

Ministry of Agriculture
The Kingdom of Bhutan

**PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR
IMPROVEMENT OF MACHINERY AND EQUIPMENT
FOR CONSTRUCTION OF RURAL
AGRICULTURAL ROAD (PHASE 2)
IN
THE KINGDOM OF BHUTAN**

December 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

KATAHIRA & ENGINEERS INTERNATIONAL

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PREFACE

Japan International Cooperation Agency (JICA) conducted the preparatory survey on the Project for Improvement of Machinery and Equipment for Construction of Rural Agricultural Road (Phase 2) in the Kingdom of Bhutan.

JICA sent to Bhutan a survey team from May 17 to June 15, 2009.

The team held discussions with the officials concerned of the Government of Bhutan, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Bhutan in order to discuss a draft outline design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Kingdom of Bhutan for their close cooperation extended to the teams.

December, 2009

Motofumi Kohara
Director General, Rural Development Department
Japan International Cooperation Agency

December, 2009

Letter of Transmittal

We are pleased to submit to you the preparatory survey report on the Project for Improvement of Machinery and Equipment for Construction of Rural Agricultural Road (Phase 2) in the Kingdom of Bhutan.

This Survey was conducted by Katahira & Engineers International, under a contract to JICA, during the period from April 2009 to December 2009. In conducting the survey, we have examined the feasibility and rationale of the project with due consideration to the present situation of Bhutan and formulated the most appropriate outline design for the project under Japan's Grant Aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Takuji Kono
Project manager,
Preparatory Survey team on the Project for
Improvement of Machinery and Equipment for
Construction of Rural Agricultural Road (Phase 2) in
the Kingdom of Bhutan
Katahira & Engineers International

SUMMARY

1. Outline of the country

In Bhutan, about 60 percentages of the villages are located in about 2 to 3 days walking distance from the nearest motorable roads. Due to lack of transport facility in these areas, daily life of people is very difficult. People in these areas are not getting even the basics services such as food, medicine and education for children. Furthermore, transporting goods from market centers to villages and local products of villagers to market centers too suffer serious setbacks. Farmers in the areas are reluctant in producing surplus crops because they can not sell their products easily in the nearest market. If they wish to sell their products in the market by transporting them by porters, the cost (production and transportation) will be higher than the amount they would be received by selling their products. Thus, the farmers are discouraged to produce any surplus agricultural products.

2. Background of the project

The highest level development plan of the Kingdom of Bhutan is the “Bhutan 2020”, national development outline, formulated by the planning commission in 1999. Five-Year Plan (FYP), short/middle term national development plan, have been formulated by the Gross National Happiness Commission (GNHC) based on the “Bhutan 2020”. The current five year plan is the 10th FYP (from July 2008 to June 2013), the Ministry of Agriculture (MOA) initially set the goal of constructing rural agricultural roads of total length 750 km following the discussion with GNHC and the performance of the 9th FYP (2002-2008). Furthermore, two national elections were conducted in December 2007 (Senate, 25 seats) and March 2008 (House of Assembly, 47 seats), and most of the candidates made commitments for rural agricultural road development. As a result of the promotion of decentralization and democratization, acceleration of rural agricultural road development has become one of the most prioritized agenda for Bhutan as a means to provide basic infrastructure for regional development and thereby to alleviate the people’s sense of regional disparity, and to improve the people’s access to public facilities such as administrative offices, health facilities, and schools.

In the course of finalization of the 10th FYP, rural agricultural road development plan has aimed to construct 3,264 km rural agricultural road which is nearly 5 times as much as the initial target of 750 km. In response, the government of Bhutan is working hard to fill this large gap between this figure and the initial target of the Ministry of Agriculture.

This trend intensified further during the formulation of the 10th FYP, and total length of requested rural agricultural road construction increased to 3,264 km as mentioned above. In

this context, the Government of Bhutan requested to the Government of Japan to implement the project called “The Project for Improvement of Machinery and Equipment for Construction of Rural Agricultural Road (Phase 2)” under Japan’s Grant Aid so that the capacity needed for the achievement of the development plan may be strengthened through procurement of additional machinery and equipment in order to meet the people’s request for farm road construction.

3. The result of the survey and contents of the project

The Government of Japan understood the urgency, necessity, and appropriateness of rural agricultural road development in Bhutan based on the above-mentioned background, and conducted a survey called “The Preparatory Survey on the Project for Improvement of Machinery and Equipment for Construction Rural Agricultural Road (Phase2¹). Japan International Cooperation Agency (hereinafter referred to as “JICA”) dispatched the Preparatory Survey Team to Bhutan from May 10 to May 15, 2009. The Team made a series of discussions with concerned officials of the Government of Bhutan and conducted a field survey of the Project area. After returning back to Japan, the Team carried out the outline design of the most suitable Project based on the result of the field survey. The Team prepared the contents of the project and presented in the draft final report. JICA dispatched the Team to Bhutan for the explanation of draft report between 11 October and 20 October 2009 and held a series of discussions with concerned officials of the Government of Bhutan regarding its contents.

Approximately 600 km rural agricultural roads were constructed before the 9th FYP (2002-2008) and approximately 1,150 km rural agricultural roads were constructed during the period of the 9th FYP. The total length of rural agricultural road constructed by the end of the 9th FYP was 1,754 km. As the 10th FYP (2008-2013) has planned to construct additional 3,264 km rural agricultural roads by the end of the 10th FYP, a total 5,018 km rural agricultural road network will be developed by the year 2013. Table 1 summarizes the completed and planned rural agricultural roads by Dzongkhag.

¹ Japan conducted the grant aid project for “Basic Design Study on the Project for Improvement of Machinery and Equipment for Construction of Rural Agricultural Road (Phase 1) 2004”. As a result of this study, construction equipment to promote rural agricultural road construction was procured and deployed at Central Machinery Unit (CMU) in Bumthang Dzongkhag in 2006.

Table 1 Rural Agricultural Road Development

5,018km : Overall target by the end of 10 th FYP			
1,754km : Constructed by June 2008		3,264km : Planned in 10th FYP period	
598km : Constructed before 9 th FYP	1,156km : During 9 th FYP period		1,500km : by using CMU machinery
	440km : By CMU machinery	716km : Contract out	
		825km : by the existing CMU machinery	675km : Remaining portion

The 10th FYP intends to construct 1,500 km of rural agricultural road using CMU equipment. The past records of CMU show that the pace of construction using existing machinery including those procured in Phase 1 is 13.75 km/month in average (performance during the 9th FYP). Because the equipment procured in Phase 1 will be in the operational condition (service life) during the execution of the 10th FYP, it is assumed that achieving the same pace of construction in the future is possible. Therefore, the existing machinery is expected to cover the construction of 825 km (13.75 km x 60 months) rural agricultural road, and the Project will be planned to cover the remaining length of 675 km (1,500 km – 825 km).

According to the aforementioned situation, the Project has been considered the procurement of equipment needed for the construction of 675 km rural agricultural roads in 27 months.

The construction of 1,500 km rural agricultural roads will provide direct benefit to approximately 83,000 rural inhabitants (46,000 rural inhabitants will be benefited from 825 km road to be constructed by existing CMU equipment, and the remaining 37,000 rural inhabitants will be benefited from 675 km road to be constructed by phase 2 equipment).

The Survey Team identified type and specification of equipment to be procured through discussions and field survey. The list of equipment to be procured is shown in Table 2.

Table 2 List of Procurement

Equipment	Specifications	Requested	Proposed
Hydraulic Excavator (L)	Hydraulic excavator of class 20 ton and bucket capacity of 0.8 m ³	20	15
Hydraulic Breaker (L)	Breaker class 1600 kg	20	15
Hydraulic Excavator (M)	Hydraulic excavator of 12 ton class and bucket capacity of 0.4 m ³	5	5
Hydraulic Breaker (M)	Breaker class 1000 kg	0	5
Vibration Roller	10-11 ton type vibration roller, Front: 2100 mm width steel drum, Rear: Rubber tire	5	5
Air Compressor	Air Volume class 7-8 m ³ /min	5	5
Jack Hammer	21-22 kg class of Jack Hammer and air volume 2.4 m ³ /min	40	10
Truck Trailer	25 ton of maximum loading capacity and Low bed type	0	1
Self Loader Truck	20 ton of maximum loading capacity	1	0
Fuel Tanker	Loading capacity 3000 liter	1	1
Fuel Storage Tank	3000 liter fuel storage capacity and movable	10	10
Workshop Equipment	Manual tools, tools for welding and electrically powered tools	2	2
Mobile Workshop Van	8 ton class and 4 wheel drive van truck having tools for major repair including a crane inside	3	3
Small Truck	4 wheel drive, 800-1000 kg of Maximum Loading and 5 crew	3	3
Forklift	3 ton of maximum loading	1	1
Forklift	1.5 to 2 ton of maximum loading	1	0
Spare Parts	Quantity calculated based on the following conditions, Heavy equipment with 3,000 hr working time, Vehicles with 30,000 km driving	1	1

4. Operation plan and cost estimation of the project

The Project will be implemented under the framework of Japan's Grant Aid. According to the proposed schedule a total 13.5 months is allocated; 4.0 month for detailed design and 9.5 month for the procurement. The project cost to be borne by the Government of Bhutan is estimated to be about Nu. 296.4 thousand.

5. Project evaluation and recommendations

(1) Project evaluation

1) Present Status and Problems

Although 1,754 km of rural agricultural road development was constructed before the 10th FYP, there are still many isolated rural villages scattered throughout Bhutan.

2) Actions in the Grant Aid Project

To provide machinery and equipment for rural agricultural road construction that can achieve the rural agricultural road construction target (1,500 km) of Bhutan during the period of the 10th FYP (675 km by Phase 2 equipment and 825 km by the existing equipment).

3) Direct Impacts

- The total length of rural agricultural roads constructed by CMU machinery will be 1,500 km within the 10th FYP.
- Additional 14,312 households (83,040 persons) will have access to rural agricultural roads.
- The Project shortens the travel time to the Gewog center including administrative offices, healthcare facilities and education facilities.

4) Indirect Impacts

- Transport of agricultural products and commodities using automobiles will lead to increase the income and improve living conditions in the project area.
- The development of social infrastructure including electricity will be accelerated.
- The participation percentage of inhabitants in meetings, elections, and other social activities will be increased and consequently promote for further progress in decentralization.

(2) Recommendations

(1) Reporting after Procurement of Equipment

Although we can now evaluate the Phase 1 project and can conclude that the target has been achieved, this fact was not clear before the field survey in Bhutan. In this respect, we urged to the Bhutanese side concerning the obligation of reporting after the procurement of equipment. The Team has explained the reasons why Japanese side needs it and Bhutanese side agreed in this matter and mentioned in the M/D accordingly.

- Reports on an operational plan and the actual performance of CMU should be submitted from Bhutan's Ministry of Agriculture to JICA Bhutan Office biannually at least 3 years after procuring the machinery in the Project or by the time total extension length reach to 1,500 km, whichever comes later.
- The reports would include not only for machinery procured by the Project but also the existing ones managed by CMU.

(2) Technical Support to CMU

The results of the field survey indicate that CMU has proper capability for the management, operation maneuvers, and maintenance of equipment to be procured. The dispatch of JICA senior volunteers is planned for 2 years starting from October 2009, and it is thought that it may help for further improvement of operation and maintenance techniques.

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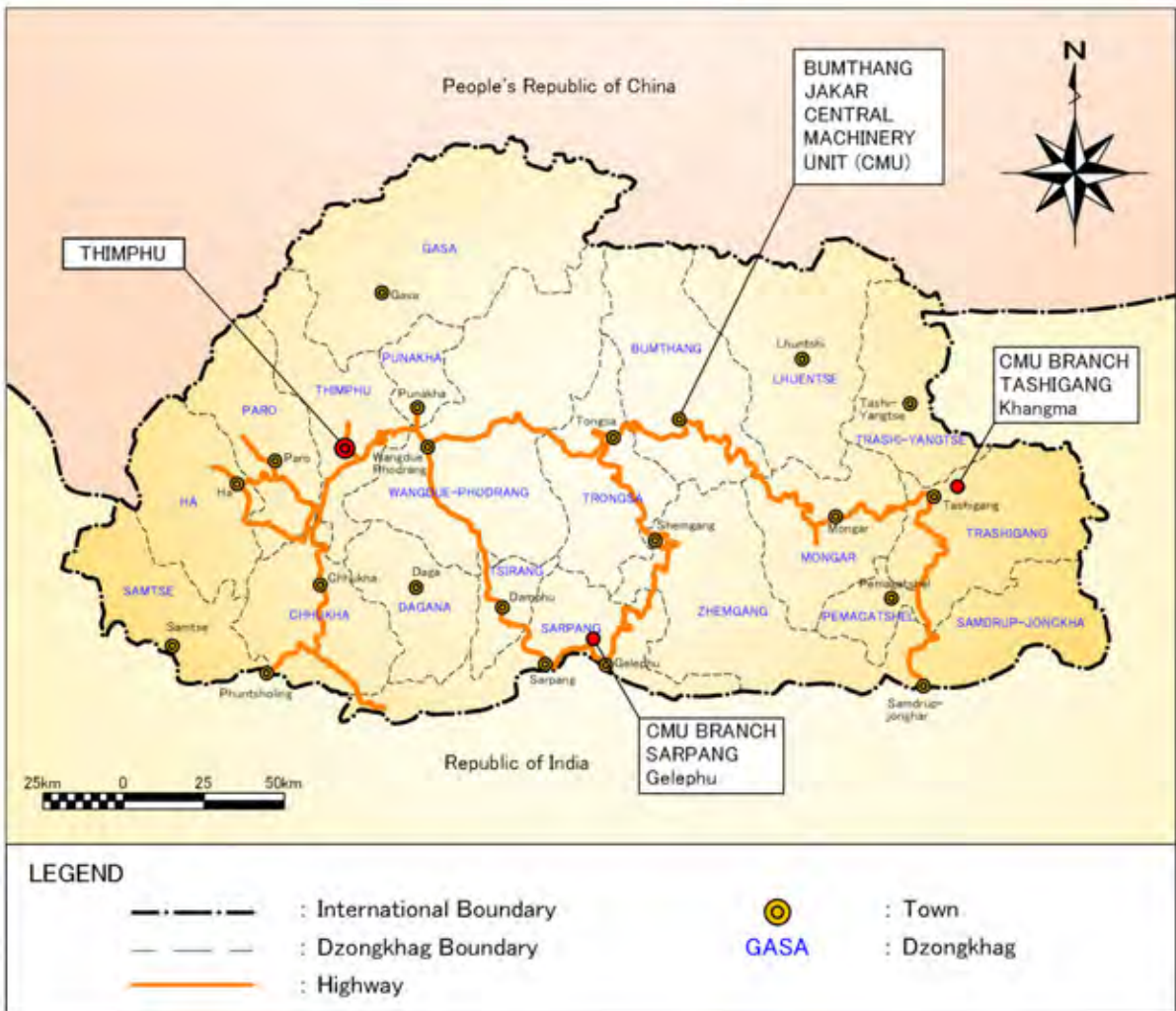
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LOCATION MAP

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ABBREVIATIONS

A/P	: Authorization to Pay
ADB	: Asian Development Bank
AMEPP	: Agriculture Marketing and Enterprise Promotion Programme
B.I.T.	: Business Income Tax
B.S.T.	: Bhutan Sale Tax
B/A	: Banking Arrangement
BTC	: Bhutan Trade Classification
C.I.T.	: Corporation Income Tax
CBD	: Construction Development Board
CDCL	: Construction Development Co. Ltd.
CMU	: Central Machinery Unit
DANTAK	: Indian Border Roads Organization
DOA	: Department of Agriculture
DOR	: Department of Road
DRDP	: Decentralized Rural Development Project
DSP	: Decentralized Support Project
E/N	: Exchange of Note
ECR-ADP	: Eastern Central Region Agriculture Development Project
EIA	: Environmental Impact Assessment
EU	: European Union
FAO	: Food and Agriculture Organization of the United Nations
FR	: Farm Road
FYP	: Five Year Plan
G/A	: Grant Agreement
GDP	: Gross Domestic Product
GNHC	: Gross National Happiness Commission
GNI	: Gross National Income
GOB	: Government of Bhutan
GOI	: Government of India
GOJ	: Government of Japan
GTZ	: German Technical Cooperation
IFAD	: International Fund for Agricultural Development
IEE	: Initial Environmental Examination
IRC	: Indian Road Congress
JICA	: Japan International Cooperation Agency
KR-II	: Kennedy Round II
M/D	: Minutes of Discussion
MOU	: Memorandum of Understanding

MOWHS	:	Ministry of Works and Human Settlement
NEC	:	National Environment Commission
NSB	:	National Statistics Bureau
Nu.	:	Ngultrum
P.I.T.	:	Personal Income Tax
PTT	:	Power Tiller Track
RGOB	:	Royal Government of Bhutan
RNR	:	Renewable Natural Resources
Rs.	:	Rupee
SDC	:	Swiss Development Cooperation
SDS	:	Sustainable Development Secretariat
SEZAP	:	Second Eastern Zone Agriculture Programme
SNV	:	Netherlands Development Organization
SRDP	:	Sustainable RNR Development Project
UNDP	:	United Nations Development Programme
WB	:	World Bank
WFP	:	World Food Programme
WWMP	:	Wang Watershed Management Project

CHAPTER 1

BASIC CONCEPT OF THE PROJECT

CHAPTER 1

BACKGROUND OF THE PROJECT

1.1 BACKGROUND OF THE REQUEST

The highest level development plan of the Kingdom of Bhutan is the “Bhutan 2020”, national development outline, formulated by the planning commission in 1999. Five-Year Plan (FYP), short/middle term national development plan, have been formulated by the Gross National Happiness Commission (GNHC) based on the “Bhutan 2020”. The current five year plan is the 10th FYP (from July 2008 to June 2013).

