ANNEXES

THE STUDY ON GROUNDWATER DEVELOPMENT IN WANGDUEPHODRANG DISTRICT OF BHUTAN

FINAL REPORT

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SCOPE OF WORK

FOR

THE STUDY

ON

GROUNDWATER DEVELOPMENT

IN

WANGDUEPHODRANG DISTRICT

OF

BHUTAN

AGREED UPON BETWEEN

MINISTRY OF AGRICULTURE

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

THIMPHU, AUGUST 18, 1993

DASHO-KINZANG DORJI
BUTTECTOR GENERAL
DEPARTMENT OF AGRICULTURE
MINISTRY OF AGRICULTURE
ROYAL GOVERNMENT OF BHUTAN

MR.SEIJI KAIHO LEADER, PREPARATORY STUDY TEAM, JAPAN INTERNATIONAL COOPERATION AGENCY

I. INTRODUCTION

In response to the request of the Royal Government of Bhutan, the Government of Japan has decided to conduct a study on groundwater development project in Wangduephodrang District of Bhutan (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations inforce in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of the Royal Government of Bhutan.

The present document sets forth the scope of work with regard to the Study.

II. OBJECTIVE OF THE STUDY

The objective of the Study is to conduct a study on water resources development plan with an emphasis on groundwater in Wangduephodrang District of Bhutan.

III. STUDY AREA

The Study will cover the area of Wangduephodrang District.

IV. SCOPE OF THE STUDY

The Study shall include followings:

PHASE I :

- (1) Data Collection and Review
 - 1) socio-economic conditions
 - 2) relevant ongoing and planned projects
 - 3) data on existing wells and water supply system
 - 4) data on water demand
 - 5) topographical, geological and hydrogeological maps
 - 6) aerial photos
 - 7) data on land use
 - 8) data on meteorology, hydrology and hydrogeology
 - 9) environmental conditions
 - 10) law, regulation policies and customary practices
 - 11) institutions, organizations and administrations

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(2) Basic Study

- topographic and geological reconnaissance
- 2) meteorological and hydrological investigations
- 3) topographic survey
- 4) electrical prospectings
- 5) survey on cross sections and profiles of rivers
- 6) survey on water demand and existing water supply system
- 7) selection of test boring sites
- 8) initial environmental examination

PHASE II :

- (1) Detailed Study
 - 1) test boring
 - 2) pumping test
 - 3) hydrological survey
 - 4) survey on water quality
 - 5) surface water survey
- (2) Study and Analysis
 - 1) hydrogeological analysis
 - 2) design of experimental facilities

PHASE III :

- (1) Formulation of Water Resources Development Plan
 - 1) installation and operation of experimental facilities
 - 2) evaluation of water resources potential
 - 3) formulation of water resources development plan
 - 4) facility planning and cost estimation
 - 5) operation and maintenance planning
 - 6) implementation planning
- (2) Project Evaluation
 - 1) socio-economic evaluation
 - 2) environmental impact analysis

V. STUDY SCHEDULE

The Study, in principle, shall be carried out in accordance with the tentative schedule shown in the attached sheet.

VI REPORT

JICA shall prepare and submit following reports in English to the Royal Government of Bhutan.

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- (1) Inception Report (IC/R) Twenty (20) copies at the commencement of the work in Bhutan.
- (2) Progress Report(1) (P/R1)
 Twenty (20) copies within six (6) months after the
 commencement of the Study.
- (3) Interim Report (IT/R)

 Twenty (20) copies within thirteen (13) months after the commencement of the Study.
- (4) Progress Report(2) (P/R2)

 Twenty (20) copies within seventeen (17) months after the commencement of the Study.
- (5) Draft Final Report (DF/R)
 Twenty (20) copies within twenty-six (26) months after the commencement of the Study.
 The Royal Government of Bhutan shall submit their comments within thirty (30) days after the receipt of the Draft Final Report.
- (6) Final Report (F/R) Thirty (30) copies within thirty (30) days after the receipt of the comments on the Draft Final Report.

VII. UNDERTAKINGS OF THE ROYAL GOVERNMENT OF BHUTAN

- To facilitate smooth conduct of the Study, the Royal Government of Bhutan shall take necessary measures;
 - (1) to secure the safety of the Japanese study team,
 - (2) to permit the members of the Japanese study team to enter, leave and sojourn in Bhutan for the duration of their assignment therein, and exempt team from alien registration requirements and consular fees,
 - (3) to exempt the members of the Japanese study team from taxes, duties and any other charges on equipment, machinery and other materials brought into Bhutan for the conduct of the Study,
 - (4) to exempt the members of the Japanese study team from income tax and charges of any kind imposed on or in connection with any emolument or allowance paid to the members of the Japanese study team for their services in connection with the implementation of the Study,
 - (5) to provide necessary facilities to the Japanese study team for remittance as well as utilization of the funds introduced into Bhutan from Japan in connection with the implementation of the Study,



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- (6) to secure permission for entry into private properties or restricted areas for the conduct of the Study,
- (7) to secure permission for the Japanese study team to take all data and documents (including photographs and maps) related to the Study out of Bhutan to Japan, and
- (8) to provide medical services as needed. Its expenses will be chargeable on the members of the Japanese study team.
- The Royal Government of Bhutan shall bear claims, if any arises against the members of the Japanese study team resulting from, occurring in the course of, or otherwise connected with the discharges of their duties in the implementation of the Study, except willful misconduct on the part of the members of the Japanese study team.
- 3. Ministry of Agriculture, the Royal Government of Bhutan (hereinafter referred to as "MOA") shall act as counterpart agency to the Japanese study team and also coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.
- 4. MOA shall, at its own expense, provide the Japanese study team with the following, in cooperation with other relevant organizations:
 - (1) available data and information related to the Study,
 - (2) counterpart personnel,
 - (3) suitable office spaces with necessary equipment in the study areas and Thimphu,
 - (4) credential or identification cards, and
 - (5) vehicles with drivers and fuels.

