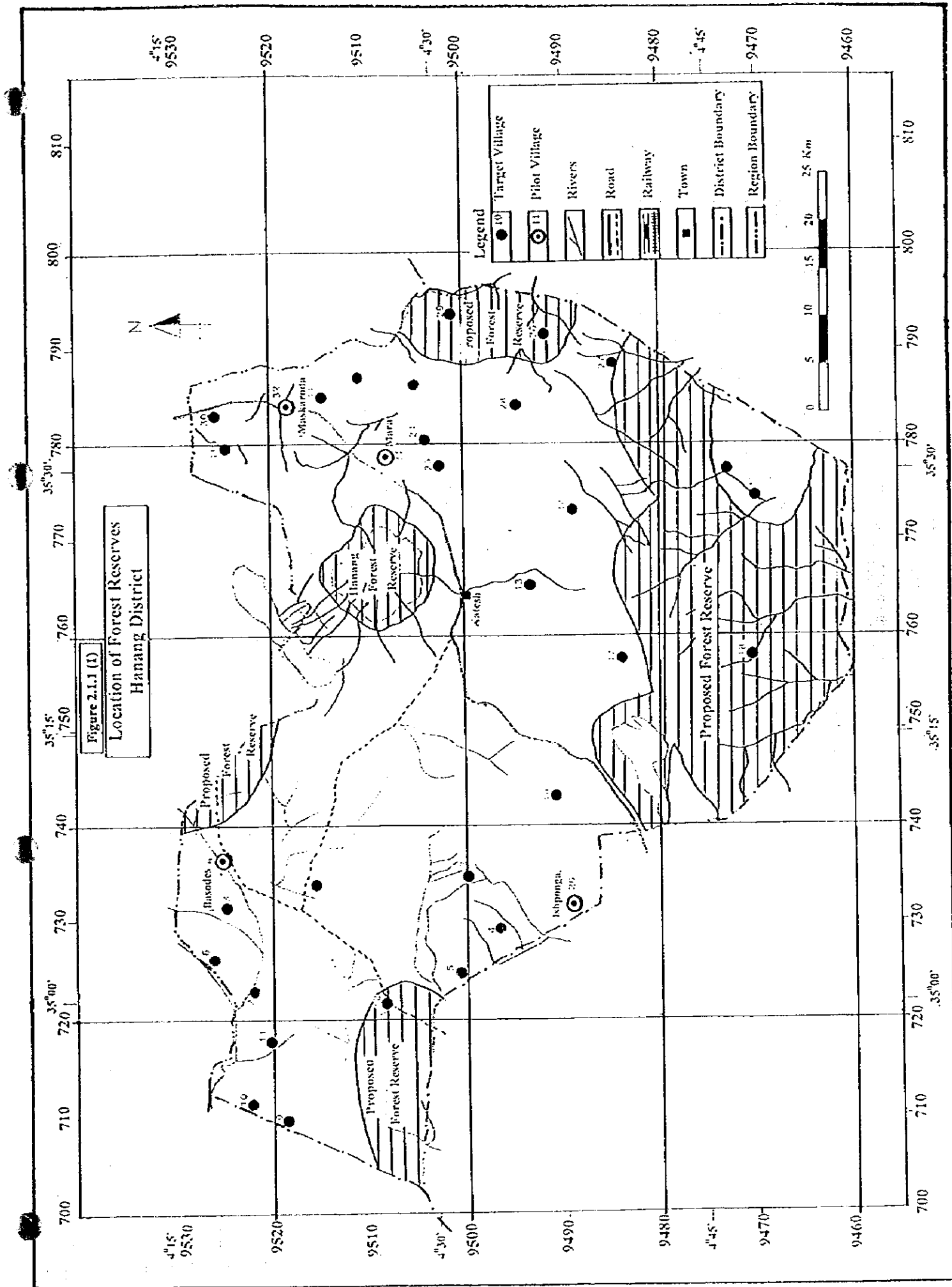
12) are required, some existing borehole may be influenced by over-pumping of new boreholes to drawdown of water level inmoderately and to change of water quality.

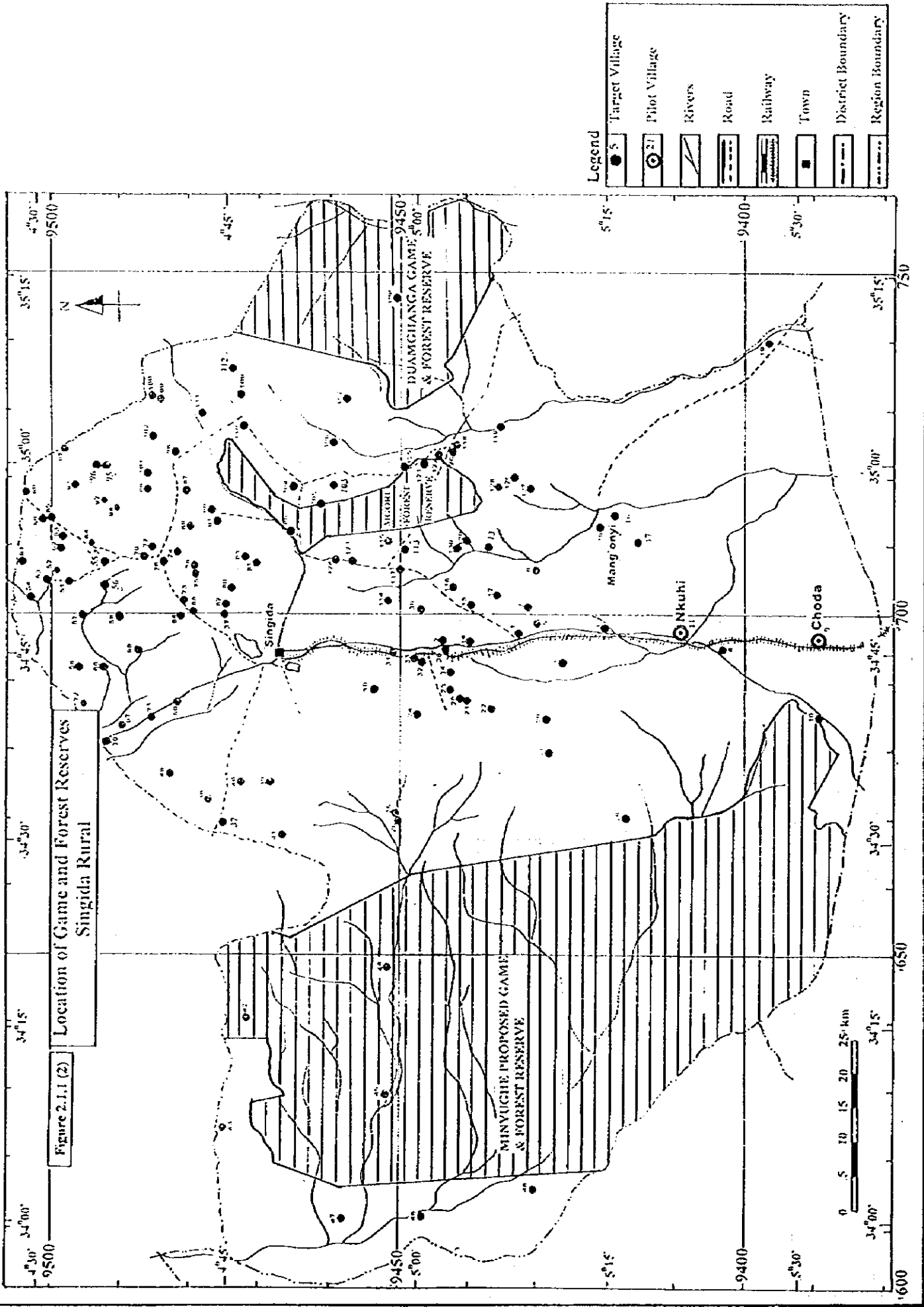
The following measure is recommended to avoid such influence :

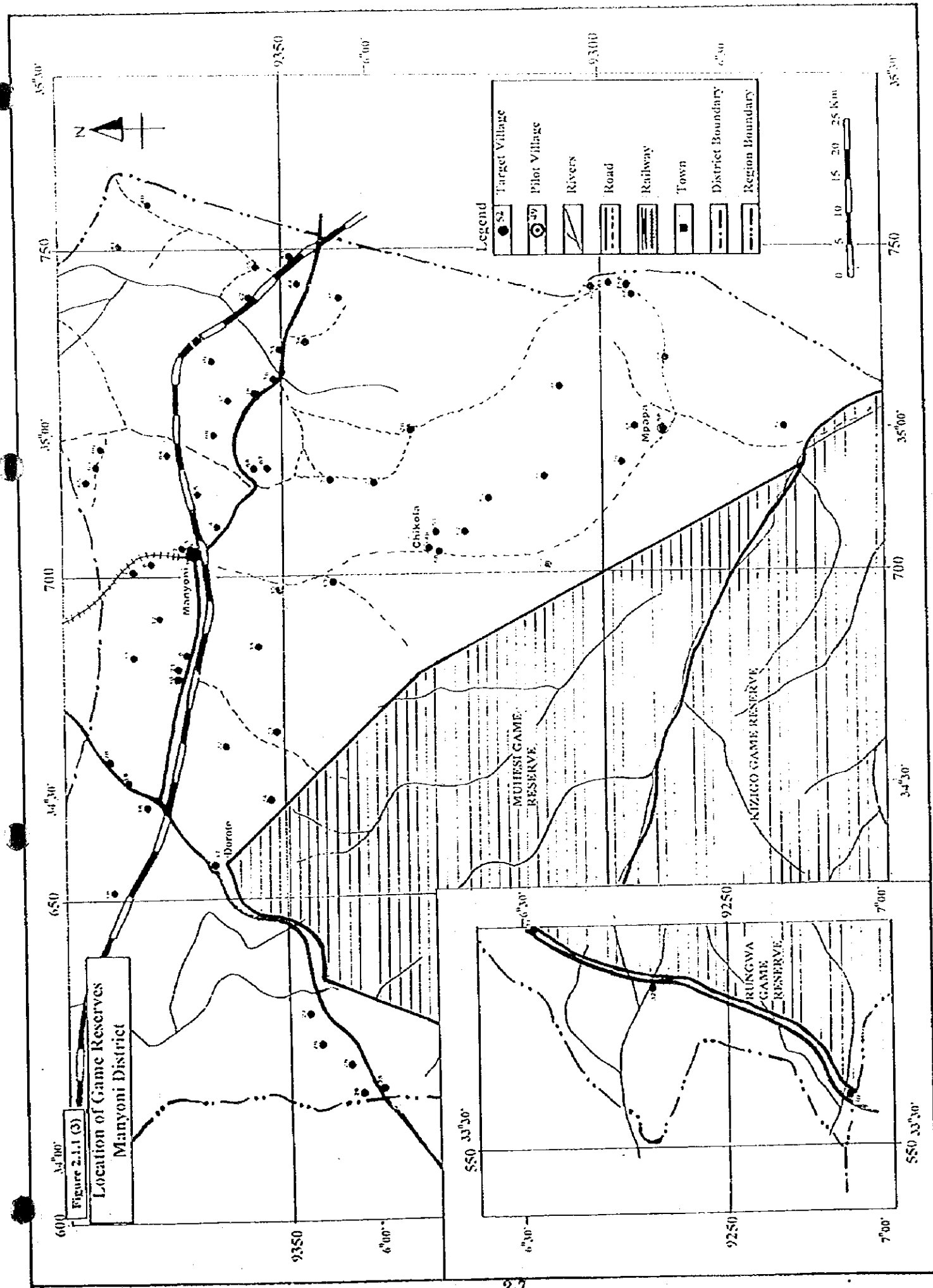
- to investigate in detail hydrogeological condition of existing boreholes such as drawdown of water level and pumping discharge, and change of water quality by pumping test,
- based on hydrogeological investigation to estimate enough interval between existing borehole and new borehole,
- to unify the existing and new boreholes adopting L-2 systems, and
- to make periodical monitoring on water level and water quality after construction of borehole.

Table 2.1.1 Outline of the Project

Item	Contents
Project Title	The groundwater development project for Hanang, Singida Rural, Manyoni and Igunga districts in the United Republic of Tanzania
Back Ground	The basic human needs for the study area are not satisfied especially for safe and sustainable domestic water
Objectives	To promote villagers living standard for domestic water use and health providing safety and sustainable water developing groundwater.
Location	Hanang district of Arusha region, Singida Rural and Manyoni districts of Singida region and Igunga district of Tabora region in the United Republic of Tanzania
Project implement agency	Ministry of Water, and Regional and District water engineer office.
Beneficial Population	696,040 people
Major Components	Drilling of new borehole, installation of handpump and/or motor pump and new construction of water supply facilities, and rehabilitation of water supply system.
Water Depth / Quality	Groundwater from deeper aquifer / to meet water quality standard of the Tanzania.
Water supply facilities	Borehole expecting from 70 m to 150 m depth Handpump with headwork (slab, soak way and drainage pit) and wind pump with water tank. Motor pump and power supply system, delivery and distribution pipeline, water tank and public taps
Other Specific Items	







