APPENDIX-VII

DEPARTMENTS CONCERNED

APPENDIX VII: DEPARTMENTS CONCERNED

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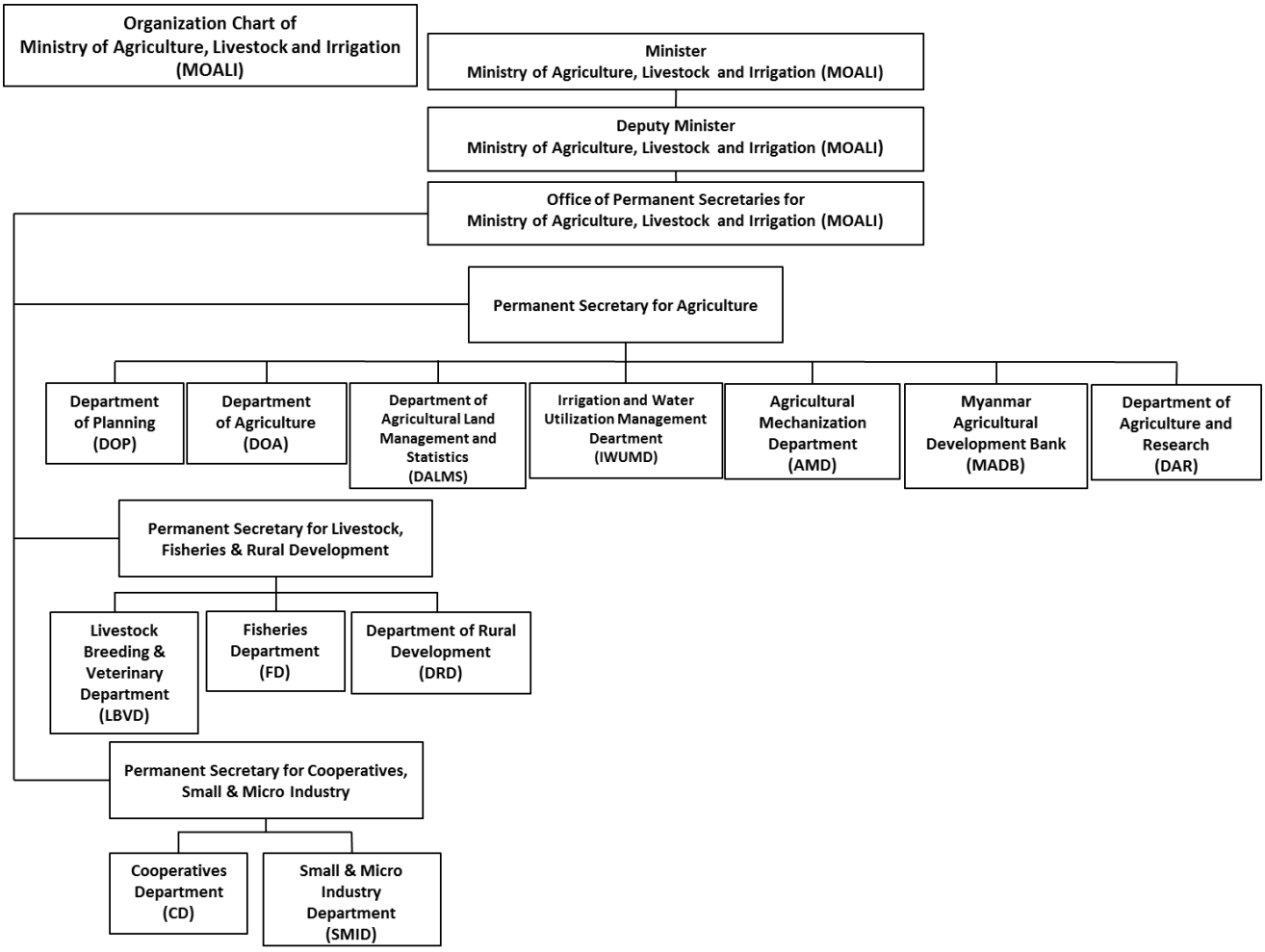
APPENDIX VII. DEPARTMENTS CONCERNED

VII.1 Ministry of Agriculture, Livestock and Irrgation (MOALI)

1) Organization Chart



Source: Department of Planning /ADB (prepared on 25 September 2016), JICA Survey Team

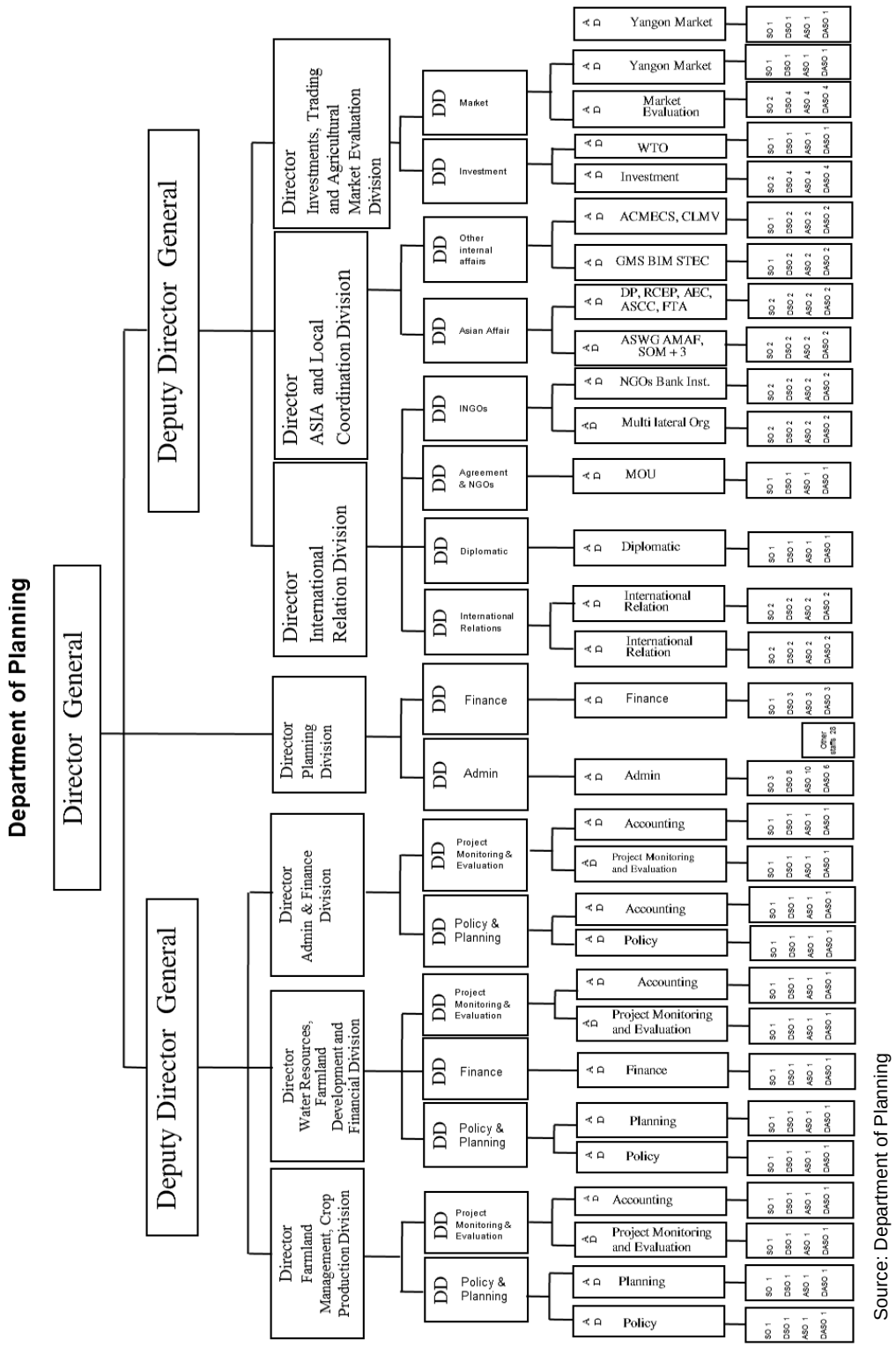
2) Staffing

Officer/staff	Number (Permitted)
Officers	8,397
Staff	106,224
Total	114,627

Source: Depratment of Planning

VII.2 Departmen of Planning (DOP)

1) Organization Chart



Source: Department of Planning

2) Staffing

Year	Staff Number (Permitted)			Staff Number(Actual)		
	Officers	Other Staffs	Total	Officers	Other Staffs	Total
2012	24	87	111	22	82	104
2013	52	111	163	40	76	116
2014	52	111	163	47	66	113
2015	49	101	150	44	64	108
2016	109	239	348	42	54	96

Source: Department of Planning

3) Budget

(Million Kyats)

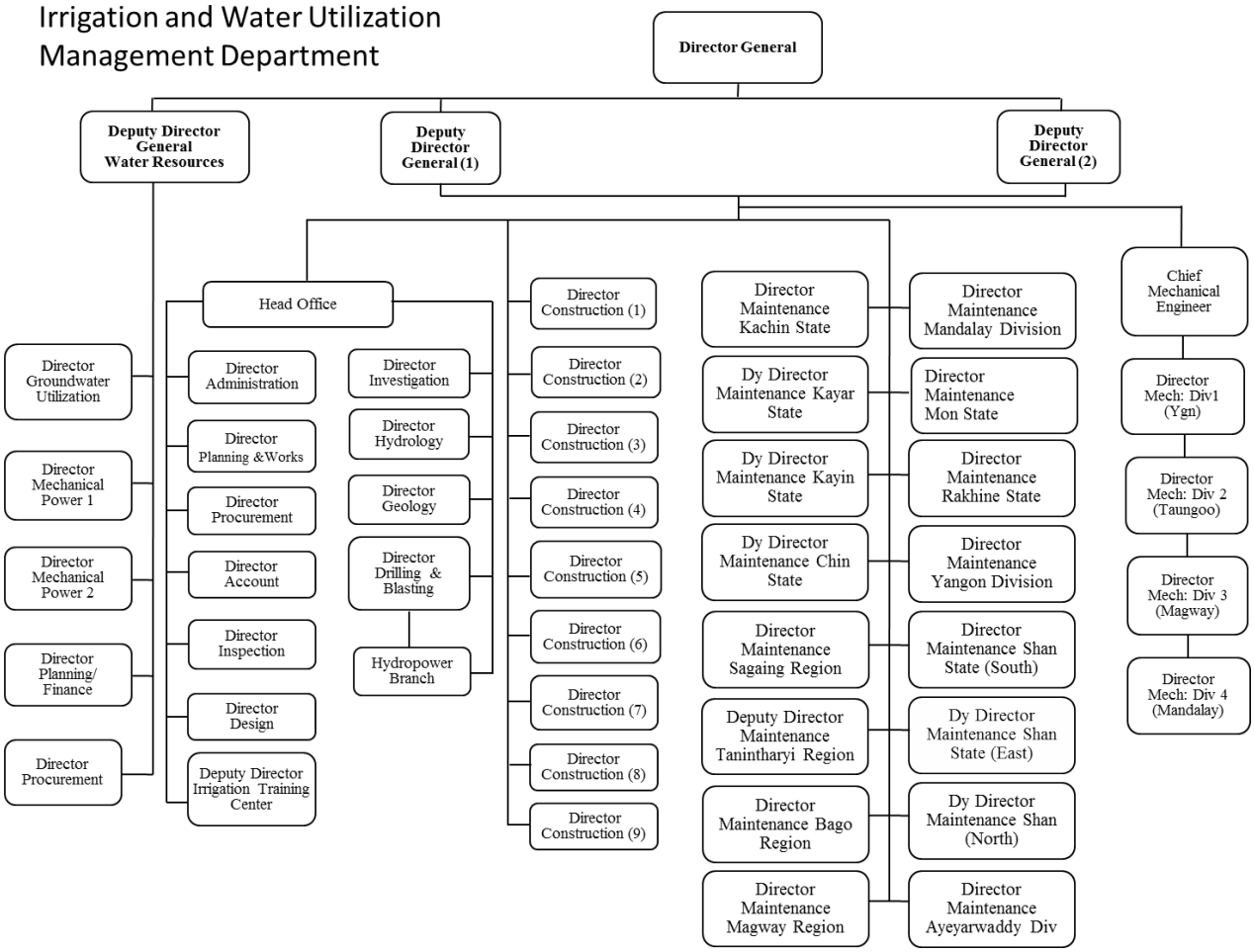
Year	Current	Capital
2011-2012		
2012-2013		
2013-2014		
2014-2015		
2015-2016		
Total		

Source: Department of Planning

VII.3 Irrigation and Water Utilization Manegement Department (IWUMD)

1. Headquaters Level

1) Organization Chart



Source: Irrigation and Water Utilization Management Department

2) Staffing

Year	Staff Number (Permitted)			Staff Number(Actual)		
	Officers	Other Staffs	Total	Officers	Other Staffs	Total
2012	1,019	20,472	21,491	817	12,374	13,191
2013	1,019	20,472	21,491	859	11,897	12,756
2014	1,019	20,472	21,491	830	12,653	13,483
2015	1,019	20,472	21,491	824	13,118	13,942
2016	1,564	20,927	22,491	1,212	14,150	15,362

Source: Irrigation and Water Utilization Management Department

3) Budget

(Million Kyats)

Year	Current	Capital
2011-2012		
2012-2013		
2013-2014		
2014-2015		
2015-2016		

Source: Irrigation and Water Utilization Management Department

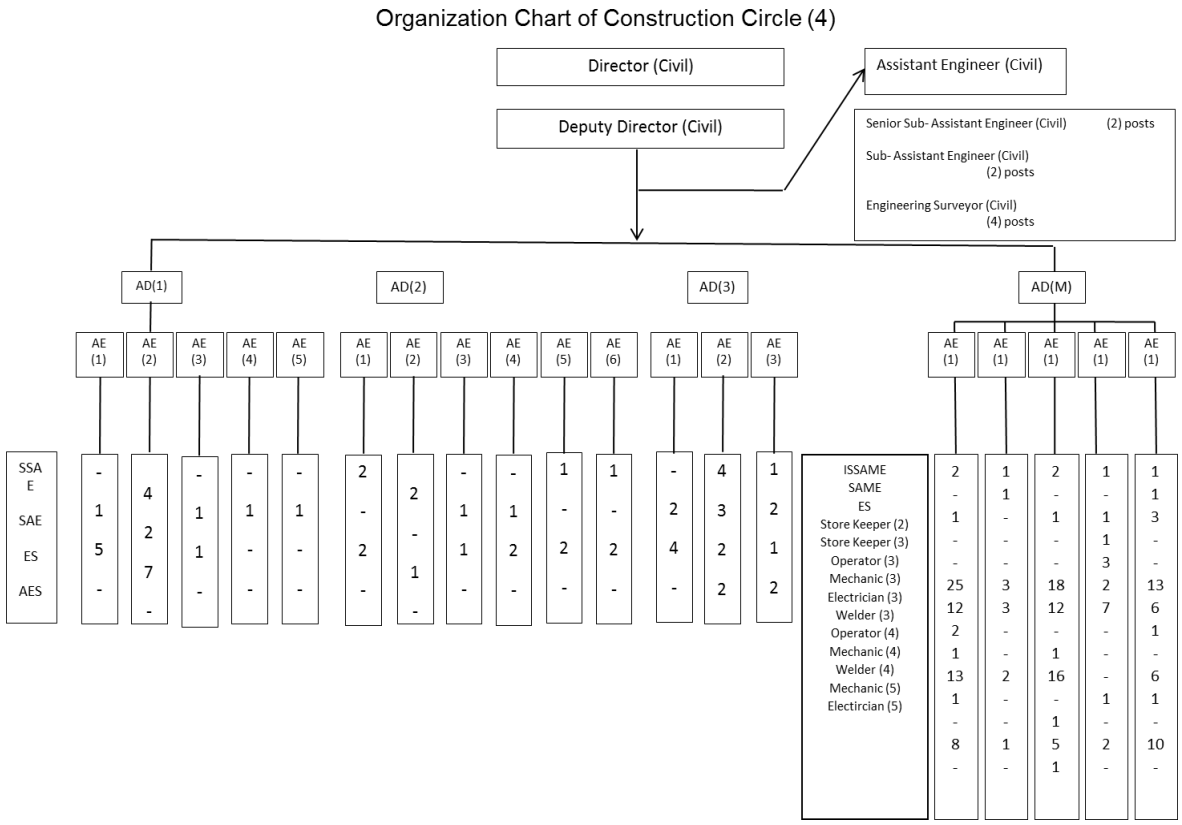
4) Experience of the Loan/Grant Project Implementation

No	Name of Project	Amount (Million)	Implementing Agency	Funding Source	Duration (Years)	Location
1	Irrigation Development Project in Western Bago Region	14870 yen	IWUMD & AMD	JICA	4	Western Bago Region
2	Agriculture Development Support Project	US$ 100	IWUMD , AMD, DoA, DAR, DALMS	World Bank	7	Sagain Region, Madalay Region, NayPyiTaw & Babo Region
3	Development of Irrigation Schemes and Land consolidation in Myanmar	US$ 198.96	IWUMD & AMD	EXIM Bank of India	3	Sagain Region, Madalay Region, NayPyiTaw & Babo Region, Magway Region, Mon State, Kayin State & Yangon Region
4	Fostering Agriculture Revitalization in Myanmar	19.504	IWUMD , AMD, DoA, DAR, DALMS	IFAD	6	NayPyiTaw
5	Eastern Sttes Agri-business Project	65.2	IWUMD , AMD, DoA, DAR, DALMS	IFAD	Negociating	Shan State, Kayin State
6	Irrigated Agriculture Inclusive Development Project	129.45	DoP,IWUMD, AMD,DoA	ADB & AFD	7	Magway Region, Mandalay Region, Sagian Region & Kayah State
7	Mini Hydro Power Project	31.995 Yuan	IWUMD	Government of China	3	Ayawaddy Region
8	Establishment of the Advnced Hydrological Data Acquisition System in Ngamoeyeik and Neighbouring Dams	14	IWUMD	Government of Japan	1	Yangon Region
9	Improving the Effectiveness of Pumped Irrigation Schemes in the dry Zone	5	IWUMD	LIFT	4	Sagain Region
10	The Rebabilitation and Upgrading of the Existing and Drainage System of Pump Irrigation Projects	Euro 3	IWUMD	AFD	4	Magway Region

Source: Irrigation and Water Utilization Management Department

2. Construction Circle No.4 (Shwebo)

1) Organization Chart



Source: Irrigation and Water Utilization Management Department

2) Staffing

Officer/Staff	Permit	Present
Construction Circle No.4		
Officer	36	33
Staff	593	523
Total	**629**	**556**

Officer/ Staff	Permit	Present
Director Office		
Officer	5	7
Staff	71	76
Sub-Total	**76**	**83**
Assitant Director Office (1)		
Officer	8	7
Staff	94	64
Sub-Total	**102**	**71**
Assitant Director Office (2)		
Officer	8	7
Staff	94	71
Sub-Total	**102**	**78**
Assitant Director Office (3)		
Officer	8	5
Staff	95	67
Sub-Total	**103**	**72**
Assitant Director Office (Mechanical)		
Officer	7	7
Staff	239	245
Sub-Total	**246**	**252**

Source: Irrigation and Water Utilization Management Department

3) Budget
Project Budget

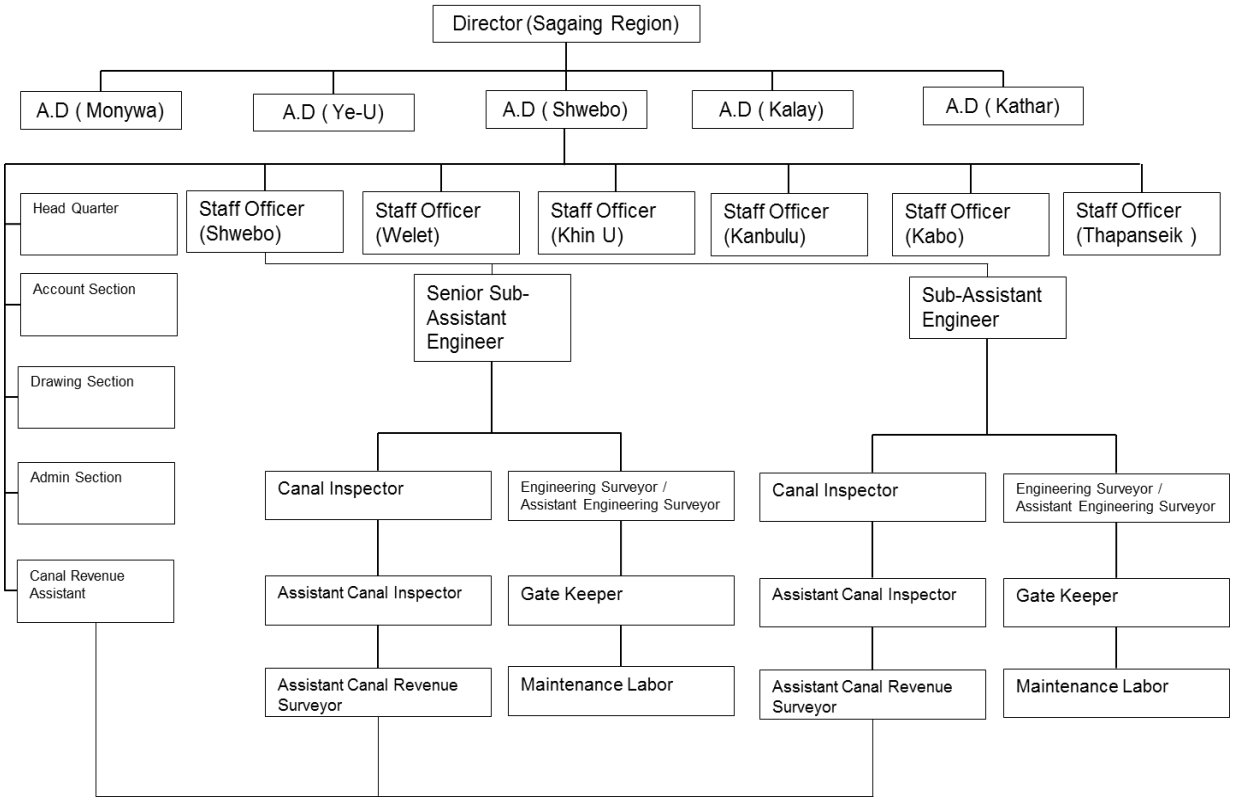
(Million Kyats)

No.	Project Name	Estimated Cost	Start Year to (2010-2011)		2011-2012		2012-2013		2013-2014		2014-2015		2015-2016		2016-2017	Total	
			Permitted Budget	Actual Cost	Permitted Budget	Actual Cost	Permitted Budget	Actual Cost	Permitted Budget	Actual Cost	Permitted Budget	Actual Cost	Permitted Budget	Actual Cost	Permitted Budget	Permitted Budget	Actual Cost
1	Thein Yin Dam																
2	Daung Myau Dam																
3	Paung Nat Dam																
4	Hta Man Thi Dam																
5	North Yamar Extension (left)																
6	North Yamar Extension (Right)																
7	Min Myin Dam																
8	Yar Za Gyo Dam																
9	Manipura Dam																
10	North Yamar Water Supply																
11	Si Pa Tone Dam																
12	Nan Paw Law Dam																
13	Water Supply for Kanbulu Mango Farm (1000) Ac																
14	Kone Gyi Weir																
15	Hae Kin Weir																
16	Distributory Canal for North Yamar Dam																
17	Maintanace for Min Myin Dam																
18	Myit Thar River Extension																
Total																	

Source: Irrigation and Water Utilization Management Department

3. Maintenance Office (Shwebo District)

1) Organization Chart



Source: Irrigation and Water Utilization Management Department

2) Staffing

Shwebo Maintenance Office

Description	AD's Office	AE's Office	AE's Office	AE's Office	AE's Office	AE's Office	AE's Office	Total
	Shwebo	Shwebo	Wetlet	Kabo	Kantbalu	Khin Oo	Thaphanzeik	
Assistant Director (AD)	1							1
Canal Revenue Assistant (CRA)	1							1
Assistant Engineer (AE)		1	1	1	1	1	1	6
Senior Sub-Assistant Engineer (SSAE)		2	3	3	2	2		12
Sub-Assistant Engineer (SAE)		3	2		2	1	1	9
Engineering Surveyors(ES)		2	2		2	1		7
Assistant Engineering Surveyor (AES)			3					3
Canal Inspector (CI)		4	3	1	2	1		11
Assistant Canal Inspector (ACI)		9	11	2	4	3		29
Assistant Canal Revenue Surveyor(ACRS)		2						2
Maintanance Labour (Permitnamce)		16	39	31	11	9	10	116
Work Charges		23	18	13	37	8	33	132
Total	**2**	**62**	**82**	**51**	**61**	**26**	**45**	**329**

Note: Not including administrative and clerical staff. It is indicated only engineering category staff.

Source: Irrigation and Water Utilization Management Department

Ye-U Maintenance Office

Description	AD's Office	AE's Office	AE's Office	AE's Office	AE's Office	AE's Office	Total
	Ye-U	Ye-U	Dabayin	Kindat	Taze	Saing Pyin	
Assistant Director (AD)	1						1
Canal Revenue Assistant (CRA)	1						1
Assistant Engineer (AE)	-	1	1	1	1	1	5
Senior Sub-Assistant Engineer (SSAE)	-	3	1	2	2	1	9
Sub-Assistant Engineer (SAE)	-	1	2	1	-	2	6
Engineering Surveyors(ES)	2	1	-	-	-	-	3
Assistant Engineering Surveyor (AES)	1	4	3	1	2	-	11
Draft Man (DM)	6	-	-	-	-	-	6
Canal Inspector (CI)	-	3	6	-	1	1	11
Mechanic	-	2	-	-	-	-	2
Assistant Canal Inspector (ACI)	-	4	2	1	6	5	18
Assistant Canal Revenue Surveyor(ACRS)	-	-	-	-	-	-	0
Maintanance Labour (Permitnamce)	-	5	6	-	-	-	11
Work Charges	-	12	12	4	4	-	32
Total	**11**	**36**	**33**	**10**	**16**	**10**	**116**

Note: Not including administrative and clerical staff. It is indicated only engineering category staff.

Source: Irrigation and Water Utilization Management Department

3) Budget

Shwebo Maintenance Office

(Million Kyats)

Description	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017(up to August)	Annual Average
Ordinary Repair							
Thanzeik Dam							
OMC							
SMC							
Sub-total							
Special Repair							
Thanzeik Dam							
OMC							
SMC							
Sub-total							
Total							

Note: Kabo O&M cost included in SMC Cost

Ye-U Maintenance Office

(Million Kyats)

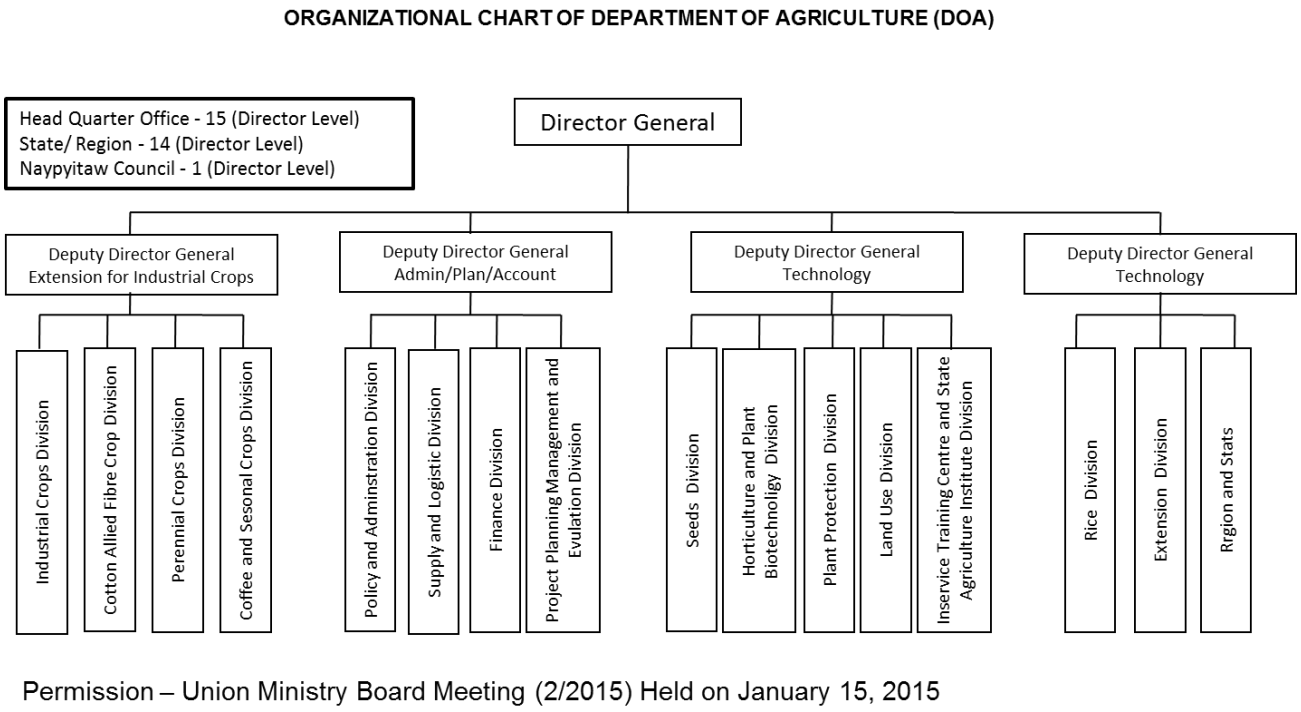
Description	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017(up to August)	Annual Average
Ordinary Repair							
(1) Kindat Diversion Dam							
(2) RMC (Kindat)							
(3) YMC (Kabo)							
Sub-total							
Special Repair							
(1) Kindat Diversion Dam							
(2) RMC (Kindat)							
(3) YMC (Kabo)							
Sub-total							
Total							

Source: Irrigation and Water Utilization Management Department

VII.4 Department of Agriculture (DOA)

1. Headquaters Level

1) Organization Chart



Source: Department of Agriculutre

2) Staffing

Position	2011-2012			2012-2013			2013-2014		
	DOA	DIC	Total	DOA	DIC	Total	DOA	DIC	Total
Officers	770	725	1495	895	569	1464	1009	496	1505
Other Staffs	6,682	9,235	15,917	7396	6433	13829	7637	5699	13336
Total	7,452	9,960	17,412	8291	7002	15293	8646	6195	14841

Position	2014-2015			2015-2016
	DOA	DIC	Total	DOA/DIC Total
Officers	1106	556	1662	1615
Other Staffs	9216	4586	13802	13334
Total	10322	5142	15464	14949

Source: Department of Agriculutre

3) Budget

(Million Kyats)

Year	Current	Capital
2012-2013		
2013-2014		
2014-2015		
2015-2016		
2016-2017		

Source: Department of Agriculutre

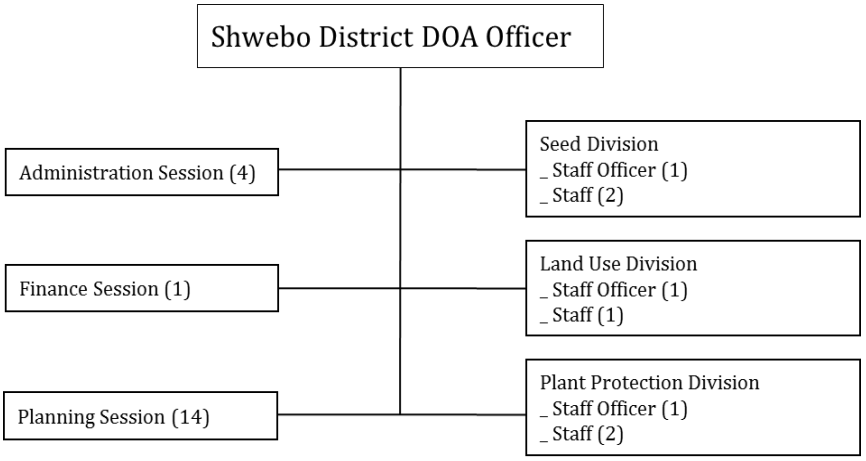
4) Experience of the Loan/Grant Project Implementation

No.	Name of Project	Funding Organization	Amount	Implementing Organization	Period	Location
1.	Fostering Agricultural Revitalisation in Myanmar (FARM) Project	International Fund for Agricultural Development (IFAD)	Loan - SDR 12.15 ($-18.726)	DOA	6 Years 2014-2015 to 2019-2020	Nay Pyi Taw Consil Area Tatkone, Pyinmana, Layway, Oktarathiri, Zayyarthiri
2	Agricultural Development Support Project-ADSP	World Bank	From 100 million $, DOA Agricultural Suggestions and Technical Assist (11.003) million $	DOA (Seed Division, Land use Division, PP Division, Extension Division)	6 years 2016 - 2017 to 2022 -2023	Sagaing Region (Pale, Yinmarpin), Yamar(north) Dam, Mandalay Region (Sintgu) (Marle Nat Taung Dam)(Nay Pyi Taw) (Tatkone, Popathiri)(Sin Thae Dam) Bago Region (Taunggoo, Yetarshae)(Swa Dam)
3	Immediate Response Mechanism-IRM	World Bank	$ (18.044) million	DOA Seed Division, Horti and Bio Tech Division, Extension Division	1 Year (2016-2017)	Sagaing Region, Magway Region, Bago Region, Ayeyarwaddy Region, Chin Stae, Rakhaine State

Source: Department of Agriculutre

2. District Level

1) Organization Chart



Source: Department of Agriculutre

2) Staffing

Position	No. of Staff
Assistant Director	1
Staff Officer	3
Deputy Officer	6
Assistant Officer	7
Deputy AssistantOfficer	7
Upper Division Clerk	2
Lower Division Clerk	2
Cleaner	1
Security	1
Daily Wages	2
Total	32

Source: Department of Agriculutre

3) Budget

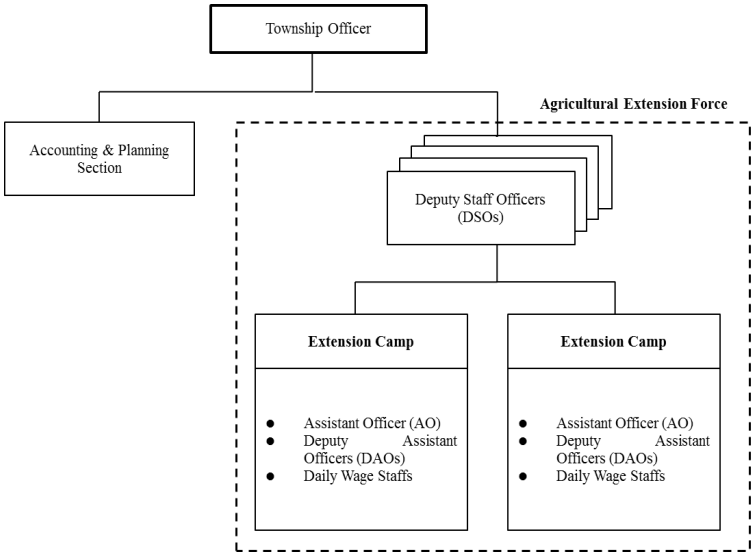
(Million Kyats)

Item / Year		2011-2012		2012-2013		2013-2014		2014-2015		2015-2016		2016-2017	
		R.G	U.M	R.G	U.M	R.G	U.M	R.G	U.M	R.G	U.M	R.G	U.M
Extension	Salary												
	Operation												
	TA												
Total													

Note: R.G – Regional Government
U.M - Union Ministry
Source: Department of Agriculutre

3. Township Level

1) Organization Chart



Source: Department of Agriculutre

2) Staffing

No.	Township (District)	Position					No. of Extension Camps
		Deputy Staff Officer (DSO)	In Extension Camp (Extension Worker)				
			Assistant Officer (AO)	Deputy Assistant Officer (DAO)	Daily Wage Staff	Total	
1	Kanbalu (Kanblu)	2	2	9	2	13	9
2	Kin-U (Shwebo)	4	5	2	5	12	5
3	Shwebo (Shwebo)	4	7	8	10	25	7
4	Wetlet (Shwebo)	5	7	6	2	15	9
5	Taze (Shwebo)	5	7	7	5	19	5
6	Ye-U (Shwebo)	2	10	7	6	23	4
7	Tabayin (Shwebo)	3	8	3	5	16	5
8	Budalin (Monywa)	3	8	2	4	14	3
9	Ayadaw (Monywa)	4	7	7	9	23	5
	Total	**32**	**61**	**51**	**48**	**160**	**52**

Source: Department of Agriculutre

3) Budget

Shwebo Township (Shwebo Distict)

(Million Kyats)

Item / Year		2011/12			2012/13			2013/14			2014/15			2015/16			2016/17		
		R.G	U.M	Total	R.G	U. M	Total	R.G	U. M	Total	R.G	U.M	Total	R.G	U. M	Total	R.G	U. M	Total
Extension	Salary																		
	Operation																		
Total																			

(Million Kyat)

Khin U Township(Shwebo District) (Million Kyats)

Item / Year		2011/12			2012/13			2013/14			2014/15			2015/16			2016/17		
		R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total
Extension	Salary																		
	Operation																		
Total																			

Wetlet Township (Shwebo District) (Million Kyats)

Item / Year		2011/12			2012/13			2013/14			2014/15			2015/16			2016/17		
		R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total
Extension	Salary																		
	Operation																		
Total																			

Kanbalu Township (Kanbalu District) (Million Kyats)

Item / Year		2011/12			2012/13			2013/14			2014/15			2015/16			2016/17		
		R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total
Extension	Salary																		
	Operation																		
Total																			

Ye U Township (Shwebo District) (Million Kyats)

Item / Year		2011/12			2012/13			2013/14			2014/15			2015/16			2016/17		
		R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total
Extension	Salary																		
	Operation																		
Total																			

Tabayin Township (Shwebo District) (Million Kyats)

Item / Year		2011/12			2012/13			2013/14			2014/15			2015/16			2016/17		
		R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total
Extension	Salary																		
	Operation																		
Total																			

Taze Township (Shwebo District) (Million Kyats)

Item / Year		2011/12			2012/13			2013/14			2014/15			2015/16			2016/17		
		R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total
Extension	Salary																		
	Operation																		
Total																			

Budalin Township (Monywa District) (Million Kyats)

Item/Year		2011/2012			2012/2013			2013/2014			2014/2015			2015/2016			2016/2017		
		R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total
Extension	Salary																		
	Operation																		
Total																			

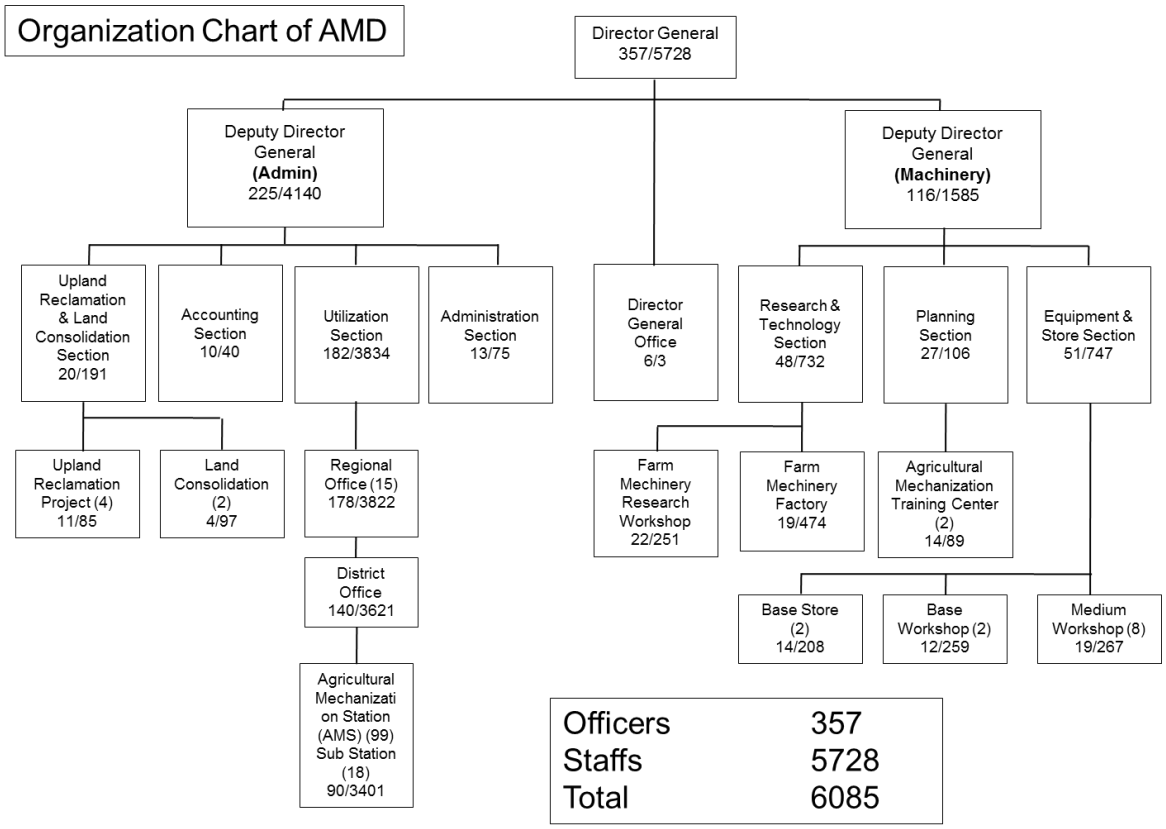
Ayadaw Township (Monywa District) (Million Kyats)

Item/Year		2011/2012			2012/2013			2013/2014			2014/2015			2015/2016			2016/2017		
		R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total	R.G	U.M	Total
Extension	Salary																		
	Operation																		
Total																			

Source: Department of Agriculutre

VII.5 Agricultural Mechanization Department (AMD)

1) Organization Chart (Headquater, region, District, TS level)



Source: Agricultural Mechanization Department

2) Staffing

No	Station	Officer	Staff				Total
			Operator	Mechanic	Other Staff	Total	
A	Project Area	-	-	-	-	-	**-**
1	Shwe-bo District	1	-	-	7	7	**8**
2	(3)Shwe-bo	1	32	3	12	47	**48**
3	(21)Ye-U	1	25	4	9	38	**39**
4	(40)Kantbalu	1	19	9	12	40	**41**
5	(61)Wetlet	1	18	1	11	30	**31**
6	(62)Budalin	1	14	9	13	36	**37**
B	AMD Union	357	-	-	-	5,728	**6,085**

Source: Agricultural Mechanization Department

3) Budget

(2011-2012) (Million Kyats)

No	Station	Expenditure			Income		
		Capital	Current	Total	Hiring Sevices	Sale	Total
A	Shwe-bo District						
1	(3)Shwe-bo						
2	(21)Ye-U						
3	(40)Kantbalu						
4	(61)Wetlet						
5	(62)Budalin						
	Sub Total						
B	AMD Union						

(2012-2013) (Million Kyats)

. No	Station	Expenditure			Income		
		Capital	Current	Total	Hiring Sevices	Sale	Total
A	Shwe-bo District						
1	(3)Shwe-bo						
2	(21)Ye-U						
3	(40)Kantbalu						
4	(61)Wetlet						
5	(62)Budalin						
	Sub Total						
B	AMD Union						

(2013-2014) (Million Kyats)

. No	Station	Expenditure			Income		
		Capital	Current	Total	Hiring Sevices	Sale	Total
A	Shwe-bo District						
1	(3)Shwe-bo						
2	(21)Ye-U						
3	(40)Kantbalu						
4	(61)Wetlet						
5	(62)Budalin						
	Sub Total						
B	AMD Union						

(2014-2015) (Million Kyats)

No	Station	Expenditure			Income		
		Capital	Current	Total	Hiring Sevices	Sale	Total
A	Shwe-bo District						
1	(3)Shwe-bo						
2	(21)Ye-U						
3	(40)Kantbalu						
4	(61)Wetlet						
5	(62)Budalin						
	Sub Total						
B	AMD Union						

(2015-2016) (Million Kyats)

No	Station	Expenditure			Income		
		Capital	Current	Total	Hiring Sevices	Sale	Total
A	Shwe-bo District						
1	(3)Shwe-bo						
2	(21)Ye-U						
3	(40)Kantbalu						
4	(61)Wetlet						
5	(62)Budalin						
	Sub Total						
B	AMD Union						

Source: Agricultural Mechanization Department

4) Experience of the Loan/Grant Project Implementation

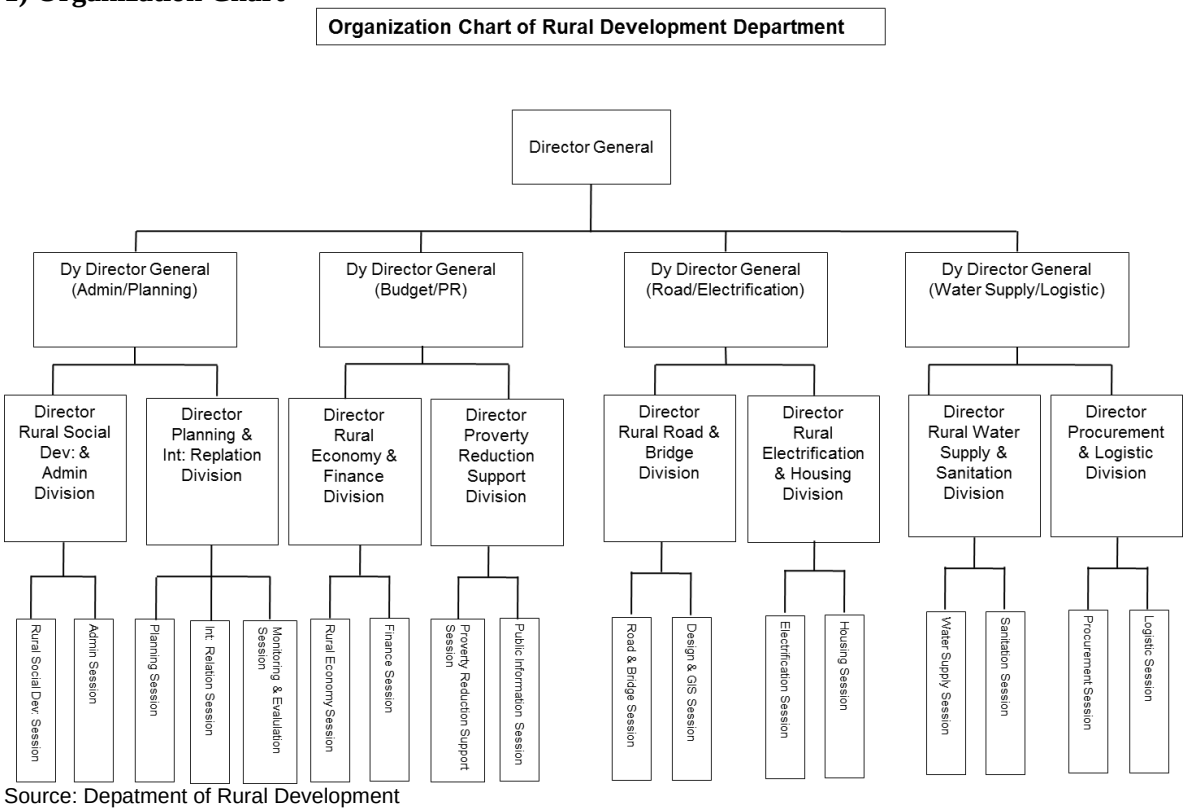
No.	Project Title	Funding Organization	Grant/Loan Amount	Project Period	Implementation task
Completed Project					
1	Non-Project Grand Aid	Japan ODA Grant	JPY(144.58) Million	(2012-2013)-(2013-2014) (2)years	To provide the tractors (65)units and implements for recovery of crops land affected by the flood in six project sites.
2	Irrigation Development in Bago Region (West)	Japan ODA Loan	JPY(750) Million	(2014-2015)-(2018-2019) (5)years	-To support farm machinery such as Tractor (220)units, Combine Harvester (31)units and Excavator (5)units to five project site in order to provide land preparation, land consolidation and harvesting service for local farmers .
On-going Project					
1	Food Security Project for UnderPrivileged Farmer (2KR-2012)	JICA Grant	JPY(230) Million	(2013-2014)-(2016-2017) (4)years	-To provide the mechanization services on land preparation with tractors(92) units and harvesting with combine harvester (10)Units in four project sites and Meikhtila Training Center. Counterpart fund in collected from hiring service of the machinery to get one half (FOB) price of Machinery
2	Food Security Project for UnderPrivileged Farmer (2KR-2013)	JICA Grant	JPY(230) Million	(2014-2015)-(2017-2018) (4)years	-To provide the mechanization services on land preparation with tractor(93)units and harvesting with combine harvester (10)units in four project sites . Counterpart fund in collected from hiring service of the machinery to get one half (FOB) price of Machinery.
3	The Project for Farmland Consolidation and Agricultural Machinery Training for Agricultural Mechanization in Myanmar	KOICA Grant	USD(6) Million	(2014-2015)-(2016-2017) (3)years	-To emerge mechanized farmland (100 ha.) -To establish Agricultrual Machinery Training Center and conduct training program for farmers and AMD's staff on operation & maintenance of farm machinery.
4	Fosterring Agricultural Revitalization in Myanmar-FARM	IFAD Loan	USD(18.7) Million (No use directly from AMD)	(2014-2015)-(2019-2020) (6)years	-To emerge modernized farmland by consolidating in irrigated areas.
5	Agriculture Development Support Project-ADSP	World Bank Grant	USD(4) Million	(2014-2015)-(2020-2021) (7)years	-To support farm machineries to four AMS for demonstration and conducting farmers training. -To supply farm machineries and equipment as well as teaching aids in order to upgrade the Meikhtila Training Center
6	Development of Irrigation Schemes in Myanmar	Exim Bank of India Loan	USD(101.626) Million	(2014-2015)-(2016-2017) (3)years	-To procure and sell farm machineries and implements to farmers by installment paying system and AMS of AMD in project areas and to upgrade the workshops

Source: Agricultural Mechanization Department

VII.6 Department of Rural Development (DRD)※as of December 2016

1. Headquter Level

1) Organization Chart



Source: Depatment of Rural Development

2) Staffing

Officer /Year	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Offficer	179	245	5,075	5,356	5,262
Staff	488	626	11,264	11,692	11,468
Total	**667**	**871**	**16,339**	**17,048**	**16,730**

Source: Depatment of Rural Development

3) Budget

(Million Kyats)

No.	Budget Title	2011-2012 Municipal Department	2012-2013 DRD	2013-2014 DRD	2014-2015 DRD	2015-2016 DRD
1	Normal Income					
2	Capital					
3	Foreign Donation					
4	Loan (Income)					
	Total Income					
1	Expenditure					
2	Capital Cost					
3	Cost for Loan					
	Total Expenditure					

Source: Depatment of Rural Development

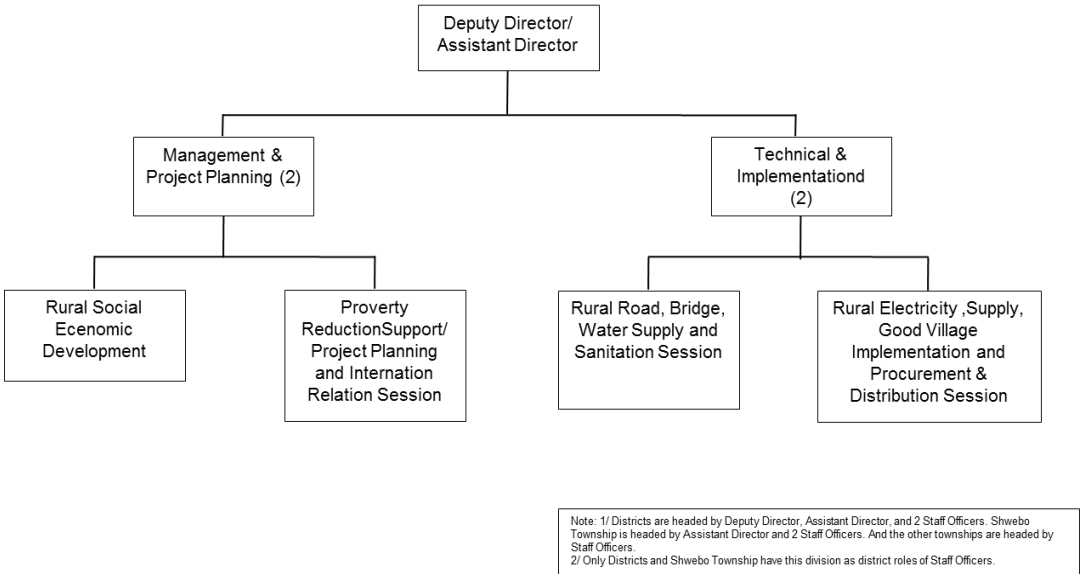
4) Experience of the Loan/ Grant Project Implementation

No	Project Title	Funding Organization	Grant/Loan Amount	Project Period	Implementation task
On-going Project					
1	Regional Development Project for Poverty Reduction Phase-1(MY-PI) Water Supply Projects for 23 Towns	JICA	Yen (2,593.320) million	2013-2014 to 2016-2017	Townships Water Supply
2	National Community Driven Development Project-NCDDP	World Bank	US$(400)million	September, 2015 to November, 2021	Infrastructure
3	National Electrification Plan-NEP	World Bank	US$(90)million	2016-2017 to 2020-2021	Electrification
4	Italian Contribution to Up-Scaling to National Community Driven Development Program-NCDDP	Italy Government	Euro(20) million	2015-2016 to 2017-2018	Infrastructure

Source: Depatment of Rural Development

2. District Level

1) Organization Chart



Source: Depatment of Rural Development

2) Staffing

Shwebo District

No.	Rank	Permit	Present Staff		
			Male	Female	Total
1	Deputy Director	1	1	0	1
2	Assistant Director (Technical)	1	1	0	1
3	Staff Officer	1	0	1	1
4	Staff Officer (Technical)	1	0	1	1
5	Deputy Staff Officer	2	1	1	2
6	Junior Engineer (2)	2	1	1	2
7	Senior Clerk	3	1	3	4
8	Assistant Computer Operator	1	0	0	0
9	Junior Engineer(3)	2	1	1	2
10	Junior Clerk	3	0	2	2
11	Dy Assistant Computer Operator	3	0	3	3
12	Junior Engineer (4)	2	1	0	1
13	Accountant (4)	1	0	1	1
14	Driver (5)	1	1	0	1
15	Security	1	0	0	0
	Total	**25**	**8**	**14**	**22**

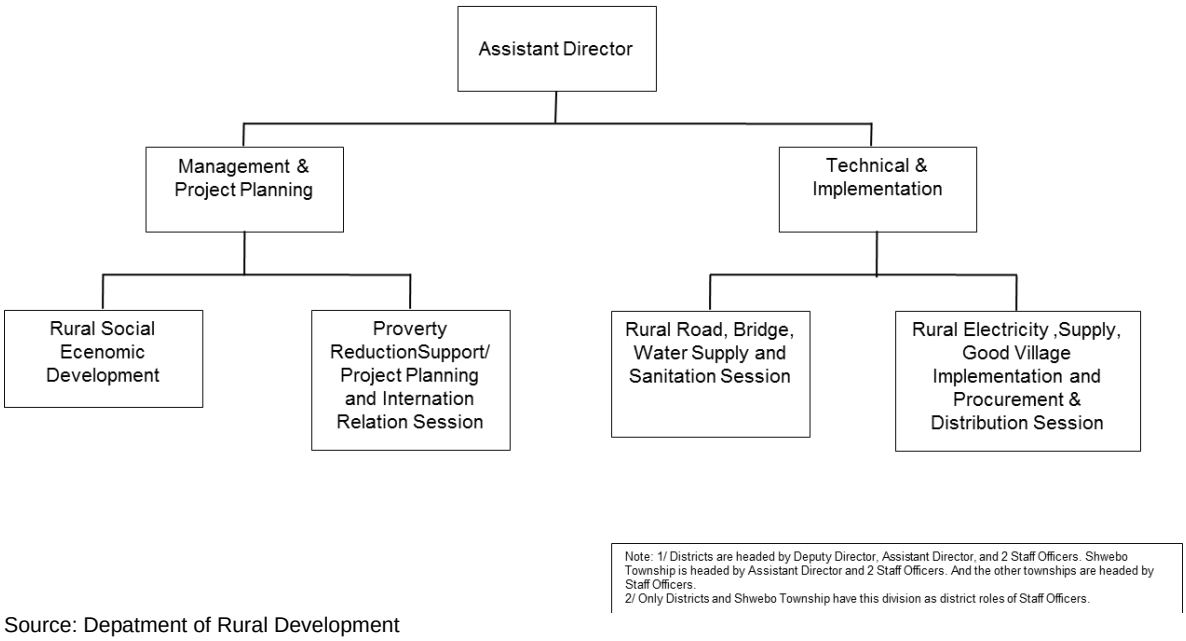
Kanbalu District

No.	Rank	Permit	Present Staff		
			Male	Female	Total
1	Director	0	0	0	0
2	Deputy Director	0	0	0	0
3	Deputy Director (Technical)		0	0	0
4	Assistant Director	1	1	0	1
5	Assistant Director (Technical)	0	0	0	0
6	Staff Officer	1	0	0	0
7	Staff Officer (Technical)	1	1	0	1
8	Deputy Staff Officer	2	0	2	2
9	Junior Engineer (2)	2	1	0	1
10	Computer Operator	0	0	0	0
11	Senior Clerk	3	0	3	3
12	Account (3)	0	0	0	0
13	Assistant Computer Operator	1	0	0	0
14	Junior Engineer (3)	2	0	1	1
15	Heavy Machinery Operator (3)	0	0	0	0
16	Assistant Supervisor (Drilling)	0	0	0	0
17	Junior Clerk	3	0	0	0
18	Dy Assistant Computer Operator	3	1	0	1
19	Account (4)	1	0	0	0
20	Junior Engineer (4)	2	0	0	0
21	Dy Assistant Supervisor (Drilling)	0	0	0	0
22	Heavy Machinery Operator (4)	0	0	0	0
23	Driver (5)	1	0	0	0
24	Security	1	0	0	0
	Total	**24**	**4**	**6**	**10**

Source: Depatment of Rural Development

3. Township Level

1) Organization Chart



Source: Depatment of Rural Development

2) Staffing

Shwebo Township (Shwebo District)

No	Rank	Permit	Present Staff		
			Male	Female	Total
1	Assistant Director	1	1	0	1
2	Staff Officer	1	0	0	0
3	Staff Officer (Technical)	1	0	2	2
4	Deputy Staff Officer	4	1	5	6
5	Junior Engineer (2)	4	0	2	2
6	Senior Clerk	6	2	5	7
7	Assistant Computer Operator	2	0	0	0
8	Junior Engineer (3)	4	0	3	3
9	Heavy Machinery Operator(3)	1	0	0	0
10	Junior Clerk	6	1	0	1
11	Dy Assistant Computer Operator	2	1	1	2
12	Junior Engineer (4)	2	1	0	1
13	Accountant (4)	1	0	1	1
14	Heavy Machinery Operator (4)	1	0	0	0
15	Driver (5)	2	0	0	0
16	Security	2	0	0	0
	Total	**40**	**7**	**19**	**26**

Khin U Township (Shwebo District)

No.	Rank	Permit	Present Staff		
			Male	Female	Total
1	Sfaff Officer (Technical)	1	0	1	1
2	Deputy Staff Officer	2	1	2	3
3	Junior Engineer (2)	2	0	1	1
4	Senior Clerk	5	2	2	4
5	Assistant Computer Operator	1	0	0	0
6	Junior Engineer (3)	2	0	2	2
7	Heavy Machinery Operator(3)	0	0	0	0
8	Junior Clerk	5	1	0	1
9	Dy Assistant Computer Operator	2	0	1	1
10	Junior Engineer (4)	2	1	0	1
11	Accountant (4)	1	0	0	0
12	Heavy Machinery Operator (4)	1	0	0	0
13	Driver (5)	2	0	0	0
14	Security	1	0	0	0
	Total	**27**	**5**	**9**	**14**

Ye U Township (Shwebo District)

No	Rank	Permit	Present Staff		
			Male	Female	Total
1	Sfaff Officer (Technical)	1	0	1	1
2	Deputy Staff Officer	2	1	2	3
3	Junior Engineer (2)	2	0	1	1
4	Senior Clerk	5	1	5	6
5	Assistant Computer Operator	1	0	0	0
6	Junior Engineer (3)	2	1	1	2
7	Heavy Machinery Operator(3)	0	0	0	0
8	Junior Clerk	5	1	0	1
9	Dy Assistant Computer Operator	2	0	1	1
10	Junior Engineer (4)	2	0	1	1
11	Accountant (4)	1	0	1	1
12	Heavy Machinery Operator (4)	1	1	0	1
13	Driver (5)	2	0	0	0
14	Security	1	0	0	0
	Total	**27**	**5**	**13**	**18**

Tabayin Township (Shwebo District)

No	Rank	Permit	Present Staff		
			Male	Female	Total
1	Sfaff Officer	1		1	1
2	Deputy Staff Officer	2		3	3
3	Junior Engineer (2)	2			0
4	Senior Clerk	5	2	4	6
5	Assistant Computer Operator	1			0
6	Junior Engineer (3)	2		2	2
7	Heavy Machinery Operator(3)	0			0
8	Junior Clerk	5			0
9	Dy Assistant Computer Operator	2		2	2
10	Junior Engineer (4)	2	1		1
11	Accountant (4)	1		1	1
12	Heavy Machinery Operator (4)	1			0
13	Driver (5)	2			0
14	Security	1			0
	Total	**27**	**3**	**13**	**16**

Wetlet Township (Shwebo District)

No	Rank	Permit	Present Staff		
			Male	Female	Total
1	Sfaff Officer	1	1	0	1
2	Deputy Staff Officer	2	1	1	2
3	Junior Engineer (2)	2	1	1	2
4	Senior Clerk	5	0	6	6
5	Assistant Computer Operator	1	0	0	0
6	Junior Engineer (3)	2	0	2	2
7	Junior Clerk	5	1	0	1
8	Dy Assistant Computer Operator	2	0	3	3
9	Junior Engineer (4)	2	0	0	0
10	Accountant (4)	1	0	1	1
11	Heavy Machinery Operator (4)	1	0	0	0
12	Driver (5)	2	1	0	1
13	Security	1	0	0	0
	Total	**27**	**5**	**14**	**19**

Taze Township (Shwebo District)

No	Rank	Permit	Present Staff		
			Male	Female	Total
1	Sfaff Officer (Technical)	1	1	0	1
2	Deputy Staff Officer	2	2	2	4
3	Junior Engineer (2)	2	0	0	0
4	Senior Clerk	5	1	4	5
5	Assistant Computer Operator	1	0	0	0
6	Junior Engineer (3)	2	0	1	1
7	Junior Clerk	5	0	1	1
8	Dy Assistant Computer Operator	2	0	2	2
9	Junior Engineer (4)	2	0	0	0
10	Accountant (4)	1	0	0	0
11	Heavy Machinery Operator (4)	1	0	0	0
12	Driver (5)	2	0	0	0
13	Security	1	0	0	0
	Total	**27**	**4**	**10**	**14**

KanbaluTownship (Kanbalu District)

No	Rank	Permit	Present Staff		
			Male	Female	Total
1	Assistant Director	1	0	0	0
2	Staff Officer	2	1	0	1
3	Deputy Staff Officer	3	0	4	4
4	Junior Engineer (2)	3	0	2	2
5	Junior Engineer (3)	3	2	1	3
6	Heavy Machinery Operator (3)	1	0	0	0
7	Senior Clerk	5	3	4	7
8	Assistant Computer Operator	1	0	0	0
9	Junior Clerk	4	0	0	0
10	Dy Assistant Computer Operator	2	0	1	1
11	Account (4)	1	1	1	2
12	Junior Engineer (4)	2	1	0	1
13	Heavy Machinery Operator (4)	1	0	0	0
14	Driver (5)	2	0	0	0
15	Security	2	0	0	0
	Total	**33**	**8**	**13**	**21**

BudalinTownship (Monywa district)

No	Rank	Permit	Present Staff		
			Male	Female	Total
1	Sfaff Officer	1	1	0	1
2	Deputy Staff Officer (Admin/Finance)	1	0	2	2
3	Deputy Staff Officer (Project / Intern -ational Relation)	1	0	1	1
4	Junior Engineer (2)	2	0	1	1
5	Senior Clerk	5	3	3	6
6	Assistant Computer Operator	1	0	0	0
7	Junior Engineer (3)	2	0	3	3
8	Junior Clerk	5	0	0	0
9	Dy Assistant Computer Operator	2	0	2	2
10	Junior Engineer (4)	2	0	1	1
11	Accountant (4)	1	0	1	1
12	Heavy Machinery Operator (4)	1	1	0	1
13	Driver (5)	2	0	0	0
14	Security	1	1	0	1
	Total	**27**	**6**	**14**	**20**

AyadawTownship (Monywa District)

No	Rank	Permit	Present Staff		
			Male	Female	Total
1	Staff Officer	1	1	0	1
2	Deputy Staff Officer	2	1	2	3
3	Junior Engineer(2)	2	0	1	1
4	Senior Clerk	5	1	4	5
5	Assistant Computer Operator	1	0	0	0
6	Junior Engineer(3)	2	1	1	2
7	Junior Clerk	5	0	1	1
8	Deputy Assistant Computer Operator	2	0	2	2
9	Junior Engineer(4)	2	1	1	2
10	Accountant(4)	1	0	1	1
11	Heavy Machinery Operator(4)	1	0	0	0
12	Driver(5)	2	0	0	0
13	Security	1	0	0	0
	Total	**27**	**5**	**13**	**18**

Source: Depatment of Rural Development

3) Budget

Shwebo Township (Shwebo District)

(Million Kyats)

Sr	Year	Road									Bridge									Permitted Budgets (Million Kyats)
		Asphalt (No, Mile)		Gravel (No, Mile)		Earth (No, Mile)		Total (No, Mile)		Permitted Budgets (Million Kyats)	Concrete (No, Length)		Box Culvert (No, Length)		Wooden (No, Length)		Total (No, Length)		Permitted Budgets (Million Kyats)	
1	2012-2013																			
2	2013-2014																			
3	2014-2015																			
4	2015-2016																			
5	2016-2017																			
Total																				

Wetlet Township (Shwebo District)

(Million Kyats)