VIII. UNDERTAKINGS OF JICA

For the implementation of the Study, JICA shall take the following measures;

- (1) to dispatch, at its own expense, Japanese study team to Bhutan and
- (2) to pursue technology transfer to the Bhutanese counterpart personnel in the course of the Study.

IX. CONSULTATION

JICA and MOA shall consult with each other in respect of any matter that may arise from or in connection with the Study.

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APPENDIX I TENTATIVE STUDY SCHEDULE

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A.

HINUTES OF MEETING

FOR

THE STUDY

ON

GROUNDWATER DEVELOPMENT

IN

WANGDUEPHODRANG DISTRICT

OF

BHUTAN

fire Preparatory Study Team was organized by Japan International Cooperation Agency (JICA) and dispatched to Bhutan from 5th August to 25th August, 1993. The team conducted field reconaissance in Wangduephodrang district as well as Lhuntse district respectively and had a series of discussions with the officers and engineers of the Department of Agriculture (DDA). List of officers and engineers is as shown in annex 1.

Through exchange of opinions and discussions, both JICA team and DOA agreed upon the scope of work as per hereto attached in annex 2. The major points discussed in connection with the scope of work are the following.

1. Study Area

As to the study area, both the parties agreed to carry out the study on water resources potential for the specified coverage of the terrain in Wangduephodrang as shown in the attached map, and formulating water resources development plan in Rubeysa, Fhangyul, Lobeysa and Bajo for irrigation and Wangduephodrang town water supply.

As to Tangmachy project in Lhuntshe District, JICA team pointed out that in view of JICA's past study in the area in connection with integrated agricultural development in Lhuntshe and Mongar, it was agreed not to take up the District in the present study.

2. Study Schedule

Both the parties agreed to conduct the study in accordance with the study schedule as attached to the Scope of Work. However, in view of the reduction in size of the project area, NOA requested the mission to consider shortening the study period. It is, however, noted that due to the topographic conditions of the study area it may be necessary to consult each other on the modification of the study period.



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Relevant Organizations

Both the parties agreed that DOA should make necessary arrangements for co-ordinating the interministeral/departmental co-operations at various occasions during the course of the study.

4. Equipment

DDA requested to JICA to provide any additional equipment, to those which have been retained in custody, which may be required for the study, either due to the possible defects occurred on those procured for long time custody, or due to the change of the study area from Gaylegphug to Wandduephodrang.

5. Experimental Work

With reference to the item 1)-(i)- phase iii- iv in the scope of work, both the parties agreed that experimental facility construction be made to ensure outcoming water development plan in the study. Therefore, DOA secure the land for the work.

6. Undertakings of the Government of Bhutan

With reference to the item 4-vii in the scope of work, DOA stressed that efforts will be made as much as possible to secure office space both in Thimphu and in Wangduephodrang, counterpart personnel assignment etc. The responsibility of maintenance of the vehicles provided for the study will be borne by the MOA. However, on the request of the MOA, JICA may consider bearing the operation and maintenance cost of the vehicles while the study team is in the country.

7. Technology Transfer

DOA requested the team that technology transfer pursued during the course of the study and specific stress be put on the field of ground water development as this exercise has not been conducted in the country.



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8. Others

Both the parties confirmed that the scope of work formerly concluded on November 28 1989 for the Ground Water Project is superseded.

Thimphu, August 18, 1993

DASHO KINZANG DORJI DIRECTOR GENERAL DEPARTMENT OF AGRICULTURE

MINISTRY OF AGRICULTURE

ROYAL GOVERNMENT OF BHUTAN

MR. SEIJI KATHO
LEADER,
PREPARATORY STUDY TEAM,
JAPAN INTERNATIONAL
COOPERATION AGENCY

GROUND WATER STUDY TRAM BEHBERS

JICA:

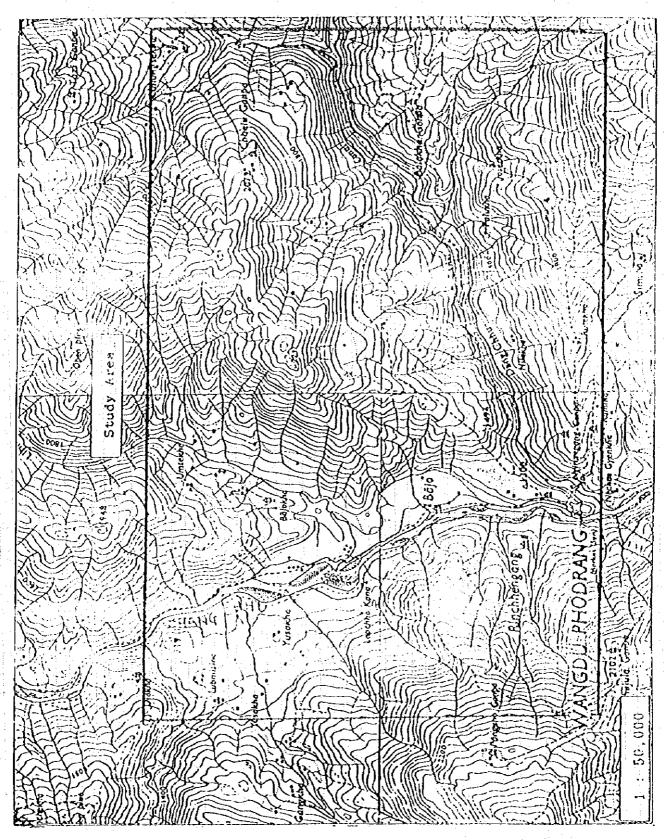
1.	Mr. Seiji Kaiho	Team Leader
2.	Mr. Kiyotaka Otsuki	Study Planner
3.	Mr. Keiji Tokuda	Hydrogeologist
4	Nı Shinichi Yoshikawa	Drilling Engineer