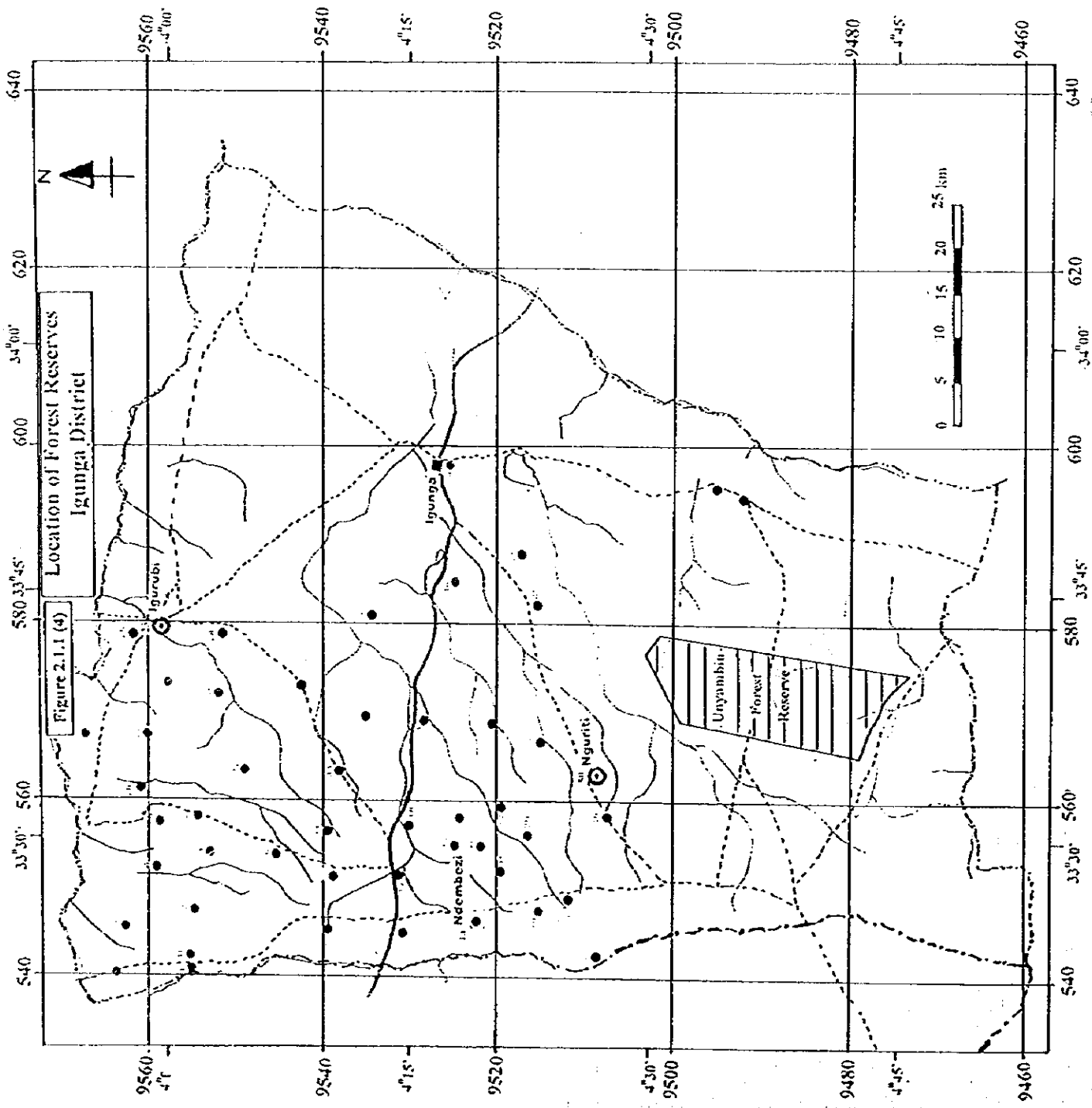


Figure 2.1.1 (4)
Location of Forest Reserves
Igunga District

Legend

● 12	Target Village
⊙ 50	Pilot Village
~	Rivers
—	Road
—+—	Railway
■	Town
---	District Boundary
----	Region Boundary

Table 2.1.2. Site Description

Item		Description
Project Title		The groundwater development project for Hanang, Singida Rural, Manyoni and Igunga districts in the United Republic of Tanzania
Social environment	Regional Inhabitants (Resident/Indigenous people/ Awareness of Project/others)	The villages consist of widely scattered houses. Villagers eager for realisation of the project
	Livelihood Related Facilities: (Borehole/storage-pond/water-supply/electricity-supplies/others)	Domestic water is dependent on mainly dug well and water hole, and most of water supply system with borehole are out of order Most of villages have not been served with electricity
	Health and Sanitation (Epidemic-diseases/Hospital/ customs/others)	Waterborne diseases break out frequently
Natural environment	Geomorphology and Geology (Steep-slope/soft-foundation /marsh/faults/others)	Undulating plateau of 1100 - 1500 meters above sea level mainly underlain by granite and gneiss of Precambrian and rift valleys bounded by fault filled by Neogene sediment
	Groundwater, Lake, Stream and Climate (Water quality/quantity/rainfall/ other)	Shallow aquifer is polluted by sewage from household and livestock, deeper aquifer of Precambrian granite and schist is available for domestic use, and average annual precipitation is 750 mm. For most river on the plateau permanent flow is not observed
	Precious Flora and Fauna: There Habitats: (National park/habitat for specific species/others)	Hanang mountain is specified to forest reserve and the southern part of Manyoni is specified to the Rungwa game reserve
Public pollution	Cause of Claims: (Interested pollution/others)	No problem
	Counter measure	No need
Other Specific Items		Nothing

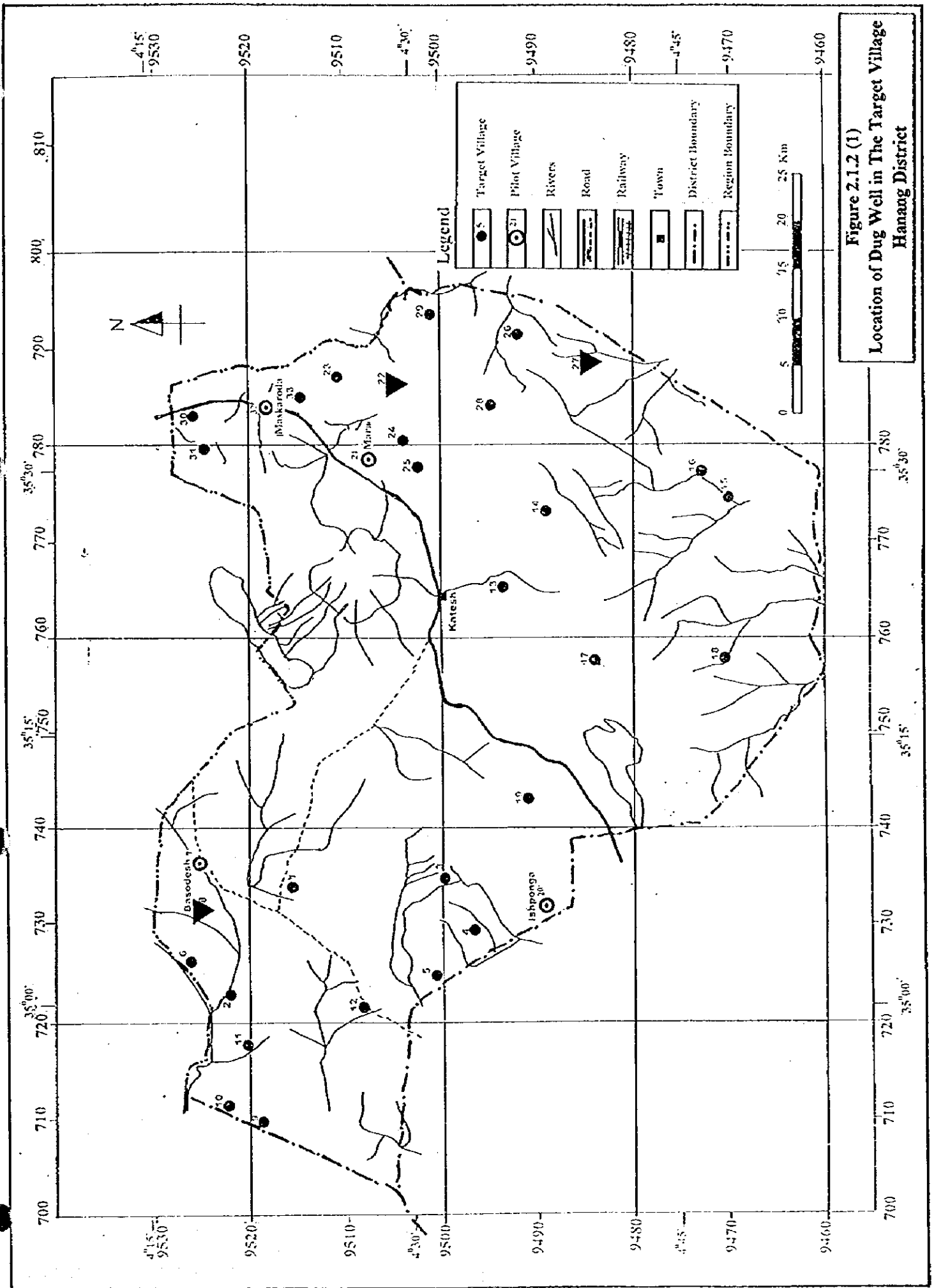
Table 2.1.3 Screening of the Project

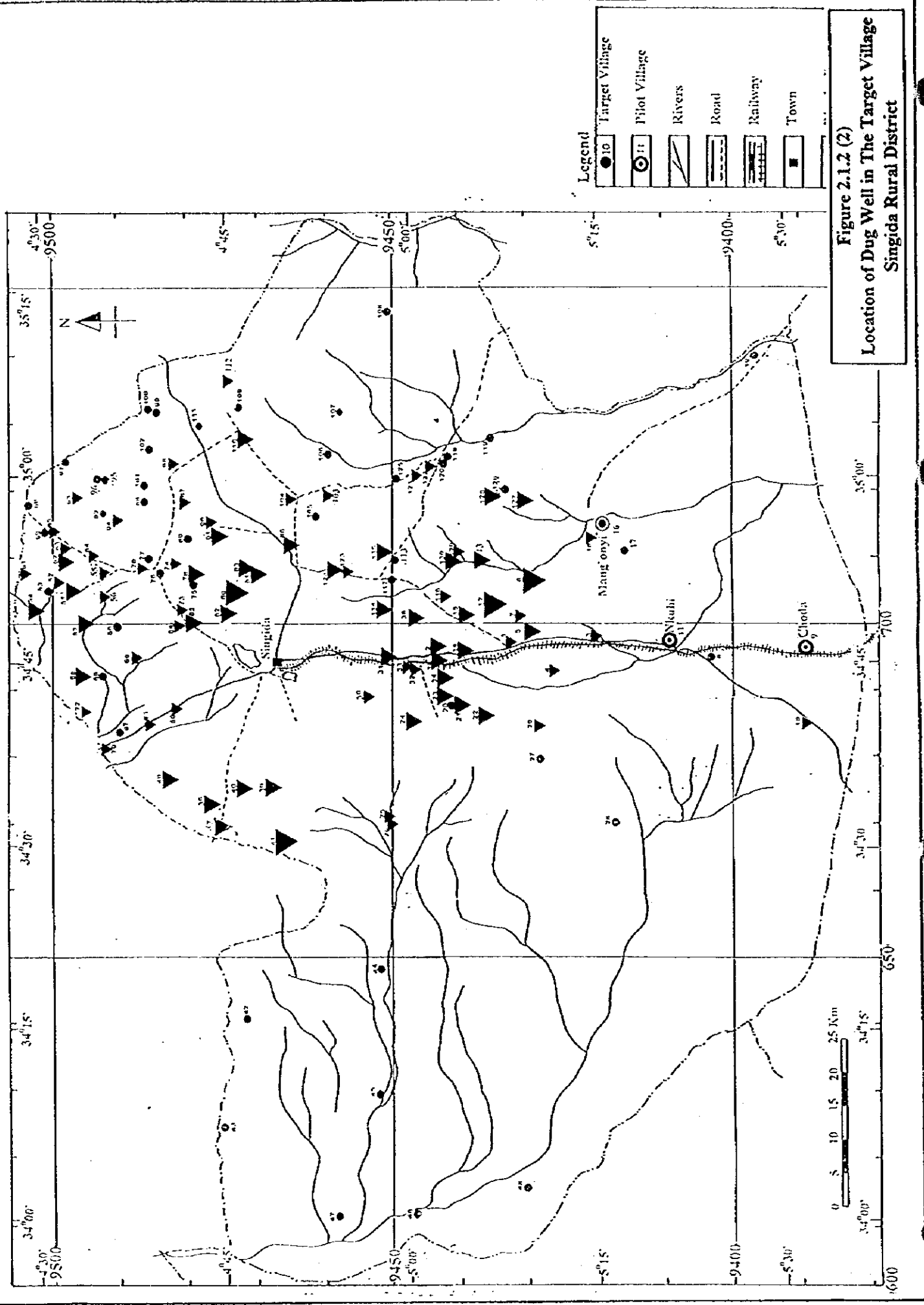
No.		Environmental impact	Evaluation	Comment
A. Social Environment				
1	Resettlement	Removal by occupation of land	No	Don't occur.
2	Economic activity	Exchange of economic activity	No	Economic conditions will be improved.
3	Transportation and Life Facilities	Congestion, traffic accident, Influence to school and hospital	No	Don't occur.
4	Split of Area	Divide of community	No	Don't occur.
5	Historical/Cultural Heritage	Influence for ruins and Cultural assets.	No	Can avoid such place.
6	Water Right/Right of Common	Infringe to vested rights of irrigation, water, and common land	Yes	It is necessary to investigate unknown impact factor on vested water rights by drilling of new boreholes.
7	Public health conditions	Deterioration of sanitation by garbage and breed of harmful insects	No	Sanitary condition shall be improved.
8	Industrial waste	Occurrence of industrial waste and solid disposal	No	Don't occur.
9	Disaster (Risk)	Increase of Disaster and accident caused by facility construction	No	Isn't induced.
B. Natural Environment				
10	Topography/ Geology	Modification of landscape by Excavation and banking	No	Not modify land.
11	Soil Erosion	Soil erosion caused by deforestation	No	Isn't occurred.
12	Groundwater	Remarkable draw down of groundwater level/head and pollution / change of water quality, caused by over discharge of groundwater	Yes	It is necessary to investigate change of quantity and quality of existing boreholes affected by drilling of new boreholes.
13	Hydrologic Regime of Lake/River	Change of the discharge and quality caused by reclamation, and pollution by inflow of drainage	No	Not influenced.