The Government of Japan understood the urgency, necessity, and appropriateness of rural agricultural road development in Bhutan based on the above-mentioned background, and conducted the development study called “The Study on Agriculture and Farm Road Development 2003”. Based on the development report study report, the Government of Bhutan requested to the Government of Japan for the assistance. In response to the request, the Government of Japan conducted the Grant Aid project called “Basic Design Study on the Project for Improvement of Machinery and Equipment for Construction of Rural Agricultural Road (Phase 1) 2004”. As a result of this study, construction equipment to promote rural agricultural road construction was procured and deployed at Central Machinery Unit (CMU) in Bumthang Dzongkhag in 2006.

Table 1-1 Rural Agricultural Road Development with CMU Machinery (2006-2009)

SN.	Dzongkhag	Eastern 6 Dzongkhag	Planned (km)	Achieved (km)
1	Bumthang		0.00	64.90
2	Chukha		0.00	4.00
3	Dagana		0.00	5.00
4	Gasa		0.00	0.00
5	Haa		0.00	27.50
6	Lhuentse	*	65.00	43.00
7	Mongar	*	35.00	83.10
8	Paro		0.00	10.70
9	Pemagatshel	*	29.00	4.10
10	Punakha		0.00	25.90
11	S/Jongkhar	*	27.00	0.00
12	Samtse		0.00	0.00
13	Sarpang		0.00	5.35
14	Thimphu		0.00	23.90
15	Tashigang	*	40.00	13.00
16	Tashiyangtse	*	39.00	42.10
17	Trongsa		0.00	60.04
18	Tsirang		0.00	6.00
19	W/phodrang		0.00	8.00
20	Zhemgang		0.00	13.41
	Total		235.00	440.00
	6 Dzongkhag	*	235.00	185.30
	Planned Total	*		134.10

Source: MOA

As shown in the above Table, while the initial target in Phase 1 was the rural agricultural roads in 6 eastern Dzongkhags of total length of 235 km, it was expanded to cover the construction of 440 km length rural agricultural road in 17 Dzongkhags in response to the request from nationwide for farm road construction. The rapid increase of demand of construction of rural agricultural road is because of the socio-economic changes that brought by decentralization. Decentralization is accelerating after the beginning of the 9th FYP. This trend intensified further during the formulation of the 10th FYP.

In formulating the 10th FYP, the Ministry of Agriculture initially set the goal of constructing rural agricultural roads of total length of 750 km following the discussion with GNHC and the performance of the 9th FYP (2002-2008). However, national elections were conducted in December 2007 (Senate, 25 seats) and March 2008 (House of Assembly, 47 seats), and most of the candidates made commitments for rural agricultural road development. As a result of the promotion of decentralization, acceleration of rural agricultural road development has become one of the most prioritized agenda for Bhutan as a means to provide basic infrastructure for regional development and thereby to alleviate the people's sense of regional disparity.

The requests for rural agricultural road development are made by the Chiwog, which is the smallest unit of local administration, to the development commission of the Gewog, the unit on the next level of Chiwog (there are 205 Gewogs in the country). The commission submits plans to the Dzongkhag after necessary discussion within the commission setting priorities to some extent. After reviewing these plans, the Dzongkhag generally approve them and forward the approved plans to GNHC. When received by GNHC, these plans become part of the high level plan for rural agricultural road development. In the course of finalization of the 10th FYP, rural agricultural road development plan has aimed to construct 3,264 km rural agricultural road which is nearly 5 times as much as the initial target of 750 km. In response, the government of Bhutan is working hard to fill this large gap between this figure and the initial target of the Ministry of Agriculture.

Approximately 600 km rural agricultural roads were constructed before the 9th FYP (2002-2008) and approximately 1,150 km rural agricultural roads were constructed during the period of the 9th FYP. The total length of rural agricultural road constructed by the end of the 9th FYP was 1,754 km. As the 10th FYP (2008-2013) has planned to construct additional 3,264 km rural agricultural roads by the end of the 10th FYP, a total 5,018 km rural agricultural road network will be developed by the year 2013. Table 1-2 and Table 1-3 summarize the completed and planned rural agricultural roads by nationwide and Dzongkhag respectively.

In this situation, the Government of Bhutan requested “The Project for Improvement of Machinery and Equipment for Construction of Rural Agricultural Road (Phase 2)” so that the

capability needed for the achievement of the development plan may be strengthened through procurement of additional equipment in order to meet the people's request for farm road construction.

Table 1-2 Rural Agricultural Road Development

5,018km : Overall target by the end of 10th FYP				
1,754km : Constructed by June 2008			3,264km : Planned in 10th FYP period	
598km : Constructed before 9th FYP	1,156km : During 9th FYP		1,500km : By CMU machinery	1,764km : Contract out
	440km : By CMU machinery	716km : Contract out		

Source: MOA

Table 1-3 Rural Agricultural Road Development by Dzongkhag

SN	Dzongkhag	Farm Road Before 9FYP (km)	Farm Road During 9FYP (km)	Plan of 10FYP Period		Covered Population Ratio by Rural Agr. Road Development after the completion of 1500 km (by the end of 10 th FYP)	
				With CMU Machinery (km)	Others (km)	No. of persons who can access to rural road	Percentage (%)
1	Bumthang	20	65	41	0	6,832	100%
2	Chukha	15	26	105	90	10,750	13%
3	Dagana	29	49	75	41	10,053	35%
4	Gasa	14	15	23	0	2,778	71%
5	Haa	5	29	41	0	4,014	31%
6	Lhuentse	86	81	105	106	17,737	81%
7	Mongar	13	93	112	524	32,227	27%
8	Paro	42	62	75	74	12,140	24%
9	Pemagatshel	18	57	105	254	18,102	32%
10	Punakha	15	124	75	21	11,328	47%
11	S/Jongkhar	109	90	75	75	15,620	52%
12	Samtse	14	29	75	68	9,535	10%
13	Sarpang	10	45	58	0	5,923	18%
14	Tashigang	68	122	105	199	22,311	31%
15	Thimphu	37	20	39	0	4,802	30%
16	Trongsa	9	60	62	0	6,255	46%
17	Tashiyangtse	45	43	75	32	9,427	48%
18	Tsirang	10	25	75	5	6,298	27%
19	W/phodrang	22	73	105	171	16,460	33%
20	Zhemgang	17	47	75	106	11,790	38%
	Sub-total	598	1,156	1,500	1,764	Total	Average
			1,754		3,264	234,382	53%
	Total				5,018		

Source: MOA

While Table 1-3 shows the steady progress of rural agricultural road development, the evaluation of rural agricultural road development in terms of rural population coverage (the rightmost column of the Table) indicates that approximately 25% of rural populations (approximately 110,000 persons) were covered by the rural agricultural roads constructed during the 9th FYP. This means that the remaining approximately 75% of rural populations

(approximately 330,000 persons) do not have access to the modern physical infrastructures and social services. Furthermore, approximately 60,000 persons out of 330,000 persons require a journey of half a day or more to reach the nearest road (Source: Ministry of Works and Human Settlement, 2007). In the future, the percentage of road network coverage is planned to increase to approx. 41% (national average) by the time when the 1,500 km farm road construction under the jurisdiction of CMU is completed during the period of the 10th FYP. When all 5,018 km lengths of farm roads including those constructed using a bidding method is completed, the farm road network will cover approximately 53% of total population.

Note: As mentioned above, the initial target of Phase 1 was the rural agricultural roads in 6 eastern Dzongkhags of total length of 235 km. However, equipment and machinery procured under Phase 1 were used for construction of farm road in only two eastern Dzongkhags because farm roads in 2 southeastern Dzongkhags and 2 northeastern Dzongkhags (Lhuentse and Tashiyangtse) were constructed by other equipment. Farm roads in 2 southeastern Dzongkhags were constructed using bidding method employing privately owned equipment because CMU equipment were not dispatched due to security reason. Similarly, farm roads in 2 northeastern Dzongkhags were constructed from other donors funds.

1.2 OUTLINE OF THE REQUEST

During the discussion between the Ministry of Agriculture, Department of Agriculture and the Survey Team, the Ministry of Agriculture expressed their intension to replace the equipment list with the revised list indicating the changes in the situation after the submission of the request. After the confirmation of details, the revised equipment list was accepted as the final request, and attached to M/D. In the list, the Ministry of Agriculture assigned priorities (A: high priority and B: medium priority) to each item as a guide for determining the quantities of the equipment. The final list of requested equipment is shown in Table 1-4.

Table 1-4 Requested Machinery and Equipment

No.	Items	Specification	Quantity		Priority	Purpose of Use
			Original	Final		
1	Excavator (Large)	20t (0.8m ³) (with Breaker)	10	20	A	Excavating, digging, loading etc.
2	Excavator (Medium)	12t (0.4m ³)	5	5	B	Excavating, digging, loading etc.
3	Excavator (Small)	6-7t (0.28m ³)	5	5	B	Cutting, digging side ditches and wall loading, slope formation etc.
4	Vibration Roller	11t	5	5	B	Vibration compacting work on the soil and gravel road
5	Air Compressor	7-8m ³ /min	5	5	A	For jack hammer at rocky job site
6	Fuel Tanker	3,000 L	1	1	B	For supplying fuel at the job site
7	Low Lorry	20t (Self Loader Truck)	1	1	A	Transportation of construction machinery/equipment such as hydraulic excavator
8	Fuel Storage Tank	3,000 L (with wheel)	10	10	B	For storing fuel at the job site
9	Mobile Workshop Van	4WD (with tools)	2	3	A	For repair and maintenance of machinery/equipment at the job site
10	Double Cabin Vehicle	4WD	3	3	A	For supervision and inspection purpose at the job site, and transportation of service parts for maintenance and repair of machine
11	Workshop Equipment		2	2	B	
12	Jack Hammer	21-22kg	40	40	B	Drilling works for blasting hard rock
13	Forklift	3t	1	1	B	For lifting and transporting of heavy parts in the store
14	Forklift	1.5-2t	1	1	B	For lifting and transporting of medium parts in the store
15	Spare Parts (10%)	(lot)	1	1	A	

Source : Survey Team

The revisions made to the list of equipment altered the numbers of hydraulic shovel excavators (Large) from 10 to 20 and the numbers of mobile workshop vans from 2 to 3. The reasons for these revisions are as follows;

Because the amount of rural agricultural road to be constructed by CMU doubled from 750 km to 1,500 km, the requested numbers of hydraulic shovel excavators (Large) which are the main machinery used in rural agricultural road construction are also increased. In addition, because of the increase in construction sites and the demand for equipment maintenance, the requested number of mobile workshop vans to be used for on-site repair of equipment was also increased.

1.3 NATURAL CONDITIONS

Rural agricultural road construction is planned over the entire country excluding high mountainous areas with the elevation of 3,000 m or more. The natural conditions of are as follows.

Temperature: -5°C to +35°C.

Elevation: 100 to 3,000 m above sea level.

Rainfall: 500 to 5,000 mm/year.

Geology: The bedrock mostly the bedeck mostly consists of weathered andesite. The surface is covered with a thick weathered zone. The ground structure shows wide variations. Outcrops of bedrock can be seen in many places.

1.4 SOCIAL ENVIRONMENTAL CONSIDERATION

Under construction of the agricultural road, EIA should be carried out along Environment Act established in 2002. District Environment Committee reviews the environment impact about less than 5km of the agricultural road. National Environment Committee reviews the environment impact about more than 5km of the agricultural road. Additionally, the Forest Clearance is separately needed for the tree trimming. These procedures are done by the responsibility of each Dzongkhag.

CHAPTER 2

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2.1 BASIC CONCEPT OF THE PROJECT

As described in Chapter 1, the equipment procured under the project Phase 1 is being used in the almost whole area of the country; in 17 Dzongkhags out of 20 Dzongkhags. However, the initial project target of Phase 1 project was to use those equipment and machinery only in 6 eastern Dzongkhags. Because of democratization of the country and decentralized development approach, rural inhabitants can demand their needs without any hesitations and difficulties. Government is also forced to address their demands as early as possible because of the political and social changes.

The present request covers all 20 Dzongkhags of the country. Although it has planned to construct rural agricultural road of total length 1,500 km using the CMU's existing equipment during the period of the 10th FYP, it is hardly possible to complete all construction works using those equipment. Therefore, after procurement of equipment under the Phase 2 project, the newly procured equipment will be used in combination with existing equipment for the execution of rural agricultural road construction plan covering the entire country. In addition, priorities have been assigned to Dzongkhags as shown in Table 2-1 for the purpose of ensuring effective use of equipment. This assignment of priorities does not mean that the rural agricultural road construction in the most prioritized Dzongkhags is completed before the commencement of road construction in the next prioritized Dzongkhags. Rather, it is intended to facilitate the effective use of equipment in the situation where there are too many requests for CMU equipment. The adoption of these priorities may improve the above-mentioned situation because the Ministry of Agriculture is having difficulty in prioritizing the requests. However, concentrating the use of CMU equipment in a small number of Dzongkhags is not a good idea because other Dzongkhags may feel as being treated unfairly. It is necessary to promote rural agricultural road construction in the entire country simultaneously while ensuring the regional balances and effective use of equipment.

Table 2-1 Priority of Rural Agricultural Road Development with CMU Machinery in 10th FYP Period

Dzongkhag	Connectivity to block centers	Arable Area	Vulnerability to food insecurity	Priority	Plan in 10FYP Period (km)	
Lhuentse	A	A	A	A	105.0	597.5
Tashiyangtse	A	A	A		75.0	
S/Jongkhar	A	A	A		75.0	
Sarpang	A	A	A		57.5	
Samtse	A	A	A		75.0	
Chukha	A	A	A		105.0	
W/phodrang	A	A	A		105.0	
Mongar	A	B	A	B	112.3	492.9
Pemagatshel	A	B	A		105.0	
Dagana	A	B	A		75.0	
Trongsa	A	A	B		61.5	
Zhemgang	A	B	A		75.0	
Gasa	B	A	A		23.0	
Haa	A	A	B		41.1	
Tashigang	B	A	B	C	105.0	221.0
Tsirang	B	A	B		75.0	
Bumthang	B	A	B		41.0	
Punakha	B	B	B	D	75.0	188.6
Paro	B	B	B		75.0	
Thimphu	B	B	B		38.6	
Total						1500.0

Source : MOA

(1) Explanation of the criteria for priority setting

- Connectivity to block (Gewog) centers

The percentage of “the number of blocks that are not connected to the block (Gewog) center by roads (motorways)” to “the total number of blocks” is calculated for each Dzongkhag.