DEPARTMENT OF AGRICULTURE:

1.	Dasho Kinzang Dorji	Director General
2.	Mr. Kinzang Wangchuk	Superintending Engineer
3.	Mr. Kaylzang Tshering	Dy, Executive Engineer
4.	Mr. Rinchen Wangdi	Junior Engineer



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MINUTES OF MEETING

ON

THE INCEPTION REPORT

FOR

THE STUDY

ON

GROUNDWATER DEVELOPMENT

IN

WANGDUEPHODRANG DISTRICT

OF

BHUTAN

THIMPHU, FEBRUARY 15,1994

DASHO DIS KINZANG DORJI
JOINT SECRETARY
MINISTRY OF AGRICULTURE
ROYAL GOVERNMENT OF
BHUTAN

DR. SHOJI KANATSU
TEAM LEADER
STUDY TEAM
JAPAN INTERNATIONAL
COOPERATION AGENCY

In accordance with the Scope of Work signed on August 18.4.95 between the Ministry of Agriculture (MOA) and Japan International Cooperation Agency (JICA), a Study Team, arrived in Bhutan on February 10,1994

The inception Report was submitted by the Study Team. A series of discussions was held and views were exchanged between the Study Team headed by Dr. SHOII KANATSU and Ministry of Agriculture represented by Dasho Dr. Kind ANG DORJI

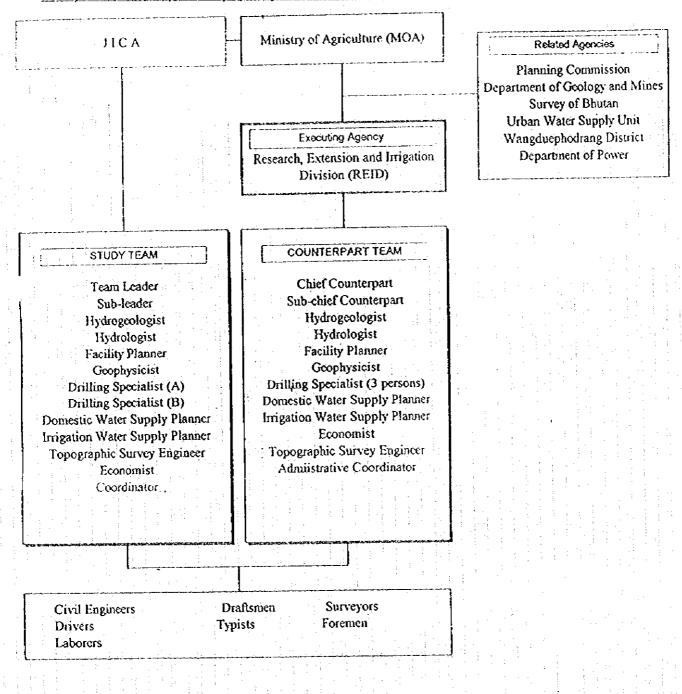
As a result or the discussions, both sides reconfirmed and agreed as stated below

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- Both side reconfirmed the Scope of Work for the Study agreed that between the HCA Presuratory Study Team and MOA on August 18, 1993
- The requests stated in the Inception Report were generally accepted by MOA with the following conditions.
 - 4 Fuel and maintenance costs of the vehicles provided by IIC 5 will be born by the Study Team during the study period.
 - One is station wagon being repaired will be ready for the use of the Study Team it, early as possible.
- 4. Both sides will take best efforts so that the truck with crane which is requested in to love; Percent would be arranged as soon as possible
- 5. Both sides confirmed that the technology transfer to counterparts will be carried out on the jeb in Bhutan. In addition, the Royal Government of Bhutan expressed their wish to send counterpart(s) to Japan in order to receive the technology transfer.
- 6. Due to recent shuffling of the organization of MOA, the present Rsearch, Extension and Irrigation Division (REID) will take the responsibilities for the Study instead of the former Department of Agriculture.