Sr	Year	Road												Bridge										Permitted Budgets (Million Kyats)
		Asphalt (No, Mile)		Concrete (No, Mile)		Gravel (No, Mile)		Laterite/ Kankar (No, Mile)		Earth (No, Mile)		Total (No, Mile)	Permitted Budgets (Million Kyats)	Concrete (No, Length)		Wooden (No, Length)		Cause-Way (No, Length)		Box Culvert (No, Length)		Total (No, Length)	Permitted Budgets (Million Kyats)	
1	2012-2013																							
2	2013-2014																							
3	2014-2015																							
4	2015-2016																							
5	2016-2017																							
Total																								

Khin-U Township (Shwebo District)

(Million Kyats)

Sr	Year	Road							Bridge										Permitted Budgets (Million Kyats)
		Gravel (No, Mile)		Earth (No, Mile)		Total (No, Mile)		Permitted Budgets (Million Kyats)	Concrete (No, Length)		Box Culvert (No, Length)		Wooden (No, Length)		Cause-Way (No, Length)		Total (No, Length)		Permitted Budgets (Million Kyats)	
1	2012-2013																			
2	2013-2014																			
3	2014-2015																			
4	2015-2016																			
5	2016-2017																			
Total																				

Ye-U Township (Shwebo District)

(Million Kyats)

Sr	Year	Road									Bridge											Permitted Budgets (Million Kyats)
		Asphalt (No, Mile)		Gravel (No, Mile)		Earth (No, Mile)		Total (No, Mile)		Permitted Budgets (Million Kyats)	Concrete (No, Length)		Box Culvert (No, Length)		Wooden (No, Length)		Cause-Way (No, Length)		Total (No, Length)		Permitted Budgets (Million Kyats)	
1	2012-2013																					
2	2013-2014																					
3	2014-2015																					
4	2015-2016																					
5	2016-2017																					
Total																						

Taze Township (Shwebo District)

(Million Kyats)

Sr	Year	Road								Bridge									Permitted Budgets (Million Kyats)
		Asphalt (No, Mile)		Gravel (No, Mile)		Earth (No, Mile)		Total (No, Mile)	Permitted Budgets (Million Kyats)	Concrete (No, Length)		Box Culvert (No, Length)		Wooden (No, Length)		Total (No, Length)		Permitted Budgets (Million Kyats)	
1	2012-2013																		
2	2013-2014																		
3	2014-2015																		
4	2015-2016																		
5	2016-2017																		
Total																			

Tabayin Township (Shwebo District)

(Million Kyats)

Sr	Year	Road								Bridge									
		Asphalt (No, Mile, Furlong)		Gravel (No, Mile, Furlong)		Kankar (No, Mile, Furlong)		Total (No, Mile, Furlong)	Permitted Budgets (Million Kyats)	Concrete (No, Length)		Box Culvert (No, Length)		Wooden (No, Length)		Total (No, Length)		Permitted Budgets (Million Kyats)	Permitted Budgets (Million Kyats)
1	2012-2013																		
2	2013-2014																		
3	2014-2015																		
4	2015-2016																		
5	2016-2017																		
Total																			

Kanbalu Township (Kanbalu District)

(Million Kyats)

Sr	Year	Road									Bridge									Permitted Budgets (Million Kyats)
		Gravel (No, Mile, Furlong)		Kankar (No, Mile, Furlong)		Earth (No, Mile, Furlong)		Total (No, Mile, Furlong)		Permitted Budgets (Million Kyats)	Cause-Way (No, Length)		Box Culvert (No, Length)		Wooden (No, Length)		Total (No, Length)		Permitted Budgets (Million Kyats)	
1	2012-2013																			
2	2013-2014																			
3	2014-2015																			
4	2015-2016																			
5	2016-2017																			
Total																				

Budalin Township (Monywa District)

(Million Kyats)

Sr	Year	Road										Bridge										Permitted Budgets (Million Kyats)
		Asphalt (No, Mile)		Gravel (No, Mile)		Latterite (No, Mile)		Earth (No, Mile)		Total (No, Mile)	Permitted Budgets (Million Kyats)	Concrete (No, Length)		Box Culvert (No, Length)		Cause-Way (No, Length)		Wooden (No, Length)		Total (No, Length)		Permitted Budgets (Million Kyats)	
1	2012-2013																						
2	2013-2014																						
3	2014-2015																						
4	2015-2016																						
5	2016-2017																						
Total																							

Ayadaw Township (Monywa District)

(Million Kyats)

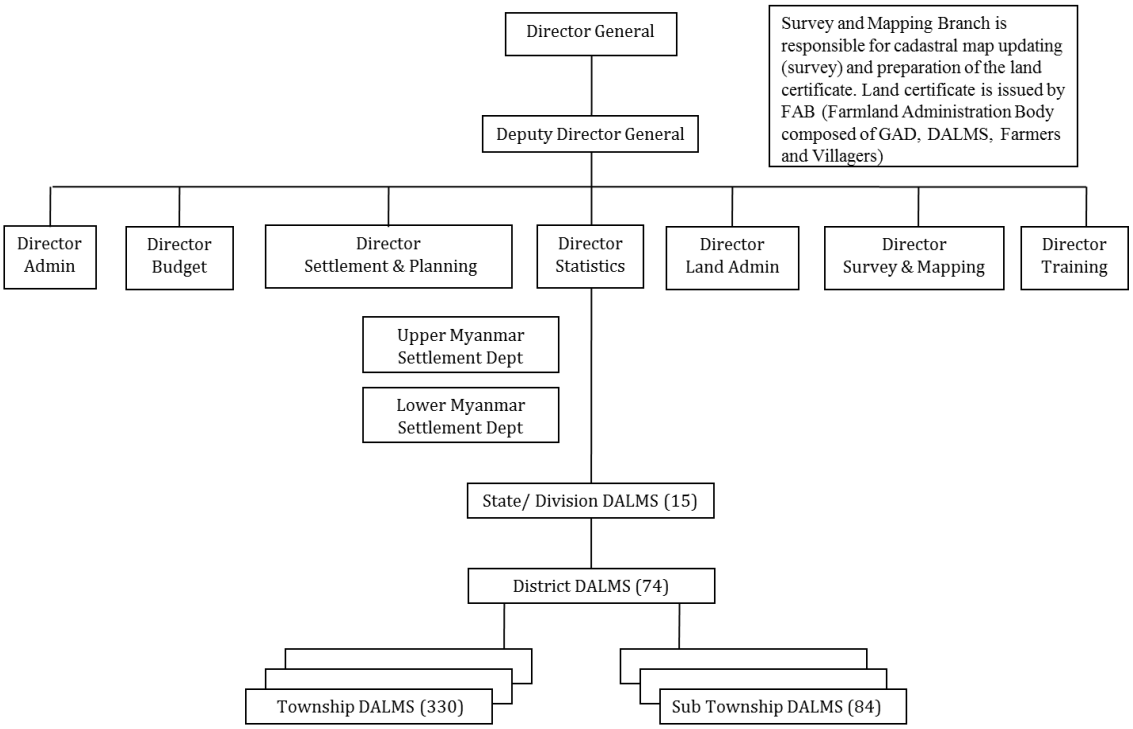
Sr	Years	Road									Bridge									Permitted Budget (Million Kyats)
		Asphalt (No,Mile)		Gravel (No,Mile)		Kanker (No,Mile)		Total (No,Mile)		Permitted Budget (Million Kyats)	Concrete (No,Length)		Box Culvert (No,Length)		CauseWay (No,Length)		Total (No,Length)		Permitted Budget (Million Kyats)	
1	2012-2013																			
2	2013-2014																			
3	2014-2015																			
4	2015-2016																			
5	2016-2017																			
Total																				

Source: Depatment of Rural Development

VII.7 Department of Agricultural Land Management and Statistics (DALMS)

1. Headquter Level

1) Organization Chart



Source: Department of Agricultural Land Management and Satistics

2) Staffing

Year	Staff Number		
	Officers	Other Staffs	Total
2012	346	9,228	9,574
2013	355	10,492	10,847
2014	320	10,157	10,477
2015	299	10,672	10,971
2016	366	11,370	11,736

Source: Department of Agricultural Land Management and Satistics

3) Budget

(Million Kyats)

Year	Permitted Budgets		Actual Expenditure	
	Current	Capital	Current	Capital
2011-2012				
2012-2013				
2013-2014				
2014-2015				
2015-2016				

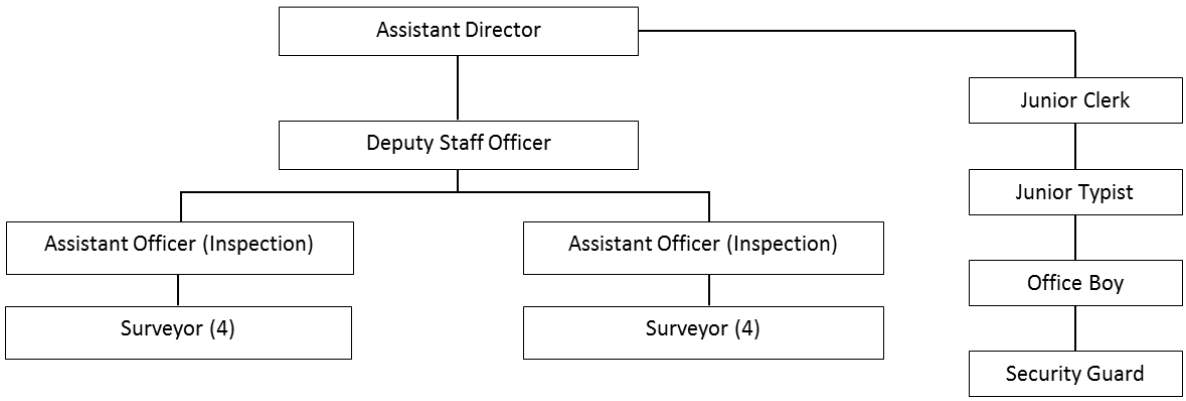
Source: Department of Agricultural Land Management and Satistics

4) Experience of the Loan/Grant Project Implementation

Not Avaliable

2. District Level

1) Organization Chart



Source: Department of Agricultural Land Management and Satistics

2) Staffing

Shwebo district

No.	Position	Permission	Appointed
1	Assiatant Director	1	1
2	Staff Officer		
3	Deputy Officer	1	1
4	Account-3		
5	Assistant Officer (Inspection)	1	1
6	Assistant Officer (Proceeding)	1	1
7	Surveyor - 4	2	
8	Account-4		
9	Junior Clerk	1	1
10	Dy-Assistant Officer (Inspection)		
11	Dy-Assistant Officer (Proceeding)		
12	Typist	1	
13	Dy-Assistant Computer Operator		
14	Surveyor - 5		1
15	Office-boy	1	
16	Security Guard	1	
17	Labourer		1
	Total	10	7

Monywa District

No.	Position	Permission	Appointed
1	Assistant Director	1	1
2	Staff Officer		1
3	Deputy Staff Officer	1	1
4	Assi: Staff Officer (File Control)	1	1
5	Assi: Staff Officer (Inspect)	1	1
6	Accountant-3		
7	Accountant-4		
8	Junior Clerk	1	1
9	Junior Typist	1	
10	Dy Assi: Staff Officer(File Control)		
11	Dy Assi: Staff Officer (Inspect)		
12	Surveyor-4	2	1
13	Surveyor-5		
14	Helper	1	
15	Security	1	
	Total	10	7

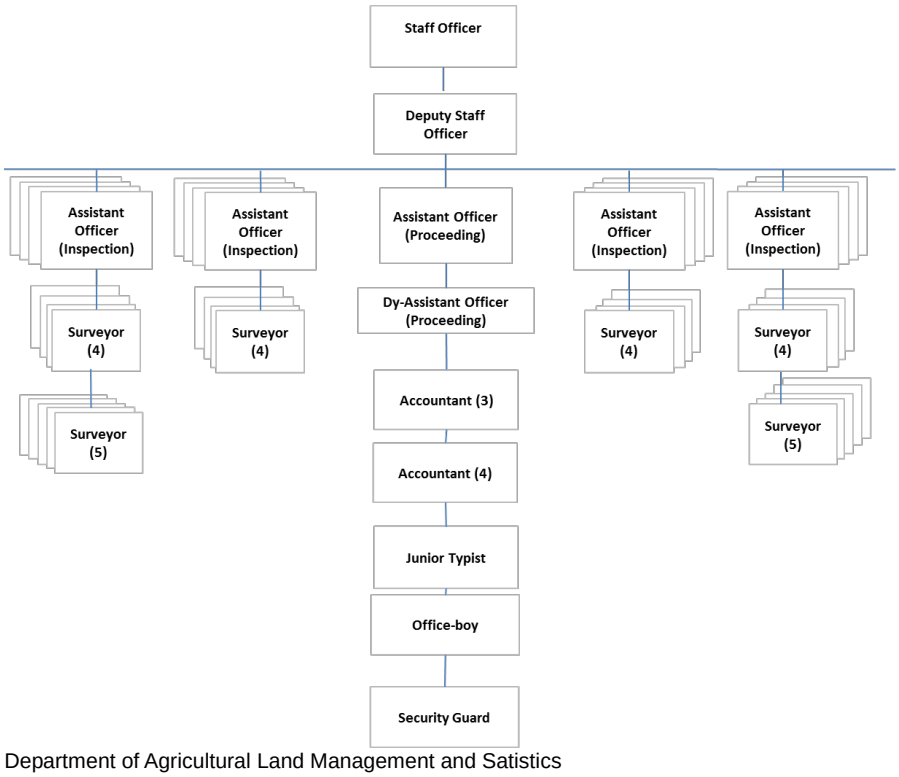
Source: Department of Agricultural Land Management and Satistics

3) Budget

Not Avaliable

3. Township Level

1) Organization Chart



Source: Department of Agricultural Land Management and Satistics

2) Staffing

Shwebo Township (Shwebo District)

No.	Position	Permission	Appointed
1	Assiatant Director		
2	Staff Officer	1	
3	Deputy Officer	1	1
4	Account-3	1	1
5	Assistant Officer (Inspection)	13	12
6	Assistant Officer (Proceeding)	1	
7	Surveyor - 4	53	28
8	Account-4	1	1
9	Junior Clerk		
10	Dy-Assistant Officer (Inspection)	1	
11	Dy-Assistant Officer (Proceeding)	1	
12	Typist	1	1
13	Dy-Assistant Computer Operator		
14	Surveyor - 5	2	20
15	Office-boy	4	1
16	Security Guard	1	
17	Labourer		
	Total	81	65

Wetlet Township (Shwebo District)

No.	Position	Permission	Appointed
1	Assiatant Director	1	1
2	Staff Officer		
3	Deputy Officer	1	1
4	Account-3		
5	Assistant Officer (Inspection)	1	1
6	Assistant Officer (Proceeding)	1	1
7	Surveyor - 4	2	
8	Account-4		
9	Junior Clerk	1	1
10	Dy-Assistant Officer (Inspection)		
11	Dy-Assistant Officer (Proceeding)		
12	Typist	1	
13	Dy-Assistant Computer Operator		
14	Surveyor - 5		1
15	Office-boy	1	
16	Security Guard	1	
17	Labourer		1
	Total	10	7

Khin-U Township (Shwebo District)

No.	Position	Permission	Appointed
1	Assiatant Director		
2	Staff Officer	1	
3	Deputy Officer	1	1
4	Account-3	1	
5	Assistant Officer (Inspection)	8	7
6	Assistant Officer (Proceeding)	1	1
7	Surveyor - 4	36	18
8	Account-4		1
9	Junior Clerk		
10	Dy-Assistant Officer (Inspection)	1	1
11	Dy-Assistant Officer (Proceeding)		
12	Typist	1	1
13	Dy-Assistant Computer Operator		
14	Surveyor - 5	2	17
15	Office-boy	2	1
16	Security Guard	1	
17	Labourer		
	Total	55	48

Ye-U Township (Shwebo District)

No.	Position	Permission	Appointed
1	Assiatant Director		
2	Staff Officer	1	1
3	Deputy Officer	1	1
4	Account-3	1	
5	Assistant Officer (Inspection)	6	4
6	Assistant Officer (Proceeding)	1	1
7	Surveyor - 4	26	17
8	Account-4		1
9	Junior Clerk		
10	Dy-Assistant Officer (Inspection)	1	
11	Dy-Assistant Officer (Proceeding)		
12	Typist	1	1
13	Dy-Assistant Computer Operator		
14	Surveyor - 5	2	11
15	Office-boy	2	2
16	Security Guard	1	
17	Labourer		
	Total	43	39

Tabayin Township (Shwebo District)

No.	Position	Permission	Appointed
1	Assiatant Director		
2	Staff Officer	1	1
3	Deputy Officer	1	1
4	Account-3	1	
5	Assistant Officer (Inspection)	8	8
6	Assistant Officer (Proceeding)	1	1
7	Surveyor - 4	37	26
8	Account-4		
9	Junior Clerk		
10	Dy-Assistant Officer (Inspection)	1	
11	Dy-Assistant Officer (Proceeding)		
12	Typist	1	1
13	Dy-Assistant Computer Operator		
14	Surveyor - 5	2	13
15	Office-boy	2	
16	Security Guard	1	
17	Labourer		
	Total	56	51

Taze Township (Shwebo District)

No.	Position	Permission	Appointed
1	Assiatant Director		
2	Staff Officer	1	1
3	Deputy Officer	1	1
4	Account-3	1	
5	Assistant Officer (Inspection)	9	9
6	Assistant Officer (Proceeding)	1	1
7	Surveyor - 4	37	27
8	Account-4		
9	Junior Clerk		
10	Dy-Assistant Officer (Inspection)	1	1
11	Dy-Assistant Officer (Proceeding)		
12	Typist	1	1
13	Dy-Assistant Computer Operator		
14	Surveyor - 5	2	12
15	Office-boy	2	1
16	Security Guard	1	1
17	Labourer		
	Total	57	55

Kanbalu Township (Kanbalu District)

No.	Position	Permission	Appointed
1	Assiatant Director		
2	Staff Officer	1	1
3	Deputy Officer	1	1
4	Account-3	1	1
5	Assistant Officer (Inspection)	13	13
6	Assistant Officer (Proceeding)	1	1
7	Surveyor - 4	58	33
8	Account-4		
9	Junior Clerk		
10	Dy-Assistant Officer (Inspection)	1	
11	Dy-Assistant Officer (Proceeding)		
12	Typist	1	
13	Dy-Assistant Computer Operator		
14	Surveyor - 5	2	25
15	Office-boy	3	1
16	Security Guard	1	
17	Labourer		
	Total	83	76

Budalin Township (Monywa District)

No.	Position	Permission	Appointed
1	Assistant Director		
2	Staff Officer	1	1
3	Deputy Staff Officer	1	1
4	Assi: Staff Officer (File Control)	1	1
5	Assi: Staff Officer (Inspect)	10	10
6	Accountant-3	1	
7	Accountant-4		1
8	Junior Clerk		
9	Junior Typist	1	
10	Dy Assi: Staff Officer(File Control)		
11	Dy Assi: Staff Officer (Inspect)	1	
12	Surveyor-4	45	35
13	Surveyor-5	2	11
14	Helper	2	1
15	Security	1	
	Total	66	61

Ayadaw Township (Monywa District)

No.	Position	Permission	Appointed
1	Assistant Director		
2	Staff Officer	1	1
3	Deputy Staff Officer	1	1
4	Assi: Staff Officer (File Control)	1	1
5	Assi: Staff Officer (Inspect)	10	10
6	Accountant-3	1	1
7	Accountant-4		
8	Junior Clerk		
9	Junior Typist	1	1
10	Dy Assi: Staff Officer(File Control)		
11	Dy Assi: Staff Officer (Inspect)	1	
12	Surveyor-4	46	30
13	Surveyor-5	2	11
14	Helper	2	1
15	Security	1	1
	Total	67	58

Source: Department of Agricultural Land Management and Satistics

3) Budget

Not Availiable

APPENDIX-VIII

ENVIRONMENT

APPENDIX VIII: EMVIRONMENT

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APPENDIX VIII. ENVIRONEMENT

VIII.1 RESULT OF SOCIO-ECONOMIC SURVEY TO AFFECTED PERSONS BY KYAUNK MYAUNG JETTY IMPROVEMENT

Kyaunk Myaung Jetty is located on Kyung Myaung Town under Shwebo District, which is in due east of Shwebo Town, around 20 km away (refer to Figure 1). It has been established along the Ayeyarwady River, traveling down through almost of the land of Myanmar from north to south. About 500 thousands rice bags per year transported from the jetty to China, and 50-100 labors per day work at the jetty. However, the bridge between ships and the jetty are wooden as shown in photo below (left), which makes the works inefficient and unsafe. The water level of the Ayeyarwady River is fluctuated by rainfall, and sometimes, surrounding area is flooded in rainy season. Just near the jetty, there are some temporary shops, while there are some permanent houses. Such temporary shops are constructed every year at the beginning of dry season (see photo right).

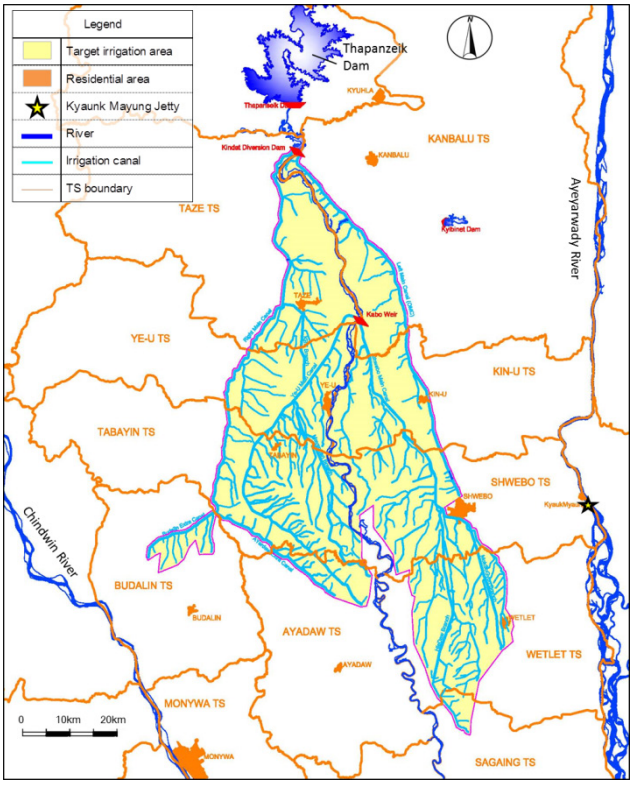


Figure VIII.1.1 Location of Kyaunk Myaung

Shipment by labors at the jetty

Shops facing the jetty

It is necessary to demolish such structures mentioned above for the jetty improvement works, and the occupants are requested to shift to other sites. There are 16 households who will be affected by the jetty improvement works. A socio-economic survey targeting them was implemented (refer to Table-1). Out of 16 households, 6 households reside and operate their business in the affected area, while remaining 10 households have their residents in other sites. The affected area is governmental land, which means that all of the people are illegal settlers. It is noted that 10 shops are temporary operated in dry season, and the people re-construct their structures every year, since the structures can be flooded by the Ayeyarwady River in rainy season. They have stayed for many years and their income are mainly obtained from the shop operation near jetty.

The affected persons by the jetty improvement generally get stable income, around 5 million Kyat /household annually on average, and they cannot be categorized into the poor. Almost all of the occupants are Burma, while there is only one Kayin woman who married Burma guy. She migrated

from her hometown for marriage and she does not have any difficulties to communicate in Burma language, hence, it is not necessary to pay special attention to her. Therefore, it can be said that there are no the poor, indigenous, and ethnic people whom consideration have to be taken.

During construction period, the current jetty will be closed, however, a temporary jetty will be operated nearby. Therefore, present labors for shipment at the jetty will work at the temporary jetty. The persons who are requested to shift their houses/shops also can continue their business around the temporary jetty, so that, their livelihood will not severely affected by the Component. During operation, they will re-start their business near jetty, even after their residences are moved to other sites. Due to improvement of jetty, it is expected that the area will be developed. Therefore, it can be said that the impacts on livelihood of affected persons will be not be significant.

Table VIII.1.1 Result of Socio-eonomic Survey to Affected Persons by Jetty Improvement (1/6)

No.	Name	Contact number (mobile phone)	Age	No. of male family member	No. of female family member	Educational status of household head	Ethnicity	Properties	1. Purpose of structure near jetty (for commercial/ residence)	2. Land status holding (yes/no)	3. Since when have you stayed here?	4. How many months per year do you stay here?
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												

Table VIII.1.1 Result of Socio-eonomic Survey to Affected Persons by Jetty Improvement (2/6)

No.	Name	5. Do you hire somebody for the business **here**?	6.How much do you get **net income** per month by business **here**? (Kyat/month)	7.How much do you spend for raw materials **here**? (Kyat/month)	8.How much do you spend for electric fee for busines **here**? (Kyat/month)	9.How much do you spend for water fee for busines **here**? (Kyat/month)	10.How much do you spend for fuel for busines **here**? (Kyat/month)	11.How much do you spend for transportation fee for busines **here**? (Kyat/month)	11.How much do you spend for maintecane of truck ? (Kyat/month)	12.How much do you spend for labor for busines **here**? (Kyat/month)
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										

Table VIII.1.1 Result of Socio-eonomic Survey to Affected Persons by Jetty Improvement (3/6)

No.	Name	13. Do you have other shops **(not around jetty**)?	14.If yes, how much do you get net income (Kyat/month)?	15. While you do not stay here (monsoon), how do you get income?	16. If you work during monsoon serason, how much net income do you get ? (Kyat/month)	17. Do you have farmland?	18. If you have farm income, how much is gross income? (Kyat/year)	19. Do you get income by selling of livestock? If so, how much per year?	20. Do you get income by working as casual labor? If so, how much do you get? (Kyat/ month)
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									

Table VIII.1.1 Result of Socio-eonomic Survey to Affected Persons by Jetty Improvement (4/6)

No.	Name	21. Do you have other income source? If yes, what?	22. How much do you get by the work? (Kyat/month)	23. Do you have handycaped family member?	24. How many minutes from your house to shop arouond jetty on	25. Have you been requested to relocate to other sites before?	26. If so, why you did not move?
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							

Table VIII.1.1 Result of Socio-eonomic Survey to Affected Persons by Jetty Improvement (5/6)

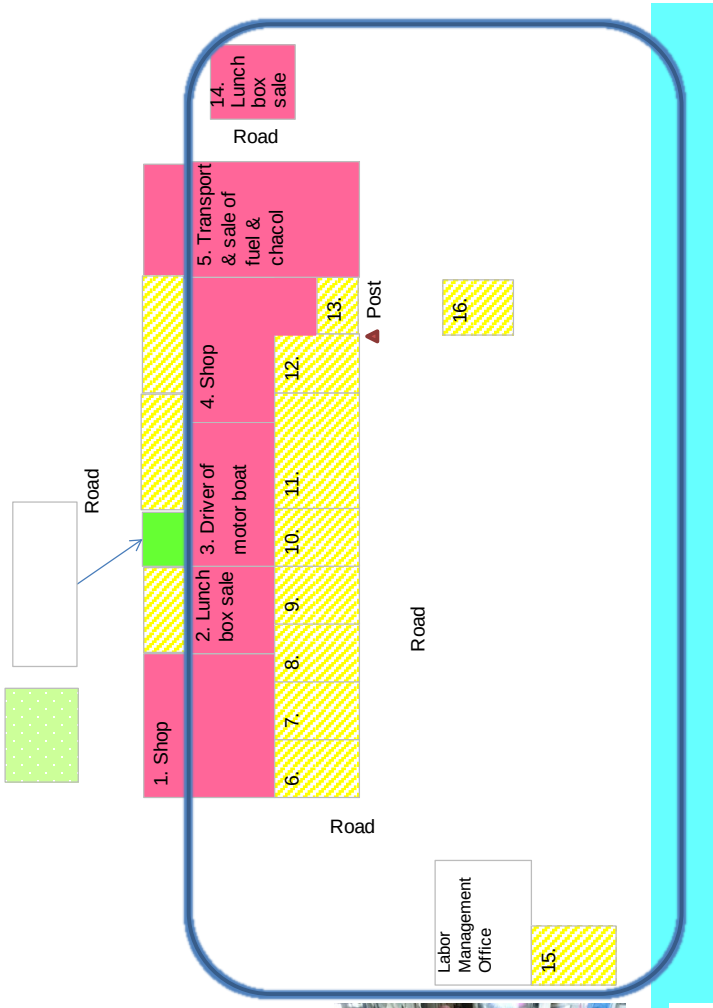
No.	Name	27. Which compensation measure preferable, cash or land?	28. What kinds of conditions are needed for resettlement by jetty improvement?	29. Any remarks
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				

Table VIII.1.1 Result of Socio-eonomic Survey to Affected Persons by Jetty Improvement (6/6)

No.	Name	Residences is in affected area.	Income source	Annual Income (Kyat/year)								
				Business near jetty (dry season)	Business (rainy season)	Other shop	Farm income	Casual labor	Other business	Public office	Pension	**Total**
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
Average												

* Female headed household ** Those incomes gained by works in rainy season.

VIII.2 LAYOUT OF AFFECTED AREA BY JETTY IMPROVEMENT



VIII.3 SIZE AND TYPE OF PROJECT REQUIRED IEE AND EIA

No.	Type of Investment Project	Size Required IEE	Size Required EIA
Special investment project			
1.	Projects in which investment is decided by the Parliament or the government cabinet or the President	-	Any size
Project for developing energy sector			
2.	Hydro Power Plants	Installed capacity ≥ 1 MW but < 15 MW and Reservoir volume (full supply level) < 20,000,000 m3 and Reservoir area (full supply level) < 400 ha	Installed capacity ≥ 15 MW or Reservoir volume (full supply level) ≥ 20,000,000 m3 or Reservoir area (full supply level) ≥ 400 ha
3.	Nuclear Power Plants	-	All sizes
4.	Natural Gas or Bio Gas Power Plants	Installed capacity ≥ 5 MW but < 50 MW	Installed capacity ≥ 50 MW
5.	Coal-fired Power Plants	Installed capacity ≥ 1 MW but < 10 MW	Installed capacity ≥ 10 MW
6.	Power Plants from Waste Products	Installed capacity ≥ 50 MW	All activities where the Ministry requires that the Project shall undergo EIA
7.	Geothermal Facilities	Installed capacity ≥ 5 MW but < 50 MW	Installed capacity ≥ 50 MW
8.	Combined Cycle Power Plants (gas & thermal)	Installed capacity ≥ 5 MW but < 50 MW	Installed capacity ≥ 50 MW
9.	Thermal Power Plants (other than the types in items 4, 5, 6, 7 and 8)	Installed capacity ≥ 5 MW but < 50 MW	Installed capacity ≥ 50 MW
10.	Wind Power Plants	Installed capacity ≥ 5 MW but < 50 MW	Installed capacity ≥ 50 MW
11.	Solar Power Plants	Installed capacity ≥ 50 MW	All activities where the Ministry requires that the Project shall undergo EIA
12.	Onshore Oil and Gas Seismic Surveys	All sizes	
13.	Onshore Oil and Gas Exploration Drillings	-	All sizes
14.	Onshore Oil and Gas Production drilling and production activities; transportation activities including pipelines; pump stations, compressor stations and storage facilities; ancillary and support operations; and decommissioning	-	All sizes
15.	Offshore Oil and Gas Seismic Surveys	All sizes	-
16.	Offshore Oil and Gas Exploration Drillings	-	All sizes
17.	Offshore Oil and Gas Production drilling and production activities; offshore pipeline operations, offshore transportation, compressor stations and storage facilities; ancillary and support operations; and decommissioning	-	All sizes
18.	Petroleum Refineries or Natural Gas Refineries (including manufacturing of liquefied petroleum gas, motor gasoline, kerosene, diesel oil, heating oil, fuel oil, bitumen, asphalt, sulphur, and intermediate products e.g. propane/propylene mixtures, virgin naphtha, middle distillate and vacuum distillate for the petrochemical industry)	-	All sizes

No.	Type of Investment Project	Size Required IEE	Size Required EIA
19.	Natural Gas Processing Plants; Production of liquid products from natural gas (this may include methanol and petroleum liquid products such as naphtha, gasoline, kerosene, diesel fuel, waxes, and lubes)	-	All sizes
20.	Natural Gas Liquefaction Plants	-	All sizes
21.	Oil or Natural Gas Terminals	-	All sizes
22.	Petroleum Depots or Liquid Gas Depots	Storage capacity Petroleum < 10,000 t; Liquid gas < 2,500 t	Storage capacity Petroleum ≥ 10,000 t; Liquid gas ≥ 2,500 t
23.	Oil or Gas Transmission or Distribution Systems	< 10 km	≥ 10 km
24.	Filling Stations (including liquefied petroleum gas and compressed natural gas)	≥ 10 m3 (10,000 l) fuel storage capacity	All activities where the Ministry requires that the Project shall undergo EIA
25.	Petroleum-based Organic Chemicals Manufacturing	-	All sizes
26.	Electrical Power Transmission Lines ≥ 115 kV but < 230 kV	≥ 50 km	All activities where the Ministry requires that the Project shall undergo EIA
27.	Electrical Power Transmission Lines ≥ 230 kV	All sizes	All activities where the Ministry requires that the Project shall undergo EIA
28.	High Voltage (230 kV and 500 kV) Transformer Substations	≥ 4 ha	All activities where the Ministry requires that the Project shall undergo EIA
29.	Plantation Industrial/Crop Production (e.g. rubber, palm oil, cocoa, coffee, tea, bananas, sugar cane)	≥ 200 ha but < 500 ha	≥ 500 ha
30.	Annual Crop Production (e.g. cereals, pulses, roots, tubers, oil-bearing crops, fibre crops, vegetables, and fodder crops)	≥ 500 ha but < 3,000 ha	≥ 3,000 ha
31.	Livestock Farms (e.g. cows, buffaloes, horses, goats, sheep and others)	≥ 500 livestock units but < 3,000 livestock units	≥ 3,000 livestock units
32.	Farms for Poultry and Other Commercially Raised Fowl	Fowl (poultry, ducks, turkeys) ≥ 5,000 but < 20,000 Ostriches ≥ 50 but < 200 Quail ≥ 25,000 but < 100,000	Fowl ≥ 20,000 Ostriches ≥ 200 Quail ≥ 100,000
33.	Pig Farms	≥ 2,000 pigs but < 5,000 pigs	≥ 5,000 pigs
34.	Inland Fish Raising and Aquaculture (in rivers, lakes, ponds; including shrimp raising)	Total water surface ≥ 1 ha but < 25 ha	Total water surface ≥ 25 ha
35.	Marine and Coastal Fish Raising and Aquaculture	Total water surface ≥ 1 ha but < 100 ha	Total water surface ≥ 100 ha
36.	Oyster Raising and Pearl Production	≥ 50 ha but < 200 ha	≥ 200 ha
37.	Raising and Caring for Wild Animals	All sizes	All activities where the Ministry requires that the Project shall undergo EIA
38.	Reptile Farms	Alligators, monitor lizards or pythons < 1,000 reptiles other reptiles < 5,000 reptiles	≥ 1,000 alligators, monitor lizards or pythons ≥ 5,000 snakes or other reptiles
39.	Clear-cut Logging	< 500 ha	≥ 500 ha
40.	Concession Forest	< 10,000 ha	≥ 10,000 ha
41.	Irrigation Systems	≥ 100 ha but < 5,000 ha	≥ 5,000 ha
Good Manufacturing			

No.	Type of Investment Project	Size Required IEE	Size Required EIA
Food and Beverage Manufacturing			
42.	Meat Processing Plants (slaughter of cattle, pigs, sheep and other livestock)	≥ 15 t/d but < 50 t/d carcase production	≥ 50 t/d carcase production
43.	Poultry Processing Plants (slaughter of poultry and other commercially raised fowl)	≥ 15 t/d but < 50 t/d carcase production	≥ 50 t/d carcase production
44.	Fish Processing Plants (fish, crustaceans, gastropods, cephalopods, and bivalves; includes by-products such as fish oil and fish meals)	≥ 15 t/d but < 75 t/d	≥ 75 t/d
45.	Food and Beverage Processing Facilities (processing of beef, pork, mutton and poultry meats, vegetable, and fruit raw materials into value-added food and non-fermented beverage products for human consumption)	≥ 10 t/d but < 20 t/d	≥ 20 t/d
46.	Dairy Processing Plants (reception, storage, and industrial processing of raw milk and the handling and storage of processed milk and dairy products)	≥ 200 t/d raw milk on annual average basis	All activities where the Ministry requires that the Project shall undergo EIA
47.	Manufacture of Animal Feeds	≥ 100 t/d but < 300 t/d product and < 600 t/d if production is operating a maximum of 90 d/a	≥ 300 t/d product or ≥ 600 t/d if production is operating a maximum of 90 d/a
48.	Vegetable Oil Production and Processing Facilities	≥ 100 t/d but < 300 t/d product and < 600 t/d if production is operating a maximum of 90 d/a	≥ 300 t/d product or ≥ 600 t/d if production is operating a maximum of 90 d/a
49.	Manufacture of Starches and Starch Products	≥ 100 t/d but < 300 t/d product and < 600 t/d if production is operating a maximum of 90 d/a	≥ 300 t/d product or ≥ 600 t/d if production is operating a maximum of 90 d/a
50.	Manufacture of Grain Mill Products (grain milling, rice milling, production of rice flour, vegetable milling, coffee and cocoa milling, manufacture of flour)	≥ 100 t/d but < 300 t/d product and < 600 t/d if production is operating a maximum of 90 d/a	≥ 300 t/d product or ≥ 600 t/d if production is operating a maximum of 90 d/a
51.	Monosodium Glutamate (seasoning powder) Factories	≥ 50 t/d but <100 t/d	≥ 100 t/d
52.	Sugar Manufacturing Plants	≥ 50 t/d but < 300 t/d and < 600 t/d if production is operating a maximum of 90 d/a	≥ 300 t/d refined sugar or ≥ 600 t/d if production is operating a maximum of 90 d/a
53.	Alcohol, Wine and Beer Production Factories	≥ 50,000 l/d but < 300,000 l/d product and	≥ 300,000 l/d product or
54.	Non-Alcohol Factories (soda, soft drink, mineral water production)	≥ 20,000 l/d	All activities where the Ministry requires that the Project shall undergo EIA
55.	Ice Factories	≥ 500 t/d but < 2,000 t/d	≥ 2,000 t/d
56.	Drinking Water Factories (for bottled refined water)	≥ 100,000 l/d	All activities where the Ministry requires that the Project shall undergo EIA
57.	Tobacco Processing Plants	≥ 1 t/d but < 15 t/d product	≥ 15 t/d product
Garments, Textiles and Leather Products			
58.	Textile Manufacturing Facilities (production of yarn, fabric, garments and finished goods based on natural fibres, synthetic fibres and/or regenerated fibres)	All sizes	All activities where the Ministry requires that the Project shall undergo EIA
59.	Pre-treatment (washing, bleaching, mercerisation) or Dyeing of Textiles or Fibres	≥ 1 t/d but < 10 t/d	≥ 10 t/d

No.	Type of Investment Project	Size Required IEE	Size Required EIA
60.	Leather Products Manufacturing (includes synthetic leather, handbags, luggage, saddle, footwear)	≥ 1,000 t/a	All activities where the Ministry requires that the Project shall undergo EIA
61.	Tanning and Leather Finishing	< 12 t/d finished products	≥ 12 t/d finished products
Timber based Products			
62.	Sawmilling and Manufactured Wood Products	Sawmills: input ≥ 3,000 m3/a but < 50,000 m3/a Wood products: input ≥ 1,000 m3/a but < 15,000 m3/a	Sawmills: input ≥ 50,000 m3/a Wood products: input ≥ 15,000 m3/a
63.	Board and Particle-based Products Manufacturing (board and particle-based products, plywood and glued and laminated products, board from other raw materials such as sugar cane bagasse, straw, and linen)	< 600 m3/d or < 420 t/d	≥ 600 m3/d or ≥ 420 t/d
64.	Pulp and/or Paper Mills	≥ 20 t/d but < 50 t/d	≥ 50 t/d
65.	Printing or Other Surface Treatment Facilities (using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating)	≥ 6 kg/h but < 150 kg/h consumption of organic solvents	≥ 150 kg/h or ≥ 200 t/a consumption of organic solvents
Chemical			
66.	Large Volume Inorganic Compounds Manufacturing and Coal Tar Distillation (includes ammonia, acids [nitric, hydrochloric, sulphuric, hydrofluoric, phosphoric acid], chlor-alkali [e.g. chlorine, caustic soda, soda ash], carbon black, and coal tar distillation [naphthalene, phenanthrene, anthracene])	-	All sizes
67.	Petroleum-based Polymers Manufacturing Plants	-	All sizes
68	Coal Processing Plants (processing of coal into gaseous or liquid chemicals including fuels)		All sizes
69	Chemical Fertilizer Manufacturing Plants	-	All sizes
70	Pesticide Manufacturing, Formulation, and Packaging Plants	-	All sizes
71	Oleochemicals Manufacturing Plants (production of fatty acids, _lycerine, and biodiesel using fats and oils from vegetable or animal sources)		All sizes
72	Pharmaceuticals and Biotechnology Manufacturing Plants	< 50 t/a	≥ 50 t/a
73	Other Basic Organic Chemicals Manufacturing Plants	-	All sizes
74	Other Basic Inorganic Chemicals Manufacturing Plants	-	All sizes

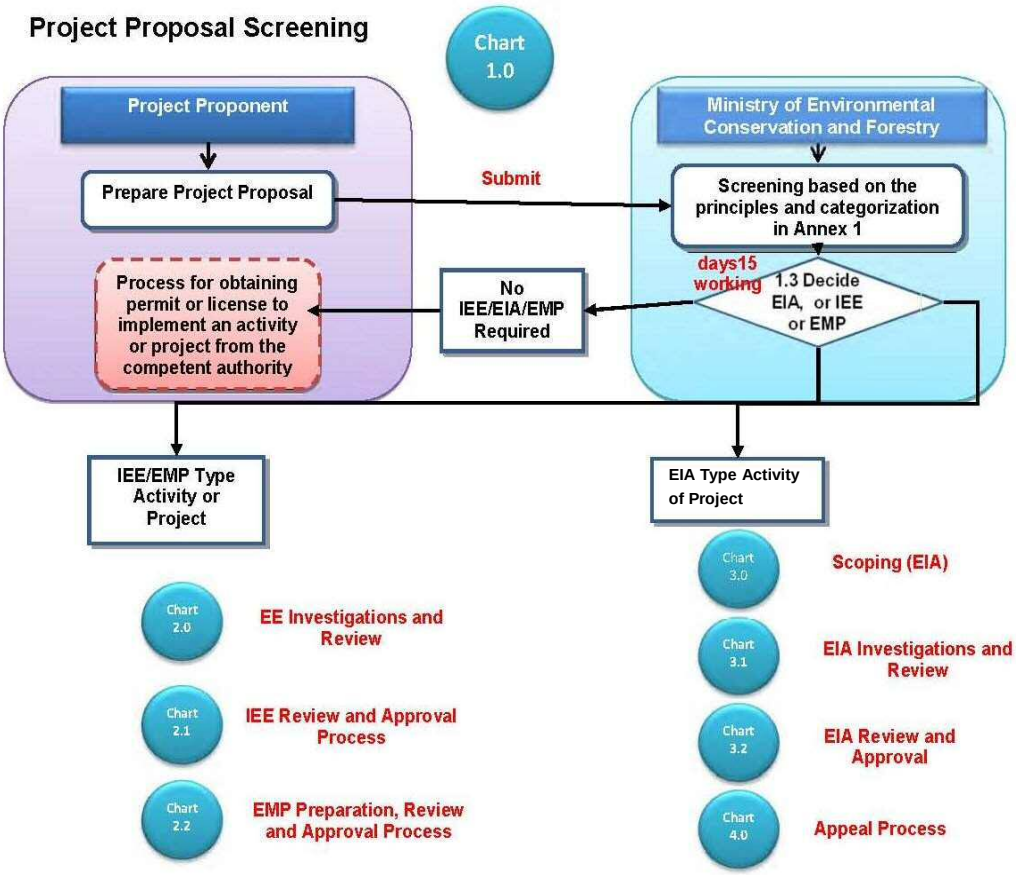
No.	Type of Investment Project	Size Required IEE	Size Required EIA
75	Other Chemical Products Manufacturing Plants (e.g. paints, inks, varnishes, soap, detergents, perfumes, pyrotechnic products, photographic chemicals)	≥ 5 t/d but < 10 t/d	≥ 10 t/d
76	Explosives Manufacturing Plants	-	All sizes
77	Manufacturing of Extinguishers and Other Firefighting Products	All sizes	All activities where the Ministry requires that the Project shall undergo EIA
78	Manufacturing of CO2 Gas and Filling and Liquefying Industrial Gas	≥ 1,000 t/a but < 3,000 t/a	≥ 3,000 t/a
Manufacture of Glass and Ceramics			
79	Glass, Glass Fiber or Mineral Fiber Manufacturing Plants	All sizes	All activities where the Ministry requires that the Project shall undergo EIA
80	Ceramic Tile and Sanitary Ware Manufacturing Plants	≥ 1,000 t/a fine ceramics ≥ 10,000 t/a ceramic tiles	All activities where the Ministry requires that the Project shall undergo EIA
Manufacture of Construction Materials			
81	Cement and Lime Manufacturing Plants	Cement ≥ 10 t/h but < 30 t/h Lime ≥ 20 t/d but < 50 t/d	Cement ≥ 30 t/h Lime ≥ 50 t/d
82	Clinker Plants	All sizes	All activities where the Ministry requires that the Project shall undergo EIA
83	Other Construction Supplies and Materials Production	≥ 30,000 t/a but < 50,000 t/a	≥ 50,000 t/a
84	Asphalt Production Plants	< 100 t/d	≥ 100 t/d
	Minerals, Machinery and Electrical devices		
85	Base Metal Smelting and Refining Plants (base metal smelting and refining of lead, zinc, copper, nickel, and aluminum)	Non-ferrous metal < 20 t/d melting capacity, except for lead and cadmium < 4 t/d melting capacity	Non-ferrous metal ≥ 20 t/d melting capacity, except for lead and cadmium ≥ 4 t/d melting capacity
86	Manufacture of Pig Iron, Raw and Low Alloy Steel from Iron Ore or Scrap Metal	< 2.5 t/h	≥ 2.5 t/h
87	Foundries (casting ferrous [iron and steel] and nonferrous [primarily aluminum, copper, zinc, lead, tin, nickel, magnesium, and titanium] metals)	Ferrous metal < 20 t/d production capacity Non-ferrous metal < 20 t/d production capacity except for lead and cadmium < 4 t/d production capacity	Ferrous metal ≥ 20 t/d production capacity Non-ferrous metal ≥ 20 t/d production capacity except for lead and cadmium ≥ 4 t/d production capacity
88	Non-ferrous Metal Melting, Smithy and Filigree	Production capacity ≥ 5 t/d but < 20 t/d	Production capacity ≥ 20 t/d
89	Shipyards and Ship Building Enterprises	< 1 ha and < 20,000 t lifting capacity	≥ 1 ha or ≥ 20,000 t lifting capacity
90	Locomotives and Other Railway Rolling Material Manufacturing, Repairing and Assembling	-	≥ 100 vehicles/a
91	Metal, Plastic, Fiber and Rubber Products Manufacturing Plants (material processing operations common to multiple industries engaged in the manufacture of metal, plastic, fibre, and rubber products)	≥ 5,000 m2 production area, or ≥ 6 kg/h consumption of organic solvents	All activities where the Ministry requires that the Project shall undergo EIA
92	Rubber and Latex Processing Plants	≥ 2,000 t/a	All activities where the Ministry requires that the Project shall undergo EIA
93	Vehicle Tire Manufacturing Plants	≥ 5,000 m^2 production area, or ≥ 6 kg/h consumption of organic solvents	All activities where the Ministry requires that the Project shall undergo EIA

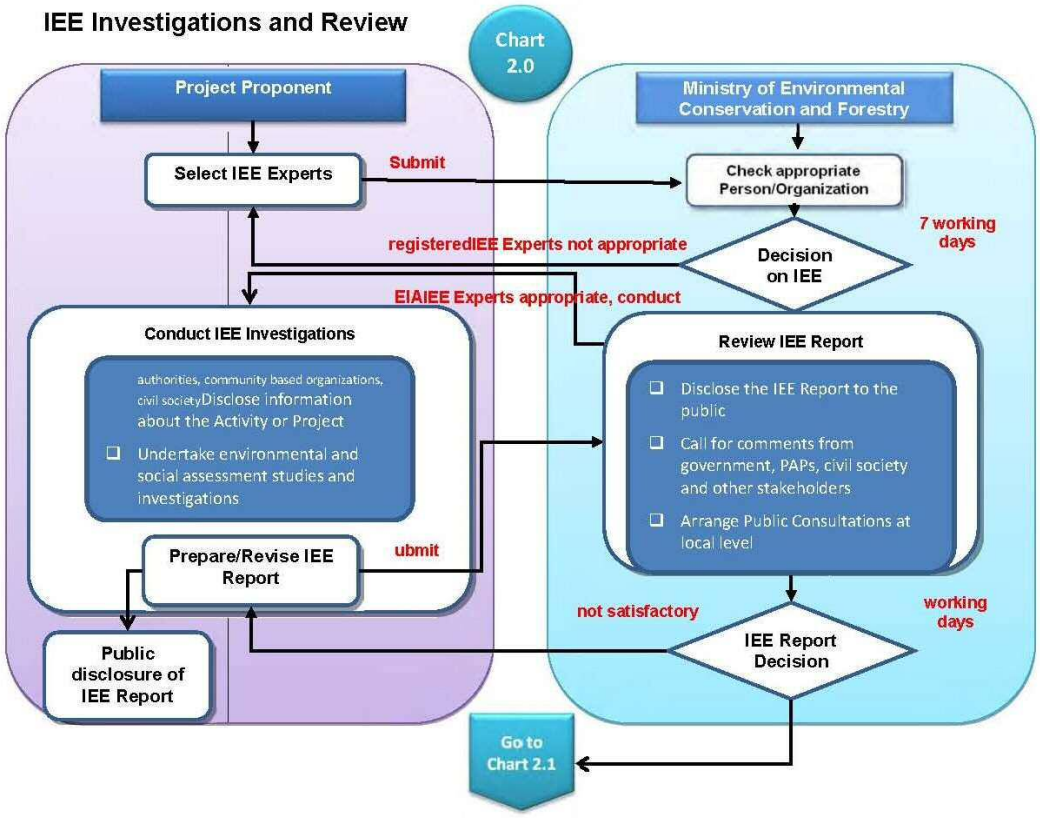
No.	Type of Investment Project	Size Required IEE	Size Required EIA
94	Semiconductors and Other Electronics Manufacturing Plants (manufacturing of semiconductors, printed circuit boards, printed wiring assemblies, screens, passive components, and magnetic devices)	≥ 5,000 m^2 production area, or ≥ 6 kg/h consumption of organic solvents	All activities where the Ministry requires that the Project shall undergo EIA
95	Electronic and Electric Equipment Manufacturing Plants (computers, communication equipment, consumer electronics (cooking, washing, food, warm and cooling domestic and public electronic, laboratory equipment, electric motors, electric lightning etc.)	≥ 5,000 m^2 production area, or ≥ 6 kg/h consumption of organic solvents	All activities where the Ministry requires that the Project shall undergo EIA
96	Batteries and Accumulators Manufacturing Plants	< 3,000 t/a	≥ 3,000 t/a
97	Machinery, Vehicles and Equipment Manufacturing Plants	≥ 5,000 m^2 production area, or ≥ 6 kg/h consumption of organic solvents	All activities where the Ministry requires that the Project shall undergo EIA
98	Motor Vehicle and Motor Bike Assembly Plants	≥ 5,000 m^2 production area, or ≥ 6 kg/h consumption of organic solvents	All activities where the Ministry requires that the Project shall undergo EIA
99	Motor Vehicle Accessories, Related Equipment and Engine Manufacturing Factories	≥ 5,000 m^2 production area, or ≥ 6 kg/h consumption of organic solvents	All activities where the Ministry requires that the Project shall undergo EIA
100	Motor Vehicle Maintenance Workshops	Utilization area ≥ 5,000 m^2	All activities where the Ministry requires that the Project shall undergo EIA
101	Car Breaking	< 10 vehicles/d, < 50 motorbikes/d	≥ 10 vehicles/d ≥ 50 motorbikes/d
102	Weapons and Ammunition Manufacturing Plants	-	All sizes
Waste Management			
103	Non-Hazardous Waste Disposal Facilities	Landfills < 10 t/d and total capacity < 25,000 t Others < 50 t/d	Landfills ≥ 10 t/d or total capacity ≥ 25,000 t Others ≥ 50 t/d
104	Non-Hazardous Waste Incinerators	< 3 t/h	≥ 3 t/h
105	Non-Hazardous Waste Recycling, Recovery or Reuse Facilities	< 50 t/d	≥ 50 t/d
106	Hazardous Waste Disposal Facilities	-	All sizes
107	Hazardous Waste Recycling, Recovery or Reuse Facilities	< 10 t/d	≥ 10 t/d
108	Wastewater Treatment Plants (centralized systems)	-	All sizes
109	Wastewater and Storm Water Collection Systems	Length ≥ 1 km but < 10 km	≥ 10 km
Water supply			
110	Groundwater Development for Industrial, Agricultural or Urban Water Supply		< 4,500 m3/d
Infrastructure and Service Development			
111	Dams and Reservoirs		Dam height < 15 m and Reservoir area < 400 ha
112	Lake, River and Channel Land Filling which Impacts on the Public		Area < 50 ha

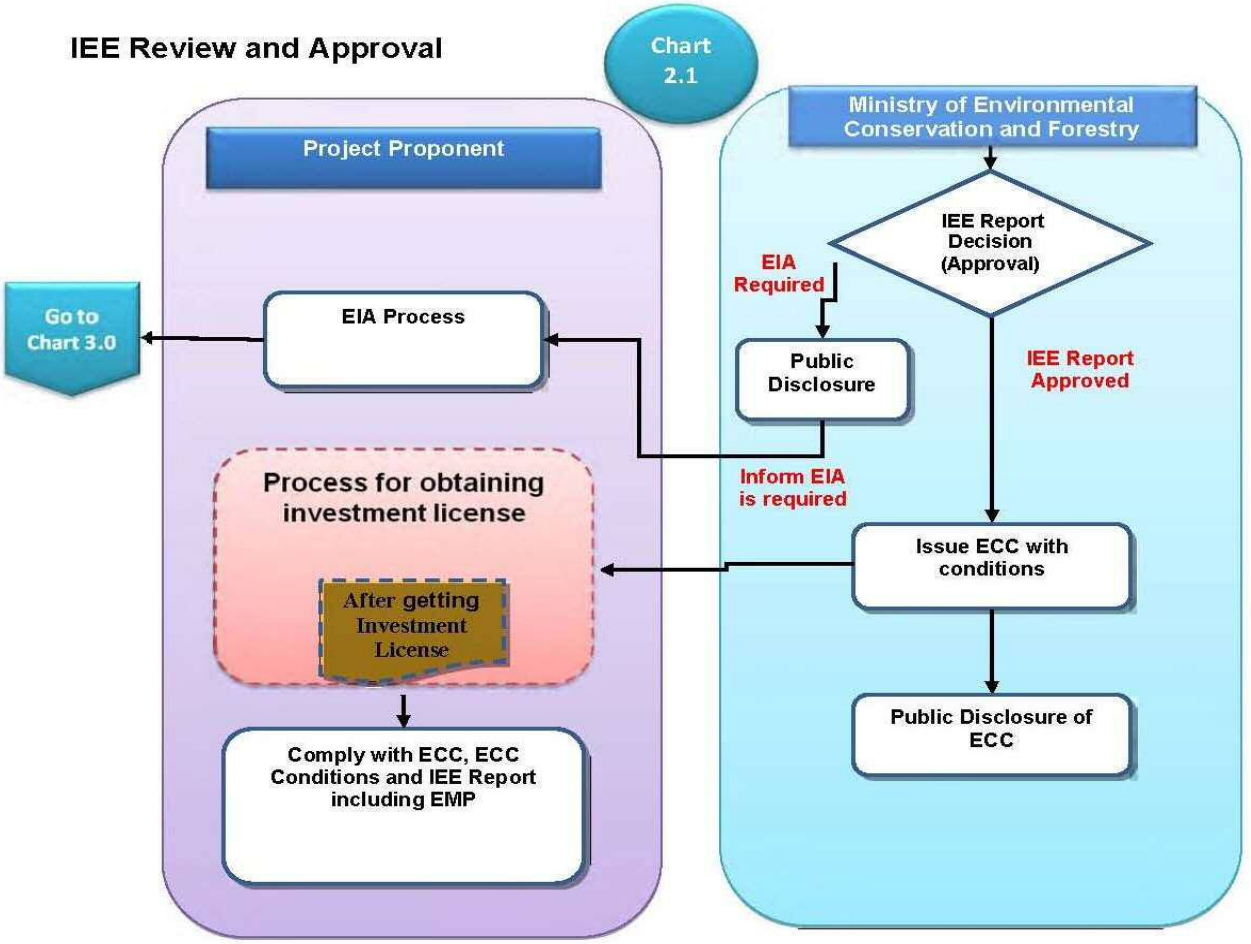
No.	Type of Investment Project	Size Required IEE	Size Required EIA
113	Other Large Civil Works Construction (embankments, seawalls, offshore breakwater)		Length < 2 km and Area < 25 ha
114	Dredging		Total < 500,000 t
115	River Channel Conservation (surface water & water volume control)		
116	Shipping (operation and maintenance of ships used for the transport of bulk cargo, and goods, and ship breaking)		All sizes
117	Ports, Harbors, and Terminals (ports, harbors, and terminals for cargo and passengers transfer)		Area < 25 ha
118	Industrial Zone Construction and Development		-
119	Hospitals		All sizes
120	Cemeteries and Crematoria (for burial, incineration and other forms)		All sizes
121	Tourism and Hospitality Development	total utilization area ≥ 200,000 m^2 but < 500,000 m^2	≥ 80 rooms but < 200 rooms or total utilization area is ≥ 500,000 m^2
122	Golf Court	9 holes	18 holes
Transportation			
123	Railways and Tramways (construction and maintenance of rail infrastructure and operation of rolling stock)	Length < 5 km	Length ≥ 5 km
124	Cable Cars	Length < 0.5 km	Length ≥ 0.5 km
125	Airports and Runway Construction	Runway length < 2,100 m	Runway length ≥ 2,100 m
126	Bridges, River Bridges and Viaducts (new construction)	Length ≥ 200 m but < 2 km	Length ≥ 2 km
127	Bridges, River Bridges and Viaducts (upgrading)	Length ≥ 300 m	All activities where the Ministry requires that the Project shall undergo EIA
128	Tunnels	Length < 1 km	Length ≥ 1 km
129	Expressways and Highways (ASEAN Highway Standard; new construction or widening)	Length ≥ 2 km but < 50 km	Length ≥ 50 km
130	Other Roads (state, region, urban; new construction or widening)	Length ≥ 50 km but < 100 km	Length ≥ 100 km
131	Road Improvement (upgrading from seasonal to all weather surface, widening of shoulders)	Length ≥ 50 km	All activities where the Ministry requires that the Project shall undergo EIA
Mining			
132	Extraction of Rock, Gravel or Sand from a River or Marine Waters	≥ 1,000 m3/a but < 50,000 m^3/a	≥ 50,000 m^3/a
133	Construction, Building and Ceramic Minerals Extraction (aggregates, limestone, slates, clay, gypsum, feldspar, silica sands, granite, kaolin, bentonite, marble, and quartzite)	< 200 acre and < 100,000 t/a	≥ 200 acre or ≥ 100,000 t/a
134	Extraction and Refining of Industrial Minerals (barite, fluorite, phosphate, potash, salt, soda ash, asbestos)	< 200 acre and < 100,000 t/a ore	≥ 200 acre or ≥ 100,000 t/a ore

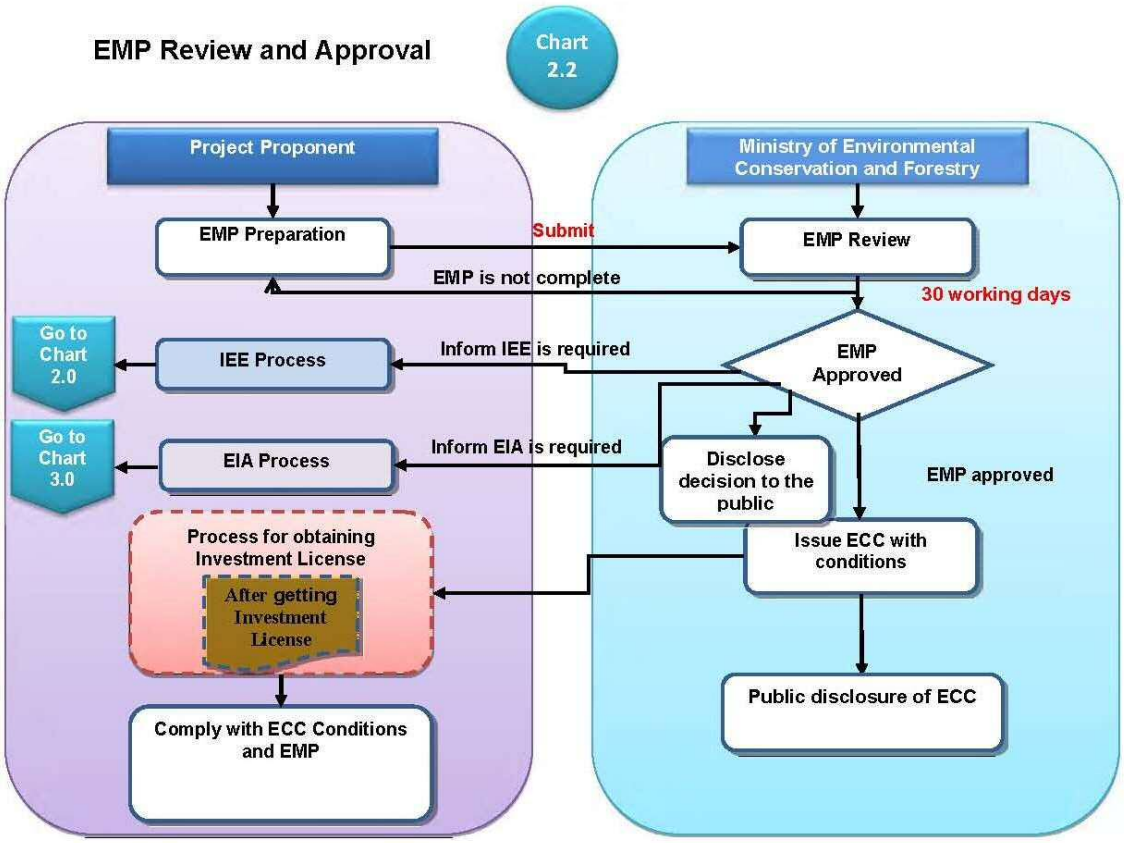
No.	Type of Investment Project	Size Required IEE	Size Required EIA
135	Extraction of Ferrous, Non-Ferrous Metal and Precious Metal Ore Except Gold (iron, manganese, silver, copper, tin, antimony, lead, nickel, zinc, chromium, bauxite), and Precious Stone	< 50 acre and < 50,000 t/a	≥ 200 acre or ≥ 50,000 t/a
136	Refining of Metal Mineral Ore (without using hazardous chemicals)	< 50,000 t/a	≥ 50,000 t/a
137	Refining of Metal Mineral Ore (using hazardous chemicals)	< 25,000 t/a	≥ 25,000 t/a
138	Extraction and Refining of Gold Ore (without using hazardous chemicals)	< 20 acre	≥ 20 acre
139	Extraction and Refining of Gold Ore (using hazardous chemicals)	< 20 acre and < 25,000 t/a	≥ 20 acre or ≥ 25,000 t/a
140	Coal Mining (underground and surface)	< 100,000 t/a coal	≥ 100,000 t/a coal
141	Mining, including Dredging of Heavy Mineral Sands (tungsten, ilmenite, rutile, zircon, titanium, monazite)	≥ 1,000 m^3/a but < 50,000 m^3/a	≥ 50,000 m^3/a