A: a Dzongkhag where 3% or more Gewogs are not connected.

B: less than 3% Gewogs are connected (Source: Ministry of Agriculture, 2009)

- Arable area

It is defined as the area of arable land in each Dzongkhag.

A: Dzongkhag with 5000 ha or more arable land

B: less than 5000 ha (Source: Ministry of Agriculture, 2008).

- Vulnerability to food insecurity

This is the ranking based on the vulnerability index for each Dzongkhag in “Vulnerability Analysis and Mapping, 2005” prepared by Policy and Planning Division (present GNHC), Ministry of Agriculture, and WFP. Vulnerability has been expressed as an index using a

combination of food supply, food expenditure, population, and other factors. RNR (Renewable National resources) SECTOR 10th FYP interprets this result as a representation of the need for poverty reduction (Source: *ibid.* and RNR SECTOR 10th FYP).

Table 2-2 shows the general situation of the rural agricultural road routes to be constructed by CMU.

Table 2-2 Summary of 10th FYP Rural Agricultural Road (CMU Portion)

Priority	Dzongkhag	Length	Geographical Ratio (%)		Geological Ratio (%)			Main agricultural Products	No. of Household	No. of Population
			Hilly Area	Mountainous	Soil	Soft Rock	Hard Rock			
A	Lhuentse							Rice, Maize, Wheat, Potato, Chili		
	4Roads	105.00	90.0	10.0	70.0	20.0	10.0		850	4,675
	Trashiyangtse							Rice, Maize, Potato, Millet, Veggies		
	11Roads	75.00	34.9	65.1	69.3	15.7	15.0	Fruits	1,414	9,777
	S/jongkhar							Rice, Potato, Maize, Citrus, Ginger		
	6Roads	75.00	23.4	76.6	41.3	11.4	47.4	Barley, Rajma bean	155	852
	Sarpang							Rice, Maize, Mustard, Bwheat, Millet		
	10Roads	57.50	26.6	73.4	50.3	27.7	22.1	Arecannut, Ginger, Citrus, Veggies	762	3,810
	Samtse							Cardamom, Orange, Liv pdts		
	7Roads	75.00	24.5	75.5	34.5	20.0	45.5		995	5,420
Chukha							Rice, Potato, Orange, Veggies, Liv pdts			
16Roads	105.00	14.0	86.0	77.3	15.3	7.5		1,022	6,646	
W/phodrang							Rice, Wheat, Potato, Veggies			
37Roads	105.00	32.1	67.9	60.0	23.4	16.6	Liv pdts	759	7,093	
Sub Total										
	91Roads	597.50							5,957	38,273
B	Mongar							Rice, Maize, Beans, Citrus, Potato		
	20Roads	112.30	32.3	67.7	60.4	22.7	16.9	Chili, Veggies	1,495	10,795
	Pemagatshel							Orange, Potato, Maize, Groundnut		
	13Roads	105.00	28.9	71.1	31.0	30.1	38.9	Mustard, Bwheat, Veggies, Local Cotton	810	5,797
	Dagana							Rice, Citrus, Maize, Bwheat		
	10Roads	75.00	32.3	67.7	70.8	12.7	16.5		445	1,980
	Trongsa							Rice, Maize, Wheat, Barley, Bwheat		
	14Roads	61.50	3.7	96.3	0.0	29.6	70.4	Potato, Chili, Passion fruit, Mandarin	524	3,074
	Zhemgang							Rice, Maize, Orange		
	7Roads	75.00	39.3	60.7	45.7	23.3	31.0		100	514
Gasas							Rice, Wheat, Potato			
5Roads	23.00	62.2	37.8	40.0	45.2	14.8		39	176	
Haa							Rice, Millet, Wheat, Bwheat			
4Roads	41.10	7.4	92.6	66.4	20.5	13.2	Maize, Potato, Veggies	150	1,033	
Sub Total										
	73Roads	492.90							3,563	23,369
C	Trashigang							Rice, Wheat, Maize, Potato		
	12Roads	105.00	22.2	77.8	37.0	53.6	9.5	Mustard, Veggies	1,288	5,990
	Tsirang							Rice, Maize, Chili, Tree crops		
	16Roads	75.00	13.3	86.7	70.3	19.7	10.0	Veggies	1,367	5,468
	Bumthang							Potato, Wheat, Barley, Bwheat		
13Roads	41.00	22.9	77.1	23.9	14.8	61.3	Mustard	426	2,057	
Sub Total										
	38Roads	221.00							3,081	13,515
D	Punakha							Rice, Wheat, Potato, Maize, Chili		
	18Roads	75.00	42.7	57.3	63.6	18.5	17.9		429	2,463
	Paro							Rice, Wheat, Potato, Apple		
	41Roads	75.00	58.5	41.5	61.7	13.5	24.8		869	3,934
	Thimphu							Apple, Wheat, Rice, Potato, Veggies		
14Roads	38.60	36.7	63.3	65.0	27.8	7.2		413	1,486	
Sub Total										
	73Roads	188.60							1,711	7,883
Grand Total										
	275Roads	1,500.00	32.9	67.1	53.3	23.1	23.6		14,312	83,040

Source : Ministry of Agriculture

Total length of rural agricultural road to be constructed by CMU is 1,500 km as described in 10th FYP.

The length of rural agricultural road to be constructed by procured equipment in this project is 675 km. The rest of 825 km will be constructed by utilizing the CMU's equipment previously procured. The construction of 1,500 km rural agricultural roads will contribute to more than 83,000 rural inhabitants for their better access to public facilities including administrative offices, clinics, and schools.

2.2 OUTLINE DESIGN OF THE JAPANESE ASSISTANCE

2.2.1 Design Policy

(1) Basic Policy

The Ministry of Agriculture, Department of Agriculture plans to construct 1,500 km rural agricultural roads using CMU equipment during the period of the 10th FYP. Construction works are performed in two stages; primary excavation and finishing works after a certain period of time. In addition to rural agricultural road construction works, CMU is also executing supportive works for smooth operation and maintenance of construction equipment.

With respect to the specifications for the equipment, if the topography and geology of construction areas are known, it may be possible to estimate the intensity of work and amount of work to be performed by the equipment. Based on such information the specifications for the equipment can be determined. However, because the rural agricultural road construction in the Project covers 275 routes (total length of 1,500 km) across the country in diversified topographical and geological conditions and unknown details, it is difficult to calculate the intensity of work and amount of work for the roads to be constructed.

In this survey, past records are available concerning the equipment procured in Phase 1 and their use in various parts of country, and work performance assessment of such equipment established prepared by CMU. Therefore, specifications for equipment will be determined based on the work performance of the equipment procured in Phase 1, considering the diversity of topography and geology, and transportation possibility of such equipment in narrow winding roads.

The quantities of equipment are planned assuming that the target rural agricultural roads of total length 1,500 km will be constructed using the existing equipment and the equipment to be procured in Phase 2.

(2) Policy Concerning Natural Conditions

Rural agricultural road construction is planned over the entire country excluding high mountainous areas with the elevation of 3,000 m or more. The natural conditions of are as follows.

Temperature: -5°C to +35°C.

Elevation: 100 to 3,000 m above sea level.

Rainfall: 500 to 5,000 mm/year.

Geology: The bedrock mostly the bedeck mostly consists of weathered andesite. The surface is covered with a thick weathered zone. The ground structure shows wide variations. Outcrops

of bedrock can be seen in many places.

(3) Environmental and Safety Policy

“Road Sector Development and Environmental Friendly Road in Bhutan”, the guidelines published by the Ministry of Works and Human Settlement in 2005, remarks the following points related to rural agricultural road construction in mountainous areas from the standpoint of environmental protection.

Instead of bulldozers, hydraulic shovel excavators that are flexible and can perform excavation, cargo loading, crushing, and hoisting/carrying of small equipment should be used.

A hydraulic shovel with an appropriate size should be used for each work to minimize the amount of excavation and improve the efficiency of work.

According to the above, hydraulic shovel excavators are employed as the main machinery for rural agricultural road construction, and the models with sizes appropriate for each work are selected. Because the works frequently involve operation on slopes of mountains, models equipped with a roll-over protection system (ROPS) are selected considering work safety.

Although there are no particular regulations concerning the exhausts from engines of construction machines and vehicles in Bhutan, some of fuels having low stability in product quality which have high sulfur content. Therefore, main machines should have double fuel filters to prevent troubles of the engine system and to reduce air pollution due to exhausts.

(4) Policy Concerning the Maintenance Capacity of the Implementing Organization

While the CMU headquarters is equipped with repair machinery and materials procured in Phase 1, these machinery and materials are being used for maintenance works such as regular overhauls. Any trouble occurs unexpectedly at construction sites are being repaired by a mobile workshop van and a small truck, and currently both of them are in full operation. As the number of equipment will be increased at CMU upon the procurement of equipment under Phase 2 project, the frequency of equipment failures is also expected to increase. Thus, it is necessary to strengthen the capacity of CMU for repair and maintenance works at construction sites.

There are CMU branches in southern and eastern regions where many rural agricultural road construction projects are being implemented. These branches are undertaking the responsibility of operation and maintenance of the equipment. However, these branches currently do not have sufficient repair equipment, and consequently dependent on the dispatch of repair teams from CMU headquarters in Central Region in the event of equipment failure.

To be able to perform planned rural agricultural road construction on schedule, it is important to prevent equipment failures and also repair of failure equipment as quickly as possible. For this reason, procurement of repair equipment is necessary to enable repair works at construction sites.

The construction cost for rural agricultural road of 1,500 km accounts only for 6% of the budget of agricultural sector in the 10th FYP, which approved by the Ministry of Finance. Since the Government of Bhutan gives high priority to construction of rural agricultural road, the construction cost is much affordable.

On the other hand, for the personnel plan, CMU has been planning to additionally employ twelve (12) people. In addition, CMU has appropriate criteria of employment. Judging from these situations, proper technical level can be maintained.

Because CMU staffs have basic skills and knowledge on operation of machinery, initial operational guidance as the soft component is not required.

(5) Spare Parts Procurement Policy

Mainly the spare parts for regular replacement and expendable spare parts that are needed in the early stage of operation will be procured to improve the operation rate of equipment. Assuming that the equipment will be operated 300 days/year, 5 hours/day, and each vehicle travels 50 km/day, the Project considers the procurement of spare parts for 3,000 hours of operation and 30,000 km of travel distance that are expected in for 2 years. After confirming the complete usage of parts procured under Phase 2, the Bhutanese side will procure spare parts from the agents of the respective manufacturers.

(6) Standard Specification of Machinery

The procurement of machinery aiming at construction of rural agricultural road includes no special machinery. Since CMU highly evaluates the quality and its easiness of operation, standard specification of machinery to be procured is determined based on the existing machineries are produced in Japan and the machineries which are widely spread in Bhutan.

(7) Timing of Procurement and Construction Period

The 10th FYP intends to construct 1,500 km of rural agricultural road using CMU equipment. The past records of CMU show that the pace of construction using existing machinery including those procured in Phase 1 is 13.75 km/month in average (performance during the 9th FYP). Because the equipment procured in Phase 1 will remain in the operational condition during the execution of the 10th FYP, it is assumed that achieving the same pace of construction in the future is possible.

Therefore, the existing machinery is expected to cover the construction of 825 km (13.75 km x 60 months) rural agricultural road, and the Project will be planned to cover the remainder remaining length of 675 km (1,500 km – 825 km). The details are shown in Table 2-3.

Table 2-3 Rural Agricultural Road to be covered by Phase 2 Machinery

3,264km : Planned in 10th FYP period		
1,500km : by using CMU machinery		1,764km : Contract out
825km : By the existing CMU machinery	675km : Remaining portion	

According to the aforementioned context, the Project will consider the procurement of equipment needed for the construction of 675 km rural agricultural roads in 27 months as shown in Table 2-4.

Table 2-4 Construction Period

Period		10th FYP						Total & Monthly Progress (km)
		July 2008	2009	2010	2011	2012	June 2013	
Existing Machinery	Construction							825km (13.75km)
	Procurement							
Phase 2 Machinery	Construction							675km (25.0km)

2.2.2 Basic Plan

(1) Overall Plan

The equipment to be procured in the Project is intended to use for the construction of rural agricultural roads with motorway width of 3.5 m, which will be performed in 2 stages; first excavation work and finishing work. In addition to these construction works, the Project also requires supporting work needed for the operation and maintenance of construction equipment. The following lists show the specific works and matters requiring attention for each work.

1) First Excavation

- First excavation of natural ground
- First excavation and rock breaking at rocky construction site
- Embankment
- Drilling works for blasting hard rock using explosives

It is necessary to consider various geological features ranging from sand and soil to hard rock.

2) Finishing Work

- Finishing excavation and drilling works

- Embankment
- Sloping
- Compaction of road surface
- Side ditch excavation

It is necessary to consider various geological features and to perform work at higher precision than the first excavation.

3) Supporting Work

- Transporting of construction machines
- Fuel supply and storage
- Maintenance and repair
- Lifting and transporting of heavy parts at repair facilities

It is necessary to cover the areas which require a long travel time (2-3 days) from the CMU headquarters.

(2) Required Equipment

Required equipment for construction for agricultural road are shown in Table 2-5.

(3) Basic Specifications for Equipment Item

The basic specifications for equipment were determined based on the design policy and the standard specifications described under “Earthwork” in Standards for Cost Estimation of Civil Works by the Ministry of Land, Infrastructure, Transport and Tourism. The popularity of particular equipment used in Bhutan is also taken into consideration during preparation of specifications. The basic specifications for the equipment are considered appropriate based on the evaluation as shown in Table 2-5.

Table 2-5 Basic Specifications of Equipment

Work Item	Equipment	Purpose of Use	Specification
		Selection Reason	
First Excavation	Hydraulic Excavator (L)	Excavation & Embankment	Hydraulic excavator of 20 ton class and bucket capacity of 0.8 m ³
		Earth work for Farm Road having 4000mm width Referring to the existing equipment.	
	Hydraulic Breaker (L)	Breaking hard rock at rocky site	Breaker class 1600 kg
		Refer to the hydraulic excavator above.	
Air Compressor	Power supply of jack Hammer	Air Volume 7-8 m ³ /min	
Jack Hammer	Drilling works at rocky site Refer to the existing equipment	21-22 kg class of Jack Hammer and air volume 2.4 m ³ /min	
Finishing Work	Hydraulic Excavator (M)	Finishing excavation, Finishing works for embanked slope, and Excavation for side ditch.	Hydraulic excavator of 12 ton class and bucket capacity of 0.4 m ³
		Refer to the existing equipment, Effective excavation for drainage can be done.	
	Hydraulic Breaker (M)	Breaking hard rock at rocky site Refer to the hydraulic excavator above.	Breaker class 1000 kg
Vibration Roller	Compaction Required compaction performance needs more than that of the existing 7ton type vibration roller.	10-11 ton type vibration roller, Front: 2100 mm width steel drum, Rear: Rubber tire	
Supporting Work	Low Lorry	Transporting of construction machine	25 ton of maximum loading capacity & Low bed type
		To carry the hydraulic excavator (L) over 20ton weight.	
	Fuel Tanker	Fuel supply	Loading capacity 3000 liter
		Refer to the existing equipment.	
	Fuel Storage Tank	Fuel storage	3000 liter fuel storage capacity and 4 wheel and tow bar
		Fuel storage for 10 days work at site and movable required.	
	Workshop Equipment	Maintenance & Repair For daily and minor maintenance and repair at 2 branch workshops	2 set of manual tools, tools for welding and electrically powered tools
Mobile Workshop Van	Major repair at site	8ton class & 4 wheel drive van truck having tools for major repair including a crane inside	
	Mobile workshop with many kinds of equipment for major repair at construction site with high driving performance.		
Small Truck	Minor & urgent repair at construction site	4 wheel drive, 800-1000 kg of Maximum Loading and 5 crew	
	To carry small parts, mechanics and operators to construction site with high driving performance.		
Forklift	For lifting & transporting of heavy parts at workshop	3 ton of maximum loading	
	Due to weight of the parts, loading capacity of forklift needs more than 2 ton.		