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ORGANIZATION CHART FOR EXECUTING THE STUDY



LIST OF ATTENDANTS

1. MINISTRY OF AGRICULTURE

Dasho Dr. Kinzang Dorji Mr. Kinzang Wangchuk

Mr. Phuntsho Wangdi

Joint Secretary Chief Irrigation Officer,

Research, Extension and Irrigation

Division

Imigation Engineer

Research, Extension and Irrigation

Division

Mr. Kiyotaka Otsuki

Staff,

Head Quarter,

Japan International Cooperation Agency

3. JICA Study Team

2. JICA Head Office

Dr. Shoji Kanatsu

Dr. Mutsumi Motegi

Mr. Soichiro Yumoto

Mr. Takao Sakamoto

Mr. Kazuo Uchida

Mr. Toshihiko Kogo

Mr. Yoshito Kimura

Team Leader

Sub-leader/Hydrogeology

Hydrology/Water Quality

Facility Planning/Experimental Facilities

Electric Prospecting

Test boring(Planning)

Test Boring(Operation)



MINUTES OF MEETING
ON
THE PROGRESS REPORT (1)
FOR
THE STUDY
ON
GROUNDWATER DEVELOPMENT
IN
WANGDUEPHODRANG DISTRICT
OF
BHUTAN

THIMPHU, JULY 19,1994

DASHO-DR. KINZANG DORJI SEGRETARY

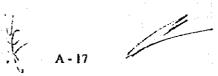
MINISTRY OF AGRICULTURE ROYAL GOVERNMENT OF 3HUTAN DR. SHOJI KANATSU
TEAM LEADER
STUDY TEAM
JAPAN INTERNATIONAL
CCOPERATION AGENCY

In accordance with the Scope of Work signed on August 18,1993 between the Ministry of Agriculture (MOA) and Japan International Cooperation Agency (JICA), a Study Team arrived in Bhutan on February 10,1994, a minutes of meeting was signed between MOA and the Study Team on February 15, 1994.

Based on the above minutes of meeting, the Study Team has conducted the field survey and investigation so far, and submitted MOA twenty (20) copies of Progress Reports (1) (hereinafter referred to as the Report) as stated in the Scope of Work. The report presents the results of the field survey, investigation and preliminary studies. A series of discussions was held and views were exchanged between the Study Team headed by Dr. SHOJI KANATSU and Ministry of Agriculture represented by Dasho Dr. KINZANG DORJI.

As a result of the discussions, both sides agreed as stated below.

- 1. The MOA accepted and agreed the contents of the Report submitted by the Study Team.
- 2. Both sides confirmed that the Study Team would not conduct the test borings in Phangyul, Rubeysa and Bajo subareas due to the difficulty in their access and the unnecessity found through the field surveys having been conducted in the Study Area so far.
- 3. The MOA understood and agreed to the concept of the proposed plan of the experimental facilities as per the Report, and requested the Team to realize all of the proposed facilities in the next phase.
- 4. The MOA agreed that at least two (2) counterparts and one (1) surveyor who have worked together with the Team since the beginning would be assigned for the works to be conducted during the absence of the Team from the site, because they mutually understood that such requirement would facilitate the transfer of knowledge as stated in the signed Scope of Work.
- 5. The MOA requested that the Study during the next phase should be carried out focusing more on irrigation aspect.



LIST OF ATTENDANTS

1. MINISTRY OF AGRICULTURE

Dasho Dr. Kinzang Dorji

Mr. Kinzang Wangchuk

Mr. Wangdi Gyaltshen

Mr. Kesang Jamtsho,

Mr. Phuntsho Wangdi

Mr. Karchung

Mr. H. R. Ghalley

Mr. Mani Tapa

2. JICA Study Team

Dr. Shoji Kanatsu

Dr. Mutsumi Motegi Mr. Soichiro Yumoto

Mr. Takao Sakamoto

Mr. Eizaburo Furutani

Mr. Yutaka Nozaki

Secretary.

Ministry of Agriculture

Chief Irrigation Officer, Research, Extension and

Irrigation Division, MOA

Deputy Executive Engineer,

Research, Extension and

Irrigation Division, MOA

Deputy Executive Engineer,

Research, Extension and

Irrigation Division, MOA

Section Officer,

Research, Extension and

Irrigation Division, MOA

Section Officer,

Research, Extension and

Irrigation Division, MOA

Junior Engineer,

Research, Extension and

Irrigation Division, MOA

Planning Officer,

MOA

Team Leader

Sub-leader/Hydrogeology Hydrology/Water Quality

Facility Planning/Experimental

Facilities

Domestic Water Supply Planning

Regional Economy/Project

Evaluation

MINUTES OF MEETING
ON
THE INTERIM REPORT
FOR
THE STUDY
ON
GROUNDWATER DEVELOPMENT
IN
WANGDUEPHODRANG DISTRICT
OF
BHUTAN

THIMPHU, NOVEMBER 8,1994

MR. SHERUB GYALTSHEN

HEAD

RESEARCH, EXTENSION AND

IRRIGATION DIVISION

MINISTRY OF AGRICULTURE

ROYAL GOVERNMENT OF BHUTAN

OR SHOJI KANATSU
TEAM LEADER
STUDY TEAM
JAPAN INTERNATIONAL
COOPERATION AGENCY

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In accordance with the Scope of Work signed on August 18,1993 between the Ministry of Agriculture (MOA) and Japan International Cooperation Agency (JICA), the JICA Study Team submitted MOA twenty (20) copies of Interim Report (hereinafter referred to as the Report) on November 7, 1994. The report have been prepared through the home office work in Japan based on the Progress Report (1). A series of discussions were held and views were exchanged on November 3, 1994 between Ministry of Agriculture represented by Mr. SHERUB GYALTSHEN and the Study Team headed by Dr. SHOJI KANATSU.

As a result of the discussions, both sides agreed as stated below,

- 1. The MOA accepted and agreed the contents of the Report submitted by the Study Team.
- 2. The MOA understood and agreed to the concept of the additional surveys for the irrigation component on the Phase 2 study.
- 3. The MOA will request Ministry of Communication to give comments on domestic water supply section of the Report.
- 4. For the construction of the experimental facilities, the MOA shall take necessary measures;
 - 1) to exempt taxes, duties and any other charges on equipment, machinery and other materials brought into Bhutan for the construction work,
 - 2) to secure necessary permissions for the construction work,
 - 3) to secure the lands required for the construction work,
 - 4) to provide electric power supply line for the river pumping station in the CARD farm.