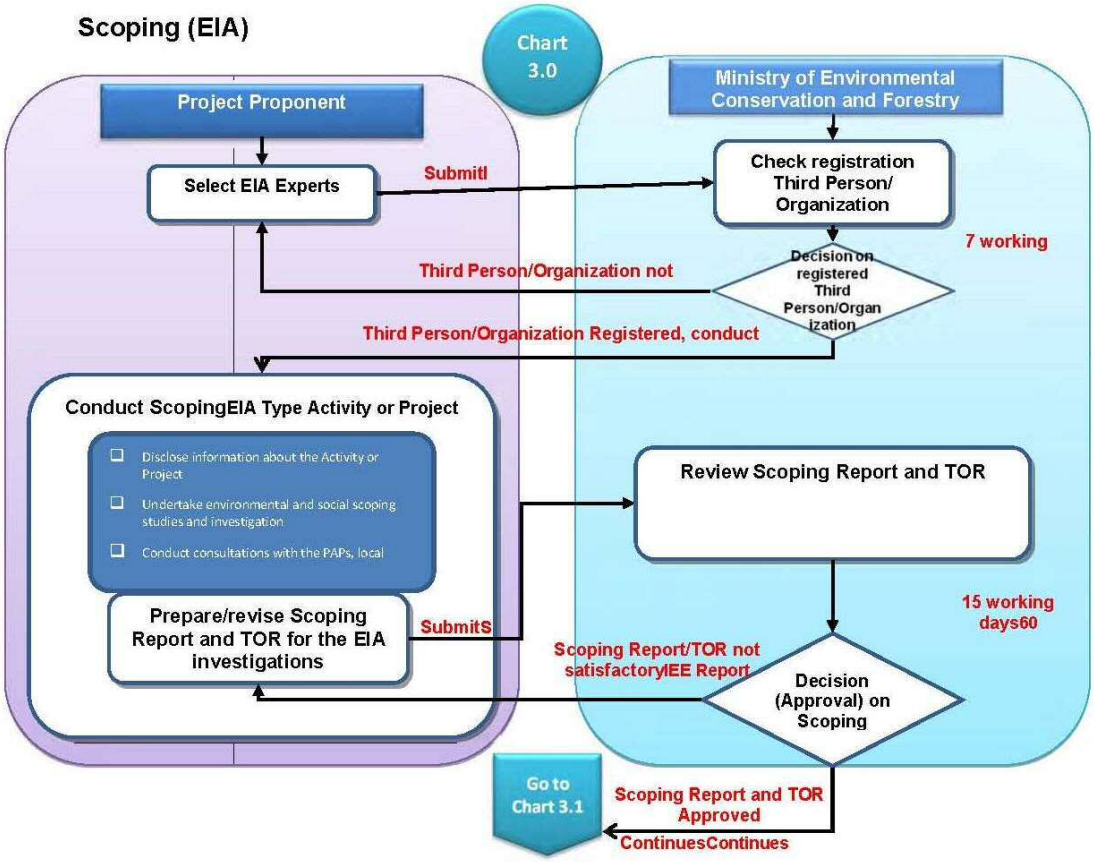
VIII.4 PROCEDURE OF EIA/IEE

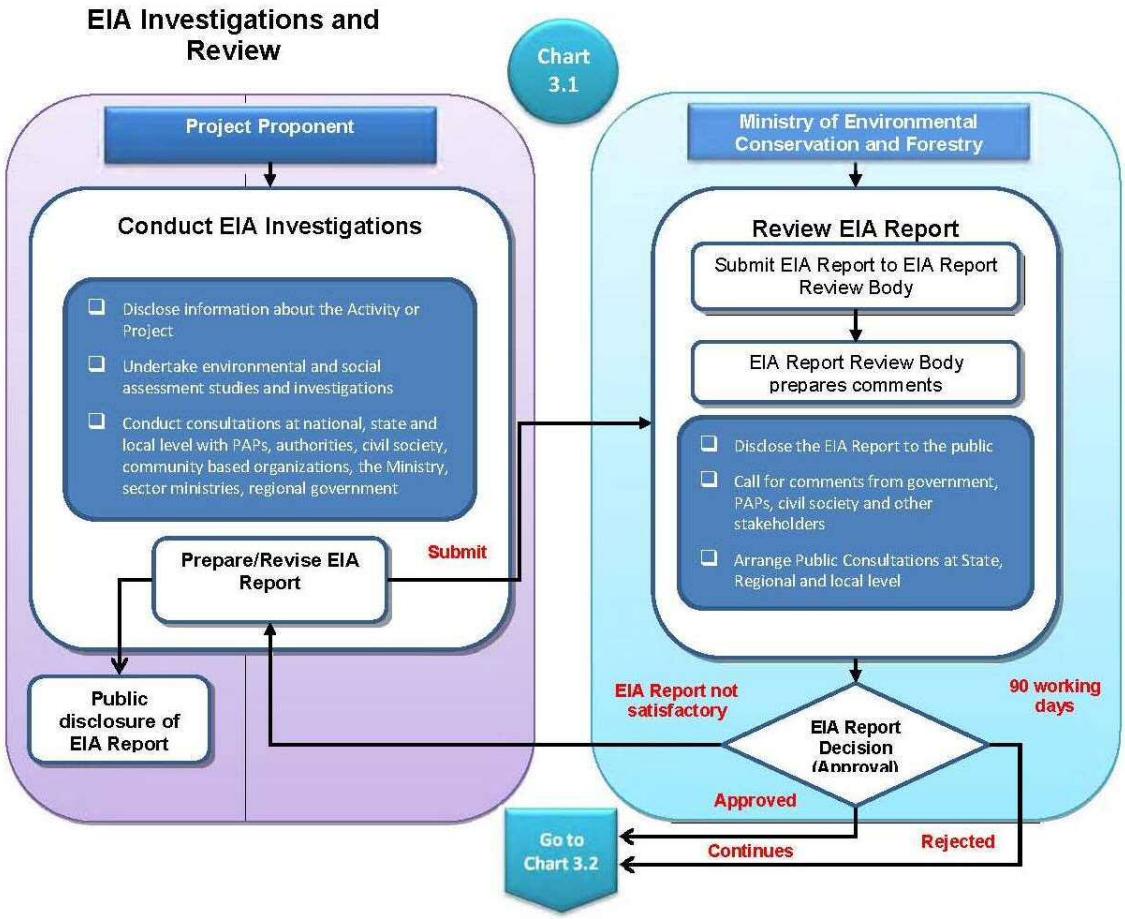


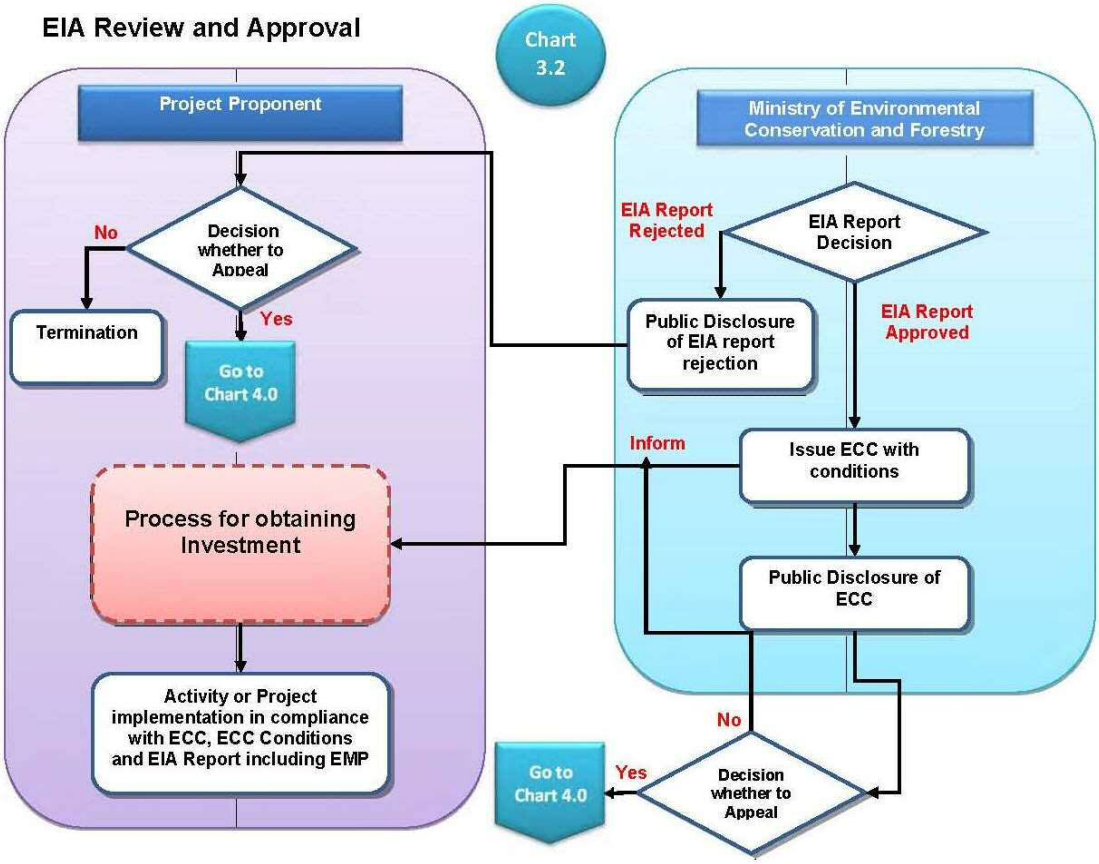


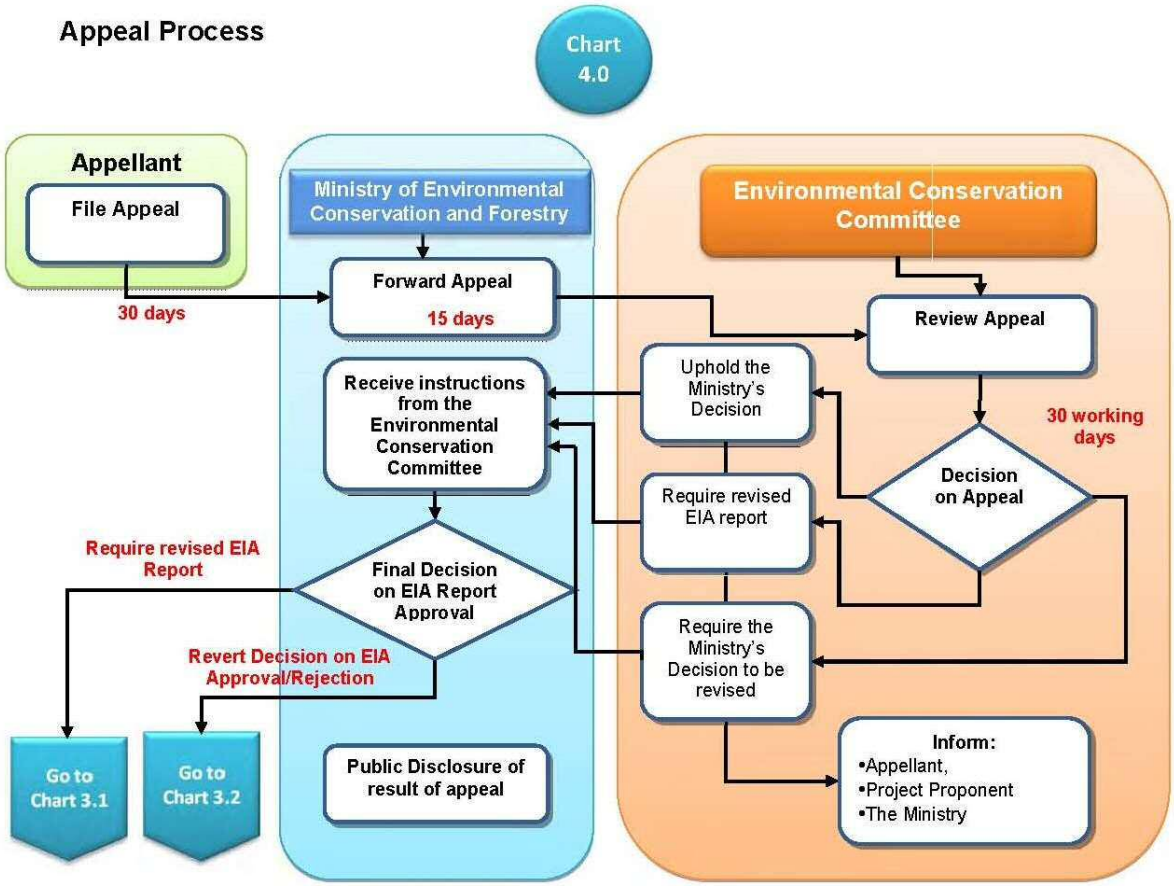

IEE Review and Approval
Chart 2.1
Project Proponent
Ministry of Environmental Conservation and Forestry
IEE Report Decision (Approval)
EIA Required
IEE Report Approved
Go to Chart 3.0
EIA Process
Public Disclosure
Inform EIA is required
Process for obtaining investment license
After getting Investment License
Issue ECC with conditions
Public Disclosure of ECC
Comply with ECC, ECC Conditions and IEE Report including EMP


EMP Review and Approval
Chart 2.2
Project Proponent
Ministry of Environmental Conservation and Forestry
EMP Preparation
Submit
EMP Review
EMP is not complete
30 working days
Go to Chart 2.0
IEE Process
Inform IEE is required
EMP Approved
Go to Chart 3.0
EIA Process
Inform EIA is required
Disclose decision to the public
EMP approved
Process for obtaining Investment License
After getting Investment License
Issue ECC with conditions
Public disclosure of ECC
Comply with ECC Conditions and EMP


Scoping (EIA)
Chart 3.0
Project Proponent
Ministry of Environmental Conservation and Forestry
Select EIA Experts
Submitl
Check registration Third Person/ Organization
7 working
Decision on registered Third Person/Organ ization
Third Person/Organization not
Third Person/Organization Registered, conduct
Conduct ScopingEIA Type Activity or Project
Disclose information about the Activity or Project
Undertake environmental and social scoping studies and investigation
Conduct consultations with the PAPs, local
Review Scoping Report and TOR
Prepare/revise Scoping Report and TOR for the EIA investigations
SubmitS
15 working days60
Scoping Report/TOR not satisfactoryIEE Report
Decision (Approval) on Scoping
Go to Chart 3.1
Scoping Report and TOR Approved
ContinuesContinues


EIA Investigations and Review
Chart 3.1
Project Proponent
Ministry of Environmental Conservation and Forestry
Conduct EIA Investigations
Disclose information about the Activity or Project
Undertake environmental and social assessment studies and investigations
Conduct consultations at national, state and local level with PAPs, authorities, civil society, community based organizations, the Ministry, sector ministries, regional government
Review EIA Report
Submit EIA Report to EIA Report Review Body
EIA Report Review Body prepares comments
Disclose the EIA Report to the public
Call for comments from government, PAPs, civil society and other stakeholders
Arrange Public Consultations at State, Regional and local level
Prepare/Revise EIA Report
Submit
Public disclosure of EIA Report
EIA Report not satisfactory
90 working days
EIA Report Decision (Approval)
Approved
Go to Chart 3.2
Continues
Rejected





Source: EIA Procedure, 2015

VIII.5 MINUTES OF STAKEHOLDER MEETING

(1) Village: Late Chin **District/City:** Shwebo

1. **Venue :** Chapel of village

2. **Date & Time:** From 10:00 am to 12:00 am on 21 September 2016

3. **Participants:**
   1) JICA Team: Mr. Hideaki Hiruta Mr. Ryo Inoue, Mr. Takahiro Funayama
   2) Surveyor Team Mr. Kyaw Thu Aung, Mr. Aung Htay Lin, Mr. Kaung Htut Win, Mr. Aung Moe Naing
   3) Number of participants from the village: 79 (Male 36 and Female 43, Farmers 64 and non-farmers 15)

4. **Meeting Content**

i. Project introduction

- Explained about objectives and three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas – How randomly selected 12 villages for survey and project will cover Shwebo irrigation scheme and related areas in Sagaing Region.
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season - up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project asked by the participants.

ii. Comments on the Project

- Villagers ask who will bear for the construction costs of the irrigation rehabilitation (Mr. Hiruta answers the cost will be shouldered by the Project)
- The villagers are willing to participate for the implementing of the other two project components – 1) Agricultural extension strengthening, 2) Road and bridge Improvement for their brighter future.
- The villagers agree for two conditions of project implementation but ensure that to supply the water for the other crops instead of summer paddy on the sowing time.
- Relating to the land consolidation they have prior idea for road to farm land and small canals (tertiary) but it is difficult to implement by themselves.

iii. Questions to the village by the Project

1) Irrigation
   a) Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   b) Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/Three seasons/Never>
   c) There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   d) Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/Three seasons/Never >

2) Land consolidation
   a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
   b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(2) Village: Htan Zin **District/City:** Shwebo

1. **Venue:** School (Primary)

2. **Date & Time:** From 9:00 am to 10:30 am on 23 September 2016

3. **Participants:**
   1) JICA Team: Mr. Hideaki Hiruta, Mr.Takahiro Funayama
   2) IWUMD: Mr. Saw Thet Khine Win (Executive Engineer) and Mr. Tay Zar Tun (Assistant Engineer)
   3) Surveyor Team-Mr. Kyaw Thu Aung, Mr. Aung Htay Lin, Mr. Kaung Htut Win, and Mr. Aung Moe Naing
   4) Villagers
      Number of participants: 129 (Male 95 and Female 34, Farmer 97 and Non-farmer 32)

4. **Meeting Content**

i. Project introduction

- Explained about objective of three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas – How randomly selected 12 villages for survey and project will cover Shwebo irrigation scheme and related areas in Sagaing Region.
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation work and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project asked by the participants.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	He agrees with the project implementation because summer paddy is less profitable crop.
2.	Non Farmer	He agrees to implement the project because Myanmar government prioritizes the agriculture than other sectors. Therefor he believes that if the agricultural sector is developed, the other sectors will be developed as well.
3.	Women	If agriculture sector develops, village’s economy will be better soon. She thinks that is mutual development.
4.	The old	• He thinks that it is possible to improve in future for agriculture.

No.	Type of person	Remark
		• They want to have road to farm land and small canal (tertiary) because their farmland can only get the water by farm to farm irrigation. (Mr. Hiruta responded that the project will not construct any extension of existing canals. The project just intends to rehabilitate existing canals).
5.	Youth	He asks about drainage system because his farmland was flooded two times last year. Therefore, we would like to propose about improvement of drainage system. The project side answered that the project will examine the drainage improvement as well as irrigation canal, but at this moment, it is under the discussion.

iii. Questions to the village by the Project

1) Irrigation
   a) Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   b) Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/Three seasons/Never>
   c) There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   d) Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/Three seasons/Never >

2) Land consolidation
   a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
   b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(3) Village: Lat Pan Gyi **District/City:** Kin-U

1. **Venue:** Monastery
2. **Date & Time:** From 10:20 am to 11:10 am on 26 September 2016
3. **Participants:**
   1) JICA Team: Mr. Ryo Inoue
   2) IWUMU: Mr. Aung Thu Rain Maw (Assistant Engineer)
   3) Surveyor Team: Mr. Kyaw Thu Aung, Mr. Aung Htay Lin, Mr. Kaung Htut Win, Mr. Aung Moe Naing
   4) Number of participants from the village 58 (Male 48 and Female 10, Farmer 56 and Non-farmer 2)

4. Meeting Content

i. Project introduction

- Explained about objective of three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas – How randomly selected 12 villages for survey and project will cover Shwebo irrigation scheme and related areas in Sagaing Region.
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	His farm was flooded every year because the drainage canal was not in good condition. He requested to rehabilitate existing drainage canal.
2.	Non-farmer	He agrees with project implementation. He hopes the project will help to improve their live in future. If agriculture sector is improved, livelihood of non-farmers will be improved as well.
3.	Women	She requests to get small irrigation canal (tertiary) to her farmland.
4.	The old	He has no comments. But he agrees with this project.
5.	Youth	He requests to improve access road which connects the market.

iii. Questions to the village by the Project

1) Irrigation
   a) Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   b) Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/Three seasons/Never>
   c) There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   d) Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/Three seasons/Never >

2) Land consolidation
   a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
   b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(4) Village: Pyin Htaung **District/City:** Kin-U

1. **Venue:** Monastery

2. **Date & Time**: From 09:30 am to 10:45 am on 28 September 2016

3. **Participants:**
   1) JICA Team: Mr. Hideaki Hiruta and Mr. Takahiro Funayama
   2) IWUMD: Mr. Aung Thurain Maw (Assistant Engineer)
   3) Surveyor Team: Mr. Kyaw Thu Aung, Mr. Aung Htay Lin, Mr. Kaung Htut Win, Mr. Aung Moe Naing
   4) Number of participants from the village: 60 (Male 43 and Female 17, Farmer 59 and non-farmer 1)

4. **Meeting Content**

i. Project introduction

- Explained about objective and three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas – How randomly selected 12 villages for survey and project will cover Shwebo irrigation scheme and related areas in Sagaing Region.
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	He strongly agrees with project implementation but he worries about cost of rehabilitation for irrigation canal. And he would like to add one more request to rehabilitate existing drainage canal.
2.	Non Farmer	He agrees with project because farm labors depend on farmers. If the farmers are improved, farm labors’ livelihood will be improved as well.
3.	Women	She would like to request to repair or rehabilitate existing drainage canal which were damaged since long ago. For this year, her farm was flooded three times. Mostly, two or three times per year her farmlands were flooded in monsoon season. The cause is in-flowing from three drainage canal (about 200ft) to one drainage canal (about 80ft). Therefore, every year she faced flood problem.

No.	Type of person	Remark
4.	The old	He thinks that flood issue started 5 year ago after Kindat Weir was constructed. One time flood takes 5-7 days. Normally, the flood occurs in July, August and September (in Monsoon season).
5.	Youth	They are in rain-fed area. After Thapanzeik Dam was constructed, they get the water not only from rainfall but also from irrigation canal. If the rainfall is too much, they have to face flood issue but they don't have good drainage canal to drain of exceeding water.

iii. Questions to the village by the Project

1) Irrigation
   a) Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   b) Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/Three seasons/Never>
   c) There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   d) Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/Three seasons/Never >

2) Land consolidation
   a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes /No>
   b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(5) Village: Ywet Kyan **District/City:** Kanbulu

1. **Venue**: Monastery

2. **Date & Time**: From 11:00 am to 12:30 pm on 30 September 2016

3. **Participants:**
   1) Surveyor Team: Mr. Kyaw Thu Aung, Mr. Aung Htay Lin, Mr. Kaung Htut Win, and Mr. Aung Moe Naing
   2) IWUMD: Mr. Thi Aye Nyein (Assistant Engineer)
   3) Participants from the villages: 31 (Male 24 and Female7, Farmer15 and Non-farmer 16)

4. **Meeting Content**

i. Project introduction

- Explained about objective of three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas (Shwebo irrigation scheme and related areas in Sagaing Region)
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project asked by the participants.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	He wants to know if the farm road will be constructed alongside with the irrigation canal for the land consolidation. Answer: Yes
2.	Non Farmer	-
3.	Women	She wants to upgrade the access road to market because it is very bad condition and therefore farm gate price of their crops are lower than the other villages’ ones.
4.	The old	-
5.	Youth	-

iii. Questions to the village by the Project

1) Irrigation
   a) Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   b) Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/Three seasons/Never>
   c) There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   d) Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/Three seasons/Never >

2) Land consolidation
   a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
   b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(6) Village: Ta Kaung Min **District/City:** Watlat

1. **Venue:** Monastery

2. **Date & Time:** From 09:30 am to 11:05 am on 03 October 2016

3. **Participants**
   1) IWUMD: Mr. Yan Naing (Assistant Engineer)
   2) Surveyor Team - Mr. Kyaw Thu Aung, Mr. Aung Htay Lin, Mr. Kaung Htut Win, and Mr. Aung Moe Naing
   3) Participants from the village: 30 (Male 24 and Female 6 and Farmer 26 and Non-farmer 4)

4. Meeting Content

i. Project introduction

- Explained about objectives and three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas (Shwebo irrigation scheme and related areas in Sagaing Region)
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project asked by the participants.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	• Only 200 acre can get the water from irrigation canal and rest of 600 acre get water from drainage canal. • They faced flooded in every year. Sometime it takes 18 days.
2.	Non-Farmer	None
3.	Women	She does not have any comments on the project. If all the farmers agree, she will follow the project.
4.	The Old	They would like to request one new canal bridge cross over drainage canal which is located western part of their village.
5.	Youth	They couldn’t cultivate any crops in summer season, and access road from village needs to be improved by the project. They would like to request to rehabilitate Mote Soe Gyone canal.

iii. Questions to the village by the Project

1) Irrigation
   a) Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   b) Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/ Three seasons/Never>
   c) There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   d) Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/ Three seasons/Never >

2) Land consolidation
   a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
   b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(7) Village: Indai **District/City:** Taze

1. **Venue:** Monastery (Hman Yin) Indai

2. **Date & Time**: From 10:00 am to 11:00 am on 05 October 2016

3. **Participants:**
   1) JICA Team: Mr. Hideaki Hiruta
   2) IWUMD: Mr. Tun Tun
   3) Surveyor Team: Mr. Kyaw Thu Aung, Mr. Aung Htay Lin, Mr. Kaung Htut Win, Mr. Aung Moe Naing
   4) Participants from the village: 115 (Male 71 and Female 44, Farmer 115 and Non-farmer:0)

4. **Contents**

i. Project introduction

- Explained about objective of three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas (Shwebo irrigation scheme and related areas in Sagaing Region)
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project asked by the participants.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	If it is necessary to stop irrigation water during summer season for one to three years, he can only agree up to one year because he wants to cultivate in the summer season.
2.	Non Farmer	-
3.	Women	She agrees with the project but she wants to finish the project within the short time as soon as possible.
4.	The old	He agrees with the project implementation and he wants to get access road to his farmland
5.	Youth	He agrees with the project and he also wants land consolidation to be implemented in his farmland.

iii. Questions to the village by the Project

1) Irrigation
    a) Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
    b) Up to how many seasons of stoppage of irrigation during summer season can you accept?
    <One season/Two seasons/Three seasons/Never>
    c) There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
    d) Up to how many seasons of this arrangement can you accept?
    <One season/Two seasons/Three seasons/Never >

2) Land consolidation
    a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
    b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(8) Village: Htan Gyi **District/City:** Ye-U

1. **Venue**: Monastery

2. **Date & Time**: From 11:15 am to 12:20 am on 07 October 2016

3. **Participants**:
   1) JICA Team: Mr. Takahiro Funayama
   2) IWUMD: Mr. Aung Naing (Assistant Engineer)
   3) AMD: Mr. Ngwe Zaw Soe (Staff Officer)
   4) Surveyor Team: Mr. Kyaw Thu Aung, Mr. Aung Htay Lin, Mr. Kaung Htut Win, Mr. Aung Moe Naing
   5) Number of participants from the village: 67 (Male 37 and Female 30, Farmer 64 and Non-farmer 3)

4. **Meeting Content**

i. Project introduction

- Explained about objective of three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas (Shwebo irrigation scheme and related areas in Sagaing Region)
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project asked by the participants.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	He agrees to rehabilitate and improve irrigation system. He can fallow his farmland in summer season when irrigation is stopped.
2.	Non Farmer	He would like to propose to get access road to urban area. Their village road is not in good condition.
3.	Women	She is a casual labor and she agrees with implementation of the project, which will increase labor cost.
4.	The old	He agrees but requests to avail of sufficient water in summer season upon the rehabilitation of irrigation system.
5.	Youth	At present, they don’t get sufficient water and they need to get more water, and if possible, consider about farm road and access road to market.

iii. Questions to the village by the Project

1) Irrigation
   a) Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   b) Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/Three seasons/Never>
   c) There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   d) Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/Three seasons/Never >

2) Land consolidation
   a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
   b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(9) Village: Kone Thar **District/City:** Ye-U

1. **Venue:** Monastery

2. **Date & Time:** From 09:40 am to 10:40 am on 10 October 2016

3. Participants:

1) IWUMD: Mr. San Lwin Oo (Executive Engineer)
2) Surveyor Team-Mr. Kyaw Thu Aung, Mr. Aung Htay Lin, Mr. Kaung Htut Win, Mr. Aung Moe Naing
2) Number of participants from the village: 66 (Male 39 and Female 27, Farmer 66 and Non-farmer: 0)

4. Meeting Content

i. Project introduction

- Explained about objective of three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas (Shwebo irrigation scheme and related areas in Sagaing Region)
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answer the questions related to the project asked by the participants.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	Lack of farm labor and high price of farm labor are very problem now.
2.	Non Farmer	Canal bridge was damaged which crosses over Ye U Main Canal (YMC). This bridge is located on a access road to market.
3.	Women	High prices of chemical fertilizers and erosion of bank of her farmland about 1.5 acre are very problem.
4.	The old	There are two problems that they have faced in every year; 1) pests and diseases 2) quality of chemical fertilizer
5.	Youth	-

iii. Questions to the village by the Project

1) Irrigation
   a) Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   b) Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/ Three seasons/Never>
   c) There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   d) Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/ Three seasons/Never >

2) Land consolidation
   a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
   b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(10) Village: Pauk Taw **District/City:** Tabayin

1. **Venue**: Village Administrator's residence

2. **Date & Time**: From 10:20 am to 11:30 am on 12 October 2016

3. **Participants:**
   1) IWUMD: Mr. Win Myint (Assistant Engineer)
   2) DOA: Mr. Aye Min Tun (Staff Officer)
   3) DALMS: Mr. Myint Oo (Staff Officer)
   4) Surveyor Team: Mr. Kyaw Thu Aung, Mr. Aung Htay Lin, Mr. Kaung Htut Win, Mr. Aung Moe Naing
   5) Number of participants from the village: 60 (Male 36 and Female 24 and Farmer 40 and Non-farmer: 20)

4. **Meeting Content**

i. Project introduction

- Explained about objective of three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas (Shwebo irrigation scheme and related areas in Sagaing Region)
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See "iii. Questions to the villagers by the Project" below).
- Answer the questions related to the project asked by the participants.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	They do not get sufficient amount of irrigation water, so that they pump up water from the drainage canal.
2.	Non Farmer	N/A
3.	Women	She has no comment and she is very pleased with this project.
4.	The old	About 15 farmers are suffered 2 times occurrence of flood every year and they lost their nurseries. Therefore, they have to plant again and again.
5.	Youth	N/A

iii. Questions to the village by the Project

1) Irrigation

a) Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
b) Up to how many seasons of stoppage of irrigation during summer season can you accept?
<One season/Two seasons/Three seasons/Never>
c) There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
d) Up to how many seasons of this arrangement can you accept?
<One season/Two seasons/Three seasons/Never >

2) Land consolidation
a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(11) Village: Mee Kyaung Ai **District/City:** Tabayin

1. **Venue:** Monastery (Phote Htan Taw)

2. **Date & Time:** From 09:00 am to 10:20 am on 17 October 2016

3. **Participants:**
   1) JICA Team; Mr. Takahiro Funayama
   2) IWUMD: Mr. Win Myint (Assistant Engineer)
   3) Surveyor Team-Mr. Kyaw Thu Aung, Mr. Aung Htay Lin, Mr. Kaung Htut Win, and Mr. Aung Moe Naing
   4) Number of participants from the village: 52 (Male 39 and Female 13, Farmer 50 and Non-farmer 2)

4. **Meeting Content**

i. Project introduction

- Explained about objective of three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas (Shwebo irrigation scheme and related areas in Sagaing Region)
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project asked by the participants.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	Agree with the project because he believes that he would have more income after this project is implemented.
2.	Non Farmer	Lack of job opportunities. And farm labor wages are also low.
3.	Women	She asked about the compensation for the land losses regarding the land consolidation. The project side responded that no compensation for the land loss will be provided.
4.	The old	He has problem with shortage of irrigation water.
5.	Youth	He agrees with the project.

iii. Questions to the village by the Project

1) Irrigation
   a) Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   b) Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/Three seasons/Never>
   c) There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   d) Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/Three seasons/Never >

2) Land consolidation
   a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
   b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(12) Village: Na Ga Bo **District/City:** Tabayin

1. **Venue:** School

2. **Date & Time:** From 10:20 am to 11:30 am on 19 October 2016

3. **Participant:**
   1) JICA Team: Mr. Takahiro Funayama
   2) IWUMD: Mr. Win Myint
   3) Surveyor Team: Mr. Kyaw Thu Aung, Mr. Aung Htay Lin, Mr. Kaung Htut Win, Mr. Aung Moe Naing
   4) Number of participants of the village: 215 (Male 52 and Female 163, Farmer 113 and Non-farmer 102)

4. **Meeting Content**

i. Project introduction

- Explained about objective of three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas (Shwebo irrigation scheme and related areas in Sagaing Region)
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project asked by the participants.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	Over 800 acres of farmlands don’t get sufficient amount of irrigation water.
2.	Non Farmer	He agrees with the project. He thinks if farmers are developed, so do farm labors.
3.	Women	She agrees with the project.
4.	The old	Agree with the project and no comment.
5.	Youth	RMC AEC DY-4 cannot supply sufficient irrigation water in monsoon and summer seasons.

iii. Questions to the village by the Project

1) Irrigation
   a) Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   b) Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/Three seasons/Never>
   c) There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   d) Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/Three seasons/Never >

2) Land consolidation
   a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
   b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

VIII.6 MINUTE OF STAKEHOLDER MEETING IN LAND CONSOLIDATION PILOT SITES

(1) Village: Late Chin **District/City:** Shwebo

1. **Venue**: Chapel of village

2. **Date & Time**: From 10:00 am to 11:15 am on 24 October 2016

3. **Participants:**
   1) JICA Team: Mr. Takahiro Funayama
   2) IWUMD: Mr. Myo Tint ()
   3) AMD: Mr. Tun Naing Than (Staff Officer)
   4) DOA: Ms. Zar Zar Min (Staff Officer)
   5) DALMS: Mr. Soe Tun Aung (Staff Officer)
   6) GAD: Ms. Su Su Hlaing (Dy Staff Officer)
   7) Surveyor Team: Mr. Kyaw ThuAung, Mr. AungHtay Lin, Mr. KaungHtut Win, and Mr. Aung Moe Naing
   8) Number of participants from the village side: 164 (Male 127 and Female 37, Farmer 154 and non-farmer 10)

4. **Meeting Content**

i. Project introduction

- Explained about objective of three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas (Shwebo irrigation scheme and related areas in Sagaing Region)
- Explained briefly about the benefits of land consolidation
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Also presented that farmers who owned farmlands under the targeted area must stop cultivation (winter crop and summer crop) during the implementation period for the land consolidation. The implementation period will start after monsoon paddy cultivated and finish before the seeding time of next monsoon paddy. It would last about three to six months.
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the irrigation canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project asked by the participants.

ii. Comments on the Project

No.	Type of person	Remark
1.	Village Chairman	He asked that why didn't choose the other farmland apart from the targeted area irrigated by SMC DY-4 MR-2. He also asked that the targeted area could change to another place if the other farmers are interested in this land consolidation project. The project side responded that the village was selected as a pilot site for land consolidation site. Therefore, it is important to ask the farmers' feeling about the project. On the other hand, the whole actual target area of the land consolidation covering 4,000 ha (10,000 acre) has yet to be fixed at this moment.
2.	Farmer (Male)	He agrees with this project and he is expecting that the other farmlands of his village also to be land-consolidated.
3.	Farmer (Female)	N/A
4.	The old	He agrees with the project and has no comment.
5.	Youth	He said that there is difference between registered land area and actual cultivated area. He asked, in such case, how the project will precede the land consolidation. The project side responded that it is needed to survey the actual farmland area prior to the land consolidation.

iii. Questions to the village by the Project

1) Irrigation
   a. Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   b. Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/Three seasons/Never>
   c. There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   d. Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/Three seasons/Never >

2) Land consolidation
   a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
   b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>
   c) Do you accept winter and summer crop stoppage for land consolidation work? <Yes/No>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(2) Village: Khon Taung Gyi **District/City:** Shwebo

1. **Venue:** Monastery

2. **Date & Time:** From 09:40 am to 11:00 am on 27 October 2016

3. **Participants:**
   1) JICA Team: Mr. Takahiro Funayama
   2) IWUMD: Mr. Myo Tint (Staff Assistant Engineer)
   3) AMD: Mr. Tun Naing Than (Staff Officer)
   4) DOA: Ms. Zar Zar Min (Staff Officer)
   5) DALMS: Mr. Soe Tun Aung (Staff Officer)
   6) GAD: Ms. Su Su Hlaing (Dy Staff Officer)
   7) Surveyor Team: Mr. Kyaw ThuAung, Mr. AungHtay Lin, Mr. KaungHtut Win and Mr. Aung Moe Naing
   8) Participants from the village side: 112 (Male 80 and Female 32, Farmer 83 and Non-farmer 29)

4. **Meeting Content**

i. Project introduction

- Explained about objective of three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas(Shwebo irrigation scheme and related areas in Sagaing Region)
- Explained briefly about the benefits of land consolidation
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Also presented that farmers who owned farmlands under the targeted area must stop cultivation (winter crop and summer crop) during the implementation period for the land consolidation. The implementation period will start after monsoon paddy cultivated and finish before the seeding time of next monsoon paddy. It would last about three to six months.
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project asked by the participants.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	He asks how to arrange the segmented pieces of farmland after the land consolidation. The project side answered that it is needed to prepare the replotting plan and the plan should be presented to the farmers for the further discussion, and agreed upon by all the beneficiary farmers.
2.	Farmer (Male)	His concern is that the farmers can get their existing places after land consolidation. The project side answered that basically it will be arranged as requested with other farmers consensus.
3.	Farmer (Female)	She is very pleased with land consolidation and has no comment.
4.	The old	N/A
5.	Youth	Agree with the project.

iii. Questions to the village by the Project

3) Irrigation
   e. Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   f. Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/Three seasons/Never>
   g. There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   h. Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/Three seasons/Never >

4) Land consolidation
   d) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
   e) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>
   f) Do you accept winter and summer crop stoppage for land consolidation work? <Yes/No>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(3) Village: Kan Byar (Ywa Shae) **District/City:** Tabayin

1. **Venue:** Monastery (Kan byar)

2. **Date & Time**: From 10:15 am to 11:20 am on 31 October 2016

3. **Participants:**
   1) JICA Team: Mr. Takahiro Funayama
   2) IWUMD: Mr. Win Myint
   3) DOA: Mr. Aye Min Tun
   4) DALMS: Mr. Myint Oo
   5) GAD: Mr. Win Zaw Htwe
   6) Surveyor Team: Mr. Kyaw ThuAung, Mr. AungHtay Lin, Mr. KaungHtut Win, Mr.Aung Moe Naing
   7) Participants from the village: 70 (Male 51 and Female 19, Farmer 55 and Non-farmer 15)

4. **Meeting Content**

i. Project introduction

- Explained about objective of three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas (Shwebo irrigation scheme and related areas in Sagaing Region)
- Explained briefly about the benefits of land consolidation
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Also presented that farmers who owned farmlands under the targeted area must stop cultivation (winter crop and summer crop) during the implementation period for the land consolidation. The implementation period will start after monsoon paddy cultivated and finish before the seeding time of next monsoon paddy. It would last about three to six months.
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project asked by the participants.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	Asked who will bear the cost for the project. Answer: the project
2.	Farmer (Male)	He wishes that his farmland to be measured before land consolidation. He said that the actual farmland area is different from the registered one. The project side responded that it is needed to measure the actual farmland area prior to the land consolidation.
3.	Farmer (Female)	Asked how to arrange the segmented farmlands which are less than one acre. The project side answered that the segmented lands will be consolidated.
4.	The old	Asked whether he can get his own place after the land consolidation project. The project side answered that it is not fixed who will get which site after the land consolidation at this moment. It is planned to prepare a replotting plan, which will be reviewed and shall be agreed upon by the beneficiaries.
5.	Youth	N/A

iii. Questions to the village by the Project

1) Irrigation
   a. Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   b. Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/Three seasons/Never>
   c. There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   d. Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/Three seasons/Never >

2) Land consolidation
   a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
   b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>
   c) Do you accept winter and summer crop stoppage for land consolidation work? <Yes/No>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

(4) Village: Tavayin **District/City:** Tabayin

1. **Venue:** Chapel

2. **Date & Time**: From 10:00 am to 11:20 am on 03 November 2016

3. **Participants:**
   1) JICA Team: Mr. Takahiro Funayama
   2) IWUMD: Mr. Win Myint
   3) DOA: Mr. Aye Min Tun
   4) DALMS: Mr. Myint Oo
   5) Surveyor Team: Mr. Kyaw Thu Aung, Mr. Aung Htay Lin, Mr. Kaung Htut Win, and Mr. Aung Moe Naing
   6) Participants from the village side: 74 (Male 60 and Female 14, Farmer 63 and Non-farmer 11)

4. **Meeting Content**

i. Project introduction

- Explained about objective of three main components of this project (irrigation rehabilitation, Road and bridge Improvement and Agricultural Extension Strengthening)
- Explained about survey areas (Shwebo irrigation scheme and related areas in Sagaing Region)
- Explained briefly about the benefits of land consolidation
- Presented about the two project conditions which have to contribute by beneficiaries (two conditions are 1) stopping irrigation for summer season up to three years 2) beneficiaries have to surrender 6% to 10% of their farm land).
- Also presented that farmers who owned farmlands under the targeted area must stop cultivation (winter crop and summer crop) during the implementation period for the land consolidation. The implementation period will start after monsoon paddy cultivated and finish before the seeding time of next monsoon paddy. It would last about three to six months.
- Explained that compensation for 1) land area decrease (6-10%) due to the land consolidation, 2) irrigation/cultivation suspension due to the canal rehabilitation works and 3) cultivation suspension due to the land consolidation works will not be provided.
- After the explanation, some questions such as "Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years?" are asked to the participants to confirm their feelings about the Project under the conditions (See “iii. Questions to the villagers by the Project” below).
- Answered the questions related to the project asked by the participants.

ii. Comments on the Project

No.	Type of person	Remark
1.	Farmer	Asked how to arrange the segmented pieces of farmland after the land consolidation. The project side responded that replotting plan will be prepared and the plan will be presented to the beneficiaries for review

No.	Type of person	Remark
		and agreement by all the beneficiary farmers.
2.	Farmer (Male)	Agree with the project but wish to surrender his farmer less than 6% if possible.
3.	Farmer (Female)	Agree with the project and no comment.
4.	The Old	He wishes that his farmland to be measured before land consolidation.
5.	Youth	N/A

iii. Questions to the village by the Project

1) Irrigation
   a) Do you agree with the project, although it is necessary to stop irrigation water during summer season for one to three years? <Yes/No>
   b) Up to how many seasons of stoppage of irrigation during summer season can you accept?
      <One season/Two seasons/Three seasons/Never>
   c) There may be an arrangement with which irrigation water is released for the sowing times of sesame or green gram so that you can cultivate these crops instead of summer paddy for one to three seasons. Do you agree with the project with this condition? <Yes/No>
   d) Up to how many seasons of this arrangement can you accept?
      <One season/Two seasons/Three seasons/Never >

2) Land consolidation
   a) Typical land consolidation usually needs minimum 6% to max 10% of your farmland to construct the new farm roads and small (tertiary) canals. So, still can your village agree on the land consolidation with the loss of the farmlands or percentage (6-10%)? <Yes/No>
   b) Up to how much percentage of the farmland, can your villagers surrender for the construction of farm roads and small (tertiary) canals? <10%>
   c) Do you accept winter and summer crop stoppage for land consolidation work? <Yes/No>

As a whole, the proposed project is accepted by the village, under the condition that part of farmland will be decreased and cultivation will be suspended due to irrigation canal improvement for some seasons.

VIII.7 MINUTE OF STAKEHOLDER MEETING ON LAND ACQUISITION

1. Target Road: Sb-33

(1) Venue: Lone Taw Pyae Pagoda Compound, Village Tact: Yin Mar, District/City: Shwebo

(2) Date & Time: From 09:45 am to 12:30 pm on 25 April 2017

(3) Participants: 109 in total including PAPs

(a) Participants of governmental staff and the AIIP Project members

	Name	Organization	Position
1	U Aung Thura Khaing	MOHA	Staff (Clerk)
2	U Chit Win	MOHA – Yin Mar village	Village Administrator
3	Dr. A Zin Latt	Parliament of Shwebo TS	Lower House member
4	U Tay Zar Tun	IWUMD	Staff Officer
5	U Myo Lwin	DALMS	Staff Officer
6	U Soe Tun	DALMS	Deputy Staff Officer
7	U Aung Myint Zaw	DALMS	Surveyor – 4
8	U Aung Myint Than	DRD- District	Assistant Director
9	U Win Myat Thein	DRD	A.D (township officer)
10	Daw Nyein Nyein Aye	DRD	Staff Officer (Technology)
11	Daw May Zaw Oo	DRD	Junior Engineer -3
12	Ms. Rie Kitao	JICA Project Team	Environmental and Social Consideration
13	U Han Soe	JICA Project Team	Project Assistant
14	U Thaw Zin Naing	JICA Project Team	Project Assistant
15	U Aung Moe Naing	JICA Project Team	Project Assistant

(b) Number of Project Affected Persons (PAPs): 94 (Male:74, Female: 20)
See "Attachment: Participant list" for all of name of PAP in this Appendix VIII.7

(4) Meeting Content

(a) Opening speech by Dr. A Zin Latt (Parliament member of Shwebo Township)

She explained the road project briefly. Implementation date of the Project is not too close, since the Loan Agreement between the Government of the Myanmar and JICA has not been exchanged. It is the first opportunity of our rural people to make comments and to raise their opinion prior to project implementation. Our people should take this opportunity for their regional development

(b) Explanation of the Project, road expansion and land acquisition by the Project Team staff

- Overall of the Project
- Location of rural road improvement site
- Implementation structure, target area, road improvement from macadam to asphalt, upgrading and land acquisition and project implementation schedule, precondition of the project, proposed grievance mechanism.

(c) Questions from JICA Project Team to the participants

Survey Team staff asked the following questions to the land owners.

Q-1 Do you agree with the road improvement?

A-1 Yes, we agree that. (All of the participant raise their hand to show their agreement.)

Q-2 Do you agree for land loss without compensation?

A-2 We can agree the land loss without compensation because -

Land Owner-male (from Yin Mar village) – This project is for public purpose, not only for individual. Therefore, we can give not only for some portion but also for all our own land for road so as to develop our village.

Q-3 Do you accept the unit price set by the Land Management Committee?

A-3 Yes, We can accept that.

Q-4 Do you accept the proposed grievance handling mechanism? Any modification of that is needed?

A-4 Yes, we accept this proposed grievance handling mechanism.

(d) Supplementary explanation by U Win Myat Thein, Township Officer, DRD Shwebo

This village is one of the project areas of the rural road improvement site with JICA agriculture income improvement project in Shwebo. We need to cooperate with the project team for successful project implementation. Road's width will be expanded from current 18 feet to 20 feet by 1 foot for both sides of the Road Sb-33. If we complete the road improvement, we can use it for a long time until our next generation.

(e) Questions from the participants and answers

Speaker	Opinion/question	Respondent	Answer
One male villager from Yin Mar village	We installed electricity line with our own budget in 2013. At this time, we donated our land to build electricity posts. We can also donate our land for this time (road expansion).	-	-
One female villager from Yin Mar village	I don't want to lose my land anymore as I had already donated my residential land for electricity line.	U Win Myat Thein Township Officer DRD Shwebo	In accordance with road standard design, we need only 2 feet for road expansion. If you don't agree road expansion because of land loss, we will not expand in-front of your house, only upgrading shall be implemented.

2. Target Road: Sb-36

(1) Venue: Thiri Mingalar Monastery, Village Tract: Myin Chin District/City: Shwebo

(2) Date & Time: From 09:30 am to 12:30 pm on 26 April 2017

(3) Participants: 125 in total including PAPs

(a) Participants of governmental staff and the AIIP Project members

No	Name	Organization	Position
1	U Pho Kan	MOHA – GAD	Village Administrator
2	U Win Myat Thein	DRD	Assistant Director – Shwebo Township
3	Daw Nyein Nyein Aye	DRD	Staff Officer (Technology)
4	Daw May Zaw Oo	DRD	Junior Engineer-3
5	U Kyaw Tun Oo	IWUMD	Canal Inspector
6	U Myo Lwin	DALMS	Staff Officer
7	U Thein Swe Oo	DALMS	Surveyor-4
8	U Win Tun	DALMS	Surveyor-4
9	Ms. Rie Kitao	JICA Project Team	Environmental and Social Consideration
10	U Han Soe	JICA Project Team	Project Assistant
11	U Thaw Zin Naing	JICA Project Team	Project Assistant
12	U Aung Moe Naing	JICA Project Team	Project Assistant

(b) Number of Project Affected Persons (PAPs): 113 (Male:90, Female: 23)
See "Attachment: Participant list" for all of name of PAPs.

(4) Meeting Content

(a) Opening Speech and introduction by JICA Team and DRD Township Officer

(b) Explanation of the Project, road expansion and land acquisition by the Project Team staff

- Overall explanation of the Project
- Location of rural road improvement site
- Implementation structure, target area, road improvement from macadam to asphalt, upgrading and land acquisition and project implementation schedule, precondition of the project, proposed grievance mechanism.

(c) Supplementary explanation by U Win Myat Thein, Township Officer, DRD Shwebo

- Road will be upgraded to asphalt road with 20 feet.
- If the villagers agree and cooperate in the land acquisition for the road upgrade project, it is easier to upgrade the road, which leads to convenient transportation.
- Road will be extend by about 1 feet each for both sides upon as far as the current road is 18 feet.

(d) Question from the JICA Team to the participants

Survey Team staff asked the following question to the land owner.

Q-1 Do you agree with the road improvement, even if a part of your land is lost and compensation is provided?

A-1 Yes, We agree totally.

Q-2 If compensation is not provided for the land loss, do you agree with the road improvement? If yes, why?

A-2 Yes, we can agree without compensation because -

One villager –male (from Myin Chin village) – This project intend for all, not only for individual. We can donate our land up to total 24 Ft road expansion.

Q-3 Do you accept the unit price set by the Land Management Committee? If no , any suggestions?

A-3 Yes, we can accept that.

Q-4 Do you accept the proposed grievance handling mechanism? Any modification of that is needed?

A-4 Yes, We accept this proposed grievance handling mechanism.

(e) Questions from the participants and answers

Speaker	Opinion/question	Respondent	Answer
U Pho Kan, Village Tract Administrator	When the road is upgraded, drainage system for the road is also constructed? We want to include drain line in each side of the road to be upgraded, since we used to face water flood in raining season in our village.	U Win Myat Thein, Township Officer, DRD Shwebo	The drain line is not included in our design for this road upgrading. However, I shall consider that case depending on the land availability of each side.

3. Target Road: KU-7 Village Tract: Kan Tar Yar District/City: Khin-U

(1) Venue: Kan Thar Yar Monastery

(2) Date & Time: From 10:05 am to 12:30 pm on 27 April 2017

(3) Participants: 91 in total including PAPs, JICA Team members and governmental staff

(a) Participants of governmental staff and the AIIP Project members

No	Name	Organization	Position
1	U Kyaw Min Tun	Regional Parliament	Parliament member
2	Daw Khin May Soe	MOHA, GAD	Staff/ Clerk
3	Daw Cho Cho Nwe	DRD	Assistant Engineer, Township
4	Daw Myo Myo	DRD	Sub Assistant Engineer
5	Daw Htay Mar Myint	DRD	Assistant Computer Operator
6	U Thiha Maung Maung	DRD	Junior Engineer -3
7	U Zaw Lin Oo	DALMS	Surveyor-4
8	U Zaw Moe Lwin	DALMS	Surveyor-4
9	U Thein Win Aung	DALMS	Assistant Canal Inspector
10	U Soe Htet Nyi Nyi	DALMS	Surveyor-5
11	U Pyae Phyo Kyaw	DALMS	Surveyor-5
12	Ms. Rie Kitao	JICA Project Team	Environmental and Social Consideration
13	U Han Soe	JICA Project Team	Project Assistant
14	U Thaw Zin Naing	JICA Project Team	Project Assistant
15	U Aung Moe Naing	JICA Project Team	Project Assistant

(b) Number of Project Affected Persons (PAPs): 76 (Male: 60, Female: 16)
See “Attachment: Participant list” for all of name of PAPs.

(4) Meeting Content

(a) Introduction and Opening speech by JICA Project Team.

(b) Introduction and Opening speech by U Kyaw Min Tun (Parliament member of Regional Parliament)

This project aims at rural development, and participation from local people side is important. In our township, it is planned to upgrade three roads by JICA. This is a chance to develop our rural area and we are very lucky this time. After the implementation of this project, we can access to town easily for your education, religious and social affairs. I hope that you would understand this purpose and warmly welcome this project.

(c) Introduction of Daw Cho Cho Nwet, Township Officer, DRD Khin U.

We, DRD are very close relationship with this village, since we are one of Municipal departments. In this road upgrading project, we will do our best and cooperate with JICA. Therefore, you need to maintain this road for long life. In addition, we need to avoid crossing of animals carts on the road because it can damage to the asphalt pavement. JICA wants to know about your opinions for this project especially from land owners which have beside of the road.

(d) Explanation of the Project, road expansion and land acquisition by the Project Team staff

- Overall explanation of the Project

- Location of rural road improvement site
- Implementation structure, target area, road improvement from macadam to asphalt, upgrading and land acquisition and project implementation schedule, precondition of the project, proposed grievance mechanism.

(e) Questions from JICA Project Team to the participants

Project Team asked the following question to the land owner.

Q-1 Do you agree with the road improvement, even if a part of your land is lost and compensation is provided?

A-1 Yes, we agree totally. (100% of land owner are agreed.)

Q-2 If compensation is not provided for the land loss, do you agree with the road improvement? If yes, why?

A-2 Yes, we can agree without compensation because –

Land Owner - male (from Kan Thar Yar village) – By using this upgraded road, we can promote our health care, education, transportation until our next generation.
Land Owner – male (from Ba O village) – If we won a lottery, we shall use it for daily activities and the money will be gone out within one day. However, this upgraded road can be kept for our next generation.
Land Owner – male (from Mya Kan Thar Ward) – This project is for our rural area development.
Land Owner – female (from Kan Thar Yar village) – It will be useful for our next generation.

Q-3 Do you accept the unit price set by the Land Management Committee? If no, any suggestions?

A-3 Yes, We can accept that.

Q-4 Do you accept the proposed grievance handling mechanism? Any modification of that is needed?

A-4 Yes, We accept this proposed grievance handling mechanism.

(f) Questions from the participants and answers

Speaker	Opinion/question	Respondent	Answer
One villager, Kan Thar Yar Village	Please construct the farm road within the farmlands in our village.	JICA Project Team	In our project components, land consolidation project is included. If your area is target for the land consolidation project site, it will be constructed as you requested.

4. Target Road: KU-12

(1) Venue: Si Bok taya Monastery, Village Tract: Si Bok taya District/City: Khin-U

(2) Date & Time: From 10:00 am to 12:30 pm on 28 April 2017

(3) Participants: 125 in total including PAPs

(a) Participants of governmental staff and the AIIP Project members

No	Name	Organization	Position
1	U Kyaw Min Tun	Regional Parliament	Parliament member
2	U Nyunt Swe	MOHA, GAD	Village Tract Administrator
3	Daw Cho Cho Nwe	DRD	AE – Township Officer
4	Daw Myo Myo	DRD	SAE
5	U Thiha Maung Maung	DRD	Junior Engineer -3
6	Ms. Rie Kitao	JICA Project Team	Environmental and Social Consideration
7	U Han Soe	JICA Project Team	Project Assistant
8	U Thaw Zin Naing	JICA Project Team	Project Assistant
9	U Aung Moe Naing	JICA Project Team	Project Assistant

(b) Number of Project Affected Persons (PAPs): 116 (Male: 95, Female: 21)
See "Attachment: Participant list" for all of name of PAPs.

(4) Meeting Content

(a) Introduction and Opening speech by JICA Project Team.

(b) Opening Speech and introduction by U Kyaw Min Ttun (Parliament member ,Regional Parliament)

This project aims at development of rural economy. Therefore, you need to participate actively from local people side. We can use this upgraded road not only for agriculture products transportation but also for ambulance, fire track & vehicle for social affairs and rescue in emergency case. I hope that you will understand and accept the project.

(c) Opening Speech and introduction by Daw Cho Cho Nwet, Township Officer, DRD Khin U

This road is connected to Old Mu Canal IP road, and villagers can transport their agriculture inputs and products by using the road, and also for social affairs (education, health, emergency cases). After the implementation of the project, it is suggested to use animal cart wheel with rubber cover for long life road.

(d) Explanation of the Project, road expansion and land acquisition by the Project Team staff

- Overall explanation of the Project
- Location of rural road improvement site
- Implementation structure, target area, road improvement from macadam to asphalt, upgrading and land acquisition and project implementation schedule, precondition of the project, proposed grievance mechanism.

(e) Question from the JICA Project Team

Q-1 Do you agree with the road improvement, even if a part of your land is lost and compensation is provided?

A-1 Yes, We agree totally. (99 % of land owner are agreed.)

Q-2 If compensation is not provided for the land loss, do you agree with the road improvement? If Yes, why?

A-2 Yes, we can agree land loss without compensation because –

Land Owner - male (from Si Bok taya village) – I can donate our land as much as you need for road expansion because this type of project is target for all people, not only for individual.
Land Owner – male (from Tha yet kan village) – By upgrading this road, people can access easily famous historical pagoda near our village.
Land Owner – male (from Gya Bo village) – This project is intend for our rural area development.
Land Owner – male (from Pay Gone village) – Everyone can access easily to famous historical pagoda.

Q-3 Do you accept the unit price set by the Land Management Committee? If no, any suggestions?

A-3 Yes, we can accept that.

Q-4 Do you accept the proposed grievance handling mechanism? Any modification of that is needed?

A-4 Yes, We accept this proposed grievance handling mechanism.

(f) Questions from the participants and answers

Speaker	Opinion/question	Respondent	Answer
One villager, Si Bo taya village	If a land owner cannot provide his/her land with or without compensation, how shall you do?	JICA Project Team	If land owner cannot provide his/her land, we will not make expansion for that. Only upgrading will be performed.
One villager, Tha yet kan village	How about the quality of road?	Daw Cho Cho Nwet, Township Officer , DRD Khin U	The construction of this road shall be implemented by JICA expert and DRD. Therefore, we will perform in accordance with international standards.

Apart from the stakeholder meeting, JICA Team visited one villager who does not accept the land acquisition of his land, even if compensation for the land loss is provided, since he does not want to cut down his tamarind trees. Following opinion and answer were exchanged:

Speaker	Opinion/question	Respondent	Answer
U Nyo Aye, Gya Bo village (tamarind tree owner along road)	I cannot agree road expansion in-front of my land with or without compensation. I don't understand why they choose my way as there has another old way along this road. They can also use this old road for road expansion. Road distance is not so different between old road and new road. In addition, I don't want to lose my long life tamarind tree (about 55 years old)	JICA Project Team	JICA choose this road to implement so as to link with OMC IP road for rural transportation. However, if you don't agree loss of your land for road expansion, we will only upgrade without expansion.

5. Target Road: Tz-17

(1) Venue: Chaung Zon(S) Dhamma Hall, Village Tract: Chaung Zon (South) District/City: Taze

(2) Date & Time: From 10:00 am to 12:30 pm on 28 April 2017

(3) Participants: 121 in total including PAPs

(a) Participants of governmental staff and the AIIP Project members

No	Name	Organization	Position
1	U Myint Tun	Lower House Parliament	Member (Taze township)
2	U Thi Han Soe	GAD, MOHA	Township Administrator/Assistant Director
3	U Chan Tun	Immigration Department	Township Officer
4	U Htay Oo	Myanmar Police Force	Township Officer (police)
5	U Kyaw Shwebo	Education Department	Assistant Director
6	U Than Aung	DALMS	Staff officer of Township
7	U Zaw Thet Naing	DRD	Staff officer of Township
8	U Wai Phyo	GAD, Chaung Zon (S) Village Tract	Village Tract Administrator
9	U Tun Naing Win	GAD, Chaung Zon (S) Village Tract	Village Tract Clerk
10	U Myo Min Oo	GAD, Fa Lan Chaing Village Tract	Village Tract Administrator
11	U Nyo Win	GAD, In Kok Ka Village Tract	Village Tract Administrator
12	Ms. Rie Kitao	JICA Project Team	Environmental and Social Consideration
13	U Han Soe	JICA Project Team	Project Assistant
14	U Thaw Zin Naing	JICA Project Team	Project Assistant
15	U Aung Moe Naing	JICA Project Team	Project Assistant

(b) Number of Project Affected Persons (PAPs): 106 (Male:88, Female: 18)
See “Attachment: Participant list” for all of name of PAPs.

(4) Meeting Content

(a) Introduction and Opening speech by U Myint Tun (Lower House Parliament Member, Taze Township.

Under leading of State counselor, Daw Aung San Su Kyi, new government tries to get peace countrywide and economic development. For that case, we need to improve infrastructure such as transportation, telecommunication for economic development. On the other hand, we need budgets (via economic development) to implement those infrastructure improvement. Our country is under poverty and we need international development assistance, e.g. from JICA. The JICA assistant is a sign of good relationship between Myanmar and Japan. Therefore, JICA plans to start this development project in Sagaing Region with the improvement of many components such as irrigation, agriculture, rural road and bridges. Among them, Chaung Zon(S) road is one of the project sites for road improvement, and beneficiary people are very lucky. I request and suggest villagers to be unity and to participate actively for successful of this project.

(b) Introduction of U Thi Han Soe (Township Administrator, GAD, Taze Township)

Today is the good (Mingalar) day for people in this area. Formerly, rural development was responsible for township municipal with municipal budget, which was collected tax from Township level. Nowadays, Department of Rural Development organizes rural economy development, sanitation, road and bridges, electrification etc. In our township, we plan to implement development

sectors such rural road, health, education, not only support from international organization such as JICA, Europe but also from ourselves. I hope that villager will actively participate in this project

(c) Explanation of the Project, road expansion and land acquisition by the Project Team staff

- Overall explanation of the Project
- Location of rural road improvement site
- Implementation structure, target area, road improvement from macadam to asphalt, upgrading and land acquisition and project implementation schedule, precondition of the project, proposed grievance mechanism.

(d) Question from the JICA Project Team

Q-1 Do you agree with the road improvement, even if a part of your land is lost and compensation is provided?

A-1 Yes, We agree totally. (100% of land owner are agreed.)

Q-2 If compensation is not provided for the land loss, do you agree with the road improvement? If Yes, why?

A-2 Yes, we can agree land loss without compensation because –
Land Owner - male (from Chaung Zon village) – This upgraded road is majorly effect for our village development.
Land Owner – male (from Chaung Zon village) – This project is mainly for all, not for individual.
Land Owner – male (from In Kok Ka village) – This project is greatly beneficial for our two villages (Chaung Zon and In Kok Ka) transportation.
Land Owner – female (from Chaung Zon village) – It is very difficult to set one stone (for road construction) in-front of our house by our own budgets. Therefore, we warmly welcome JICA project and be really appreciated.

Q-3 Do you accept the unit price set by the Land Management Committee? If no, any suggestions?

A-3 Yes, We can accept that.

Q-4 Do you accept the proposed grievance handling mechanism? Any modification of that is needed?

A-4 Yes, We accept this proposed grievance handling mechanism.

(e) Questions from the participants and answers

Speaker	Opinion/question	Respondent	Answer
One Villager from Chaung Zon Village	Where will you construct asphalt pavement in the target road, center or right/left side of the road? I wish to use one side of the roads for animal cart after the pavement, and I hope the pavement is applied only for one side.	U Zaw Thet Naing, Township Officer , DRD Taze	JICA will upgrade to asphalt pavement based on existing macadam base. Therefore, upgraded road site will be same as current macadam pavement.
One villager from	As parliament member	JICA Project team	We have already submitted

Speaker	Opinion/question	Respondent	Answer
Chaung Zon Village	said that we want to include road extension to school from this road (about 1 furlong) if possible.		to JICA project scope. However, DRD can include this road part their own plan by union budget or regional budget.

6. Target Road: KU-10 (1)

(1) Venue: Village Administrator House, Village Tract: Ma daung hla District/City: Khin U

(2) Date & Time: From 12:00 am to 1:30 pm on 02 May 2017

(3) Participants: 32 in total including PAPs

(a) Participants of governmental staff and the AIIP Project members

No	Name	Organization	Position
1	U Win Khaing	GAD, MOHA	Village Tract Administrator
2	Daw Cho Cho New	DRD	Staff officer of Township
3	Daw Khin Moh Moh Lwin	DRD	Deputy Staff Officer
4	U Thiha Maung Maung	DRD	Junior Engineer-3
5	Ms. Rie Kitao	JICA Project Team	Environmental and Social Consideration
6	U Han Soe	JICA Project Team	Project Assistant
7	U Thaw Zin Naing	JICA Project Team	Project Assistant
8	U Aung Moe Naing	JICA Project Team	Project Assistant

(b) Number of Project Affected Persons (PAPs): 24 (Male: 16, Female: 8)
See "Attachment: Participant list" for all of name of PAPs.

(4) Meeting Content

(a) Introduction and Opening speech by JICA Project Team.

(b) Introduction of Daw Cho Cho Nwe (Township Officer, DRD Khin U township)

(c) Explanation of the Project, road expansion and land acquisition by the Project Team staff

- Overall explanation of the Project
- Location of rural road improvement site
- Implementation structure, target area, road improvement from macadam to asphalt, upgrading and land acquisition and project implementation schedule, precondition of the project, proposed grievance mechanism.

(d) Question from the JICA Project Team to the participants

Project Team staff ask the following questions to the land owner.

Q-1 Do you agree with the road improvement, even if a part of your land is lost and compensation is provided?

A-1 Yes, We agree totally. (100% of land owner are agreed.)

Q-2 If compensation is not provided for the land loss, do you agree with the road improvement? If yes, why?

A-2 Yes, we can agree land loss without compensation because –

Land Owner - Male (from Ma daung hla village) – This project will improve our village transportation and economic opportunity of villagers.

Q-3 Do you accept the unit price set by the Land Management Committee? If no, any suggestions?

A-3 Yes, We can accept that.

Q-4 Do you accept the proposed grievance handling mechanism? Any modification of that is needed?

A-4 Yes, We accept this proposed grievance handling mechanism.

(e) Questions from the participants and answers

Speaker	Opinion/question	Respondent	Answer
One farmer from Ma daung hla village	If I lose large farmland area (more than one acre), I need to be compensated. However, one or two feet of land loss is no problem for me.	JICA Project Team	According to road design, you will lose one or two feet of land for road expansion. The land loss is not very big. If government can get budgets, it is possible to provide compensation for the land loss. If not, the road will not be expanded, just only upgrading of existing condition.

7. Target Road: KU-10 (2)

(1) Venue: High School, Ma daung gyi village, Village Tract: Ma daung gyi District/City: Khin U

(2) Date & Time: From 10:00 am to 12:30 pm on 28 April 2017

(3) Participants: 49 in total including PAPs

(a) Participants of governmental staff and the AIIP Project members

No	Name	Organization	Position
1	U Swe Lin Oo	GAD, MOHA	Village Tract Administrator
2	Daw Cho Cho New	DRD	Staff officer of Township
3	Daw Khin Moh Moh Lwin	DRD	Deputy Staff Officer
4	U Thiha Maung Maung	DRD	Junior Engineer-3
5	Ms. Rie Kitao	JICA Project Team	Environmental and Social Consideration
6	U Han Soe	JICA Project Team	Project Assistant
7	U Thaw Zin Naing	JICA Project Team	Project Assistant
8	U Aung Moe Naing	JICA Project Team	Project Assistant

(b) Number of Project Affected Persons (PAPs): 41 (Male:28 Female: 13)
See "Attachment: Participant list" for all of name of PAPs.

(4) Meeting Content

(a) Introduction and Opening speech by JICA Project Team

(b) Introduction of Daw Cho Cho Nwe (Township Officer , DRD Khin U township)

JICA plans to upgrade three roads in our township. This time is only preparatory survey, not actual implementation period. JICA will implement their project step by step systematically. JICA project team will explain you about the Project by using vinyl (banner) later. Please listen carefully to their explanation and make a question for unclear points.

(c) Explanation of the Project, road expansion and land acquisition by the Project Team staff

- Overall explanation of the Project
- Location of rural road improvement site
- Implementation structure, target area, road improvement from macadam to asphalt, upgrading and land acquisition and project implementation schedule, precondition of the project, proposed grievance mechanism.

(d) Question from the JICA Project Team to the participants

Q-1 Do you agree with the road improvement, even if a part of your land is lost and compensation is provided?

A-1 Yes, We agree totally. (100% of land owner are agreed.)

Q-2 If compensation is not provided for the land loss, do you agree with the road improvement? If yes, why?

A-2 Yes, we can agree with the land loss without compensation because –

Land Owner - male (from Ma daung gyi village) – Being a farmer, I have to use this road to transport agriculture products and inputs. This upgraded road shall be effective for our agriculture business.
Land Owner – male (from Shwe Kar village) – For our village, it is very important to get enough space for road expansion. Even government cannot provide compensation for land loss, our village can pay that by ourselves.
Land Owner – female (from Ma daung gyi village) – We can donate our land for road because this road is for public use.