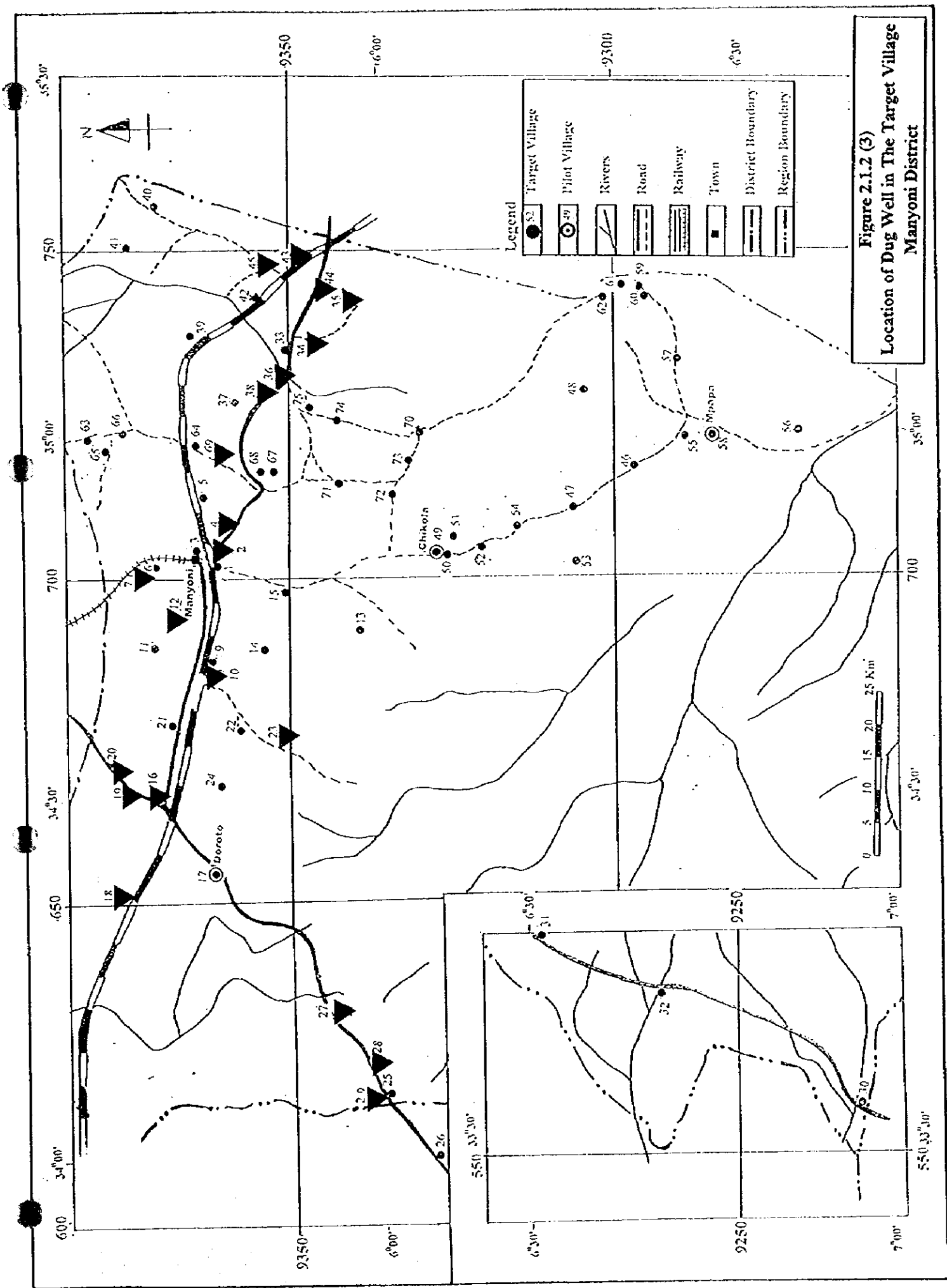
14	Sea Coast	Beach erosion and Sedimentation caused by Reclamation and change of oceanic condition	No	Situated on inland.
15	Fauna/Flora	Obstruction for reproduction and extinction of species caused by change of inhabit condition	No	Avoid to affect the game reserved area.
16	Climate	Change of temperature, precipitation and wind caused by land reclamation and construction of building	No	Isn't influenced.
17	Landscape	Change of landscape and miss match caused by land reclamation and construction of building	No	Isn't influenced.
C. Environmental Pollution				
18	Air pollution	Pollution by engine exhaust and harmful gas discharged from vehicles and plants	No	There are no origins.
19	Water pollution	Discharge of slurry and oils with drilling	No	It is feared to discharge of slurry only near drilling point.
20	Soil pollution	Pollution by discharged and diffused harmful materials	No	There are no origins.
21	Noise/Vibration	Noise and Vibration caused by excavation and pumping	No	Some temporary Noises will be occurred with drilling.
22	Land subsidence	Land subsidence caused by groundwater potential with excessive groundwater discharge	No	Groundwater discharge is not so large volume to cause land subsidence.
23	Offensive odour	Engine exhaust and occurrence of offensive odour	No	Isn't occurred.
Total Evaluation ; Necessity of Environmental Impact Assessment (EIA)			necessary	There are some items to e affected.

Table 2.1.4 Check List for Scoping of the Project

Environmental Item		Evaluation	Ground	
Social environment				
1	Resettlement	D	Drilling point shall be selected to avoid affecting removal, ruins and cultural assets.	
2	Economic Activity	D		
3	Transport/Life Facility	D		
4	Split of Area	D		
5	Historical/Cultural Heritage	D		
6	Vested right of water, irrigation and common land	C	Unknown impact factor on vested water right is decrease of yield of shallow well affected by drilling of new borehole.	
7	Sanitation	D	After completion of the project sanitary condition will be improved.	
8	Industrial waste	D	Any industrial waste is not happened.	
9	Disaster and Accident	D	Disaster and serious accident is not caused.	
Natural environment				
10	Topography, Geology	D	Large scale of excavation, banking and deforestation is not caused.	
11	Soil erosion	D		
12	Groundwater	C	Unknown impact factor is influence to existing boreholes on water qualities and quantity by drilling of new borehole.	
13	Lake, River flow	D	Shall be not affected by groundwater discharge from deeper aquifer.	
14	Seashore, Sea area	D	The project area is located on inland.	
15	Animals and Plant	D	Can avoid affecting the game reserved area and habitat.	
16	Weather	D	Any change of weather is not caused because of only small scale facility construction.	
17	Landscape	D		
Public Pollution				
-	18	Air pollution	D	Any pollutant is not occurred.
-	19	Water pollution	D	Slurry occurred with drilling could be disposed not to cause any water and soil pollution.
-	20	Soil pollution	D	
-	21	Noise and Vibration	D	Only temporally noise will be occurred during drilling.
-	22	Land subsidence	D	Groundwater discharge is not so large volume to cause land subsidence.
-	23	Offensive odour	D	Any offensive odour is not occurred.







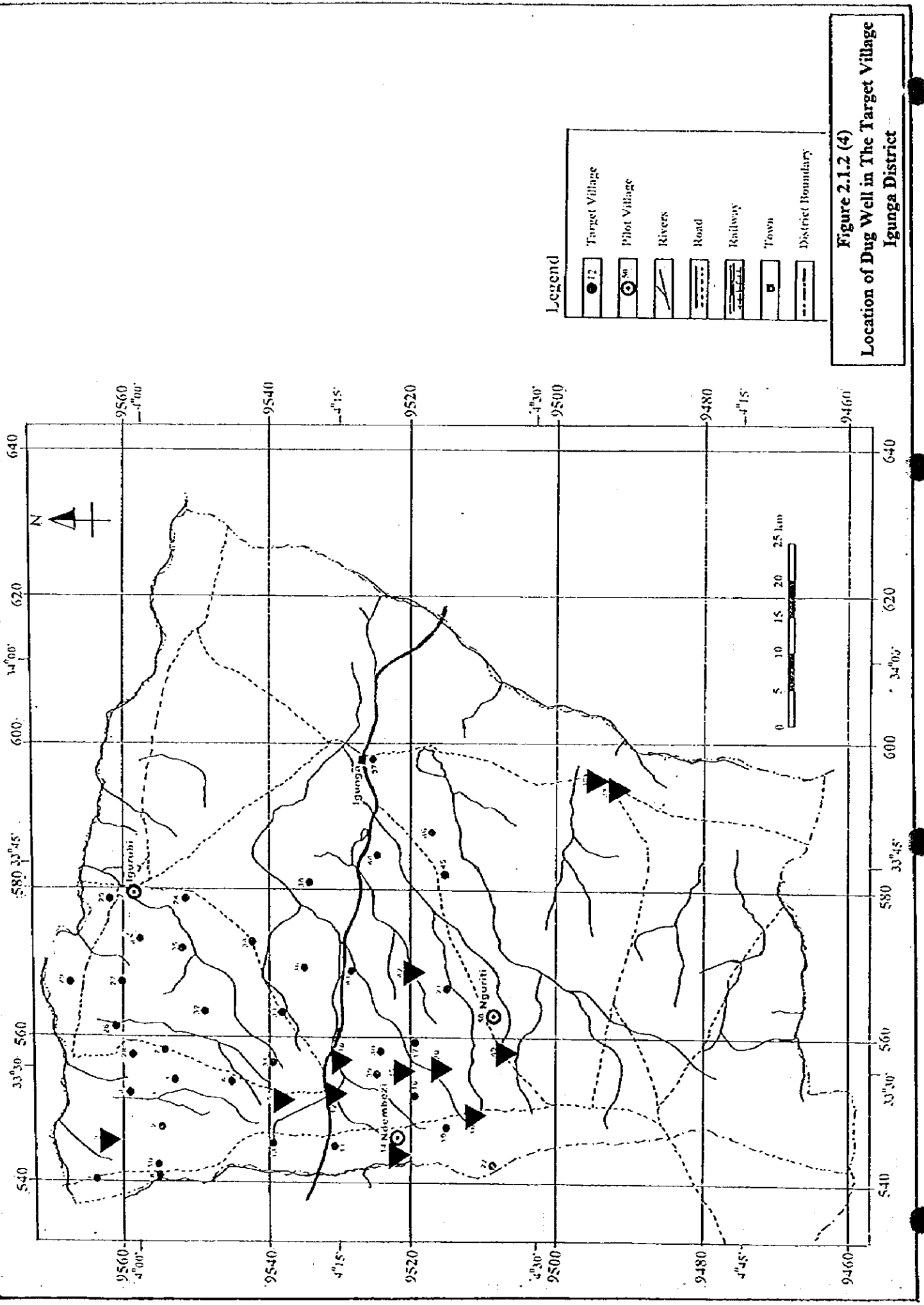


Figure 2.1.2 (4)
Location of Dug Well in The Target Village
Igunga District

District	Village		Required Service at 2001		Hydrogeological condition			Evaluation		Countermeasure	Remarks
	Cord	Name	Population	BH no.	Type	Unit	Yield	SWL	Grade		
Hanang	26	Sirap	1198	3	New	B-2	1	20	Medium	Take enough interval	
	31	Lambo	1798	4	L-2	B-1	20	15	Small	Unite to a borehole with Masakta village	
Singda	10	Mkwa	875	2	New	F-2	7	30	Small		
	20	Ihanja	3079	7	L-2	E-3	6	15	Large	Unite to a borehole	
	30	Matyuku	345	1	New	E-1	3	15	Small		
	42	Mwaru	1249	3	New	G	2	30	Medium	Take enough interval	
	66	Ughandi B	1298	3	New	A-2	1	5	Medium	Take enough interval	
	69	Misinko	2024	5	New/Reha	A-2	1	30	Medium	Take enough interval	
	71	Msis	1457	3	New	A-2	2	5	Medium	Take enough interval	
	73	Madamigha	2252	5	L-2	B-2	40	0	Medium	Unite to a new borehole with Mrama	
	74	Mrana	3107	7	L-2	B-2	7	5	Large	Unite to a new borehole with Madamiga	
	92	Ikhanoda	1156	3	Rehabili	B-1	2	10	Medium	Take enough interval	
Manyoni	98	Mipilo	3709	9	New	B-1	2	40	Large	Take enough interval and make monitoring	
	104	Mkola	327	1	New/Reha	C	10	35	Small		
	117	Unyamighum	2252	5	New	E-1	4	10	Medium	Take enough interval	
	126	Nhuntu	628	2	New	E-4	5	30	Small		
	1	Manyoni	3354	8	L-2	C-1	10	25	Large	Unite to a new borehole with Mubalala	
	2	Kipondoda	3659	9	L-2	C-1	35	1	Large	Unite to a new borehole	
	4	Mubalala	501	1	New S-P	B-1	60	7	Small		Deep SWL
	6	Mitoo	508	1	New	C-1	1	15	Small		
	9	Aghondi	415	1	New	C-3	10	30	Small		
	13	Idoyandole	1553	4	New	C-3	3	20	Medium	Take enough interval	
14	Mbungami	1489	3	New	C-3	2	20	Medium	Take enough interval		

District	Village		Required Service at 2001		Hydrogeological condition			Evaluation		Countermeasure	Remarks
	Cord	Name	Population	BH no.	Type	Unit	Yield	SWL	Grade		
	16	Itigi	5252	12	L-2	C-3	9	16	Large	Unite to a new borehole	Pilot village
	17	Doroto	797	2	L-2	C-4	1	30	Small		
	19	Sanjaranda	1537	4	New	C-3	5	15	Medium	Take enough interval	
	21	Kitopeni	955	2	New	C-3	20	2	Small		
	22	Ipande	691	2	New	C-4	1	30	Small		
	23	Muhanga	226	1	New	C-4	1	30	Small		
	24	Damwetu	815	2	New	C-4	2	23	Small		
	46	Nkonko	828	2	New	D-2	3	30	Small		
	52	Heke	1580	4	New	D-2	1	5	Medium	Take enough interval	
	54	Chikombo	2852	7	New	D-1	1	25	Large	Take enough interval and make monitoring	
	59	Sanza	1576	4	New	A-4	10	10	Small		
	63	Msemembo	1956	5	New	C-2	1	30	Medium	Take enough interval	
Igunga	8	Chomachank	3728	9	L-2	B-1	6	40	Large	Unite to a new borehole	
	11	Ziba	2364	5	New	A-1	2	20	Medium	Take enough interval	
	12	Ibologero	2404	6	New	A-1	2	3	Large	Take enough interval	
	39	Ussongo	1126	3	New	A-1	8	5	Small		

Grade : Small = Influence may be small because small number of new boreholes compared with Yield of existing borehole
Middle = influence will be avoided keeping adequate interval between existing and new boreholes.
Large = some influence is estimated because of requested number of borehole and hydrogeological condition therefore it's necessary to investigate hydrogeological conditions and to make monitoring of water level and quality

CHAPTER THREE: TARGET VILLAGES



CHAPTER THREE : TARGET VILLAGES

3.1 Institutional and Legislative Setups

3.1.1 General

The local government of Tanzania is administratively divided into regions, districts, divisions, wards and villages.

Focusing on the project area, its administrative compositions are as shown below:

Name of Regions	Arusha	Singida	Singida	Tabora
Name of Districts	Hanang	Singida Rural	Manyoni	Igunga
No. of Divisions	3	7	5	4
No. of Wards	21	26	21	26
No. of Villages	53	136	76	94

As the above table shows, the project area encompasses 3 regions and is composed of 4 districts. The total number of divisions, wards and villages in the 4 districts is 19, 94 and 359 respectively. Out of the 359 villages, 284 are the target villages.

3.1.2. Institutional and Legislative Aspects of Each Level of Administrative Units

(1) Regions

Tanzania consists of 25 regions. A region is composed of several districts. The total number of districts comes to 80.

The regional commissioner is the head of a regional government. He is the proper officer for district authorities situated within his region. He is therefore empowered to approve their annual budget.

(2) Districts

A district is governed by the district council. The district council is the highest authority under the Local Government (District Authorities) Act No. 7. It, in accordance with the provisions of Act 9 of 1982, is required to provide financial support to the village councils and township authorities established within the area of its jurisdiction.

The district council discharges the administrative and judicial functions of the suppression of crime, maintenance of peace and order, and the protection of public and private property.

At the same time, it is charged with the following responsibilities:

- a. the control and improvement of agriculture, trade, commerce and industry,
- b. the furtherance and enhancement of health, education, social, cultural and recreational life of people,
- c. the relief of poverty and distress, and assistance and amelioration of life for the young, aged and disabled, and
- d. the development, mobilisation and application of productive forces to combat poverty, disease and ignorance.

A district council must make decisions on all these varied functions. The provisions under Section 74 empower the council to establish 6 standing committees to handle the latter groups of responsibilities as shown in Figure 3.1.1.

Also, the minister responsible for local government approved the establishment of 7 departments under the district executive director as shown in the same figure. The district executive director is responsible to the district council in the execution of its decisions.