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LIST OF ATTENDANTS

1. MINISTRY OF AGRICULTURE

Mr Sherub Gyaltshen

Head,

Mr. Kinzang Wangchuk

Research, Extension and Irrigation Division, MOA

Chief Irrigation Officer, Research, Extension and

Mr. Wangdi Gyaltshen

Irrigation Division, MOA Deputy Executive Engineer,

Research, Extension and Irrigation Division, MOA

Mr. Ugyen Tshewang

Assistant Engineer,

Mr. Y.N. Sharma

Research, Extension and Irrigation Division, MOA Geotechnical Engineer,

Research, Extension and Irrigation Division, MOA

Mr. Phuntsho Wangdi

Section Officer,

Research, Extension and Irrigation Division, MOA

Section Officer,

Mr. Karchung

Mr. Dorji Khandu

Research, Extension and Irrigation Division, MOA

Section Officer,

Research, Extension and Irrigation Division, MOA

JICA Head Office

Staff

Mr. Satoshi Kimura

Head Quarter

JICA

3. JICA Study Team

Dr. Shoji Kanatsu

Mr. Takao Sakamoto

Team Leader

Facility Planning/Experimental

Facilities

Irrigation Engineer

Mr. Yujiro Itakura Mr. Daigo Yano

Coordinator

MINUTES OF MEETING
ON
THE PROGRESS REPORT (2)
FOR
THE STUDY
ON
GROUNDWATER DEVELOPMENT
IN
WANGDUEPHODRANG DISTRICT
OF
BHUTAN

THIMPHU, MARCH 21, 1995

MR. SHERUB GYALYSHEN

HEAD, REID

MINISTRY OF AGRICULTURE

ROYAL GOVERNMENT OF

BHUTAN

DR. SHOJI KANATSU
TEAM LEADER
STUDY TEAM
JAPAN INTERNATIONAL

COOPERATION AGENCY

In accordance with the Scope of Work signed on August 18,1993 between the Ministry of Agriculture (MOA) and Japan International Cooperation Agency (JICA), the JICA Study Team submitted MOA twenty (20) copies of Progress Report (2) (hereinafter referred to as the Report). The report have been prepared through the field work in Bhutan based on the Interim Report. A series of discussions was held and views were exchanged between the Study Team headed by Dr. SHOJI KANATSU and Ministry of Agriculture represented by Mr. Sherub Gyaltshen.

As a result of the discussions, both sides agreed as stated below;

- 1. The MOA accepted and agreed the contents of the Report submitted by the Study Team.
- 2. For the monitoring of the experimental facilities, the MOA shall take necessary measures as stated below;
 - to assign the following staff of MOA during the absence of the Study Team
 - Three (3) counterpart staff (2 Section Officers and 1 Surveyor) (Full time at the site in Wangduephodrang)
 - Three (3) staff of the RNR-RC in Bajo (Full time at the site in Wangduephodrang)
 - 2) The support from AMC in Bajo is required for maintenance and repair of the facilities.
 - 3) The MOA will allow the above counterpart staff assigned for monitoring works to use all the vehicles provided by JICA during the absence of the Study Team
 - 4) The MOA duly understands that the counterpart staff assigned for the above monitoring works would have to continue the on-going meteo-hydrological observation also.

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LIST OF ATTENDANTS

1. MINISTRY OF AGRICULTURE

Mr.Sherub Gyaltshen

Head,

Mr. Kinzang Wangchuk

Research, Extension and Irrigation Division, MOA Chief Irrigation Officer.

Research, Extension and

Mr. Wangdi Gyaltshen

Irrigation Division, MOA Deputy Executive Engineer,

Research, Extension and Irrigation Division, MOA

Mr. Karchung

Section Officer,

Research, Extension and Irrigation Division, MOA

2. JICA Study Team

Dr. Shoji Kanatsu

Dr. Mutsumi Motegi

Mr. Takao Sakamoto

Mr. Soichiro Yumoto

Mr. Yujiro Itakura

Mr. Daigo Yano

Team Leader

Sub-leader/Hydrogeology

Facility Planning/Experimental

Facilities

Hydrology/Water Quality

Irrigation Improvement Planning

Coordinator

MINUTES OF MEETING FOR THE STUDY ON GROUNDWATER DEVELOPMENT IN WANGDUEPHODRANG DISTRICT OF BHUTAN

THIMPHU, SEPTEMBER 5, 1995

MR. SHERUB GYALTS/IEN

HEAD, REID

MINISTRY OF AGRICULTURE

ROYAL GOVERNMENT OF

BHUTAN

DR. SHOJI KANATSU
TEAM LEADER
STUDY TEAM
JAPAN INTERNATIONAL
COOPERATION AGENCY

In accordance with the Scope of Work signed on August 18,1993 between the Ministry of Agriculture (MOA), Bhutan and Japan International Cooperation Agency (JICA), the JICA Study Team has conducted the field surveys and investigations, and completed all of its necessary field works. Based on the results obtained through such field works, a series of discussions was held and views were exchanged between the Study Team headed by Dr. SHOJI KANATSU and Ministry of Agriculture represented by Mr. Sherub Gyaltshen.