Q-3 Do you accept the unit price set by the Land Management Committee? If no, any suggestions?

A-3 Yes, We can accept that.

Q-4 Do you accept the proposed grievance handling mechanism? Any modification of that is needed?

A-4 Yes, We accept this proposed grievance handling mechanism.

(e) Questions from the participants and answers

Speaker	Opinion/question	Respondent	Answer
One villager from Ma daung gyi village	How about irrigation rehabilitation?	JICA Survey Team	Irrigation rehabilitation is the one of the major components for our project. We plan to rehabilitate the structures of Thapanzeik Dam Irrigation Scheme.

8. Target Road: Tb-20

(1) Venue: Dhamma Hall, Yin dwe Village Monastery, Village Tract: Yin dwe District/City: Tabayin

(2) Date & Time: From 10:35 am to 11:45 pm on 16 May 2017

(3) Participants: 56 in total including PAPs

(a) Participants of governmental staff and the AIIP Project members

No	Name	Organization	Position
1	U Win Zaw Htwe	GAD, MOHA	Assistant Director, Township Administrator
2	U Min Aung	GAD, MOHA	Village Tract Administrator , Yin dwe Village Tract
3	U Myint Thein	GAD, MOHA	Village Tract Administrator , Let ti Village Tract
4	Daw Khin Mya Yu	GAD, MOHA	Village Tract Clerk, Yin dwe Village Tract
5	Daw Khin Mi Mi Aung	DRD	Staff Officer , Township Officer
6	Daw Swe Lae Maw	DRD	Junior Engineer -3
7	Daw Han Thu Zar Maw	DRD	Computer Operator
8	Ms. Rie Kitao	JICA Project Team	Environmental and Social Consideration
9	U Han Soe	JICA Project Team	Project Assistant
10	U Thaw Zin Naing	JICA Project Team	Project Assistant
11	U Aung Moe Naing	JICA Project Team	Project Assistant

(b) Number of Project Affected Persons (PAPs): 45 (Male: 37, Female: 8)
See "Attachment: Participant list" for all of name of PAPs.

(4) Meeting Content

(a) Introduction and Opening speech by JICA Project Team.

(b) Introduction by U Win Zaw Htwe (Assistant Director, GAD Tabayin Township)

JICA always helps our county to improve infrastructure and it is a well-known organization by Myanmar people. They plan to improve two roads in our township, namely, Yin dwe road and Ohm Tabin road. It is very difficult to upgrade to asphalt pavement by government budgets within next ten years. JICA road standard will be higher than local. JICA requests you to use this road for transport of agricultural inputs and products. As for me, let me request to participate actively in this meeting.

(c) Introduction by Daw Khin Mi Mi Aung (Staff Officer, DRD Tabayin Township)

We need 20fts for road expansion in accord with road standard design. With our DRD budgets, it is very difficult to plan asphalt pavement for village road. Please ask unclear points on their explanation and participate well for successful road project.

(d) Explanation of the Project, road expansion and land acquisition by the Project Team staff

- Overall explanation of the Project
- Location of rural road improvement site
- Implementation structure, target area, road improvement from macadam to asphalt, upgrading and land acquisition and project implementation schedule, precondition of the project, proposed grievance mechanism.

(e) Question from the JICA Project Team to the participants

Q-1 Do you agree with the road improvement, even if a part of your land is lost and compensation is provided?

A-1 Yes, We agree totally. (100% of land owner are agreed.)

Q-2 If compensation is not provided for the land loss, do you agree with the road improvement? If yes, why?

A-2 Yes, we can agree land loss without compensation because –

Land Owner - male (from Let ti village) – This road is greatly beneficial to our village transportation, education, health and even for emergency case.
Land Owner – female (from Yin dwe village) – This road project is not only for individual, for all people. Therefore, we can donate our land as much as you want for road expansion.

Q-3 Do you accept the unit price set by the Land Management Committee? If no, any suggestions?

A-3 Yes, We can accept that.

Q-4 Do you accept the proposed grievance handling mechanism? Any modification of that is needed?

A-4 Yes, We accept this proposed grievance handling mechanism.

(f) Questions from the participants and answers

Speaker	Opinion/question	Respondent	Answer
One villager, Yin dwe village	What kind of materials do you use for road shoulder?	Daw Khin Mi Mi Aung, Staff Officer, DRD Tabayin Township	In accordance with the standard road design, we will use kanker rock for road shoulder.
One villager , Let ti village	What is the starting time for road construction?	JICA Survey Team	In regard with implementation schedule, we will construct road construction in the period from 2019 to 2024. However, we cannot say exact year.

9. Target Road: Tb-25 (1)

(1) Venue: Shwe Thein Taw Monestry, Village Tract: Min Swe Hnit District/City: Tabayin

(2) Date & Time: From 10:30 am to 11:15 am on 17 May 2017

(3) Participants: 59 in total including PAPs

(a) Participants of governmental staff and the AIIP Project members

No	Name	Organization	Position
1	U Myo Naing Tun	GAD, MOHA	Village Tract Administrator , Min Swe Hnit Village Tract
2	U Yay Maung	GAD, MOHA	Village Tract Administrator , Ohn Ta Pin Village Tract
3	Daw Khin Mi Mi Aung	DRD	Staff Officer , Township Officer
4	Daw Phyo Phyo Thwe	DRD	Deputy Staff Officer
5	Daw Wah Wah Khaing	DRD	Engineer – 3
6	Ms. Rie Kitao	JICA Project Team	Environmental and Social Consideration
7	U Han Soe	JICA Project Team	Project Assistant
8	U Thaw Zin Naing	JICA Project Team	Project Assistant
9	U Aung Moe Naing	JICA Project Team	Project Assistant

(b) Number of Project Affected Persons (PAPs): 50 (Male: 41, Female: 9)
See "Attachment: Participant list" for all of name of PAPs.

(4) Meeting Content

(a) Introduction and Opening speech by JICA Project Team.

(b) Introduction by Daw Khin Mi Mi Aung (Staff Officer, DRD Tabayin Township)

We held meeting here in last month for 1 mile asphalt pavement for this road. JICA plan to upgrade 4.5 mile asphalt for this road. We will discuss with JICA for another remaining parts. Thank you very much for coming here today. Please ask them openly your unclear points.

(c) Explanation of the Project, road expansion and land acquisition by the Project Team staff

- Overall explanation of the Project
- Location of rural road improvement site
- Implementation structure, target area, road improvement from macadam to asphalt, upgrading and land acquisition and project implementation schedule, precondition of the project, proposed grievance mechanism.

(d) Question from the JICA Project Team to the participants

Survey Team staff ask the following questions to the land owner.

Q-1 Do you agree with the road improvement, even if a part of your land is lost and compensation is provided?

A-1 Yes, We agree totally. (100% of land owner are agreed.)

Q-2 If compensation is not provided for the land loss, do you agree with the road improvement? If yes, why?

A-2 Yes, we can agree land loss without compensation because –

Land Owner - male (from Min Swe Hnit village) – Road width have enough space for 20 ft. No one will effect as land loss. Therefore, we can agree for road expansion.
Land Owner - male (from Min Swe Hnit village) – This upgraded road will effect directly to our village development.
Land Owner - male (from Min Swe Hnit village) – I guess that no one will face land loss. Since our childhood, first construction time, the road width is about 50 fts. Therefore, we agree for road expansion.
Land Owner - female (from Min Swe Hnit village) – By using this upgrade road, we will easy to access to Tabayin town.

Q-3 Do you accept the unit price set by the Land Management Committee? If no, any suggestions?

A-3 Yes, We can accept that.

Q-4 Do you accept the proposed grievance handling mechanism? Any modification of that is needed?

A-4 Yes, We accept this proposed grievance handling mechanism.

(e) Questions from the participants and answers

Speaker	Opinion/question	Respondent	Answer
One villager from Min Swe Hnit Village	I request you to implement this project as quickly as possible.	-	-
One villager from Min Swe Hnit Village	When is the construction work implemented?	JICA Project Team	In accordance with our schedule, the construction of this road will be started in (2020-2021) fiscal year.

10. Target Road: Tb-25 (2)

(1) Venue: Ohm Ta Pin Monestry, Village Tract: Ohm Ta Pin District/City: Tabayin

(2) Date & Time: From 1:30 pm to 3:00 pm on 18 May 2017

(3) Participants: 58 in total including PAPs

(a) Participants of governmental staff and the AIIP Project members

No	Name	Organization	Position
1	U Win Zaw Htwe	GAD, MOHA	Assistant Director , Township Administrator
2	U Yay Maung	GAD, MOHA	Village Tract Administrator , Ohn Ta Pin Village Tract
3	Daw Khin Mi Mi Aung	DRD	Staff Officer , Township Officer
4	Daw Phyo Phyo Thwe	DRD	Deputy Staff Officer
5	Daw Wah Wah Khaing	DRD	Engineer – 3
6	Ms. Rie Kitao	JICA Project Team	Environmental and Social Consideration
7	U Han Soe	JICA Project Team	Project Assistant
8	U Thaw Zin Naing	JICA Project Team	Project Assistant
9	U Aung Moe Naing	JICA Project Team	Project Assistant

(b) Number of Project Affected Persons (PAPs): 49 (Male:44, Female: 5)
See "Attachment: Participant list" for all of name of PAPs.

(4) Meeting Content

(a) Introduction and Opening speech by JICA Project Team.

(b) Introduction by U Win Zaw Htwe (Assistant Director, Township Administrator, GAD)

JICA project plan to upgrade rural road and bridge and also irrigation rehabilitation, agriculture, mechanization. In our township, 67 miles for macadam upgrade and 6 mile for asphalt upgrade will be implemented. This project will not start in very near future because JICA take time to implement systematically. Therefore, villagers need to be patient. I suggested villagers to participate actively on this meeting.

(c) Introduction by Daw Khin Mi Mi Aung (Staff Officer, DRD Tabayin Township)

I am very happy to come here for road upgraded project. JICA team will explain about the project detail later. Please discuss and make comments on this project and female aslo be welcome.

(d) Explanation of the Project, road expansion and land acquisition by the Project Team staff

- Overall explanation of the Project
- Location of rural road improvement site
- Implementation structure, target area, road improvement from macadam to asphalt, upgrading and land acquisition and project implementation schedule, precondition of the project, proposed grievance mechanism.

(e) Questions from JICA Project Team to the participants

Q-1 Do you agree with the road improvement, even if a part of your land is lost and compensation is provided?

A-1 Yes, We agree totally. (100% of land owner are agreed.)

Q-2 If compensation is not provided for the land loss, do you agree with the road improvement? If Yes, why?

A-2 Yes, we can agree land loss without compensation because –

Land Owner - male (from Ohm Ta Pin village) – This project will benefit to rural economy and transportation.
Land Owner - female (from Ohm Ta Pin village) – Since I was child, our villagers try to upgrade this road. But they could not it until now. Today, we have such kind of chance to fulfill village requirement. Therefore, we can give our land as much as you need. I am very pleased and thankful to JICA for this project.

Q-3 Do you accept the unit price set by the Land Management Committee? If no, any suggestions?

A-3 Yes, We can accept that.

Q-4 Do you accept the proposed grievance handling mechanism? Any modification of that is needed?

A-4 Yes, We accept this proposed grievance handling mechanism.

(f) Questions from the participants and answers

Speaker	Opinion/question	Respondent	Answer
One villager from Ohm Ta Bin village	I have known from parliament member that this road will upgrade to 2 miles asphalt in this year. Is the 2 mile interval to be upgraded included in the JICA project?	Daw Khin Mi Mi Aung , Staff Officer , DRD Tabayin	At this year, we will upgrade 1 mile asphalt (not 2 miles) by DRD budget. JICA plans to upgrade 4.5 mile for this road and hopefully will be started in 2019-2020 fiscal year.

11. Target Road: YU-3

(1) Venue: Shaw Phyu Primary School, Village Tract: Shaw Phyu District/City: Ye U

(2) Date & Time: From 1:30 pm to 2:30 pm on 19 May 2017

(3) Participants: 42 in total including PAPs

(a) Participants of governmental staff and the AIIP Project members

No	Name	Organization	Position
1	U Kyaw Naing	GAD, MOHA	Assistant Director, Township Administrator, Ye U
2	U Khin Maung Lay	GAD, MOHA	Village Tract Administrator, Shaw Phyu village Tract
3	Daw Khin San Win	GAD, MOHA	Village Tract Clerk, Shaw Phyu Village Tract
4	U Chit Win	GAD, MOHA	Village Tract Administrator, Tin Tain Yan village tract
5	Daw Tin Mar Myint	DRD	Staff Officer, Township Officer, DRD Ye U
6	Daw Win Win Han	DRD	Deputy Staff Officer
7	Daw Aye Khaing Moe	DRD	Junior Engineer-3
8	Daw Hnin Hnin Htet Lwin	DRD	Junior Engineer-2
9	U Thein Htike Aung	DRD	Senior Clerk
10	Daw Shwe Paw	DRD	Senior Clerk
11	Ms. Rie Kitao	JICA Project Team	Environmental and Social Consideration
12	U Han Soe	JICA Project Team	Project Assistant
13	U Thaw Zin Naing	JICA Project Team	Project Assistant
14	U Aung Moe Naing	JICA Project Team	Project Assistant

(b) Number of Project Affected Persons (PAPs): 28 (Male: 19 Female: 9)
See “Attachment: Participant list” for all of name of PAPs.

(4) Meeting Content

(a) Introduction and Opening speech by JICA Project Team.

(b) Introduction by U Than Lwin (Assistant Director, Township Administrator, GAD Ye U)

There are total 67 village tract in our township. We try to construct macadam and asphalt roads in our township as much as we get budget from the government. Among them, JICA chooses your road to upgrade to asphalt. JICA tries to make less environmental and social impact by the project in accordance with their policy. They came here to know your opinion and comments on this project in advance. Please try to make opinions and question for your unclear points.

(c) Introduction by Daw Win Myint (Staff Officer, DRD Ye U Township)

We proposed total 51 roads to upgrade asphalt in our township. Among them, this road is one of our proposed roads and JICA selects this road to upgrade. We upgraded this road 1 mile to asphalt in last fiscal year and will upgrade another 0.625 mile in this year by DRD budget. For this road, it is needed to upgrade only 1.625 mile by the JICA project. Therefore, we need to discuss the matter with JICA. For my concern, that is all my information.

(d) Explanation of the Project, road expansion and land acquisition by the Project Team staff

- Overall explanation of the Project
- Location of rural road improvement site

- Implementation structure, target area, road improvement from macadam to asphalt, upgrading and land acquisition and project implementation schedule, precondition of the project, proposed grievance mechanism.

(e) Question from the JICA Project Team to the participants

JICA Project Team asked following questions to the land owners.

Q-1 Do you agree with the road improvement, even if a part of your land is lost and compensation is provided?

A-1 Yes, We agree totally. (100% of land owner are agreed.)

Q-2 If compensation is not provided for the land loss, do you agree with the road improvement? If yes, why?

A-2 Yes, we can agree land loss without compensation because –

Land Owner - male (from Shaw Phyu village) – This project intend for all, not only for individual.
Land Owner - female (from Shaw Phyu village) – I can donate my land for road.

Q-3 Do you accept the unit price set by the Land Management Committee? If no, any suggestions?

A-3 Yes, We can accept that.

Q-4 Do you accept the proposed grievance handling mechanism? Any modification of that is needed?

A-4 Yes, We accept this proposed grievance handling mechanism.

(f) Questions from the participants and answers

Speaker	Opinion/question	Respondent	Answer
One villager from Shaw Phyu village	There are 9 pipes between drains of each side of road. Does the Project cover improvement of the pipes also?	DRD officer	The pipes are not under the management of DRD. If you want to replace current ones to new ones, you have to pay the cost by yourselves.

It is noted that some of village elders asked about the impacts by the animal carts on the paved road to the DRD officer after the project. The DRD officer responded that DRD can construct additional new road for animal cart along the target road.

12. Target Road: Ad-5

(1) Venue: High School, Wartawma village, Village Tract: Wartawma District/City: Ayadaw

(2) Date & Time: From 11:30 am to 1:00 pm on 22 May 2017

(3) Participants: 9 except PAPs

(a) Participants of governmental staff and the AIIP Project members

No	Name	Organization	Position
1	U Shwe Po	GAD, MOHA	Village Tract Administrator, Wartawma Village Tract
2	U Zaw Lin Tun	GAD, MOHA	Village Tract Clerk, Wartawma Village Tract
3	U Tay Zar Tun	DRD	Staff Officer , Township Officer, DRD Ayadaw
4	Daw Aye Aye Aung	DRD	Deputy Staff Officer, DRD Ayadaw
5	Daw Su Sandi Moe	DRD	Junior Engineer-2 , DRD Ayadaw
6	Ms. Rie Kitao	JICA Project Team	Consultant
7	U Han Soe	JICA Project Team	Project Assistant
8	U Thaw Zin Naing	JICA Project Team	Project Assistant
9	U Aung Moe Naing	JICA Project Team	Project Assistant

(b) Number of Project Affected Persons (PAPs): unknown due to no cadastral map

(4) Meeting Content

(a) Introduction and Opening speech by JICA Project Team.

(b) Introduction by U Tay Zar Tun (Staff Officer, DRD Ayadaw Township)

We also plan to upgrade 1.5 miles asphalt for this road in this budget year by DRD budget and I had been working in Ayadaw DRD for 3 years. I request you to participate in this meeting actively.

(c) Explanation of the Project, road expansion and land acquisition by the Project Team staff

- Overall explanation of the Project
- Location of rural road improvement site
- Implementation structure, target area, road improvement from macadam to asphalt, upgrading and land acquisition and project implementation schedule, precondition of the project, proposed grievance mechanism.

(d) Question from the JICA Project Team to the participants

JICA Team staff ask the following questions to the land owner.

Q-1 Do you agree with the road improvement, even if a part of your land is lost and compensation is provided?

A-1 Yes, We agree totally. (100% of land owner are agreed.)

Q-2 If compensation is not provided for the land loss, do you agree with the road improvement? If Yes, why?

A-2 Yes, we can agree land loss without compensation because –

Land Owner - male (from Wartawma village) – This road greatly beneficial to our village.

Land Owner - female (from Wartawma village) – I prefer this project because it intend for our village development.

Land Owner - male (from Wartawma village) – I can donate as much as you need for road as my land is beside the road.

Q-3 Do you accept the unit price set by the Land Management Committee? If no, any suggestions?

A-3 Yes, We can accept that.

Q-4 Do you accept the proposed grievance handling mechanism? Any modification of that is needed?

A-4 Yes, We accept this proposed grievance handling mechanism.

(e) Questions from the participants and answers

Speaker	Opinion/question	Respondent	Answer
One villager from Wartawma Village	Could you start the project earlier than 2019-2020?	JICA Project	In accordance with JICA policy, we shall take enough time for preparing state before starting the project. That is why we can start this project in 2019-2020.
One villager from Wartawma Village	If the government do not sign the loan agreement, can or cannot this road upgrade project implement?	JICA Project	If two governments do not sign loan agreement, we cannot start the project. We can no say exactly until now because the loan agreement has not yet.
One villager from Ywa si gon village	Can you extend this road up to our village?	JICA Project	We have already submitted project site to JICA. Therefore we cannot extend this road up to your village. However, you can request to DRD to include in government budgets.

13. Target Road: Ad-3

(1) Venue: Village Administration Office, Village Tract: Oak Shi Gyi District/City: Ayadaw

(2) Date & Time: From 12:30 am to 2:00 pm on 23 May 2017

(3) Participants: 16 in total including PAPs

(a) Participants of governmental staff and the AIIP Project members

No	Name	Organization	Position
1	U Won Na	Regional Parliament	Parliament member, Sagaing Region
2	U Kyaw Soe Tun	GAD, MOHA	Village Tract Administrator, Oak Shi Gyi Village Tract
3	U Tay Zar Tun	DRD	Staff Officer , Township Officer, DRD Ayadaw
4	Daw Aye Aye Aung	DRD	Deputy Staff Officer, DRD Ayadaw
5	Daw Su Sandi Moe	DRD	Junior Engineer-2 , DRD Ayadaw
6	Ms. Rie Kitao	JICA Project Team	Environmental and Social Consideration
7	U Han Soe	JICA Project Team	Project Assistant
8	U Thaw Zin Naing	JICA Project Team	Project Assistant
9	U Aung Moe Naing	JICA Project Team	Project Assistant

(b) Number of Project Affected Persons (PAPs): 7 (Male: 7, Female: 0)
Due to lack of cadastral map in Ayadaw Township, only 7 PAPs were identified.
See "Attachment: Participant list" for all of name of PAPs.

(4) Meeting Content

(a) Introduction and Opening speech by JICA Project Team

(b) Explanation of the Project, road expansion and land acquisition by the Project Team staff

- Overall explanation of the Project
- Location of rural road improvement site
- Implementation structure, target area, road improvement from macadam to asphalt, upgrading and land acquisition and project implementation schedule, precondition of the project, proposed grievance mechanism.

(c) Question from the JICA Project Team

Q-1 Do you agree with the road improvement, even if a part of your land is lost and compensation is provided?

A-1 Yes, We agree totally.

Q-2 If compensation is not provided for the land loss, do you agree with the road improvement? If Yes, why?

A-2 Yes, we can agree land loss without compensation because –

Land Owner - male (from Oak Shi Gyi village) – This road will directly effect to villagers economy.
Land Owner - male (from Oak Shi Gyi village) – I had donated 2 acres for road construction since last 30 years ago. I can also donate this time for road.

Q-3 Do you accept the unit price set by the Land Management Committee? If no, any suggestions?

A-3 Yes, We can accept that.

Q-4 Do you accept the proposed grievance handling mechanism? Any modification of that is needed?

A-4 Yes, We accept this proposed grievance handling mechanism.

(d) Questions from the participants and answers

Speaker	Opinion/question	Respondent	Answer
One villager from Oak Shi Gyi village	Please start the project as quickly as possible	JICA Survey Team	As we have already explained the project will start in 2019-2020 Fiscal Years.
One villager from Oak Shi Gyi village	You mentioned that this project is loan project. Do we (villagers) need to pay back this loan?	JICA Survey Team	Loan agreement is between Myanmar and Japan government. Therefore, the villagers no need to pay back loan themselves. The government will pay for that.
One villager from Oak Shi Gyi village	Our current road condition is earth pavement. This project includes upgrading of earth to macadam and macadam to asphalt both step.	U Tay Zar Tun, Staff Officer , DRD Ayadaw	In this project, we will upgrade earth to asphalt directly. As you know, we construct two types like as 1) earth to macadam road and 2) macadam to asphalt road. However, we can construct earth to asphalt directly in technology.

APPENDIX-IX

COST ESTIMATION

APPENDIX IX: COST ESTIMATION

TABLE OF CONTENTS

APPENDIX IX COST ESTIMATION

1. Summary of Project Cost

1-1. Plan A

(1) MMK Version (million kyat)

Breakdown of Cost	Foreign Currency Portion (millon MMK)			Local Currency Portion (millon MMK)			Total (millon MMK)		
	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others
IWUMD-1.1 Rehabilitation of Kindat Diversion Dam (Procurement)									
IWUMD-1.2 Rehabilitation of Kindat Diversion Dam (Construction)									
IWUMD-1.3 Rehabilitation of Kindat Diversion Dam (Dredging)									
IWUMD-1.4 Rehabilitation of Kindat Diversion Dam (Gate Installation)									
IWUMD-2.1 Rehabilitation of Kabo Weir (Procurement)									
IWUMD-2.2 Rehabilitation of Kabo Weir (Construction)									
IWUMD-2.3 Rehabilitation of Kabo Weir (Gate Installation)									
IWUMD-3 Rehabilitation of OMC Irrigation System									
IWUMD-4.1 Rehabilitation of SMC Irrigation System (U/S)									
IWUMD-4.2 Rehabilitation of SMC Irrigation System (M/S & D/S)									
IWUMD-5.1 Rehabilitation of RMC Irrigation System (U/S)									
IWUMD-5..2 Rehabilitation of RMC Irrigation System (AEC & BEC)									
IWUMD-6.1 Rehabilitation of YMC Irrigation System (U/S & MBC)									
IWUMD-6.2 Rehabilitation of YMC Irrigation System (M/S & D/S)									
IWUMD-7 Flood monitoring & water management system									
IWUMD-8 Preparation Work and Quality Control and Maintenance of Machinery									
IWUMD-9 Procurement of maintenance machineries									
IWUMD-10 Canal inspection road improvement									
IWUMD-11 Land Consolidation (Farm road and tertiary canal construction)									
DRD-1 Rural road improvement									
DRD-2 Rural bridge improvement									
AMD-1.1 Maintenance workshop (equipment procurement)									
AMD-1.2 Maintenance workshop (building construction)									
AMD-2.1 Agriculture Machineries Testing Centre (equipment procurement)									
AMD-2.2 Agriculture Machineries Testing Centre (building construction)									
AMD-3 Capacity developement for AMD staff & operators									
AMD-4.1 Land Consolidayion (procurement of LC machineries)									
AMD-4.2 Land Consolidayion (Land leveling and consolidation)									
DOA-1 Capacity building for DOA extension staff									
DOA-2 Agriculture extension strengthening									
DOA-3.1 Improvement of camp & TS offices									
DOA-3.2 Improvement of camp & TS offices (procurement of office equipment)									
DOA-4.1 Establishment of seed center (equipment procurement)									
DOA-4.2 Establishment of seed center (building and storage construction)									
DALMS-1 Land Consolidation (Updating cadastral map)									
Civil Works Sub Total									
Price Escalation									
Physical Contingency									
Consulting Services									
Land Acquisition									
Administration Cost									
VAT									
Import Tax									
Interest during construction									
Front End Fee									
Total									

(2) JPY Version (million JPY)

Breakdown of Cost	Foreign Currency Portion (million JPY)			Local Currency Portion (million JPY)			Total (million JPY)		
	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others
IWUMD-1.1 Rehabilitation of Kindat Diversion Dam (Procurement)									
IWUMD-1.2 Rehabilitation of Kindat Diversion Dam (Construction)									
IWUMD-1.3 Rehabilitation of Kindat Diversion Dam (Dredging)									
IWUMD-1.4 Rehabilitation of Kindat Diversion Dam (Gate Installation)									
IWUMD-2.1 Rehabilitation of Kabo Weir (Procurement)									
IWUMD-2.2 Rehabilitation of Kabo Weir (Construction)									
IWUMD-2.3 Rehabilitation of Kabo Weir (Gate Installation)									
IWUMD-3 Rehabilitation of OMC Irrigation System									
IWUMD-4.1 Rehabilitation of SMC Irrigation System (U/S)									
IWUMD-4.2 Rehabilitation of SMC Irrigation System (M/S & D/S)									
IWUMD-5.1 Rehabilitation of RMC Irrigation System (U/S)									
IWUMD-5..2 Rehabilitation of RMC Irrigation System (AEC & BEC)									
IWUMD-6.1 Rehabilitation of YMC Irrigation System (U/S & MBC)									
IWUMD-6.2 Rehabilitation of YMC Irrigation System (M/S & D/S)									
IWUMD-7 Flood monitoring & water management system									
IWUMD-8 Preparation Work and Quality Control and Maintenance of Machinery									
IWUMD-9 Procurement of maintenance machineries									
IWUMD-10 Canal inspection road improvement									
IWUMD-11 Land Consolidation (Farm road and tertiary canal construction)									
DRD-1 Rural road improvement									
DRD-2 Rural bridge improvement									
AMD-1.1 Maintenance workshop (equipment procurement)									
AMD-1.2 Maintenance workshop (building construction)									
AMD-2.1 Agriculture Machineries Testing Centre (equipment procurement)									
AMD-2.2 Agriculture Machineries Testing Centre (building construction)									
AMD-3 Capacity developement for AMD staff & operators									
AMD-4.1 Land Consolidayion (procurement of LC machineries)									
AMD-4.2 Land Consolidayion (Land leveling and consolidation)									
DOA-1 Capacity building for DOA extension staff									
DOA-2 Agriculture extension strengthening									
DOA-3.1 Improvement of camp & TS offices									
DOA-3.2 Improvement of camp & TS offices (procurement of office equipment)									
DOA-4.1 Establishment of seed center (equipment procurement)									
DOA-4.2 Establishment of seed center (building and storage construction)									
DALMS-1 Land Consolidation (Updating cadastral map)									
Civil Works Sub Total									
Price Escalation									
Physical Contingency									
Consulting Services									
Land Acquisition									
Administration Cost									
VAT									
Import Tax									
Interest during construction									
Front End Fee									
Total									

※ 1 USD = 112 JPY, 1 USD = 1,350 Kyat, 1 MMK = 0.083 JPY

1-2. Plan B

(1) MMK Version (million kyat)

Breakdown of Cost	Foreign Currency Portion (millon MMK)			Local Currency Portion (millon MMK)			Total (millon MMK)		
	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others
IWUMD-1.1 Rehabilitation of Kindat Diversion Dam (Procurement)									
IWUMD-1.2 Rehabilitation of Kindat Diversion Dam (Construction)									
IWUMD-1.3 Rehabilitation of Kindat Diversion Dam (Dredging)									
IWUMD-1.4 Rehabilitation of Kindat Diversion Dam (Gate Installation)									
IWUMD-2.1 Rehabilitation of Kabo Weir (Procurement)									
IWUMD-2.2 Rehabilitation of Kabo Weir (Construction)									
IWUMD-2.3 Rehabilitation of Kabo Weir (Gate Installation)									
IWUMD-3 Rehabilitation of OMC Irrigation System									
IWUMD-4.1 Rehabilitation of SMC Irrigation System (U/S)									
IWUMD-4.2 Rehabilitation of SMC Irrigation System (M/S & D/S)									
IWUMD-5.1 Rehabilitation of RMC Irrigation System (U/S)									
IWUMD-5.2 Rehabilitation of RMC Irrigation System (AEC & BEC)									
IWUMD-6.1 Rehabilitation of YMC Irrigation System (U/S & MBC)									
IWUMD-6.2 Rehabilitation of YMC Irrigation System (M/S & D/S)									
IWUMD-7 Flood monitoring & water management system									
IWUMD-8 Preparation Work and Quality Control and Maintenance of Machinery									
IWUMD-9 Procurement of maintenance machineries									
IWUMD-10 Canal inspection road improvement									
DRD-1 Rural road improvement									
DRD-2 Rural bridge improvement									
AMD-1.1 Maintenance workshop (equipment procurement)									
AMD-1.2 Maintenance workshop (building construction)									
AMD-2.1 Agriculture Machineries Testing Centre (equipment procurement)									
AMD-2.2 Agriculture Machineries Testing Centre (building construction)									
AMD-3 Capacity development for AMD staff & operators									
DOA-1 Capacity building for DOA extension staff									
DOA-2 Agriculture extension strengthening									
DOA-3.1 Improvement of camp & TS offices									
DOA-3.2 Improvement of camp & TS offices (procurement of office equipment)									
DOA-4.1 Establishment of seed center (equipment procurement)									
DOA-4.2 Establishment of seed center (building and storage construction)									
IWUMD-11 Land Consolidation (Farm road and tertiary canal construction)									
AMD-4.1 Land Consolidation (procurement of LC machineries)									
AMD-4.2 Land Consolidation (Land leveling and consolidation)									
DALMS-1 Land Consolidation (Updating cadastral map)									
Civil Works Sub Total									
Price Escalation									
Physical Contingency									
Consulting Services									
Land Acquisition									
Administration Cost									
VAT									
Import Tax									
Interest during construction									
Front End Fee									
Total									

(2) JPY Version (million JPY)

Breakdown of Cost	Foreign Currency Portion (million JPY)			Local Currency Portion (million JPY)			Total (million JPY)		
	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others
IWUMD-1.1 Rehabilitation of Kindat Diversion Dam (Procurement)									
IWUMD-1.2 Rehabilitation of Kindat Diversion Dam (Construction)									
IWUMD-1.3 Rehabilitation of Kindat Diversion Dam (Dredging)									
IWUMD-1.4 Rehabilitation of Kindat Diversion Dam (Gate Installation)									
IWUMD-2.1 Rehabilitation of Kabo Weir (Procurement)									
IWUMD-2.2 Rehabilitation of Kabo Weir (Construction)									
IWUMD-2.3 Rehabilitation of Kabo Weir (Gate Installation)									
IWUMD-3 Rehabilitation of OMC Irrigation System									
IWUMD-4.1 Rehabilitation of SMC Irrigation System (U/S)									
IWUMD-4.2 Rehabilitation of SMC Irrigation System (M/S & D/S)									
IWUMD-5.1 Rehabilitation of RMC Irrigation System (U/S)									
IWUMD-5.2 Rehabilitation of RMC Irrigation System (AEC & BEC)									
IWUMD-6.1 Rehabilitation of YMC Irrigation System (U/S & MBC)									
IWUMD-6.2 Rehabilitation of YMC Irrigation System (M/S & D/S)									
IWUMD-7 Flood monitoring & water management system									
IWUMD-8 Preparation Work and Quality Control and Maintenance of Machinery									
IWUMD-9 Procurement of maintenance machineries									
IWUMD-10 Canal inspection road improvement									
DRD-1 Rural road improvement									
DRD-2 Rural bridge improvement									
AMD-1.1 Maintenance workshop (equipment procurement)									
AMD-1.2 Maintenance workshop (building construction)									
AMD-2.1 Agriculture Machineries Testing Centre (equipment procurement)									
AMD-2.2 Agriculture Machineries Testing Centre (building construction)									
AMD-3 Capacity development for AMD staff & operators									
DOA-1 Capacity building for DOA extension staff									
DOA-2 Agriculture extension strengthening									
DOA-3.1 Improvement of camp & TS offices									
DOA-3.2 Improvement of camp & TS offices (procurement of office equipment)									
DOA-4.1 Establishment of seed center (equipment procurement)									
DOA-4.2 Establishment of seed center (building and storage construction)									
IWUMD-11 Land Consolidation (Farm road and tertiary canal construction)									
AMD-4.1 Land Consolidation (procurement of LC machineries)									
AMD-4.2 Land Consolidation (Land leveling and consolidation)									
DALMS-1 Land Consolidation (Updating cadastral map)									
Civil Works Sub Total									
Price Escalation									
Physical Contingency									
Consulting Services									
Land Acquisition									
Administration Cost									
VAT									
Import Tax									
Interest during construction									
Front End Fee									
Total									

※ 1 USD = 112 JPY, 1 USD = 1,350 Kyat, 1 MMK = 0.083 JPY

1-3. Plan C

(1) MMK Version (million kyat)

Breakdown of Cost	Foreign Currency Portion (millon MMK)			Local Currency Portion (millon MMK)			Total (millon MMK)		
	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others
IWUMD-1.1 Rehabilitation of Kindat Diversion Dam (Procurement)									
IWUMD-1.2 Rehabilitation of Kindat Diversion Dam (Construction)									
IWUMD-1.3 Rehabilitation of Kindat Diversion Dam (Dredging)									
IWUMD-1.4 Rehabilitation of Kindat Diversion Dam (Gate Installation)									
IWUMD-2.1 Rehabilitation of Kabo Weir (Procurement)									
IWUMD-2.2 Rehabilitation of Kabo Weir (Construction)									
IWUMD-2.3 Rehabilitation of Kabo Weir (Gate Installation)									
IWUMD-3 Rehabilitation of OMC Irrigation System									
IWUMD-4.1 Rehabilitation of SMC Irrigation System (U/S)									
IWUMD-4.2 Rehabilitation of SMC Irrigation System (M/S & D/S)									
IWUMD-5.1 Rehabilitation of RMC Irrigation System (U/S)									
IWUMD-5.2 Rehabilitation of RMC Irrigation System (AEC & BEC)									
IWUMD-6.1 Rehabilitation of YMC Irrigation System (U/S & MBC)									
IWUMD-6.2 Rehabilitation of YMC Irrigation System (M/S & D/S)									
IWUMD-7 Flood monitoring & water management system									
IWUMD-8 Preparation Work and Quality Control and Maintenance of Machinery									
IWUMD-9 Procurement of maintenance machineries									
IWUMD-10 Canal inspection road improvement									
IWUMD-11 Land Consolidation (Farm road and tertiary canal construction)									
DRD-1 Rural road improvement									
DRD-2 Rural bridge improvement									
AMD-1.1 Maintenance workshop (equipment procurement)									
AMD-1.2 Maintenance workshop (building construction)									
AMD-2.1 Agriculture Machineries Testing Centre (equipment procurement)									
AMD-2.2 Agriculture Machineries Testing Centre (building construction)									
AMD-3 Capacity developement for AMD staff & operators									
AMD-4.1 Land Consolidayion (procurement of LC machineries)									
AMD-4.2 Land Consolidayion (Land leveling and consolidation)									
DOA-1 Capacity building for DOA extension staff									
DOA-2 Agriculture extension strengthening									
DOA-3.1 Improvement of camp & TS offices									
DOA-3.2 Improvement of camp & TS offices (procurement of office equipment)									
DOA-4.1 Establishment of seed center (equipment procurement)									
DOA-4.2 Establishment of seed center (building and storage construction)									
DALMS-1 Land Consolidation (Updating cadastral map)									
Civil Works Sub Total									
Price Escalation									
Physical Contingency									
Consulting Services									
Land Acquisition									
Administration Cost									
VAT									
Import Tax									
Interest during construction									
Front End Fee									
Total									

(2) JPY Version (million JPY)

Breakdown of Cost	Foreign Currency Portion (million JPY)			Local Currency Portion (million JPY)			Total (million JPY)		
	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others
IWUMD-1.1 Rehabilitation of Kindat Diversion Dam (Procurement)									
IWUMD-1.2 Rehabilitation of Kindat Diversion Dam (Construction)									
IWUMD-1.3 Rehabilitation of Kindat Diversion Dam (Dredging)									
IWUMD-1.4 Rehabilitation of Kindat Diversion Dam (Gate Installation)									
IWUMD-2.1 Rehabilitation of Kabo Weir (Procurement)									
IWUMD-2.2 Rehabilitation of Kabo Weir (Construction)									
IWUMD-2.3 Rehabilitation of Kabo Weir (Gate Installation)									
IWUMD-3 Rehabilitation of OMC Irrigation System									
IWUMD-4.1 Rehabilitation of SMC Irrigation System (U/S)									
IWUMD-4.2 Rehabilitation of SMC Irrigation System (M/S & D/S)									
IWUMD-5.1 Rehabilitation of RMC Irrigation System (U/S)									
IWUMD-5.2 Rehabilitation of RMC Irrigation System (AEC & BEC)									
IWUMD-6.1 Rehabilitation of YMC Irrigation System (U/S & MBC)									
IWUMD-6.2 Rehabilitation of YMC Irrigation System (M/S & D/S)									
IWUMD-7 Flood monitoring & water management system									
IWUMD-8 Preparation Work and Quality Control and Maintenance of Machinery									
IWUMD-9 Procurement of maintenance machineries									
IWUMD-10 Canal inspection road improvement									
IWUMD-11 Land Consolidation (Farm road and tertiary canal construction)									
DRD-1 Rural road improvement									
DRD-2 Rural bridge improvement									
AMD-1.1 Maintenance workshop (equipment procurement)									
AMD-1.2 Maintenance workshop (building construction)									
AMD-2.1 Agriculture Machineries Testing Centre (equipment procurement)									
AMD-2.2 Agriculture Machineries Testing Centre (building construction)									
AMD-3 Capacity developement for AMD staff & operators									
AMD-4.1 Land Consolidayion (procurement of LC machineries)									
AMD-4.2 Land Consolidayion (Land leveling and consolidation)									
DOA-1 Capacity building for DOA extension staff									
DOA-2 Agriculture extension strengthening									
DOA-3.1 Improvement of camp & TS offices									
DOA-3.2 Improvement of camp & TS offices (procurement of office equipment)									
DOA-4.1 Establishment of seed center (equipment procurement)									
DOA-4.2 Establishment of seed center (building and storage construction)									
DALMS-1 Land Consolidation (Updating cadastral map)									
Civil Works Sub Total									
Price Escalation									
Physical Contingency									
Consulting Services									
Land Acquisition									
Administration Cost									
VAT									
Import Tax									
Interest during construction									
Front End Fee									
Total									

※ 1 USD = 112 JPY, 1 USD = 1,350 Kyat, 1 MMK = 0.083 JPY

2. Implementation Schedule

(1) Overall Project (Plan A)

	2017	2018	2019	2020	2021	2022	2023	2024	Month
	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	
Pledge									
Myanmar side process for signing of loan agreement including loan agreement negotiation									
Signing of loan agreement									
Consulting services									
Selection of consulting firm (12M)									
[Irrigation and Drainage Improvement]									
1) Irrigation and drainage rehabilitation									
1-1) Topographic survey and structure survey (by IWUMD)									
1-2) Detail design for irrigation project (survey and basic design stage)									
1-3) Implementation (by IWUMD)									
2) Water management & flood monitoring system									
3) Procurement of the maintenance machinery (by ICB)									
[Distribution Infrastructure Improvement]									
1) Rural road & rural bridge & canal inspection road improvement									
1-1) Topographic survey and geological survey									
1-2) Detail design on rural road & bridge									
1-3) Tender process (LCB)									
1-4) Rehabilitation of the road & bridge 25 packages (by contractor)									
2) Canal inspection road upgrading (by contractor)									
3) Rehabilitation of canal inspection road (by IWUMD)									
[Agriculture Mechanization Strengthening]									
1) Maintenance workshop establishment (including procurement)									
2) Agriculture Machineries Testing Centre (including procurement)									
3) Capacity development for AMD staff & operators									
[Land Consolidation]									
1) Preparation: Selection of LC area, Topographic survey, Design									
2) Land consolidation (land leveling and consolidation, farm road and tertiary canal)									
3) Procurement of machinery for land consolidation (by ICB)									
4) Cadastral map upgrading & registration of consolidated farmland									
[Agriculture Development and Extension Strengthening]									
1) Capacity building for DOA extension staff (trainings, manuals, etc.)									
2) Agriculture extension strengthening (demo farms, logistics, etc.)									
3) Improvement of camp and TS office									
4) Establishment of seed center and capacity development									
5) Procurement of the equipment for seed center (by ICB)									

By the Government (with JICA Facilitation team)

Items which will have been completed until Oct over 2020

[Irrigation and Drainage Improvement]

- ◆ Rehabilitation of one (1) irrigation system
- ◆ Procurement of the maintenance machinery

[Distribution Infrastructure Improvement]

- ◆ Rehabilitation of the road (approx. 80km)
- ◆ Rehabilitation/construction of the bridge (9 places)
- ◆ Upgrade of canal inspection road (80km)

[Agriculture Mechanization Strengthening]

- ◆ Construction of maintenance workshop (4 places)
- ◆ Construction of agriculture machineries testing centre (1 place)

[Land Consolidation]

- ◆ Procurement of machinery for land consolidation
- ◆ Land consolidation (800 ha)

[Agriculture Development and Extension Strengthening]

- ◆ Improvement of camp and TS office (50 places)
- ◆ Construction of seed center
- ◆ Procurement of the equipment for seed center

Land Acquisition									
IWUMD-1.1 Rehabilitation of Kindat Diversion Dam (Procurement)									
IWUMD-1.2 Rehabilitation of Kindat Diversion Dam (Construction)									
IWUMD-1.3 Rehabilitation of Kindat Diversion Dam (Dredging)									
IWUMD-1.4 Rehabilitation of Kindat Diversion Dam (Gate Installation)									
IWUMD-2.1 Rehabilitation of Kabo Weir (Procurement)									
IWUMD-2.2 Rehabilitation of Kabo Weir (Construction)									
IWUMD-2.3 Rehabilitation of Kabo Weir (Gate Installation)									
IWUMD-3 Rehabilitation of OMC Irrigation System									
IWUMD-4.1 Rehabilitation of SMC Irrigation System (U/S)									
IWUMD-4.2 Rehabilitation of SMC Irrigation System (M/S & D/S)									
IWUMD-5.1 Rehabilitation of RMC Irrigation System (U/S)									
IWUMD-5..2 Rehabilitation of RMC Irrigation System (AEC & BEC)									
IWUMD-6.1 Rehabilitation of YMC Irrigation System (U/S & MBC)									
IWUMD-6.2 Rehabilitation of YMC Irrigation System (M/S & D/S)									
IWUMD-7 Flood monitoring & water management system									
IWUMD-8 Preparation Work and Quality Control and Maintenance of Machinery									
IWUMD-9 Procurement of maintenance machineries									
IWUMD-10 Canal inspection road improvement									
IWUMD-11 Land Consolidation (Farm road and tertiary canal construction)									
DRD-1 Rural road improvement									
DRD-2 Rural bridge improvement									
AMD-1.1 Maintenance workshop (equipment procurement)									
AMD-1.2 Maintenance workshop (building construction)									
AMD-2.1 Agriculture Machineries Testing Centre (equipment procurement)									
AMD-2.2 Agriculture Machineries Testing Centre (building construction)									
AMD-3 Capacity developement for AMD staff & operators									
AMD-4.1 Land Consolidayion (procurement of LC machineries)									
AMD-4.2 Land Consolidayion (Land leveling and consolidation)									
DOA-1 Capacity building for DOA extension staff									
DOA-2 Agriculture extension strengthening									
DOA-3.1 Improvement of camp & TS offices									
DOA-3.2 Improvement of camp & TS offices (procurement of office equipment)									
DOA-4.1 Establishment of seed center (equipment procurement)									
DOA-4.2 Establishment of seed center (building and storage construction)									
DALMS-1 Land Consolidation (Updating cadastral map)									

(2) Overall Project (Plan B)

★Note: The timing of L/A singning is subject to change upon the decision by the higher authorities. The timing shown here is only the tentative plan.

By the Government (with JICA Facilitation team)

Items which will have been completed until Oct over 2020

[Irrigation and Drainage Improvement]

- ◆ Rehabilitation of one (1) irrigation system
- ◆ Procurement of the maintenance machinery

[Distribution Infrastructure Improvement]

- ◆ Rehabilitation of the road (approx. 80km)
- ◆ Rehabilitation/construction of the bridge (9 places)
- ◆ Upgrade of canal inspection road (80km)

[Agriculture Mechanization Strengthening]

- ◆ Construction of maintenance workshop (5 places)
- ◆ Construction of agriculture machineries testing center (1 place)

[Land Consolidation]

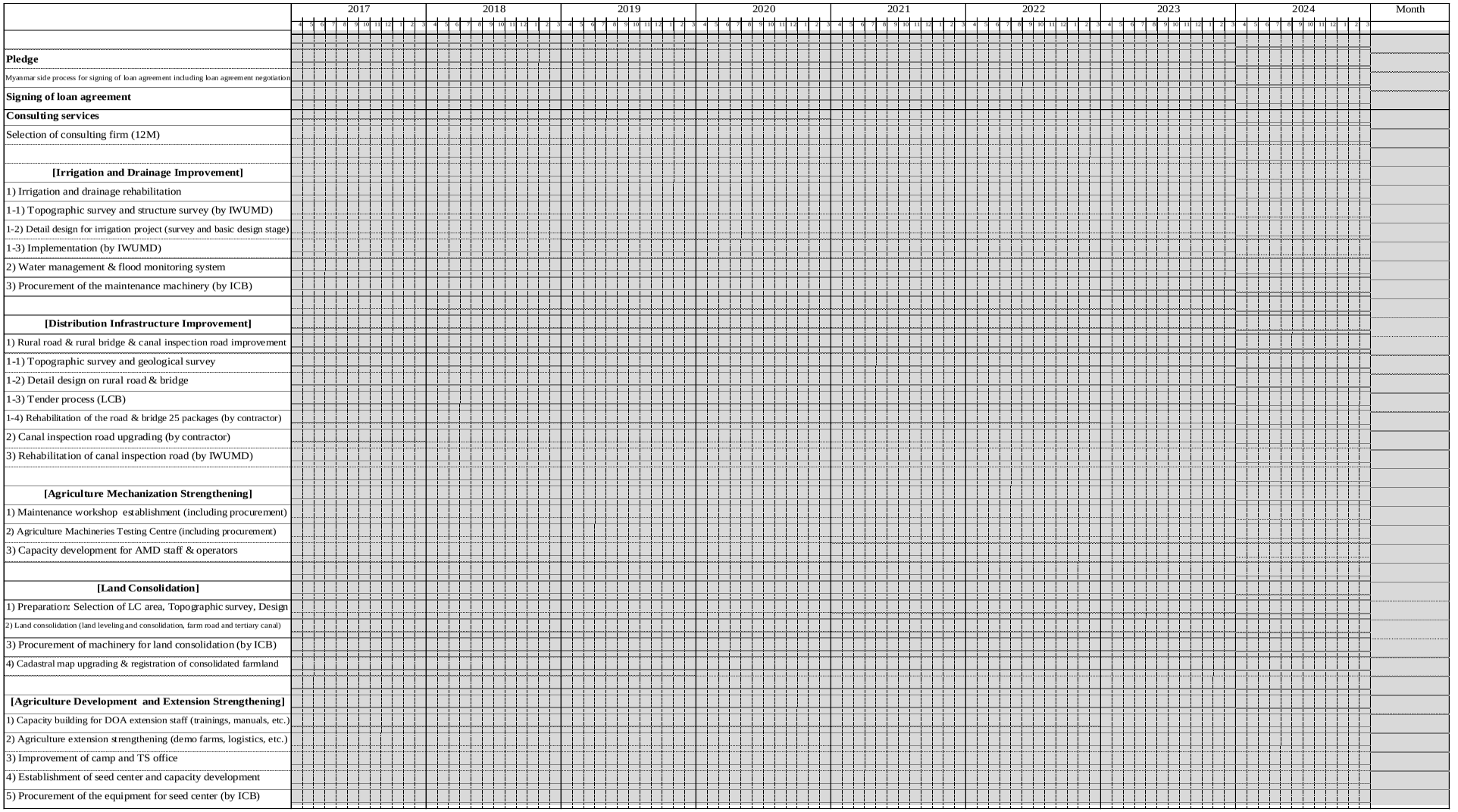
- ◆ Procurement of machinery for land consolidation
- ◆ Land consolidation (400 ha)

[Agriculture Development and Extension Strengthening]

- ◆ Improvement of camp (52 places) and TS office (9 places)
- ◆ Construction of seed center
- ◆ Procurement of the equipment for seed center

Land Acquisition									
IWUMD-1.1 Rehabilitation of Kindat Diversion Dam (Procurement)									
IWUMD-1.2 Rehabilitation of Kindat Diversion Dam (Construction)									
IWUMD-1.3 Rehabilitation of Kindat Diversion Dam (Dredging)									
IWUMD-1.4 Rehabilitation of Kindat Diversion Dam (Gate Installation)									
IWUMD-2.1 Rehabilitation of Kabo Weir (Procurement)									
IWUMD-2.2 Rehabilitation of Kabo Weir (Construction)									
IWUMD-2.3 Rehabilitation of Kabo Weir (Gate Installation)									
IWUMD-3 Rehabilitation of OMC Irrigation System									
IWUMD-4.1 Rehabilitation of SMC Irrigation System (U/S)									
IWUMD-4.2 Rehabilitation of SMC Irrigation System (M/S & D/S)									
IWUMD-5.1 Rehabilitation of RMC Irrigation System (U/S)									
IWUMD-5.2 Rehabilitation of RMC Irrigation System (AEC & BEC)									
IWUMD-6.1 Rehabilitation of YMC Irrigation System (U/S & MBC)									
IWUMD-6.2 Rehabilitation of YMC Irrigation System (M/S & D/S)									
IWUMD-7 Flood monitoring & water management system									
IWUMD-8 Preparation Work and Quality Control and Maintenance of Machinery									
IWUMD-9 Procurement of maintenance machineries									
IWUMD-10 Canal inspection road improvement									
IWUMD-11 Land Consolidation (Farm road and tertiary canal construction)									
DRD-1 Rural road improvement									
DRD-2 Rural bridge improvement									
AMD-1.1 Maintenance workshop (equipment procurement)									
AMD-1.2 Maintenance workshop (building construction)									
AMD-2.1 Agriculture Machineries Testing Centre (equipment procurement)									
AMD-2.2 Agriculture Machineries Testing Centre (building construction)									
AMD-3 Capacity development for AMD staff & operators									
AMD-4.1 Land Consolidation (procurement of LC machineries)									
AMD-4.2 Land Consolidation (Land leveling and consolidation)									
DOA-1 Capacity building for DOA extension staff									
DOA-2 Agriculture extension strengthening									
DOA-3.1 Improvement of camp & TS offices									
DOA-3.2 Improvement of camp & TS offices (procurement of office equipment)									
DOA-4.1 Establishment of seed center (equipment procurement)									
DOA-4.2 Establishment of seed center (building and storage construction)									
DALMS-1 Land Consolidation (Updating cadastral map)									

(3) Overall Project (Plan C)



Items which will have been completed until Oct over 2020

[Irrigation and Drainage Improvement]

- ◆ Rehabilitation of one (1) irrigation system
- ◆ Procurement of the maintenance machinery

[Distribution Infrastructure Improvement]

- ◆ Rehabilitation of the road (approx. 80km)
- ◆ Rehabilitation/construction of the bridge (9 places)
- ◆ Upgrade of canal inspection road (80km)

[Agriculture Mechanization Strengthening]

- ◆ Construction of maintenance workshop (4 places)
- ◆ Construction of agriculture machineries testing centre (1 place)

[Land Consolidation]

- ◆ Procurement of machinery for land consolidation
- ◆ Land consolidation (800 ha)

[Agriculture Development and Extension Strengthening]

- ◆ Improvement of camp and TS office (50 places)
- ◆ Construction of seed center
- ◆ Procurement of the equipment for seed center

Land Acquisition									
IWUMD-1.1 Rehabilitation of Kindat Diversion Dam (Procurement)									
IWUMD-1.2 Rehabilitation of Kindat Diversion Dam (Construction)									
IWUMD-1.3 Rehabilitation of Kindat Diversion Dam (Dredging)									
IWUMD-1.4 Rehabilitation of Kindat Diversion Dam (Gate Installation)									
IWUMD-2.1 Rehabilitation of Kabo Weir (Procurement)									
IWUMD-2.2 Rehabilitation of Kabo Weir (Construction)									
IWUMD-2.3 Rehabilitation of Kabo Weir (Gate Installation)									
IWUMD-3 Rehabilitation of OMC Irrigation System									
IWUMD-4.1 Rehabilitation of SMC Irrigation System (U/S)									
IWUMD-4.2 Rehabilitation of SMC Irrigation System (M/S & D/S)									
IWUMD-5.1 Rehabilitation of RMC Irrigation System (U/S)									
IWUMD-5.2 Rehabilitation of RMC Irrigation System (AEC & BEC)									
IWUMD-6.1 Rehabilitation of YMC Irrigation System (U/S & MBC)									
IWUMD-6.2 Rehabilitation of YMC Irrigation System (M/S & D/S)									
IWUMD-7 Flood monitoring & water management system									
IWUMD-8 Preparation Work and Quality Control and Maintenance of Machinery									
IWUMD-9 Procurement of maintenance machineries									
IWUMD-10 Canal inspection road improvement									
IWUMD-11 Land Consolidation (Farm road and tertiary canal construction)									
DRD-1 Rural road improvement									
DRD-2 Rural bridge improvement									
AMD-1.1 Maintenance workshop (equipment procurement)									
AMD-1.2 Maintenance workshop (building construction)									
AMD-2.1 Agriculture Machineries Testing Centre (equipment procurement)									
AMD-2.2 Agriculture Machineries Testing Centre (building construction)									
AMD-3 Capacity developement for AMD staff & operators									
AMD-4.1 Land Consolidayion (procurement of LC machineries)									
AMD-4.2 Land Consolidayion (Land leveling and consolidation)									
DOA-1 Capacity building for DOA extension staff									
DOA-2 Agriculture extension strengthening									
DOA-3.1 Improvement of camp & TS offices									
DOA-3.2 Improvement of camp & TS offices (procurement of office equipment)									
DOA-4.1 Establishment of seed center (equipment procurement)									
DOA-4.2 Establishment of seed center (building and storage construction)									
DALMS-1 Land Consolidation (Updating cadastral map)									

3. Manning Schedule for the Consulting Service/ Expert

(1) Plan A

		Position	Billing Rate		2018				2019								2020								2021								2022								2023								2024				Total	Fright
			FC/ JPY	LC/ MMK	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10		
A	1	Project Team Leader																																																		
A	2	Procurement/ Bid Document																																																		
A	3	Disbursement Management																																																		
A	4	EIA Monitoring																																																		
B	1	Deputy Project Team Leader																																																		
B	2	Project monitoring expert																																																		
B	3	Procurement Expert/ Bid Document																																																		
B	4	Disbursement Management																																																		
B	5	EIA Monitoring																																																		
		[Irrigation and Drainage Improvement]																																																		
A	5	Section Leader (DD for Irrigation Project)/ Chief Engineer																																																		
A	6	Section Leader (SV for Irrigation Project)																																																		
A	7	Irrigation Design Engineer																																																		
A	8	Irrigation Design Engineer																																																		
A	9	Hydraulic Structure Engineer 1 (Canal & Drainage Structure)																																																		
A	10	Hydraulic Structure Engineer 2 (Canal & Drainage Structure)																																																		
A	11	Hydraulic Structure Engineer 3 (Weir & spillway)																																																		
A	12	Hydro Mechanical Engineer																																																		
A	13	Hydrologist/Drainage/Flood Management																																																		
A	14	Procurement Expert on Construction Machinery																																																		
A	15	Construction Plan/ Cost Estimation																																																		
A	16	System Engineer of Monitoring System for Water management & Flood																																																		
A	17	Water Management/ System Operation																																																		
A	18	Construction Supervision (Irrigation)																																																		
B	6	Deputy Section Leader (DD for Irrigation Project)																																																		
B	7	Deputy Team Leader (SV for Irrigation Project)																																																		
B	8	Irrigation Design Engineer 1																																																		
B	9	Irrigation Design Engineer 2																																																		
B	10	Irrigation Design Engineer 3																																																		
B	11	Irrigation Design Engineer 4																																																		
B	12	Irrigation Design Engineer 5																																																		
B	13	Irrigation Design Engineer 6																																																		
B	14	Irrigation Design Engineer 7																																																		
B	15	Irrigation Design Engineer 8																																																		
B	16	Hydraulic Structure Engineer 1 (Canal & Drainage Structure)																																																		
B	17	Hydraulic Structure Engineer 2 (Canal & Drainage Structure)																																																		
B	18	Hydraulic Structure Engineer 3 (Canal & Drainage Structure)																																																		
B	19	Hydraulic Structure Engineer 4 (Canal & Drainage Structure)																																																		
B	20	Hydraulic Structure Engineer 5 (Canal & Drainage Structure)																																																		
B	21	Hydraulic Structure Engineer 6 (Canal & Drainage Structure)																																																		
B	22	Hydraulic Structure Engineer 7 (Canal & Drainage Structure)																																																		
B	23	Hydraulic Structure Engineer 8 (Canal & Drainage Structure)																																																		
B	24	Hydraulic Structure Engineer 9 (Canal & Drainage Structure)																																																		
B	25	Hydraulic Structure Engineer 10 (Canal & Drainage Structure)																																																		
B	26	Hydraulic Structure Engineer 11 (Canal & Drainage Structure)																																																		
B	27	Hydraulic Structure Engineer 12 (Canal & Drainage Structure)																																																		
B	28	Hydraulic Structure Engineer 13 (Weir & spillway)																																																		
B	29	Hydro Mechanical Engineer																																																		
B	30	Hydrologist/Drainage/Flood Management																																																		
B	31	Construction Plan																																																		
B	32	Quantity & Cost Estimation 1																																																		
B	33	Quantity & Cost Estimation 2																																																		
B	34	Quantity & Cost Estimation 3																																																		
B	35	Quantity & Cost Estimation 4																																																		
B	36	Quantity & Cost Estimation 5																																																		
B	37	Water Management/ System Operation																																																		
B	38	Construction Supervision (Irrigation) 1																																																		
B	39	Construction Supervision (Irrigation) 2																																																		
B	40	Construction Supervision (Irrigation) 3																																																		
B	41	Construction Supervision (Irrigation) 4																																																		
B	42	Construction Supervision (Irrigation) 5																																																		
B	43	Construction Supervision (Irrigation) 6																																																		
B	44	Construction Supervision (Irrigation) 7																																																		
B	45	Construction Supervision (Irrigation) 8																																																		
B	46	Quality Management Engineer																																																		
		[Distribution Infrastructure Improvement]																																																		
A	19	Section Leader (Road & Bridge)																																																		
A	20	Bridge Design Engineer																																																		
A	21	Bridge Design Engineer																																																		
A	22	Hydraulic Structure Engineer/River Management																																																		
A	23	Construction Supervision (Road & Bridge)																																																		
B	47	Deputy Section Leader (Road & Bridge)																																																		
B	48	Road Design Engineer 1																																																		
B	49	Road Design Engineer 2																																																		
B	50	Road Design Engineer 3																																																		
B	51	Road Design Engineer 4																																																		
B	52	Road Design Engineer 5																																																		
B	53	Road Design Engineer 6																																																		
B	54	Bridge Design Engineer 1																																																		
B	55	Bridge Design Engineer 2																																																		
B	56	Bridge Design Engineer 3																																																		
B	57	Geological Engineer																																																		
B	58	Hydrologist/River Management																																																		
B	59	Quantity & Cost Estimation 1																																																		
B	60	Quantity & Cost Estimation 2																																																		
B	61	Quantity & Cost Estimation 3																																																		
B	62	Quantity & Cost Estimation 4																																																		
B	63	Construction Supervision (Road & Bridge) 1																																																		
B	64	Construction Supervision (Road & Bridge) 2																																																		
B	65	Construction Supervision (Road & Bridge) 3																																																		
B	66	Construction Supervision (Road & Bridge) 4																																																		
B	67	Construction Supervision (Road & Bridge) 5																																																		
B	68	Construction Supervision (Road & Bridge) 6																																																		
B	69	Quality Management Engineer																																																		
		[Agriculture Mechanization Strengthening]																																																		
A	24	Section Leader (Agriculture Mechanization Strenghening)																																																		
B	70	Construction Supervision for Maintenance Work Shop																																																		
B	71	Construction Supervision for Machinery Testing Center																																																		
B	72	Specialist on maintenance of Agriculture Machinery																																																		
B	73	Specialist on Agriculture Machinery Testing																																																		
		[Land Consolidation]																																																		
		[Agriculture Development and Extension Strengthening]																																																		
		[Total of Pro-A]																																																		
		[Total of Pro-B]																																																		
		[Total of Pro-A+Pro-B]																																																		
C	1	Secretary 1																																																		
C	2	Secretary 2																																																		
C	3	Administration/ account 1																																																		
C	4	Administration/ account 2																																																		
C	5	CAD Operator (for Irrigation Project) 1																																																		
C	6	CAD Operator (for Irrigation Project) 2																																																		
C	7	CAD Operator (for Irrigation Project) 3																																																		
C	8	CAD Operator (for Irrigation Project) 4																																																		
C	9	CAD Operator (for Irrigation Project) 5																																																		
C	10	CAD Operator (for Irrigation Project) 6																																																		
C	11	CAD Operator (For Road Project) 1																																																		
C	12	CAD Operator (For Road Project) 2																																																		
C	13	CAD Operator (For Road Project) 3																																																		
C	14	Office support 1																																																		
C	15	Office support 2																																																		
C	16	Office support 3																																																		
C	17	Office support 4																																																		
		[Total of Supporting Staff]																																																		
		Grand Total																																																		

(2) Plan B

		Position	Billing Rate		2018	2019	2020	2021	2022	2023	2024	Total	Fright
			FC/ JPY	LC/ MMK	10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10		
A	1	Project Team Leader											
A	2	Procurement/ Bid Document											
A	3	Disbursement Management											
A	4	EIA Monitoring											
B	1	Deputy Project Team Leader											
B	2	Project monitoring expert											
B	3	Procurement Expert/ Bid Document											
B	4	Disbursement Management											
B	5	EIA Monitoring											
		[Irrigation and Drainage Improvement]											
A	5	Section Leader (DD for Irrigation Project)/ Chief Engineer											
A	6	Section Leader (SV for Irrigation Project)											
A	7	Irrigation Design Engineer											
A	8	Hydraulic Structure Engineer 1 (Canal & Drainage Structure)											
A	9	Hydraulic Structure Engineer 2 (Weir & spillway)											
A	10	Hydro Mechanical Engineer											
A	11	Hydrologist/Drainage/Flood Management											
A	12	Procurement Expert on Construction Machinery											
A	13	Construction Plan/ Cost Estimation											
A	14	System Engineer of Monitoring System for Water management & Flood											
A	15	Water Management/ System Operation											
A	16	Construction Supervision (Irrigation)											
B	6	Deputy Section Leader (DD for Irrigation Project)											
B	7	Deputy Team Leader (SV for Irrigation Project)											
B	8	Irrigation Design Engineer 1											
B	9	Irrigation Design Engineer 2											
B	10	Irrigation Design Engineer 3											
B	11	Irrigation Design Engineer 4											
B	12	Hydraulic Structure Engineer 1 (Canal & Drainage Structure)											
B	13	Hydraulic Structure Engineer 2 (Canal & Drainage Structure)											
B	14	Hydraulic Structure Engineer 3 (Canal & Drainage Structure)											
B	15	Hydraulic Structure Engineer 4 (Canal & Drainage Structure)											
B	16	Hydraulic Structure Engineer 5 (Canal & Drainage Structure)											
B	17	Hydraulic Structure Engineer 6 (Canal & Drainage Structure)											
B	18	Hydraulic Structure Engineer 7 (Canal & Drainage Structure)											
B	19	Hydraulic Structure Engineer 8 (Canal & Drainage Structure)											
B	20	Hydraulic Structure Engineer 9 (Weir & spillway)											
B	21	Hydro Mechanical Engineer											
B	22	Hydrologist/Drainage/Flood Management											
B	23	Construction Plan											
B	24	Quantity & Cost Estimation 1											
B	25	Quantity & Cost Estimation 2											
B	26	Quantity & Cost Estimation 3											
B	27	Water Management/ System Operation											
B	28	Construction Supervision (Irrigation) 1											
B	29	Construction Supervision (Irrigation) 2											
B	30	Construction Supervision (Irrigation) 3											
B	31	Construction Supervision (Irrigation) 4											
B	32	Quality Management Engineer											
		[Distribution Infrastructure Improvement (IWUMD, Canal Inspection Road)]											
A	17	Road Design Engineer											
A	18	Construction Supervision (Road & Bridge)											
B	33	Road Design Engineer 1											
B	34	Road Design Engineer 2											
B	35	Quantity & Cost Estimation											
B	36	Construction Supervision (Road & Bridge) 1											
B	37	Construction Supervision (Road & Bridge) 2											
		[Distribution Infrastructure Improvement (DRD, Rural Road & Bridge)]											
A	19	Section Leader (Road & Bridge)											
A	20	Bridge Design Engineer											
A	21	Hydrologist/River Management											
B	38	Deputy Section Leader (Road & Bridge)											
B	39	Road Design Engineer 1											
B	40	Road Design Engineer 2											
B	41	Bridge Design Engineer 1											
B	42	Bridge Design Engineer 2											
B	43	Geological Engineer											
B	44	Hydrologist/River Management											
B	45	Quantity & Cost Estimation											
B	46	Construction Supervision (Road & Bridge) 1											
B	47	Construction Supervision (Road & Bridge) 2											
B	48	Quality Management Engineer											
		[Agriculture Mechanization Strengthening]											
A	22	Section Leader (Agriculture Mechanization Strengthening)											
B	49	Construction Supervision for Machinery Testing Center											
B	50	Construction Supervision for Machinery Testing Center											
B	51	Specialist on maintenance of Agriculture Machinery											
B	52	Specialist on Agriculture Machinery Testing											
		[Land Consolidation]											
		[Agriculture Development and Extension Strengthening]											
		[Total of Pro-A]											
		[Total of Pro-B]											
		[Total of Pro-A+Pro-B]											
		[Overall Project (excluding DRD Rural Road & Bridge)]											
C	1	Secretary 1											
C	2	Secretary 2											
C	3	Administration/ account 1											
C	4	Administration/ account 2											
C	5	CAD Operator (for Irrigation Project) 1											
C	6	CAD Operator (for Irrigation Project) 2											
C	7	CAD Operator (for Irrigation Project) 3											
C	8	CAD Operator (for Irrigation Project) 4											
C	9	CAD Operator (for Irrigation Project) 5											
C	10	CAD Operator (for Irrigation Project) 6											
C	11	CAD Operator (For Canal Inspection Pass)											
C	12	Office support 1											
C	13	Office support 2											
C	14	Office support 3											
		[Distribution Infrastructure Improvement (DRD, Rural Road & Bridge)]											
C	15	Secretary											
C	16	Administration/ account											
C	17	CAD Operator (For Rural Road & Bridge) 1											
C	18	CAD Operator (For Rural Road & Bridge) 2											
C	19	CAD Operator (For Rural Road & Bridge) 3											
C	20	Office support											
		[Total of Supporting Staff]											
		Grand Total											