(3) Divisions

The division physically makes up the area of a district council. However, regional administration administers this unit.

Historically, when the African Chiefs Ordinance (Cap. 331) was repealed in 1963 and the position of the chief relinquished, the title of the chiefdom was replaced by that of a division.

(4) Wards

Physically wards make up a division. Administratively, however, they are under the district council.

In the Local Government Acts Nos. 7 and 8 provisions are made for the establishment in each ward of a ward committee to be responsible for the implementation of decisions and policies of the district council, and of development schemes which relate to the ward. (Refer to Figure 3.1.1)

(5) Villages

A ward consists of several villages. The village government is the smallest local government unit on mainland Tanzania. A village basically must have 250 households or more.

The main organs of the village government are the village assembly and the village council. The former is composed of all the adult members of the village, while the latter is composed of 25 representatives. The village council is the executive arm of the village assembly, and has been delegated with the powers to oversee the day-to-day activities in the village, and to make decisions on matters concerning the village on behalf of the village assembly.

The legal status acquired through registration by a village government binds it to observe and perform some basic functions in its area of jurisdiction. These functions include the maintenance of peace, order and good government, promotion of social welfare and economic well-being of its people, and the furtherance of social and economic development in its area.

Like the district council, a village government discharges its functions through its standing committees under the overall management of the village council. Thus any business requiring reference to the village council is first referred to the appropriate committee.

Each village government has the following three standing committees:

- a. Finance, economy and planning
- b. Defence and security
- c. Social services and self-reliance

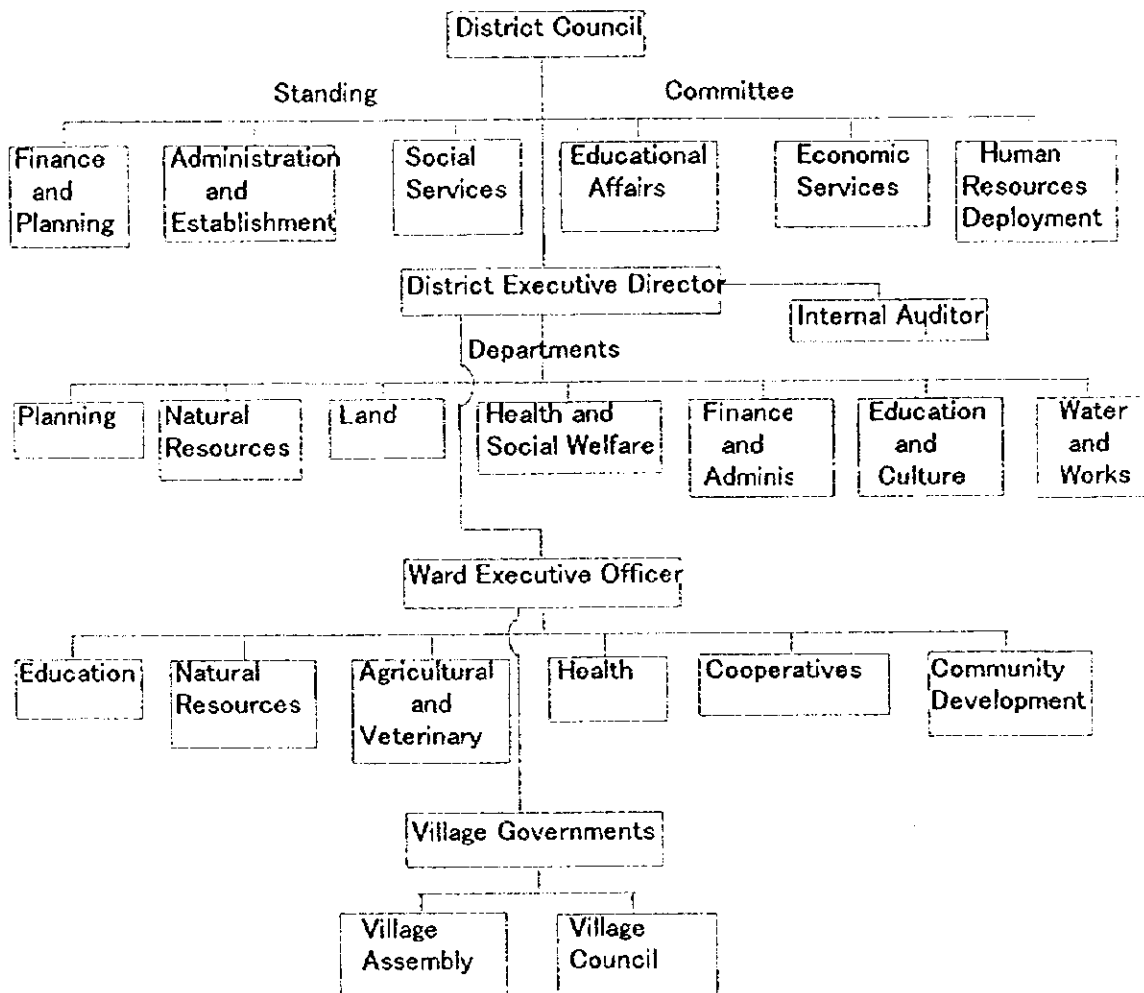


Figure 3.1.1 Organisational Set-Ups of Local Administrations

3.2 Inventories of Target Villages

With the purpose of collecting and analysing data and information which are deemed necessary for planning of rural water supply schemes, designing of water supply facilities and management of rural water supply projects, the village inventory surveys were conducted in the phase 2 study period covering the 284 target villages. The village inventory surveys consist of target village survey, sample household survey, hydrogeological survey, water quality survey, geophysical survey and inventory of existing water supply facilities.

In this chapter the salient outcomes of the target village survey and sample household survey are presented, whereas the results of other fields are given in the respective chapters.

3.2.1 Methodology

The Study team organised several survey teams so as to conduct the survey of the 284 target villages and 4,489 sample household survey within the given time schedule. The survey items for the village survey included general profiles of villages, village administrative setup, economic activities, gender division of labour, current water supplies, public health and health education and others. And for the sample household survey, it covered household information, current water supply, water supply required, health and sanitation, gender issues and willingness to pay for water.

(Motivation of Villagers)

Prior to the commencement of the inventory survey, motivation of villagers for the village survey and sample household survey was carried out by the District Water Engineers concerned and the Study team. The attendants included the village executive officers, the chairperson or secretary of the village water committee, teachers of the primary school, the chairpersons or secretaries of parents, women and youth organisations.

(Village Survey)

In most villages, attendants were the village chairpersons, the members of village councils, the members of village water committees, the village government officers, the teachers of primary schools, staff of dispensaries and the leaders of voluntary groups including women's organisations; in several villages, participants included the council members of districts, divisions and wards, health care assistants and extension workers for agriculture and livestock.

(Sample Household Survey)

The village convened a general meeting specifically for this exercise. On arrival at each village, the survey team comprising of the supervisor and assistant surveyors attended the village meeting, and then the chairperson invited the supervisor to explain the purpose of the sample household survey. The supervisor divided the villagers presented at the meeting into four groups, i.e. males aged 30 and above, females aged 30 and above, female youths aged below 20 and male youths of the same age. After conducting that exercise, the supervisor and assistant surveyors used the cluster sampling technique to determine the final samples for the whole villages to be interviewed.

3.2.2 Village Survey

(Population)

The total numbers of population of the 284 target villages was 692,538 as of 1996 according to the data provided by the district offices concerned. The population of the villages ranges from 410 persons at Kitanula village, Manyoni district to 8,258 persons at Iigi village, Manyoni district with the average of 2,439 persons per village.

Table 3.2.2-1(1) Population in 1996

District	Villages	Sub-villages	Population
Hanang	33	143	62,691
Singida Rural	129	729	339,791
Manyoni	72	287	147,358
Igunga	50	278	142,698
Total	284	1,437	692,538

(Village Water Committees and Village Water Funds)

The village survey has revealed that out of the 284 target villages 278 villages have organised a Village Water Committee (VWC) and similarly 241 villages have established a Village Water Fund (VWF). The villages do not have a VWC are those four villages in Singida Rural district and two villages in Igunga district; and those which do not have a VWF amount to 43 villages including two villages in Hanang district, eight villages in Singida Rural district, 10 villages in Manyoni district and 23 villages in Igunga district.

The total numbers of committee members of VWCs are 1,834 persons with an average of 6.6 persons per VWC; however, 49 VWCs have committee members of less than six persons. The seats of women members are less than half of the VWC members in 102 villages; eight villages in Hanang District, 66 villages in Singida Rural district, 14 villages in Manyoni district and 14 villages in Igunga district.

The total VWFs raised for village water supplies amount to Tsh 31,732 thousand, or equivalent to Tsh 132,000 per VWF ranging from Tsh 3,000 to Tsh 1,685 thousand.

(Public Health)

There are 191 of health facilities including hospitals, health centres, mother and child health clinics (MCHCs) and dispensaries as given below:

Table 3.2.2-1(2) Health Facilities

Facilities	Hanang	Singida (R)	Manyoni	Igunga	Total
Hospital	-	1	5	2	8
Health Centre	-	11	5	1	17
MCHC	6	39	28	13	86
Dispensary	5	37	27	11	80
Total	11	88	65	27	191

(Village Health Committees)

238 villages have organised a Village Health Committee (VHC). Activities of VHCs include:

- To oversee health activities in their respective villages.
- To ensure environmental sanitation.
- To ensure that underfives are weighed and vaccinated monthly for BCG, DPT, polio, measles and tetanus; and that expectant mothers and all child bearing-mothers are given the tetanus vaccine.
- To sensitise parents to fight malnutrition of their children.
- To serve as liaison between health workers and community members.
- To assist to sensitise the villagers on human cleanliness and water and environmental sanitation.
- To ensure that all people have pit-latrines in the villages and make use of them effectively.
- To sensitise community on vaccinations, environmental sanitation, building spacious houses with ventilation, using pit-latrines and drinking safe and clean water.

(Vaccination Campaigns)

Vaccination campaigns were carried out in 150 villages with health facilities mentioned above including two villages in Hanang district, 121 villages in Singida Rural district, 17 villages in Manyoni district and 10 villages in Igunga district. The vaccinations for the underfives are BCG and TB; and others are polio, measles, DPT and tetanus. Also, the tetanus vaccine is given to expectant mothers who visit the clinic.

(Hygiene Education)

There are 257 primary schools with a total enrolment of about 103,000 pupils. Hygiene education is not taught as an independent subject in the primary schools in the Study area. The elements of hygiene education are taught under the health subject for Standards - and under domestic science and science (nutrition) subject for Standards - in most of the primary schools. Teaching is done by applying theory in classes and by making demonstrations during practical

presentations. Due to shortage of demonstration materials, greater emphasis is placed on classroom teaching. At some primary schools, the pupils are taught when they visit the dispensary.

3.2.3 Sample Household Survey

A total of 4,489 respondents were interviewed using questionnaires: 540 samples in Hanang district, 2,119 samples in Singida Rural district, 940 samples in Manyoni district and 890 samples in Igunga district.

(Current Water Supply)

The results of survey centring on water fetching and per capita water consumption are given as follows:

The average distance from the houses to the water sources is the longest in Hanang district with 4.3 km, being followed by 3.8 km in Igunga district, 2.9 km in Singida Rural district and 2.4 km in Manyoni district.

The average time taken for water fetching at a time is the longest in Hanang district with 2.8 hours, being followed by 2.0 hours in Igunga district, 1.7 hours in Singida Rural district and 1.4 hours in Manyoni district.

The average number of persons per household who join in water fetching at a time is the largest in Manyoni district with 2.5 persons, being followed by 2.4 persons in Singida Rural district, 2.3 persons in Hanang district and 2.2 persons in Igunga district. There is a tendency that the longer the distance is, the fewer the number of persons to fetch water becomes; however, there is not much difference in the number of persons to fetch water among the districts.

The average frequency of water fetching per day is the highest in Manyoni district and Igunga district with 2.5 times, being followed by 2.4 times in Singida Rural district and 2.1 times in Hanang district.

The average volume of water fetched a day per household is the greatest in Igunga district with 4.2 bucketfuls (84.0 lit.), being followed by 4.1 bucketfuls (82.0 lit.) in Singida Rural and Manyoni districts and 4.0 bucketfuls (80.0 lit.) in Hanang district. There is not much different in the average volume of water fetched among the districts.

Per capita per day water consumption is obtained by dividing the above-mentioned volume of water by the average household sizes of 5.9 persons in Igunga district, 5.8 persons in Singida Rural district, 5.7 persons in Manyoni district and 5.6 persons in Hanang district. The water consumption rates in terms of litre per capita per day (lcd) are 14.5 lcd in Manyoni district, 14.3 lcd in Hanang district and 14.1 lcd in Singida Rural and Igunga districts.

The situation of current water supplies in the Study area is given as the weighted average of the four districts as follows:

- Distance to water sources : 3.1 km
- Time for water fetching : 1.8 hours
- Number of persons for water fetching : 2.4 persons
- Daily frequency : 2.4 times
- Volume of water fetched per day : 4.1 bucketful
- Water consumption rate : 12.0 lcd

(Willingness to Pay for Water)

The interviewees have responded to the question "How much will you pay for water if water for domestic use with good quality is provided throughout the year?" The average value of willingness to pay for water in terms of Tsh per bucketful is the highest in Singida Rural district with Tsh 96.4 (Tsh 4.8/lit.), being followed by Tsh 72.7 (Tsh 3.6/lit.) in Hanang district, Tsh 71.9 (Tsh 3.6/lit.) in Manyoni district and Tsh 61.1 (Tsh 3.1/lit.) in Igunga district. The weighted average is Tsh 81.5 (Tsh 4.1/lit.) for the whole Study area.

(Common Diseases)

The common diseases in the Study area are presented in their degree of severity from above: malaria, diarrhoea, typhoid, skin disease, worms infestation, dysentery, amoebiasis, cholera, bilharzia and hepatitis. The incidences of the top five diseases are 81% for malaria, 56% for diarrhoea, 45% for typhoid, 31% for skin diseases and 30% for worms infestation. The above-mentioned diseases are in one way or another connected with water provision; and such there is a need to intensify community efforts to sensitise villagers about the need to use clean and safe water.

3.2.4 Household Economy

(1) Economic Activity

General information on household economy is obtained from the results of sample household survey covering 4,489 samples. The Study team conducted surveys of 84 households in the pilot villages by means of interviews with villagers in order to supplement the results of the sample household survey. Detailed statistical data on villagers' economy were available with the district offices.

In the Study area, households usually engage in two or more kinds of economic activities. Questions about their annual income by sources were put to villagers allowing multiple answers. The surveys show that a majority of households engage in livestock raising and commerce along with growing of crops. Major commercial activities of villagers include the making and selling of local brews, bakeries and handicrafts, grain milling and oil processing. The percentage of households by their economic activities are given below:

Economic Activity	Percentage of Households
Growing of Crops	100
Livestock Raising	78
Commerce	33
Others	11

(2) Annual Household Income

According to the above-mentioned surveys, the average annual household income worked out to Tsh 410,276 (\$ 449), or equivalent to 83% of the national average annual household income in rural area of Tsh 494,448 (\$ 791) in 1996. In the calculation, home consumption is included, as the amount of agricultural products consumed by the households is theoretically a part of household income.