As a result of the discussions, both sides agreed on the basic concepts on the water resources master plan and the further schedules as stated below;

- 1. The MOA accepted and agreed the basic concepts for formulating the water resources master plan of the area as per the attached figures and tables.
- 2. The MOA agreed that the target year of the master plan would be set at 2002 and 2007 considering the period of its five-year plan.
- 3. The MOA agreed that the Final Report, which will be prepared during the home office work after the field work, will include the following volumes.

Volume I: Executive Summary

Volume II: Main Report

Volume III: Supporting Report

Volume IV: DrawingsVolume V: Data Book

The contents of the above Volume II to V are agreed as per the attached, and MOA understood that the attached contents is subjected to change depending upon the results of the Study. The Draft Final Report will be submitted to MOA in the middle of December 1995 as scheduled.

SY

LIST OF ATTENDANTS

1. MINISTRY OF AGRICULTURE

Mr. Sherub Gyaltshen Head, Research, Extension and

Mr. Kinzang Wangchuk

Mr. Kinzang Wangchuk

Chief Irrigation Officer,
Research, Extension and

Irrigation Division, MOA

Mr. Karchung Section Officer,

Research, Extension and Irrigation Division, MOA

Mr. Phuntsho Wangdi Section Officer,

Research, Extension and Irrigation Division, MOA

Mr. Homraj Ghalay Junior Engineer,

Research, Extension and Irrigation Division, MOA

2. JICA Study Team

Dr. Shoji Kanatsu Team Leader
Dr. Mutsumi Motegi Sub-leader/Hydrogeology

Mr. Takao Sakamoto Facility Planning/Experimental

Facilities

Mr. Soichire Yumoto Hydrology/Water Quality

Mr. Yujiro Itakura Irrigation Improvement Planning

M

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	CLASSIFICATION MAPS	VJ.	GROUNDWATER INVENTORY MAPS
111	GEOLOGICAL MAPS	el y a vij.	LAND USE MAPS

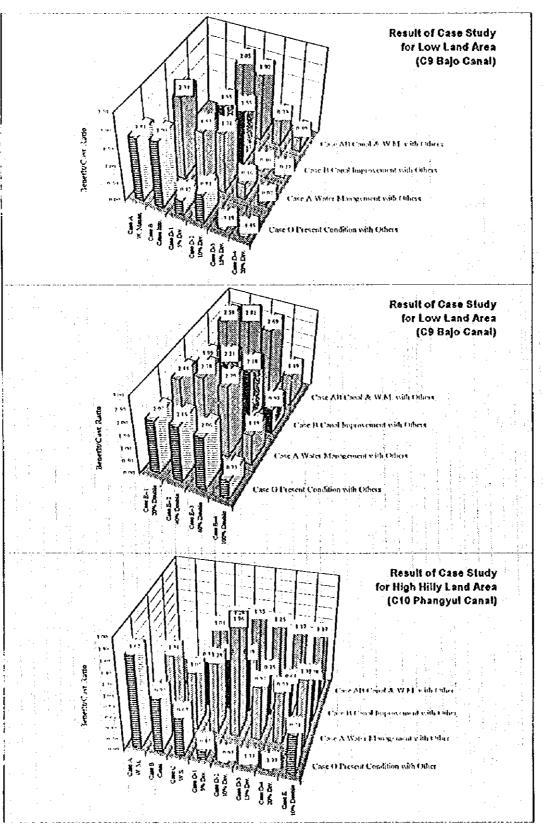
VOLUMB V: DATA BOOK

I. TOPOGRAPHIC DATA III. GEOPHYSICAL SURVEY DATA

II. METEO-HYDROLOGICAL DATA IV. MONITORING DATA

A - 28

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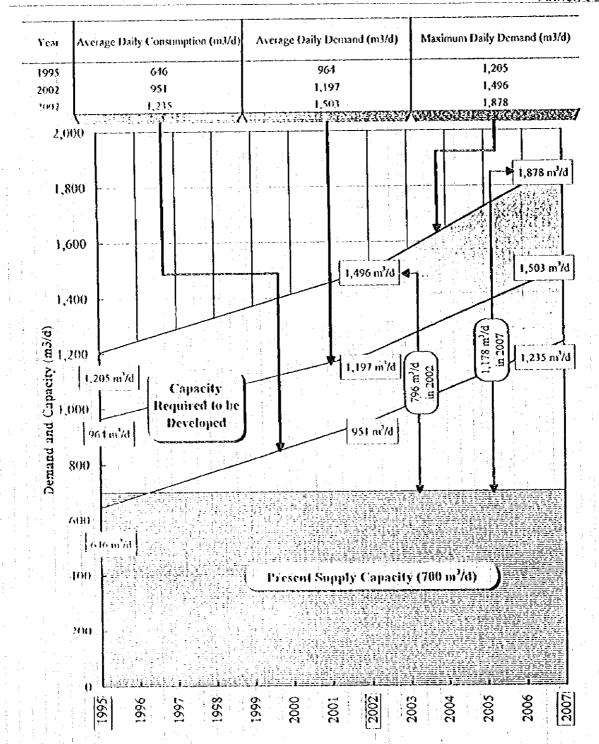
Sy