(4) Determination of the Quantities of Required Equipment

1) First Excavation

The record of rural agricultural road construction executed by CMU using existing equipment is 13.75 km/month in average. This is equivalent to the mean monthly progress of first excavation, which represents the critical path in rural agricultural road construction. Because this amount of work is the sum of primary excavation at 8 sites in average, the monthly progress at a site is 13.75 km/month (equivalent to 1.72 km/month). The monthly progress that must be achieved by Phase 2 equipment is:

$$675 \text{ km} / 27 \text{ months} = 25 \text{ km/month}$$

The number of sites required is:

$$(25 \text{ km/month}) / (1.72 \text{ km/month}) = 14.53 \text{ sites (equivalent to 15 sites)}$$

Therefore, the number of hydraulic shovel excavator (large) and hydraulic breakers (large) required for first excavation is 15 units each.

According to the list of project road provided by the Department of Agriculture, the geological condition along the planned routes is soft rock and hard rock which covers 46.7% of the total length of 1,500 km. However, according to the past records of construction in the country, the percentage of sites requiring rock drilling and blasting was about 33% of the total sites operated. Therefore, the numbers of sites requiring air compressors are 5 sites (15 sites x 33%).

The cross-sectional area of rock blocks at each site is 2-5 m². Simultaneous drilling using two jack hammers is considered appropriate from the view point of reduction of the waiting time of hydraulic shovels and work efficiency improvement. Because jack hammers are subjected to strong vibration and impacts, they are prone to sudden failures. Allocation of two units for each site is planned from the consideration of the need of a backup unit. Two jack hammers require an air compressor with 7-8 m³/min class discharge capacity.

Table 2-6 Quantity of Equipment for First Excavation

Equipment	Specification	Quantity
Hydraulic Excavator (L)	Hydraulic excavator of class 20 ton and bucket capacity of 0.8 m ³	15
Hydraulic Breaker (L)	Breaker class 1600 kg	15
Air Compressor	Air Volume class 7-8 m ³ /min	5
Jack Hammer	21-22 kg class of Jack Hammer and air volume 2.4 m ³ /min	10

2) Finishing Work

The mean daily progress of the first excavation at a site is (1.72 km/month) / (25 day/month; average number of operating days per month) = 68.8 m/day. In comparison, finishing work has been performed at the rate of 210 m/day in average. Therefore, the number of equipment sets required for finishing work to match with the first excavation at 15 sites is as follows.

$$(68.8 \text{ m/day}) / (210 \text{ m/day}) = 0.328$$

$$15 \text{ sites} \times 0.328 = 4.9 \cong 5 \text{ sets}$$

Quantity of equipment for finishing work is as shown in Table 2-7.

Table 2-7 Quantity of Equipment for Finishing Work

Equipment	Specification	Quantity
Hydraulic Excavator (M)	Hydraulic excavator of 12 ton class and bucket capacity of 04 m ³	5
Hydraulic Breaker (M)	Breaker class 1000 kg	5
Vibration Roller	10-11 ton type vibration roller, Front: 2100 mm width steel drum, Rear: Rubber tire	5

3) Supporting Work

Truck-trailer

The 15 hydraulic shovel excavators (large) planned for procurement weigh more than 20 t each. Because CMU does not have vehicles for transporting machinery with 20 t or more carrying capacity, procurement of truck-trailer with 25 t carrying capacity is considered. While 25 heavy machines including hydraulic shovel excavators of the procured equipment would be required to be transported, procurement of one truck-trailer is considered, because the frequency of transportation would be about once in a half year.

Fuel Tanker

The fuel tanker currently owned by CMU is used in full operation for the supply of fuel to existing machinery. Therefore, procurement of a fuel tanker for the purpose of fuel supply to the procured machinery is considered. The fuel consumption required for Phase 2 rural agricultural road construction is calculated as shown in Table 2-8.

Table 2-8 Fuel Consumption by Work and Equipment

Work	Equipment	Engine Power (kW)	Fuel Consumption per Hour ※ (Lit/kW·h)	Running Time per Day (h)	Fuel Consumption per Day (Lit/Unit·d)	Number	Fuel Consumption per Day (Lit/d)
First Excavation	Excavator (L)	109	0.175	5	95	15	1,425
	Breaker (L)	-	-	-	-	15	-
	Air Compressor	62	0.189	3	35	5	175
	Jack Hammer	-	-	-	-	10	-
	Sub-total	-	-	-	130	-	1,600
Finishing Work	Excavator (M)	69	0.175	5	60	5	300
	Breaker (M)	-	-	-	-	5	-
	Vibration Roller	92	0.152	5	70	5	350
	Sub-total	-	-	-	130	-	650
Total		-	-	-	260	-	2,250

※Source : Coefficient of Fuel and Oil Consumption are based on the standard of the Ministry of Land, Infrastructure and Transportation, of Japan.

Monthly fuel consumption is:

$$2,250 \times 25 \text{ days} = 56,250 \text{ Lit/month.}$$

Fuel Storage Tank

Procurement of 3,000 liter fuel storage tanks for on-site fuel storage is considered for the purpose of ensuring stable supply of fuel and transportability of stored fuel at construction sites. One fuel tanker can supply 56,250 liter/month fuel. Considering on-site transportability, each fuel tank should have 4 wheels and a tow bar.

Ten tanks will be provided for the sites consuming much fuel; one each for 5 sites using air compressor for first excavation (130 liters/day) and 5 sites of finishing work (130 liter/day). At each of these sites, the placement of a fuel tank will enable the storage of fuel covering the operating days in approximately a month (3,000 liter / 130 liter/day = 23 days).

In the 10 sites where fuel consumption is low and fuel storage tanks are not placed, fuel will be provided with drums (200 liter x 6 drums = 1,200 liter) for the storage of fuel for about 13 days (1,200 liter / 95 liter/day). This would require fuel delivery at the frequency of twice a month.

Because past records show that a fuel tanker can deliver fuel to 1.5 sites/day in average, the number of deliveries that can be performed in a month (operating days) would be (1.5 deliveries/day) x (25 days/month) = 37.5 deliveries/month.

The number of deliveries required is 10 sites x once/month = 10 deliveries/month to the sites with fuel storage tanks plus 10 sites x twice/month = 20 deliveries/month to the sites without fuel storage tanks, totaling to 30 deliveries/month.

Because 37.5 deliveries/month is larger than 30 deliveries/month, the fuel tankers and the fuel storage tanks in quantities planned above are sufficient for providing fuel delivery.

Workshop Equipment

Procurement of manual tool sets, electrically powered tools, welding tools, etc. for 2 CMU branches is considered.

Mobile Workshop Van

At the present, CMU owns a mobile workshop van and it is being used in responding to major failures occurring at work sites. Major failures occur mostly in the machines procured before Phase 1, and the number of major failures occurring in Phase 1 equipment is also expected to increase as a result of aging.

According to past operation records, the average time required for repair is 5 days per site, including the days used for travel. Repair work is performed at 5 sites per month in average, and the mobile workshop van is used practically in full operation. The existing van is used for

the repair of mainly the 15 heavy machines procured before Phase 1, but the approximately 50 heavy machines and large vehicles procured in Phase 1 are also expected to require repair at a similar rate in the future. Based on this assumption, past records indicate that the number of new mobile workshop vans required would be:

$$50 \text{ units} / 15 \text{ vans} = 3.3 \cong 3 \text{ vans.}$$

Therefore, procurement of 3 vans is considered. To minimize the days needed for travel, each mobile workshop van will be assigned to regions as follows.

Table 2-9 Operation of Mobile Workshop Van

	Area	Base
Existing Mobile Workshop Van	Central	CMU (Bumthang)
New Mobile Workshop Van	Southern	Gelephu Branch (Sarpang)
	Eastern	Khangma Branch (Tashigang)
	Western & Northern	CMU (Bumthang)

Small Truck

At the present, CMU has a small truck and it is being used for regular inspection of equipment, replacement of expendable parts on construction sites, and repair of relatively minor failures. It is also being used for contacting transporting operators to and from the construction sites.

According to operation records, the period of work at a site is 2.5 days in average including travel days. It serves 10 sites in every month in average. However, according to the vehicle operation manager of CMU, the number of sites requesting dispatch is 14 in monthly average, and the existing trucks are actually insufficient to meet the current needs. Because the 11 sites (8 first excavation sites + 3 finishing work sites) in typical construction operation require 14 dispatches of the small truck in monthly average, the beginning of operation at 20 new sites using Phase 2 equipment (15 first excavation sites + 5 finishing work sites) would require small truck dispatch as follows.

$$20 \text{ sites/month} \times (14 \text{ sites/month} / 11 \text{ sites/month}) = 22.5 \text{ sites/month}$$

Therefore, the total number of dispatches required to the existing and newly procured machinery is:

$$14 \text{ sites/month} + 25.5 \text{ sites/month} = 39.5 \text{ sites/month}$$

Therefore, the required number of small trucks is:

$$39.5 \text{ sites/month} / 10 \text{ sites/month} = 3.95 \text{ units} \cong 4 \text{ units}$$

Only 3 new small trucks are required because one small truck is already exists.

To minimize travel days and improve efficiency of operation, each small truck will be assigned to regions as shown in Table 2-10.

Table 2-10 Operation of Small Truck

	Area	Base
Existing Small Truck	Central	CMU (Bumthang)
New Small Truck	Southern	Gelephu Branch (Sarpang)
	Eastern	Khangma Branch (Tashigang)
	Western & Northern	CMU (Bumthang)

Forklift

The request included 2 models of forklifts (1.5-2 t class and 3 t class loading capacity) for transporting parts in the repair workshop of the CMU headquarters. As CMU currently does not have a forklift, the parts arriving at the warehouse are taken out of packages (e.g., crates) and carried in small parts by human power, if such handling is possible. However, much manpower and time are consumed for carrying-in and carrying-out of cargos at the warehouse, and it is difficult to put items onto higher shelves. Although indivisible heavy parts are unloaded using the overhead travelling crane at the repair facility, this does not allow storage in the warehouse, and such items are stored in the repair yard, causing a shortage of work space for repair.

Therefore, a forklift is needed for carrying-in and carrying-out of parts and the movement within the warehouse to support efficient management of parts, effective use of warehouse space, and the use of the repair yard for its original purpose as a repair work space. The expected heavy parts would weigh 2 t or more in the case of a combination of chain link and truck shoe. The forklift is not likely to be operated regularly for purposes other than transporting parts, and a forklift with the 3 t class loading capacity is sufficient for all tasks.

Table 2-11 Quantity of Equipment for Supporting Work

Equipment	Specification	Quantity
Truck Trailer	25 ton of maximum loading capacity and Low bed type	1
Fuel Tanker	Loading capacity 3000 liter	1
Fuel Storage Tank	3000 liter fuel storage capacity and movable	10
Workshop Equipment	Manual tools, tools for welding and electrically powered tools	2
Mobile Workshop Van	8ton class and 4 wheel drive van truck having tools for major repair including a crane inside	3
Small Truck	4 wheel drive, 800-1000 kg of Maximum Loading and 5 crew	3
Forklift	3 ton of maximum loading	1

2.2.3 Outline Design Drawing

Table 2-12 shows the list of equipment to be procured according to the examination in the previous section.

Table 2-12 List of Equipment to be Procured

Equipment	Specification	Requested	Proposed
Hydraulic Excavator (L)	Hydraulic excavator of class 20 ton and bucket capacity of 0.8 m ³	20	15
Hydraulic Breaker (L)	Breaker class 1600 kg	20	15
Hydraulic Excavator (M)	Hydraulic excavator of 12 ton class and bucket capacity of 0.4 m ³	5	5
Hydraulic Breaker (M)	Breaker class 1000 kg	0	5
Vibration Roller	10-11 ton type vibration roller, Front: 2100 mm width steel drum, Rear: Rubber tire	5	5
Air Compressor	Air Volume class 7-8 m ³ /min	5	5
Jack Hammer	21-22 kg class of Jack Hammer and air volume 2.4 m ³ /min	40	10
Truck Trailer	25 ton of maximum loading capacity and Low bed type	0	1
Self Loader Truck	20 ton of maximum loading capacity	1	0
Fuel Tanker	Loading capacity 3000 liter	1	1
Fuel Storage Tank	3000 liter fuel storage capacity and movable	10	10
Workshop Equipment	Manual tools, tools for welding and electrically powered tools	2	2
Mobile Workshop Van	8 ton class and 4 wheel drive van truck having tools for major repair including a crane inside	3	3
Small Truck	4 wheel drive, 800-1000 kg of Maximum Loading and 5 crew	3	3
Forklift	3 ton of maximum loading	1	1
Forklift	1.5 to 2 ton of maximum loading	1	0
Spare Parts	Quantity calculated based on the following conditions, Heavy equipment with 3,000h working time, Vehicles with 30,000kmdriving	1	1

2.2.4 Implementation Plan

2.2.4.1 Implementation Policy

(1) Project Implementation Structure

Figure 2-1 shows the systematic relationship of organizations in the both countries assuming

that the Project would be implemented by the grant aid from the Government of Japan.

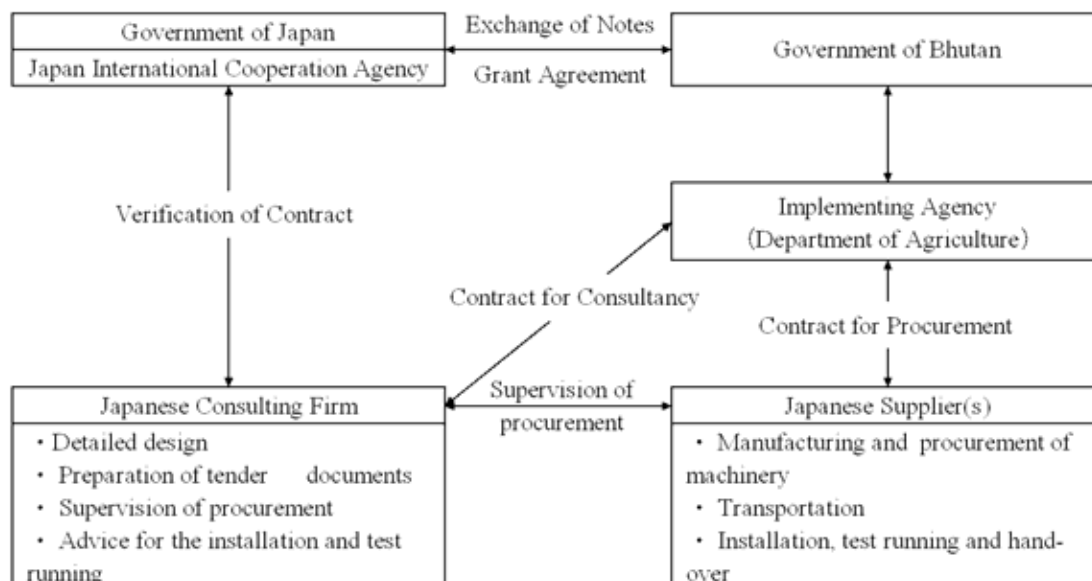


Figure 2-1 Mechanism of Project Implementation

The implementing agency on the Bhutanese side is the Ministry of Agriculture Department of Agriculture. Following the system of Japan's grant aid, implementation design and procurement supervision will be performed by the Japanese consulting firm, and Japanese entities will act as the main contracting party in equipment procurement for the Project.