(C) Plan C

		Position	Billing Rate		2018	2019	2020	2021	2022	2023	2024	Total	Fright
			FC/ JPY	LC/ MMK	10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10		
A	1	Project Team Leader											
A	2	Procurement/ Bid Document											
A	3	Disbursement Management											
A	4	EIA Monitoring											
B	1	Deputy Project Team Leader											
B	2	Project monitoring expert											
B	3	Procurement Expert/ Bid Document											
B	4	Disbursement Management											
B	5	EIA Monitoring											
		[Irrigation and Drainage Improvement]											
A	5	Section Leader (DD for Irrigation Project)/ Chief Engineer											
A	6	Section Leader (SV for Irrigation Project)											
A	7	Hydraulic Structure Engineer 2 (Weir & spillway)											
A	8	Hydro Mechanical Engineer											
A	9	Hydrologist/Drainage/Flood Management											
A	10	Procurement Expert on Construction Machinery											
A	11	Water Management/ System Operation											
A	12	Construction Supervision (Irrigation)											
B	6	Deputy Section Leader (DD for Irrigation Project)											
B	7	Deputy Team Leader (SV for Irrigation Project)											
B	8	Irrigation Design Engineer 1											
B	9	Irrigation Design Engineer 2											
B	10	Hydraulic Structure Engineer 1 (Canal & Drainage Structure)											
B	11	Hydraulic Structure Engineer 2 (Canal & Drainage Structure)											
B	12	Hydraulic Structure Engineer 9 (Weir & spillway)											
B	13	Hydro Mechanical Engineer											
B	14	Hydrologist/Drainage/Flood Management											
B	15	Water Management/ System Operation											
B	16	Construction Supervision (Irrigation) 1											
B	17	Construction Supervision (Irrigation) 2											
B	18	Construction Supervision (Irrigation) 3											
B	19	Construction Supervision (Irrigation) 4											
B	20	Quality Management Engineer											
		[Distribution Infrastructure Improvement]											
A	13	Section Leader (Road & Bridge)											
A	14	Construction Supervision (Road & Bridge)											
B	21	Construction Supervision (Road & Bridge) 1											
B	22	Construction Supervision (Road & Bridge) 2											
B	23	Construction Supervision (Road & Bridge) 3											
B	24	Construction Supervision (Road & Bridge) 4											
B	25	Quality Management Engineer											
		[Agriculture Mechanization Strengthening]											
A	15	Section Leader (Agriculture Mechanization Strengthening)											
B	26	Construction Supervision for Maintenance Work Shop											
B	27	Construction Supervision for Machinery Testing Center											
B	28	Specialist on maintenance of Agriculture Machinery											
B	29	Specialist on Agriculture Machinery Testing											
		[Land Consolidation]											
		[Agriculture Development and Extension Strengthening]											
		[Total of Pro-A]											
		[Total of Pro-B]											
		[Total of Pro-A+Pro-B]											
C	1	Secretary 1											
C	2	Secretary 2											
C	3	Administration/ account 1											
C	4	Administration/ account 2											
C	5	CAD Operator (for Irrigation Project) 1											
C	6	CAD Operator (for Irrigation Project) 2											
C	7	CAD Operator (for Irrigation Project) 3											
C	8	CAD Operator (for Irrigation Project) 4											
C	9	CAD Operator (for Irrigation Project) 5											
C	10	CAD Operator (for Irrigation Project) 6											
C	11	CAD Operator (For Road Project) 1											
C	12	CAD Operator (For Road Project) 2											
C	13	CAD Operator (For Road Project) 3											
C	14	Office support 1											
C	15	Office support 2											
C	16	Office support 3											
C	17	Office support 4											
		[Total of Supporting Staff]											
		Grand Total											

4. Cost Breakdown for the Consulting Services

(1) Plan A

x	Unit	Qty.	Foreign Portion (JPY) Rate	Foreign Portion (JPY) Amount ('000)	Local Portion MMK Rate	Local Portion MMK Amount ('000)	Combined Total ('000) JPY
A Remuneration							
1 Professional (A)	M/M						
2 Professional (B)	M/M						
3 Supporting Staffs	M/M						
Subtotal of A							
B Direct Cost							
1 International Airfare							
2 Domestic Airfare							
3 Domestic Travel							
4 Accommodation Allowance	Month						
	Month						
	Month						
5 Vehicle (4WD)							
Purchase of Vehicle (Used 4WD)	nos						
Rental Vehicle (4WD)	Month						
Incidental Cost	Month						
Car Fuel	Month						
Driver Wage	M/M						
6 Office Rental							
Shwebo office	Month						
For design stage	Month						
Ye-U office	Month						
7 International Communications	M/M						
8 Domestic Communications	M/M						
9 Office Supply	M/M						
10 Office Furniture and Equipment	M/M						
11 Report Preparation	Month						
12 Topographic survey							
AT the bridge	location						
At the Rual Road	km						
At the Miantenace Workshop	location						
At the Agriculture Machinery Testing Center	location						
At Seed Center	location						
At the Camp building/office	location						
At the frontline station	location						
13							
Geological survey	nos						
At the bridge	nos						
14 At the emergency spillway of Kindat	lot						
15 ELA monitoring Devices	lot						
16 Survey equipment for SV & DD	lot						
Miscellaneous Expenses for Seminars etc…							
Subtotal of B							
Total							

(2) Plan B

	Unit	Qty.	Foreign Portion (JPY) Rate	Foreign Portion (JPY) Amount ('000)	Local Portion MMK Rate	Local Portion MMK Amount ('000)	Combined Total ('000) JPY
A Remuneration							
1 Professional (A)	M/M						
2 Professional (B)	M/M						
3 Supporting Staffs	M/M						
Subtotal of A							
B Direct Cost							
1 International Airfare							
2 Domestic Airfare							
3 Domestic Travel							
4 Accommodation Allowance	Month						
	Month						
	Month						
5 Vehicle (4WD)							
Purchase of Vehicle (Used 4WD)	nos						
Rental Vehicle (4WD)	Month						
Incidental Cost	Month						
Car Fuel	Month						
Driver Wage	M/M						
6 Office Rental							
Shwebo office	Month						
For design stage	Month						
Ye-U office	Month						
7 International Communications	M/M						
8 Domestic Communications	M/M						
9 Office Supply	M/M						
10 Office Furniture and Equipment	M/M						
11 Report Preparation	Month						
12 Topographic survey							
AT the bridge	location						
At the Rural Road	km						
At the Maintenance Workshop	location						
At the Agriculture Machinery Testing Center	location						
At Seed Center	location						
At the Camp building/office	location						
At the frontline station	location						
13 Geological survey							
At the bridge	nos						
At the emergency spillway of Kindat	nos						
13 EIA monitoring Devices	lot						
13 Survey equipment for SV & DD	lot						
13 Miscellaneous Expenses for Seminars etc…	lot						
Subtotal of B							
Total							

※ Not including price escalation & contingency

※ 1 USD = 112 JPY, 1 USD = 1,350 Kyat, 1 MMK = 0.083 JPY

(3) Plan C

	Unit	Qty.	Foreign Portion (JPY)		Local Portion MMK		Combined Total
			Rate	Amount ('000)	Rate	Amount ('000)	('000) JPY
A Remuneration							
1 Professional (A)	M/M						
2 Professional (B)	M/M						
3 Supporting Staffs	M/M						
Subtotal of A							
B Direct Cost							
1 International Airfare							
2 Domestic Airfare							
3 Domestic Travel							
4 Accommodation Allowance	Month						
	Month						
	Month						
5 Vehicle (4WD)							
Purchase of Vehicle (Used 4WD)	nos						
Rental Vehicle (4WD)	Month						
Incidental Cost	Month						
Car Fuel	Month						
Driver Wage	M/M						
6 Office Rental							
Shwebo office	Month						
For design stage	Month						
Ye-U office	Month						
7 International Communications	M/M						
8 Domestic Communications	M/M						
9 Office Supply	M/M						
10 Office Furniture and Equipment	M/M						
11 Report Preparation	Month						
12 Topographic survey							
AT the bridge	location						
At the Rual Road	km						
At the Miantenace Workshop	location						
At the Agriculture Machinery Testing Center	location						
At Seed Center	location						
At the Camp building/office	location						
At the frontline station	location						
13							
Geological survey	nos						
At the bridge	nos						
14 At the emergency spillway of Kindat	lot						
15 ELA monitoring Devices	lot						
16 Survey equipment for SV & DD	lot						
Miscellaneous Expenses for Seminars etc…							
Subtotal of B							
Total							

※ Not including price escalation & contingency

※ 1 USD = 112 JPY, 1 USD = 1,350 Kyat, 1 MMK = 0.083 JPY

IX.5. Cost of Component

IX.5.1 Agriculture Development and Extension Strengthening

Unit: Million Kyats

Item	Total, Million Kyats			2018			2019			2020			2021			2022			2023			2024		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
Agriculture Extension Strengthening (Total), I+II																								
I. Agriculture Extension Strengthening (Direct)																								
1. Capacity building for DOA extension staff & private sector																								
TOT of the officers, including IT-based extension system																								
Workshops for the preparation of contents, including IT-based extension system																								
Production of materials & IT-based extension establishment (using SNS, e.g. Facebook)																								
Trainings/ Workshops (plenary)																								
Training at camp site																								
Expert/ trainer recruitmet																								
2. Agriculture extension & marketing strengthening																								
Demonstration plot																								
Transportation																								
Field day and evaluation workshop																								
Marketing enhancement																								
IT based extension																								
3. Improvement of Camp & DOA offices																								
Land acquisition																								
Construction of camp building																								
Procurement of office equipment (camp)																								
Procurement of ICT equipment (TS/district office)																								
II. In-direct Cost (20%)																								
Excluding Seed Center (including in-direct20%)																								
Only land acquisition cost (for Camp construction)																								
Total I + II - Land Acquisition																								
Total I + II - Land Acquisition - Seed Center																								

Unit: million kyat

Table Breakdown of the Cost Estimation for Agricultural Extension Strengthening and Seed Center

1. Capacity building for DOA extension staff and private sector

Main Items	Specifications (TK=thousand Kyat)	Cost (TK)
TOT of the officers, including IT-based extension system		
Workshops for the preparation of contents, including IT-based extension system		
Production of materials & IT-based extension establishment (using SNS, e.g. Facebook)		
Trainings/ Workshops (plenary)		
Training at camp site		

1.1 Expert/trainer recruitment (Capacity building for DOA extension staff) 1347.7

Main Items	Specifications (TK=thousand Kyat)	Cost (US$) Cost (TK)
Input to the TOT of the officers		
Input to the Trainings/ workshops (plenary)		
	US$	
	TK (1US$ = 1347.7)	

1. Capacity building for DOA extension staff + 1.1 Expert/trainer recruitment

2. Agriculture extension & marketing strengthening

Main Items	Specifications (TK=thousand Kyat)	Cost (TK)
Conduct of demo activities 2 plots x 2 staff x 52 camps = 208 plots per season		
Marketing enhancement		
IT Based Extension, using SNS e.g. Facebook		

3. Improvement of Camp and DOA Offices

Main Items	Specifications (TK=thousand Kyat)	Cost (TK)
Land acquisition		
Construction of buildings		
Procurement of office equipment (camp)		
Procurement of ICT equipment (TS and district office)		

4. Establishment of Seed Center

Main Items	Specifications (TK=thousand Kyat)	Cost (TK)
Land acquisition		
Construction of buildings		
Procurement		

Total	
In-direct (20% of above)	
Grand Total	

Establishment of Seed Center (PPP)

Unit: JPY

	Type	Type A	Type B	Type C	Laboratory Equipment	Amount
Content (Quotation by Manufacturer)	Location	On Govt. Land (e.g. at Ext. Camp, Sai Naing Gyi)	On Govt. Land (e.g. at Chipper/ Ye-U Seed Farm)	At Village (e.g. Theelone, Shwebo (Birthplace of Shwebo Powsan))		
	Operator	To be selected by tendering	To be selected by tendering	Seed Growers Group		
	Country of Origin	Thailand（Japanese Company）	Thailand（Japanese Company）	India	made in Japan	
	Capacity	350-400ton, Dried Paddy	150-200ton, Dried Paddy	50-100ton, Dried Paddy		
	Seed Production Farm	about 160ha (400ac)	about 80ha (200ac)	about 40ha (100ac)		
	Grain Production Farm	about 8000ha (20,000ac)	about 4000ha (10,000ac)	about 2000ha (5,000ac)		
	CS Purchase Scale	280 million kyat	140 million kyat	Nil		
	Major Sales	Lending to grain farmers& selling to rice millers	Lending to grain farmers& selling to rice millers	Rice millers and brokers		
	Major Equipment	Drying＋Processing＋Packaging Equip	Processing Equip	Seed Cleaner		
A Receiving section B Drying section C Cleaning section D Grading section E Sorting & Packing section F Dust collecting section G Others H Laboratory section 1 set I Pallet, Forklift, Stanby Generator						
(a) Installation material, Power Receiving equipment Equipment and Machineries, Installation, Test operation, Initial Training						
(b) Establishment of Seed Center (Building and Storage Construction)						
Building for Processing						
Building for Seed Storage						
Concrete Yard						
Soil Basement (for flood protection)						
Gravel Placement on the Soil B.						
Installation materials, Power Receiving Board						
(c) Transformer						
Transformer						
Total						

Establishment of Seed Center (Equipment Procurement) = (a) = **JPY** **US$**

Establishment of Seed Center (Building and Storage Construction) = (b) = **JPY** **Kyats**

Transformer = (c) = **JPY**

112 @

1350 @

5-2. Agriculture Mechanization Strengthening

(1) Maintenance Workshop Establishment

Sr.	Equipment Name	Specification	Q'ty	Allocation (unit or set)					Unit Price (JPY)	Amount (JPY)
				Shwebo AMS	Wetlet AMS	Ye-U AMS	Kanbalu AMS	Butalin AMS		
1	Cylinder Boring Machine	boring size φ180mm×460mmD	unit							
2	Cylinder Honing Machine	honing size φ170mm	unit							
3	Line Boring Machine	block length 1800mm	unit							
4	Connecting Rod Aligner	rod length 420mm	unit							
5	Crank Shaft Grinder	center distance 1,800mm	unit							
6	Surface Grinder	grinding length 1,600mm	unit							
7	Eccentric Valve Seat Grinder	valve seat φ65mm	unit							
8	Diesel Compression Gauge Set	for agricultural tractors	unit							
9	Diesel Fuel Injection Pump Tester	plunger 8pcs	unit							
10	Nozzle Tester	50 Mpa	unit							
11	Engine Lathe	swing over bed 500-510mm	unit							
12	Diesel Engine Arc Welder	7.9kW	units							
13	Gas Welder Set	oxygen and acetylene gas	sets							
14	Bench Drill, large capacity	capacity 23mm	unit							
15	Bench Drill, small capacity	capacity 13mm	units							
16	Bench Electric Grinder	640W, stand	units							
17	Hydraulic Shop Press	480N	units							
18	Air Compressor	diesel engine 7.5kW, unloading	units							
19	Portable Gantry Crane	load 3.0ton	unit							
20	Giant Tire Mounting and Demounting Mach	tire size 25"-51"	set							
21	Cut-off Machine	disc 405mm	units							
22	Silicon Quick Charger	1.1KVA	units							
23	Hydraulic Garage Jack	10ton	units							
24	Disc Grinder	860W	units							
25	Outside Micrometer Set	50-75mm, 75-100mm	set							
26	Standard Thickness Gauge	19 leaf	unit							
27	Tap & Dies Set	M8-M18, holder, reamer wrench	sets							
28	Torque Wrench	preset ratchet, 12Nm, 23Nm	sets							
29	Engineer Tools Kit		sets							
30	Special Tools for Combine Harvester		set							
31	Diesel Engine Generator	50KVA	unit							
32	Diesel Engine Generator	30KVA	units							
33	Cylinder Sleeve Puller	17 ton	units							
34	AC Arc Welder	250A	units							
35	Positioner	1.0 ton	units							
36	Parts Cleaner	20lit/min	units							
37	Portable Hydraulic Test Kit with Hoses & Ad	40MPa, 400lit/min., 120C	units							
38	Hydraulic Test Gauge Set	2.5, 10, 40MPa with Hoses & Adaptors	units							
39	Air Hose Reel with Air Gun	15m	units							
40	Air Impact Wrench with impact wrench set	3/4"	units							
41	Tool Cabinet		units							
42	Mobile Work Bench	With stationary type machine vice, 1,200mmL×800mmW×740mmH	units							
43	Service Car	4×4, front winch and diagnostic instrument	units							
									Total in JPY Total in MMK	

Sr	Item	Building Area/ Q'ty		Total P.A.E. Rate for Building		Quotation Estimation (MMK)	Amount (MMK)
				(US$)	(MMK)		
1	Maintenance Workshop at Shwebo (60mL x 24mW x 10mH)		m2				
2	Maintenance Workshop at 4 Sites (30mL x 16mW x 7.5mH)		m2 m2 per site				
3	Transformer 100kVA, at Shwebo (on-loading tap charge type)		unit				
4	Transformer 50kVA at 4 Sites (on-loading tap charge type)		units				
5	Overhead Crane Set at Shwebo (5 ton and 10 ton)		set				
						Total in MMK	

(2) Agriculture Machineries Testing Center (Mandalay)

Sr .	Equipment Name	Specification	Q'ty		Unit Price (JPY)	Amount (JPY)
1	PTO Dynamometer	120kW		set		
2	Axle Dynamometer (for left & right wheels)	170kW		set		
3-1	Cooling Tower	500lit/min		set		
3-2	Tank, Booster Pump and Plumbing Pipes			set		
4	Dynamometer Car	30kN m		set		
5	Exhaust Line & Fuel Supply Line	Flexible Pipe & Fuel Tank 200L		set		
6	Diesel Smoke Meter (Opacimeter)	Resolution of opacity 0.1 %		set		
7	Power Lift Testing Device	Load 60000N, Lift 5000kg, 1200mm, 30MPa, 100L/min.		set		
8	Water Proof Testing Device	Load 6000kg, lift 800mm		set		
9	Truck Scale	10 ton×2 units		set		
10	Diagnostic Tool Set			set		
11	Mechanic Tool Set			set		
12	Portable Gantry Crane	3 ton		unit		
13	Office Equipment (Control Room)	PC, printer, network, copier, camera		set		
14	Standby Generator	250kVA		unit		
					Total in JPY Total in MMK	

Sr	Item	Building Area/ Q'ty		Total P.A.E. Rate for Building		Quotation/ Estimation (MMK)	Amount (MMK)
				(US$)	(MMK)		
1	Testing Building (52mL x 20mW x 15mH)		m2				
2	Overhead Crane		set				
3	Installation of Specified Equipment		set				
4	Office Building (30mL x 12mW x 7.5mH)		m2				
5	Garage (20mL x 10mW)		m2				
6	Testing Track concrete, W=12ft		m				
7	Internal Road concrete, W=12ft		m				
8	Water Supply and Water Tank		set				
9	Fence		m				
10	Furniture		set				
11	Transformer 500kVA (on-loading tap type)		unit				
						Total in MMK	

(3) Capacity Building for AMD Staff and Operators

Sr	Item	Description	Q'ty		Unit Price (JPY)	Amount (JPY)
1	Training for Agricultural Machineries Testing Center in Japan			persons		
1-1	Loading and Per Diem	360days/person		days		
1-2	Flight Fare	YGN→HND, economy class		trips		
1-3	Domestic Transportation Cost			persons		
1-4	Communication & Internet			months		
1-5	Safety Cloths & Boots			persons		
1-6	Payment to Instructing Organization			persons		
	Sub-Total					
2	Training for Agricultural Machineries Testing Center at Mandalay					
2-1	Foreign Instructor	Major 7 kinds of Testing Devices		days		
2-2	Loading and Per Diem			days		
2-3	Local Assitant Engineer			days		
2-4	Loading and Per Diem			days		
2-5	Flight Fare	HND→MDY, economy class		trip		
2-6	Translator	English－Myanmar		days		
2-7	Transportation (Local)	Rent-a-car, sedan		days		
2-8	Teaching Materials & Prints			set		
2-9	Safety Boots			pcs		
2-10	Fuel for Testing			lit		
2-11	Special Tools for Testing	weights, transceiver, grease, hyraulic oil, etc.		set		
	Sub-Total					
3	Training for Maintenance Workshop Equipment at Shwebo					
3-1	Foreign Instructor	Major 15 kinds of Testing Devices		days		
3-2	Loading and Per Diem			days		
3-3	Flight Fare	HND→MDY, economy class		trip		
3-4	Translator	English－Myanmar		days		
3-5	Transportation (Local)	Rent-a-car, sedan		days		
3-6	Teaching Materials & Prints			set		
3-7	Safety Boots			pcs		
3-8	Metalic Materials for Mechanical Processing			set		
	Sub-Total					
4	Training for Maintenance Workshop Equipment at Tractor Manufacturer's Factory			persons		
4-1	Foreign Instructor	Borne by the Supplier				
4-2	Loading and Per Diem	30days/person		days		
4-3	Flight Fare	YGN→BKK, economy class		trips		
4-4	Domestic Transportation Cost			persons		
4-5	Communication & Internet			months		
	Sub-Total					
5	Training for Survey Equipment for LC					
5-1	Local Instructor	Despatching the Supplier's Expert		days		
5-2	Loading and Per Diem			days		
5-3	Transportation (Local)	Rent-a-car, sedan		days		
5-4	Teaching Materials & Prints			set		
	Sub-Total					
6	Training for Tractor Operation for LC					
6-1	Fuel for Training	Diesel for Tractor and Mini Excavator		lit		
6-2	Safety Boots	For operators of Tractors and Mini Excavators		pcs		
6-3	Loading and Per Diem	AMD Budget				
6-4	Instructor	AMD Budget, despatching AMD expert				
6-5	Transportation to SWB, MTL and NPT	AMD Budget				
	Sub-Total					
	Remarks					
	The engineers dispatched by the Supplier for assembiling, test-run, initial instruction and final inspection are included in euqipment costs.					
					Total in JPY Total in MMK	

(4) Land Leveling and Consolidation (Procurement of Machineries)

Sr	Equipment Name	Specification	Q'ty (for 2500ac/yr)	Unit Price (JPY)	Amount (JPY)
1	90 HP Tractor	4WD, diesel engine	units		
2	50 HP Tractor	4WD, diesel engine	units		
3	Rotavator	Attachment, for 50 HP, side gear system	units		
4	Plough type Disc Harrow	Attachment, 6 disc for 50 HP	units		
5	Plough type Disc Harrow	Attachment, 7 disc for 90 HP	units		
6	Disc Plough	Attachment, 4 disc for 90 HP	units		
7	Rear Blade Leveler	Attachment, for 90 HP	units		
8	Front Blade Leveler (Front Dozer)	Attachment, for 90 HP	units		
9	Front Blade Leveler (Front Dozer)	Attachment, for 50 HP	units		
10	Ridge Plastering Machine	Attachment, for 90 HP	units		
11	Total Station		sets		
12	Auto Level Instrument	28×	sets		
13	Mini Hydraulic Excavator	5 ton	units		
14	Tipper Truck	4-5 Ton	units		
15	Self-Loading Truck	40-50 ton	units		
				Total in JPY Total in MMK	

5-3. Land Consolidation

(1) Unit Cost of Land Consolidation (by tractor)

Work Item	Quantity of Work Item (a)	Unit Price of Work Item (b)	Unit Cost (c) = (a) * (b)		
1. Land Leveling & Consolidation					
1.1 Earth Work				AMD	Share
(1) Excavation and Spreading					
1.2 Irrigation Canal Work					
(1) Excavation and Compaction					
1.3 Drainage Canal Work					
(1) Excavation and Compaction					
2. Canal Structure				IWUMD	Share
(1) Concrete Work					
3. Farm Road					
3.1 Subgrade					
(1) Spreading of Soil (by Manual)					
(2) Compaction of Soil (by Tractor)					
3.2 Base Course					
(1) Base Course Material (Kanker)					
(2) Spreading of Kanker (by Manual)				IWUMD	Share
(3) Compaction of Kanker (by Tractor)					
			Total		

(2) Schedule and Cost

No.	0	1st	2nd	3rd	4th	5th	Total	Remarks
Year								
Month								
Target (annual)								
Target (cumulated)								
Fiscal Yr								
Target by Fiscal Yr								
Construction Cost								
AMD (construction), Kyats								
IWUMD (construction), Kyats (a+b+c+d)								
a. Topographic survey and design on land consolidation								
b. Facilitation for the land consolidation								
c. Tertiary canal & Drainage construction								
d. Farm Road construction								
DALMS Cost (cadastral map update), Kyats								
DALMS Cost (cadastral map registration), Kyats								
DALMS In-direct Cost (20% of above)								
Total (DALMS)								
Cost Breakdown								
AMD (construction), Kyats								
IWUMD (construction, design, facilitation), Kyats								
DALMS (cadastral map update/ registration), Kyats								
Grand Total								

5-4. Irrigation and Drainage Improvement

(1) Irrigation and Drainage Rehabilitation/ Water Management and Flood Monitoring System

Cost estimation on Irrigation and Drainage Rehabilitation

	Description	Cost (Million Kyat)	Cost (Million JPY)	Remark
1	**Kindat Diversion Dam**			
1-1	Rehabilitation of the Undersluice gate			
1-2	Rehabilitation of the gate of Head Regulator			
1-3	Repaier and maintenace of drainage canal			
1-4	Dredging of sedimentation for RMC Head Regulator			
1-5	Upgrade of emergency spillway			
2	**Kabo Weir**			
2-1	Replacement of spillway gate to hydraulic flap gate			
2-2	Rehabilitation of the Undersluice gate & operation deck			
2-3	Rehabilitation of the gate of Head Regulator			
2-4	Protection of left bank at U/S of the weir			
2-5	Removing of sand bank at U/S right side of the weir			
2-6	Protection of riverbed at D/S of the weir			
2-7	Protection of right bank at D/S of the weir			
3	**Old Mu Canal (OMC) Irrigation Scheme**			
3-1	Unsilting of canal bed & Reshaping of Canal Section			
3-2	Lining of Canal			
3-3	Rehabilitation/construction of the structures			
4	**Shwebo Min Canal (SMC) Irrigation Scheme**			
4-1	Unsilting of canal bed & Reshaping of Canal Section			
4-2	Lining of Canal			
4-3	Rehabilitation/construction of the structures			
5	**(Kindat Right Main Canal (RMC) Irrigation Scheme**			
5-1	Unsilting of canal bed & Reshaping of Canal Section			
5-2	Lining of Canal			
5-3	Rehabilitation/construction of the structures			
6	**Ye-U Main Canal (YMC) Irrigation Scheme**			
6-1	Unsilting of canal bed & Reshaping of Canal Section			
6-2	Lining of Canal			
6-3	Rehabilitation/construction of the structures			
7	**Flood monitering & water management system**			
	Monitering system forr water management			
	Monitoring system for flood management for OMC including Thapanzeik Dam			
Total (Direct construction cost)				
Indirect Construction Cost (10% of direct construction cost)				
	Construction Cost			

1 kyat = 0.0830 円

Rehabilitation of Kindat Diversion Dam

Sr. No	Description	unit	Quantity	Unit Price (Kyat)	Cost (Kyat)	Remark
Ⅰ	**Rehabilitation of the Undersluice gate**					
1	Procurement of undersluice gate (B 10 ft x H 8 ft) (B 3.0 m x H 2.4 m)	nos				duplex stainless steel roller slide gate
	Installation of gate	nos				
	Sub-total					
Ⅱ	**Rehabilitation of the gate of Head Regulator**					
1	Procurement of intake gate (B 8 ft x H 6 ft) (B 2.4 m x H 1.8 m)	nos				duplex stainless steel roller slide gate
2	Installation of gate	nos				
	Sub-total					
Ⅲ	**Repair and maintenance of side drainage on dam**					
1	Maintenance of side drainage on surface of dam D/S slope	sq-ft				
	Sub-total					
Ⅴ	**Dredging of sedimentation for RMC Head Regulator**					
1	Dredging of Sedimentation for head-race canal	sud				
2	Dredging of Sedimentation for RMC intake area:	sud				
	Sub-total					
Ⅳ	**Upgrade of emergency spillway**					
1	Construction of the concrete crest (width 500ft) for the emergency spillway	LS				
2	Construction of protection wall for inlet and outlet of the spillway	LS				
3	Construction of riverbed protection at D/S of the spillway	LS				
4	Excavation of spillway canal (L=approx.8,500 ft)	LS				
	Sub-total					
	Total					

Rehabilitation of Kabo Wier

Sr. No	Description	unit	Quantity	Unit Price (Kyat)	Cost (Kyat)	Remark
I	**Replacement of spillway gate to hydraulic flap gate**					
1	Procurement of the gate with operation device (hydraulic overturning gate: duplex stainless steel, spillway width 455 ft)	LS				duplex stainless steel roller slide gate
2	Installation of gate and related facility construction	LS				including gate manufacture engineering cost
3	Renewal of concrete structure for gate installation	LS				
	Sub-total					
II	**Rehabilitation of the Undersluice gate & operation deck**					
1	Replacement of gate leaf of undersluice gate (in front of head regulator of SMC) with counterweight manual operation device, B 12.19 m x H 3.35 m (B 40 ft x H 11 ft), duplex stainless steel roller slide gate	nos				duplex stainless steel roller slide gate
2	Replacement of gate leaf of undersluice gate (in front of head regulator of YMC) with counterweight manual operation device, B 9.14 m x B 3.65 m (B 30 ft x B 12 ft) duplex stainless steel roller slide gate	nos				
3	Installation of gate and related facility construction	nos				including gate manufacture engineering cost
4	Improvement of operation deck and other rapier works	LS				
	Sub-total					
III	**Rehabilitation of the gate of Head Regulator**					
1	Rehabilitation of Intake Gate for Irrigation (Head regulator of SMC) B 5.79 m x B 2.29 m (B 19 ft x B 7.5 ft) radial gate with counterweight	nos				
2	Rehabilitation of Intake Gate for water supply Irrigation (Head regulator of SMC) B 5.79 m x B 2.29 m (B 19 ft x B 7.5 ft) slide gate with counterweight	nos				
3	Replacement of Intake Gate (Head regulator of YMC) to hydraulic overturning gate B 5.59 m x B 1.76 m (B 18.33 ft x B 5.8 ft) duplex stainless steel	nos				duplex stainless steel roller slide gate
4	Installation of gate and related facility construction	nos				including gate manufacture engineering cost
	Sub-total					
IV	**Protection of left bank at U/S of the weir**					
1	Raising of the right river bank at U/S of the weir	ft				
2	Protection of the bank at U/S of the weir	ft				
3	Riverbed protection at curve portion	ft				
	Sub-total					
V	**Removing of sand bank at U/S right side of the weir**					
1	Removing of sand bank at U/S right side of the weir	Sud				
2	Dredging of Sedimentation for RMC intake area:	sud				
	Sub-total					
VI	**Protection of riverbed at D/S of the weir**					
1	Protection of riverbed at D/S of the weir	sq-ft				
2	Dredging of Sedimentation for RMC intake area:	sud				
	Sub-total					
VII	**Protection of right bank at D/S of the weir**					
1	Protection of the bank at U/S of the weir	ft				
	Sub-total					
	Total					

Upgrading of canal (Resectioning, Unsilting and lining)

OMC Irrigation System

Sr. No	Description	Length / Volume		Unit Price	Cost	Remark
		(ft)	(sud)	(kyat/sud)	(Kyats)	
	Resectioning and Unsilting					
1	OMC					
2	OMC, Dy-1					
3	OMC, Dy-2					
4	OMC, Dy-3					
5	OMC, Dy-4					
6	OMC, Dy-5					
7	OMC, Dy-6					
8	OMC, Dy-7					
9	OMC, Dy-7A					
10	OMC, Dy-9					
11	OMC, Dy-9, Minor1					
12	OMC, Dy-9, Minor2					
13	OMC, Dy-9, Minor3					
14	OMC, Dy-9, Minor4					
15	OMC, ThinPayungkyin Canal					
16	OMC, Long Shae Dy Canal					
17	OMC, Si Thar Dy Canal					
18	OMC, Tha Yet Kan Dy Canal					
19	OMC, Ywa Than Dy Canal					
20	OMC, LayHtoke DY					
21	OMC, DO-1					
22	OMC, DO-2					
23	OMC, DO-3					
24	OMC, DO-4					
25	OMC, DO-4A					
26	OMC, DO-5					
27	OMC, DO-6					
28	OMC, DO-8					
29	OMC, DO-8A					
30	OMC, DO-9					
31	OMC, DO-10					
32	OMC, DO-11					
33	OMC, DO-12					
34	OMC, DO-13					
35	OMC, DO-14					
36	OMC, SSW-7 canal					
37	OMC, Pauk Ma storage reservoir cleaning					
38	Other canals					
	Total					

Sr. No	Description	Length / Volume		Unit Price	Cost	Remark
		(ft)	(sq-ft)	(kyat/sud)	(Kyats)	
	Lining					
1	Main canal					
2	Dy canal and DO canal					
	Total					

Rehabilitation of canal structure

OMC Irrigation System

Sr. No	Description	unit	Quantity	Unit Price (Kyat)	Cost (Kyat)	Remark
I	**Rehabilitation of Head Regulator for Branch & DY & minor canal**					
1	OMC, Repairing of H/R for Dy-1	nos				20' 0" x 10' 0" x 6' 0" 8333 Ks/ft
2	OMC, Repairing of H/R for Dy-2	nos				
3	OMC, Repairing of H/R for Dy-3	nos				
4	OMC, Repairing of H/R for Dy-4	nos				
5	OMC, Repairing of H/R for Dy-5	nos				
6	OMC, Repairing of H/R for Dy-6	nos				
7	OMC, Repairing of H/R for Dy-7	nos				
8	OMC, Repairing of H/R for Dy-9	nos				
9	OMC, Repairing of H/R for Direct Outlet No.1	nos				
10	OMC, Repairing of H/R for Direct Outlet No.2	nos				
11	OMC, Repairing of H/R for Direct Outlet No.3	nos				
12	OMC, Repairing of H/R for Direct Outlet No.4	nos				
13	OMC, Repairing of H/R for Direct Outlet No.4A	nos				
14	OMC, Repairing of H/R for Direct Outlet No.6	nos				
15	OMC, Repairing of H/R for Direct Outlet No.6A	nos				
16	OMC, Repairing of H/R for Direct Outlet No.7	nos				
17	OMC, Repairing of H/R for Direct Outlet No.7A	nos				
18	OMC, Repairing of H/R for Direct Outlet No.8	nos				
19	OMC, Repairing of H/R for Direct Outlet No.8A	nos				
20	OMC, Repairing of H/R for Direct Outlet No.9	nos				
21	OMC, Repairing of H/R for Thayetkan Direct Outlet	nos				
22	OMC, Repairing of H/R for Shwe Phaung Oo Direct Outlet	nos				
23	OMC, Repairing of H/R at Shwe Thein Taw Direct Outlet	nos				
24	OMC, Repairing of H/R at Direct Outlet No.10	nos				
25	OMC, Repairing of H/R at Ywa Than Direct Outlet	nos				
26	OMC, Repairing of H/R for Kyee Kan Direct Outlet	nos				
27	OMC, Repairing of H/R for Direct Outlet No.11	nos				
28	OMC, Repairing of H/R for Direct Outlet No.12	nos				
29	OMC, Repairing of H/R for Direct Outlet No.13	nos				
30	OMC, Repairing of H/R for Direct Outlet No.14	nos				
31	OMC, Si Pote-Tara Dy Canal, Repairing of HR of Minor No.2	nos				20' 0" x 10' 0" x 6' 0" 8333 Ks/sft
32	OMC, Tha Yet Kan Dy canal, Construction of lining Work at H/R of Minor No.2	nos				20' 0" x 20' 0" x 5' 0" 10000 Ks/cft
33	OMC, Tha Yet Kan Dy canal, Repairing of Shutters of Minor No.2	nos				
34	OMC, Tha Yet Kan Dy canal, Repairing of HR for Minor No.3	nos				20' 0" x 10' 0" x 6' 0" 8333 Ks/ sft
35	OMC, Tha Yet Kan Dy canal, Repairing of Brifuncation for Minor No.3	nos				35' 0" x 20' 0" x 5' 0" 10000 Ks/sft
36	Mainor repair woks for Head regulator	nos				
37	Installation of the water measurement facilities (parshall flume, etc.)	nos				
	Sub-total					
II	**Rehabilitation of Outlet Structutre for Water course & DO**					
1	Construction of pipe outlet	nos				
2	Rehabilitation of Outlet Structutre and gate installation for water courses & DO	nos				
	Sub-total					
III	**Rehabilitation of Check Structure**					
1	OMC, Repairing of Check Structure (for Dy-2)	nos				
2	OMC, Repairing of Check Structure (for Dy-3)	nos				
3	OMC, Repairing of Check Structure (for Dy-4)	nos				
4	OMC, Repairing of Check Structure (for Dy-6)	nos				
5	OMC, Repairing of Check Structure (for Dy-7)	nos				
6	OMC, Repairing of Check Structure near Lay Htoke Canal	nos				
7	OMC, Repairing of Check Structure near DO-7	nos				
8	OMC, Repairing of Check Structure near Tha Yet Kan Canal	nos				
9	OMC, Repairing of Check Structure near Lawn Shae Canal	nos				
10	OMC, Repairing of Check Structure near Shwe Thein Taw Canal	nos				
11	OMC, Repairing of Check Structure near Ywa Than Canal	nos				
12	OMC, Repairing of Check Structure near Shwe Phaung Oo Canal	nos				
13	OMC, DY-1, construction of Check Structure (RD 7+000 ' RD 8+500)	nos				
14	OMC, DY-2, reparing of Check Structure (RD 1+000)	nos				
15	OMC, ThinPayungkyin Canal, construction of Tail Structure	nos				
16	OMC, DO-4, construction of Check Structure (RD 4+000, RD 6+000, 8+500)	nos				
17	OMC, SSW-7 canal, construction of Check Structure (RD 6+000, RD 8+500, 15+500, 19+500, 21+000, 23+500, 25+000)	nos				
18	OMC, LayHtoke DY canal, construction of Check Structure (RD 12+500, 16+200, 18+300, 20+800)	nos				
19	Mainor repair woks for Check Structure	nos				
	Sub-total					

Sr. No	Description	unit	Quantity	Unit Price (Kyat)	Cost (Kyat)	Remark
IV	**Rehabilitation of Fall Structure**					
1	OMC, Tha Yet Kan Dy Canal, Minor No.3, Repairing of Fall Structure (2 Nos)	nos				2(20' 0" x 10' 0" x 6' 0") 8333 Ks/ sft
2	OMC, Tha Yet Kan Dy Canal, Repairing of Fall Structure (RD 15+400)	nos				20' 0" x 20' 0" x 6' 0" 8333 Ks/sft
3	OMC, Shwe Thein Taw Dy canal, Repairing of Fall Strtuctures (7 Nos)	nos				20' 0" x 10' 0" x 6' 0" 8333 Ks/sft
4	OMC, DO-8, Repairing of Fall Structure (7 Nos)	nos				20' 0" x 10' 0" x 6' 0" 8333 Ks/sft
5	OMC, DO-8A, Repairing of Fall Structure (7 Nos)	nos				20' 0" x 10' 0" x 6' 0" 8333 Ks/sft
6	OMC, DO-9 Repairing of Fall Structures (15 Nos)	nos				20' 0" x 10' 0" x 6' 0" 8333 Ks/sft
7	OMC, DY-4 Repairing of Fall Structures (4 Nos)	nos				
8	OMC, DY-5 Repairing of Fall Structures (2 Nos)	nos				
9	OMC, DY-6 Repairing of Fall Structures (2 Nos)	nos				
10	OMC, DY-7A Construction of Fall Structures (1 Nos)	nos				
11	OMC, DY-9, Minor 4 Repairing of Fall Structures (2 Nos)	nos				
12	OMC, DY-9, Minor 5 Repairing of Fall Structures (2 Nos)	nos				
13	OMC, DO-3 Construction of Fall Structures (3 Nos)	nos				
14	OMC, DO-4 Construction of Fall Structures (5 Nos)	nos				
15	OMC, DO-5 Construction of Fall Structures (4 Nos)	nos				
16	OMC,ThinPayungkyin Canal, Construction of Fall Structures (3 Nos)	nos				
17	Mainor repair woks for Fall Structure	nos				
	Sub-total					
V	**Rehabilitation of Syphon and flume (canal bridge)**					
1	OMC, Syphon No.1 (RD 85+500)	nos				-
2	OMC, Syphon No.2 (RD 113+000)	nos				-
3	OMC, Do-5, Minor 2, Syphon No.1 (RD 12+400)	nos				2361 Ks/cft
	Sub-total					
VI	**Rehabilitation of Spill-out & Spill-in facility**					
1	OMC, Repairing of SSW-7 (RD 108+000)	nos				
2	OMC, Repairing of pauk Taw Sluice Gate	nos				
3	OMC, Repairing of 6/6 Sluice (RD 238+900)	nos				
4	OMC, Repairing of 3/3 Sluice (RD 257+500)	nos				
5	OMC, DO-4, Construction of pipe spill-in (RD 6+500, RD 8+900)	nos				
6	Mainor repair woks for Spill-out & Spill-in facility	nos				
	Sub-total					
VII	**Rehabilitation of Bridge**					
1	OMC, Repairing and lining Work of Boat Taw Bridge (RD 10+500)	nos				
2	OMC, Repairing and lining Work of Kan Phyu Bridge (RD 15+350)	nos				
3	OMC, Repairing and lining Work of Myoy Du Bridge (RD 21+900)	nos				
4	OMC, Repairing and lining Work of Hmaw Taw Bridge (RD 24+180)	nos				
5	OMC, Repairing and lining Work of Moe Kaung Bridge (RD 63+000)	nos				
6	OMC, Repairing and lining Work of Htan Kone Bridge (RD 75+300)	nos				
7	OMC, Repairing and lining Work of Su Poke Bridge (RD 87+100)	nos				
8	OMC, Repairing and lining Work of Min Kone Bridge (RD 101+600)	nos				
9	OMC, Repairing and lining Work of That Yat Gyi Bridge (RD124+000)	nos				
10	OMC, Repairing and lining Work of Tee Kone Bridge (RD 134+000)	nos				
11	OMC, Repairing and lining Work of Pi Tag Kone Bridge (RD 150+000)	nos				
12	OMC, Repairing and lining Work of Hnae Twin Bridge (RD 154+000)	nos				
13	OMC, Repairing and lining Work of Ma Down Hla Bridge	nos				
14	OMC, Repairing and lining Work of Inn Gyie Pin Bridge (RD167+000)	nos				
15	OMC, Repairing and lining Work of Tha Yat Kan Bridge (RD 177+500)	nos				
16	OMC, Repairing and lining Work of Pin Din Bridge (RD 192+000)	nos				
17	OMC, Repairing and lining Work of Kon Taing Bridge(196+500)	nos				
18	OMC, Repairing and lining Work of Khin Oo Bridge (RD 198+000)	nos				
19	OMC, Repairing and lining Work of Kyee Kan Bridge (RD 225+000)	nos				
20	OMC, Repairing and lining extension Work of Mi Gyaung Pin Bridge (RD 231+00	nos				
21	OMC, DO-3 Construction cart bridge (RD8+500, 11+500)	nos				
22	OMC, DO-4 Construction cart bridge (RD 6+000, 8+500, 18+000)	nos				
23	OMC, ThinPayungkyin Canal Construction cart bridge (RD6+000, 11+500)	nos				
24	OMC, DO-4A Construction cart bridge (RD 6+800)	nos				
25	OMC, SSW-7 canal Construction cart bridge (RD 6+700, 9+000, 14+500, 21+30	nos				
26	OMC,LayHtoke DY canal, Construction cart bridge (RD 8+500, 15+500, 19+000)	nos				
27	Mainor repair woks for Bridge	nos				
	Sub-total					
VIII	**Rehabilitation of Cross Drainage and drainage canal**					
1	OMC, DO-4, Construction of pipe CDC (RD 9+500)	nos				
2	OMC, DO-5, Construction of CDC (RD 1+000, 4+000, 8+000)	nos				
3	Mainor repair woks for Cross Drainage	nos				
4	Improvement of drainage canals	lot				
5	Improvement of facility for reuse of drainage water	lot				
	Sub-total					
	Total					

Upgrading of canal (Resectioning, Unsilting and lining)

RMC Irrigation System

Sr. No	Description	Length / Volume		Unit Price	Cost	Remark
		(ft)	(sud)	(kyat/sud)	(Kyats)	
	Resectioning and Unsilting					
1	RMC, RD 64+000 to 73+000					
2	RMC, Te Sar Direct MinorRMC					
3	RMC, Kha Paung Kyaing branch canal (KBC)					
4	RMC, Shwe Gu Direct Minor					
5	RMC, Dy-1					
6	RMC, Dy-1, Minor 1					
7	RMC, Dy-2A					
8	RMC, Dy-2, Minor 3					
9	RMC, Dy-2, Minor 4					
10	RMC, Dy-2, Minor 4A					
11	RMC, KBC, Dy-1					
12	RMC, KBC, Dy-1, Minor-1					
13	RMC, Dy-4					
14	Other canals					
	Total					

Sr. No	Description	Length / Volume		Unit Price	Cost	Remark
		(ft)	(sq-ft)	(kyat/sud)	(Kyats)	
	Lining					
1	Main canal					
2	AEC					
3	BEC					
4	Dy canal and DO canal					
	Total					

Rehabilitation of canal structure

RMC Irrigation System

Sr. No	Description	unit	Quantity	Unit Price (Kyat)	Cost (Kyat)	Remark
I	**Rehabilitation of Head Regulator for Branch & DY & minor canal**					
1	RMC, repair and maintenance of gate leaf of H/R (RD 0 - RD 200)	LS				
2	RMC, repair and maintenance H/R of Direct Minor 1 (RD 216+000)	sq-ft				(2'-6"*3'-0") (1) No
3	RMC, stone pitching at H/R of direct Minor 1 (RD 216+000)	sq-ft				(500"*63'-9")
4	RMC, repair and maintenance H/R of Direct Minor 2 (RD 222+000)	sq-ft				(3'-0"*3'-0") (1) No
5	RMC, stone pitching at H/R of direct Minor 2 (RD 222+000)	sq-ft				(500"*63'-9")
6	RMC, repair and maintenance H/R of Direct Minor 3 (RD 227+150)	sq-ft				(2'-6"*2'-6") (1) No
7	RMC, stone pitching in main canal at HR of Direct Minor 3 (RD 227+150)	sq-ft				(500"*63'-9")
8	RMC, repair and maintenance H/R of Direct Minor 4 (RD 237+750)	sq-ft				(2'-6"*2'-6") (1) No
9	RMC, stone pitching in main canal at HR of Direct Minor 4 (RD 237+750)	sq-ft				(500"*63'-9")
10	RMC, repair and maintenance H/R of Dy-5 (RD 242+000)	sq-ft				(4'-0"*4'-0") (1) No
11	RMC, stone pitching in main canal at HR of Direct Dy-5 (RD 242+000)	sq-ft				(500"*63'-9")
12	RMC, stone pitching in main canal at HR of Direct Minor 5 (RD 251+000)	sq-ft				(500"*58'-6")
13	RMC, repair and maintenance H/R of Dy-5-A (RD 252+150)	sq-ft				(4'-0"*4'-0") (1) No
14	RMC, repair and maintenance H/R of Direct Minor 5 (RD 272+000)	sq-ft				(2'-6"*2'-6") (1) No
15	RMC, stone pitching in main canal at HR of Direct Minor 5 (RD 272+000)	sq-ft				(500"*58'-6")
16	RMC, repair and maintenance H/R of Ma Dine Kyin (RD 275+500)	sq-ft				(2'-6"*2'-6") (2) No
17	RMC, stone pitching in main canal at HR of Pa Daing Kyin canal (RD 275+500)	sq-ft				(500"*58'-6")
18	RMC, Butalin Extension Canal (BEC), U/S & D/S stone pitching of H/R (RD 0+00	sq-ft				(300"*34'-6") sandy soil
19	RMC, BEC, repair and maintenance H/R (RD 0+000)	sq-ft				(6'-0"*6'-0") (3) No
20	RMC, BEC, Stone pitching in front of main canal H/R (RD 5+000)	sq-ft				(500"*34'-6") sandy soil
21	RMC, BEC, Stone pitching in front of main canal H/R (RD 7+500)	sq-ft				(500"*34'-6") sandy soil
22	RMC, BEC, repair and maintenance H/R of Bi Shu Branch Canal (RD 5+000)	sq-ft				(2'-6"*2'-6") (1) No
23	RMC, BEC, repair and maintenance H/R of Sin Yan Branch Canal (RD 7+500)	sq-ft				(2'-6"*2'-6") (1) No
24	RMC, BEC, repair and maintenance H/R of Direct Minor 2 (RD 30+000)	sq-ft				(2'-6"*2'-6") (1) No
25	RMC, BEC, repair and maintenance H/R of U Nyan Win's tube (RD 31+500)	sq-ft				(2'-6"*2'-6") (1) No
26	RMC, BEC, repair and maintenance H/R of Direct Minor 3 (RD 33+800)	sq-ft				(2'-6"*2'-6") (1) No
27	RMC, BEC, repair and maintenance H/R of Direct Minor 4 (RD 38+300)	sq-ft				(2'-6"*2'-6") (1) No
28	RMC, AEC, repair and maintenance H/R of Direct Minor 1 (RD 5+719)	sq-ft				(2'-6"*2'-6") (1) No
29	RMC, AEC, repair and maintenance H/R of Direct Minor 2 (RD 8+114)	sq-ft				(2'-6"*2'-6") (1) No
30	RMC, AEC, repair and maintenance H/R of Direct Minor 3 (RD 11+000)	sq-ft				(2'-6"*2'-6") (1) No
31	RMC, AEC, repair and maintenance H/R of Dy-1 (RD 21+850)	sq-ft				(3'-0"*3'-0") (1) No
32	RMC, AEC, repair and maintenance H/R of Dy-2 (RD 23+600)	sq-ft				(2'-6"*2'-6") (1) No
33	RMC, AEC, repair and maintenance H/R of Direct Minor 5 (RD 25+630)	sq-ft				(2'-6"*2'-6") (1) No
34	RMC, AEC, repair and maintenance H/R of Dy-2 (RD 29+800)	sq-ft				(3'-0"*3'-0") (1) No
35	RMC, AEC, repair and maintenance H/R of Dy-3 (RD 38+050)	sq-ft				(3'-0"*3'-0") (1) No
36	RMC, AEC, repair and maintenance H/R of Dy-4 (RD 42+7009	sq-ft				(3'-0"*3'-0") (1) No
37	RMC, AEC, repair and maintenance H/R of Director Minor 6 (RD 50+300)	sq-ft				(2'-6"*2'-6") (1) No
38	RMC, AEC, repair and maintenance H/R of Dy -5 (RD 52+950)	sq-ft				(3'-0"*3'-0") (1) No
39	RMC, AEC, repair and maintenance H/R of Dy-7 (RD 68+200)	sq-ft				(2'-6"*2'-6") (1) No
40	RMC, AEC, repair and maintenance H/R of DO No 15 (RD 71+000)	sq-ft				(2'-6"*2'-6") (1) No
41	RMC, AEC, repair and maintenance H/R of Director Minor 7 (RD 75+500)	sq-ft				(2'-6"*2'-6") (1) No
42	RMC, AEC, repair and maintenance H/R of Dy-8 (RD 76+720)	sq-ft				(3'-0"*3'-0") (1) No
43	RMC, AEC, repair and maintenance H/R of Dy-9 (RD 83+900)	sq-ft				(3'-0"*3'-0") (1) No
44	RMC, AEC, repair and maintenance H/R of Director Minor 8 (RD 93+800)	sq-ft				(2'-6"*2'-6") (1) No
45	RMC, AEC, repair and maintenance H/R of Director Minor 9 (RD 100+200)	sq-ft				(2'-6"*2'-6") (1) No
46	RMC, AEC, repair and maintenance H/R of Director Minor 10 (RD 103+400)	sq-ft				(2'-6"*2'-6") (1) No
47	RMC, AEC, repair and maintenance H/R of Director Minor 11 (RD 106+800)	sq-ft				(2'-6"*2'-6") (1) No
48	RMC, AEC, repair and maintenance H/R of Director Minor 12 (RD 109+200)	sq-ft				(2'-0"*2'-0") (1) No
49	RMC, AEC, repair and maintenance H/R of Director Minor 13 (RD 112+200)	sq-ft				(2'-0"*2'-0") (1) No
50	RMC, AEC, repair and maintenance H/R of Director Minor 14 (RD 118+200)	sq-ft				(2'-0"*2'-0") (1) No
51	Mainor repair woks for Head regulator	nos				
52	Installation of the water measurement facilities (parshall flume, etc.)	nos				
	Sub-total					

Ⅱ	**Rehabilitation of Outlet Structutre for Water course & DO**					
1	RMC, repair and maintenance H/R of DO No.49 (RD 204+500)	nos				(2'-6"*2'-6") (1) No
2	RMC, repair and maintenance H/R of DO No.50 (RD 208+000)	nos				(2'-6"*2'-6") (1) No
3	RMC, repair and maintenance H/R of DO No.51 (RD 209+500)	nos				(2'-6"*2'-6") (1) No
4	RMC, repair and maintenance H/R of DO No.52 (RD 210+500)	nos				(2'-6"*2'-6") (1) No
5	RMC, repair and maintenance H/R of DO No.53 (RD 232+500)	nos				(2'-6"*2'-6") (1) No
6	RMC, repair and maintenance H/R of DO No.54 (RD 233+200)	nos				(2'-6"*2'-6") (1) No
7	RMC, repair and maintenance H/R of DO No.55 (RD 235+900)	nos				(2'-6"*2'-6") (1) No
8	RMC, repair and maintenance H/R of DO No.56 (RD 236+800)	nos				(2'-6"*2'-6") (1) No
9	RMC, repair and maintenance H/R of DO No.57 (RD 244+100)	nos				(2'-6"*2'-6") (1) No
10	RMC, repair and maintenance H/R of DO No.58 (RD 247+200)	nos				(2'-6"*2'-6") (1) No
11	RMC, repair and maintenance H/R of DO No.59 (RD 249+900)	nos				(2'-6"*2'-6") (1) No
12	RMC, repair and maintenance H/R of DO No.60 (RD 251+600)	nos				(2'-6"*2'-6") (1) No
13	RMC, repair and maintenance H/R of DO No.61 (RD 255+900)	nos				(2'-6"*2'-6") (1) No
14	RMC, Dy-1, repair and maintenance of D.O	nos				
15	RMC, Dy-2, repair and maintenance of D.O	nos				
16	RMC, Dy-2A, repair and maintenance of D.O	nos				
17	RMC, KBC, repair and maintenance of D.O	nos				
18	RMC, Dy-4 minor-1, repair and maintenance of D.O	nos				
19	RMC, Dy-4, repair and maintenance of D.O	nos				
20	RMC, Dy-4, Minor 1, repair and maintenance of D.O	nos				
21	RMC, Dy-4, Minor 2, repair and maintenance of D.O	nos				
22	RMC, Dy-4, Minor 2A, repair and maintenance of D.O	nos				
23	RMC, Dy-4, Minor 3, repair and maintenance of D.O	nos				
24	RMC, BEC, repair and maintenance H/R of Sae Gyi D.O (RD 3+000)	nos				(2'-6"*2'-6") (1) No
25	RMC, BEC, repair and maintenance H/R of U Kyi Win D.O (RD 13+500)	nos				(2'-6"*2'-6") (1) No
26	RMC, BEC, repair and maintenance H/R of D.O-1 (RD 17+200)	nos				(2'-6"*2'-6") (1) No
27	RMC, BEC, repair and maintenance H/R of U Kyaw Myint D.O (RD 20+500)	nos				(2'-6"*2'-6") (1) No
28	RMC, BEC, repair and maintenance H/R of U Than Aye D.O (RD 22+000)	nos				(2'-6"*2'-6") (1) No
29	RMC, BEC, repair and maintenance H/R of U Than Aye D.O (RD 24+800)	nos				(2'-6"*2'-6") (1) No
30	RMC, BEC, repair and maintenance H/R of Shar Taw D.O (RD 28+500)	nos				(2'-6"*2'-6") (1) No
31	RMC, BEC, repair and maintenance H/R of D.O No.2 (RD 42+150)	nos				(2'-6"*2'-6") (1) No
32	RMC, BEC, repair and maintenance H/R of D.O No.3 (RD 46+200)	nos				(2'-6"*2'-6") (1) No
33	RMC, Ayartaw Extension Canal (AEC), repair and maintenance H/R of Sae Gyi	nos				(2'-6"*2'-6") (1) No
34	RMC, AEC, repair and maintenance H/R of DO No.1 (RD 5+000)	nos				(2'-6"*2'-6") (1) No
35	RMC, AEC, repair and maintenance H/R of DO No.2 (RD 9+500)	nos				(2'-6"*2'-6") (1) No
36	RMC, AEC, repair and maintenance H/R of DO No.3 (RD 13+000)	nos				(2'-6"*2'-6") (1) No
37	RMC, AEC, repair and maintenance H/R of DO No.4 (RD 18+000)	nos				(2'-6"*2'-6") (1) No
38	RMC, AEC, repair and maintenance H/R of DO No 5 (RD 27+000)	nos				(2'-6"*2'-6") (1) No
39	RMC, AEC, repair and maintenance H/R of DO No 6 (RD 33+000)	nos				(2'-6"*2'-6") (1) No
40	RMC, AEC, repair and maintenance H/R of DO No 7 (RD 35+000)	nos				(2'-6"*2'-6") (1) No
41	RMC, AEC, repair and maintenance H/R of DO No 8 (RD 36+000)	nos				(2'-6"*2'-6") (1) No
42	RMC, AEC, repair and maintenance H/R of DO No 9 (RD 45+000)	nos				(2'-6"*2'-6") (1) No
43	RMC, AEC, repair and maintenance H/R of DO No 10 (RD 45+700)	nos				(2'-6"*2'-6") (1) No
44	RMC, AEC, repair and maintenance H/R of DO No 11 (RD 54+000)	nos				(2'-6"*2'-6") (1) No
45	RMC, AEC, repair and maintenance H/R of DO No 12 (RD 55+500)	nos				(2'-6"*2'-6") (1) No
46	RMC, AEC, repair and maintenance H/R of DO No 13 (RD 60+500)	nos				(2'-6"*2'-6") (1) No
47	RMC, AEC, repair and maintenance H/R of DO No 14 (RD 68+000)	nos				(3'-0"*3'-0") (1) No
48	Rehabilitation of Outlet Structutre and gate installation for water courses & DO	nos				
	Sub-total					

Ⅲ	**Rehabilitation of Check Structure**					
1	RMC, repair and maintenance of gate leaf of C/R (RD 0 - RD 200)	LS				
2	RMC, repair and maintenance CR of Direct Minor 1 (RD 216+000)	sq-ft				(6'-0"*6'-0") (6) No
3	RMC, repair and maintenance CR of Dy-5 (RD 242+000)	sq-ft				(6'-0"*6'-0") (6) N0
4	RMC, repair and maintenance CR of Dy-5-A (RD 252+250)	sq-ft				(6'-0"*6'-0") (6) No
5	RMC, BEC, repair and maintenance CR of Sin Yan Branch Canal (RD 7+520)	sq-ft				(6'-0"*6'-0") (3) No
6	RMC, BEC, repair and maintenance CR of Direct Minor 1 (RD 24+820)	sq-ft				(6'-0"*4'-0") (3) No
7	RMC, BEC, repair and maintenance CR of Direct Minor 2 (RD 30+020)	sq-ft				(5'-0"*5'-0") (1) No
8	RMC, BEC, repair and maintenance CR of Direct Minor 3 (RD 33+820)	sq-ft				(5'-0"*5'-0") (1) No
9	RMC, BEC, repair and maintenance CR Direct Minor 4 (RD 38+320)	sq-ft				(5'-0"*5'-0") (1) No
10	RMC, BEC, repair and maintenance CR of D.O NO.2 (RD 42+200)	sq-ft				(3'-0"*3'-0") (2) No
11	RMC, BEC, repair and maintenance CR of D.O NO.3 (RD 46+250)	sq-ft				(3'-0"*3'-0") (2) No
12	RMC, AEC, repair and maintenance CR (RD 2+650)	sq-ft				(6'-0"*6'-0") (2) No
13	RMC, AEC, repair and maintenance CR of Dy-1 (RD 21+900)	sq-ft				(6'-0"*6'-0") (3) No
14	RMC, AEC, repair and maintenance CR of Dy-3 (RD 38+100)	sq-ft				(6'-0"*6'-0") (2) No
15	RMC, AEC, repair and maintenance CR of Dy-7 (RD 68+250)	sq-ft				(6'-0"*6'-0") (2) No
16	RMC, AEC, repair and maintenance CR of Dy-9 (RD 83+980)	sq-ft				(5'-0"*5'-0") (2) No
17	RMC, AEC, repair and maintenance CR of Director Minor 8 (RD 94+000)	sq-ft				(5'-0"*5'-0") (1) No
18	Mainor repair woks for Check Structure	nos				
	Sub-total					
Ⅳ	**Rehabilitation of Fall Structure**					
1	RMC, Dy-1, repair and maintenance of drops	nos				
2	RMC, Dy-1, Minor 1, repair and maintenance of drops	nos				
3	RMC, Kha Paung Kyaing Branch Canan (KBC), Dy-1, minor 1, repair and main	nos				
4	RMC, Dy-4, Minor 1, repair and maintenance of drops	nos				
5	RMC, Dy-4, Minor 1A, repair and maintenance of drops	nos				
6	RMC, Dy-4, Minor 2A, repair and maintenance of drop	nos				
7	RMC, Dy-4, Minor 3, repair and maintenance of drops	nos				
8	RMC, BEC, stone pitching of U/S & D/S of drop structure (RD 11+600)	nos				(500"*34'-6") sandy soil
9	Mainor repair woks for Check Structure	nos				
	Sub-total					
Ⅴ	**Rehabilitation of Syphon and flume (canal bridge)**					
1	RMC, Rehabilitation of syphon (RD0+000 to 204+200)	nos				
2	RMC, U/S & D/S lining of Fot Chaung flume (RD 64+200)	sq-ft				
3	RMC, U/S & D/S lining of Aung Nage Zin flume (RD 185+950)	sq-ft				
4	RMC, repair and maintenane of retain wall of paung Ka daung syphon (RD 36+0	nos				
5	RMC, Dy-4 , construction of Saw Mae syphon retaining wall (RD 13+250)	nos				
6	RMC, Extension of Fot Chaung Flume (RD 64+200)	nos				
7	RMC, Construction of Si Pa Done syphon retaining wall (RD 84+000)	nos				
8	RMC, U/S & D/S lining of Chaung Ma Gyi syphon (RD 213+300)	sq-ft				sandy soil
9	RMC, U/S & D/S lining of Tat Tae Syphon (RD 224+750)	sq-ft				sandy soil
10	RMC, U/S & D/S stone pitching Kone Yoe flume (RD 229+250)	sq-ft				sandy soil
11	RMC, U/S & D/S stone pitching of Ba Gar syphon (RD 234+000)	sq-ft				sandy soil
12	RMC, U/S & D/S stone pitching of Min Gan Boke syphon (RD 239+350)	sq-ft				sandy soil
13	RMC, U/S & D/S stone pitching kyat Chay Yar flume (RD 253+150)	sq-ft				(500"*58'-6") sandy soil
14	RMC, U/S & D/S stone pitching of Pa Yar Gyi Syphon (RD 263+800)	sq-ft				(500"*58'-6") sandy soil
	Sub-total					