Income Sources	Annual Income (Tsh)	Percentage
Selling of Crops	115,105	28.0
Selling of Livestock	71,274	17.4
Commerce	49,264	12.0
Wages and others	44,629	10.9
Home consumption	130,004	31.7
Total	410,276	100.0

The average annual household income on the district basis are Tsh 531,786 in Igunga district, Tsh 423,945 in Singida Rural district, Tsh 317,752 in Hanang district and Tsh 315,815 in

Manyoni district with the weighted average of Tsh 410,276 for the whole Study area as explained above.

The median of the household income is Tsh 245,000; namely, the annual income of the 50% households is lower or higher than Tsh 245,000. Annual income of 77% of the total households is lower than the average annual income of Tsh 410,276. The households are classified into five equal number of household groups regarding their annual income, namely lowest 20% group, second 20% group, third 20% group, fourth 20% group and upper 20% group. The average annual income of the groups is as follow:

Income Group		Average Annual Income	
Lowest	20%	Tsh	145,000
Second	20%	Tsh	215,000
Third	20%	Tsh	280,000
Fourth	20%	Tsh	460,000
Upper	20%	Tsh	1,000,000

3.3 Village Type

Among many parameters that represent the socio-economic situation of the target villages, four parameters, which can be quantitatively evaluated, have been selected in order to provide the representative indexes of the characteristics of individual target villages. They include: village population, average annual household income, number of livestock and current water service coverage.

(Village Population)

The village population in 1996 ranges from 8,258 persons at Higi village in Manyoni district to 410 persons at Kitanula village in Manyoni district with the average of 2,439 persons per village. The village population of 284 target villages was classified into four equal number of village groups, namely A (3,000 population and over), B (2,200 to 2,999 population), C (1,600 to 2,199 population) and D (410 to 1,599 population) in the order of high to low. The distribution of village population is given below:

Table 3.3.1(I) Village Population

District	A	B	C	D	Total
Hanang	5	5	10	13	33
Singida Rural	42	36	32	19	129
Manyoni	7	15	18	32	72
Igunga	17	15	11	7	50
Total	71	71	71	71	284

(Annual Household Income)

Information on annual income of villagers are gathered through the sample household survey and pilot village survey, based on which the average annual household income is estimated on the village basis. The average annual household income on the district basis is worked out at: Tsh 318,000 for Hanang district, Tsh 424, 000 for Singida Rural district, Tsh 316,000 for Manyoni district and Tsh 532,000 for Igunga district.

The annual household income groups are classified into four equal number of village groups, namely A (Tsh 410,000 and over), B (Tsh 308,000 to 409,000), C (Tsh 205,000 to 307,000) and D (less than Tsh 205,000) in the sequence of A to D in the order of high to low income. The distribution of household income groups is as follow:

Table 3.3.1(2) Annual Household Income

District	A	B	C	D	Total
Hanang	4	8	12	9	33
Singida Rural	45	36	27	21	129
Manyoni	13	10	15	34	72
Igunga	9	17	17	7	50
Total	71	71	71	71	284

(Livestock)

Livestock raising is a major economic activity in the Study area. About 80% of households are engaging in livestock keeping and selling of products. The survey of livestock was made through the village inventory survey. The number of cattle, goats and sheep is converted into the livestock units as defined that one livestock unit is equivalent to one head of cattle, or five goats, or five sheep. Then the livestock units are divided by the village population to estimate the number of livestock per capita of the village concerned.

The livestock unit groups are classified into four equal number of village groups, namely A (1.36 unit and over), B (0.80 to 1.35 unit), C (0.55 to 0.79 unit) and D (less than 0.54 unit) as given below:

Table 3.3.1(3) Livestock Unit

District	A	B	C	D	Total
Hanang	17	6	6	4	33
Singida Rural	19	36	37	37	129
Manyoni	26	11	12	23	72
Igunga	9	18	16	7	50
Total	71	71	71	71	284

(Current Water Supply)

The village inventory survey included data collection and analysis of the situation of current water supplies such as number and types of water sources, types of pumps, delivery systems, causes of interruption of water supplies and so on. Available water sources are boreholes, shallow wells, dams and charco. The water yields of these water sources were estimated to obtain present service populations as presented in 4.4 Inventory of Existing Water Facilities of this chapter.

The service population per village is converted into service coverage in terms of percentage by dividing the number of people served by the total village population. As a result, it is known that service coverage of 54 villages is 100% and 0% for 94 villages. The people of 94 villages are fetching water from dug wells and other temporary water sources.

The service coverage groups are classified into four village groups, namely A (100% coverage), B (50% to 99% coverage), C (10% to 49% coverage) and D (0% coverage). Distribution of villages is given below:

Table 3.3.1(4) Service Coverage

District	A	B	C	D	Total
Hanang	-	2	2	29	33
Singida Rural	35	28	28	38	129
Manyoni	14	11	20	27	72
Igunga	5	27	18	-	50
Total	54	68	68	94	284

3.4 Gender Issues and WID

3.4.1 Situation of Women

In the Study area, women have to take responsibilities for most of work in agriculture and for all household activities. Despite women's heavy responsibilities, their participation in decision making at all levels is still very limited.

The main occupation of the people in the Study area is agriculture, both crop production and livestock rearing. Taking the Hadzabe for instance, who depend on solely on hunting and gathering men do the former, the gathering is shared. The Barbaig on the other hand, who also depend solely on livestock keeping, it is women who construct the temporary huts, look after

cattle/calves, do milking and look after children while men are responsible for increasing the herd.

For the rest of tribes residing in the Study area, the case is different. Being mostly farmers, the division of labour between men and women is quite unequal.

Overall picture connotes the facts that women in most of the villages have been deprived of their basic human rights. The majority of women are poor, who are being exploited as agricultural producers involved in food and cash crop production. Women do all household activities, and they do not have any access and control over resources. They are not even involved fully in decision making structures at different levels of the society.

3.4.2 Daily Activities

In the Study area, it is women who provide welfare needs to their families, on top of which they have responsibilities for the care, informal education and up-bringing of children. The daily activities carried out by women are much more similar from one village to another. Most of women interviewed have argued that they work for almost 15 to 16 hours every day. The daily activities done by most women, among others, include fetching of water for domestic use.

According to the results of the sample household survey, about 50% of households could not differentiate the roles performed within the households; however, the fact remains that women have the overall responsibilities of collecting water for home use. Taking Singida Rural district as an example, of those 772 households that were able to differentiate the roles within the household, 685 households (or, 76%) argued that water fetching for domestic use is the responsibilities of women.

In addition to water collection, daily activities by women include cleanliness of the home and its environment, cooking of food for family, washing of clothes, dishes and others, care of children, collection of cow dung, processing of milk products and selling of milk, and looking after calves.

The gender division of labour in most of the villages overloads women with many activities as compared to men, denying women's time for leisure at all, as enjoyed by men. According to the village inventory survey, the major activities done by men in all districts are farming and livestock grazing.

3.4.3 Women in Agriculture

Women in the Study area, as it is the case in many parts of the country, are the main producers of agricultural products. There are agricultural roles which are specific to each sex and those which are shared. Agricultural roles specific to women are farm preparation, cutting of crop remnants, sowing, spreading of farmyard manure in the farms, looking after birds, separation of the produce and husks, transportation, storing and preservation of the produce. The shared ones are cultivating, weeding, harvesting and threshing.

Most of women in the Study area are smallholder agricultural producers and face additional constraints which men do not. These constraints include: limited assistance from their husbands, time constraints because of heavy demands of house work and child care, limited access to extension advice for raising yields, limited money to invest in improved inputs due to lack of access to credit, greater demands on cash for household expenses, and fewer opportunities and less time for other income generating activities.

3.4.4 Income Generating Activities

In the Study area, the sample household survey revealed that a very small portion of women are members of women groups: 10.4% in Manyoni district, 17.6% in Hanang district and 25.7% in Singida Rural district. Most of women are not aware of the idea of forming or joining women organisations and/or groups: 68.3% in Manyoni district, 73.7% in Hanang district and 60.2% in Singida Rural district. Very few women had not joined women groups because of their husband refusal to give permission: 0.1% in Manyoni district, 1.7% in Hanang district and 0.2% in Singida Rural district.

The majority of women interviewed indicated that among the major constraints they face as regards their income generating activities include lack of capital; lack of raw materials; lack of market information; and lack of the necessary skills to effectively run their projects. The sample household survey, however, showed that most of women interviewed are not aware of any training programmes to be provided to women groups on how to run income generating activities: 67.7% in Manyoni district, 70.1% in Hanang district and 59.8% in Singida Rural district.

3.4.5 Access and Control over Resources

Women in all villages do not have access and control over available resources. As a result, women can not carry out production activities effectively. Land, for example, which is a major and most valuable resource in the rural areas, is being owned by men. The responses to the question that who control the income from sales of farm products between men and women or both gave the highest score of 43.6% (both) in Singida Rural district, 55.5% (both) in Manyoni district and 48.9% (both) in Hanang district according to the results of the sample household survey. The basic fact, however, is that when farm products are sold, it is men who have control over cash money obtained.

In pastoralist communities, it is men who have control and the say on the animals, including decision on when and how many to be sold. Women are not involved in such decision at all.

3.4.6 Participation in Decision Making Structure

Women in the Study area are not equally represented like men in the decision making structures at different levels. As a result, women development needs are not fully addressed when various decisions are being made. The sample household survey revealed that very few women have ever participated in village meetings: 33.

6% in Manyoni district, 33.0% in Singida Rural district and 25.8% in Hanang district. Although the Government has issued various policy directives to ensure increased participation of women in decision making, but the number of women involved is still very small.

3.5 Pilot Study

3.5.1 Objectives of the Pilot Study

In accordance with the Minutes of Meetings on the Scope of the Work agreed upon between the Ministry of Water and JICA on November 8, 1996, the pilot study has been implemented with the following objectives:

(i) **Geophysical Exploration and Test Drilling**

In order to confirm the groundwater potential, geophysical exploration and test drilling will be conducted at selected two sites in three districts of Singida Rural, Manyoni and Igunga and four sites in Hanang district. As the geological configuration is more

complicated in Hanang district compared to other districts, four test drillings will be carried out in Hanang district.

(ii) Production Wells

If these test wells are proved to yield sufficient amount of water, adequate types of water facilities will be installed to convert them into production wells.

(iii) Rehabilitation Works

Rehabilitation works of certain water supply facilities at selected sites will be carried out to scrutinise the availability of these types of facilities to the present natural and socio-economic situation of the villages.

(iv) Mobilisation of Villagers

When sufficient amount of water for installing facilities is assured, mobilisation of beneficiaries be realised through various training for members of village water committees, etc.

3.5.2 Types of Proposed Water Supply Facilities and Service Level

For the purpose of the Study, proposed water sources include boreholes (BH) and dug wells. Four types of water supply facilities are applied to the pilot projects as agreed upon by the Project Working Committee and the Study team. Outlines of the four types of water supply facilities and their service levels are as follows:

- New construction of Borehole with a handpump L-1 service level
- New construction of Borehole with an engine-pump
and a simple distribution system L-2 service level
- Rehabilitation of water supply facilities with L-1 service level
- Rehabilitation of water supply facilities with L-2 service level

3.5.3 Pilot Villages

(1) Selection of Pilot Villages

(Preliminary Selection)

General information of the target villages was available from the village reports prepared by the district offices concerned. Among many villages that are confronted by water problems, 29

villages were selected for consideration: 10 villages in Hanang district, six villages in Singida Rural district, six villages in Manyoni district and seven villages in Igunga district. In the selection, considerations were given to geographical distribution of villages, types of existing water sources and facilities and levels of current water supply services.

(Survey Method)

A survey team was organised for selection of pilot villages among the 29 villages above. The survey team was composed of the members of JICA Study team, counterpart personnel and officials from the district offices.

On arrival of the survey team, meetings with leaderships of the village were held for explanation of the purposes of the survey and hearing of general conditions on water problems the villagers are facing. In most villages, the attendants were village chairpersons, members of village councils, village government officers, members of village water committees, teachers of primary schools, staff of dispensaries and leaders of voluntary groups. The survey team used two survey methods, i.e. questionnaires and site observation with the purpose of compiling the socio-economic and technical information.

The questionnaires were administered by experts in the fields of operation and maintenance of water schemes, health and environmental sanitation, gender issues and women in development. The questionnaires focused on village executive officers, chairpersons of women organisations, secretaries of village water committees, representatives of youth groups, headmasters of primary schools, rural medical aids and medical assistants in charge of public dispensaries and health centres.

The site visits and observation guides to the water sources and water facilities were carried out by a group of experts in the fields of groundwater, hydrogeology, water quality and water supply facilities, being accompanied by the members of village water committees and village leaders concerned with rural water supplies. Using check lists, observation was made covering availability of water sources, quality of water, working conditions of engineering structures and causes for failure of water supply facilities and so on.

(Selection of 13 Pilot Villages)

Careful selection of villages where pilot projects are to be implemented has been made. All villages for new construction of water supply facilities should have development potentiality of groundwater within certain distances from their village centres. Another consideration was given to community interest and involvement, an important factor for planning and management

of rural water supply projects. Villages should have a functional village water committee capable of dealing with operation and maintenance of project facilities and management of water supply projects including collection of water fee from villagers.

In accordance with the agreements made by between the Project Working Committee and the JICA Study team, following 13 villages have been warranted for the implementation of the pilot study:

Table 3.3.1(5) Pilot Villages and Construction Works

District	Village	Population	Types of Works and Service Level
Hanang	Bassodesh	1,992	New construction : BH, L-1
	Ishponga	1,494	New construction : BH, L-1
	Mara	1,976	New construction : BH, L-1
	Maskaroda	2,504	New construction : BH, L-1
Singida Rural	Choda	1,325	New construction : BH, L-1
	Nkuhi	2,199	New construction : BH, L-2
	Mang'onyi	2,102	Rehabilitation : BH, L-2
Manyoni	Doroto	1,410	Rehabilitation : BH, L-2
	Chikola	2,152	New construction : BH, L-2
	Mpapa	1,837	New construction : BH, L-1
Igunga	Ndembezi	5,293	Rehabilitation : BH, L-1
	Igurubi	4,425	New construction : BH, L-2
	Nguriti	4,689	New construction : BH, L-1

3.5.4 Participatory Rural Appraisal

(1) General

In order to inform the villagers of the proposed pilot study and implementation procedures of the study, as well as to elaborate on their responsibilities as regards the pilot study and hence get feedback on their preparedness and willingness actively to participate in the study, Participatory Rural Appraisal (PRA) has been carried out at the 13 pilot villages. PRA is an important exercise within the overall study as it leads, to a great extent, to a "sustainable consumer-driven programme based on self-reliance" rather than on a programme that wholly depends on external assistance.