(2) Bhutanese side

The implementing agency on the Bhutanese side is the Department of Agriculture, Ministry of Agriculture, which carry out the constructions of rural agricultural road. Under the Department of Agriculture, CMU (Central Machinery Unit) operate and maintain the equipment. CMU has headquarters office at Jakar in Bumthang Dzongkhag and 2 branch office at Gelephu in Sarpang Dzongkhag and at Khangma in Tashigang Dzongkhag. The main work on operation and maintenance for the equipment is executed in the CMU headquarters.

(3) Consultant

After the conclusion of E/N and G/A, the Ministry of Agriculture, Department of Agriculture promptly enters into a service contract (consultant contract) with the Japanese consultant. The consultant under the contract provides engineering services for the Project, including those concerning implementation design, preparation of tender documents, support in tender execution, supervision of procurement, etc., and assumes responsibility until the completion of equipment delivery in the Project.

(4) Equipment Supplier

The supplier(s) who passed the examination regarding the required product quality and specifications and made a successful bid in competitive bidding with pre-qualification enters into a contract with the Ministry of Agriculture, Department of Agriculture regarding the supply of equipment planned for the Project.

2.2.4.2 Implementation Conditions

The procured equipment will be landed at Kolkata Port in India with a trip of about one month and about 8,800 km from Japan by surface. After provisional customs clearance at Kolkata Port, the equipment will be transported by land transportation in India and subjected to customs clearance procedures in Phuntsholing on the Indian-Bhutanese border. The equipment will be transported from there to CMU in Jakar, Bumthang Dzongkhag over the distance of about 426 km, and will be handed over to the Bhutanese side.

While the transportation to CMU will be carried out by the Japanese side, the transportation of equipment after hand over to the rural agricultural road construction sites in the Project will be carried out by the Bhutanese side.

Because equipment will be procured under the aforementioned transport conditions, the equipment supplier must make necessary arrangements so that there will be no discordance with the Bhutanese side regarding liability for flaws such as possible breakage and theft during marine transport, during landing, and during land transport (in India and Bhutan).

2.2.4.3 Scope of Works

All cost concerning equipment procurement including the cost of transport to CMU and the cost of assembly at the time of unloading will be borne by the Japanese side. However, the Bhutanese side will bear all the cost after unloading of equipment, such as the cost of transport to the rural agricultural road construction site. Table 2-13 lists the costs covered by respective countries.

Table 2-13 Responsibility of Each Governments

Item	Contents	Undertaken by		Remarks
		Japan	Bhutan	
Procurement of Equipment	Procurement	○		Up to Customs
	Land and Marine Transportation	○		
	Customs Clearance		○	Including tax exemption Beyond Customs
	Inland Transportation	○		
Operation Guidance	Operation Guidance	○	○	
	Inspection Guidance	○	○	
Maintenance Work	Forwarding the equipment		○	to operating office
	To Secure Parking Place		○	
	Maintenance of Equipment		○	

2.2.4.4 Consultant Supervision

After the conclusion of E/N and G/A, the Japanese consultant enters into a consulting service contract with the Bhutanese government within the scope of work indicated in E/N under the framework of Grant Aid, and performs implementation design and procurement supervision services. It is important that the consultant provides services with sufficient understanding of the background of the Project and the background and purpose of outline design concerning the formulation of assistance details.

(1) Implementation Design Service

The main components of implementation design service are as follows.

- Starting discussion and on-site confirmation
- Review of equipment specifications
- Preparation of tender documents
- Explanation of tender documents and obtaining approval
- Support to tender work (public announcement, distribution of documents, execution of bidding, evaluation of result)
- Support to contract facilitation (contract negotiations, attendance to the signing of contract, contract authorization procedures)

(2) Procurement Supervision Service

The main components of procurement supervision service are as follows.

- Issuance confirmation of equipment order forms
- Factory inspection and pre-delivery inspection
- Pre-shipment inspection (entrusted to a third party organization)
- On-site preparatory meetings (delivery schedule, confirmation of tax exemption, details of

initial guidance)

- Attendance to initial operation guidance and inspection/servicing guidance
- Receiving inspection and hand-over.

2.2.4.5 Quality Control Plan

To confirm that the procured equipment satisfies the product quality and specifications defined in the contract, the following inspections will be performed at various stages of procurement work.

- Confirmation of the content of equipment order form issued by the supplier
- Factory inspection and pre-delivery inspection at the factory of equipment manufacturer
- Pre-shipment inspection
- Inspection at the time of equipment hand-over.

2.2.4.6 Procurement Plan

(1) Present State of Procurement Sources

All equipment used by CMU are the Japanese products procured in the past during “The Project for the Paro Valley Agricultural Development” and “The Project for Improvement of Machinery and Equipment for Construction of Rural Agricultural Road”. These products are evaluated highly effective in terms of performance, product quality, and servicing, and both operators and mechanics are familiar with the handling of Japanese equipment. Similarly, most of the equipment provided to the Ministry of Works and Human Settlement are also Japanese products, and these are evaluated highly in terms of performance, product quality, and reliability of after-sale servicing.

During the discussion concerning procurement sources, the Ministry of Agriculture, Department of Agriculture acting as the implementing body expressed the strong desire for early procurement in the Project, and the Department strongly wants to have Japanese products, which offer high reliability of procurement time from production to delivery. The local survey concerning requested equipment showed the advantage of Japanese products in terms of popularity, product quality, performance, servicing system, and spare parts supply system.

As shown in Table 2-14, there are local agents of major Japanese manufacturers in Bhutan, extending a system for adequate servicing in the country. The survey concerning these agents indicated that they have a satisfactory level of capability in all aspects including technical power and supply of parts.

Table 2-14 List of Local Agents of Major Japanese Manufacturer

Name of Agent	Base	Manufacturer
Chhundu Enterprises	Phuentsholing	Caterpillar
Continental Bhutan Enterprises	Phuentsholing	Komatsu
Druk Trading Equipment	Phuentsholing	Kobelco, Sakai
Kays Consultancy & Marketing Services	Phuentsholing	Hitachi
Sonam Trading (Kiang Ann Engineering Ltd.)	Thimpu	Caterpillar , Komatsu , Kobeico , Mitsubishi, Hitachi, Sumitomo, Kato
State Trading Corporation	Thimpu	Isuzu, Toyota, Mitsubishi

In addition to those listed in the above Table, there are several suppliers dealing in the parts (rather than whole systems) of Japanese products in Bhutan.

Procurement from a third country will also be considered according to the preconditions for procurement from a third country in “The Guidelines for Project Cost Estimation Concerning Grant Aid (Equipment), April 2004” for the purpose of cost reduction. The product considered for procurement from a third country will be the products of a country offering product quality comparable to Japanese products, being used popularly in the recipient country, and supported by a well-established system for after-sale servicing by agents, etc.

Because the analysis in Bhutan revealed that there is only one manufacturer of small trucks in the country, procurement from a third country must be considered as an option with respect to this item. Several Japanese manufactures are producing small trucks in Thailand, and the product quality and the system for servicing in Bhutan is well established. Therefore, Thailand is considered a source of third-country procurement of small trucks.

With respect to vehicles and construction machines, European and American products are rarely used in Bhutan and a reliable system for servicing has not been established yet. Therefore, these countries are not considered as the source of third-country procurement of these items.

Indian vehicles are used popularly in Bhutan and a system for servicing has been established. However, informants in Bhutan pointed out the following factors.

- Due to the poor quality and unevenness of metals used in parts, products show large variance in strength and frequently develop cracking and breaking of parts. Durability is poor in comparison with Japanese products.
- Variance in performance among individual units is large, and products sometimes fail to achieve the performance listed in the catalogue.
- Suppliers lack reliability in delivery time of parts and other items

Because of these factors, procurement of Indian products may reduce the effectiveness of grant aid, and therefore is considered inappropriate for the procurement in the Project.

(2) Procurement Route

1) Marine Transport

Items will be transported by sea from Japan to Kolkata (approximately 8,800 km). Although there are many container carriers that can be used for this transportation, conventional vessels operate at intervals of about once a month and the transport period is about 30 days. About 4 days is needed at Kolkata Port for offshore waiting, unloading, and provisional customs clearance.

2) Land Transport in India

The transport route from Kolkata to Phuntsholing uses Indian National Roads No. 34 and No. 31, on which road conditions are good. Major cities along the transport route and distances between cities are: Kolkata → (325 km) → Malda → (330 km) → Jalpaiguri → (100 km) → Hasimara → (21 km) → Phuntsholing, totaling to 776 km.

3) Land Transport in Bhutan

Customs clearance procedures will be completed in Phuntsholing (about 2 days). Major cities along the usual transport route from Phuntsholing to CMU in Jakar and the distances between cities are: Phuntsholing (National Road No. 2, 166 km) → Semtoka (National Road No. 1, 65 km) → Wangdu Phodrang (National Road No. 1, 129 km) → Trongsa (National Road No. 1, 66 km) → Jakar, totaling to 426 km. The transport in Bhutan requires the following precautions.

- Equipment transport during the rainy season (from June to September) should be avoided, because even trunk roads are frequently interrupted by landslides, rock falls, mudflow, etc.
- Roads passing through mountainous area exceeding the elevation of 3,000 m may freeze in winter, and roads may also be closed for snow plowing. Therefore, transportation should be planned allowing extra hours.
- Roads in mountainous areas are often routed beneath overhanging rocks. Extreme caution must be used when passing such locations. A cargo such as a large hydraulic shovel excavator may need to be unloaded and let travel by itself.
- Because the number of shipping companies having trailers is limited, transportation of all equipment would take about 1 month.

4) Third Country Procurement

Items will be transported by sea from Bangkok to Kolkata (approximately 4,600 km). In

Kolkata Port, offshore waiting, unloading, and provisional customs clearance are necessary. Then, items will be transported by land through India to Bhutan.

2.2.4.7 Operational Guidance Plan

(1) Adjustment and Test Run Plan

Following the delivery of equipment, the engineers dispatched by the procurement contractor perform the test run and adjustment of procured equipment to confirm the normal operation of equipment. Procurement of 14 different types of equipment is planned in the Project, and the number of manufacturers supplying these items is expected to be large. Staff allocation will be planned so that each engineer will take charge of multiple equipment types and all activities including initial operational guidance will be performed by 2 engineers.

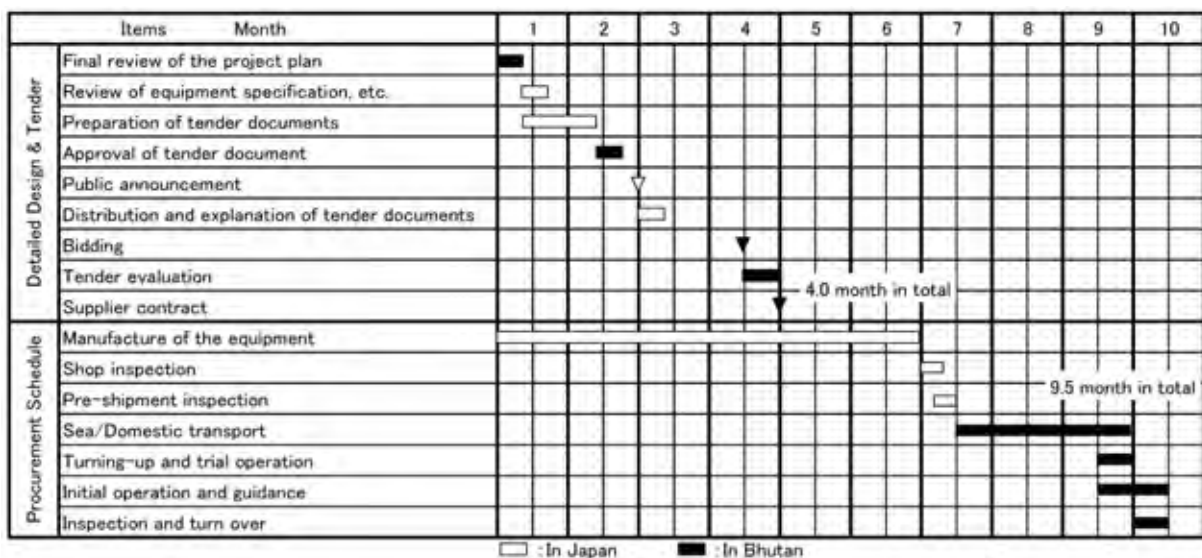
(2) Initial Operational Guidance Plan

These 2 engineers above mentioned will be in charge of instruction of operational guidance and routine inspection. Because the implementation organization has experience in the use of equipment from Japanese manufactures and is accustomed to the general handling of equipment, instructions will focus on the explanation of operation and inspection procedures that are specific to respective equipment items.

2.2.4.8 Implementation Schedule

The Project will be implemented based on Japan’s grant aid according to the schedule shown in Table 2-15.

Table 2-15 Project Implementation Schedule



2.3 OBLIGATIONS OF RECIPIENT COUNTRY

When the Project is implemented by Japan's grant aid, the obligations of the Bhutanese side will be as follows.

- Payment of banking charges to a Japanese bank based on banking arrangement (B/A).
- Provision of convenience to Japanese persons engaged in the Project concerning the entry to and staying in Bhutan and visits to relevant governmental organizations for business purposes.
- Exemption of custom duties and other domestic taxes to Japanese persons and Japanese corporations engaged in the Project.
- Preparation and exemption of documents needed for speedy customs clearance of the equipment procured in relation to the Project at Kolkata Port and Phuntsholing.
- Transportation of procured equipment from CMU to construction site.
- Placement of staff and provision of convenience concerning initial operational guidance and inspection and servicing guidance.
- Execution of appropriate and effective use and maintenance of procured equipment.
- Execution of appropriate construction and maintenance of targeted roads.
- Payment of all costs related to the Project other than those to be borne by the Japanese side as grant aid.

2.4 PROJECT OPERATION PLAN

2.4.1 Equipment Maintenance Capability

The Ministry of Agriculture, Department of Agriculture which is the implementing organization is conducting the operation and maintenance of road equipment at CMU. Most of the equipment owned by CMU at the present is the Japanese products procured in the Project “The Project for Improvement of Machinery and Equipment for Construction of Rural Agricultural Road” in 2006, and these are still used without major failures owing to adequate performance of routine inspection and regular inspections. In addition, the equipment procured in “The Project for the Paro Valley Agricultural Development” in 1990 is also operated with overhauling and other maintenance efforts despite aging, demonstrating a high level of technical capability. Thus, CMU has established a system for reliable maintenance, and the equipment procured in the Project can be maintained appropriately using the same method as before.

2.4.2 Personnel Plan

CMU currently employs 66 personnel including operators, drivers, and assistants. The procurement of new equipment in the Project will necessitate 34 new employees estimated by the survey team as listed in Table 2-16.

Table 2-16 Staffing after Procurement of Equipment

Equipment	Number	
	Operator	Driver
Excavator (L)+Breaker (L)	15	
Excavator (M)+Breaker (M)	5	
Vibration Roller	5	
Air Compressor		
Jack Hammer		
Low Lorry		1
Fuel Tanker		1
Mobile Workshop Van		3
Small Truck		3
Forklift		1
Sub-total	25	9
Total	34	

In response, CMU has developed a staffing plan shown in Table 2-17 to meet the needs arising from the procurement of equipment. This staffing plan and associated budget have been approved by the Ministry of Agriculture and GNHC, and the increase in personnel will be deployed in time for the procurement of equipment. This will ensure the provision of personnel required for the procured equipment.