Result of Case Study

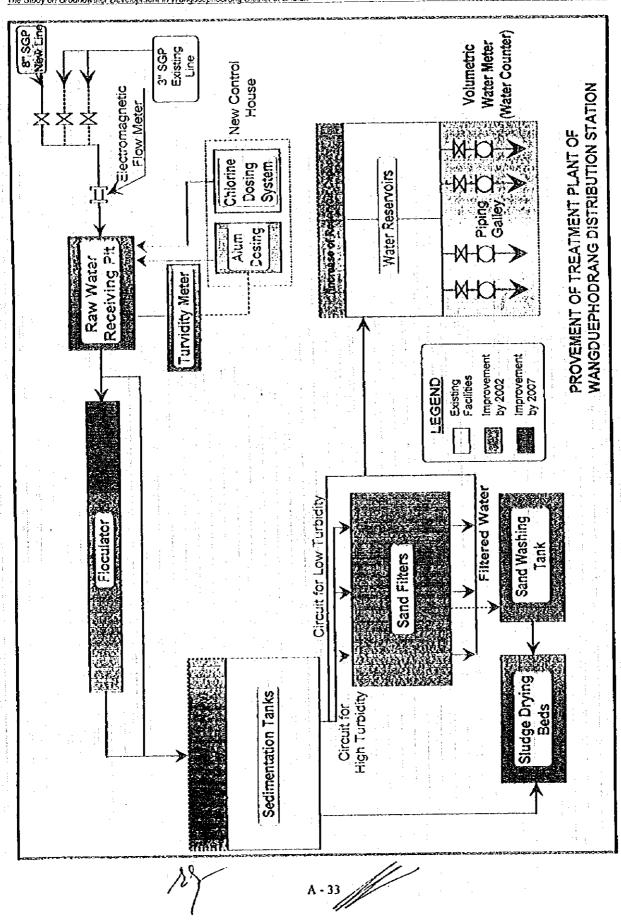
Schematic Flow of Alternatives (based on the result of case study)

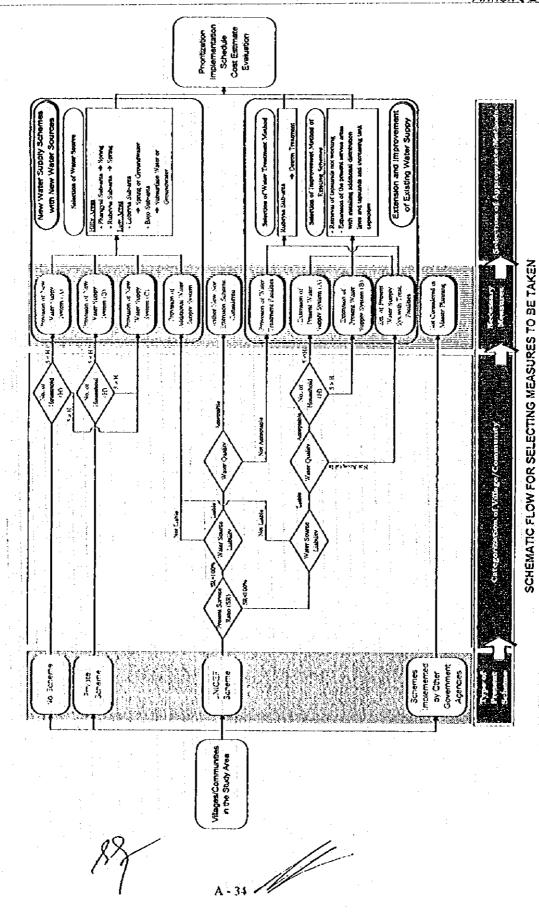
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FUTURE WATER REQUIREMENT





	Ava	able W	ater So	vices	
Sub∙areas	Spring Water	Sub-surface Water	Groundwater	Stream/River Water**	Water Sources Considered In Alternative Study
Lobeysa	•	•	•	×	⇒ Spring Water & Groundwater
Bajo*	6	•	0	×	→ Sub-surface Water & Groundwater
Phangyul	•	×	×	×	→ Spring Water
Rubeysa	•	×	×	×	→ Spring Water

Note:

- * Spring water source is considered partly in hilly area.
 ** Stream and river water is not considered in the study since they may easily contaminated biologically.



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Case S.1:	Spring Development - New (Large)	Case D-1	Groundwater vs Subsurface Development (Large)
Cass S.2	Spring Development - New (Small)	Case B-2:	Groundwater vs Subsurface Development (Small)
Case S.1.	Spring Development - Extension (Small)	Case I.1:	Spring vs Groundwater Development (Large)
Case S. I.	Spring Development - Extension (Large)	Case 1.2	Spring vs Groundwater Development (Small)
Cate 1-1:	Water Trealment - Deiron		

OPTIONS CONSIDERED IN THE ALTERNATIVE STUDY

MINUTES OF MEETING ON THE DRAFT FINAL REPORT FOR THE STUDY ÓΝ **GROUNDWATER DEVELOPMENT** IN WANGDUEPHODRANG DISTRICT OF **BHUTAN**

THIMPHU, January 17,1996

MR SHERUB GYALTSHEN

HEAD

RESEARCH, EXTENSION, AND IRRIGATION DIVISION MINISTRY OF AGRICULTURE ROYAL GOVERNMENT OF

BHUTAN

DR. SHOJI KANATSU TEAM LEADER STUDY TEAM

JAPAN INTERNATIONAL COOPERATION AGENCY In accordance with the Scope of Work for the Study on Groundwater Development in Wangduephodrang District of Bhutan (hereinafter referred to as the Study), the Government of Japan through Japan International Cooperation Agency (JICA) dispatched from January 10 to January 18, 1996 the Study Team headed by Dr. Shoji Kanatsu, Pacific Consultants International and accompanied Mr. Narihito Fujisawa, JICA Head Office for exposition of the Draft Final Report to the officials of the Government of Bhutan concerned with the Study.