During PRA the villagers were able to collect data, analyse it, identify their problems and prepare their action plans for resolving the identified problems. The philosophy behind this exercise is action by the end-users. Whatever is to be done, should be thought of and decided upon by the villagers themselves, as the programme/project is theirs. The villagers as end-users are made aware of the fact that they will own the facilities and thus they will take full responsibilities for the management, financing and operation and maintenance of the facilities after completion of water supply facilities.

PRA was conducted by well-experienced facilitators who were recruited by the Study team. One district community development officer joined the PRA at the respective district. The overall exercise was supervised by the Study team.

(2) Objective of PRA

PRA at the pilot villages was carried out so as to fulfil the following objectives:

- To create awareness of the villagers regarding the proposed study on groundwater development so as to achieve active community participation in planning, implementation and management of their water projects.
- To create awareness and mobilise the villagers to look at their own resources and development needs, come up with priorities, and prepare their own action plans to tackle these needs.
- To create awareness and mobilise the villagers of the importance of active participation by women just like men in decision-making, planning and implementation of the projects.

(3) Methodology

PRA is a combination of semi-structured tools, techniques and activities, used to create awareness and mobilise the villagers. Different tools and techniques were used as given below:

- Semi-structured interviews to obtain community level information. These interviews included focus group discussions, key informant interviews, household interviews and individual interviews.
- Direct observations mainly used to cross check findings and to generate on-the-spot questions and information.
- Ranking used to help identify the main problems of the villagers, their preferences and ranking criteria.

- Review meetings used by PRA facilitators to sort out all the information collected, and compare notes among themselves to avoid inconsistent information or gaps.

The target groups were the villagers themselves including members of the village governments, village water committees, village health committees, sub-village leaders, religious institution leaders, individual villagers, groups of women, influential people, youth, and even children.

(4) Overall Findings

By conducting PRA, it has been possible to enlarge the portion of the community involvement in planning of the rural water scheme. PRA has revealed the fact that in all the 13 pilot villages, water is a major problem and it affects the overall socio-economic development of the villagers. Women are the most affected group as far as water problems are concerned as they have overall responsibilities of providing water for domestic use at their houses.

Although the villagers are eager to develop their village water schemes, very few are aware of their responsibilities as regards planning, implementation and management of their own village water projects, hence awareness raising on the importance of community management on self-help basis is to be emphasised. Effective implementation of rural water supply schemes is very much dependent on good and strong local leadership.

Giving the wideness of most of the villages to be involved, it was assumed that the water facilities would be spread over the villages. For this reason, it is important for effective management of a village water supply scheme to scale down to the lowest level as possible. In organising the beneficiaries, the focus should be on water users' groups probably at a sub-village level.

Most of villagers keep livestock. Almost 90% of the villagers were very much concerned about water for their livestock.

During PRA it was evident that the use of household latrines is not a common habit. Most of the villagers do not have and hence do not use latrines. This speeds up the spread of diseases such as diarrhoea, besides polluting the environment.

Gender awareness in all the pilot villages needs to be promoted as it appeared to be lagging behind. Gender awareness could be more related to water and sanitation activities. Women and men can participate, if well educated, in very specific planning and management activities.

3.5.5 Training and Sensitisation of Villagers

(1) Preparation of Education Materials

Regular training and sensitisation of the villagers are prerequisite for successful management of the rural water supply projects on a continuous basis. In order to enable the villagers effectively manage their water schemes and to generate the benefits from improving the quality and quantity of village water supplies, draft training materials were prepared for use at the pilot villages, then training materials have been revised for use at the target villages after consideration of the results of the trials.

The training materials contain three major subjects related to rural water supplies: health and environmental sanitation; management of the rural water supply projects; and gender awareness.

(Health and Environmental Sanitation)

The most important benefit is an improvement in public health. The provision of safe water is of prime importance to public health and, in combination with other sanitary measures, is an essential prerequisite to eradicating many endemic diseases. The village leaders and especially the members of village health committees need to be educated on how to prevent the villagers from the spread of contagious diseases including:

- dissemination of proper hygiene knowledge on the linkage between water, environmental sanitation and health; and enhancement of the important role in the empowerment of individual user, household and community for self-reliance in the operation and maintenance of water and sanitary facilities, and
- encouragement of individuals to adopt hygiene sense and habit as well as other measures regards health and nourishment.

(Management of Water Scheme)

Depending on their specific roles and responsibilities, it is of at most importance that the members of village water committees and water users' groups be strengthened through training on:

- awareness of roles and responsibilities,
- communication to village governments and other committees,
- water scheme management including financial aspects,
- operation and maintenance of water supply facilities, and
- team work and participation of the villagers.

(Gender Issues)

Women are the principal beneficiaries of the rural water supply projects. Given the fact that for a quite long time women have not enjoyed equal opportunities like men in life thus resulting in poor status of women, special training for women are important. Such as:

- competence building,
- economic empowerment i.e. effective identification, planning and implementation of income generating activities,
- family planning, and
- legal rights.

(2) Outlines of the Programme

(a) Task Forces

Two teams of task forces were organised by the JICA Study team to conduct the training and sensitisation programme at the pilot villages. Each team consisted of three facilitators qualified in the field of health and environmental sanitation; management of the rural water supply projects; and gender issues. The programme was implemented in January, 1998 at nine pilot villages. Out of 13 pilot villages, four pilot villages were excluded from the programme; test boreholes were dry at two villages of Ishponga and Nguriti; and two villages of Ndembezi and Igurubi were not accessible during the survey period due to heavy rainfall and road communication breakdown. District officers concerned were invited to join in the programme.

(b) Objectives

It was expected that by the end of the training session participants will:

- have gained sufficient knowledge, skills and information to improve their effectiveness and efficiency in managing their water project,
- have learned participatory methodologies so as to enable them to increase the participation of their fellow villagers in identification, planning, implementation, monitoring and evaluation of their development projects, including the pilot water project,
- have understood the concept of gender and the relationship of gender and development, and thus being in a position to sensitise other villagers on gender issues.
- have learned better health and sanitation practices to educate their fellow villagers with the aim of raising their health status.

(c) Participants

Participants included the representatives of village governments, members of village water committees, village health committees, water users, women representatives, religion leaders and some ward leaders. The numbers of participants range from 28 persons at Chikola and Mpapa villages to 56 persons at Bassodesh village with the average of 37 persons per village.

(d) Methodology

Participatory methodologies were used in conducting the training programme with a view of enabling the participants to apply their own experiences and knowledge in discussing different subjects presented. Methodologies used included role plays, story-telling, group work and plenary discussions. Application of these participatory training methods proved to be efficient as it creates quick and better understanding of subjects discussed by the participants.

(e) Lesson

Lessons learnt from the implementation of the programme are as follows:

(i) The importance of being self reliant:

The participants noted that it is important for all villagers to unite in trying to solve their own water problems using their own locally available resources. They must show their own initiatives, before donors come-in to assist their efforts. Donor assistance should be appreciated, but should be seen as a catalyst to the whole process.

(ii) Cooperation between different actors:

The participants noted that in order to succeed in any development endeavour cooperation between different actors is imperative i.e. villagers, local governments, district councils, NGOs, religious organisations etc.

(iii) On latrines the following were noted:

- Most of latrines constructed are not permanent.
- A good and permanent latrine can be constructed using simple, locally available resources.
- Poor and outdated traditional beliefs regarding the use of latrines do exist. These need to be abolished immediately.
- Villagers are not well educated on the importance of using latrine.

(iv) Factors affecting effective community participation:

- Problems of water, consuming most of villagers' day's time.
- Poor leadership.
- Low level of education of leaders and villagers.
- Most of husbands are denying their wives opportunities to participate in development activities because of outdated customs and beliefs.

(v) Village water fund (VWF)

The following is noted as regards VWF:

- Sufficient funds are necessary for management of the pilot water projects, at all times.
- Water funds should only be used for water project activities and not for any other use. Stern measures should be taken against person(s) to be involved in misuse of these funds.
- Many villagers have not paid the required water fee over a long period of time as there is no properly established systems of collecting water funds. If followed properly, the amount of money in the VWFs will increase considerably.

(vi) Water fees:

The participants noted that villagers do not fear to pay water fees. What is important is to educate them the importance of such funds as regards operation and maintenance of their water projects, and giving them transparent financial reports from time to time.

(vii) Gender division of labour:

In all the villages, it was observed that gender division of labour has overburdened women with many jobs.

3.5.6 Monitoring

Monitoring and evaluation of the pilot projects were conducted in February 1998 by the monitoring teams organised by the JICA Study team. The intentions of monitoring are to improve the efficiency of the pilot projects and to contribute more effectively to formulation of development proposals for the Study through generalising findings from the pilot project villages to other target village in the Study area.

The team prepared two formats; Form A which was administered to the village government officials and other related officials such as village chairpersons, village executive officers,

chairpersons of the village water committees, secretaries or treasurers of the village water committees, chairpersons of the village health committees, officers-in-charge of village dispensary or health centre, chairpersons of education/social affairs/community development committees, headteachers of village primary schools, women representatives, and representatives of youths.

On the first day, the meeting was officially opened by the village chairman; and then the chief of the team described the procedure to be followed by the villagers in order to secure the number required for interviews as well as visits to households and public facilities. After interviews, visits to households/public facilities and group discussions, the villagers were reconvened in a plenary session to receive briefings as regards interviews, visits and group discussions

On the second day, the sessions began to review what had transpired on the previous day. Then participants had another plenary session to discuss and make suggestions for improvement.

3.6 Economy and Finance

3.6.1 Socio-economic Conditions

(1) Hanang District

(a) Land Use

This district, which is one of the 10 districts under the Arusha region, has an area of 3,463 km² or 346,300 ha. It is the smallest among the 4 districts concerned. The area by land use is as shown below.

Land Use	Area (km ²)	Composition (%)
Wooden bushland & bushed grassland	297,082	86.4
Cultivated land	41,500	12.1
Lakes and swamps	5,018	1.5
Total	346,300	100

As the above table shows, the wooden bushland and the cultivated land combinedly occupy 86.4% of the district area, while the cultivated land accounts for 12.1% of it only.

(b) Administrative Units

The district has 3 divisions, 21 wards and 53 villages as shown below.

(c) Population

The population is estimated at 147,513 as of 1996. It is the smallest among the 4 districts concerned. It grew at the average annual rate of 3.73% during 18 years from 1978 to 1996. This growth rate is the highest among the 4 districts concerned. Supposing the average household size is 6, the number of households is calculated at 24,586 in 1996.

Year	Population	Average annual growth rate (%)
1978 (Census)	76,297	-
1988 (Census)	113,270	4.03
1996 (Estimates)	147,513	3.36

Major tribes are Barbaig and Iraqw. There are other minor tribes such as Warangi, Chaggas, Sukuma, Nyaturu and Nyiramba.

(d) Economy

Major economic activities in the district are crop farming and animal husbandry. There are also fishing, beekeeping, tourism, mining, industry and commerce.

- Agriculture

(Agricultural production in 1996)

Crops	Planted area (ha)	Production (tonnes)
A. Food crops		
1. Maize	32,286.0	58,114.0
2. Millet	4,809.0	5,770.0
3. Sorghum	94.0	75.2
4. Others	51,237.0	74,051.4
Sub-total	88,426.0	138,010.6
B. Cash crops		
1. Sunflower	1,007.0	1,208.0
2. Groundnut	68.2	68.2
3. Onions	1.2	1.0
4. Others	383.1	4,075.4
Sub-total	1,459.5	5,352.6
Total	89,885.5	143,363.2

Major food crops are maize, millet, beans, wheat, and peas. Sunflower is the No. 1 cash crop. The total planted area and production came to 89,885.5 ha and 143,363.2 tonnes respectively in 1996. Yields comes to 1.6 tonne/ha. The planted area and production per household is estimated at 3.7 ha and 5.8 tonnes respectively in 1996, both of which are very high.

- Animal husbandry

The district has 266,700 cattle, 49,000 sheep, 114,266 goats, 56,330 chickens and 900 donkeys. A household is estimated to have on average 10.8 cattle, 2.0 sheep, 4.6 goats, 2.3 chickens and 0.04 donkeys.

(e) **Social Services**

- Education

There are 54 primary schools in the district. It means 1 school per 2,098 people. There are 5,794 children eligible for standard I (7-13 years) enrolment, out of which 4,346 children or 75% are enrolled. The enrolment ratio is high. Literacy rate was 33% in 1993, which is low.

- Water

The district serves piped water to 32% of the population. The groundwater is the main water source. The villages with water committees and water funds comprise 100.0% and 54.7% of the total villages respectively. Village people's awareness regarding water supply seems to be on the high side. There is one functional water supply facility per every 2,045 population served.

Item	Quantity
Total population (1996)	147,513
Population served	47,030
Service ratio	32%
No. of village water committees	53
No. of village water funds	29
Total amount of water funds	Tsh7,595,862
No. of motor pumped boreholes	3
No. of hand pumped wells	10
No. of gravity schemes	5
No. of dams	5

- Health

(Top 10 diseases in 1996)

Diseases	No. of cases
1. Malaria	33,644
2. URTI	19,761
3. Diarrhoea	12,305
4. Pneumonia	17,208
5. Intestinal worms	5,710
6. Eye infections	8,072
7. Ear infections	3,976
8. Skin infections	14,219
9. Fungal infections	12,870
10. Urethral discharges	2,238
Total	130,003

23% and 13% of the population suffer from malaria and diarrhoea respectively, adding up to 36% every year. 88 persons out of 100 suffer from some disease or another in a year. The incidence of diseases is high in this district. There is no hospital, but there are 1 health centre and 15 dispensaries. The population per health facility comes to (100,000) for the hospital, 147,513 (50,000) for the health centre and 9,834 (10,000) for the dispensary. The national targets are shown in brackets. The level of the provision of health facilities is low. The regional average of infantile mortality rate, under 5 mortality rate and maternal mortality rate were 52/1,000 (96/1,000), 78/1,000 (158/1,000) and 114/100,000 (197/10,000) respectively in 1995. The national averages are shown in brackets.

(f) Non-Governmental Organisations (NGO's)

The district has 5 NGO's, namely Bulgalda Sustainable Development Organisation, Disabled and Orphans Hope Centre (DOHOCE), Hanang Women Counselling and Development Association (HAWOCODA), KIPOC HANANG BRANCH (or KIPOC Barbaig) and Hanang Education Trust Fund (HET). Mention is made below for the first 3 organisations.

- Bulgalda Sustainable Development Organisation

It is located in Katesh, Hanang district. The objective of the project is community development. The period of the project is 1994 to 1997. Major activities are those for human rights, education for primary and secondary schools and health education for women and children.