Table 2-17 CMU's Staffing Plan

Position	Number	Position	Number
Mechanic	3	Operator	26
Assistant mechanic	2	Driver	8
Technician	7		
Sub-total	12	Sub-total	34
Total			46

2.5 PROJECT COST ESTIMATION

2.5.1 Initial Cost

(1) Cost Borne by the Government of Japan

The project will be implemented in accordance with the Japan's Grant Aid scheme and the cost will be determined before concluding the Exchange of Note for the Project.

(2) Cost Borne by the Bhutanese Side

Cost Borne by the Government of Bhutan is Nu 296.4 thousand.

(3) Conditions in Cost Estimation

- Estimated timing: June, 2009
- Exchange rate: 1 US\$ = Yen 95.69, Nu 1.0 = Yen 0.49
- The period of procurement: The period of implementation design and equipment procurement is as shown in the implementation schedule.
- Other: The Project is assumed to be implemented according to the scheme of Japan's Grant Aid.

2.5.2 Operation and Maintenance Cost

Table 2-18 shows the estimates of fuel and oil cost required for the operation of equipment after the introduction of equipment. Because fuel cost will be borne by the Dzongkhags requesting construction, CMU needs to cover the cost of oil, including grease, lubricating oil, working oil, etc., which is estimated to be US\$3,923 (approximately 186,200 Nu) annually.

Table 2-18 Estimated Cost of Fuel and Oil

No.	Equipment	Spec. (kw)	No. of Unit	Working Hour		Fuel Consumption		
				(h/day)	(day/year)	(L/h · unit)	(L/year · unit)	(L/year)
1	Hydraulic Excavator (L)	109	15	5	240	19.0	22,800	342,000
2	Hydraulic Excavator (M)	69	5	5	240	12.0	14,400	72,000
3	Vibration Roller	92	5	5	240	14.0	16,800	84,000
4	Air Compressor	62	5	3	240	11.7	8,424	42,120
5	Jack Hammer	—	10	—	—	—	—	—
6	Fuel Tanker	88	1	5	240	3.5	4,200	4,200
7	Truck Trailer	230	1	5	240	11.5	13,800	13,800
8	Fuel Storage Tank	—	10	—	—	—	—	—
9	Mobile Workshop Van	130	3	5	240	6.5	7,800	23,400
10	Small Truck	65	3	5	240	3.3	3,960	11,880
11	Forklift	37	1	3	240	1.4	1,008	1,008
	Total							594,408
Conditions in the cost estimate: - Fuel consumption: “Depreciation Calculation Table for Construction Equipment, Etc.” (2008 Version), Japanese edition - Oil cost: 1% of fuel consumption cost - Diesel price : US\$0.66/litter = 63.16Yen/litter								
Fuel Cost (Annual)	594,408L×US\$0.66/L=US\$392,309					Approx. 18,39 million Nu		
Oil Cost (Annual)	US\$392,309×1%=US\$3,923					Approx. 183,942 Nu		
Total	US\$396,232					Approx. 18,58 million Nu		

Annual maintenance and repair cost is estimated to be US\$138,437 (approximately 6.49 million Nu), as shown in Table 2-19. As mentioned above, the operation and maintenance cost to be borne by CMU is estimated to be US\$142,360/year (approximately 13.63 million yen).

CMU has planned an estimated budget of US\$228,952/year (approximately 10.73 million Nu) for the operation and maintenance cost associated with the procurement of equipment. Similar to the personnel plan and budget, this estimation has been approved by the Ministry of Agriculture and GNHC, and the increase in budget will be disbursed in time for the procurement of equipment. This will ensure the coverage of operation and maintenance cost associated with the procurement of equipment.

Table 2-19 Estimated Cost of Maintenance and Repair

No.	Equipment	Spec. (kw)	Unit	Rate of Maintenance and Repair Cost/ Year • Unit	Maintenance and Repair Cost/ Year • Unit	Maintenance and Repair Cost/ Year (10000 Yen)
1	Hydraulic Excavator (L)	109	15	0.35/11.25=0.031	465,000	697.5
2	Hydraulic Excavator (M)	69	5	0.35/11.25=0.031	310,000	155.0
3	Vibration Roller	92	5	0.35/16.5=0.021	210,000	105.0
4	Air Compressor	62	5	0.30/16.5=0.018	63,000	31.5
5	Jack Hammer	—	10	0.30/7.5=0.040	6,000	6.0
6	Fuel Tanker	88	1	0.45/15=0.030	150,000	15.0
7	Truck Trailer	230	1	0.35/15=0.023	359,000	35.9
8	Fuel Storage Tank	—	10	0.35/15=0.023	46,000	46.0
9	Mobile Workshop Van	130	3	0.45/15=0.030	660,000	198.0
10	Small Truck	65	3	0.45/15=0.030	90,000	27.0
11	Forklift	37	1	0.35/13.5=0.026	78,000	7.8
	Total					1,324.7
Conditions in the cost estimate: - Rate of annual maintenance and repair cost: Rate of maintenance and repair cost for standard working year / standard working year - Working Lifetime: Working Lifetime of Japan ×1.5 (Apply to actual condition in Bhutan) Equipment Price: Body price or estimated price (CIF) - Rate of maintenance and repair cost: Standard working year and body price is based on the “Depreciation Calculation Table for Construction Equipment, Etc.” (2008 Version), Japanese edition						
Annual Maintenance and Repair Cost				US\$138,437	Approx. 6.49 million Nu	

2.6 OTHER RELEVANT ISSUES

When the Project is implemented by Japan’s grant aid, it is necessary that the Bhutanese side reliably execute its obligations according to the aforementioned list of obligations.

While the customs clearance procedures and tax exemption treatment in Phuntsholing are the obligations of the Bhutanese side, the fact that these take place after land transport from Kolkata Port in India makes it necessary that the Bhutanese side can reliably predict the time when each equipment item would reach Phuntsholing. For this sake, procurement contractors should communicate in advance with the implementing organization and make regular contacts during transportation as well.

Because the Ministry of Agriculture, Department of Agriculture which is the implementing organization has an experience of grant aid in the past, it is anticipated that there would be no problems in the implementation of the Project.

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATION

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATIONS

3.1 PROJECT EFFECT

(1) Present State and Problems

Although 1,754 km of rural agricultural road development was constructed before the 10th FYP, there are still many isolated rural villages scattered throughout Bhutan.

(2) Actions in the Grant Aid Project

To provide machinery and equipment for rural agricultural road construction that can achieve the rural agricultural road construction target (1,500 km) of Bhutan during the period of the 10th FYP (675 km by Phase 2 equipment and 825 km by the existing equipment).

(3) Direct Effects and Extent of Improvement

- The total length of rural agricultural roads constructed by CMU machinery will be 1,500 km within the 10th FYP.
- Additional 14,312 households (83,040 persons) will have access to rural agricultural roads.
- The Project shortens the travel time to the Gewog center including administrative offices, healthcare facilities and education facilities.

(4) Indirect Effects and Extent of Improvement

- Transport of agricultural products and commodities using automobiles will lead to increase the income and improve living conditions in the project area.
- The development of social infrastructure including electricity will be accelerated.
- The participation percentage of inhabitants in meetings, elections, etc. will be increased and consequently promote for further progress in decentralization.

3.2 RECOMMENDATIONS

(1) Obligation of Reporting after Procurement of Equipment

Although we can now evaluate the Phase 1 project that the target has been achieved, this fact was not clear before the field survey in Bhutan. In this respect, we urged to the Bhutanese side concerning the obligation of reporting after the procurement of equipment. The Team has explained the reasons why Japanese side needs it and Bhutanese side agreed in this matter and mentioned in the M/D accordingly.

- Reports should be submitted from Bhutan's Ministry of Agriculture to JICA Bhutan Office twice a year at least 3 years after procuring the machinery in the Project or by the time total extension length reach to 1,500 km, whichever comes later.
- The plan would include not only for machinery procured by the Project but also the existing ones managed by CMU.

The format showing the details of reporting is attached in the Appendices 5.

(2) Technical Support to CMU

The results of the field survey indicate that CMU has sufficient basic capability for the management, operation maneuvers, and maintenance of equipment. The dispatch of JICA senior volunteers is planned for 2 years starting from October 2009, and it is thought that it may help for further improvement of operation and maintenance techniques. Numbers of senior volunteers have been dispatched to CMU in the past and they contributed greatly for the training of district-level engineers and operation and management of workshop. Senior volunteer dispatch in the field of mechanics is also planned from October, 2009.

CMU wishes to have engineers trained in Japan in the maintenance and repair of equipment. Modern construction machines often incorporate the integration of electrical systems and mechanical parts (electromechanical) and conventional technical skills cannot maintain properly because conventional technicians cannot perform both job individually. There are no institutions in Bhutan that can teach such technology to meet such electromechanical skills. Therefore, it is necessary to learn the state-of-the-art of the maintenance of equipment at appropriate places in Japan such as manufacturing companies. Participation in appropriate JICA training courses in Japan is considered an effective solution.

APPENDICES

1. Member List of the Survey Team
2. Survey Schedule
3. List of Parties Concerned in the Recipient Country
4. Minutes of Discussions
5. Monitoring Sheet

APPENDIX 1

MEMBER LIST OF THE SURVEY TEAM

Appendix 1: Member List of the Survey Team

1) Field Surveys

	Name	Job title	Affiliation
1	Mr. Takao SHIBUSAWA	Team Leader	Director of Planning and Coordination Division, Rural Development Department, JICA
2	Mr. Kenichirou KOBAYASHI	Coordinator	South Asia Division 2, South Asia Department, JICA
3	Mr. Takuji KONO	Chief Consultant/ Farm Road Planner	Katahira & Engineers International
4	Mr. Kiyohito KOBAYASHI	Equipment Planner/ Maintenance Planner	Katahira & Engineers International
5	Mr. Kazuo Mizukoshi	Procurement Planner/ Cost Estimator	Katahira & Engineers International

2) Explanation of the Draft Final Report

	Name	Job title	Affiliation
1	Mr. Tomoki NITTA	Team Leader	Resident Representative, JICA Bhutan Office
2	Mr. Takuji KONO	Chief Consultant/ Farm Road Planner	Katahira & Engineers International
3	Mr. Kiyohito KOBAYASHI	Equipment Planner/ Maintenance Planner	Katahira & Engineers International

APPENDIX 2

SURVEY SCHEDULE

1) Field surveys (May 10 2009 to June 15 2009)

		Leader MR.SHIBSAWA	Coordinator MR.KOBAYASHI	Chief Consultant/ Farm Road Planner MR.KONO	Equipment Planner/ Maintenance Planner MR.KOBAYASHI	Procurement Planner/ Cost Estimator MR.MIZUKOSHI
1	MAY 10 (Sun)					Tokyo to Bangkok
2	MAY 11 (Mon)					Bangkok to Paro
3	MAY 12 (Tue)					Meeting w/ JICA Bhutan Office
4	MAY 13 (Wed)					Meeting w/ MOA, CDCL
5	MAY 14 (Thu)					Meeting w/ MOA, DOA
6	MAY 15 (Fri)					Meeting w/ DOA, MOWHS
7	MAY 16 (Sat)					Reporting
8	MAY 17 (Sun)				Tokyo to Bangkok	Reporting
9	MAY 18 (Mon)	Tokyo to Bangkok	Katmandu to Paro	AM:Bangkok to Paro, PM:Meeting w/ JICA Bhutan Office		
10	MAY 19 (Tue)	AM:Bangkok to Paro, PM:Meeting w/ JICA Bhutan Office, MOA				
11	MAY 20 (Wed)	Meeting w/ GNHC, JICA Bhutan Office, MOA, CDCL				
12	MAY 21 (Thu)	Field trip Thimphu to CDCL office in Hesothangkha of W/phodrang, CMU in Jakar of Bumthang				
13	MAY 22 (Fri)	Meeting w/ CMU, FR construction site investigation in Bumthang				
14	MAY 23 (Sat)	Moving from Jakar to Trongsa, FR construction site investigation in Trongsa				
15	MAY 24 (Sun)	Moving from Trongsa to Thimphu				
16	MAY 25 (Mon)	Meeting w/ MOA, DOA, GNHC and JICA on MD				
17	MAY 26 (Tue)	AM:Signing on MD, Meeting w/ JICA, PM:Field trip to Paro, AMC				
18	MAY 27 (Wed)	Paro to Bangkok		Moving from Paro to Thimphu		
19	MAY 28 (Thu)	Bangkok to Tokyo		Team meeting and reporting		
20	MAY 29 (Fri)			FR construction site investigation in Thimphu		
21	MAY 30 (Sat)			Reporting		
22	MAY 31 (Sun)			FR construction site investigation in Punakha		
23	JUNE 1 (Mon)			Meeting w/ DOA, Reporting		
24	JUNE 2 (Tue)			Meeting w/ DOA, Reporting		
25	JUNE 3 (Wed)			Meeting w/ DOA, Reporting		
26	JUNE 4 (Thu)			Meeting w/ DOA, Reporting		
27	JUNE 5 (Fri)			Meeting w/ DOA, CMU, Reporting		
28	JUNE 6 (Sat)			Field trip to Dampu of Tsirang		
29	JUNE 7 (Sun)			Field trip to Gelephu and CMU branch office and W/phodrang		
30	JUNE 8 (Mon)			Moving from W/phodrang to Thimphu		
31	JUNE 9 (Tue)			Meeting w/ DOA, Reporting		
32	JUNE 10 (Wed)			Meeting w/ DOA, Reporting		
33	JUNE 11 (Thu)			Meeting w/ DOA, Reporting		
34	JUNE 12 (Fri)			Meeting w/ SNV, DOA, JICA Bhutan Office		
35	JUNE 13 (Sat)			Team meeting and Reporting		
36	JUNE 14 (Sun)			Paro to Bangkok		
37	JUNE 15 (Mon)			Bangkok to Tokyo		

MOA:Ministry of Agriculture
MOWHS:Ministry of Works & Human Settlement
GNHC:Gross National Happiness Commission

CMU:Central Machinery Unit, Bumthang
DOA:Department of Agriculture
DOR:Department of Roads

2) Explanation of the draft final report (October 11 2009 to October 20 2009)

		Mr. Tomoki NITTA Team leader Resident Representative JICA Bhutan Office	Mr. Takuji KONO Chief Consultant/ Farm Road Planner	Mr. Kiyohito KOBAYASHI Equipment Planner/ Maintenance Planner
1	OCTOBER 11 (Sun)			Narita-Bangkok (JL717)
2	OCTOBER 12 (Mon)			Bangkok-Paro (KB125, 0940 AM), Courtesy call to JICA, and MOA
3	OCTOBER 13 (Tue)			Draft report explanation and Discussion with MOA and DOA
4	OCTOBER 14 (Wed)			Draft report explanation and Discussion with MOA and DOA
5	OCTOBER 15 (Thu)			Draft report explanation and Discussion with MOA and DOA
6	OCTOBER 16 (Fri)	Signing on Minutes of Discussion(M/D)		
7	OCTOBER 17 (Sat)		Datum collection and arrangement	
8	OCTOBER 18 (Sun)		Datum collection and arrangement	
9	OCTOBER 19 (Mon)		Paro-Bangkok	
10	OCTOBER 20 (Tue)		Bangkok-Narita	

APPENDIX 3

LIST OF PARTIES CONCERNED IN THE RECIPIENT COUNTRY

Appendix 3: List of Parties Concerned in the Recipient Country

Ministry of Foreign Affairs

Lyonpo Ugyen Tshering Minister
Mr. Sonam Phuntsho Senior Desk Officer, Asia Desk II, Dep. of Bilateral Affairs

Gross National Happiness Commission

Mr. Norbu Wangchuk Officer

Ministry of Agriculture

Lyonpo (Dr.) Pema Gyamtsho Minister
Dasho Sherub Gyaltsen Secretary
Mr. Tenzin Chophel Chief Planning Officer, Policy and Planning Division
Mr. Karma Sonam Planning Officer, Policy and Planning Division
Mr. Tashi Samdup Director, Council for Renewable Natural Resources Research

Department of Agriculture

Mr. Chencho Norbu Director
Mr. Minjur Dorji Chief Engineer, Engineering Division
Mr. Tenzin Executive Engineer, Engineering Division
Mr. D.S.Tamang Engineer, Engineering Division
Mr. Ugyen Drukpa Assistant Engineer, Engineering Division

Central Machinery Unit

Mr. Penjor Officer-in-charge of CMU
Mr. Rinchen Wangdi Executive Engineer (in charge, Branch office Gelephu)
Mr. Ugen Dorji Senior Accountant
Mr. Namgay Tshering Workshop in charge
Mr. N.B.Chhetri Store Officer
Mr. Chencho Dorji Equipment in charge

Construction Development Co. Ltd.