The explanation and an exchange of opinions on the Draft Final Report was made by the Study Team from January 12 to January 17, 1996.

As a consequence of the said explanation as well as exchange of opinions on the Draft Final Report, the Study Team and the Bhutan side agreed upon as follows:

- 1. The Bhutan side received from JICA Tokyo Head Office the Draft Final Report which is composed of twenty (20) copies of Executive Summary, Main report and Supporting Report and two (2) copies of Drawings and Data Book on January 10, 1996.
- 2. The Bhutan side agreed on the contents of the Draft Final Report which has been prepared in due compliance with the stipulations of the Scope of the Work and with the methodology set forth in the Inception Report.
- 3. Despite the agreement to the report expressed in the numeral 2 above, the Bhutan side will make detailed analysis on the Draft Final Report and will provide the Study Team with their comments and observations on the report within thirty (30) days after receipt of the Draft Final Report, namely, by February 10, 1996.
- 4. The Study Team shall make a revision of the Draft Final Report, if necessary, based on the comments and observations of the Bhutan side and will submit the Final Report to the Bhutan Government within thirty (30) days after receipt of the comments and observations on the report.
- 5. The Bhutan side has no objection for the Final Report being open to the public immediately after the Final Report is received by Ministry of Agriculture.

M

LIST OF ATTENDANTS

Head,

1. MINISTRY OF AGRICULTURE

Mr. Sherub Gyaltshen

Research, Extension and Irrigation Division, MOA

Mr. Kinzang Wangchuk

Project Manager,

Mr. Kaylzang Tshering

Paro Valley Development Project

Chief Irrigation Officer, Research, Extension and Irrigation Division MOA

Mr. Kinga Doiji

Irrigation Division, MOA Dy. Executive Engineer, Research, Extension and

Mr. Karchung

Irrigation Division, MOA Section Officer,

Research, Extension and Irrigation Division, MOA

Mr. H. R. Ghalley

Junior Engineer,

Research, Extension and Irrigation Division, MOA

2. JICA Head Office

Mr. Natihito Eujisawa

Staff
JICA Head Office

3. JICA Study Team

Dr. Shoji Kanatsu

Dr. Mutsumi Motegi

Mr. Takao Sakamoto

Team Leader
Sub-leader/Hyde

Sub-leader/Hydrogeology

Facility Planning/Experimental Facilities

M

LIST OF THE STUDY TEAM

· · · · · · · · · · · · · · · · · · ·	NAME	CHARGE		
1	Dr. Shoji KANATSU	Team Leader		
2	Dr. Mutsumi MOTEGI	Sub-leader/Hydrogeology		
3	Mr. Soichiro YUMOTO	Hydrology/Water Quality		
4	Mr. Takao SAKAMOTO	Facilities Planning/Experimental Facilities		
5	Mr. Kazuo UCHIDA	Electric Prospecting		
6	Mr. Toshihiko KOGO	Test Boring		
7	Mr. Yoshito KIMURA	Test Boring		
8:	Mr. Eizaburo FURUTANI	Domestic Water Supply Planning		
9	Mr. Isao DOJUN	Irrigation Water Supply Planning		
10	Mr. Osamu NOGOSHI	Topographic Survey		
11	Mr. Yutaka NOZAKI	Regional Economy/Project Evaluation		
12	Mr. Yujiro ITAKURA	Irrigation Improvement Planning		
13	Mr. Daigo YANO	Coordinator		

LIST OF THE COUNTERPARTS

CHARGE	NAME
 Chief Counterpart Sub-chief Counterpart 	Dasho (Dr.) Kinzang Dorji Secretary, MOA (Till Oct. 1994) Mr. Sherab Gyaltshen Head, REID, MOA (From Nov. 1994) Mr. Kinzang Wangchuk Chief Irrigation Officer, REID, MOA
3. Hydrogeologist	Mr. Y. N. Sharma Geotechnical Engineer, REID, MOA
4. Hydrologist (A)	Mr. J. N. Sharma Assistant Hydrologist, Hydrology Unit, DOP
5. Hydrologist (B)	Mr. Karchung Section Officer, REID, MOA
6. Facility Planner	Mr. Kinzang Wangchuk Chief Irrigation Officer, REID, MOA
7. Geophysicist	Mr. Santa Bahadur Rai Mechanic, AMC Bajo, MOA
8. Drilling Specialist (A)	Mr. Dorji Khandu Mechanic, PVADP, MOA
9. Drilling Specialist (B)	Mr. Wangchuk Mechanic, PVADP, MOA
10. Drilling Specialist (C)	Mr. Lungten Norbu Mechanic, AMC Paro, MOA
11 Domestic Water Supply Planner	Mr. Prem Rai Work Assistant, Wanduephodrang District
12. Irrigation Water Supply Planner (A)	Sonam Tobgay Project Engineer, PWVDP
13. Irrigation Water Supply Planner (B)	Mr. Homraj Ghaley Junior Engineer, REID, MOA
14. Economist	Mr. Mani Thapa Planning Officer, MOA
15. Topographic Survey Engineer	Mr. Namgay Tshering Surveyor, PWVDP
16. Administrative Coordinator (A)	Mr. Phuntsho Wangdi Section Officer, REID, MOA
17. Administrative Coordinator (B)	Mr. Dorji Khandu Section Officer, REID, MOA