Ⅵ	**Rehabilitation of Spill-out & Spill-in facility**					
1	RMC, BEC, stone pitching of spill in (RD 16+400)	sq-ft				(500"*34'-6")
	Sub-total					
Ⅶ	**Rehabilitation of Bridge**					
1	RMC, upstream and downstram lining of bridges (from RD 0+000 to 204+200)	sq-ft				29 No * 500"*95'
2	RMC, Repair and maintenance of Aung Swar bridges (RD 29+800)	nos				1 No
3	RMC, Construction of bridge in Paung Ka Daung D.O (RD 36+500)	nos				
4	RMC, Dy-1, repair and maintenance of bridges	nos				3 No
5	RMC, U/S & D/S lining of Kyat Taw Thar bridge (RD 204+200 RMC)	sq-ft				(500"*63'-9")
6	RMC, U/S & D/S lining of Lae Thit Taw bridge (RD 209+500)	sq-ft				(500"*63'-9")
7	RMC, upstram and downstram lining of Bos Gone bridge (RD 212+150)	sq-ft				(500"*63'-9")
8	RMC, U/S & D/S lining of Lae Pyin Gwat bridge (RD 214+000)	sq-ft				(500"*63'-9")
9	RMC, U/S & D/S lining of Tat Tae bridge (RD 225+075)	sq-ft				(500"*63'-9")
10	upstream and downstream stone pitching of Thein Win bridge	sq-ft				(500"*58'-6")
11	upstream and downstream stone pitching of Shan Taw bridge	sq-ft				(500"*58'-6")
12	RMC, U/S & D/S stone pitching of In Boke bridge (RD 234+000)	sq-ft				(500"*63'-9")
13	RMC, U/S & D/S stone pitching of Oh Htain bridge (RD 242+500)	sq-ft				(500"*58'-6")
14	RMC, U/S & D/S stone pitching of Boke Tan bridge (RD 249+150)	sq-ft				(500"*58'-6")
15	RMC, U/S & D/S stone pitching of Chone Ywa bridge (RD 251+000)	sq-ft				(500"*58'-6")
16	RMC, BEC, stone pitching in U/S & D/S of cart bridge (RD 12+500)	sq-ft				(500"*34'-6")
17	Mainor repair woks for Bridge	nos				
	Sub-total					
Ⅷ	**Rehabilitation of Cross Drainage and drainage canal**					
1	RMC, construction of Myin Pyaing drainage canal passing bridge (RD 84+000)	nos				1 No
2	RMC, stone pitching in main canal and upstram and downstram of C.D.C (RD 22	sq-ft				(500"*63'-9")
3	RMC, stone pitching in main canal and U/S & D/S of C.D.C (RD 257+500)	sq-ft				(500"*58'-6")
4	RMC, U/S & D/S stone pitching of level crossing (RD 259+550)	sq-ft				(500"*58'-6")
5	RMC, stone pitching in main canal and U/S & D/S of Hnaw Gyin C.D.C (RD 266+	sq-ft				(500"*58'-6")
6	RMC, Dy-1, Minor 1, repair and maintenance of drainage structure (RD14+500)	nos				
7	RMC, Dy-2, Minor 1, repair and maintenance of drainage structure (RD 8+500)	nos				
8	RMC, Dy-4, Minor 1 Extension of I Wun Gyi drainage structure (RD 5+570)	nos				
9	RMC, BEC, stone pitching of U/S & D/S of drainage sturcture and main canal (R	sq-ft				(500"*34'-6")
10	RMC, BEC, stone pitching of U/S & D/S of drainage sturcture and main canal	sq-ft				(500"*34'-6")
11	Mainor repair woks for Cross Drainage	nos				
12	Improvement of drainage canals	lot				
13	Improvement of facility for reuse of drainage water	lot				
	Sub-total					
	Total					

Upgrading of canal (Resectioning, Unsilting and lining)

SMC Irrigation System

Sr. No	Description	Length / Volume		Unit Price	Cost	Remark
		(ft)	(sud)	(kyat/sud)	(Kyats)	
	Resectioning and Unsilting					
1	Shwebo Main Canal (SMC) (at essential parts)					
2	SMC, Dy-1, Minor 7					
3	SMC, Dy-3					
4	SMC, Dy-3, Minor 2					
5	SMC, Dy-3, Minor 3					
6	SMC, Dy-3, Minor 4					
7	SMC, Dy-3, Minor 5					
8	SMC, Dy-6, Minor 1					
9	SMC, Dy-6, Minor 1-B					
10	SMC, Dy-6, Minor 2					
11	SMC, Dy-6, Minor 3					
12	SMC, Dy-7 (From RD- 36/500 to RD- 53/500)					
13	SMC, Dy-7, Minor 2					
14	Moke So Gyone Branch Canal (MBC) (at essential parts)					
15	MBC, Dy-3					
16	MBC, Dy-3, RD 28/0 to 65/0					
17	MBC, Dy-4 RD 25/0					
18	MBC, Dy-4, Minor 4, RD 10/0 Tail					
19	MBC, Dy-5					
20	MBC, Dy-5, RD 10/0 to 32/300					
21	MBC, RD 55/0 to 90/0					
22	MBC, WC between DY-4 and DY-5					
23	Hla Daw Branch Cana (HBC) (at essential parts)					
24	HBC, Dy-1					
25	HBC, Dy-1 (at essential parts)					
26	HBC, Dy-1, Minor 1					
27	HBC, Dy-1, Minor 4					
28	HBC, Dy-2					
29	HBC, Dy-3, Minor 6, 7, 8, Tail					
30	HBC, DY-3, Minor 8					
31	HBC, Dy-3, RD 45/0 to Tail					
32	HBC, Dy-3, WC-12					
33	HBC, Dy-5					
34	HBC, DY-5, Minor 3 & 5					
35	HBC, Dy-5, RD 0/0 to 24/0					
36	Other canals					
	Total					

Sr. No	Description	Length / Volume		Unit Price	Cost	Remark
		(ft)	(sq-ft)	(kyat/sud)	(Kyats)	
	Lining					
1	Main canal					
2	MBC					
3	HBC					
4	Dy canal and DO canal					
	Total					

Rehabilitation of canal structure

SMC Irrigation System

Sr. No	Description	unit	Quantity	Unit Price (Kyat)	Cost (Kyat)	Remark
I	**Rehabilitation of Head Regulator for Branch & DY & minor canal**					
1	SMC, Repairing of Head Regulator of DY-7	nos				20' 0" x 10' 0" x 7' 0" 8071 Ks/cft
2	SMC, Repairing of Head Regulator of Dy-7A	nos				20' 0" x 15' 0" x 5' 0" 5333 Ks/cft
3	SMC, Dy-1, Gate Leaf repairing of Minors outlet	nos				
4	SMC, Dy-2, Repairing of Gate Leaf and Structure	nos				
5	SMC, Dy-3, Repairing of Head Regulator of Minors	nos				
6	SMC, Dy-4, Repairing of Gate Leaf of Minor No-1	nos				
7	SMC, Dy-6, Repairing of Outlet Structures of Minor 1B	nos				
8	SMC, Dy-6, Repairing of Outlet Structures of Minor 3	nos				
9	SMC, Dy-6, Repairing of stone pitching at outlet portion of Dy-6 H/R	nos				100' 0" x 35' 0" 4571 Ks/ cft
10	SMC, Dy-6, Repairing of Bifurcation Structure on Minor 1B	nos				15' 0" x 10' 0" x 5' 0" 4000 Ks/ cft
11	SMC, Dy-7, Repairing of Head Regulator of Minor 3	nos				
12	SMC, Dy-7, Repairing of Head Regulator of Minor 4	nos				20' 0" x 10' 0" x 6' 0" 8333 Ks/cft
13	SMC, Dy-7, Repairing of Head Regulator of Minor 7	nos				
14	SMC, Repairing and installation of the gates for bifurcation	nos				
15	SMC, HBC, reparing Gate Leaf for Head regulator of Dy Channels	nos				
15	SMC, HBC, Dy-3, reparing bridge of HR of Minor 4	nos				
16	SMC, MBC, reparing Gate Leaf for Head regulator of Dy Channels	nos				
17	SMC, MBC, DY-3, Construction of Inlet Structure (RD 2+800)	nos				
18	Mainor repair woks for Head regulator	nos				
19	Installation of the water measurement facilities (parshall flume, etc.)	nos				
	Sub-total					
II	**Rehabilitation of Outlet Structutre for Water course & DO**					
1	SMC, Dy-1, installation of Gate Leaf fixing woks of main water courses	nos				
2	SMC, Dy-7, Repairing of WC-6 outlet Structure (RD 14+000)	nos				20' 0" x 4' 0" x 5' 0" 7500 Ks/cft
3	SMC, Dy-7, Repairing of WC-8 outlet Structure (RD 25+300)	nos				20' 0" x 4' 0" x 5' 0" 7500 Ks/cft
4	SMC, Dy-7, Repairing of WC-10 outlet Structure (RD 27+400)	nos				20' 0" x 4' 0" x 5' 0" 7500 Ks/cft
5	SMC, Dy-7, Repairing of WC-11 outlet Structure (RD 33+950)	nos				20' 0" x 4' 0" x 5' 0" 7500 Ks/cft
6	SMC, Dy-7, Repairing of WC-12 outlet Structure (RD 34+300)	nos				20' 0" x 4' 0" x 5' 0" 7500 Ks/cft
7	Rehabilitation of Outlet Structutre and gate installation for water courses & DO	nos				
	Sub-total					
III	**Rehabilitation of Check Structure**					
1	SMC, Upgrading of check Structure No (1)	nos				
2	SMC, Upgrading of check Structure No (2)	nos				
3	SMC, Upgrading of check Structure No (3)	nos				
4	SMC, Upgrading of check Structure No (4)	nos				
5	SMC, Upgrading of check Structure No (5)	nos				
6	SMC, Upgrading of check Structure No (6)	nos				
7	SMC, Dy-1, Repairing of Check Structures	nos				
8	Mainor repair woks for Check Structure	nos				
	Sub-total					

IV	**Rehabilitation of Fall Structure**						
1	SMC, Dy-1, Upgrading of Fall Structures	nos					
2	SMC, Dy-2, Upgrading of fall Structures	nos					
3	SMC, Dy-3, Upgrading of Fall Structures	nos					
4	SMC, Dy-4, Repairing of Fall Structure	nos					
5	SMC, Dy-5, Repairing of Fall Structures	nos					
6	SMC, Dy-3, Minor 2, Linning Extension Works of Falls & Bridges	nos					
7	SMC, Dy-3, Minor 2, Repairing of Fall Structures	nos					
8	SMC, Dy-6, Repairing of Fall Structure (RD 5+300)	nos				35' 0" x 20' 0" x 5' 0"	1000 Ks/cft
9	SMC, Dy-6, Repairing of Fall Structure (RD 22+000)	nos				35' 0" x 20' 0" x 5' 0"	1000 Ks/cft
10	SMC, Dy-6, Minor 1, Repairing of Fall Structure (RD 6+300)	nos				22' 0" x 12' 0" x 5' 0"	6060 Ks/ cft
11	SMC, Dy-6, Minor 1, Repairing of Fall Structure (RD 11+000)	nos				22' 0" x 12' 0" x 5' 0"	6060 Ks/ cft
12	SMC, Dy-6, Minor 1, Repairing of Fall Structure (RD 15+310)	nos				22' 0" x 12' 0" x 5' 0"	6060 Ks/ cft
13	SMC, Dy-6, Minor 1, Repairing of Fall Structure(RD 20+000)	nos				22' 0" x 12' 0" x 5' 0"	6060 Ks/ cft
14	SMC, Dy-6, Minor 3, Repairing of Fall Structure (RD 2+500)	nos				20' 0" x 10' 0" x 5' 0"	3200 Ks/ cft
15	SMC, Dy-6A, Repairing of Fall Structures	nos					
16	SMC, Dy-7, Repairing of Fall Structure (RD 2+650)	nos				35' 0" x 20' 0" x 5' 0"	10000 Ks/cft
17	SMC, Dy-7, Repairing of Fall Structure (RD 6+000)	nos				35' 0" x 20' 0" x 5' 0"	10000 Ks/cft
18	SMC, Dy-7, Repairing of Fall Structure (RD 10+000)	nos				35' 0" x 20' 0" x 5' 0"	10000 Ks/cft
19	SMC, Dy-7, Repairing of Fall Structure (RD 36+450)	nos				22' 0" x 12' 0" x 5' 0"	6060 Ks/cft
20	SMC, Dy-7, Repairing of Fall Structure (RD 39+800)	nos				22' 0" x 12' 0" x 5' 0"	6060 Ks/cft
21	SMC, Dy-7, Minor 2, Repairing of Fall Structure & (3 Nos;)	nos				35' 0" x 20' 0" x 5' 0"	10000 Ks/cft
22	SMC, Dy-7, Minor 3, Repairing of Fall Structure (RD 10+000)	nos				20' 0" x 10' 0" x 5' 0"	3209 Ks/cft
23	SMC, Dy-7, Minor 7, Repairing of Fall Structures	nos					
24	SMC, Dy-8, Repairing of Fall Structures	nos					
25	SMC, HBC, Repairing of Fall Structures	nos					
26	SMC, HBC, Dy-1, Repairing of Falls Structures	nos					
27	SMC, MBC, Dy-1, Repairing of Falls Structures	nos					
28	SMC, MBC, Dy-2, Repairing of Fall Structure	nos					
29	SMC, MBC, Dy-3, Repairing of Fall Structure	nos					
30	SMC, MBC, Repairing of Fall Structure	nos					
31	Mainor repair woks for Fall Structure	nos					
	Sub-total						
	78/500						
V	**Rehabilitation of Syphon and flume (canal bridge)**						
1	SMC, Syphon No.1 (RD 28+500)	nos					-
2	SMC, Flume-No.2 (RD 36+000)	nos					-
3	SMC, Flume (RD 55+000)	nos					2361 Ks/cft
4	SMC, Syphon No.3 (RD 78+500)	nos					-
5	SMC, Syphon No.4 (RD 110+000)	nos					-
6	SMC, Syphon No.5 (RD 124+000)	nos					2361 Ks/cft
7	SMC,MBC, extension of flume (RD 70+000)	nos					2361 Ks/cft
8	Mainor repair woks for Syphon	nos					-
	Sub-total						

VI	**Rehabilitation of Spill-out & Spill-in facility**					
1	SMC, Dy-1, Repairing of Spill-out Structure (RD 11+400)	nos				
2	SMC, Dy-7, Construchion of Spill-in Structure (RD 11+000)	nos				20' 0" x 20' 0" x 4' 0" 5000 Ks/cft
3	SMC, Dy-7, Construchion of Spill-in Structure (RD 17+000)	nos				100' 0" x 35' 0" 4571 Ks/cft
4	SMC, Dy-7, Minor 3, Lining works of Spill-in Structure	nos				20' 0" x 20' 0" x 4' 0" 3750 Ks/cft
5	Mainor repair woks for Spill-out & Spill-in facility	nos				
	Sub-total					
VII	**Rehabilitation of Bridge**					
1	SMC, Dy-2, Repairing of Bridges	nos				
2	SMC, Dy-3, Upgrading of Bridges	nos				
3	SMC, Dy-4, Repairing of Bridges	nos				
4	SMC, Dy-5, Repairing of Bridges	nos				
5	SMC, Dy-8, Repairing of Bridges	nos				
6	SMC, HBC, Repairing of Bridges	nos				
7	SMC, MBC, Repairing of Bridges	nos				
8	Mainor repair woks for Bridge	nos				
	Sub-total					
VIII	**Rehabilitation of Cross Drainage and drainage canal**					
1	Mainor repair woks for Cross Drainage	nos				
2	Excavation of Hnamazayit drainage channel	sud				L = 5km
3	Strengthening of embankment of Hnamazayit drainage channel	sud				L = 2km
4	Excavation of Nyaungpintha - Kyeekan drainage channel	sud				L = 7km
5	Excavation of Natkyitan drainage channel	sud				L = 15km
6	Excavation of Thabyetha – Zeetaw drainage channel	sud				L = 3km
7	Excavation of Repair of inside Thatkal chaung	sud				L = 20km
8	Excavation of drainage channel	sud				L = 8km
9	Construction of new bypass drainage channels	sud				L = 11km
10	Improvement of drainage canals	lot				
11	Improvement of facility for reuse of drainage water	lot				
	Sub-total					
IX	**Other works**					
1	Construchion of Low Lift Pump Station from Mu River	nos				
2	Construchion of Won Si Village low lift Pump Station	nos				
3	Construction of Seik Khon Weir	nos				150' 0" x 40' 0" x 6' 0" 2361 Ks/cft
	Sub-total					
	Total					

Upgrading of canal (Resectioning, Unsilting and lining)

YMC Irrigation System

Sr. No	Description	Length / Volume (ft)	Length / Volume (sud)	Unit Price (kyat/sud)	Cost (Kyats)	Remark
	Resectioning and Unsilting					
1	YMC					
2	DY (1)					
3	DY (3)					
4	DY (4)					
5	DY (4-A)					
6	DY (5)					
7	DY (6)					
8	DY (7)					
9	DY (8)					
10	DY (9)					
11	DY (10)					
12	DY (11)					
13	DY (12)					
14	DY (13)					
15	DY (14)					
16	DY (15)					
17	DY (15-A)					
18	DY (16)					
19	DY (17)					
20	DY (18)					
21	DY (19)					
22	DY (20)					
23	DY (21)					
24	DY (22)					
25	DY (22) Minor (1)					
26	DY (22) Minor (2)					
27	DY (23)					
28	DY (24)					
29	Tail DY					
30	Ma Ya Kan Branch Canal (MBC)					
31	MBC DY (1)					
32	MBC DY (2)					
33	MBC DY (3)					
34	MBC Dy (4)					
35	MBC DY (5)					
36	MBC DY (7)					
37	MBC DY (9)					
38	MBC DY (11)					
39	MBC DY (12)					
40	MBC DY (13)					
41	MBC Tail DY					
42	Minor Canals					
	Total					

Sr. No	Description	Length / Volume (ft)	Length / Volume (sq-ft)	Unit Price (kyat/sud)	Cost (Kyats)	Remark
	Lining					
1	Main canal					
2	MBC					
3	Dy canal and DO canal					
	Total					

Rehabilitation of canal structure

YMC Irrigation System

Sr. No	Description	unit	Quantity	Unit Price (Kyat)	Cost (Kyat)	Remark
I	**Rehabilitation of Head Regulator for Branch & DY & minor canal**					
1	YMC, U/S & D/S lining of Dy-1 HR (RD 32+734)	sq-ft				
2	YMC, U/S & D/S lining of Dy-4 HR (RD 54+900)	sq-ft				
3	YMC, U/S & D/S lining of Dy-4A HR (RD 59+919)	sq-ft				
4	YMC, gate leaf installation of undersluice of cross regulator (1) & (2) and Dy, HR	LS				
5	YMC, U/S & D/S lining of Chaungna bifurcation (RD 77+000)	sq-ft				
6	YMC, gate leaf installation of Chaungna bifurcation	LS				
7	YMC, gate leaf installation tof HR of Dy-1 3	LS				
8	YMC, DY-4, gate leaf installation to HR of Minor 1	LS				
9	YMC, U/S & D/S lining of HR of Dy-5 (RD 70+450)	sq-ft				
10	YMC, U/S & D/S stone pitching in main canal at HR of Dy-6 (RD 88+900)	sq-ft				500'*80'
11	YMC, repair and maintenance of Dy-6 gate leaf (RD 88+900)	set				(3'-0"*3'-6") (1) No
12	YMC, U/S & D/S stone pitching in main canal at HR of Dy-7 (RD 91+500)	sq-ft				500'*80'
13	YMC, repair and maintenance of Dy-7 gate leaf (RD 91+500)	set				(3'-0"*4'-0") (2) No
14	YMC, stone pitching in main canal at HR of Dy-8 (RD 95+000)	sq-ft				500'*72.5'
15	YMC, repair and maintenance of Dy-8 gate leaf (RD 95+000)	set				(3'-3"*3'-3") (1) No
16	YMC, stone pitching in main canal at HR of Dy-9 (RD 102+200)	sq-ft				500'*72'
17	YMC, repair and maintenance of Dy-9 gate leaf (RD 102+200)	set				(5'-9"*2'-3") (2) No
18	YMC, repair and maintenance of Dy-10 gate leaf (RD 104+000)	set				(3'-0"*2'-6") (1) No
19	YMC, repair and maintenance of Dy-11 gate leaf (RD 114+000)	set				(4'-0"*4'-0") (2) No
20	YMC, stone pitching in main canal at HR of Dy-12 (RD 120+000)	sq-ft				500'*66.21'
21	YMC, repair and maintenance of Dy-12 gate leaf (RD 120+000)	set				(4'-0"*4'-0") (1) No
22	YMC, stone pitching in main canal at HR of Direct Minor 1 (RD 124+500)	sq-ft				500'*63.84'
23	YMC, stone pitching in main canal at HR of Dy-13 (RD 131+550)	sq-ft				500'*63.84'
24	YMC, repair and maintenance of Dy-13 gate leaf (RD 131+550)	set				(3'-0"*4'-0") (1) No
25	YMC, stone pitching in main canal at HR of Dy-14 (RD 136+700)	sq-ft				500'*62.85'
26	YMC, repair and maintenance of Dy-14 gate leaf (RD 136+700)	set				(6'-0"*4'-0") (1) No
27	YMC, repair and maintenance of Dy-15 gate leaf (RD 141+900)	set				(6'-0"*6'-0") (1) No
28	YMC, stone pitching in main canal at HR of Dy-15A (RD 153+000)	sq-ft				500'*58.31'
29	YMC, repair and maintenance of Dy-15-A gate leaf (RD 153+000)	set				(6'-0"*6'-0") (1) No
30	YMC, stone pitching in main canal at HR of Dy-16 (RD 157+100)	sq-ft				500'*58.31'
31	YMC, repair and maintenance of Dy-16 gate leaf (RD 157+100)	set				(5'-0"*4'-0") (1) No
32	YMC, stone pitching in main canal at HR of Dy-17 (RD 165+800)	sq-ft				500'*55.76'
33	YMC, repair and maintenance of Dy-17 gate leaf (RD 165+800)	set				(5'-0"*4'-0") (1) No
34	YMC, repair and maintenance of Dy-18 gate leaf (RD 170+000)	set				(5'-6"*4'-0") (1) No
35	YMC, stone pitching in main canal at HR of Dy-19 (RD 176+200)	sq-ft				500'*49.04'
36	YMC, repair and maintenance of Dy-19 gate leaf (RD 176+200)	set				(5'-6"*4'-0") (1) No
37	YMC, stone pitching in main canal at HR of Dy-20 (RD 186+900)	sq-ft				500'*45.5'
38	YMC, repair and maintenance of Dy-20 gate leaf (RD 186+900)	set				(4'-6"*3'-6") (1) No
39	YMC, repair and maintenance of Dy-21 gate leaf (RD 192+150)	set				(4'-6"*3'-6") (1) No
40	YMC, stone pitching in main canal at HR of Dy-22 (RD 198+100)	sq-ft				500'*41.60'
41	YMC, repair and maintenance of Dy-22 gate leaf (RD 198+100)	set				(4'-7"*3'-6") (1) No
42	YMC, stone pitching in main canal at HR of DMR-1 (RD 204+000)	sq-ft				500'*37.88'
43	YMC, repair and maintenance of DMR-1 gate leaf (RD 204+000)	set				(2'-5"*2'-6") (1) No
44	YMC, repair and maintenance of Dy-23 gate leaf (RD 211+500)	set				(3'-10-"*3'-5") (1) No
45	YMC, repair and maintenance of Dy-24 gate leaf (RD 217+080)	set				(4'-9"*5'-1") (1) No
46	YMC, stone pitching in main canal at HR of DMR-2 (RD 220+100)	sq-ft				500'*31.80'
47	YMC, repair and maintenance of DMR-2 gate leaf (RD 220+100)	set				(2'-9"*2'-9") (1) No
48	YMC, repair and maintenance of Canal tail Dy gate leaf (RD 223+000)	set				(5'-4"*3'-7") (2) No
49	YMC, TDY, repair and maintenance of gate leaf at Hrof Minor 1	set				(4'-0"*3'-1") (1) No
50	YMC, Mayankan Branch Canal (MBC), U/S & D/S lining of Dy -5 HR (RD 34+00	sq-ft				
51	YMC, MBC, U/S & D/S lining of Dy -1 HR (RD 0+745)	sq-ft				
52	YMC, MBC, U/S & D/S lining of Dy -2 HR (RD 5+600)	sq-ft				
53	YMC, MBC, Extension of HR at Dy-2 and 3	nos				
54	YMC, MBC, U/S & D/S lining of Dy -3 HR (RD 8+400)	sq-ft				
55	YMC, MBC, U/S & D/S lining of Dy -4 HR (RD 15+384)	sq-ft				
56	YMC, MBC, U/S & D/S lining of DMR(1) HR (RD 41+000)	sq-ft				
57	YMC, MBC, gate leaf installation to HR of Dy-1, 2, 3	LS				
58	YMC, MBC, Installation of gate leaf to HR of Dy-5, 7, 9, 11	set				
59	YMC, MBC, Installation of gate leaf to HR of direct minor(1)	set				
60	YMC, MBC, U/S & D/S lining of FB-3A (RD 42+500)	sq-ft				
61	YMC, MBC, U/S & D/S lining of Dy -7 (HR RD 47+000)	sq-ft				
62	YMC, MBC, U/S & D/S lining of Dy -9 HR (RD 52+000)	sq-ft				
63	YMC, MBC, U/S & D/S lining of Dy -12 HR (RD 69+500)	sq-ft				
64	YMC, MBC, U/S & D/S lining of DMR(2) HR (RD 91+000)	sq-ft				
65	YMC, MBC, Repair and Installation of gate leaf to HR of Dys and minors in Tayat	LS				
66	YMC, MBC, Dy-3, Installation of gate leaf to HR of Direct Minor 1	set				
67	YMC, MBC, Dy-4, gate leaf installation to HR of Minor 1	LS				
68	Mainor repair woks for Head regulator	nos				
69	Installation of the water measurement facilities (parshall flume, etc.)	nos				
	Sub-total					

II	**Rehabilitation of Outlet Structutre for Water course & DO**					
1	YMC, MBC, Repairing and Installation of gate leaf of DO (RD0+000 to RD 30+00	LS				
2	YMC, MBC, Repairing and Installation of gate leaf of DO (Nyaung Hla Area)	set				
3	YMC, MBC, Repair and Installation of DO in Tayatkan area	set				
	YMC, Rehabilitation of Outlet Structutre and gate installation for water courses &	nos				
	Sub-total					
III	**Rehabilitation of Check Structure**					
1	YMC, U/S & D/S lining of of cross regulator 1 (RD 45+375)	sq-ft				
2	YMC, U/S & D/S lining of of cross regulator 2 (RD 70+450)	sq-ft				
3	YMC, gate leaf installation of of cross regulator (1) & (2)	LS				
4	YMC, stone pitching of cross regulator (RD 104+300)	sq-ft				500'*70.93'
5	YMC, repair and maintenance of cross regulator (2-A) gate leaf (RD 104+000)	set				(6'-0"*6'-0") (8) No
6	YMC, stone pitching of cross regulator (RD 114+000)	sq-ft				500'*69.82'
7	YMC, repair and maintenance of cross regulator (3) gate leaf (RD 114+000)	set				(6'-0"*6'-0") (6) No
8	YMC, U/S & D/S stone pitching of cross regulator (RD 142+000)	sq-ft				500'*59.67'
9	YMC, repair and maintenance of cross regulator (4) gate leaf (RD 142+000)	set				(6'-0"*4'-0") (4) No
10	YMC, U/S & D/S stone pitching of cross regulator (RD 170+000)	sq-ft				500'*51.58'
11	YMC, repair and maintenance of cross regulator (5) gate leaf (RD 170+000)	set				(6'-0"*4'-0") (5) No
12	YMC, U/S & D/S stone pitching of cross regulator (RD 192+800)	sq-ft				500'*44.96'
13	YMC, repair and maintenance of cross regulator (6) gate leaf (RD 192+800)	set				(5'-0"*3'-6") (6) No
14	YMC, U/S & D/S stone pitching of cross regulator (RD 211+510)	sq-ft				500'*37.88'
15	YMC, repair and maintenance of cross regulator (7) gate leaf (RD 211+510)	set				(5'-0"*3'-6") (5) No
16	Mainor repair woks for Check Structure	nos				
	Sub-total					
IV	**Rehabilitation of Fall Structure**					
1	YMC, U/S & D/S lining of Fall(1) (RD 2+500)	sq-ft				
2	YMC, U/S & D/S lining of Fall(2) (RD 9+7009	sq-ft				
3	YMC, U/S & D/S lining of Fall(3) (RD 15+480)	sq-ft				
4	YMC, MBC, U/S & D/S lining of Fall(4) (RD 53+000)	sq-ft				
5	YMC, MBC, U/S & D/S lining of Fall(5) (RD 64+500)	sq-ft				
6	YMC, MBC, Dy-5, Repair and Construction of Fall 6, 7	set				
7	Rehabilitation for fall structure	nos				
8	Mainor repair woks for Check Structure	nos				
	Sub-total					
V	**Rehabilitation of Syphon and flume (canal bridge)**					
1	YMC, U/S & D/S lining of syphon of Drainage (2) (RD 40+300)	sq-ft				
2	YMC, U/S & D/S lining of syphon of Drainage (4) (RD 73+350)	sq-ft				
3	YMC, DY-3, repairing of flume structure retaining wall (RD 16+800)	nos				
	Sub-total					
VI	**Rehabilitation of Spill-out & Spill-in facility**					
1	YMC, spill in construction (RD 7+500)	nos				1 No
1	YMC, spill in construction (RD 12+500)	nos				1 No
3	YMC, repair and maintenance of drainage(6) side spill gate leaf (RD 222+800)	set				(3'-6"*2'-1") (2) No
	Sub-total					

Ⅶ	**Rehabilitation of Bridge**					
1	YMC, U/S & D/S lining of bridge (1) (RD 4+386)	sq-ft				
2	YMC, U/S & D/S lining of bridge (RD 7+840)	sq-ft				
3	YMC, U/S & D/S lining of bridge (2) (RD 10+628)	sq-ft				
4	YMC, U/S & D/S lining of bridge (RD 17+500)	sq-ft				
5	YMC, U/S & D/S lining of bridge (3) (RD 19+150)	sq-ft				
6	YMC, U/S & D/S lining of bridge (4) (RD 25+275)	sq-ft				
7	YMC, U/S & D/S lining of bridge (5) (RD 33+134)	sq-ft				
8	YMC, U/S & D/S lining of bridge (6) (RD 46+133)	sq-ft				
9	YMC, U/S & D/S lining of bridge (7) (RD 59+500)	sq-ft				
10	YMC, U/S & D/S lining of bridge (8) (RD 67+171)	sq-ft				
11	YMC, U/S & D/S lining of railway bridge (RD 71+900)	sq-ft				
12	YMC, U/S & D/S stone pitching of bridge (RD 84+000)	sq-ft				500*80'
13	YMC, U/S & D/S stone pitching of bridge (RD 96+000)	sq-ft				500*72.5'
14	YMC, U/S & D/S stone pitching of bridge (RD 104+000)	sq-ft				500*70.93'
15	YMC, U/S & D/S stone pitching of bridge (RD 113+800)	sq-ft				500*69.82'
16	YMC, U/S & D/S stone pitching of bridge (RD 118+400)	sq-ft				500*66.21'
17	YMC, U/S & D/S stone pitching of bridge (RD 132+335)	sq-ft				500*63.84'
18	YMC, U/S & D/S stone pitching of bridge (RD 145+535)	sq-ft				500*58.31'
19	YMC, U/S & D/S stone pitching of bridge (RD 152+425)	sq-ft				500*58.31'
20	YMC, U/S & D/S stone pitching of bridge (RD 155+700)	sq-ft				500*58.31'
21	YMC, U/S & D/S stone pitching of bridge (RD 162+435)	sq-ft				500*56.95'
22	YMC, U/S & D/S stone pitching of bridge (RD 168+780)	sq-ft				500*51.58'
23	YMC, U/S & D/S stone pitching of bridge (RD 178+050)	sq-ft				500*45.5'
24	YMC, U/S & D/S stone pitching of bridge (RD 184+900)	sq-ft				500*45.5'
25	YMC, U/S & D/S stone pitching of bridge (RD 194+500)	sq-ft				500*44.96'
26	YMC, U/S & D/S stone pitching of bridge (RD 194+500)	sq-ft				500*41.60'
27	YMC, U/S & D/S stone pitching of bridge (RD 201+000)	sq-ft				500*37.88'
28	YMC, U/S & D/S stone pitching of bridge (RD 211+000)	sq-ft				500*37.88'
29	YMC, U/S & D/S stone pitching of bridge (RD 212+700)	sq-ft				500*35.34'
30	YMC, U/S & D/S stone pitching of bridge (RD 217+100)	sq-ft				800*35.34'
31	YMC, Dy-4, U/S & D/S lining of bridge (1) (RD 9+850)	sq-ft				
32	YMC, Dy-4, U/S & D/S lining of bridge (5) (RD 19+100)	sq-ft				
33	YMC, MBC, U/S & D/S lining of bridge (3) (RD 37+600)	sq-ft				
34	YMC, MBC, U/S & D/S lining of bridge(3-B) (RD 47+600)	sq-ft				
35	YMC, MBC, U/S & D/S lining of bridge(4) (RD 51+400)	sq-ft				
36	YMC, MBC, U/S & D/S lining of bridge(5) (RD 57+200)	sq-ft				
37	YMC, MBC, U/S & D/S lining of bridge(6) (RD 63+000)	sq-ft				
38	YMC, MBC, U/S & D/S lining of bridge(6) (RD 63+800)	sq-ft				
39	YMC, MBC, U/S & D/S lining of bridge (RD 64+500)	sq-ft				
40	YMC, MBC, U/S & D/S lining of Causeway (6) (RD 75+000)	sq-ft				
41	YMC, MBC, U/S & D/S lining of bridge (RD 78+000)	sq-ft				
42	YMC, MBC, U/S & D/S lining of Causeway (7) (RD 79+500)	sq-ft				
43	YMC, MBC, U/S & D/S lining of bridge (RD 83+300)	sq-ft				
44	YMC, MBC, U/S & D/S lining of bridge (RD 94+500)	sq-ft				
45	YMC, MBC, U/S & D/S lining of Causeway (8) (RD 95+500)	sq-ft				
46	YMC, MBC, U/S & D/S lining of bridge (Dy-tail) (RD14+700)	sq-ft				
47	YMC, MBC, Lining (RD77+500)	sq-ft				
48	Mainor repair woks for Bridge	nos				
	Sub-total					

Ⅷ	**Rehabilitation of Cross Drainage and drainage canal**					
1	YMC, U/S & D/S lining of silt excluder (H/R) (RD 33+400)	sq-ft				
2	YMC, U/S & D/S lining of C.D.C of Drainage(1) (RD 33+664)	sq-ft				
3	YMC, U/S & D/S lining of C.D.C of Drainage(3-A) (RD 61+700)	sq-ft				
4	YMC, U/S & D/S lining of C.D.C of Drainage(3-B) (RD 64+900)	sq-ft				
5	YMC, Outfall channel canal bed repair of drainage (2) Tayapin chaung (RD 40+3	nos				
6	YMC, Extension of Drainage Canal Structure CDC (RD 61+700)	nos				
7	YMC, downstram bed repair of Hnaw Gone drainage(4) syphon (RD 73+350)	nos				
8	YMC, U/S & D/S stone pitching of Drainage (5) (RD 82+600)	sq-ft				500*80'
9	YMC, U/S & D/S stone pitching of drainage (5-A) (RD 86+000)	sq-ft				500*80'
10	YMC, U/S & D/S stone pitching of drainage (5-B) (RD 93+200)	sq-ft				500*72.5'
11	YMC, U/S & D/S stone pitching of drainage (6) (RD 100+400)	sq-ft				500*72'
12	YMC, U/S & D/S stone pitching of drainage (6-A) (RD 107+300)	sq-ft				500*69.82'
13	YMC, U/S & D/S stone pitching of drainage (7) (RD 116+900)	sq-ft				500*66.21'
14	YMC, U/S & D/S stone pitching of drainage (9) (RD 129+000)	sq-ft				500*63.84'
15	YMC, U/S & D/S stone pitching of drainage (8-A) (RD 134+200)	sq-ft				500*62.85'
16	YMC, U/S & D/S stone pitching of drainage (9) (RD 139+900)	sq-ft				500*59.67'
17	YMC, U/S & D/S stone pitching of drainage (10) (RD 154+200)	sq-ft				500*58.31'
18	YMC, U/S & D/S stone pitching of drainage (11) (RD 158+400)	sq-ft				500*56.95'
19	YMC, U/S & D/S stone pitching of drainage (11-A) (RD 166+900)	sq-ft				500*51.58'
20	YMC, U/S & D/S stone pitching of drainage (9-A) (RD 150+400)	sq-ft				500*58.31'
21	YMC, U/S & D/S stone pitching of drainage (12) (RD 173+500)	sq-ft				500*49.04'
22	YMC, U/S & D/S stone pitching of drainage (12-A) (RD 178+500)	sq-ft				500*45.5'
23	YMC, U/S & D/S stone pitching of drainage (13) (RD 189+180)	sq-ft				500*44.96'
24	YMC, U/S & D/S stone pitching of drainage (14) (RD 202+000)	sq-ft				500*37.88'
25	YMC, U/S & D/S stone pitching of drainage (15) (RD 209+800)	sq-ft				500*37.88'
26	YMC, U/S & D/S stone pitching of drainage (15-A) (RD 214+300)	sq-ft				500*35.34'
27	YMC, U/S & D/S stone pitching of drainage (16) (RD 222+800)	sq-ft				500*31.80'
28	Mainor repair woks for Cross Drainage	nos				
29	Improvement of drainage canals	lot				
30	Improvement of facility for reuse of drainage water	lot				
	Sub-total					
	Total					

Rehabilitation of canal structure

Monitoring system for Water management improvement and flood management

Sr. No	Description	unit	Quantity	Unit Price (Kyat)	Cost (Kyat)	Remark
Ⅰ	**Monitoring system for Water management improvement (Rainfall gauge, water level gauge, flow meter, data transmission system, monitor and recording system)**					
1	Rainfall gauge	nos				
2	Water level gauge with recorder	nos				Quartz type for Thapanzeik dam
3	Water level gauge with recorder	nos				Water pressure type for Kindat Diversion dam
4	Water level gauge with recorder	nos				Water pressure type for Canal
5	Flow meter with recorder	nos				
6	Data transmission system, monitor and recording system	LS				
7	Monitor and recording system at the office	LS				
8	Installation of the facility and related civil works	LS				
	Sub-total					
Ⅱ	**Monitoring system for flood management improvement (Rainfall gauge, water level gauge, flow meter, data transmission system, monitor and recording system)**					
1	Rainfall gauge	nos				
2	Rainfall gauge with recorder	nos				
3	Water level gauge with recorder	nos				Water pressure type for Canal
4	Flow meter with recorder	nos				
5	Data transmission system, monitor and recording system	LS				
6	Monitor and recording system at the office	LS				
7	Installation of the facility and related civil works	LS				
	Sub-total					
	Total					

Rehabilitation of canal structure

Indirect Cost

Sr. No	Description	unit	Quantity	Unit Price (Kyat)	Cost (Kyat)	Remark
1	Construction of the project office including procurement of office facilities	LS	1			
2	Survey Work (Topographic survey, geological survey, other)	LS	1			
3	Preparation Work (Site camps, workshops in field for the works, etc)	LS	1			
4	Quality Control	LS	1			
5	Maintenance of Machinery (Spare parts of machineries, etc)	LS	1			
6	Water users association establishment	LS	1			
7	Other expense	LS	1			
	Total					

(2) Procurement of Maintenance Machineries

Sr	Equipment Name	Specification	Q'ty	Unit Price (JPY)	Amount (JPY)
1	Mini Hydraulic Excavator	7 ton	units		
2	Hydraulic Excavator	20 ton	units		
3	Long Armed Hydraulic Excavator	20 ton + long arm	units		
4	Amphibious Hydraulic Excavator	20 ton + amphibious crawlers	units		
5	Track Dozer CL III	T-4 or T-5	units		
6	Motor Grader	120-150 HP	units		
7	Roller Compacter	10-20 ton	units		
8	Self-Loading Truck	40-50 ton	units		
9	Water Bowser Truck	1600 gal (7.2 m3 or more)	units		
10	Tipper Truck	6-8 ton	units		
11	Dredging Boat	12" suction, more than 450 HP	units		
				Total in JPY	
				Total in MMK	

5-5. Distribution Infrastructure Improvement

(1) Rural Road Improvement

District	Township	No.	Description	Road Length		Pavement Type		Roadway and Shoulder		Unit Cost (million kyat/mile)	Construction Cost (million kyat)
				(mile)	(km)	Present Condition	Upgrade Plan				
Kanbalu	Kanbalu	1	Kanbulu - Htan Gone - Kabo Road	2.63	4.23	Earth	Metal/Macadam	12ft	3ft		
		2	Zee Gone-Ywa Thit-Baw Di Gone-Se Sone Gyi-Lay Htoke Village to Village Road	5.00	8.05	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		3	Kabo - Aung Chan Thar - I Paung Chaung Road	1.25	2.01	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		4	Kanbulu - Nga Toe - Kyay Pin Act- Nga Pyaw Tine Road	12.63	20.33	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		5	Htan Gone-Zee Pin Thar-Ye Dwe-Htain Taw-Kine Yoe Village to Village Road	5.00	8.05	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		6	Muu River Bank to Nyaung Zin - Nyaung Zin Gyi - Tin Paung Kyin Road	3.00	4.83	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		7	Kanbulu- Tak Ka Shat- Hmaw Taw Road	2.90	4.67	Earth	Metal/Macadam	12ft	3ft		
		8	Inn Lae Gyi-Tha Yat Taw-Kyun Pin Kone-Shan Tat-Nyaung Kine-Pyin Taw-Popa Road	13.63	21.94	Earth	Metal/Macadam	12ft	3ft		
			Total	**46.04**	**74.11**						
Shwebo	Kin-U	1	Kan Gyi Kone-Shwe Yamin-Thein Taw-Kyar Pin Aing Road	5.50	8.85	Earth	Metal/Macadam	12ft	3ft		
		2	Shwe Yamin-Thein Taw-Kyun Le-Kyar Pin Aing-Nyaung Pin Thar Road	5.00	8.05	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		3	OMC-Ywa Than Road	1.00	1.61	Earth	Metal/Macadam	12ft	3ft		
		4	OMC-Laung Shay-Let Pan Gyi-Pan twin Road	2.75	4.43	Earth	Metal/Macadam	12ft	3ft		
		5	OMC-Paunk Tone-Win Gyi Road	1.00	1.61	Earth	Metal/Macadam	12ft	3ft		
		6	Khin U-Thin Paung Kar-Chaung Zone-Than Bo Road	2.50	4.02	Earth	Metal/Macadam	12ft	3ft		
		7	Khin U - Kan Tar Yar - Ba Oo Road	5.00	8.05	Metal/Macadam	Asphalt	12ft	4ft		
		8	Kin U-Kun Tine-Nyaung Kan Road	4.00	6.44	Earth	Metal/Macadam	12ft	3ft		
		9	OMC - Pi daw gon - Yauk thin gan	1.90	3.06	Earth	Metal/Macadam	12ft	3ft		
		10	OMC- Ma daing gyi - Ma daung hla - Shwe Kar	1.50	2.41	Metal/Macadam	Asphalt	12ft	4ft		
		11	Ngar Yon Gyi- Jya Poet- Payk Thint Ton	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		12	Pauk thin dan - Gya Bo - Si Bok taya - Tha yet kan - OMC	2.80	4.51	Metal/Macadam	Asphalt	12ft	4ft		
		13	Khin - U - Ye U Road - Hnaw gon	1.30	2.09	Earth	Metal/Macadam	12ft	3ft		
		14	Khin U - Ye U Road - Ok sa twin	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
			Total	**39.25**	**63.18**						
	Shwebo	1	Nyaung Yin Kon - Pauk Ton Village to Village Road	0.57	0.91	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		2	Chaung Zone - Pauk Ton Village to Village Road	1.80	2.90	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		3	Tint Tal - Zi Kon Lay Road	1.06	1.71	Earth	Metal/Macadam	12ft	3ft		
		4	Ye Kyi Wa - Kyaung Shar Taw Road	1.75	2.82	Earth	Metal/Macadam	12ft	3ft		
		5	Yon Taw - Kyaung Shar Taw Road	1.14	1.83	Earth	Metal/Macadam	12ft	3ft		
		6	Htan Zin - Seik Kun Road	1.00	1.61	Earth	Metal/Macadam	12ft	3ft		
		7	Hta Naung Kine - Ze Pyu Kon Village to Village Road	1.33	2.13	Earth	Metal/Macadam	12ft	3ft		
		8	Seik Kun - Ze Pyu Kon Road	1.00	1.61	Earth	Metal/Macadam	12ft	3ft		
		9	Ku To Seik - Hta Naung Kine Village to Village Road	2.46	3.96	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		10	War Yone Kan - Palaing Road	2.14	3.44	Earth	Metal/Macadam	12ft	3ft		
		11	Nyaung Kan - Zee Kone lay Road	4.00	6.44	Earth	Metal/Macadam	12ft	3ft		
		12	Tint Tal-Sate Khon Road (Repair)	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		13	Kyuk Myint-Shwe Bo-Nyaung Pin Thar Road(Kyuk Myint Branch -Ye Oh Sin)	1.29	2.07	Earth	Metal/Macadam	12ft	3ft		
		14	Nat Thar Kone-Tint Tal Road	0.50	0.80	Earth	Metal/Macadam	12ft	3ft		
		15	Sate Khon Village (Inside) (Thu Ka Road) Road	0.23	0.37	Earth	Metal/Macadam	12ft	3ft		
		16	Ta Kon Tai-Shwe Bo Road	2.63	4.22	Earth	Metal/Macadam	12ft	3ft		
		17	From Kon Gyi to That Kal Tan Chaung Road	0.50	0.80	Earth	Metal/Macadam	12ft	3ft		
		18	Kyaung Pan Kan - Tike Ka Taw Road	1.13	1.81	Earth	Metal/Macadam	12ft	3ft		
		19	From Sin Kut(East) to Kyuk Myaung Road	1.25	2.01	Earth	Metal/Macadam	12ft	3ft		
		20	From Shwebo - Kyuk Myaung Road to Hta Naung Kone Road	1.00	1.61	Earth	Metal/Macadam	12ft	3ft		
		21	Tha Phay Thit Cho - Kone Gyi Village to Village	0.76	1.22	Earth	Metal/Macadam	12ft	3ft		
		22	Thike Ka Taw - Thit Cho Pin Road	0.75	1.21	Earth	Metal/Macadam	12ft	3ft		
		23	Myit Kyi Nar-Tae Kyi Village Entrance Road	1.00	1.61	Earth	Metal/Macadam	12ft	3ft		
		24	Tha Pay Thit Choe to Shwe Bo-Kyut Myaung Road	1.50	2.41	Earth	Metal/Macadam	12ft	3ft		
		25	Shwe Bo -Kyuk Myaung to Min Bay Road	1.38	2.21	Earth	Metal/Macadam	12ft	3ft		
		26	Ywa Meik Tha - MaHar Nadar Kan Exist Road	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		27	Seik Kon - Ywa Zo (Road)	3.50	5.63	Earth	Metal/Macadam	12ft	3ft		
		28	Te Bin - Tha Bye Gan (Road)	1.40	2.25	Earth	Metal/Macadam	12ft	3ft		
		29	Tu Gyi - Than Ba Ya Gyan - Ye Daw Mu (Road)	7.00	11.27	Earth	Metal/Macadam	12ft	3ft		
		30	Khun Taung Gyi (Road)	1.00	1.61	Earth	Metal/Macadam	12ft	3ft		
		31	Ku Toet Seik- Thaung Htut Kaing (Road)	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		32	Min Kyaung - Sinn Kwet (Road)	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		33	Yin Mar Ywar Ah Win (Road)	2.25	3.62	Metal/Macadam	Asphalt	12ft	4ft		
		34	Shwebo- Yae Oo Road-Saing Doe(Road)	3.50	5.63	Earth	Metal/Macadam	12ft	3ft		
		35	Zee Hpyu Kone- Hna Ma Sar Yit- Leik Chin (Road)	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		36	Zee Kone Lay- Myin Chin (Road)	2.00	3.22	Metal/Macadam	Asphalt	12ft	4ft		
		37	Tha But Taw Ywar Ah Win (Road)	0.50	0.80	Earth	Metal/Macadam	12ft	3ft		
			Total	**66.29**	**106.67**						

District	Township	No.	Description	Road Length		Pavement Type		Roadway and Shoulder		Unit Cost (million kyat/mile)	Construction Cost (million kyat)
				(mile)	(km)	Present Condition	Upgrade Plan				
Shwebo	Wetlet	1	Kyee Pin Kan - Le Kine Road	1.00	1.61	Earth	Metal/Macadam	12ft	3ft		
		2	Ywa Tan - Kan Thar Village to Village Road	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		3	Wetle Ywe - Nat Kone Village to Village Road	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		4	Shwe Pan Kon-Taw Kon Road	2.75	4.43	Earth	Metal/Macadam	12ft	3ft		
		5	Than Taw Gyi-Thit Poke Kan-Hla Taw Village to Village Road	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		6	Shwe Pan Kone-Shwe Oh Kya-Kine Ywa-Nga Bae Hla Road	5.00	8.05	Earth	Metal/Macadam	12ft	3ft		
		7	Shwe Pan Kone-Taw Kone-Tha Man Thar Village to Village Road	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		8	Han Lin-Oh Pauk-Shwebo Road	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		9	From Ta Ga Nan-Ma Ha Bo-Shwe Pon Tha Road - Kun Seik (ShweBo) Road	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		10	Min Thi - Mu Kan Lay Road	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		11	Myin Thi-Mahar Bo-Taganan-Kwe Sin Village Road	4.00	6.44	Earth	Metal/Macadam	12ft	3ft		
		12	Min Thi - U Yin Tha (North) Village to Village Road	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		13	Mauk Kyo - Zin Ba - Hnaw Bin - Ta Gaung Min - Pin Xin (Road)	7.60	12.23	Earth	Metal/Macadam	12ft	3ft		
		14	Ye Cwin Gon - Lay De - Tha Byauk Gon (Road)	2.90	4.67	Earth	Metal/Macadam	12ft	3ft		
			Total	**43.25**	**69.63**						
	Taze	1	Tamar Taw-Chaung U-Ye U-Ka Lay Wa Road	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		2	Kha Baung Kyaing-Shwe Ta Kyae Road	4.00	6.44	Earth	Metal/Macadam	12ft	3ft		
		3	Thar Gaya-Mu Sate Road	1.00	1.61	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		4	Malze Li Kone-At Gyi-Thar Gala Road	6.00	9.66	Earth	Metal/Macadam	12ft	3ft		
		5	Taze-In Tine-Man Yin Road	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		6	Taze-Tok Talok-NarNaungKya Road	6.00	9.66	Earth	Metal/Macadam	12ft	3ft		
		7	Tok Talok-Nga Tan Road	4.00	6.44	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		8	Na Bet Gyi-Kyun Le Road	6.00	9.66	Earth	Metal/Macadam	12ft	3ft		
		9	Sein Sar-Kone Yoe Road	4.00	6.44	Earth	Metal/Macadam	12ft	3ft		
		10	Htan Pin Sate-Mu Kwa Road	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		11	Ye U Kone-Myauk Inn Road	3.30	5.31	Earth	Metal/Macadam	12ft	3ft		
		12	Tae Sar-Bay Yin-Mu Gwa Road	9.50	15.29	Earth	Metal/Macadam	12ft	3ft		
		13	Nga Nyaung Kya - Kyun Le Road	3.00	4.83	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		14	Ywa Shae-Kone Aing-Htan Pin Sate Road	5.00	8.05	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		15	Ywa Shae-Ka Baung Kya Road	4.00	6.44	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		16	Htan Bin Zeik - Hpet Than Gon - Bay Yin Ywa Thit - Mu Gyin (Road)	2.80	4.51	Earth	Metal/Macadam	12ft	3ft		
		17	In Kok Ka - Chaung Zon (Road)	2.50	4.02	Metal/Macadam	Asphalt	12ft	4ft		
		18	Wa Ya Nge - Ka Nu Ze - Kyun Daw Gon - In Kok Ka (Road)	3.60	5.79	Earth	Metal/Macadam	12ft	3ft		
		19	Taze - Inn Tile (Road)	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
			Total	**74.70**	**120.25**						
	Ye-U	1	Kyar Pan Nyo-lay Ywar-Mone Taing Pin-In Pin Road	7.00	11.27	Earth	Metal/Macadam	12ft	3ft		
		2	Me O - Si Thar Myae - Boke Village Road	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		3	Tabayin-Tin Tain Yan Road	3.25	5.23	Metal/Macadam	Asphalt	12ft	4ft		
		4	Oh Pho - Daunk Doe - Meik Hti Lar - Nyi Naung Road	4.25	6.84	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		5	From Kin Tat R.M.C to Nyung Lae-Nay Pu Kone entrance Road	1.50	2.41	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		6	Zaya Wati-Tar Tine-In Gyi Road	7.00	11.27	Non Pavement Earth	Earth Metal/Macadam	12ft	3ft		
		7	Si Gyi-Pyi Daung-Let Pan Gwet	3.80	6.12	Earth	Metal/Macadam	12ft	3ft		
		8	Chaung U-Zee Kan-Sa Khan Thar	1.50	2.41	Earth	Metal/Macadam	12ft	3ft		
		9	Monywa-Ye U Road - Htan Taw	1.00	1.61	Earth	Metal/Macadam	12ft	3ft		
			Total	**32.30**	**51.99**						

District	Township	No.	Description	Road Length (mile)	Road Length (km)	Pavement Type: Present Condition	Pavement Type: Upgrade Plan	Roadway and Shoulder		Unit Cost (million kyat/mile)	Construction Cost (million kyat)
Shwebo	Tabayin	1	Aung Thar Yar-Negar Twin Road	0.47	0.76	Earth	Metal/Macadam	12ft	3ft		
		2	Pyaw Bawe-Pin Si Road	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		3	That Yat Kyin RMC Road	1.63	2.62	Earth	Metal/Macadam	12ft	3ft		
		4	Mae Ole-Let Yat Kone Road	1.00	1.61	Earth	Metal/Macadam	12ft	3ft		
		5	Wae Kyi-Nyaung Hla-Tha Yat Taw Road	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		6	Kyun Yin YMC Road	0.38	0.61	Earth	Metal/Macadam	12ft	3ft		
		7	Negar Twin-Tin Tain Yan Road	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		8	Paung Taung Ku-Tat Ti (East)-Tat Ti (West) Road	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		9	Ma Ya Kan-Dai Net Road	1.63	2.62	Earth	Metal/Macadam	12ft	3ft		
		10	Kyi-Htaung Tan Village to Village Road	1.00	1.61	Earth	Metal/Macadam	12ft	3ft		
		11	Inn Bote-Kone Yoe Village to Village Road	1.25	2.01	Earth	Metal/Macadam	12ft	3ft		
		12	Sai Pyin-Gawe Pin Kone Road	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		13	Paung Taung Ku-Lae Pyin Kyet RMC Road	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		14	Pa Ga (Dy-11) Road	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		15	Sat Pyar Kyin-Inn Pin Gyi-Chaung Oo Road	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		16	Htaung Tan-Chaung Yoe-Thar Yar Aye-Owne Chan Road	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		17	Inn Tai Lay-Nge Wae Taw Road	1.50	2.41	Earth	Metal/Macadam	12ft	3ft		
		18	Tae Taw MBC Road	0.63	1.01	Earth	Metal/Macadam	12ft	3ft		
		19	Tabayin-Khon Taung-Ta Nae-Paut Taw Road	6.00	9.66	Earth	Metal/Macadam	12ft	3ft		
		20	(Tabayin - Monywa Road) - Yin dwe - Let ti	1.50	2.41	Metal/Macadam	Asphalt	12ft	4ft		
		21	(Tabayin - Monywa Road) - Pyan gya - Na be hla	2.70	4.35	Earth	Metal/Macadam	12ft	3ft		
		22	RMC-Kyaut Mae Taw	2.50	4.02	Earth	Metal/Macadam	12ft	3ft		
		23	YMC-A Baya-Zee Phyu Kone-Taw Tan-Mya Yake	3.00	4.83	Earth	Metal/Macadam	12ft	3ft		
		24	YMC-Tha Yet Kaung-Saing Pyin	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		25	YMC-Min Swe Hnit-Ohn Ta Pin	4.50	7.24	Metal/Macadam	Asphalt	12ft	4ft		
		26	Branch Canal-Let Ti	1.20	1.93	Earth	Metal/Macadam	12ft	3ft		
		27	Kywe Toe Chon-Chaung Mee To-Oke Se	2.40	3.86	Earth	Metal/Macadam	12ft	3ft		
		28	MBC-Ba Bwe-Ma Ya Kan	4.00	6.44	Earth	Metal/Macadam	12ft	3ft		
		29	MBC-Yin Kyay-ma Ya Kan Branch Canal	2.20	3.54	Earth	Metal/Macadam	12ft	3ft		
		30	MBC-Sin Wut Kone	1.20	1.93	Earth	Metal/Macadam	12ft	3ft		
		31	DY7-Myin Ta Kyay	1.40	2.25	Earth	Metal/Macadam	12ft	3ft		
			Total	**67.09**	**107.97**						
Monywa	Budalin	1	Maung Htaung - Ku Taw - Ywa Mon	4.50	7.24	Earth	Metal/Macadam	12ft	3ft		
		2	Ma Daing Kyin - Chaung Mi Toe - Hnaw Pin Gyi	4.00	6.44	Non Pavement	Earth	12ft	3ft		
						Earth	Metal/Macadam	12ft	3ft		
		3	Maung Htaung - Ku Kaw Road	4.50	7.24	Earth	Metal/Macadam	12ft	3ft		
		4	Ye Htwat - Lat Pan Road	1.25	2.01	Earth	Metal/Macadam	12ft	3ft		
		5	Ywa Mon - Mauk Tat Road	4.00	6.44	Earth	Metal/Macadam	12ft	3ft		
		6	Butalin - Sin Yan - Kin San Road	4.00	6.44	Earth	Metal/Macadam	12ft	3ft		
		7	Ku Taw - Wat Ye Road	4.00	6.44	Earth	Metal/Macadam	12ft	3ft		
			Total	**26.25**	**42.25**						
	Ayadaw	1	Ayadaw-Naung Gyi Aei-MaKyii KanKone Thar-Wat Pyit Access Road	4.00	6.44	Earth	Metal/Macadam	12ft	3ft		
		2	Thar Ci-Naung Gyi Aei - Naung Gyi Aei-ChinPin Accesss Road	1.50	2.41	Earth	Metal/Macadam	12ft	3ft		
		3	FokeKone-Oak Shi Gyi-Kaung Thit Access Road	2.00	3.22	Metal/Macadam	Asphalt	12ft	4ft		
		4	Fokekone-KywanTaw Access Road	2.00	3.22	Earth	Metal/Macadam	12ft	3ft		
		5	Ayadaw-Wartawma Access Road	5.00	8.05	Metal/Macadam	Asphalt	12ft	4ft		
			Total	**14.50**	**23.34**						

(2) Rural Bridge Improvement

District	Township	Description	Bridge Length (feet)	Cost (million kyat)
Kanbalu	Kanbalu	Kanbulu-Nga Toe-Kyay Pin Act-Nga Pyaw Tine Road Bridge (1)	30 ft	
		Kanbulu-Nga Toe-Kyay Pin Act-Nga Pyaw Tine Road Bridge (2)	90 ft	
	Kyunhla	Phyut Chaung Bridge	150 ft	
Shwebo	Kin-U	Ywar Thit - Ywar Thar's Road (1) (Bridge)	60 ft	
		Ywar Thit - Ywar Thar's Road (2) (Bridge)	60 ft	
	Shwebo	Kyaung Pan Kan - Thike Ka Taw's Road (Bridge)	30 ft	
		Year Made Thar to Mahar Nandar Kan's Road (Bridge)	40 ft	
		Sate Kon to Htun Zin Village's Road (Bridge)	30 ft	
		Than Pu Yar Chan Bridge	90 ft	
		Sin Kut Village out line bridge	40 ft	
		PaLaing - Kun Seik Bridge	60 ft	
		Ywar Taw Bridge	20 ft	
		Myin Si Bridge (1)	250 ft	
		Thit Pin Cho Bridge (Concrete Floor and Access Road)	130 ft	
		Myin Si Bridge (2)	50 ft	
		Min Pay Bridge	160 ft	
		Yekyiwa Kyaungshataw Bridge	150 ft	
		Minpay Bridge	200 ft	
		Myinsi Bridge	150 ft	
	Wetlet	Han Lin Village Entrance (S) Cause way Repair (Bridge)	60 ft	
		Shwe Pan Kone Village (S) -Kee Canal Bridge	110 ft	
		Han Lin - Sar Taung Gyi Village Entrance Bridge	50 ft	
	Taze	Si Tone Lone Chaung Bridge	610 ft	
		I Aye Inn bridge on Bay Yin - Thae Sar's Road	40 ft	
		Cross Phout Chaung bridge on Nga Bat Kyi - Kyun Lae's Road	90 ft	
		Si Sar village entrance bridge	30 ft	
		Ma Aye bridge on Taze - Toke Ta Loke's Road (Bridge)	40 ft	
		Nat Kyi Sin bridge on Taze - Toke Ta Loke's Road (Bridge)	30 ft	
		Phyut Chaung Bridge	100 ft	
	Ye-U	Ku Za La Stream Bridge on Mon Tine Pin - Hlae Twin Road	40 ft	
		Pone Paw Stream Bridge on Oak Pho - Aung Kae Zin Road	90 ft	
	Tabayin	Tabayin-Nyaung Hla Road (On) Ywar Shae (Near) Bridge Construction	30 ft	
		Tabayin-Nyaung Hla Bridge Construction	20 ft	
		Kyun Taw (S) Ywar Lae Chaung Canal Bridge Construction	30 ft	
		Tabayin -Naung Hla	60 ft	
		Tabayin-Naung Hla	40 ft	
		Tabayin -Naung Hla	30 ft	
		Tabayin -Naung Hla	30 ft	
		YMC-Tha Yat Kaung	110 ft	
Monywa	Budalin	Bridge on Maung Htaung Road (1)	30 ft	
		Bridge on Maung Htaung Road (2)	30 ft	
		Sae Wa Village Entrance Bridge	80 ft	
			Total	

(3) Canal Inspection Road Improvement

System	Canal Name	Station No.(ft)	Canal Length		Condition of Pavement			Unit Cost (million kyat/mile)	Re-sectioning Work	Construction Cost (million kyat)
			(mile)	(km)	Type of Pavement	Roadway Width	Shoulder Width			
Right Main Canal System	Right Main Canal (RMC)	RD 114 + 800 - RD 275 + 650	30.46	49.03	Metal/Macadam	12 feet	3 feet			
	Ayardaw Extension Canal	RD 0 + 000 - RD 17 + 200	3.26	5.24	Metal/Macadam	12 feet	3 feet			
	Ayardaw Extension Canal	RD 17 + 200 - RD 83 + 400	12.54	20.18	Metal/Macadam	12 feet	3 feet			
	Budalin Extension Canal	RD 0 + 000 - RD 60 + 000	11.36	18.29	Metal/Macadam	12 feet	2 feet			
	Ayataw Extension Canal	RD 95 + 000 - RD 122 + 000	5.11	8.23	Earth to Kanker	12 feet	3 feet			
	Ayataw Extension Canal	RD 83 + 400 - RD 90 + 000	1.25	2.01	Repair of Kanker	12 feet	3 feet			
	Right Main Canal (RMC)	RD 0 + 000 - RD 4 + 000	0.76	1.22	Repair of Kanker	12 feet	3 feet			
	Right Main Canal (RMC)	RD 4 + 000 - RD 4 + 450	0.09	0.14	Repair of Kanker	12 feet	3 feet			
	Right Main Canal (RMC)	RD 4 + 450 - RD 8 + 600	0.79	1.26	Repair of Kanker	12 feet	3 feet			
	Right Main Canal (RMC)	RD 8 + 600 - RD 9 + 700	0.21	0.34	Repair of Kanker	12 feet	3 feet			
	Right Main Canal (RMC)	RD 9 + 700 - RD 42 + 000	6.12	9.85	Repair of Kanker	12 feet	3 feet			
	Right Main Canal (RMC)	RD 50 + 000 - RD 56 + 000	1.14	1.83	Repair of Kanker	12 feet	3 feet			
		Sub-total	**73.09**	**117.62**						
Old Mu Canal System	Old Mu Canal (OMC)	RD 0 + 000 - RD 70 + 000	13.26	21.34	Metal/Macadam	12 feet	3 feet			
	Old Mu Canal (OMC)	RD 70 + 000 - RD 125 + 200	10.45	16.82	Metal/Macadam	12 feet	3 feet			
	Old Mu Canal (OMC)	RD 125 + 200 - RD 184 + 300	11.19	18.01	Metal/Macadam	12 feet	3 feet			
	Old Mu Canal (OMC)	RD 184 + 300 - RD 264 + 000	15.09	24.29	Asphalt	12 feet	3 feet			
	Thayat Kan DY	RD 1 + 200 - RD 19 + 200	3.41	5.49	Earth to Kanker	12 feet	3 feet			
	DY-1	RD 1 + 200 - RD 4 + 000	0.53	0.85	Earth to Kanker	12 feet	3 feet			
	DY-4	RD 2 + 000 - RD 3 + 000	0.19	0.30	Earth to Kanker	12 feet	3 feet			
	DY-7	RD 1 + 000 - RD 2 + 000	0.19	0.30	Earth to Kanker	12 feet	3 feet			
	DY-9	RD 2 + 000 - RD 3 + 800	0.34	0.55	Earth to Kanker	12 feet	3 feet			
	DO-5	RD 0 + 000 - RD 38 + 000	7.20	11.58	Earth to Kanker	12 feet	3 feet			
	Lay Tote DY	RD 0 + 000 - RD 19 + 500	3.69	5.94	Earth to Kanker	12 feet	3 feet			
	DO-4	RD 0 + 000 - RD 32 + 000	6.06	9.75	Earth to Kanker	12 feet	3 feet			
	DO-3	RD 0 + 000 - RD 18 + 000	3.41	5.49	Earth to Kanker	12 feet	3 feet			
		Sub-total	**75.01**	**120.72**						
Ye-U Main Canal	Ye-U Main Canal (YMC)	RD 0 + 000 - RD 131 + 000	24.81	39.93	Metal/Macadam	12 feet	3 feet			
	Ye-U Main Canal (YMC)	RD 131 + 000 - RD 183 + 000	9.85	15.85	Metal/Macadam	12 feet	3 feet			
	Ye-U Main Canal (YMC)	RD 183 + 000 - RD 223 + 000	7.58	12.19	Metal/Macadam	12 feet	3 feet			
	Ma Ya Kan Branch of YMC	RD 0 + 000 - RD 11 + 400	2.16	3.47	Metal/Macadam	12 feet	3 feet			
	Ma Ya Kan Branch of YMC	RD 11 + 400 - RD 72 + 300	11.53	18.56	Asphalt	12 feet	3 feet			
	Ma Ya Kan Branch of YMC	RD 72 + 300 - RD 95 + 500	4.39	7.07	Metal/Macadam	12 feet	3 feet			
Ye-U Main Canal System	DY-11	RD 0 + 000 - RD 12 + 200	2.31	3.72	Metal/Macadam	12 feet	3 feet			
	DY-7	RD 0 + 000 - RD 37 + 900	7.18	11.55	Earth to Kanker	12 feet	3 feet			
	DY-9	RD 0 + 000 - RD 20 + 500	3.88	6.25	Earth to Kanker	12 feet	3 feet			
	DY-11	RD 12 + 200 - RD 25 + 400	2.50	4.02	Earth to Kanker	12 feet	3 feet			
	DY-15	RD 0 + 000 - RD 28 + 400	5.38	8.66	Earth to Kanker	12 feet	3 feet			
	DY-15 A	RD 0 + 000 - RD 15 + 200	2.88	4.63	Earth to Kanker	12 feet	3 feet			
	DY-16	RD 0 + 000 - RD 18 + 000	3.41	5.49	Earth to Kanker	12 feet	3 feet			
	DY-18	RD 0 + 000 - RD 22 + 000	4.17	6.71	Earth to Kanker	12 feet	3 feet			
	DY-19	RD 0 + 000 - RD 18 + 700	3.54	5.70	Earth to Kanker	12 feet	3 feet			
	T.D.Y	RD 0 + 000 - RD 41 + 000	7.77	12.50	Earth to Kanker	12 feet	3 feet			
	DY-21	RD 0 + 000 - RD 11 + 000	2.08	3.35	Earth to Kanker	12 feet	3 feet			
	DY-23	RD 0 + 000 - RD 6 + 000	1.14	1.83	Earth to Kanker	12 feet	3 feet			
		Sub-total	**106.56**	**171.49**						
Shwebo Main Canal System	Shwebo Main Canal (SMC)	RD 0 + 000 - RD 143 + 400	27.16	43.71	Metal/Macadam	12 feet	3 feet			
	Mode Soe Chone Branch Canal	RD 15 + 000 - RD 90 + 000	14.20	22.86	Metal/Macadam	12 feet	2 feet			
	DY-1	RD 47 + 000 - RD 117 + 400	13.33	21.46	Metal/Macadam	12 feet	3 feet			
	DY-3	RD 0 + 000 - RD 35 + 400	6.70	10.79	Metal/Macadam	12 feet	3 feet			
	DY-4	RD 0 + 000 - RD 29 + 300	5.55	8.93	Metal/Macadam	8 feet	1 feet			
	DY-1	RD 82 + 000 - RD 123 + 500	7.86	12.65	Earth to Kanker	12 feet	3 feet			
	DY-3	RD 35 + 000 - RD 47 + 345	2.34	3.76	Earth to Kanker	12 feet	3 feet			
	DY-4	RD 0 + 000 - RD 19 + 000	3.60	5.79	Earth to Kanker	12 feet	3 feet			
	DY-5	RD 0 + 000 - RD 29 + 000	5.49	8.84	Earth to Kanker	12 feet	3 feet			
	DY-6	RD 0 + 000 - RD 12 + 000	2.27	3.66	Earth to Kanker	12 feet	3 feet			
	DY-6	RD 19 + 000 - RD 53 + 000	6.44	10.36	Earth to Kanker	12 feet	3 feet			
	DY-7	RD 0 + 000 - RD 53 + 000	10.04	16.15	Earth to Kanker	12 feet	3 feet			
	DY-8	RD 0 + 000 - RD 19 + 100	3.62	5.82	Earth to Kanker	12 feet	3 feet			
	DY-8	RD 24 + 500 - RD 43 + 660	3.63	5.84	Earth to Kanker	12 feet	3 feet			
	MBC DY-1	RD 0 + 000 - RD 13 + 800	2.61	4.21	Earth to Kanker	12 feet	3 feet			
	MBC DY-2	RD 0 + 000 - RD 23 + 300	4.41	7.10	Earth to Kanker	12 feet	3 feet			
	MBC DY-3	RD 0 + 000 - RD 20 + 000	3.79	6.10	Earth to Kanker	12 feet	3 feet			
	HBC DY-1	RD 0 + 000 - RD 28 + 000	5.30	8.53	Earth to Kanker	12 feet	3 feet			
	HBC DY-2	RD 0 + 000 - RD 12 + 000	2.27	3.66	Earth to Kanker	12 feet	3 feet			
	DY-2	RD 0 + 000 - RD 21 + 000	3.98	6.40	Earth to Kanker	12 feet	3 feet			
	HBC	RD 74 + 000 - RD 100 + 350	4.99	8.03	Repair of Kanker	12 feet	3 feet			
		Sub-total	**139.58**	**224.65**						
		Total	**394.24**	**634.47**						

APPENDIX-X

PROJECT EVALUATION

APPENDIX X: PROJECT EVALUATION

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APPENDIX X. PROJECT EVALUATION

X.1 Comparison of Three Options

There are three options proposed by the Team, namely, plan A - C. Plan C is made based on the minimum requirement, but some of upgrading / rehabilitation may not sufficient enough for long-term service period. Plan B was made by adding factors to plan C. For irrigation and drainage rehabilitation, for example, plan B is expected to increase the safety of the facilities, reduce the operation and maintenance costs etc. On the other hand, plan A is proposed as a modern systems by adding advanced facilities to plan B, however, advanced technology may not be cost-effective, so the best option is qualitatively uncertain and should be identified quantitatively.