- DOHOCE

It is located in Katesh, Hanang district. The objective of the current project is capacity building and support to the target groups, that is, disabled, orphans, abandoned girls, street children, widows, etc. The period of the project is June, 1996 to 1997. 8 villages are served. Major activities are to raise awareness and mass mobilisation towards recognition of the status of disabled and other socially displaced people by the community for their subsistence and sustainability, to educate and support target groups in self-reliance including income generating activities and to offer counselling and home based care.

- HAWOCODA

It is located in Katesh, Hanang district. The period of the project is 1993 to 1997. All the villages in the district are served. Major activities are those for human rights for women, primary and adult education to illiterate agro-pastoral and urban women and primary health education for both sexes at grassroot level.

(2) Singida Rural District

(a) Land Use

This district, which is one of the 3 districts under the Singida region, has an area of 12,037 km² or 1,203,700 ha. The area by land use is as shown below.

Land Use	Area (ha)	Composition (%)
Arable land	528,220	43.9
Grazing land	373,720	31.0
Forest and bush land	220,000	18.3
Water area	5,000	0.4
Others	76,760	6.4
Total	1,203,700	100.0

As the above table shows, the arable and grazing land accounts for 43.9% and 31.0% of the total area respectively, summing up to 74.9%. Out of 528 km² of arable land, 118 km² or 9.8% of the total area is under cultivation.

(b) Administrative Units

The district has 7 divisions, 26 wards and 136 villages as shown below.

Division	No. of wards	No. of villages
Ikungi	4	20
Ihanja	4	18
Sepuka	4	14
Mtinko	3	24
Ilongero	5	31
Mgori	2	10
Mungaa	4	19
Total	26	136

(c) Population

The population is estimated at 351,798 as of 1995. It is the largest among the 4 districts concerned. It grew at the average annual rate of 2.9% over the past 28 years. Supposing the number of members per household is 6, the number of households is calculated at 58,633 for 1995.

Year	Population	Average annual growth rate (%)
1967 (Census)	159,398	-
1978 (Census)	213,732	2.7
1988 (Census)	285,092	2.9
1995 (Estimates)	351,798	3.0

(d) Economy

Major economic activities in the district are crop farming and animal husbandry. There are also lumbering, fishing, beekeeping, tourism, industry and mining.

- Agriculture

(Agricultural production in 1995/96)

Crops	Planted area (ha)	Production (tonnes)
A. Food crops		
1. Sorghum	29,847	59,694
2. Maize	17,042	51,126
3. Millet	17,465	20,958
4. Others	6,389	23,270
Sub-total	70,743	155,048
B. Cash crops		
1. Cotton	1,807	758
2. Sunflower	6,380	7,656
3. Tobacco	18	12
4. Onions	1,197	3,591
5. Groundnut	2,740	1,370
6. Others	2,541	2,236
Sub-total	14,683	15,623
Total	85,426	170,671

Major food crops are sorghum, maize and millet. Various cash crops are grown as shown above. The total planted area and production came to 85,426 ha and 170,671 tonnes in 1995/96. Yields comes to 2.0 tonne/ha. The planted area and production per household is estimated at 1.5 ha and 2.9 tonnes respectively in 1995/96. Yields and production per household is high.

- Animal husbandry

The district has 538,705 cattle, 163,791 sheep, 302,402 goats, 565,200 chickens and 16,128 donkeys. A household is estimated to have on average 9.2 cattle, 2.8 sheep, 5.2 goats, 9.6 chickens and 0.3 donkeys. The number of livestock per household is rather large.

(e) Social Services

- Education

There are 123 primary schools in the district. It means 1 school per 2,860 people. There are 18,380 children eligible for standard I (7-13 years) enrolment, out of which 8,713 children or 47.4% are enrolled. This is high among the 4 districts concerned. Literacy rate is 48.7%. It is low.

- Water

The district serves piped water to 36% of the population. The groundwater is the main water source. The villages with water committees and water funds comprise 80.9% of the total

villages. There is one functional water supply facility per every 419 population served. The level of people's awareness and the provision of water supply facilities as well appear to be high compared with other districts. There are a number of non-operating facilities.

Item	Quantity
Total population (1995)	351,798
People served	126,900
Service ratio	37%
No. of village water committees	110
No. of village water funds	110
Total amount of water funds	Tsh4,515,054
No. of motor pumped boreholes	35(26*)
No. of windmill pumped boreholes	13(6*)
No. of hand pumped wells	337(54*)
No. of gravity schemes	0
No. of dams	12(8*)

Note: *=-not operating

- Health

(Top 10 diseases in 1995)

Diseases	No. of cases
1. Malaria	115,966
2. URTI	48,353
3. Diarrhoea	20,015
4. Pneumonia	22,024
5. Eye diseases	20,107
6. Intestinal worms	15,678
7. Skin diseases	15,499
8. Wounds/accidents	7,805
9. Gonorrhoea	-
10. Anaemia	-
Total	161,077

33 persons out of 100 fall victim to malaria every year. 46% of the population suffer from some disease or another in a year. The incidence of diseases is on the high side in this district. There are 1 hospital, 6 health centres and 36 dispensaries. The population per health facility comes to 351,798 (100,000) for the hospital, 58,633 (50,000) for the health centre and 9,772 (10,000) for the dispensary. The national targets are shown in brackets. The level of the provision of health facilities is on the low side. The regional average of infantile mortality rate, under 5 mortality rate and maternal mortality rate were 67/1,000 (96/1,000), 106/1,000 (158/1,000) and 238/100,000 (197/10,000) respectively in 1995. The national averages are shown in brackets.

(f) Non-Governmental Organisations (NGO's)

The district is working in partnership with 5 NGO's, namely TCRS, CDTF, IIRO, HPA and YADEC. Most of them support community based social projects.

- Tanganyika Christian Refugees Services (TCRS)

This organisation supports the integrated programs covering the following sectors: water - construction of shallow and medium-depth shallow wells - , health, environmental sanitation, hygiene, agriculture, afforestation and training of village health workers.

- Community Development Trust Fund (CDTF)

This organisation has been working in the district since 1970's. It uses the clustering and concentration approach. So far it supported the following projects: water - construction of 25 shallow wells - , agriculture - it supported 6 economic groups by providing them farm implements and inputs - , etc.

- International Islamic Relief Organisation (IIRO)

It supports shallow well construction.

(3) Manyoni District

(a) Land Use

This district, which is one of the 3 districts under the Singida region, has an area of 28,620 km² or 2,862,000 ha. It is the largest among the 4 districts concerned. The area by land use is as shown below.

Land Use	Area (ha)	Composition (%)
Game reserves	1,574,100	55.0
Forest reserves	858,600	30.0
Arable land	65,830	2.3
Grazing and others	358,470	12.5
Water area	5,000	0.2
Total	2,862,000	100.0

As the above table shows, the arable and grazing land accounts for 2.3% and 12.5% of the total area respectively, summing up to 14.8%. The share of the arable land is strikingly small.

(b) Administrative Units

The district has 5 divisions, 21 wards and 76 villages as shown below.

Division	No. of wards	No. of villages
Manyoni	3	14
Itigi	5	18
Kilimatinde	4	13
Nkonko	5	18
Kintinku	4	13
Total	21	76

(c) Population

The population is estimated at 169,537 as of 1996. It grew at the average annual rate of 2.6% over the past 29 years. Supposing the number of members per household is 6, the number of households is calculated at 28,256 for 1996.

Year	Population	Average annual growth rate (%)
1967 (Census)	80,157	-
1978 (Census)	102,266	2.2
1988 (Census)	135,405	2.8
1996 (Estimates)	169,537	2.8

The major tribes include Wagogo, Wanyaturu and Wakimbu. Others are Wataturu, Wabarbaig, Wasukuma and Wasangu.

(d) Economy

Major economic activities in the district are crop farming and animal husbandry. There are also lumbering, fishing, beekeeping, tourism, industry and mining.

- Agriculture

(Agricultural production in 1995/96)

Crops	Planted area (ha)	Production (tonnes)
A. Food crops		
1. Sorghum	18,655	27,982
2. Maize	18,690	33,400
3. Millet	2,940	8,321
4. Others	6,704	24,095
Sub-total	46,989	45,608
B. Cash crops		
1. Cotton	1,363	478
2. Sunflower	840	1,008
3. Tobacco	1,209	967
4. Onions	58	174
5. Groundnut	1,220	610
6. Others	2,975	1,458
Sub-total	7,665	4,695
Total	54,654	50,303

Major food crops are sorghum, maize and millet. Various cash crops are grown as shown above. The total planted area and production came to 54,654 ha and 50,303 tonnes respectively in 1995/96. Yields comes to 0.9 tonne/ha. It is strikingly little. The planted area and production per household is estimated at 1.9 ha and 1.8 tonnes respectively in 1995/96. Production per household is on the low side.

- Animal husbandry

The district has 249,659 cattle, 31,154 sheep, 67,191 goats, 123,670 chickens and 8,489 donkeys. A household is estimated to have on average 8.8 cattle, 1.1 sheep, 2.4 goats, 4.4 chickens and 0.3 donkeys. The number of livestock per household is rather small.

(c) **Social Services**

- Education

There are 71 primary schools in the district. It means 1 school per 2,388 people. There are 9,450 children eligible for standard I (7-13 years) enrolment, out of which 3,903 children or 41.30% are enrolled. This is low. Literacy rate is 68.0%.

- Water

The district serves piped water to 51% of the population. The groundwater is the main water source. The villages with water committees comprise 52.6% of the total villages. Of those

villages with water committees, 82.5% have water funds. There is one functional water supply facility per every 1,917 population served.

Item	Quantity
Total population (1995)	164,839
People served	81,000
Service ratio	49%
No. of village water committees	40
No. of village water funds	33
Total amount of water funds	Tsh5,525,680
No. of motor pumped boreholes	17(9*)
No. of windmill pumped boreholes	34(7*)
No. of hand pumped wells	53(6*)
No. of gravity schemes	2(0*)
No. of dams	3(1*)

Note: *=non operating

- Health

(Top 10 diseases in 1995)

Diseases	No. of cases
1. Malaria	31,186
2. URTI	3,366
3. Diarrhoea	10,736
4. Pneumonia	1,760
5. Eye diseases	1,355
6. Intestinal worms	912
7. Skin diseases	1,022
8. Wounds/accidents	1,375
9. Gonorrhoea	1,247
10. Anaemia	853
Total	53,812

32% or one third of the population suffer from some disease or another in a year. The top two diseases are malaria (incidence=18%) and diarrhoea (incidence=6%). The incidence of diseases is low in this district. There are 3 hospitals, 4 health centres and 33 dispensaries. The population per health facility comes to 56,512 (100,000) for the hospital, 42,384 (50,000) for the health centre and 5,137 (10,000) for the dispensary. The national targets are shown in brackets. It is noted that the provision of health facilities is satisfactory. The regional average of infantile mortality rate, under 5 mortality rate and maternal mortality rate were 67/1,000 (96/1,000), 106/1,000 (158/1,000) and 238/100,000 (197/10,000) respectively in 1995. The national averages are shown in brackets.

(f) Non-Governmental Organisations (NGO's)

The NGO's in this district are TCRS, HPA, CPPS and CDTF.

- Tanganyika Christian Refugees Services (TCRS)

It provides services in the water sector (rural water supply) specialising in shallow wells, beekkeeping extension services, tree planting in primary schools, environmental sanitation and agricultural/livestock extension services.

- Health projects Abroad (HPA)

They are still drawing up feasibility studies in health projects, education, water and environment.

- Congregation of Precious Blood Fathers (CPPS)

It assists villages in water projects, mostly drilling and installation of windmills.

- Community Development Trust Fund (CDTF)

It assists in the development of education, health and water projects. Others are small-scale industries and soft loans in the agriculture/livestock sector.

(4) Igunga District

(a) Land Use

This district, which is one of the 5 districts under the Tabora region, has an area of 4,499 km². The area by land use is as shown below.

Land Use	Area (km ²)	Composition (%)
Agricultural (crops & livestock) area	3,145	69.9
Forest	1,125	25.0
Open area for rivers and streams	229	5.1
Total	4,499	100.0

As the above table shows, the agricultural area accounts for around 70% of the total area.

(b) Administrative Units

The district has 4 divisions, 26 wards and 94 villages.

(c) Population

The population in 1996 is estimated at 215,225. It grew at the average annual rate of 0.71% during the 18 years from 1978 to 1996. The growth rate is the lowest among the 4 districts concerned. The number of households in the 1988 census was 31,793, the average household size coming to 6.4. When it is adopted, the number of households in 1996 is estimated at 33,629.

Year	Population	Average annual growth rate (%)
1978 (Census)	189,475	-
1988 (Census)	203,341	0.71
1996 (Estimates)	215,225	0.71

The major tribes in the district are Sukuma, Nyamwezi, Nyiramba (Iramba) and Nyaturu.

(d) Economy

Major economic activities in the district are crop farming and animal husbandry. There are also lumbering, fishing, beekeeping, industry and mining.

- Agriculture

(Agricultural production in 1991)

Crops	Output (tonnes)	Price (Tsh/kg)	Value (Tsh million)
A. Food crops			
1. Sorghum	38,466	8	307.73
2. Maize	7,069	12	84.83
3. Rice	995	26	25.87
4. Sweet potato	3,282	10	32.82
5. Green gram	167	25	4.18
6. Cassava	271	6	1.63
7. Chickpea	100	25	2.50
Sub-total	50,350		459.56
B. Cash crops			
1. Cotton	5,549	41	227.51
2. Groundnut	877	50	43.85
3. Sunflower	22	30	0.66
4. Sesame	5	50	0.25
Sub-total	6,453		272.27
Total	56,803		731.83

Major food crops are sorghum and maize. Cash crops are represented by cotton and groundnut. The total output and value came to 56,803 tonnes and Tsh732 million in 1991. The output per household is calculated at 1.7 tonnes, which is low.

- Animal husbandry

According to the 1984 census the district had 416,840 cattle, 84,080 sheep, 130,404 goats and 4,915 donkeys. It is calculated that a household had on average 12.4 cattle, 2.5 sheep, 3.9 goats and 0.2 donkeys. The number of cattle per household is large.

(e) Social Services

- Education

The ratio of the population of the 5 to 14 age group who had attended schools was 40.2% in 1988. It is low. Literacy rate in the same year was 81.7%, which is high.

- Water

The district serves piped water to 30% of the population. The groundwater is the main water source. The villages with water funds comprise 10.6% of the total villages. There is one water supply facility per every 1,745 population served. These things attest to the low level of people's awareness and the actual provision of water supply facilities as well.