Mr. Bharat Darji Senior Senior General Manager, HQ
Mr. D. N. Sharma Senior Manager (Procurement & Repair), HQ
Mr. Sangay Lungten Manager of Rebuild & Fabricating, Hesothangkha
Mr. Tashi Wangchuk Manager of Fleet, Hesothangkha

Ministry of Works and Human Settlement

Mr. Sangay Tenzin Chief Planning Officer, Policy & Planning Division

Department of Roads

Mr. Sangay Tenzing Director General

Appendix 3: List of Parties Concerned in the Recipient Country

Bumthang Dzongkhag	
Dasho Dzongdag	Governor
Dasho Drangpon	Royal Court of Justice
Mr. Kaylzang Tshering	Director, Samtse College of Education Royal University
Mr. Gaylog	Assistant Agriculture Officer
Mr. Sonam Dendup	Geog Administration Officer, Tang Geog
Trongsa Dzongkhag	
Mr. M.B. Mongar	Executive Engineer
Mr. Dorji Wangchuk	Junior Extension Officer, Nubi Geog
Punakha Dzongkhag	
Mr. Yonten Gyamtsho	Agriculture Officer
Mr. Doley	Geog Administration Officer, Chubu Geog
Mr. Toewang	Geog Administration Officer, Tauchu Geog
Thimphu Dzongkhag	
Mr. Jigme	District Agriculture Officer
Mr. Sonam Dorji	Geog Administration Officer, Kawang Geog
Netherlands Development Organization	
Mr. Kencho Wangdi	Portfolio Coordinator-Central
JICA Bhutan Office	
Mr. Yabe Tetsuo	Resident Representative
Mr. Nitta Tomoki	Resident Representative (Successor)
Mr. Usui Taiji	Project Formulation advisor
Mr. Kinley Dorji	Senior Program Officer
JICA Expert	
Mr. Tomoaki Tsugawa	Local Government & Decentralization Project Phase II
Dr. Hai Sakurai	Strengthening of Farm Mechanization Project

APPENDIX 4

MINUTES OF DISCUSSIONS

**MINUTES OF DISCUSSION
ON THE PREPARATORY SURVEY
ON THE PROJECT FOR IMPROVEMENT
OF MACHINERY AND EQUIPMENT
FOR CONSTRUCTION OF RURAL AGRICULTURAL ROAD (PHASE 2)
IN THE KINGDOM OF BHUTAN**

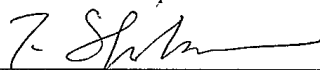
In response to the request from the Royal Government of Bhutan, the Government of Japan decided to conduct a Preparatory Survey on the Project for Improvement of Machinery and Equipment for Construction of Rural Agricultural Road (Phase 2) (hereafter referred to as "the Project") and entrusted the survey to the Japan International Cooperation Agency (hereafter referred to as "JICA").

JICA sent to the Kingdom of Bhutan (hereafter referred to as "Bhutan") the Preparatory Survey Team (hereafter referred to as "the Team"), headed by Mr. Takao Shibusawa, Director of Planning and Coordination Division, Rural Development Department, JICA. It is scheduled to stay in the country from 11th of May to 13th of June, 2009.

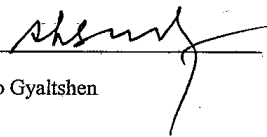
The Team held discussions with the officials concerned of the Royal Government of Bhutan and conducted a field survey.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further work and prepare the Preparatory Survey Report.

Thimphu, 26th May 2009



Mr. Takao Shibusawa
Leader
Preparatory Survey Team
Japan International Cooperation Agency



Dasho Sherub Gyaltshen
Secretary
Ministry of Agriculture
Royal Government of Bhutan

ATTACHMENT

1. Objective of the Project

The objective of the project is to improve the accessibility in rural areas by procuring the machinery and equipment for farm roads in Bhutan.

2. Priority Districts

The Project will give the priority as shown in Annex-1.

3. Responsible and Implementing Agency

3-1. The Responsible Agency is the Ministry of Agriculture, the Royal Government of Bhutan.

3-2. The Implementing Agency is the Department of Agriculture, the Ministry of Agriculture, the Royal Government of Bhutan. The organization chart is shown in Annex-2.

3-3. Districts submit their proposals for lending construction machinery and equipment to the Ministry of Agriculture, and are responsible for implementing the construction works by using the machinery and equipment.

4. Items requested by the Royal Government of Bhutan

The Bhutanese side has requested items to complement the currently available machinery and equipment in Annex-3 for the implementation of the Project. JICA will assess the appropriateness of the request described in Annex-4 based on the results of the field survey and discussion, and will recommend the suitable machinery and equipment to the Government of Japan for approval. The final components of the Japan's Grant Aid, however, shall be decided after further studies.

5. Japan's Grant Aid Scheme

5-1. The Bhutanese side understands the Japan's Grant Aid Scheme explained by the Team, as described in Annex-5.

5-2. The Bhutanese side will take the necessary measures, as described in Annex-6, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. Schedule of the Survey

6-1. The consultants will proceed to further studies in Bhutan until 13th June, 2009.

6-2. JICA will prepare the draft report in English and dispatch a mission in order to explain its contents in October 2009.

6-3. In case that the contents of the report are accepted in principle by the Government of

Bhutan, JICA will complete the final report and send it to the Government of Bhutan by January 2010.

7. Other relevant issues

7-1. The Bhutanese side shall allocate necessary budget in order to construct farm roads which would be constructed by machinery and equipment procured by the Project.

7-2. The Ministry of Agriculture shall allocate necessary budget to the Central Machinery Unit (CMU) to maintain and operate the existing and the requested machinery.

7-3. The Ministry of Agriculture agreed that CMU would be staffed with necessary numbers of operators, mechanics and other officers.

7-4. The Ministry of Agriculture will submit the budget plan and the staffing plan which are mentioned in 7-2. and 7-3. to JICA Bhutan office no later than June 5th.

7-5. The Bhutanese side shall take EIA procedures for constructing farm roads as prescribed by Environment Act enacted in 2002.

7-6. Both sides agreed that the Ministry of Agriculture shall submit a operational plan of CMU machinery annually to JICA Bhutan office for at least 3 years after procuring the machinery in the Project. The plan would include not only for machinery procured by the Project but also the existing ones managed by CMU.

ANNEXES:

Annex-1 District priority

Annex-2 Organization chart of the Ministry of Agriculture

Annex-3 Present Conditions of Construction Machinery and Equipment

Annex-4 Requested Machinery and Equipment

Annex-5 Japan's Grant Aid

Annex-6 Major Undertaking to be taken by Each Government

Annex-1

District priority

Sl.No	Dzongkhag	Criteria			Priority	10th FYP Projection (Km)
		1 Connectivity to block centers	2 Arable Area	3 Vulnerability to food insecurity		
2	Lhuentse	A	A	A	A	105
4	Trashi Yangste	A	A	A		75
6	S/Jonkhar	A	A	A		75
7	Sarpang	A	A	A		57.5
8	Samtse	A	A	A		597.5
11	Chukha	A	A	A		75
16	Wangdue	A	A	A		105
1	Mongar	A	B	A	B	112.3
5	Pemagatshel	A	B	A		105
10	Dagana	A	B	A		75
13	Trongsa	A	A	B		61.5
14	Zhemgang	A	B	A		492.9
15	Gasa	B	A	A		75
20	Haa	A	A	B		23
3	Trashigang	B	A	B	C	41.1
9	Tsirang	B	A	B		105
12	Bumthang	B	A	B		75
17	Punakha	B	B	B	D	221
18	Paro	B	B	B		41
19	Thimphu	B	B	B		75
Total						188.6
						38.6
						1500

1) Connectivity to block centers

No. of block centers not connected to motorable road in the district

Total No. of block centers not connected to motorable road

A ≥ 3%, B < 3%

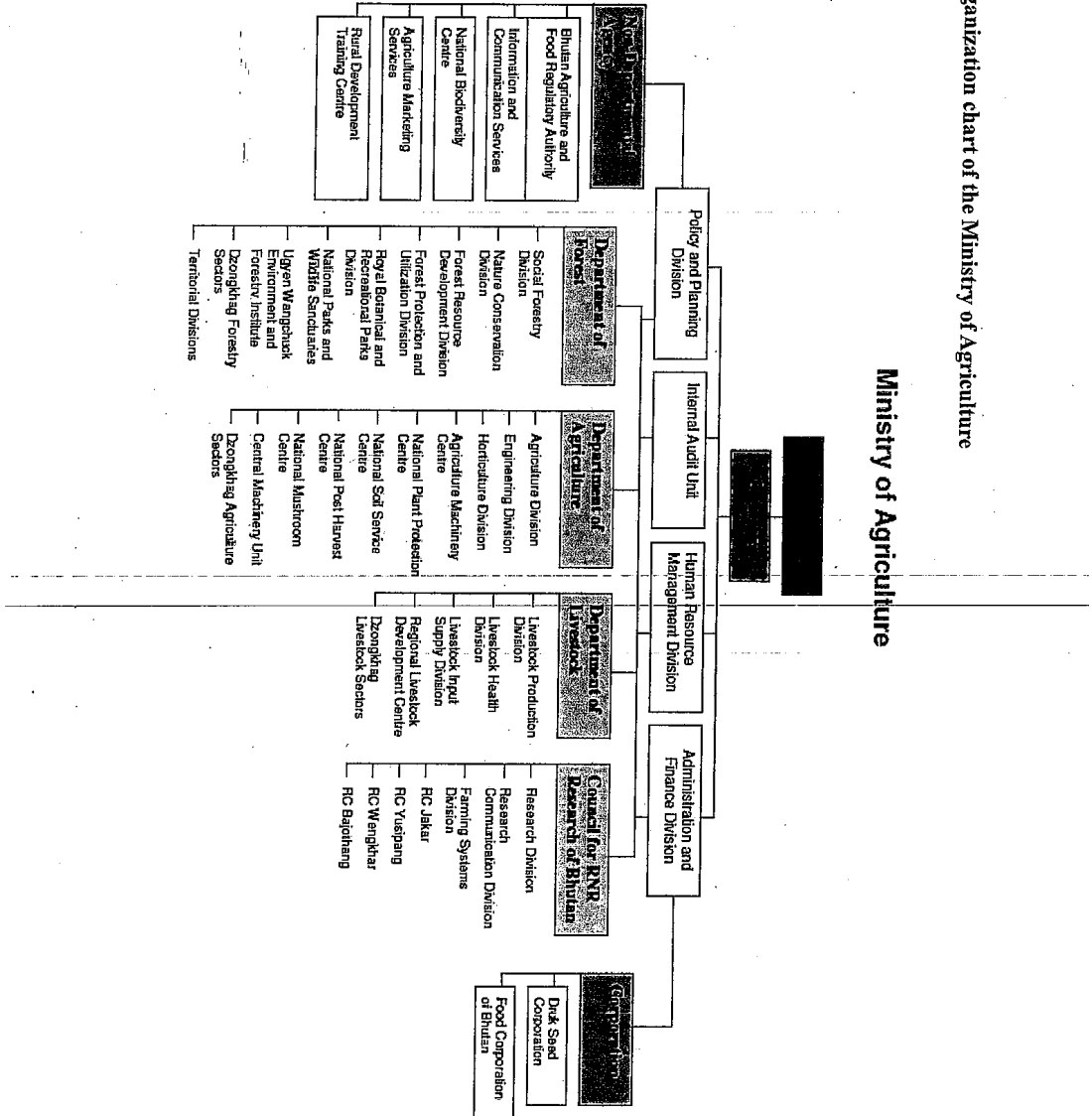
2) Arable agriculture land

A ≥ 5,000ha, B < 5,000ha

3) Vulnerability to food insecurity ("Vulnerability Analysis and Mapping", Policy and Planning Division, Ministry of Agriculture & World Food Programme, 2005)

A: Mean Principal Component Analysis (PCA) index < 0, B: Mean PCA index ≥ 0

Annex-2 Organization chart of the Ministry of Agriculture



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Annex-3

Present Conditions of Construction Machinery and Equipment

	Type of Machine	Model	Maker	Delivery Year	Condition	Location/ Dzongkhag
1	Bull Dozer	CAT-D6R	Caterpillar	2006	Running	Lhuntse
2	Bull Dozer	CAT-D6R	Caterpillar	2006	Running	Haa
3	Bull Dozer	CAT-D6R	Caterpillar	2006	Running	Tashigang
4	Bull Dozer	CAT-D6R	Caterpillar	2006	Running	Mongar
5	Bull Dozer	CAT-D6R	Caterpillar	2006	Running	Mongar
6	Excavator	CAT320C	Caterpillar	2006	Running	Punakha
7	Excavator	CAT320C	Caterpillar	2006	Running	Tashigang
8	Excavator	CAT320C	Caterpillar	2006	Running	Haa
9	Excavator	CAT320C	Caterpillar	2006	Running	Mongar
10	Excavator	CAT320C	Caterpillar	2006	Running	Trongsa
11	Excavator	CAT311C	Caterpillar	2006	Running	Lhuntse
12	Excavator	CAT311C	Caterpillar	2006	Running	Mongar
13	Excavator	CAT311C	Caterpillar	2006	Running	Tashiyangtse
14	Excavator	CAT311C	Caterpillar	2006	Running	Lhuntse
15	Excavator	CAT311C	Caterpillar	2006	Running	Dagana
16	Excavator	CAT304CR	Caterpillar	2006	Running	Bumthang
17	Excavator	CAT304CR	Caterpillar	2006	Running	Mongar
18	Excavator	CAT304CR	Caterpillar	2006	Running	Mongar
19	Excavator	CAT304CR	Caterpillar	2006	Running	Mongar
20	Excavator	CAT304CR	Caterpillar	2006	Running	Mongar
21	Dump Truck(8ton)	FVR33G	ISUZU	2006	Running	Tashigang
22	Dump Truck(8ton)	FVR33G	ISUZU	2006	Running	Thimphu
23	Dump Truck(8ton)	FVR33G	ISUZU	2006	Running	Gelephu
24	Dump Truck(8ton)	FVR33G	ISUZU	2006	Running	Mongar
25	Dump Truck(8ton)	FVR33G	ISUZU	2006	Running	Tashiyangtse
26	Cargo Truck(8ton) with crane	FVR23P	ISUZU	2006	Running	Bumthang
27	Cargo Truck(4ton) with crane	FSR33L	ISUZU	2006	Running	Tashigang
28	Fuel Tanker	NPR66Q	ISUZU	2006	Running	Bumthang
29	Self Loading Truck	CXZ51Q	ISUZU	2006	Running	Tashigang
30	Wheel Loader	50ZIV-2	Kawasaki	2006	Running	Tashigang