The Team calculated economic benefits and costs by each of three plans all of which are standardized in Base 0. Plan A has maximum components so that the benefit and cost mark the largest, while the Plan C has only minimum components and the supposed benefit should be lowest. The Team considered target irrigable area, target yield, and total target length of rehabilitation which associate with volume of agro transportation within the target roads. Table X.1.1 and Table X.1.2 summarize these parameters.

Table X.1.1 Cultivated Area and Yields by the Proposed Plan

Cops	Area Cultivated (acre)				Yield (ton/acre)			
	Current	Plan A	Plan B	Plan C	Current	Plan A	Plan B	Plan C
Shwebo Paw San	308,024	313,089	313,089	313,089	1.17	1.46	1.46	1.32
Ayeyarmin	177,873	180,798	180,798	180,798	1.15	1.88	1.88	1.53
Shwe Sae Yin	223,620	306,413	305,072	276,093	1.61	1.88	1.88	1.73
IR 747	63,148	86,527	86,148	77,965	1.73	1.88	1.88	1.82

Source: JICA Survey Team

Table X.1.2 Target Length and Volume of Transportation by the Proposed Plans

Current	Plan	Target Length (km)			Volume of Transportation (ton)		
		Plan A	Plan B	Plan C	Plan A	Plan B	Plan C
Non Pavement	Earth	150	113	80	215,064	185,827	136,772
Earth	Metal/Macadam	667	607	529	1,060,156	982,215	816,295
Metal/Macadam	Gravel	52	52	44	81,014	80,655	71,763

Source: JICA Survey Team

Based on Table X.1.1 and Table X.1.2, EIRR, NPV, and B/C are calculated. Table X.1.3 summarizes the result of comparison. The result shows that, for every components, the plan B marks the highest EIRR, indicating that it can be regarded as optimal plan. It is not reasonable and unrealistic to study every options in detail because at most only one option will be realized. Thus, hereinafter, the report refers to only plan B unless there are any necessity to mention for other options.

Table X.1.3 Comparison of Three Candidate Plans

Case	IRR	NPV[*1], million Kyats	B/C[*1]
Irrigation & Drainage Improvement			
Plan A	17.2%	83,501	1.51
Plan B	20.1%	112,963	1.85
Plan C	15.3%	31,403	1.31
Land Consolidation			
Plan A	5.6%	-1.902	0.60
Plan B	5.6%	-1.902	0.60
Plan C	5.6%	-1.902	0.60
Distribution Infrastructure Improvement			
Plan A	19.0%	29,775	1.44
Plan B	19.3%	29,636	1.46
Plan C	18.2%	22,666	1.39

Note: discount ratio of 12% was applied in calculating NPV and B/C ratio.
This comparison was made based on the project costs estimated on March. On the other hand, the result of IRR analysis in Chapter 7 refers to the project cost on June. Therefore, these results are not same each other. These cash flows are available in Appendix X-4.

Source: JICA Survey Team

X.2 Effect on Generating Employment

This chapter provides a supplementary explanation of Chapter 7.8: Effect on Generating Employment.

X.2.1 Generating Employment in the Respective Stages

Table X.2.1 summarizes expected amount of employments to be generated in each of the Project implementation stage.

Table X.2.1 Expect Generating Employment by Project Implementation

Component	Description		Million Kyat	Person (no. / day)	per month (Person× days per month)	per year (Person×days per year)
Irrigation Rehabilitation	Irrigation Rehabilitation		16,160	4,320	108,000	648,000
Road Improvement	Case 1 (10 month of construction period)	Canal Inspection Road	4,030	744	18,600	186,000
		Rural Road	5,196	936	23,400	234,000
		Rural Bridge	746.5	144	3,600	36,000
		Sub-Total	9972.5	1,824	45,600	456,000
	Case 2 (6 month of construction period)	Canal Inspection Road	4,030	1,240	31,000	234,000
		Rural Road	5,196	1,560	39,000	76,000
		Rural Bridge	746.5	240	6,000	36,000
		Sub-Total	9972.5	3,040	76,000	456,000
Total During Construction			25,386	Case1:6,144 Case2:7,360	Case1:153,600 Case2:184,000	1,104,000
Agriculture	Monsoon Paddy		916	3,052	76,305	228,915*1
	Summer Paddy		4,708	17,934	448,346	1,345,038*1
	Sesame/ Pulses		9,186	40,828	1,020,700	3,062,100*1
	Sub-Total		14,810	61,814	1,545,351	4,636,053
Processing (Rice Miller)	Permanent Labor		1,642.8	992	24,800	297,600
	Seasonal Labor		1,785.6	3,968	99,200	396,800
	Sub-Total		3,428.4	4,960	124,000	694,400
Distribution	Permanent Labor		1,127	773	19,335	232,024
	Seasonal Labor		2,254	4,640	116,012	464,049
	Sub-Total		3,381	5,414	135,348	696,073
Total After Project			21,619.4	72,188	1,804,699	6,026,526

*1 It is calculated the number of labor in respective season.

Source: JICA Survey Team

1) Project Implementation (Irrigation Rehabilitation, Road Improvement)

Table X.2.2 summarizes expected amount of employments to be generated in each of the Project implementation stage. Approximately 648,000 person-day/year (4,300 person/day, 108,000 person-day/ month) of employment opportunities are to be created to meet the construction demand. Likewise, the distribution infrastructure improvement is expected to generate additional employments; about 456,000 person-day/year, consisting of 1,800 person/day or 3,000 person/day for the construction period of 10 months and 6 months respectively.

Case1: If it is assumed that construction period is 10 month in a year, about 456,000 (744 for Canal Inspection Road, 936 persons for Rural Road and 144 for Rural Bridge) of employment to be generated. For monthly and yearly, correspond to 45,600 persons/ month and 456,000/ year of employment will be generated respectively. This case plans to implement the construction work through the year except 2 month of heavy rainy season.

Case 2: If it is assumed that construction period is 6 month in a year, approximately corresponds to 3,000 persons/ day (1,240 for Canal Inspection Road, 1,560 for Rural Road and 240 for Rural Bridge) of employment to be generated. For monthly and yearly, correspond to 76,000/month and 456,000/ year of employment will be generated. This case plans to implement the construction work except rainy season.

Table X.2.2. Expect Generating Employment by Irrigation Rehabilitation and Road Construction

Component		Million Kyat	per day (No./day)	per month (Person× days per month)	per year (Person×days per year)
Irrigation Rehabilitation		16,160	4,320	108,000	648,000
Case 1 (10 month of Construction Period)	**Road Improvement**	9,226	1,824	45,600	456,000
	Canal Inspection Road	4,030	744	18,600	186,000
	Rural Road	5,196	936	23,400	234,000
	Rural Bridge	9,972.5	144	3,600	36,000
Case 2 (6 month of construction period)	**Road Improvement**	9,226	3,040	76,000	456,000
	Canal Inspection Road	4,030	1,240	31,000	234,000
	Rural Road	5,196	1,560	39,000	76,000
	Rural Bridge	9,972.5	240	6,000	36,000

Source: JICA Survey Team

2) Agriculture

Currently, only 58% of low land irrigable area is being cultivated during summer season due to insufficient irrigation water. The cropping intensity during the summer season can be increased from 58% to 69% (21,513 ha) provided that paddy is cultivated in the project area by the project. 62,370 ha under irrigated area which is increment area of 31% are cultivated for pulses. It is proposed to archive 100% in cropping intensity in summer season. About 496,000 tons of paddy production will be increased by the project implementation totally.

In relation to increased agricultural production with the Project completed, there will be a lot of employment opportunities for farm casual labors. If the current labor intensive agriculture is assumed to continue even in future, it is expected to generate new employments of 4,636,000 person-day per year (62,000 person/day, 1,545,000 person-day/month) for the farm casual labors, composed of 228,915 person-day per season for monsoon paddy, 1,345,038 person-day per season for summer paddy, and 3,062,100 person-day per season for such alternative crops as sesame or green gram as summer crop. Note that since increment for monsoon paddy is minimal with the Project, the newly created employment is also minimal, and visa versa. Table X.2.3 is shown the number of casual labor required to cultivate 1 acre of Paddy/ Pulses field for 1 day. The amount of employment in agriculture sector is referred the table and increment area of each products.

Table X.2.3 Basic Assumptions of Labor Cost of Agriculture

Monsoon Paddy			Summer Paddy			Pulses/Sesame		
Activity	No. of Labor Force to cultivate 1 Acre/day	Cost (Kyat)	Activity	No. of Labor Force to cultivate 1 Acre/day	Cost (Kyat)	Activity	No. of Labor Force to cultivate 1 Acre/day	Cost (Kyat)
Unit cost(Kyat)		**4,000**	Unit Cost(Kyat)		**3,500**	Unit Cost(Kyat)		**3,000**
Transplanting	10	40,000	Transplanting	5	17,500	Transplanting	5	15,000
1st weeding	5	20,000	1st weeding	5	17,500	1st weeding	0	0
2nd weeding	5	20,000	2nd weeding	5	17,500	2nd weeding	5	15,000
Harvesting	10	40,000	Harvesting	10	35,000	Harvesting	10	30,000
Total	**30**	**120,000**	**Total**	**25**	**87,500**	**Total**	**20**	**60,000**

Source: JICA Survey Team

3) Processing (Rice Miller)

Due to increments of the paddy production, rice millers also need additional manpower to handle the increased amount. Approximately 694,000 person-day/year (4,960 person/day, 124,000 person-day/ month) of employment are generated in this stage. As for the seasonal labor, they will work for 4

month in a year during the peak period for processing. Table X.2.4 is shown basic assumption of labor force in rice miller which has about 50tons of milling capacity per day. If such kind of rice miller will handle the increment yield of rice (496,000 ton), aforementioned amount of labor force will be required.

Table X.2.4 Basic Assumptions of Labor cost for Processing (Case of 50t of Milling Capacity Rice Miller)

Labor	No. of Labor force	Unit cost (Day)	Labor cot (Day)	Labor cost (Month)
Permanent Labors	15	5,520	138,000	2,070,000
Seasonal Labors	20	4,500	112,500	2,250,000
Total	35	10,020	250,500	**4,320,000**

Source: JICA Survey Team

4) Distribution

As for the distribution of products, approximately 696,000 person-day per year (5,414 person/day, 135,348 person-day/month) of employment will be expected to occur upon the Project completed. The Seasonal labors are working for 4 month during the peak season. They are mainly working for loading and unloading the products. Mainly, there are two kinds of distribution way, one is from farm land to rice miller (Trader) another is from rice miller to retailer (or consumer). Table X.2.5 is shown of basic assumption of labor cost for distribution. After the road improvement, it assumes the small and medium scale of track will be used for distribution instead of bull cart.

Table X.2.5 Basic Assumptions of Labor cost for Distribution

Type of Vehicle	Working Time (hrs/time)	Number of Labor	Unit Cost	Operator	Unit Cost
S & M Truck (3 tons)	3	2	1,200	1	1,200

Source: JICA Survey Team

X.2.2 Ripple Effect on Employment in Other Sectors

To simulate the ripple effect on employment in other industries, the analysis refers to an input-output analysis approach. The process of calculation is in accordance of a paper, "*Coefficients For Input-Output Analysis and Computation Methods*", Ministry of Internal Affairs and Communications of Japan.

In Myanmar, input-output table has not frequently been updated. The Team could find only 2000-2001 version prepared by a Japanese university Team[1], and therefore the Team employs it with necessary modifications. An "*employment matrix*", which is also a necessary tool of the analysis, has been prepared by the Team with reference to "*Labor Force, Child Labor, and School-to-Work Transition Survey, 2015*" conducted by ILO for Myanmar (These Tables can be referred to Chapter X.3.4).

Table X.2.6 is the result of calculation, showing number of jobs generated by a change in demand incurred by the Project based on general industrial structure in the union of Myanmar[2]. It is estimated that 51,392 numbers of employment will be generated thanks to 125,543 million Kyats for additional demand to be born by the Project, which is the benefit with irrigation & drainage improvement including agriculture development and extension strengthening (Base 1 case).

The most benefitted sector is "Trade", creating 8,533 numbers of employment opportunities followed by "Transportation" (694 employed), "Livestock and Fishery" (534 employed), and "Processing &

[1] "Industrial Structure in Myanmar using a new Estimated Input Output Table (2000-2001)", Kan Khine Su Thwin et al (2010)

[2] The input-output table is based on 2000-2001. It is unrealistic if one would claim that current industrial structure is not significantly different from 2000-2001, but inter-sectoral linkage generally becomes stronger as being industrialized. In this regard, the result can be interpreted as lower bound of the effect on employment.

Manufacturing" (458 employed). As the overall effect, 51,392 numbers of employment opportunities are supposed to be created.

Table X.2.6 Ripple Effect on Employment to Other Sectors based on Input-Output Table in 2000-2001

No	Sectors	Additional Demand, Million Kyats (Based on Current Price in 2015)	Ripple Effect on Employment Person
1	Agricultural	125,543	40,880
2	Livestock and Fishery	0	534
3	Forestry	0	21
4	Mining	0	4
5	Processing & Manufacturing	0	458
6	Power	0	2
7	Construction	0	213
8	Transportation	0	694
9	Communication	0	30
10	Financial Sector	0	3
11	Social and Administrative Sector	0	0
12	Rental and Other Service	0	20
13	Trade	0	8,533
14	**Total**	**125,543**	**51,392**

Source: JICA Survey Team

Reference: "Industrial Structure in Myanmar using a new Estimated Input Output Table (2000-2001)", Nan Khie Su Thwin et al (2010); "Labor Force, Child Labor and School-to-Work Transition Survey, 2015", Executive Summary, January-March 2015, ILO.

X.3 Tables of the Project Evaluation

X.3.1. Basic Assumptions of the Evaluation

The applied percentage of benefit generation by year and by project component is summarized in Table X.3.1, and the basis by each of the components are shown in Table X.3.2 – Table X.3.4.

Table X.3.1 Economic Project Benefits by Year

Components	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year
Irrigation & Drainage Improvement	0.0%	0.0%	0.0%	0.0%	2.0%	8.0%	20.0%
Land Consolidation	0.0%	0.0%	20.0%	40.0%	60.0%	80.0%	100.0%
Distribution Infrastructure Improvement	0.0%	0.0%	7.0%	25.0%	42.0%	59.0%	75.0%
Components	8th Year	9th Year	10th Year	11th Year	12th Year	13th Year	After 14th
Irrigation & Drainage Improvement	40.0%	60.0%	78.0%	92.0%	100.0%	100.0%	100.0%
Land Consolidation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Distribution Infrastructure Improvement	93.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: JICA Survey Team

Table X.3.2 Percentage of Benefit Generation of Irrigation & Drainage Improvement

Particulars	1st (DD)	2nd Year	3	4	5	6	7	8	9	10	11	After 11th years
1st Segment	0%	0%	0%	0%	2%	6%	12%	20%	20%	20%	20%	20%
2nd Segment	0%	0%	0%	0%	0%	2%	6%	12%	20%	20%	20%	20%
3rd Segment	0%	0%	0%	0%	0%	0%	2%	6%	12%	20%	20%	20%
4th Segment	0%	0%	0%	0%	0%	0%	0%	2%	6%	12%	20%	20%
5th Segment	0%	0%	0%	0%	0%	0%	0%	0%	2%	6%	12%	20%
Total	**0%**	**0%**	**0%**	**0%**	**2%**	**8%**	**20%**	**40%**	**60%**	**78%**	**92%**	**100%**

Source: JICA Survey Team

Table X.3.3 Percentage of Benefit Generation of Land Consolidation

Particulars	1st year	2	3	4	5	6	7	8	9	10	After 11th years
1st Segment	0%	0%	20%	20%	20%	20%	20%	20%	20%	20%	20%
2nd Segment	0%	0%	0%	20%	20%	20%	20%	20%	20%	20%	20%
3rd Segment	0%	0%	0%	0%	20%	20%	20%	20%	20%	20%	20%
4th Segment	0%	0%	0%	0%	0%	20%	20%	20%	20%	20%	20%
5th Segment	0%	0%	0%	0%	0%	0%	20%	20%	20%	20%	20%
Total	**0%**	**0%**	**20%**	**40%**	**60%**	**80%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: JICA Survey Team

Table X.3.4 Percentage of Benefit Generation of Distribution Infrastructure Improvement

Year	1st year	2	3	4	5	6	7	8	9	10	After 11th years
Total	0%	0%	7%	25%	42%	59%	75%	93%	100%	100%	100%

Source: JICA Survey Team

Note: This percentage is in case of Plan B (the investment plan, for other plan, refer to the Appendix)

Table X.3.5 shows a list of percentage of cost disbursement over the construction periods.

Table X.3.5. List of Percentage of Cost Disbursement over the Construction Periods (Plan B)

Components	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th year
Irrigation & Drainage Improvement	1%	2%	21%	18%	22%	17%	15%	4%
Land Consolidation	0%	5.1%	10.0%	20.0%	39.7%	25.2%	0%	0%
Distribution Infrastructure Improvement	0%	6.2%	17.6%	17.0%	17.1%	17.2%	17.3%	7.5%

Source: JICA Survey Team

X.3.2. Economic Costs

Table X.3.6 summarizes the financial and economic total cost by main project component. Table X.3.7 – X.3.9 show the breakdowns of economic conversion each of total costs by main project components.

Table X.3.6. Financial and Economic Cost by Main Component, million Kyat

Component	Financial Cost (BC + PhC)			Economic Cost (BC + PhC)		
	FC	LC	Total	FC	LC	Total
Irrigation Improvement & Agriculture Extension	20,608	146,252	166,862	20,608	129,856	150,464
Land Consolidation	90	8,334	8,425	90	7,375	7,465
Distribution Infrastructure Improvement	4,298	109,606	113,906	4,298	98,217	102,516
Program Overall	**24,997**	**264,192**	**289,193**	**24,997**	**235,448**	**260,446**

Note1: The project cost used in the economic evaluation excludes Tax, Interest and Subsidies (so-called, "Transfer Items") since they represent only transfer between individuals of the nation. Likewise, price escalation is excluded as long as it can be assumed that the influences of escalation are equally likely between benefits and costs.

Note2: Program Overall is the cost of all components, that is why the sum of the three is not corresponding to it.

Note3: To accomplish the yield increases, not only irrigation & drainage improvement but also agricultural extension services need to be implemented. Therefore, the economic evaluation is performed with the total cost of these two components.

Source: JICA Survey Team

Table X.3.7. Financial and Economic Cost of Irrigation & Drainage Improvement with Agriculture Development and Extension Strengthening, million Kyat

Component	Financial Cost			Economic Cost		
	FC	LC	Total	FC	LC	Total
Construction Cost						
Other Material						
Skilled Labor						
Unskilled Labor						
Land Acquisition						
Consultant Fee						
Administration Fee (10%)						
Base Cost	19,567	138,436	158,005	19,567	123,672	143,239
Physical Contingency						
BC+PhC	20,608	146,252	166,862	20,608	129,856	150,464
Price Escalation						
VAT						
Import Tax						
Interests						
Total	21,945	192,621	214,569	21,945	129,856	151,801

Source: JICA Survey Team

Table X.3.8 Financial and Economic Cost of Land Consolidation, million Kyat

Component	Financial Cost			Economic Cost		
	FC	LC	Total	FC	LC	Total
Construction Cost						
Other Material						
Skilled Labor						
Unskilled Labor						
Land Acquisition						
Consultant Fee						
Administration Fee (10%)						
Base Cost	86	7,887.7	7,973.7	86	7,024	7,110
Physical Contingency						
BC+PhC	90	8,334	8,425	90	7,375	7,465
Price Escalation						
VAT						
Import Tax						
Interests						
Total	98.2	10,793.0	10,891.2	98	7,375	7,473

Source: JICA Survey Team

Table X.3.9 Financial and Economic Cost of Distribution Infrastructure Improvement, million Kyat

Component	Financial Cost			Economic Cost		
	FC	LC	Total	FC	LC	Total
Construction Cost						
Other Material						
Skilled Labor						
Unskilled Labor						
Land Acquisition						
Consultant Fee						
Administration Fee (10%)						
Base Cost	4,082	103,583	107,667	4,082	93,540	97,622
Physical Contingency						
BC+PhC	4,298	109,606	113,906	4,298	98,217	102,516
Price Escalation						
VAT						
Import Tax						
Interests						
Total	4,594	145,732	150,325	4,298	98,217	102,516

Source: JICA Survey Team

X.3.3 Project Benefits

Project benefits are calculated and converted to economic price by using conversion factors, which are shown in Table X.3.10 – Table X.3.15

Table X.3.10 Calculation of Economic Annual Benefits for Irrigation & Drainage Improvement with Agricultural Extension Strengthening (Base0)

Title	Current						Planned					
	Monsoon		Summer		Winter		Monsoon		Summer		Winter	
	Shwebo Paw San	Ayeyarmin	Shwe Sae Yin	IR747	Green Gram	Sesame	Shwebo Paw San	Ayeyarmin	Shwe Sae Yin	IR747	Green Gram	Sesame
Irrigable Area, acre	485,897	485,897	286,768	286,768	-	-	493,887	493,887	391,221	391,221	-	-
Area (%)	56.8	32.8	68.7	19.4	-	-	56.8	32.8	68.7	19.4	-	-
Cultivated Area, acre	308,024	177,873	223,620	63,148	-	-	313,089	180,798	305,072	86,148	-	-
Yield, basket/acre	56.0	55.0	77.0	83.0	12.0	5.0	70.0	90.0	90.0	90.0	21.0	11.5
Total Yield, 1000 bsk	17,249.3	9,783.0	17,218.8	5,241.2	-	-	21,916.2	16,271.8	27,456.5	7,753.4	-	-
Financial Price, Kyats/bsk	9,200.0	7,800.0	4,700.0	5,100.0	30,700.0	28,500.0	9,200	7,800	4,700	5,100	30,700	28,500
Economic Price, Kyats/bsk	8,096.0	6,864.0	4,136.0	4,488.0	27,016.0	25,080.0	8,096	6,864	4,136	4,488	27,016	25,080
Profit Ratio, Financial (%)	55.6	64.1	54.1	61.7	61.7	67.7	55.6	64.1	54.1	61.7	61.7	67.7
Profit Ratio, Economic (%)	54.7	62.9	52.4	61.4	61.6	63.6	54.7	62.9	52.4	61.4	61.6	63.6
Net Financial Profit per season, million Kyats	88,233.6	48,913.0	43,782.2	16,492.5	-	-	112,105.7	81,355.7	69,813.6	24,397.6	-	-
Net Economic Profit per season, million Kyats	76,388.7	42,237.7	37,317.7	14,442.8	-	-	97,056.2	70,252.8	59,505.5	21,365.5	-	-
Difference (Plan - Current)	20,667.4	28,015.1	22,187.8	6,922.7	-	-	Net Benefit, Million Kyats				77,793	

Source: JICA Survey Team

Table X.3.11 Calculation of Economic Annual Benefits for Irrigation & Drainage Improvement with Agricultural Extension Strengthening (Base1)

Title	Current						Planned					
	Monsoon		Summer		Winter		Monsoon		Summer		Winter	
	Shwebo Paw San	Ayeyarmin	Shwe Sae Yin	IR747	Green Gram	Sesame	Shwebo Paw San	Ayeyarmin	Shwe Sae Yin	IR747	Green Gram	Sesame
Irrigable Area, acre	485,897	485,897	286,768	286,768	0	0	493,887	493,887	340,782	340,782	153,105	153,105
Area (%)	56.8	32.8	68.7	19.4	0	0	56.8	32.8	68.7	19.4	50	50
Cultivated Area, acre	308,024	177,873	223,620	63,148	0	0	313,089	180,798	265,740	75,042	76,553	76,553
Yield, basket/acre	56.0	55.0	77.0	83.0	12.0	5.0	70.0	90.0	90.0	90.0	21.0	11.5
Total Yield, 1000 bsk	17,249	9,783	17,219	5,241	0	0	21,916	16,272	23,917	6,754	1,608	880
Financial Price, Kyats/bsk	9,200	7,800	4,700	5,100	30,700	28,500	9,200	7,800	4,700	5,100	30,700	28,500
Economic Price, Kyats/bsk	8,096	6,864	4,136	4,488	27,016	25,080	8,096	6,864	4,136	4,488	27,016	25,080
Profit Ratio, Financial (%)	55.6	64.1	54.1	61.7	61.7	67.7	55.6	64.1	54.1	61.7	61.7	67.7
Profit Ratio, Economic (%)	54.7	62.9	52.4	61.4	61.6	63.6	54.7	62.9	52.4	61.4	61.6	63.6
Net Financial Profit per season, million Kyats	88,233.6	48,913.0	43,782.2	16,492.5	0.0	0.0	112,105.7	81,355.7	60,812.7	21,251.9	30,451.0	16,986.9
Net Economic Profit per season, million Kyats	76,388.7	42,237.7	37,317.7	14,442.8	0.0	0.0	97,056.2	70,252.8	51,833.6	18,610.7	26,753.4	14,043.2
Difference (Plan - Current)	20,667.4	28,015.1	14,515.9	4,167.9	26,753.4	14,043.2	Net Benefit, Million Kyats				108,162.9	

Source: JICA Survey Team

Table X.3.12 Calculation of Economic Annual Benefits for Land Consolidation

Title	Current			Planned, Base0			Planned, Base1			Planned, Base2		
	Monsoon	Summer	Winter	Monsoon	Summer	Winter	Monsoon	Summer	Winter	Monsoon	Summer	Winter
	Shwebo Paw San	IR747	No Crop	Shwebo Paw San	IR747	No Crop	Ayeyarmin	IR747	Green Gram	Ayeyarmin	Sesame	Green Gram
Land Consoludation Target Area, acre	5,000.0	5,000.0	5,000.0	4,600.0	4,600.0	4,600.0	4,600.0	4,600.0	4,600.0	4,600.0	4,600.0	4,600.0
Area (%)	100	58	0	100	58	0	100	58	58	100	58	58
Cultivated Area, ac	5,000	2,900	0	4,600	2,668	0	4,600	2,668	2,668	4,600	2,668	2,668
Yield, bsk/ac	56	83	0	66	90	0	65	90	14	65	12	14
Economic Farmgate Price , Kyat/bsk	8,096	4,488	0	8,096	4,488	0	6,864	4,488	27,016	6,864	25,080	27,016
Economic Gross Profit per ac, Kyat/ac	453,376	372,504	0	534,336	403,920	0	446,160	403,920	378,224	446,160	300,960	378,224
Economic Cost per ac, Kyat/ac	247,440	207,600	0	203,920	166,720	0	156,560	166,720	124,640	156,560	44,800	124,640
Total Economic Gross Profit , M Kyat	2,266.9	1,080.3	0.0	2,457.9	1,077.7	0.0	2,052.3	1,077.7	1,009.1	2,052.3	803.0	1,009.1
Total Gross Profit Increase , M Kyat				191.1	-2.6	0.0	-214.5	-2.6	1,009.1	-214.5	-277.3	1,009.1
Total Economic Cost , M Kyat	1,237.2	602.0	0.0	938.0	444.8	0.0	720.2	444.8	332.5	720.2	119.5	332.5
Total Cost Reduction, M Kyat				299.2	157.2	0.0	517.0	157.2	-332.5	517.0	482.5	-332.5

Benefit	Profit Increase	188.5	792.0	517.3
	Cost Reduction	456.4	341.7	667.0
	Total Benefit	644.9	1,133.7	1,184.3

Source: JICA Survey Team

Table X.3.13 Annual Benefit Accrued by Transportation Mode and by Road Segment

By Type of Transportation	Current Total Cost (Million Kyats)	Target Total Cost (Million Kyats)	Million Kyats
Animal Cart (No.3-1)	22,271	3,305	18,966
Trollergyi (No.3-2)	6,321	1,750	4,570
Small and Medium Truck (No.3-3)	3,968	6,805	-2,838
Total	**32,559**	**11,861**	**20,699**
By Segment	**Current Total Cost (Million Kyats)**	**Target Total Cost (Million Kyats)**	**Million Kyats**
Plot – Farmer	3,776	1,563	2,214
Farmer - Rural Road / Canal Road	8,270	2,771	5,499
Canal Road – Market	20,512	7,526	12,986
Total	**32,559**	**11,861**	**20,699**

Source: JICA Survey Team

Table X.3.14 Current and Target Unit Cost of Agro-Transportation (Kyats/km-kg)

Unit Cost	Current Unit Cost	Target Unit Cost	Unit Cost Reduction
Plot - Farmer (0.8km)	2.805	1.161	59%
Farmer - Rural Road / Canal Road (5.46km)	0.900	0.302	66%
Canal Road - Market (22.68 km)	0.503	0.184	63%
Weighted Average Distance Cost	0.641	0.234	64%
(Reference) Shwebo - MDL (81km)	0.074		-
(Reference) YGN - MDL (710 km)	0.033		-

Source: JICA Survey Team

Table X.3.15 Annual Benefit Accrued by Road Segment (Kyats/Year)

By Cost Category	VOC	Loading	Operation	Total
Current	12,862	7,997	9,581	30,441
Plan	4,743	1,669	1,524	7,936
Difference	8,120	6,328	8,057	22,505

Source: JICA Survey Team

Concerning the estimation of Vehicle Operation Cost (VOC), the Team applies coefficients in neighboring country (Thailand) with adjusting exchange ratio and inflation. The applied parameters are shown in Table X.3.16.

Table X.3.16 Estimated Fuel Cost, kph

Speed Range (kph)	Motor Cycle	Samlor Tuk Tuk	Taxi	Car	Medium Bus	Heavy Bus	Large Truck	Medium Truck	Heavy Truck
1	204.8	440.9	1,296.1	628.1	1,690.5	2,507.5	914.2	1,274.5	2,123.4
2	201.7	411.9	1,215.0	614.9	1,607.1	2,386.6	869.1	1,217.2	2,053.3
3	198.5	382.9	1,133.9	601.6	1,523.7	2,265.7	823.9	1,159.9	1,983.2
4	195.4	353.8	1,052.8	588.4	1,440.4	2,144.9	778.7	1,102.6	1,913.2
5	192.2	324.8	971.7	575.1	1,357.0	2,024.0	733.6	1,045.2	1,843.1
6	189.1	295.7	890.6	561.9	1,273.6	1,903.2	688.4	987.9	1,773.0
7	185.7	285.5	858.3	550.5	1,239.9	1,845.9	668.6	963.8	1,741.6
8	182.2	275.2	826.0	539.1	1,206.3	1,788.5	648.8	939.7	1,710.1
9	178.8	264.9	793.8	527.7	1,172.6	1,731.2	628.9	915.5	1,678.7
10	175.4	254.6	761.5	516.3	1,139.0	1,673.9	609.1	891.4	1,647.2
11	172.0	244.3	729.2	505.0	1,105.3	1,616.6	589.3	867.2	1,615.7
12	169.7	238.9	713.2	497.0	1,087.0	1,586.1	578.9	853.8	1,597.9
13	167.5	233.4	697.1	489.0	1,068.7	1,555.7	568.6	840.4	1,580.0
14	165.2	227.9	681.0	481.1	1,050.4	1,525.2	558.2	826.9	1,562.1
15	162.9	222.5	664.9	473.1	1,032.1	1,494.7	547.8	813.5	1,544.2
16	160.7	217.0	648.8	465.2	1,013.9	1,464.3	537.4	800.1	1,526.3
17	159.0	213.6	638.8	459.1	1,000.8	1,445.4	530.7	792.1	1,515.9
18	157.3	210.1	628.7	453.1	987.8	1,426.4	524.0	784.1	1,505.4
19	155.6	206.6	618.6	447.0	974.8	1,407.5	517.4	776.1	1,494.9
20	154.0	203.2	608.6	441.0	961.7	1,388.6	510.7	768.1	1,484.4
21	152.3	199.7	598.5	434.9	948.7	1,369.7	504.0	760.2	1,474.0
22	151.0	197.4	598.5	434.9	948.7	1,369.7	499.4	760.2	1,474.0
23	149.7	195.1	598.5	434.9	948.7	1,369.7	494.8	760.2	1,474.0
24	148.3	192.8	598.5	434.9	948.7	1,369.7	490.3	760.2	1,474.0
25	147.0	190.4	598.5	434.9	948.7	1,369.7	485.7	760.2	1,474.0
26	145.7	188.1	598.5	434.9	948.7	1,369.7	481.2	760.2	1,474.0
27	144.8	186.5	586.9	426.6	935.2	1,345.9	478.1	750.5	1,460.6
28	143.9	184.9	575.4	418.2	921.6	1,322.2	475.0	740.8	1,447.3
29	142.9	183.3	563.8	409.9	908.1	1,298.4	472.0	731.2	1,434.0
30	142.0	181.7	552.3	401.6	894.5	1,274.7	468.9	721.5	1,420.7

Source: JICA Survey Team referencing "*Bangkok Urban Transport Project in Thailand*" (2005) with necessary modification.

Note: Because of data limitation, the Survey Team employs VOC in neighboring country. For S&M Truck, the Team applies "Medium Truck", while Trollergyi, the Team applies "Samlor Tuk Tuk", and for the case of bull-cart, no fuel charge is needed, however, feeding and depreciation cost have to be taken into account, so the Team applies the lowest unit cost among the list, namely; the VOC of motor cycle

Table X.3.17 Transportation Cost by vehicle and by mean

Items			(Unit:Ks/vehicle)			(Unit:Ks/basket)			(Unit:Ks/hrs)		
			Animal Cart	Trollergyi	Small and Medium Truck	Animal Cart	Trollergyi	Small and Medium Truck	Animal Cart	Trollergyi	Small and Medium Truck
Non-Pavement	Plot - Farmer	Paddy	2,585	5,510	5,484	6.8	4.4	1.8	3,232	6,887	8,914
		Agri-Inputs	2,585	5,510	5,484	6.8	4.4	1.8	3,232	6,886	8,927
		Pulses and Beans	2,585	5,510	5,483	6.8	4.4	1.8	3,231	6,874	9,080
	Farmer - Rural Road / Canal Road	Paddy	3,674	6,155	5,981	9.7	4.9	2.0	668	1,119	1,414
		Agri-Inputs	3,674	6,155	5,981	9.7	4.9	2.0	668	1,119	1,414
		Pulses and Beans	3,674	6,155	5,980	9.7	4.9	2.0	668	1,120	1,415
	Canal Road - Market	Paddy	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
		Agri-Inputs	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
		Pulses and Beans	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
Earthen	Plot - Farmer	Paddy	2,559	5,492	5,473	5.8	3.8	1.6	3,199	6,864	8,552
		Agri-Inputs	2,559	5,492	5,473	5.8	3.8	1.6	3,199	6,864	8,553
		Pulses and Beans	2,559	5,492	5,473	5.8	3.8	1.6	3,198	6,867	8,530
	Farmer - Rural Road / Canal Road	Paddy	3,492	6,029	5,903	7.9	4.1	1.7	635	1,096	1,342
		Agri-Inputs	3,492	6,029	5,903	7.9	4.1	1.7	635	1,096	1,342
		Pulses and Beans	3,492	6,029	5,904	7.9	4.1	1.7	635	1,096	1,341
	Canal Road - Market	Paddy	4,684	6,716	6,453	10.6	4.6	1.8	407	584	701
		Agri-Inputs	4,684	6,716	6,453	10.6	4.6	1.8	407	584	701
		Pulses and Beans	4,684	6,716	6,453	10.6	4.6	1.8	407	584	701
Gravel	Plot - Farmer	Paddy	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
		Agri-Inputs	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
		Pulses and Beans	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	Farmer - Rural Road / Canal Road	Paddy	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
		Agri-Inputs	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
		Pulses and Beans	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	Canal Road - Market	Paddy	5,957	7,408	6,962	11.9	4.4	1.7	291	362	437
		Agri-Inputs	5,957	7,408	6,962	11.9	4.4	1.7	291	362	437
		Pulses and Beans	5,957	7,408	6,962	11.9	4.4	1.7	291	362	437
Metal	Plot - Farmer	Paddy	2,524	5,473	5,454	4.5	2.9	1.2	3,155	6,837	9,092
		Agri-Inputs	2,524	5,473	5,454	4.5	2.9	1.2	3,155	6,822	9,108
		Pulses and Beans	2,523	5,473	5,456	4.5	2.9	1.2	3,168	6,792	8,851
	Farmer - Rural Road / Canal Road	Paddy	3,250	5,899	5,774	5.8	3.1	1.3	591	1,073	1,400
		Agri-Inputs	3,250	5,899	5,775	5.8	3.1	1.3	591	1,072	1,400
		Pulses and Beans	3,249	5,901	5,773	5.8	3.1	1.3	591	1,070	1,405
	Canal Road - Market	Paddy	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
		Agri-Inputs	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
		Pulses and Beans	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
Asphalt	Plot - Farmer	Paddy	2,510	5,464	5,450	4.0	2.6	1.1	3,137	6,829	8,811
		Agri-Inputs	2,510	5,464	5,450	4.0	2.6	1.1	3,139	6,809	8,795
		Pulses and Beans	2,511	5,466	5,451	4.0	2.6	1.1	3,103	6,660	8,621
	Farmer - Rural Road / Canal Road	Paddy	3,155	5,841	5,740	5.0	2.8	1.1	574	1,062	1,351
		Agri-Inputs	3,155	5,841	5,740	5.0	2.8	1.1	574	1,062	1,351
		Pulses and Beans	3,155	5,841	5,740	5.0	2.8	1.1	574	1,060	1,351
	Canal Road - Market	Paddy	5,211	7,040	6,667	8.3	3.4	1.3	255	344	421
		Agri-Inputs	5,211	7,040	6,667	8.3	3.4	1.3	255	344	421
		Pulses and Beans	5,211	7,040	6,667	8.3	3.4	1.3	255	344	421

Source: JICA Survey Team

X.3.4. Cash flows of the three Options

Table X.3.18 – Table 3.28 show annual cash flows derived from the economic analysis.

Table X.3.18 Balance Calculation of Irrigation and Drainage Rehabilitation (Plan A), Million Kyats

							EIRR	17.21%			B/C
							NPV	83501.3			1.51
							OCC	12.00%			
Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Opportunity Cost	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit	
1	1,887	0	1,887	0	0	-1,887	1	-1,685	1,685	0	
2	3,774	38	3,812	0	0	-3,812	1	-3,039	3,039	0	
3	41,516	113	41,629	0	12,055	-53,684	1	-38,211	38,211	0	
4	35,855	944	36,798	0	12,055	-48,853	2	-31,047	31,047	0	
5	39,629	1,661	41,289	1,563	12,055	-51,781	2	-29,382	30,269	887	
6	32,080	2,453	34,534	6,252	12,055	-40,337	2	-20,436	23,603	3,167	
7	28,306	3,095	31,401	15,630	12,055	-27,826	2	-12,587	19,657	7,070	
8	5,661	3,661	9,322	31,259	0	21,937	2	8,860	3,765	12,625	
9	0	3,774	3,774	46,889	0	43,115	3	15,548	1,361	16,909	
10	0	3,774	3,774	60,956	0	57,182	3	18,411	1,215	19,626	
11	0	3,774	3,774	71,896	0	68,122	3	19,584	1,085	20,669	
12	0	3,774	3,774	78,148	0	74,374	4	19,090	969	20,059	
13	0	3,774	3,774	78,148	0	74,374	4	17,045	865	17,910	
14	0	3,774	3,774	78,148	0	74,374	5	15,218	772	15,991	
15	0	3,774	3,774	78,148	0	74,374	5	13,588	690	14,277	
16	0	3,774	3,774	78,148	0	74,374	6	12,132	616	12,748	
17	0	3,774	3,774	78,148	0	74,374	7	10,832	550	11,382	
18	0	3,774	3,774	78,148	0	74,374	8	9,672	491	10,162	
19	0	3,774	3,774	78,148	0	74,374	9	8,635	438	9,074	
20	0	3,774	3,774	78,148	0	74,374	10	7,710	391	8,101	
21	0	3,774	3,774	78,148	0	74,374	11	6,884	349	7,233	
22	0	3,774	3,774	78,148	0	74,374	12	6,146	312	6,458	
23	0	3,774	3,774	78,148	0	74,374	14	5,488	278	5,766	
24	0	3,774	3,774	78,148	0	74,374	15	4,900	249	5,149	
25	0	3,774	3,774	78,148	0	74,374	17	4,375	222	4,597	
26	0	3,774	3,774	78,148	0	74,374	19	3,906	198	4,104	
27	0	3,774	3,774	78,148	0	74,374	21	3,488	177	3,665	
28	0	3,774	3,774	78,148	0	74,374	24	3,114	158	3,272	
29	0	3,774	3,774	78,148	0	74,374	27	2,780	141	2,921	
30	0	3,774	3,774	78,148	0	74,374	30	2,482	126	2,608	
Total	188,708	94,996	283,704	1,719,263	60,275	1,375,284	270	83,501	162,929	246,431	

Source: JICA Survey Team

Note: Cash flows included in the Comparative Analysis are all standardized in Base 0.

Table X.3.19 Balance Calculation of Land Consolidation (Plan A-C), Million Kyats

					EIRR	5.58%			
					NPV	-1901.8		B/C	0.60
					OCC	12.00%			
Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit
1	0.0	0.0	0.0	-88.0	-88.0	1.12	-78.6	0.0	-78.6
2	376.5	0.0	376.5	-133.3	-509.8	1.25	-406.4	300.1	-106.3
3	740.4	3.8	744.2	-4.4	-748.6	1.40	-532.8	529.7	-3.1
4	1,477.5	11.2	1,488.7	124.6	-1,364.1	1.57	-866.9	946.1	79.2
5	2,936.3	25.9	2,962.2	253.6	-2,708.6	1.76	-1,536.9	1,680.8	143.9
6	1,859.8	55.3	1,915.1	470.6	-1,444.6	1.97	-731.9	970.3	238.4
7	0.0	73.9	73.9	644.9	571.0	2.21	258.3	33.4	291.7
8	0.0	73.9	73.9	644.9	571.0	2.48	230.6	29.8	260.4
9	0.0	73.9	73.9	644.9	571.0	2.77	205.9	26.6	232.5
10	0.0	73.9	73.9	644.9	571.0	3.11	183.8	23.8	207.6
11	0.0	73.9	73.9	644.9	571.0	3.48	164.1	21.2	185.4
12	0.0	73.9	73.9	644.9	571.0	3.90	146.6	19.0	165.5
13	0.0	73.9	73.9	644.9	571.0	4.36	130.8	16.9	147.8
14	0.0	73.9	73.9	644.9	571.0	4.89	116.8	15.1	132.0
15	0.0	73.9	73.9	644.9	571.0	5.47	104.3	13.5	117.8
16	0.0	73.9	73.9	644.9	571.0	6.13	93.1	12.1	105.2
17	0.0	73.9	73.9	644.9	571.0	6.87	83.2	10.8	93.9
18	0.0	73.9	73.9	644.9	571.0	7.69	74.2	9.6	83.9
19	0.0	73.9	73.9	644.9	571.0	8.61	66.3	8.6	74.9
20	0.0	73.9	73.9	644.9	571.0	9.65	59.2	7.7	66.9
21	0.0	73.9	73.9	644.9	571.0	10.80	52.8	6.8	59.7
22	0.0	73.9	73.9	644.9	571.0	12.10	47.2	6.1	53.3
23	0.0	73.9	73.9	644.9	571.0	13.55	42.1	5.5	47.6
24	0.0	73.9	73.9	644.9	571.0	15.18	37.6	4.9	42.5
25	0.0	73.9	73.9	644.9	571.0	17.00	33.6	4.3	37.9
26	0.0	73.9	73.9	644.9	571.0	19.04	30.0	3.9	33.9
27	0.0	73.9	73.9	644.9	571.0	21.32	26.8	3.5	30.2
28	0.0	73.9	73.9	644.9	571.0	23.88	23.9	3.1	27.0
29	0.0	73.9	73.9	644.9	571.0	26.75	21.3	2.8	24.1
30	0.0	73.9	73.9	644.9	571.0	29.96	19.1	2.5	21.5
Total	7,390.5	1,869.8	9,260.3	16,099.7	6,839.5	270.3	-1,901.8	4,718.4	2,816.7

Source: JICA Survey Team

Note: Cash flows included in the Comparative Analysis are all standardized in Base 0.

Table X.3.20 Balance Calculation of Market Distribution System Improvement (Plan A) , Million Kyats

					EIRR	19.03%			
					NPV	29775.4		B/C	1.44
					OCC	12.00%			
Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit
1	0	0	0	0	0	1	0	0	0
2	5,862	0	5,862	0	-5,862	1	-4,673	4,673	0
3	17,889	117	18,007	1,247	-16,760	1	-11,929	12,817	888
4	17,283	475	17,758	5,051	-12,707	2	-8,076	11,286	3,210
5	17,384	821	18,205	8,726	-9,479	2	-5,379	10,330	4,951
6	17,485	1,168	18,654	12,423	-6,231	2	-3,157	9,450	6,294
7	17,586	1,518	19,104	16,141	-2,963	2	-1,340	8,642	7,301
8	7,580	1,870	9,450	19,880	10,430	2	4,212	3,817	8,029
9	0	2,021	2,021	21,492	19,471	3	7,021	729	7,750
10	0	2,021	2,021	21,492	19,471	3	6,269	651	6,920
11	0	2,021	2,021	21,492	19,471	3	5,597	581	6,178
12	0	2,021	2,021	21,492	19,471	4	4,998	519	5,516
13	0	2,021	2,021	21,492	19,471	4	4,462	463	4,925
14	0	2,021	2,021	21,492	19,471	5	3,984	414	4,398
15	0	2,021	2,021	21,492	19,471	5	3,557	369	3,927
16	0	2,021	2,021	21,492	19,471	6	3,176	330	3,506
17	0	2,021	2,021	21,492	19,471	7	2,836	294	3,130
18	0	2,021	2,021	21,492	19,471	8	2,532	263	2,795
19	0	2,021	2,021	21,492	19,471	9	2,261	235	2,495
20	0	2,021	2,021	21,492	19,471	10	2,018	210	2,228
21	0	2,021	2,021	21,492	19,471	11	1,802	187	1,989
22	0	2,021	2,021	21,492	19,471	12	1,609	167	1,776
23	0	2,021	2,021	21,492	19,471	14	1,437	149	1,586
24	0	2,021	2,021	21,492	19,471	15	1,283	133	1,416
25	0	2,021	2,021	21,492	19,471	17	1,145	119	1,264
26	0	2,021	2,021	21,492	19,471	19	1,023	106	1,129
27	0	2,021	2,021	21,492	19,471	21	913	95	1,008
28	0	2,021	2,021	21,492	19,471	24	815	85	900
29	0	2,021	2,021	21,492	19,471	27	728	76	803
30	0	2,021	2,021	21,492	19,471	30	650	67	717
Total	101,070	50,440	151,510	536,292	384,782	270	29,775	67,256	97,031

Source: JICA Survey Team

Table X.3.21 Balance Calculation of Irrigation and Drainage Rehabilitation (Plan B), Million Kyats

							EIRR	20.09%		B/C	
							NPV	112,962		1.85	
							OCC	12.00%			
Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Opportunity Cost	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit	
1	1,447	0	1,447	0	0	-1,447	1.1	-1,292	1,292	0	
2	2,893	29	2,922	0	0	-2,922	1.3	-2,329	2,329	0	
3	30,378	87	30,465	0	12,055	-42,520	1.4	-30,265	30,265	0	
4	26,038	694	26,732	0	12,055	-38,787	1.6	-24,650	24,650	0	
5	31,824	1,215	33,039	1,556	12,055	-43,539	1.8	-24,705	25,588	883	
6	24,592	1,852	26,443	6,223	12,055	-32,275	2.0	-16,351	19,504	3,153	
7	21,698	2,343	24,042	15,559	12,055	-20,538	2.2	-9,290	16,328	7,038	
8	5,786	2,777	8,564	31,117	0	22,554	2.5	9,109	3,459	12,568	
9	0	2,893	2,893	46,676	0	43,783	2.8	15,788	1,043	16,832	
10	0	2,893	2,893	60,679	0	57,785	3.1	18,605	932	19,537	
11	0	2,893	2,893	71,570	0	68,676	3.5	19,743	832	20,575	
12	0	2,893	2,893	77,793	0	74,900	3.9	19,225	743	19,968	
13	0	2,893	2,893	77,793	0	74,900	4.4	17,165	663	17,828	
14	0	2,893	2,893	77,793	0	74,900	4.9	15,326	592	15,918	
15	0	2,893	2,893	77,793	0	74,900	5.5	13,684	529	14,212	
16	0	2,893	2,893	77,793	0	74,900	6.1	12,218	472	12,690	
17	0	2,893	2,893	77,793	0	74,900	6.9	10,909	421	11,330	
18	0	2,893	2,893	77,793	0	74,900	7.7	9,740	376	10,116	
19	0	2,893	2,893	77,793	0	74,900	8.6	8,696	336	9,032	
20	0	2,893	2,893	77,793	0	74,900	9.6	7,765	300	8,065	
21	0	2,893	2,893	77,793	0	74,900	10.8	6,933	268	7,200	
22	0	2,893	2,893	77,793	0	74,900	12.1	6,190	239	6,429	
23	0	2,893	2,893	77,793	0	74,900	13.6	5,527	213	5,740	
24	0	2,893	2,893	77,793	0	74,900	15.2	4,935	191	5,125	
25	0	2,893	2,893	77,793	0	74,900	17.0	4,406	170	4,576	
26	0	2,893	2,893	77,793	0	74,900	19.0	3,934	152	4,086	
27	0	2,893	2,893	77,793	0	74,900	21.3	3,512	136	3,648	
28	0	2,893	2,893	77,793	0	74,900	23.9	3,136	121	3,257	
29	0	2,893	2,893	77,793	0	74,900	26.7	2,800	108	2,908	
30	0	2,893	2,893	77,793	0	74,900	30.0	2,500	97	2,597	
Total	144,656	72,646	217,303	1,711,447	60,275	1,433,869	270.3	112,963	132,348	245,310	

Source: JICA Survey Team

Note: Cash flows included in the Comparative Analysis are all standardized in Base 0.

Table X.3.22 Balance Calculation of Market Distribution System Improvement (Base0 of Plan B) , Million Kyats

					EIRR	19.32%			
					NPV	29635.7		B/C	1.46
					OCC	12.00%			
Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit
1	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
2	5,964.1	0.0	5,964.1	0.0	-5,964.1	1.3	-4,754.5	4,754.5	0.0
3	17,026.5	119.3	17,145.8	1,285.0	-15,860.8	1.4	-11,289.4	12,204.0	914.6
4	16,353.1	459.8	16,812.9	4,954.0	-11,858.9	1.6	-7,536.6	10,684.9	3,148.4
5	16,449.3	786.9	17,236.2	8,478.0	-8,758.2	1.8	-4,969.6	9,780.3	4,810.6
6	16,545.5	1,115.9	17,661.4	12,023.0	-5,638.4	2.0	-2,856.6	8,947.8	6,091.2
7	16,641.7	1,446.8	18,088.5	15,588.0	-2,500.5	2.2	-1,131.1	8,182.3	7,051.2
8	7,214.6	1,779.6	8,994.2	19,175.0	10,180.8	2.5	4,111.8	3,632.6	7,744.5
9	0.0	1,923.9	1,923.9	20,729.0	18,805.1	2.8	6,781.3	693.8	7,475.1
10	0.0	1,923.9	1,923.9	20,729.0	18,805.1	3.1	6,054.7	619.4	6,674.2
11	0.0	1,923.9	1,923.9	20,729.0	18,805.1	3.5	5,406.0	553.1	5,959.1
12	0.0	1,923.9	1,923.9	20,729.0	18,805.1	3.9	4,826.8	493.8	5,320.6
13	0.0	1,923.9	1,923.9	20,729.0	18,805.1	4.4	4,309.6	440.9	4,750.6
14	0.0	1,923.9	1,923.9	20,729.0	18,805.1	4.9	3,847.9	393.7	4,241.6
15	0.0	1,923.9	1,923.9	20,729.0	18,805.1	5.5	3,435.6	351.5	3,787.1
16	0.0	1,923.9	1,923.9	20,729.0	18,805.1	6.1	3,067.5	313.8	3,381.3
17	0.0	1,923.9	1,923.9	20,729.0	18,805.1	6.9	2,738.9	280.2	3,019.1
18	0.0	1,923.9	1,923.9	20,729.0	18,805.1	7.7	2,445.4	250.2	2,695.6
19	0.0	1,923.9	1,923.9	20,729.0	18,805.1	8.6	2,183.4	223.4	2,406.8
20	0.0	1,923.9	1,923.9	20,729.0	18,805.1	9.6	1,949.5	199.4	2,148.9
21	0.0	1,923.9	1,923.9	20,729.0	18,805.1	10.8	1,740.6	178.1	1,918.7
22	0.0	1,923.9	1,923.9	20,729.0	18,805.1	12.1	1,554.1	159.0	1,713.1
23	0.0	1,923.9	1,923.9	20,729.0	18,805.1	13.6	1,387.6	142.0	1,529.6
24	0.0	1,923.9	1,923.9	20,729.0	18,805.1	15.2	1,238.9	126.8	1,365.7
25	0.0	1,923.9	1,923.9	20,729.0	18,805.1	17.0	1,106.2	113.2	1,219.3
26	0.0	1,923.9	1,923.9	20,729.0	18,805.1	19.0	987.7	101.0	1,088.7
27	0.0	1,923.9	1,923.9	20,729.0	18,805.1	21.3	881.8	90.2	972.1
28	0.0	1,923.9	1,923.9	20,729.0	18,805.1	23.9	787.4	80.6	867.9
29	0.0	1,923.9	1,923.9	20,729.0	18,805.1	26.7	703.0	71.9	774.9
30	0.0	1,923.9	1,923.9	20,729.0	18,805.1	30.0	627.7	64.2	691.9
Total	96,194.8	48,033.9	144,228.7	517,541.0	373,312.3	270.3	29,635.7	64,126.5	93,762.2

Source: JICA Survey Team

Note: Cash flows included in the Comparative Analysis are all standardized in Base 0.

Table X.3.23 Balance Calculation of Irrigation and Drainage Rehabilitation (Base0 of Plan C), Million Kyats

EIRR	15.26%		B/C
NPV	31402.6		1.31
OCC	12.00%		

Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Opportu nity Cost	Net Benefit	Discount Rate	Present Value	Discounte d Cost	Discounte d Benefit
1	894	0	894	0	0	-894	1	-798	798	0
2	2,384	18	2,402	0	0	-2,402	1	-1,915	1,915	0
3	21,058	66	21,123	0	12,055	-33,178	1	-23,616	23,616	0
4	18,376	487	18,863	0	12,055	-30,918	2	-19,649	19,649	0
5	22,548	854	23,402	846	12,055	-34,611	2	-19,639	20,119	480
6	15,893	1,305	17,198	3,384	12,055	-25,869	2	-13,106	14,820	1,715
7	14,204	1,623	15,827	8,460	12,055	-19,422	2	-8,785	12,612	3,827
8	3,874	1,907	5,781	16,921	0	11,140	2	4,499	2,335	6,834
9	0	1,985	1,985	25,381	0	23,397	3	8,437	716	9,153
10	0	1,985	1,985	32,996	0	31,011	3	9,985	639	10,624
11	0	1,985	1,985	38,918	0	36,933	3	10,617	571	11,188
12	0	1,985	1,985	42,302	0	40,318	4	10,349	509	10,858
13	0	1,985	1,985	42,302	0	40,318	4	9,240	455	9,695
14	0	1,985	1,985	42,302	0	40,318	5	8,250	406	8,656
15	0	1,985	1,985	42,302	0	40,318	5	7,366	363	7,728
16	0	1,985	1,985	42,302	0	40,318	6	6,577	324	6,900
17	0	1,985	1,985	42,302	0	40,318	7	5,872	289	6,161
18	0	1,985	1,985	42,302	0	40,318	8	5,243	258	5,501
19	0	1,985	1,985	42,302	0	40,318	9	4,681	230	4,912
20	0	1,985	1,985	42,302	0	40,318	10	4,180	206	4,385
21	0	1,985	1,985	42,302	0	40,318	11	3,732	184	3,915
22	0	1,985	1,985	42,302	0	40,318	12	3,332	164	3,496
23	0	1,985	1,985	42,302	0	40,318	14	2,975	146	3,121
24	0	1,985	1,985	42,302	0	40,318	15	2,656	131	2,787
25	0	1,985	1,985	42,302	0	40,318	17	2,372	117	2,488
26	0	1,985	1,985	42,302	0	40,318	19	2,118	104	2,222
27	0	1,985	1,985	42,302	0	40,318	21	1,891	93	1,984
28	0	1,985	1,985	42,302	0	40,318	24	1,688	83	1,771
29	0	1,985	1,985	42,302	0	40,318	27	1,507	74	1,581
30	0	1,985	1,985	42,302	0	40,318	30	1,346	66	1,412
Total	99,230	49,921	149,151	930,648	60,275	721,222	270	31,403	101,992	133,394

Source: JICA Survey Team

Note: Cash flows included in the Comparative Analysis are all standardized in Base 0.

Table X.3.24 Balance Calculation of Market Distribution System Improvement (Base0 of Plan C) , Million Kyats

EIRR	18.19%		
NPV	22666.4	B/C	1.39
OCC	12.00%		

Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit
1	0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
2	5,767.8	0.0	5,767.8	0.0	-5,767.8	1.3	-4,598.1	4,598.1	0.0
3	15,380.8	115.4	15,496.1	1,180.0	-14,316.1	1.4	-10,189.9	11,029.8	839.9
4	14,856.4	423.0	15,279.4	4,327.0	-10,952.4	1.6	-6,960.5	9,710.3	2,749.9
5	14,943.8	720.1	15,663.9	7,366.0	-8,297.9	1.8	-4,708.5	8,888.1	4,179.7
6	14,943.8	1,019.0	15,962.8	10,424.0	-5,538.8	2.0	-2,806.1	8,087.3	5,281.1
7	15,031.2	1,317.9	16,349.1	13,481.0	-2,868.1	2.2	-1,297.4	7,395.5	6,098.1
8	6,466.9	1,618.5	8,085.4	16,556.0	8,470.6	2.5	3,421.1	3,265.6	6,686.7
9	0.0	1,747.8	1,747.8	17,879.0	16,131.2	2.8	5,817.1	630.3	6,447.3
10	0.0	1,747.8	1,747.8	17,879.0	16,131.2	3.1	5,193.8	562.8	5,756.6
11	0.0	1,747.8	1,747.8	17,879.0	16,131.2	3.5	4,637.3	502.5	5,139.8
12	0.0	1,747.8	1,747.8	17,879.0	16,131.2	3.9	4,140.5	448.6	4,589.1
13	0.0	1,747.8	1,747.8	17,879.0	16,131.2	4.4	3,696.9	400.6	4,097.4
14	0.0	1,747.8	1,747.8	17,879.0	16,131.2	4.9	3,300.8	357.6	3,658.4
15	0.0	1,747.8	1,747.8	17,879.0	16,131.2	5.5	2,947.1	319.3	3,266.4
16	0.0	1,747.8	1,747.8	17,879.0	16,131.2	6.1	2,631.3	285.1	2,916.5
17	0.0	1,747.8	1,747.8	17,879.0	16,131.2	6.9	2,349.4	254.6	2,604.0
18	0.0	1,747.8	1,747.8	17,879.0	16,131.2	7.7	2,097.7	227.3	2,325.0
19	0.0	1,747.8	1,747.8	17,879.0	16,131.2	8.6	1,872.9	202.9	2,075.9
20	0.0	1,747.8	1,747.8	17,879.0	16,131.2	9.6	1,672.3	181.2	1,853.5
21	0.0	1,747.8	1,747.8	17,879.0	16,131.2	10.8	1,493.1	161.8	1,654.9
22	0.0	1,747.8	1,747.8	17,879.0	16,131.2	12.1	1,333.1	144.4	1,477.6
23	0.0	1,747.8	1,747.8	17,879.0	16,131.2	13.6	1,190.3	129.0	1,319.3
24	0.0	1,747.8	1,747.8	17,879.0	16,131.2	15.2	1,062.8	115.1	1,177.9
25	0.0	1,747.8	1,747.8	17,879.0	16,131.2	17.0	948.9	102.8	1,051.7
26	0.0	1,747.8	1,747.8	17,879.0	16,131.2	19.0	847.2	91.8	939.0
27	0.0	1,747.8	1,747.8	17,879.0	16,131.2	21.3	756.4	82.0	838.4
28	0.0	1,747.8	1,747.8	17,879.0	16,131.2	23.9	675.4	73.2	748.6
29	0.0	1,747.8	1,747.8	17,879.0	16,131.2	26.7	603.0	65.3	668.4
30	0.0	1,747.8	1,747.8	17,879.0	16,131.2	30.0	538.4	58.3	596.8
Total	87,390.8	43,665.7	131,056.6	446,672.0	315,615.4	270.3	22,666.4	58,371.2	81,037.6

Source: JICA Survey Team

Note: Cash flows included in the Comparative Analysis are all standardized in Base 0.