Item	Quantity
Total population (1996)	215,225
Service ratio	30%
No. of village water funds	10
Total amount of water funds	Tsh5,603,740
No. of borcholes	5
No. of hand pumped wells	19
No. of reservoirs	8
No. of dams	5

- Health

(Major diseases in 1996)

Diseases	No. of cases	No. of deaths
1. Malaria	61,924	53
2. Diarrhoea	11,852	42
3. Eye diseases	7,965	0
4. Skin diseases	6,397	0
5. Intestinal worms	3,356	0
6. Dysentery	684	36
7. Schistosomiasis	9	0
Total	92,187	131

43% of the population suffer from some disease or another in a year. The top two diseases are malaria (incidence=29%) and diarrhoea (incidence=6%). There are 2 hospitals, 4 health centres and 9 dispensaries. The population per health facility comes to 107,613 (100,000) for the hospital, 53,806 (50,000) for the health centre and 23,914 (10,000) for the dispensary. The national targets are shown in brackets. It is noted that the provision of health facilities is rather unsatisfactory. The regional average of infantile mortality rate, under 5 mortality rate and maternal mortality rate were 73/1,000 (96/1,000), 116/1,000 (158/1,000) and 130/100,000 (197/10,000) respectively in 1995. The national averages are shown in brackets.

(f) Non-Governmental Organisations (NGO's)

The NGO's in this district are CARITAS, CBHC, World Bank and Moravian Church.

- CARITAS

The headquarter is located in Tabora. The project name is the Igunga Water Supply Programme. The number of target villages is 23. The project period is 3 years from 1997/98 to 2000/01. The major activities are water supply and sanitation.

- CBHC

The headquarter is located in Arusha. The project name is the Igunga Water Supply Programme. The number of target villages is 8. This is the rural water supply study focusing on the rehabilitation of the existing facilities.

- World Bank

There are three projects supported by IDA. One is the National Agriculture and Extension Programme (NAEP). The project period is 1989 to 1999. The major activities are to promote

agricultural activities and assist extension services. Another is the Health and Nutrition Project and the Community Health Fund (CHF). This is the 3 year programme. The major activities are to rehabilitate health services and assist medical and health services. The third is the Forest Resources Management Project (FRMP). This is the 3 year programme. The major activities are to promote the recovery of forests, assist extension services, assist the growing of nurseries and training.

- Moravian Church

The headquarter is located in Tabora. The project name is the Heifer International Project (HPI). The major activities are seed production

3.6.2 Water Fetching, LCD and Willingness to Pay

The JICA study team conducted the socio-economic questionnaire survey toward the households in the 284 target villages. The number of samples was 539 for the Hanang district, 2,128 for the Singida district, 930 for the Manyoni district and 894 for the Igunga district, totalling 4,491. The average number of samples per village was around 15.

The results of the survey centring on water fetching, lcd and willingness to pay are summarised in the table below.

Item	Hanang district	Singida rural district	Manyoni district	Igunga district
Average distance to water source (km)	4.34	2.93	2.35	3.76
Time to and from water source (hours)	2.75	1.66	1.42	1.96
No. of persons at a time (persons)	2.34	2.42	2.50	2.24
Daily frequency (times)	2.08	2.37	2.51	2.47
Volume of water per day per household (bucketfuls*)	4.00	4.08	4.13	4.15
Household size (persons)	5.6	7.9	5.7	5.9
Per capita per day water consumption (l)	14.3	10.3	14.5	14.1
Per capita per day time consumption (hours)	2.39	1.21	1.56	1.84
Willingness to pay (Tsh/bucketful)	72.7	96.4	71.9	61.1
Number of samples	539	2,128	930	894

Item	Whole districts
Average distance to water source (km)	3.14
Time to and from water source (hours)	1.80
No. of persons at a time (persons)	2.39
Daily frequency (times)	2.38
Volume of water per day per household (bucketfuls*)	4.09
Household size (persons)	6.8
Per capita per day water consumption (litre)	12.0
Per capita per day time consumption (hours)	1.51
Willingness to pay (Tsh/bucketful)	81.5
Number of samples	4,491

Note: *one bucketful = 20 litre

(I) Average Distance to Water Source

As shown in the above table, the average distance to the water sources for one way is the longest in the Hanang district with 4.34 km, followed by 3.76 km in the Igunga district, 2.93 km in the Singida Rural district and 2.35 km in the Manyoni district, the weighted average coming to 3.14 km.

(2) Time to and from Water Source

The average time taken for water fetching to and from the water sources at a time is the longest in the Hanang district with 2.75 hours, followed by 1.96 hours in the Igunga district, 1.66 hours in the Singida Rural district and 1.42 hours in the Manyoni district, the weighted average coming to 1.80 hours.

It is to be noted that the longer the distance is, the longer the water fetching time becomes.

(3) No. of Persons at a Time

The average number of persons going for water fetching at a time per household is the biggest in the Manyoni district with 2.50, followed by 2.42 in the Singida Rural district, 2.34 in the Hanang district and 2.24 in the Igunga district, the weighted average coming to 2.39.

It is to be noted that on the whole there is a tendency that the longer the distance is, the fewer the number of water fetchers becomes and also that there is not much difference in the number of water fetchers among districts.

(4) Daily Frequency

The average frequency of water fetching per day per household is the greatest in the Manyoni district with 2.51 times, followed by 2.47 times in the Igunga district, 2.37 times in the Singida Rural district and 2.08 times in the Hanang district, the weighted average working out to 2.38 times.

It is to be noticed that on the whole there is a tendency that the shorter the distance is, the more frequent the water fetching becomes.

(5) Volume of Water per Day per Household

The average volume of water fetched per day per household is the greatest in the Igunga district with 4.15 bucketfuls (83.0 lit), followed by 4.13 bucketfuls (82.6 lit) in the Manyoni district, 4.08 bucketfuls (81.6 lit) in the Singida Rural district and 4.00 bucketfuls (80.0 lit) in the Hanang district, the weighed average working out to 4.09 bucketfuls (81.8 lit).

It is to be noticed that the average volume of water fetched per day per household is not much different between districts irrespective of their household size and other factors.

(6) Household Size

The average household size is the biggest in the Singida Rural district with 7.9 persons, followed by 5.9 persons in the Igunga district, 5.7 persons in the Manyoni district and 5.6 persons in the Hanang district, the average working out to 6.8 persons.

It is to be noticed that the Singida Rural district by far leads other districts in the average household size and also that there is not much difference in the average household size among those three districts.

(7) Per Capita Per Day Water Consumption

The per capita per day consumption of water is the greatest in the Manyoni district with 14.5 lit, followed by 14.3 lit in the Hanang district, 14.1 lit in the Igunga district and 10.3 lit in the Singida Rural district, the weighted average being calculated at 12.0 lit.

It is to be reminded that the per capital per day consumption of water is markedly low in the Singida Rural district compared with other districts and also that there is not much difference in the per capita per day water consumption among those three districts. This is due to the markedly big household size in the Singida Rural district.

(8) Per Capita Per Day Time Consumption

The per capita per day consumption of time for water fetching is the greatest in the Hanang district with 2.39 hours, followed by 1.84 hours in the Igunga district, 1.56 hours in the Manyoni district and 1.21 hours in the Singida Rural district, the weighted average being calculated at 1.51 hours.

It is to be reminded that there is much difference in the per capita per day consumption of time among the four districts.

(9) Willing to Pay for Water

The average willingness to pay for water per household is the highest in the Singida Rural district with Tsh96.4/bucketful (Tsh4.8/lit), followed by Tsh72.7/bucketful (Tsh3.6/lit) in the Hanang district, Tsh71.9/bucketful (Tsh3.6/lit) in the Manyoni district and Tsh61.1/bucketful (Tsh3.1/lit) in the Igunga district, the weighted average being calculated at Tsh81.5/bucketful (Tsh4.1/lit).

It is to be reminded that the Singida Rural district leads other districts in the willingness to pay by a big margin and also that there is not so much difference in this indicator among other three districts. Generally speaking, the bigger the household size is, the less the per capita per day water consumption becomes. Also, there is a general tendency that the less the per capita per day consumption is, the higher the willingness to pay becomes.

3.6.3 Household Economy

(1) General

It was found that the results of the socio-economic survey conducted by the JICA study team toward the households in the 284 target villages centring on the household income are not satisfactory. Therefore, the team conducted an additional survey focused on the household income toward the households in the 13 pilot villages in the hope that the results of the this new survey may fill up the void that has been created.

The number of samples was 84 in total. The pilot villages surveyed were 8, namely Masqaroda, Mara, Nkuhi, Mang'onyi, Chikola, Doroto, Nguriti and Igurubi. The total number of households for the 13 pilot villages is estimated at 5,534 (=37,630 (population)/6.8 (household size)). The sampling ratio comes to 1.52%. It is to be reminded that the ratio can statistically assure a certain extent of dependability regarding the results of the survey.

(2) Economic Activities

According to the above-mentioned survey, the economic activities of households are as follows:

Unit: %

Economic activities	Percentage of households
Growing of crops	100
Animal husbandry	78
Commerce	33
Others	11

The above table shows the results of the multiple answers to a question. It is to be noted in it that a household usually engages in two or more kinds of economic activities. It shows that a majority of households engage in animal husbandry and/or commerce along with agriculture. A major commercial activity of villagers is the making and selling of local brews.

Supposing a questionnaire survey is conducted toward households in France regarding alcoholic drinking in the multiple answer scheme, 100% of the respondents may reply that they drink wine. In the same way, 70% may reply that they drink beer, 50% whiskey and 40% brandy. (The percentage figures are just provisional.) The above table shall be interpreted in the same way.

(3) Annual Household Income

According to the above-mentioned survey, the average annual household income by source is as follows:

Source	Average annual household income	
	Tsh	US\$
Selling of crops	115,010	184
Selling of livestock	71,274	114
Commerce	49,264	79
Others	44,629	71
Home consumption	130,004	208
Total	410,181	656
Total (excl. home consumption)	280,177	448

It was revealed statistically that the probability that the average annual household income lies between Tsh 410,181 - Tsh 67,087 and Tsh 410,181 + Tsh 67,087 is 95%.

For the sake of comparison, the national average of the annual household income in rural areas was Tsh 494,448 or US\$ 791 in 1996.

The above table is the results of multiple answers to a question. When we say that the average life expectancy in a district is 50 years, those dead at birth are included. When we say that the annual per capita consumption of beer in a region is such and such, those who do not drink are counted in. When we say that the average household size in a country is 4, those having no children are taken into consideration. In the same way, not all the households sell livestock, but still we say that the average household income from the selling of livestock is Tsh 71,274. Not all the households engage in commerce, but still we say that the average household income from commerce is Tsh 49,264.

Supposing a questionnaire survey is conducted toward households in France regarding the expenditures on alcoholic drinking in the multiple answer scheme, all respondents may reply that they drink wine, the average annual expenditure on it per household coming to such and such amount. But, regarding beer, some may not drink it. Still we say that the average annual

expenditure on beer per household is such and such, taking into account the non-beer drinking households. In the same manner, some may not drink whiskey. Still we calculate the average annual expenditure on whiskey per household by counting in the non-whiskey drinking households. The same procedure is applied to brandy drinking. The above table shall be interpreted in the same way.

“Home consumption” means the amount of agricultural products produced and consumed by the household which is theoretically converted into monetary terms. The average annual household income excluding this item, that is, the average annual cash income per household is also shown in the above table.

The composition of household income by income source is shown below.

Unit: %

Source	Average annual household income
Selling of crops	28.0
Selling of livestock	17.4
Trade	12.0
Others	10.9
Home consumption	31.7
Total	100.0

It is shown in the above table that “home consumption” has the largest share, followed by “selling of crops”, “selling of livestock” and “commerce” in that order.

(4) District-Wise Annual Household Income

The results of the socio-economic survey towards the target 284 villages were not satisfactory regarding the annual household income in terms of the levels or sizes of the income. People are usually unwilling to divulge the extent of their earnings to strangers. It needs a special technique to elicit the true and correct answers on such matters from the people. Nevertheless, the survey results concerning the comparative income levels between districts, income structures by source, distribution of income by income group are considered useful and meaningful.

Combining the above results of the survey towards pilot villages with those of the survey towards 284 villages, the following tables on the average annual household income by district were worked out.

Unit: Tsh

Source	Hanang	Singida Rural	Manyoni	Igunga
Selling of crops	117,512	100,093	127,613	142,801
Selling of livestock	54,121	82,902	24,290	104,321
Trading	16,856	49,048	15,221	98,214
Others	21,731	40,005	39,238	73,157
Home consumption	107,532	151,697	109,453	113,293
Total	317,752	423,745	315,815	531,786
Excl. Home cons.	210,220	272,048	206,362	418,493

Unit: US\$

Source	Hanang	Singida Rural	Manyoni	Igunga
Selling of crops	188	160	204	229
Selling of livestock	87	133	39	167
Trading	27	78	24	157
Others	35	64	63	117
Home consumption	172	243	175	181
Total	509	678	505	851
Excl. Home cons.	337	435	330	670

As the above table shows, the average annual household income is the highest in the Igunga District with the Tsh 5 hundred thousand level, followed by the Singida Rural District with the Tsh 4 hundred thousand level, and the Hanang District and the Manyoni District both with the Tsh 3 hundred thousand levels. Also, it is noticed that the composition of income by source is somewhat different between districts.

(5) Analysis of Annual Household Income

Combining the results of the survey towards pilot villages with those of the survey towards 284 villages, Figure 4.5.1 and the following tables on the annual household income by district were worked out.

(a) Mean, Mode and Median of Annual Household Income

Item	Hanang		Singida Rural		Manyoni		Igunga	
	Tsh	US\$	Tsh	US\$	Tsh	US\$	Tsh	US\$
Mean	317,751	509	423,745	678	315,815	505	531,786	851
Mode	200,000	320	300,000	480	200,000	320	300,000	480
Median	168,000	269	255,000	408	163,000	261	284,000	454

Figure 4.5.1 and the above table show that there is a wide difference between the values represented by the mean and the mode or the median, the latter being much smaller than the former. It means that households are concentrated in the lower income groups.

(b) **Cumulative Percentage of the Number of Households up to the Households Whose Income Takes the Values of Mean, Mode and Median**

Unit: %

Item	Hanang	Singida Rural	Manyoni	Igunga
Mean	85.7	74.3	85.6	71.4
Mode	68.8	67.8	77.8	53.8
Median	50.0	50.0	50.0	50.0

Figure 4.5.1 and the above table show that 70 to 80 percent of households fall under the income ranges which are less than the mean.

(6) **Poor Households**

It is proposed by the JICA Study Team that those households whose income belongs to the lower 20% when the income is aligned in the ascending order be not counted in, taking account of the social nature of water supply.

(a) **Annual Income of Households Whose Income Is Located at 20% in Income Alignment in Ascending Order**

Hanang		Singida Rural		Manyoni		Igunga	
Tsh	US\$	Tsh	US\$	Tsh	US\$	Tsh	US\$
143,547	230	171,675	275	145,386	233	150,441	241

Those households whose annual income is equal to or less than the above values will not be considered water charge bearers.

(b) **Percentage of Cumulative Income of Households Whose Income Falls under the 0% to 20% Ranges in Income Alignment in Ascending Order**

Unit: %

Hanang	Singida Rural	Manyoni	Igunga
4.5	4.0	4.6	2.8

Comparing the proposed case with the one where all households will pay for water, water revenues in the former will be less than in the latter by the percentage as shown in the above table.