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31	Wheel Loader	50ZIV-2	Kawasaki	2006	Running	Mongar
32	Wheel Loader	50ZIV-2	Kawasaki	2006	Running	Gelephu
33	Wheel Loader	50ZIV-2	Kawasaki	2006	Running	Mongar
34	Wheel Loader	50ZIV-2	Kawasaki	2006	Running	Bumthang
35	Wheel Tractor	L3000DT	Kubota	2006	Running	Bumthang
36	Wheel Tractor	L3000DT	Kubota	2006	Running	Haa
37	Wheel Tractor	L3000DT	Kubota	2006	Running	Lhuntse
38	Wheel Tractor	L3000DT	Kubota	2006	Running	Mongar
39	Wheel Tractor	L3000DT	Kubota	2006	Running	Gelephu
40	Vibration Roller	SV400D	Sakai	2006	Running	Mongar
41	Vibration Roller	SV400D	Sakai	2006	Running	Tashigang
42	Vibration Roller	SV400D	Sakai	2006	Running	Mongar
43	Vibration Roller	SV400D	Sakai	2006	Running	Bumthang
44	Vibration Roller	SV400D	Sakai	2006	Running	Bumthang
45	Handguide Roller	HV20	Sakai	2006	Running	Bumthang
46	Handguide Roller	HV20	Sakai	2006	Running	Bumthang
47	Handguide Roller	HV20	Sakai	2006	Running	Bumthang
48	Handguide Roller	HV20	Sakai	2006	Running	Bumthang
49	Service Truck	AVRURCFD22NWN	Nissan	2006	Running	Bumthang
50	Air Compressor	PDS130	Denyo	2006	Running	Haa
51	Air Compressor	PDS120	Denyo	2006	Running	Mongar
52	Air Compressor	PDS120	Denyo	2006	Running	Tashigang
53	Air Compressor	PDS120	Denyo	2006	Running	Tashigang
54	Air Compressor	PDS120	Denyo	2006	Running	Mongar
55	Air Compressor	PDS120	Denyo	2006	Running	Tashiyangtse
56	Excavator	ZAXIS 200LC	Hitach	under survey	under survey	under survey
57	Excavator	ZAXIS 200LC	Hitach	under survey	under survey	under survey
58	Excavator	ZAXIS 200LC	Hitach	under survey	under survey	under survey
59	Excavator	ZAXIS 200LC	Hitach	under survey	under survey	under survey
60	Excavator	320 LC-7	Hyunday	under survey	under survey	under survey
61	Excavator	PC200-5	Komatsu	under survey	under survey	under survey
62	Dump Truck(12ton)	CWB-45	Nissan	under survey	under survey	under survey
63	Dump Truck(13ton)	CWB-46	Nissan	under survey	under survey	under survey
64	Fuel Tanker	CMF-87	Nissan	under survey	under survey	under survey
65	Self Loading Truck	CWD-53	Nissan	under survey	under survey	under survey
66	Mahindra	Camper	Mahindra	under survey	under survey	under survey
67	Air Compressor	PDS175S	Airman	under survey	under survey	under survey

A

My

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68	Air Compressor	PDS176S	Airman	under survey	under survey	under survey
69	Air Compressor	XA125	Atlascopco	under survey	under survey	under survey
70	Air Compressor	XA125	Atlascopco	under survey	under survey	under survey
71	Air Compressor	XA125	Atlascopco	under survey	under survey	under survey
72	Air Compressor	XA125	Atlascopco	under survey	under survey	under survey
73	Air Compressor	XA125	Atlascopco	under survey	under survey	under survey
74	Air Compressor	XA125	Atlascopco	under survey	under survey	under survey
75	Backhoe Loader	4CX	JCB	under survey	under survey	under survey
76	Backhoe Loader	4CX	JCB	under survey	under survey	under survey
77	Workshop Van	CMF-87	Nissan	under survey	under survey	under survey

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My

Annex-4
Requested Machinery and Equipment

No.	Items	Specification	Quantity	Priority	Purpose of Use
1	Excavator	20t (0.8m ³) (with Breaker)	20	A	Excavating, digging, loading etc.
2	Excavator	12t (0.4m ³)	5	B	Excavating, digging, loading etc.
3	Excavator	6-7t (0.28m ³)	5	B	Cutting, digging side ditches and wall loading, slope formation etc.
4	Vibration Roller	11t	5	B	Vibration compacting work on the soil and gravel road
5	Air Compressor	7-8m ³ /min	5	A	For jack hammer at rocky job site
6	Fuel Tanker	3,000 L	1	B	For supplying fuel at the job site
7	Low Lorry	20t (Self Loader Truck)	1	A	Transportation of construction machine such as hydraulic excavator
8	Fuel-Storage Tank	3,000 L (with wheel)	10	B	For storing fuel at the job site
9	Mobile Workshop Van	4WD (with tools)	3	A	For repair and maintenance of machines at the job site
10	Double Cabin Vehicle	4WD	3	A	For supervision and inspection purpose at the job site, and transportation of service parts for maintenance and repair of machine
11	Workshop Equipment		2	B	
12	Jack Hammer	21-22kg	40	B	Drilling works for blasting hard rock
13	Forklift	3t	1	B	For lifting and transporting of heavy parts in the store
14	Forklift	1.5-2t	1	B	For lifting and transporting of medium parts in the store
15	Spare Parts (10%)	(lot)	1	A	

Annex-5

Japan's Grant Aid

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on the law and the decision of the Government of Japan (hereinafter referred to as "the GOJ"), JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is conducted as follows-

- Preparatory Survey (hereinafter referred to as "the Survey")
 - The Survey conducted by JICA
- Appraisal & Approval
 - Appraisal by The GOJ and JICA, and Approval by the Japanese Cabinet
- Determination of Implementation
 - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
 - Agreement concluded between JICA and a recipient country
- Implementation
 - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for



the implementation of the Project.

- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of a basic design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the



recipient country, and procurement conditions.

(2) Selection of Consultants

The consultant firm(s) used for the Survey will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex-6.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

- a) The Government of the recipient country or its designated authority should open an



account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

- b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

(10) Social and Environmental Considerations

A recipient country must ensure the social and environmental considerations for the Project and must follow the environmental regulation of the recipient country and JICA socio-environmental guideline.

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Annex-6

Major Undertakings to be taken by Each Government

No.	Items	To be covered by the Grant	To be covered by Recipient side
1	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		•
	2) Payment commission		•
2	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to the recipient country	•	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		•
	3) Internal transportation from the port of disembarkation to the project site		•
3	To accord Japanese nationals whose services may be required in connection with the supply of the products and		•
	the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		
4	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		•
5	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		•
6	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment		•

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

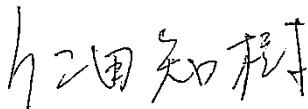
**MINUTES OF DISCUSSION
ON THE PREPARATORY SURVEY
ON THE PROJECT FOR IMPROVEMENT
OF MACHINERY AND EQUIPMENT
FOR CONSTRUCTION OF RURAL AGRICULTURAL ROAD (PHASE 2)
IN THE KINGDOM OF BHUTAN
(EXPLANATION ON DRAFT REPORT)**

Japan International Cooperation Agency (hereinafter referred to as "JICA") in May 2009 dispatched a Preparatory Survey Team on the Project for Improvement of Machinery and Equipment for Construction of Rural Agricultural Road (Phase 2) (hereafter referred to as "the Project") to the Kingdom of Bhutan (hereafter referred to as "Bhutan"), and through discussion, field survey, and technical examination in Japan, JICA prepared a draft report of the study.

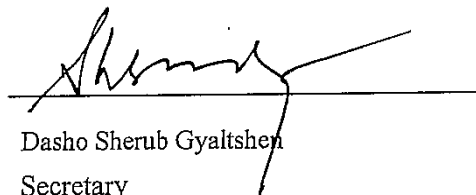
In order to explain and to discuss with officials of the Royal Government of Bhutan on the components of the draft report, JICA fielded to Bhutan the Preparatory Survey Team (hereinafter referred to as "the Team"), from 12th to 16th October, 2009 headed by Mr. Tomoki Nitta, Representative of JICA Bhutan Office.

As the result of discussion, both parties confirmed the items described on the attachment.

Thimphu, 16th October 2009



Mr. Tomoki Nitta
Leader
Preparatory Survey Team
Japan International Cooperation Agency



Dasho Sherub Gyaltshen
Secretary
Ministry of Agriculture
The Royal Government of Bhutan

5-4. Environmental Impact Assessment (EIA)

The Bhutan side reconfirms to take EIA procedures for constructing farm roads as prescribed by Environment Act enacted in 2002.

5-5. Reporting on Operational Plan

The Ministry of Agriculture shall submit an operational plan and the actual performance of CMU machinery, using the Annex-5, to JICA Bhutan office twice a year for at least 3 years after procuring the machinery in the Project or by the time total extension length reach to 1,500 km, whichever comes later. The plan would include not only for machinery procured by the Project but also the existing ones managed by CMU:—

ANNEXES:

- Annex-1 Project Cost Estimation
- Annex-2 Construction cost for farm roads approved by the Ministry of Agriculture
- Annex-3 Operation and maintenance cost for the machinery approved by the Ministry of Agriculture
- Annex-4 Staffing plan and associated budget approved by the Royal Civil Service Commission
- Annex-5 Format of Road Construction Inventory and Machinery Inventory

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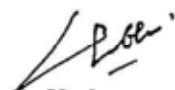
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Annex-2

**Overview of Dzongkhag Agriculture Sector
Budget Proposal in 10th. Five Year Plan
2009-2013**

Sl.No.	Dzongkhags	Budget proposal (Ngultrums in million)
1	Bumtham	54.520
2	Chukha	228.088
3	Dagana	130.597
4	Gasa	5.343
5	Haa	44.145
6	Lhuntse	128.014
7	Mongar	248.689
8	Paro	170.084
9	Pemagatshel	84.680
10	Punakha	73.535
11	Samdrupjongkhar	132.940
12	Samtse	171.930
13	Sarpang	129.895
14	Thimphu	40.550
15	Tashigang	249.822
16	Tashiyangtse	92.489
17	Trongsa	120.363
18	Tsirang	88.832
19	Wangduephodrang	122.140
20	Zhemgang	112.880
Grand Total		2429.536

Signed by:-


Chencho Norbu
 Director
 Department of Agriculture
 Ministry of Agriculture
 Thimphu Bhutan

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སྐྱེ་བོའི་རྒྱལ་ཁབ་
བཟང་ལེན་ལྷན་ཚོགས་
ཐིམ་ཕུ



"Walking the Extra Mile"

Annex-3 (1)
DEPARTMENT OF
AGRICULTURE
Royal Government of Bhutan
Ministry of Agriculture
Tashichhodzong
Thimphu

DoA/Engg-24/ 29/

4th June 09

Mr. Taiji Usui,
Project Formulation Advisor,
JICA Bhutan Office.

Sub: Manpower and Budget.

Sir,

As discussed and agreed during recent JICA mission for the project "Improvement and Equipment for Construction of Rural Agricultural Road (Phase2)", we are pleased to submit herewith the tentative list of manpower and anticipated budget that will be mobilized to handle and maintain second phase machineries at CMU.

Regards,

Yours sincerely,

Sherub Gyaltshen
Secretary

Copy to:

- The Secretary, GNHC, Thimphu
- The Director, DoA, Thimphu
- ✓ The Sr. Program Officer, CMU, Bumthang
- CPD, PPD, MOA, T/Phu
- CHRO, HRND, MOA, T/Phu

PABX 322228, Fax: 323562; Director: 322805, Agriculture Division: 321291, Eng. Division: 329122, Horticulture Division: 323184, 323183

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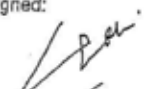
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Annex-3 (2)

Anticipated first year expenditure for Phase 2 machinery

Sl.No:Expenditure heads	Position	No	Annual Expenditure (Nu)	Total (Nu)
1 Pay and allowances				
	Degree Engineer	2	224976.00	449,952.00
	Diploma Engineer	3	153602.00	460,806.00
	Mechanic	7	124528.00	871,696.00
	Operator	30	86688.00	2,600,640.00
	Driver	8	86688.00	693,504.00
	Helpers	20	65000.00	1,300,000.00
Sub total--1				6,376,598.00
2 Travel				
	Daily allowance			1,974,000.00
	Mileage			301,450.00
Sub total--2				2,275,450.00
3 Maintenance of equipments				
	Excavator	20	389605.00	7,792,100.00
	Roller	5	69220.00	346,100.00
	Air compressor	5	155320.00	776,600.00
	Hilux	3	110000.00	330,000.00
	Self loader	1	300000.00	300,000.00
	Fuel Tanker	1	150000.00	150,000.00
	Workshop Van	3	355320.00	1,065,960.00
Sub total--3				10,760,760.00
Total (1+2+3)				19,412,808.00
			US\$ 413,038.47	(1US\$=Nu 47.00)

Note:
Total budget for the following years will increase depending on the country's fiscal policy and market dynamics

Signed:

Director
Department of Agriculture


Secretary
Ministry of Agriculture

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Annex-4

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 རྒྱལ་ཁབ་ཤིང་ཁོ་གཡེག་ལྷན་ཚོགས།
 ROYAL GOVERNMENT OF BHUTAN
 ROYAL CIVIL SERVICE COMMISSION



RCSC/HRMD/13/2009/ 1236

October 16, 2009

The Secretary
 Ministry of Agriculture
 Thimphu

Dear Sir,

Kindly refer to letter No. HRD/MoA/DoA/2/2271 dated October 14, 2009 re-submitting additional staff requisition for the Project for Improvement of Machinery and Equipment for Construction of Rural Agriculture Roads.

In this regard, the Royal Civil Service Commission during its 33rd Commission meeting held on October 15, 2009 reviewed the proposal and was pleased to approve in principle for recruitment of additional staff for the Project at the Central Machinery Unit, Bumthang as proposed on the following conditions:

1. Recruitment in phases to be decided later in consultation with the RCSC;
2. Staff to be recruited shall be on contract service; and
3. Eventually, the Ministry shall ensure sustainability of the Programme

With best wishes,

Yours sincerely,


 (Kinley Yangzom)
 for Royal Civil Service Commission

Copy to:

1. Chief HRO, HR Division, Ministry of Agriculture for necessary action.

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Annex-4(2)



ROYAL GOVERNMENT OF BHUTAN
Ministry of Agriculture
འཕྲིན་ལྷན་ཁང་།
Thimphu: Bhutan

October 14, 2009

HRD/MoA/DoA/2/ 2271

The Chief HR Officer,
Human Resource Management Division,
Royal Civil Service Commission,

Thimphu

Sub: Request for additional staff for the RCSC Phase- 2 project at CMU

Madam,

As appraised earlier through our letter no. HRD/MoA/DoA/2/6209 dated June 4, 2009 the Ministry of Agriculture and the Government of Japan signed the Minutes of Discussion for Project for Improvement of Machinery and Equipment for Construction of Rural Agriculture Road (Phase 2). The project which is a grant of USD 6.42 million from the Government of Japan is to be based in the Central Machinery Unit (CMU), Bumthang under Department of Agriculture.

As a part of the agreement, the Ministry of Agriculture shall allocate to CMU necessary budget and equip the Unit with the required number of operators, mechanics and other officers. As indicated in the list attached, the Ministry will be receiving about 34 machineries by March 2011 and as such, it is important that the Ministry recruits about 42 staffs (26 operators, 8 drivers, 5 technicians, 2 welders, 2 B.E. Mech. Engineer and 3 Diploma Mech. Engineer) by 2010 in order to successfully implement the Project. We have also been informed informally by the funding agency that if the Ministry fails to meet the necessary resources as agreed, the project may not materialize.

In view of the above, we would like to request RCSC to kindly grant approval for the recruitment of the proposed staff to take up the project. We would also like to inform that the proposed staffs, if approved, will be recruited only in 2010 so as to keep it ready before the machineries arrive in 2011.

Thanking you.

Yours Sincerely,

Kinga Wangdi

(Chief HR Officer)

Copy to:

1. Hon'ble Secretary, MoA, Thimphu for your kind information
2. Director, DoA, MoA, Thimphu.
3. Chief Engineer, Engineering Division, DoA, Moa, Thimphu

APPENDIX 5

Monitoring Sheet