X.3.5. Results of the Evaluation

Table X.3.25 Balance Calculation of Irrigation and Drainage Rehabilitation (Base0), Million Kyats

							EIRR	19.48%		B/C
							NPV	107,563		1.78
							OCC	12.00%		
Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Opportu nity Cost	Net Benefit	Discoun t Rate	Present Value	Discoun ted Cost	Discounte d Benefit
1	0	0	0	0	0	0	1.1	0	0	0
2	6,019	0	6,019	0	0	-6,019	1.3	-4,798	4,798	0
3	33,102	120	33,223	0	12,055	-45,277	1.4	-32,228	32,228	0
4	27,084	782	27,866	0	12,055	-39,921	1.6	-25,370	25,370	0
5	31,598	1,324	32,922	1,556	12,055	-43,421	1.8	-24,638	25,521	883
6	25,579	1,956	27,535	6,223	12,055	-33,366	2.0	-16,904	20,057	3,153
7	22,570	2,468	25,037	15,559	12,055	-21,534	2.2	-9,741	16,779	7,038
8	6,019	2,919	8,938	31,117	0	22,180	2.5	8,958	3,610	12,568
9	0	3,039	3,039	46,676	0	43,636	2.8	15,736	1,096	16,832
10	0	3,039	3,039	60,679	0	57,639	3.1	18,558	979	19,537
11	0	3,039	3,039	71,570	0	68,530	3.5	19,701	874	20,575
12	0	3,039	3,039	77,793	0	74,754	3.9	19,187	780	19,968
13	0	3,039	3,039	77,793	0	74,754	4.4	17,132	697	17,828
14	0	3,039	3,039	77,793	0	74,754	4.9	15,296	622	15,918
15	0	3,039	3,039	77,793	0	74,754	5.5	13,657	555	14,212
16	0	3,039	3,039	77,793	0	74,754	6.1	12,194	496	12,690
17	0	3,039	3,039	77,793	0	74,754	6.9	10,887	443	11,330
18	0	3,039	3,039	77,793	0	74,754	7.7	9,721	395	10,116
19	0	3,039	3,039	77,793	0	74,754	8.6	8,679	353	9,032
20	0	3,039	3,039	77,793	0	74,754	9.6	7,749	315	8,065
21	0	3,039	3,039	77,793	0	74,754	10.8	6,919	281	7,200
22	0	3,039	3,039	77,793	0	74,754	12.1	6,178	251	6,429
23	0	3,039	3,039	77,793	0	74,754	13.6	5,516	224	5,740
24	0	3,039	3,039	77,793	0	74,754	15.2	4,925	200	5,125
25	0	3,039	3,039	77,793	0	74,754	17.0	4,397	179	4,576
26	0	3,039	3,039	77,793	0	74,754	19.0	3,926	160	4,086
27	0	3,039	3,039	77,793	0	74,754	21.3	3,505	143	3,648
28	0	3,039	3,039	77,793	0	74,754	23.9	3,130	127	3,257
29	0	3,039	3,039	77,793	0	74,754	26.7	2,795	114	2,908
30	0	3,039	3,039	77,793	0	74,754	30.0	2,495	101	2,597
Total	151,969	76,436	228,405	1,711,447	60,275	1,422,767	270.3	107,563	137,747	245,310

Source: JICA Survey Team

Table X.3.26 Balance Calculation of Irrigation and Drainage Rehabilitation (Base1) , Million Kyats

							EIRR	24.56%		B/C
							NPV	203,331		2.48
							OCC	12.00%		
Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Opportunity Cost	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit
1	0	0	0	0	0	0	1.1	0	0	0
2	6,019	0	6,019	0	0	-6,019	1.3	-4,798	4,798	0
3	33,102	120	33,223	0	12,055	-45,277	1.4	-32,228	32,228	0
4	27,084	782	27,866	0	12,055	-39,921	1.6	-25,370	25,370	0
5	31,598	1,324	32,922	2,163	12,055	-42,813	1.8	-24,293	25,521	1,227
6	25,579	1,956	27,535	8,653	12,055	-30,937	2.0	-15,674	20,057	4,384
7	22,570	2,468	25,037	21,633	12,055	-15,460	2.2	-6,993	16,779	9,785
8	6,019	2,919	8,938	43,265	0	34,328	2.5	13,864	3,610	17,474
9	0	3,039	3,039	64,898	0	61,858	2.8	22,307	1,096	23,403
10	0	3,039	3,039	84,367	0	81,328	3.1	26,185	979	27,164
11	0	3,039	3,039	99,510	0	96,471	3.5	27,733	874	28,607
12	0	3,039	3,039	108,163	0	105,124	3.9	26,983	780	27,763
13	0	3,039	3,039	108,163	0	105,124	4.4	24,092	697	24,788
14	0	3,039	3,039	108,163	0	105,124	4.9	21,510	622	22,132
15	0	3,039	3,039	108,163	0	105,124	5.5	19,206	555	19,761
16	0	3,039	3,039	108,163	0	105,124	6.1	17,148	496	17,644
17	0	3,039	3,039	108,163	0	105,124	6.9	15,311	443	15,753
18	0	3,039	3,039	108,163	0	105,124	7.7	13,670	395	14,065
19	0	3,039	3,039	108,163	0	105,124	8.6	12,206	353	12,558
20	0	3,039	3,039	108,163	0	105,124	9.6	10,898	315	11,213
21	0	3,039	3,039	108,163	0	105,124	10.8	9,730	281	10,012
22	0	3,039	3,039	108,163	0	105,124	12.1	8,688	251	8,939
23	0	3,039	3,039	108,163	0	105,124	13.6	7,757	224	7,981
24	0	3,039	3,039	108,163	0	105,124	15.2	6,926	200	7,126
25	0	3,039	3,039	108,163	0	105,124	17.0	6,184	179	6,363
26	0	3,039	3,039	108,163	0	105,124	19.0	5,521	160	5,681
27	0	3,039	3,039	108,163	0	105,124	21.3	4,930	143	5,072
28	0	3,039	3,039	108,163	0	105,124	23.9	4,401	127	4,529
29	0	3,039	3,039	108,163	0	105,124	26.7	3,930	114	4,043
30	0	3,039	3,039	108,163	0	105,124	30.0	3,509	101	3,610
Total	151,969	76,436	228,405	2,379,584	60,275	2,090,905	270.3	203,331	137,747	341,078

Source: JICA Survey Team

Table X.3.27 Balance Calculation of Land Consolidation (Base0), Million Kyats

					EIRR	5.46%			
					NPV	-1954.9		B/C	0.59
					OCC	12.00%			

Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit
1	0.0	0.0	0.0	-88.0	-88.0	1.12	-78.6	0.0	-78.6
2	391.8	0.0	391.8	-133.3	-525.2	1.25	-418.7	312.4	-106.3
3	754.8	3.9	758.7	-4.4	-763.0	1.40	-543.1	540.0	-3.1
4	1,488.6	11.5	1,500.1	124.6	-1,375.5	1.57	-874.1	953.3	79.2
5	2,973.2	26.4	2,999.6	253.6	-2,746.0	1.76	-1,558.2	1,702.1	143.9
6	1,857.0	56.1	1,913.1	470.6	-1,442.5	1.97	-730.8	969.2	238.4
7	0.0	74.7	74.7	644.9	570.2	2.21	257.9	33.8	291.7
8	0.0	74.7	74.7	644.9	570.2	2.48	230.3	30.2	260.4
9	0.0	74.7	74.7	644.9	570.2	2.77	205.6	26.9	232.5
10	0.0	74.7	74.7	644.9	570.2	3.11	183.6	24.1	207.6
11	0.0	74.7	74.7	644.9	570.2	3.48	163.9	21.5	185.4
12	0.0	74.7	74.7	644.9	570.2	3.90	146.3	19.2	165.5
13	0.0	74.7	74.7	644.9	570.2	4.36	130.7	17.1	147.8
14	0.0	74.7	74.7	644.9	570.2	4.89	116.7	15.3	132.0
15	0.0	74.7	74.7	644.9	570.2	5.47	104.2	13.6	117.8
16	0.0	74.7	74.7	644.9	570.2	6.13	93.0	12.2	105.2
17	0.0	74.7	74.7	644.9	570.2	6.87	83.0	10.9	93.9
18	0.0	74.7	74.7	644.9	570.2	7.69	74.1	9.7	83.9
19	0.0	74.7	74.7	644.9	570.2	8.61	66.2	8.7	74.9
20	0.0	74.7	74.7	644.9	570.2	9.65	59.1	7.7	66.9
21	0.0	74.7	74.7	644.9	570.2	10.80	52.8	6.9	59.7
22	0.0	74.7	74.7	644.9	570.2	12.10	47.1	6.2	53.3
23	0.0	74.7	74.7	644.9	570.2	13.55	42.1	5.5	47.6
24	0.0	74.7	74.7	644.9	570.2	15.18	37.6	4.9	42.5
25	0.0	74.7	74.7	644.9	570.2	17.00	33.5	4.4	37.9
26	0.0	74.7	74.7	644.9	570.2	19.04	29.9	3.9	33.9
27	0.0	74.7	74.7	644.9	570.2	21.32	26.7	3.5	30.2
28	0.0	74.7	74.7	644.9	570.2	23.88	23.9	3.1	27.0
29	0.0	74.7	74.7	644.9	570.2	26.75	21.3	2.8	24.1
30	0.0	74.7	74.7	644.9	570.2	29.96	19.0	2.5	21.5
Total	7,465.4	1,890.7	9,356.1	16,099.7	6,743.7	270.3	-1,954.9	4,771.6	2,816.7

Source: JICA Survey Team

Table X.3.28 Balance Calculation of Land Consolidation (Base1), Million Kyats

					EIRR	13.68%			
					NPV	531.1		B/C	1.11
					OCC	12.00%			
Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit
1	0.0	0.0	0.0	-88.0	-88.0	1.12	-78.6	0.0	-78.6
2	391.8	0.0	391.8	-133.3	-525.2	1.25	-418.7	312.4	-106.3
3	754.8	3.9	758.7	93.4	-665.3	1.40	-473.5	540.0	66.5
4	1,488.6	11.5	1,500.1	320.1	-1,179.9	1.57	-749.9	953.3	203.4
5	2,973.2	26.4	2,999.6	546.9	-2,452.8	1.76	-1,391.8	1,702.1	310.3
6	1,857.0	56.1	1,913.1	861.6	-1,051.5	1.97	-532.7	969.2	436.5
7	0.0	74.7	74.7	1,133.7	1,059.0	2.21	479.0	33.8	512.8
8	0.0	74.7	74.7	1,133.7	1,059.0	2.48	427.7	30.2	457.9
9	0.0	74.7	74.7	1,133.7	1,059.0	2.77	381.9	26.9	408.8
10	0.0	74.7	74.7	1,133.7	1,059.0	3.11	341.0	24.1	365.0
11	0.0	74.7	74.7	1,133.7	1,059.0	3.48	304.4	21.5	325.9
12	0.0	74.7	74.7	1,133.7	1,059.0	3.90	271.8	19.2	291.0
13	0.0	74.7	74.7	1,133.7	1,059.0	4.36	242.7	17.1	259.8
14	0.0	74.7	74.7	1,133.7	1,059.0	4.89	216.7	15.3	232.0
15	0.0	74.7	74.7	1,133.7	1,059.0	5.47	193.5	13.6	207.1
16	0.0	74.7	74.7	1,133.7	1,059.0	6.13	172.7	12.2	184.9
17	0.0	74.7	74.7	1,133.7	1,059.0	6.87	154.2	10.9	165.1
18	0.0	74.7	74.7	1,133.7	1,059.0	7.69	137.7	9.7	147.4
19	0.0	74.7	74.7	1,133.7	1,059.0	8.61	123.0	8.7	131.6
20	0.0	74.7	74.7	1,133.7	1,059.0	9.65	109.8	7.7	117.5
21	0.0	74.7	74.7	1,133.7	1,059.0	10.80	98.0	6.9	104.9
22	0.0	74.7	74.7	1,133.7	1,059.0	12.10	87.5	6.2	93.7
23	0.0	74.7	74.7	1,133.7	1,059.0	13.55	78.1	5.5	83.7
24	0.0	74.7	74.7	1,133.7	1,059.0	15.18	69.8	4.9	74.7
25	0.0	74.7	74.7	1,133.7	1,059.0	17.00	62.3	4.4	66.7
26	0.0	74.7	74.7	1,133.7	1,059.0	19.04	55.6	3.9	59.5
27	0.0	74.7	74.7	1,133.7	1,059.0	21.32	49.7	3.5	53.2
28	0.0	74.7	74.7	1,133.7	1,059.0	23.88	44.3	3.1	47.5
29	0.0	74.7	74.7	1,133.7	1,059.0	26.75	39.6	2.8	42.4
30	0.0	74.7	74.7	1,133.7	1,059.0	29.96	35.3	2.5	37.8
Total	7,465.4	1,890.7	9,356.1	28,808.3	19,452.2	270.3	531.1	4,771.6	5,302.7

Source: JICA Survey Team

Table X.3.29 Balance Calculation of Land Consolidation (Base2), Million Kyats

					EIRR	14.48%				
					NPV	788.5		B/C	1.17	
					OCC	12.00%				
Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit	
1	0.0	0.0	0.0	-88.0	-88.0	1.12	-78.6	0.0	-78.6	
2	391.8	0.0	391.8	-133.3	-525.2	1.25	-418.7	312.4	-106.3	
3	754.8	3.9	758.7	103.5	-655.2	1.40	-466.3	540.0	73.7	
4	1,488.6	11.5	1,500.1	340.4	-1,159.7	1.57	-737.0	953.3	216.3	
5	2,973.2	26.4	2,999.6	577.2	-2,422.4	1.76	-1,374.5	1,702.1	327.5	
6	1,857.0	56.1	1,913.1	902.1	-1,011.0	1.97	-512.2	969.2	457.0	
7	0.0	74.7	74.7	1,184.3	1,109.6	2.21	501.9	33.8	535.7	
8	0.0	74.7	74.7	1,184.3	1,109.6	2.48	448.1	30.2	478.3	
9	0.0	74.7	74.7	1,184.3	1,109.6	2.77	400.1	26.9	427.1	
10	0.0	74.7	74.7	1,184.3	1,109.6	3.11	357.2	24.1	381.3	
11	0.0	74.7	74.7	1,184.3	1,109.6	3.48	319.0	21.5	340.4	
12	0.0	74.7	74.7	1,184.3	1,109.6	3.90	284.8	19.2	304.0	
13	0.0	74.7	74.7	1,184.3	1,109.6	4.36	254.3	17.1	271.4	
14	0.0	74.7	74.7	1,184.3	1,109.6	4.89	227.0	15.3	242.3	
15	0.0	74.7	74.7	1,184.3	1,109.6	5.47	202.7	13.6	216.4	
16	0.0	74.7	74.7	1,184.3	1,109.6	6.13	181.0	12.2	193.2	
17	0.0	74.7	74.7	1,184.3	1,109.6	6.87	161.6	10.9	172.5	
18	0.0	74.7	74.7	1,184.3	1,109.6	7.69	144.3	9.7	154.0	
19	0.0	74.7	74.7	1,184.3	1,109.6	8.61	128.8	8.7	137.5	
20	0.0	74.7	74.7	1,184.3	1,109.6	9.65	115.0	7.7	122.8	
21	0.0	74.7	74.7	1,184.3	1,109.6	10.80	102.7	6.9	109.6	
22	0.0	74.7	74.7	1,184.3	1,109.6	12.10	91.7	6.2	97.9	
23	0.0	74.7	74.7	1,184.3	1,109.6	13.55	81.9	5.5	87.4	
24	0.0	74.7	74.7	1,184.3	1,109.6	15.18	73.1	4.9	78.0	
25	0.0	74.7	74.7	1,184.3	1,109.6	17.00	65.3	4.4	69.7	
26	0.0	74.7	74.7	1,184.3	1,109.6	19.04	58.3	3.9	62.2	
27	0.0	74.7	74.7	1,184.3	1,109.6	21.32	52.0	3.5	55.5	
28	0.0	74.7	74.7	1,184.3	1,109.6	23.88	46.5	3.1	49.6	
29	0.0	74.7	74.7	1,184.3	1,109.6	26.75	41.5	2.8	44.3	
30	0.0	74.7	74.7	1,184.3	1,109.6	29.96	37.0	2.5	39.5	
Total	7,465.4	1,890.7	9,356.1	30,124.0	20,767.9	270.3	788.5	4,771.6	5,560.1	

Source: JICA Survey Team

Table X.3.30 Balance Calculation of Market Distribution System Improvement (Base0)

, Million Kyats

EIRR	17.94%		
NPV	25194.0	B/C	1.37
OCC	12.00%		

Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit
1	0	0	0	0	0	1.1	0	0	0
2	7,176	0	7,176	0	-7,176	1.3	-5,721	5,721	0
3	17,530	144	17,674	1,451	-16,223	1.4	-11,547	12,580	1,033
4	16,197	494	16,692	4,996	-11,696	1.6	-7,433	10,608	3,175
5	16,300	818	17,118	8,271	-8,847	1.8	-5,020	9,713	4,693
6	16,505	1,144	17,649	11,567	-6,082	2.0	-3,081	8,942	5,860
7	16,710	1,474	18,184	14,904	-3,280	2.2	-1,484	8,226	6,742
8	11,994	1,808	13,803	18,283	4,480	2.5	1,810	5,575	7,384
9	0	2,048	2,048	20,709	18,661	2.8	6,729	739	7,468
10	0	2,048	2,048	20,729	18,681	3.1	6,015	659	6,674
11	0	2,048	2,048	20,729	18,681	3.5	5,370	589	5,959
12	0	2,048	2,048	20,729	18,681	3.9	4,795	526	5,321
13	0	2,048	2,048	20,729	18,681	4.4	4,281	469	4,751
14	0	2,048	2,048	20,729	18,681	4.9	3,822	419	4,242
15	0	2,048	2,048	20,729	18,681	5.5	3,413	374	3,787
16	0	2,048	2,048	20,729	18,681	6.1	3,047	334	3,381
17	0	2,048	2,048	20,729	18,681	6.9	2,721	298	3,019
18	0	2,048	2,048	20,729	18,681	7.7	2,429	266	2,696
19	0	2,048	2,048	20,729	18,681	8.6	2,169	238	2,407
20	0	2,048	2,048	20,729	18,681	9.6	1,937	212	2,149
21	0	2,048	2,048	20,729	18,681	10.8	1,729	190	1,919
22	0	2,048	2,048	20,729	18,681	12.1	1,544	169	1,713
23	0	2,048	2,048	20,729	18,681	13.6	1,378	151	1,530
24	0	2,048	2,048	20,729	18,681	15.2	1,231	135	1,366
25	0	2,048	2,048	20,729	18,681	17.0	1,099	120	1,219
26	0	2,048	2,048	20,729	18,681	19.0	981	108	1,089
27	0	2,048	2,048	20,729	18,681	21.3	876	96	972
28	0	2,048	2,048	20,729	18,681	23.9	782	86	868
29	0	2,048	2,048	20,729	18,681	26.7	698	77	775
30	0	2,048	2,048	20,729	18,681	30.0	624	68	692
Total	102,413	50,944	153,358	515,490	362,132	270.3	25,194	67,688	92,882

Source: JICA Survey Team

Table X.3.31 Balance Calculation of Market Distribution System Improvement (Base1) , Million Kyats

					EIRR	17.72%			
					NPV	24204.9		B/C	1.36
					OCC	12.00%			

Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit
1	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
2	7,176.1	0.0	7,176.1	0.0	-7,176.1	1.3	-5,720.7	5,720.7	0.0
3	17,530.2	143.5	17,673.7	1,436.0	-16,237.7	1.4	-11,557.7	12,579.8	1,022.1
4	16,197.5	494.1	16,691.6	4,943.0	-11,748.6	1.6	-7,466.5	10,607.8	3,141.4
5	16,300.0	818.1	17,118.1	8,183.0	-8,935.1	1.8	-5,070.0	9,713.3	4,643.3
6	16,505.0	1,144.1	17,649.1	11,444.0	-6,205.1	2.0	-3,143.7	8,941.6	5,797.9
7	16,710.1	1,474.2	18,184.3	14,746.0	-3,438.3	2.2	-1,555.3	8,225.6	6,670.3
8	11,994.4	1,808.4	13,802.7	18,088.0	4,285.3	2.5	1,730.7	5,574.7	7,305.4
9	0.0	2,048.3	2,048.3	20,488.0	18,439.7	2.8	6,649.6	738.6	7,388.2
10	0.0	2,048.3	2,048.3	20,508.0	18,459.7	3.1	5,943.5	659.5	6,603.0
11	0.0	2,048.3	2,048.3	20,508.0	18,459.7	3.5	5,306.7	588.8	5,895.6
12	0.0	2,048.3	2,048.3	20,508.0	18,459.7	3.9	4,738.2	525.7	5,263.9
13	0.0	2,048.3	2,048.3	20,508.0	18,459.7	4.4	4,230.5	469.4	4,699.9
14	0.0	2,048.3	2,048.3	20,508.0	18,459.7	4.9	3,777.2	419.1	4,196.3
15	0.0	2,048.3	2,048.3	20,508.0	18,459.7	5.5	3,372.5	374.2	3,746.7
16	0.0	2,048.3	2,048.3	20,508.0	18,459.7	6.1	3,011.2	334.1	3,345.3
17	0.0	2,048.3	2,048.3	20,508.0	18,459.7	6.9	2,688.6	298.3	2,986.9
18	0.0	2,048.3	2,048.3	20,508.0	18,459.7	7.7	2,400.5	266.4	2,666.9
19	0.0	2,048.3	2,048.3	20,508.0	18,459.7	8.6	2,143.3	237.8	2,381.1
20	0.0	2,048.3	2,048.3	20,508.0	18,459.7	9.6	1,913.7	212.3	2,126.0
21	0.0	2,048.3	2,048.3	20,508.0	18,459.7	10.8	1,708.6	189.6	1,898.2
22	0.0	2,048.3	2,048.3	20,508.0	18,459.7	12.1	1,525.6	169.3	1,694.8
23	0.0	2,048.3	2,048.3	20,508.0	18,459.7	13.6	1,362.1	151.1	1,513.2
24	0.0	2,048.3	2,048.3	20,508.0	18,459.7	15.2	1,216.2	134.9	1,351.1
25	0.0	2,048.3	2,048.3	20,508.0	18,459.7	17.0	1,085.9	120.5	1,206.3
26	0.0	2,048.3	2,048.3	20,508.0	18,459.7	19.0	969.5	107.6	1,077.1
27	0.0	2,048.3	2,048.3	20,508.0	18,459.7	21.3	865.6	96.1	961.7
28	0.0	2,048.3	2,048.3	20,508.0	18,459.7	23.9	772.9	85.8	858.7
29	0.0	2,048.3	2,048.3	20,508.0	18,459.7	26.7	690.1	76.6	766.7
30	0.0	2,048.3	2,048.3	20,508.0	18,459.7	30.0	616.1	68.4	684.5
Total	102,413.3	50,944.2	153,357.5	509,996.0	356,638.5	270.3	24,204.9	67,687.7	91,892.5

Source: JICA Survey Team

Table X.3.32 Balance Calculation of Major Three Components (Base0) , Million Kyats

EIRR	18.89%		B/C
NPV	130,802		1.46
OCC	12.00%		

Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Opportu nity Cost	Net Benefit	Discount Rate	Present Value	Discount ed Cost	Discoun ted Benefit
1	0	0	0	-88	0	-88	1	-79	0	-79
2	13,587	0	13,587	-133	0	-13,720	1	-10,937	10,831	-106
3	51,387	268	51,655	1,447	12,055	-62,263	1	-44,318	45,347	-7,551
4	44,770	1,288	46,058	5,121	12,055	-52,992	2	-33,677	36,932	-4,407
5	50,871	2,169	53,039	10,080	12,055	-55,014	2	-31,216	36,936	-1,120
6	43,941	3,156	47,097	18,261	12,055	-40,891	2	-20,717	29,968	3,144
7	39,280	4,016	43,296	31,107	12,055	-24,244	2	-10,967	25,038	8,618
8	18,013	4,802	22,815	50,045	0	27,230	2	10,998	9,215	20,212
9	0	5,162	5,162	68,030	0	62,867	3	22,671	1,862	24,532
10	0	5,162	5,162	82,052	0	76,890	3	24,757	1,662	26,419
11	0	5,162	5,162	92,943	0	87,781	3	25,235	1,484	26,719
12	0	5,162	5,162	99,167	0	94,005	4	24,129	1,325	25,454
13	0	5,162	5,162	99,167	0	94,005	4	21,543	1,183	22,726
14	0	5,162	5,162	99,167	0	94,005	5	19,235	1,056	20,292
15	0	5,162	5,162	99,167	0	94,005	5	17,174	943	18,117
16	0	5,162	5,162	99,167	0	94,005	6	15,334	842	16,176
17	0	5,162	5,162	99,167	0	94,005	7	13,691	752	14,443
18	0	5,162	5,162	99,167	0	94,005	8	12,224	671	12,896
19	0	5,162	5,162	99,167	0	94,005	9	10,915	599	11,514
20	0	5,162	5,162	99,167	0	94,005	10	9,745	535	10,280
21	0	5,162	5,162	99,167	0	94,005	11	8,701	478	9,179
22	0	5,162	5,162	99,167	0	94,005	12	7,769	427	8,195
23	0	5,162	5,162	99,167	0	94,005	14	6,936	381	7,317
24	0	5,162	5,162	99,167	0	94,005	15	6,193	340	6,533
25	0	5,162	5,162	99,167	0	94,005	17	5,530	304	5,833
26	0	5,162	5,162	99,167	0	94,005	19	4,937	271	5,208
27	0	5,162	5,162	99,167	0	94,005	21	4,408	242	4,650
28	0	5,162	5,162	99,167	0	94,005	24	3,936	216	4,152
29	0	5,162	5,162	99,167	0	94,005	27	3,514	193	3,707
30	0	5,162	5,162	99,167	0	94,005	30	3,138	172	3,310
Total	261,848	129,271	391,118	2,243,036	60,275	1,791,643	270	130,802	210,206	306,366

Source: JICA Survey Team

Table X.3.33 Balance Calculation for All Components (Base0) , Million Kyats

EIRR	16.54%	B/C	
NPV	98,450.3	1.26	
OCC	12.00%		

Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Opportunity Cost	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit
1	0	0	0	-88	0	-88	1.1	-79	0	-79
2	29,090	0	29,090	-133	0	-29,223	1.3	-23,297	23,190	-106
3	70,931	582	71,513	1,447	12,055	-82,121	1.4	-58,452	59,482	-7,551
4	46,955	2,000	48,955	5,121	12,055	-55,890	1.6	-35,519	38,773	-4,407
5	51,701	2,940	54,640	10,080	12,055	-56,615	1.8	-32,125	37,845	-1,120
6	43,608	3,974	47,582	18,261	12,055	-41,376	2.0	-20,962	30,214	3,144
7	38,970	4,846	43,816	31,107	12,055	-24,764	2.2	-11,202	25,273	8,618
8	17,484	5,625	23,109	50,045	0	26,936	2.5	10,879	9,333	20,212
9	0	5,975	5,975	68,030	0	62,055	2.8	22,378	2,155	24,532
10	0	5,975	5,975	82,052	0	76,078	3.1	24,495	1,924	26,419
11	0	5,975	5,975	92,943	0	86,969	3.5	25,001	1,718	26,719
12	0	5,975	5,975	99,167	0	93,192	3.9	23,920	1,534	25,454
13	0	5,975	5,975	99,167	0	93,192	4.4	21,357	1,369	22,726
14	0	5,975	5,975	99,167	0	93,192	4.9	19,069	1,223	20,292
15	0	5,975	5,975	99,167	0	93,192	5.5	17,026	1,092	18,117
16	0	5,975	5,975	99,167	0	93,192	6.1	15,202	975	16,176
17	0	5,975	5,975	99,167	0	93,192	6.9	13,573	870	14,443
18	0	5,975	5,975	99,167	0	93,192	7.7	12,119	777	12,896
19	0	5,975	5,975	99,167	0	93,192	8.6	10,820	694	11,514
20	0	5,975	5,975	99,167	0	93,192	9.6	9,661	619	10,280
21	0	5,975	5,975	99,167	0	93,192	10.8	8,626	553	9,179
22	0	5,975	5,975	99,167	0	93,192	12.1	7,702	494	8,195
23	0	5,975	5,975	99,167	0	93,192	13.6	6,876	441	7,317
24	0	5,975	5,975	99,167	0	93,192	15.2	6,140	394	6,533
25	0	5,975	5,975	99,167	0	93,192	17.0	5,482	351	5,833
26	0	5,975	5,975	99,167	0	93,192	19.0	4,895	314	5,208
27	0	5,975	5,975	99,167	0	93,192	21.3	4,370	280	4,650
28	0	5,975	5,975	99,167	0	93,192	23.9	3,902	250	4,152
29	0	5,975	5,975	99,167	0	93,192	26.7	3,484	223	3,707
30	0	5,975	5,975	99,167	0	93,192	30.0	3,111	199	3,310
Total	298,740	151,412	450,152	2,243,036	60,275	1,732,610	270.3	98,450	242,558	306,366

Source: JICA Survey Team

Table X.3.34 Balance Calculation for Three Major Components (Base1) , Million Kyats

EIRR	22.89%		B/C
NPV	228,066.7		1.92
OCC	12.00%		

Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Opportunity Cost	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit
1	0	0	0	-88	0	-88	1.1	-79	0	-79
2	13,587	0	13,587	-133	0	-13,720	1.3	-10,937	10,831	-106
3	51,387	268	51,655	1,529	12,055	-62,180	1.4	-44,259	45,347	-7,492
4	44,770	1,288	46,058	5,263	12,055	-52,850	1.6	-33,587	36,932	-4,316
5	50,871	2,169	53,039	10,893	12,055	-54,201	1.8	-30,755	36,936	-659
6	43,941	3,156	47,097	20,959	12,055	-38,194	2.0	-19,350	29,968	4,511
7	39,280	4,016	43,296	37,512	12,055	-17,839	2.2	-8,069	25,038	11,516
8	18,013	4,802	22,815	62,487	0	39,672	2.5	16,023	9,215	25,237
9	0	5,162	5,162	86,519	0	81,357	2.8	29,338	1,862	31,200
10	0	5,162	5,162	106,009	0	100,846	3.1	32,470	1,662	34,132
11	0	5,162	5,162	121,152	0	115,989	3.5	33,344	1,484	34,828
12	0	5,162	5,162	129,805	0	124,642	3.9	31,993	1,325	33,318
13	0	5,162	5,162	129,805	0	124,642	4.4	28,565	1,183	29,748
14	0	5,162	5,162	129,805	0	124,642	4.9	25,504	1,056	26,561
15	0	5,162	5,162	129,805	0	124,642	5.5	22,772	943	23,715
16	0	5,162	5,162	129,805	0	124,642	6.1	20,332	842	21,174
17	0	5,162	5,162	129,805	0	124,642	6.9	18,153	752	18,905
18	0	5,162	5,162	129,805	0	124,642	7.7	16,208	671	16,880
19	0	5,162	5,162	129,805	0	124,642	8.6	14,472	599	15,071
20	0	5,162	5,162	129,805	0	124,642	9.6	12,921	535	13,456
21	0	5,162	5,162	129,805	0	124,642	10.8	11,537	478	12,015
22	0	5,162	5,162	129,805	0	124,642	12.1	10,301	427	10,727
23	0	5,162	5,162	129,805	0	124,642	13.6	9,197	381	9,578
24	0	5,162	5,162	129,805	0	124,642	15.2	8,212	340	8,552
25	0	5,162	5,162	129,805	0	124,642	17.0	7,332	304	7,636
26	0	5,162	5,162	129,805	0	124,642	19.0	6,546	271	6,817
27	0	5,162	5,162	129,805	0	124,642	21.3	5,845	242	6,087
28	0	5,162	5,162	129,805	0	124,642	23.9	5,219	216	5,435
29	0	5,162	5,162	129,805	0	124,642	26.7	4,660	193	4,853
30	0	5,162	5,162	129,805	0	124,642	30.0	4,160	172	4,333
Total	261,848	129,271	391,118	2,918,389	60,275	2,466,996	270.3	228,067	210,206	403,631

Source: JICA Survey Team

Table X.3.35 Balance Calculation for All Major Components (Base1) , Million Kyats

							EIRR	20.22%		B/C
							NPV	196,586		1.67
							OCC	12.00%		
Year	Const'on Cost	O & M Cost	Total Cost	Benefit	Opportunity Cost	Net Benefit	Discount Rate	Present Value	Discounted Cost	Discounted Benefit
1	0	0	0	-88	0	-88	1.1	-79	0	-79
2	29,090	0	29,090	-133	0	-29,223	1.3	-23,297	23,190	-106
3	70,931	582	71,513	1,365	12,055	-82,203	1.4	-58,510	59,482	-7,609
4	46,955	2,000	48,955	5,222	12,055	-55,788	1.6	-35,454	38,773	-4,342
5	51,701	2,940	54,640	11,098	12,055	-55,597	1.8	-31,547	37,845	-543
6	43,608	3,974	47,582	21,410	12,055	-38,227	2.0	-19,367	30,214	4,739
7	38,970	4,846	43,816	38,188	12,055	-17,683	2.2	-7,999	25,273	11,821
8	17,484	5,625	23,109	63,369	0	40,259	2.5	16,260	9,333	25,594
9	0	5,975	5,975	86,539	0	80,565	2.8	29,052	2,155	31,207
10	0	5,975	5,975	106,009	0	100,034	3.1	32,208	1,924	34,132
11	0	5,975	5,975	121,152	0	115,177	3.5	33,111	1,718	34,828
12	0	5,975	5,975	129,805	0	123,830	3.9	31,784	1,534	33,318
13	0	5,975	5,975	129,805	0	123,830	4.4	28,379	1,369	29,748
14	0	5,975	5,975	129,805	0	123,830	4.9	25,338	1,223	26,561
15	0	5,975	5,975	129,805	0	123,830	5.5	22,623	1,092	23,715
16	0	5,975	5,975	129,805	0	123,830	6.1	20,199	975	21,174
17	0	5,975	5,975	129,805	0	123,830	6.9	18,035	870	18,905
18	0	5,975	5,975	129,805	0	123,830	7.7	16,103	777	16,880
19	0	5,975	5,975	129,805	0	123,830	8.6	14,377	694	15,071
20	0	5,975	5,975	129,805	0	123,830	9.6	12,837	619	13,456
21	0	5,975	5,975	129,805	0	123,830	10.8	11,462	553	12,015
22	0	5,975	5,975	129,805	0	123,830	12.1	10,234	494	10,727
23	0	5,975	5,975	129,805	0	123,830	13.6	9,137	441	9,578
24	0	5,975	5,975	129,805	0	123,830	15.2	8,158	394	8,552
25	0	5,975	5,975	129,805	0	123,830	17.0	7,284	351	7,636
26	0	5,975	5,975	129,805	0	123,830	19.0	6,504	314	6,817
27	0	5,975	5,975	129,805	0	123,830	21.3	5,807	280	6,087
28	0	5,975	5,975	129,805	0	123,830	23.9	5,185	250	5,435
29	0	5,975	5,975	129,805	0	123,830	26.7	4,629	223	4,853
30	0	5,975	5,975	129,805	0	123,830	30.0	4,133	199	4,333
Total	298,740	151,412	450,152	2,920,418	60,275	2,409,991	270.3	196,586	242,558	404,502

Source: JICA Survey Team

X.3.6 Calculation Basis of Input-Output Analysis

Table X.3.36 Input-Output Matrix of the Union Myanmar 2000-2001

	X														Y	E	F	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	16'	17	18
	Agricultural	Livestock and Fishery	Forestry	Mining	Processing & Manufacturing	Power	Constructio n	Transportati on	Connmunic ation	Financial Sector	Social and Administrativ e Services	Rental and Other Services	Trade	Total Intermediat e Use	Consumptio n	Investment	Total Final Domestic Demand	Export	Total Final Demand
1 Agricultural	80,858	7,639	116	0	592,189	0	0	186	0	0	0	70	0	681,058	666319	74837	741156	7327	748483
2 Livestock and Fishery	18,352	2,077	60	0	4,980	0	0	858	0	0	0	12	0	26,339	293252	12213	305465	407	305872
3 Forestry	387	203	0	0	3,772	0	1,864	0	0	0	0	83	0	6,309	5624	7282	12906	2426	15332
4 Mining	0	0	0	26	1,909	1,086	1,854	0	0	0	0	0	0	4,875	5357	6762	12119	341	12460
5 Processing & Manufacturing	21,232	84,747	5,860	6,056	65,186	219	60,975	39,070	1,012	1,486	23,987	3,248	97,420	410,498	539239	74771	614010	1339	615349
6 Power	0	80	18	19	1,210	27	133	169	32	2	119	11	96	1,916	2187	7755	9942	0	9942
7 Construction	6,357	275	73	76	3,393	1,811	0	47,543	44	6	6,611	222	25,675	92,086	3273	54614	57887	0	57887
8 Transportation	10,149	14,207	677	714	120,628	296	16,376	4,151	175	22	1,785	472	81,251	250,903	0	0	0	0	0
9 Connmunication	154	270	60	63	1,466	46	224	427	54	7	551	72	4,998	8,392	0	0	0	0	0
10 Financial Sector	454	70	0	0	451	0	0	0	0	0	0	0	0	975	3246	38	3284	0	3284
11 Social and Administrative Services	0	0	0	0	0	0	0	0	0	0	0	0	0	0	63835	11042	74877	0	74877
12 Rental and Other Services	0	0	0	0	0	0	0	0	0	0	110	43	1,990	2,143	39214	0	39214	0	39214
13 Trade	45,073	21,176	445	184	44,689	86	21,898	12,076	8	95	2,329	1,980	4,911	154,950	608415	65954	674369	799	675168
14 Total Purchase	183,016	130,744	7,309	7,138	839,873	3,571	103,324	104,480	1,325	1,618	35,492	6,213	216,341	1,640,444	2229961	315268	2545229	12639	2557868
15 Imports	1,087	87	0	2	3,078	4	605	117	0	0	31	31	92	5,134	7517	2422	9939	0	9939
16 Labor Cost	593,239	22,454	11,247	4,143	70,054	1,460	44,728	88,802	611	172	39,247	4,635	96,345	982,334					
17 Depreciation	159,186	3,793	133	3,799	16,839	2,652	974	36,321	34	10	31	11,909	4,308	240,567					
18 Taxes (indirect)	21,389	2,326	2,556	745	18,648	447	292	10,409	611	8	77	1,809	149,147	207,977					
19 Surplus (profit or losses)	471,624	172,806	398	1,508	77,355	3,724	49	10,773	7,065	2,451	0	16,672	363,885	1,121,855					
20 Value Added	1,245,438	201,379	14,333	10,194	182,897	8,283	46,044	146,305	7,065	2,641	39,354	35,114	613,686	2,552,733					
Total Domestic Demand (14+16')	1,422,214	331,804	19,215	16,994	1,024,508	11,858	149,973	250,903	8,392	4,259	74,877	41,357	829,319						
21 Total Inputs	1,429,541	332,210	21,642	17,334	1,025,848	11,858	149,973	250,902	8,390	4,259	74,877	41,358	830,119	4,198,311					

Source: Industrial Structure in Myanmar using a new Estimated Input-Output Table (2000-2001), Nan Khine Su Thwin, Taiji Yoshida, Koshi Maeda, J.Fac.Agr., Kyushu Univ.,55(2), 387-396 (2010)

Table X.3.37 Input Coefficient Matrix of the Union Myanmar 2000-2001

Input Coefficient Matrix of Myanmar

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Agricultural	0.0566	0.0230	0.0054	0.0000	0.5773	0.0000	0.0000	0.0007	0.0000	0.0000	0.0000	0.0017	0.0000
2 Livestock and Fishery	0.0128	0.0063	0.0028	0.0000	0.0049	0.0000	0.0000	0.0034	0.0000	0.0000	0.0000	0.0003	0.0000
3 Forestry	0.0003	0.0006	0.0000	0.0000	0.0037	0.0000	0.0124	0.0000	0.0000	0.0000	0.0000	0.0020	0.0000
4 Mining	0.0000	0.0000	0.0000	0.0015	0.0019	0.0916	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5 Processing & Manufacturing	0.0149	0.2551	0.2708	0.3494	0.0635	0.0185	0.4066	0.1557	0.1206	0.3489	0.3204	0.0785	0.1174
6 Power	0.0000	0.0002	0.0008	0.0011	0.0012	0.0023	0.0009	0.0007	0.0038	0.0005	0.0016	0.0003	0.0001
7 Construction	0.0044	0.0008	0.0034	0.0044	0.0033	0.1527	0.0000	0.1895	0.0052	0.0014	0.0883	0.0054	0.0309
8 Transportation	0.0071	0.0428	0.0313	0.0412	0.1176	0.0250	0.1092	0.0165	0.0209	0.0052	0.0238	0.0114	0.0979
9 Connmunication	0.0001	0.0008	0.0028	0.0036	0.0014	0.0039	0.0015	0.0017	0.0064	0.0016	0.0074	0.0017	0.0060
10 Financial Sector	0.0003	0.0002	0.0000	0.0000	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11 Social and Administrative Services	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12 Rental and Other Services	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0015	0.0010	0.0024
13 Trade	0.0315	0.0637	0.0206	0.0106	0.0436	0.0073	0.1460	0.0481	0.0010	0.0223	0.0311	0.0479	0.0059
	1	2	3	4	5	6	7	8	9	10	11	12	13
15 Imports	0.0008	0.0003	0.0000	0.0001	0.0030	0.0003	0.0040	0.0005	0.0000	0.0000	0.0004	0.0007	0.0001

Source: Industrial Structure in Myanmar using a new Estimated Input-Output Table (2000-2001), Nan Khie Su Thwin et al (2010)

Table X.3.38 Inverse Matrix of the Union Myanmar 2000-2001

Inverse Matrix [I - (I - M^)A]-1

	1 Agricultural	2 Livestock and Fishery	3 Forestry	4 Mining	5 Processing & Manufacturing	6 Power	7 Construction	8 Transportation	9 Connmunication	10 Financial Sector	11 Social and Administrative Services	12 Rental and Other Services	13 Trade	column sum	Sensitivity of dispersion
1 Agricultural	1.080584	0.218729	0.203952	0.253607	0.697061	0.091239	0.324173	0.179380	0.090274	0.246513	0.259794	0.066190	0.110480	3.821976	2.211499
2 Livestock and Fishery	0.014139	1.011052	0.007317	0.005661	0.015137	0.002162	0.007522	0.007477	0.002039	0.005381	0.005782	0.001791	0.002768	1.088229	0.629679
3 Forestry	0.000571	0.002143	1.001539	0.001957	0.004918	0.002673	0.015057	0.003747	0.000764	0.001785	0.003042	0.002586	0.001425	1.042208	0.603050
4 Mining	0.000185	0.000964	0.001010	1.002793	0.002794	0.094366	0.014185	0.003289	0.000843	0.001082	0.002410	0.000418	0.001107	1.125448	0.651215
5 Processing & Manufacturing	0.033166	0.317324	0.323815	0.414418	1.139238	0.149027	0.529511	0.291733	0.147507	0.402875	0.424523	0.105174	0.180405	4.458716	2.579934
6 Power	0.000070	0.000693	0.001290	0.001725	0.001543	1.002817	0.001789	0.001334	0.004059	0.001065	0.002332	0.000480	0.000495	1.019692	0.590021
7 Construction	0.009336	0.023876	0.022155	0.027748	0.039032	0.168781	1.048026	0.210351	0.015312	0.017532	0.111847	0.014019	0.057890	1.765906	1.021801
8 Transportation	0.017315	0.095640	0.079843	0.101488	0.155144	0.071520	0.203187	1.087168	0.043096	0.062947	0.097874	0.032285	0.131914	2.179422	1.261072
9 Connmunication	0.000448	0.002063	0.003780	0.004755	0.002565	0.005163	0.004014	0.003261	1.006868	0.002681	0.008925	0.002311	0.006830	1.053665	0.609679
10 Financial Sector	0.000340	0.000395	0.000192	0.000243	0.000668	0.000087	0.000311	0.000172	0.000086	1.000236	0.000249	0.000062	0.000106	1.003148	0.580448
11 Social and Administrative Services	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	1.000000	0.578627
12 Rental and Other Services	0.000093	0.000225	0.000118	0.000111	0.000207	0.000111	0.000476	0.000246	0.000036	0.000130	0.001692	1.001141	0.002479	1.007066	0.582716
13 Trade	0.038833	0.093841	0.049034	0.046317	0.086424	0.046248	0.198219	0.102586	0.014864	0.053944	0.079862	0.058745	1.032581	1.901499	1.100259
rowsum	1.195081	1.766943	1.694045	1.860825	2.144731	1.634196	2.346471	1.890744	1.325749	1.796171	1.998334	1.285203	1.528481		
Power of dispersion	0.691506	1.022401	0.980220	1.076724	1.241000	0.945590	1.357731	1.094036	0.767115	1.039313	1.156290	0.743654	0.884420		

Source: JICA Survey Team
Reference: Industrial Structure in Myanmar using a new Estimated Input-Output Table (2000-2001), Nan Khie Su Thwin et al (2010)

Table X.3.39 Labor Inducement Coefficient of the Union Myanmar 2000-2001

L * [I - (I - M^)A]-1

	1 Agricultural	2 Livestock and Fishery	3 Forestry	4 Mining	5 Processing & Manufacturing	6 Power	7 Construction	8 Transportation	9 Connmunication	10 Financial Sector	11 Social and Administrative Services	12 Rental and Other Services	13 Trade	column sum	Sensitivity of dispersion
1 Agricultural	6.883320	1.393304	1.299174	1.615477	4.440279	0.581192	2.064982	1.142651	0.575045	1.570288	1.654888	0.421630	0.703758	24.345987	1.321110
2 Livestock and Fishery	0.090065	6.440401	0.046609	0.036061	0.096423	0.013772	0.047915	0.047628	0.012988	0.034277	0.036831	0.011409	0.017632	6.932012	0.376159
3 Forestry	0.003637	0.013651	6.379803	0.012466	0.031328	0.017027	0.095913	0.023868	0.004867	0.011370	0.019378	0.016473	0.009077	6.638859	0.360251
4 Mining	0.000699	0.003644	0.003818	3.790558	0.010561	0.356703	0.053619	0.012432	0.003187	0.004090	0.009110	0.001580	0.004184	4.254186	0.230849
5 Processing & Manufacturing	0.077277	0.739365	0.754489	0.965594	2.654425	0.347233	1.233761	0.679738	0.343691	0.938699	0.989139	0.245055	0.420344	10.388808	0.563738
6 Power	0.000482	0.004768	0.008875	0.011868	0.010616	6.899381	0.012308	0.009178	0.027926	0.007327	0.016044	0.003302	0.003406	7.015481	0.380688
7 Construction	0.035944	0.091923	0.085297	0.106830	0.150273	0.649807	4.034900	0.809851	0.058951	0.067498	0.430611	0.053973	0.222877	6.798734	0.368926
8 Transportation	0.116876	0.645570	0.538940	0.685044	1.047222	0.482760	1.371512	7.338384	0.290898	0.424892	0.660650	0.217924	0.890420	14.711092	0.798282
9 Connmunication	0.005107	0.023518	0.043092	0.054207	0.029241	0.058858	0.045760	0.037175	11.478295	0.030563	0.101745	0.026345	0.077862	12.011770	0.651806
10 Financial Sector	0.000629	0.000731	0.000355	0.000450	0.001236	0.000161	0.000575	0.000318	0.000159	1.850437	0.000461	0.000115	0.000196	1.855822	0.100704
11 Social and Administrative Services	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	37.000000	0.000000	0.000000	37.000000	2.007767
12 Rental and Other Services	0.003441	0.008325	0.004366	0.004107	0.007659	0.004107	0.017612	0.009102	0.001332	0.004810	0.062604	37.042217	0.091723	37.261405	2.021952
13 Trade	1.436821	3.472117	1.814258	1.713729	3.197688	1.711176	7.334103	3.795682	0.549968	1.995928	2.954894	2.173565	38.205497	70.355426	3.817766
rowsum	8.654299	12.837316	10.979077	8.996389	11.676950	11.122178	16.312961	13.906009	13.347308	6.940180	43.936353	40.213589	40.646975		
Power of dispersion	0.469617	0.696604	0.595768	0.488180	0.633638	0.603534	0.885206	0.754595	0.724278	0.376602	2.384162	2.182150	2.205667		

Source: JICA Survey Team
Reference: Industrial Structure in Myanmar using a new Estimated Input-Output Table (2000-2001), Nan Khie Su Thwin et al (2010)

Table X.3.40 Working Age Population, Labor Force, Employment, and Unemployment

ILO 2015	Number
Working age population (15years and above)	33,934,662
Labor force	21,959,797
Employment	21,791,335
Unemployment	168,462

Source: "Labor Force, Child Labor, and School-to-Work Transition Survey", ILO 2015

Table X.3.41 Estimation of Output per Employed Person by Industry, Million Kyats/Person

Titles in ILO 2015	Titles in Input-Output Table 2000-2001	Shares on Employed Persons (%)	Total Output 2000-2001, M Kyats	Estimated Number of Employed, Persons	(B)/(A), M Kyats/Employed
Agriculture, forestry and fishing	Agricultural	0.517	1429541	9,100,566	6.37
Agriculture, forestry and fishing	Livestock and Fishery	0.517	332211	2,114,880	6.37
Agriculture, forestry and fishing	Forestry	0.517	21641	137,768	6.37
Wholesale and retail trade; repair of motor vehicle and motorcycles	Trade	0.143	830118	3,140,251	3.78
Manufacturing	Processing & Manufacturing	0.109	1025847	2,393,618	2.33
Construction	Construction	0.047	149973	1,032,110	6.88
Transportation and storage	Transportation	0.044	250903	966,231	3.85
Administrative and support service activities	Social and Administrative Services	0.023	74877	505,075	6.75
Mining and quarrying	Mining	0.009	17335	197,638	11.40
Electricity, gas, steam and conditioning supply	Power	0.001	11858	21,960	1.85
Accommodation and food service activities	N.A	0.013	N.A	N.A	N.A
Domestic	N.A	0.003	N.A	N.A	N.A
Other	Communication	0.091	8392	310,511	37.00
Other	Financial Sector	0.091	4259	157,587	37.00
Other	Rental and Other Services	0.091	41357	1,530,244	37.00

Source: The Survey Team based on "Labor Force, Child Labor, and School-to-Work Transition Survey", ILO 2015 and Industrial Structure in Myanmar using a new Estimated Input-Output Table (2000-2001), Nan Khie Su Thwin et al (2010)

APPENDIX-XI

SATELITE IMAGE ANALYSIS

APPENDIXES XI: SATELLITE IMAGE ANALYSIS

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XI.1 Objective of Analysis

A field survey for planting area and harvested area has substantial limitation of data collection and encounters difficulties with its measurement at specific points and further with appropriate data selection in numerous farmlands. In case of field survey based on existing land registration, the result may be accurate but it takes huge time and requires lots of effort into continuous observation.

To release constraint of conventional methods and raise its cost–effectiveness and its ability in observation, the remote sensing by satellites image has used for the estimation of planting area and harvested area. The sensor on the satellite gathers vegetation and water cover information on temporal and spatial scales.

This satellite imagery analysis is aimed to obtain the temporal data on irrigated areas as a baseline data, and clarify long term tendency of decreasing of irrigation through the comparative analysis between a recent year and a past year when the canal system under Thapanseik dam still had maintained its full function. For this purpose, the analysis was carried out in 2015/16, 2013/14 as recent years and 2008/09 as a past year.

XI.2 Target Area of Analysis

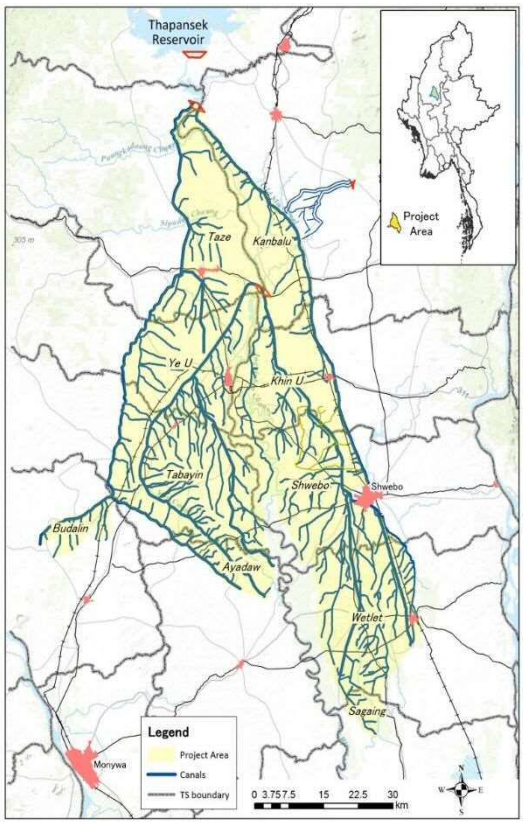
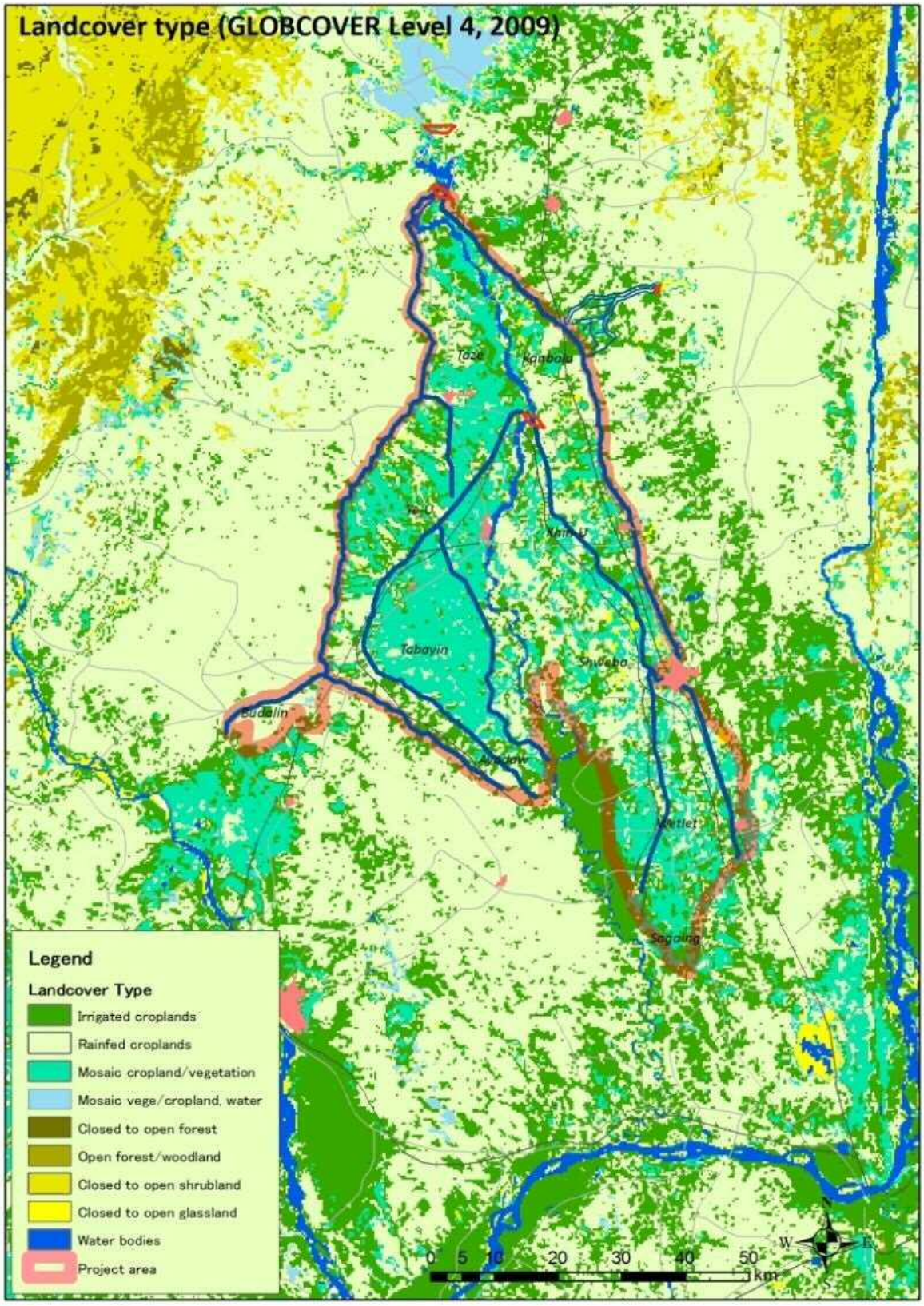


Figure XI.2.1 Target Area of Analysis

There is a spatial agricultural variation such as various cropping patterns in the target area of analysis (see Figure XI.2.1). The analysis focused on 10 townships (Ayadaw, Budalin, Kanbalu, Kin-U, Sagaing, Shwebo, Tabayin, Taze, Wetlet, and Ye-U township) which have 33,000 ha of land area as shown in Table IV.5.1. Triple cropping is dominant across the area, which is reflected by water availability from Thapanzeik dam irrigation system.

The global study of land cover (GlobCover 2009, ESA) has distinguished the rain fed cropland, irrigated cropland, and mosaic cropland / vegetation among the target area (see Figure IX.2.2). Based on GlobCover, the half of western part of the area which belongs to the lower reach of Right Main Canal (RMC) is recognized as rain-fed cropland because of the insufficient irrigation water. Likewise, in eastern part of the area covered by Shwebo Main Canal (SMC) and Old Mu canal (OMC) system, patches of rain-fed croplands are sporadically found out in the irrigated area. In the outside of the target area, the west margin consists of the upland with rain-fed croplands, while the eastern side is covered by the irrigated cropland by the neighboring canal system.



Source: GlobCover 2009 (ESA 2010) http://due.esrin.esa.int/page_globcover.php

Figure XI.2.2 Land-cover Type Classification and Project Area

XI.3 Landsat Image Data

XI.3.1 Landsat 5 and Landsat 8

Among available satellites, Landsat 5 and Landsat 8 are equipped with Thematic Mapper (TM) and Operation Land Imager (OLI) respectively and applied for the analysis. Those sensors have the spatial resolution of 30 m with multi-spectral bands (seven for TM and nine for OLI respectively) and a short revisit interval (16 days).

Landsat 5 was launched in January 1984 and ended in 2013, while the data receiving of TM had stopped in 2011. For 28 years, Landsat 5 had delivered the data of Multispectral Scanner (MSS) and Thematic Mapper (TM) with eight spectral bands (1 to 8) as longest-operated earth observation satellite (see Table XI.3.1).

Landsat 8 was launched in February 2013 and carried the improved Operational Land Imager (OLI) sensor and Thermal Infra-Red Sensor (TIRS). The OLI sensor provides nine spectral bands (1 to 9), and TIRS provides two spectral bands (10 and 11) as shown in Table XI.3.1.

Table XI.3.1 Wavelength Range and Spatial Resolution of OLI, TIRS, and TM

Band Number	Wave length range (μm)	Band Number	Wave length range (μm)	Resolution
OLI 1	0.433–0.453(coastal/aerosol)	N/A	-	30 m
OLI 2	0.450–0.515(blue)	TM 1	0.45-0.52(blue)	30 m
OLI 3	0.525–0.600(green)	TM 2	0.52-0.60(green)	30 m
OLI 4	0.630–0.680(red)	TM 3	0.63-0.69(red)	30 m
OLI 5	0.845–0.885(NIR)	TM 4	0.76-0.90(NIR)	30 m
OLI 6	1.560–1.660(SWIR-1)	TM 5	1.55-1.75(SWIR-1)	30 m
OLI 7	2.100–2.300(SWIR-2)	TM 7	2.08-2.35(SWIR-2)	30 m
OLI 8	0.500–0.680(Pan)	TM 8	(0.52-2.35) (Pan)	15 m
OLI 9	1.360–1.390(Cirrus)	N/A	-	30 m
TIRS 10	10.6-11.2(LWIR-1)	TM 6 (spans both)	10.40-12.50(LWIR)	100 m
TIRS 11	11.5-12.5(LWIR-2)	TM 6 (spans both)		100 m

Within OLI 9 bands, the bands of the very shortest wavelengths (bands 1–4 and 8) sense the visible light. The others are in parts of the invisible spectrum. The true-color view obtained from Landsat displays only half of what it senses. Six bands of OLI (band 2 to 7) are consistent with the TM bands (band 1 to 5 and 7). The band 1 and 9 of OLI make it possible to measure water resources[1], investigate coastal zone, and improve the detection of cirrus clouds.

In the analysis, TM data have been used for 2008/09 and OLI data has been applied for 2008/09 and 2015/16 respectively.

XI.3.2 Landsat Image Applied for the Analysis

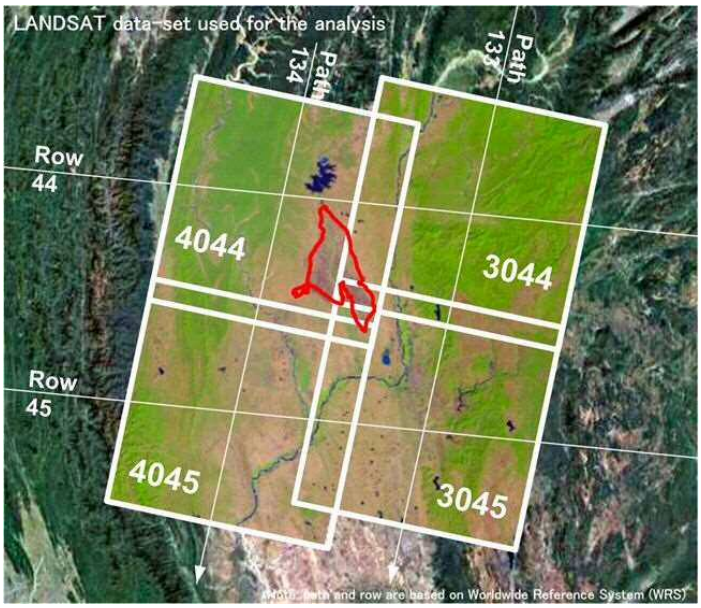
XI.3.2.1 Landsat Data

Although the analysis has used optical remote sensing data of Landsat TM and OLI to estimate the acreage of farmland in the area, in the regional-scale analysis, it is sometimes difficult to estimate the optimum stage of crops or paddy by these sensors because of limited supply of images. Landsat provides the images every 16 days with 30 m resolution, but they often contain clouds. It is sometimes hard to obtain multi-temporal cloud free images for identifying a detail stage of crops and paddy. In reality, the available image is solely acquired on monthly basis at the regional level.

[1] The OLI sensor provides better Signal to Noise Ratio (SNR) and radiometric performance. Band 1 and 9 allows more effective way to measure water resources. In addition, TIRS outputs thermal image which can be applied to the evapotranspiration rate measure.

On the other hand, plant-glowing is susceptible to changeable climate condition. The method of analysis therefore was considered as described in Chapter 5.

Landsat orbit is pre-defined by Landsat operation system with WRS; Worldwide Reference System[2]. In the vicinity of the area, their paths and rows run on the area, so that plural images are necessary to obtain one image of the month. In the Project area, four (4) scenes are overlapped at four directions of northwest (scene No. 4044), northeast (3044), southwest (4045) and southeast (3045) as shown in Figure XI.3.1.



Note: Scene numbers is given as a composite figure by WRS path and row, such as a data set taken at pass 134 and row 044 comes to 4 044 of dataset. The availability of Landsat data for the analysis refers to Table XI.3.2 with the scene numbers.

Figure XI.3.1 LANDSAT Data Sets of the Project Area

For four (4) scenes in each month of target three (3) seasons, i.e. 2008/09, 2013/14 and 2015/16, data quality affected by cloud cover and cloud shadow were confirmed before pre-processing of the analysis. By verification of data quality in target years, the eight (8) timings for each year were selected. TM and OLI products were downloaded from Earth Resources Observation and Science (EROS) Center (https://eros.usgs.gov/) as shown in Table IX.3.2. The number of available scenes totaled 94 images, i.e. 32 each for 2008-09 and 2013-14 and 30 for 2015-16.

XI.3.2.2 Data Processing

Acquired OLI and TM data are raw data and requires the calibration for proceeding the analysis. The calibration consisted of three (3) steps, i.e. 1) Radiometric Calibration, 2) Dark Subtraction, and 3) Seamless Mosaic.

1) Radiometric Calibration

The radiometric calibration attempts to compensate the radiometric errors from sensor's defects, variations in the scan angle, and system noise and produce an image which represents the true spectral radiance at the sensor location. It calibrates the imagery to radiance, reflectance, or brightness temperatures with available options depending on what the metadata of the imagery includes. Landsat Level-1 product, i.e. the raw data includes Metadata (MTL file) together with the image data.

[2] The Worldwide Reference System (WRS) is a global notation used in cataloging Landsat data. Landsat 8, 7, 5, and 4 follow the WRS-2. Landsat 1, 2, and 3 followed WRS-1. (https://landsat.gsfc.nasa.gov/the-worldwide-reference-system/)

Table XI.3.2 LANDSAT Data Quality and Applied Data Sets for the Analysis

LANDSAT5_TM

y/m/d	LT5_13				Mosaic sceane
	4_044	4 045	3_044	3_045	
2008/9/16	×	×			
2008/9/25			△	△	
2008/10/11			×	×	1(Oct)
2008/10/18	○	○			
2008/10/27			×	×	
2008/11/3	×	△			
2008/11/12			△	○	2(Nov)
2008/11/19	△	△			
2008/11/28			△	○	
2009/1/6	○	△			3(Jan)
2009/1/15			○	○	
2009/1/22	△	△			4(jan)
2009/1/31			○	○	
2009/2/7	○	○			5(Feb)
2009/2/16			○	○	
2009/2/23	○	○			6(Mar)
2009/3/4			○	○	
2009/3/27	×	△			
2009/3/20			○	○	
2009/4/12	△	○			7(Apr)
2009/4/21			△	△	
2009/4/28	○	△			8(May)
2009/5/7			○	△	
2009/5/14	×	△			
2009/5/23			×	×	
2009/5/30	×	×			

LANDSAT8_OLI

y/m/d	LC8_13				Mosaic sceanes
	4_044	4 045	3_044	3_045	
2013/10/9				△	
2013/10/16	△	△			
2013/10/25			○	○	1(Nov)
2013/11/1	○	○			
2013/11/17	○	○			2(Nov)
2013/11/26			△	×	
2013/12/3	○				
2013/12/12			○	○	3(Dec)
2013/12/19	○	○			
2013/12/28			×	×	
2014/1/4	○	○			4(Jan)
2014/1/13			○	○	
2014/1/20	○	○			
2014/1/29			○		
2014/2/5	○	○			5(Feb)
2014/2/14			○	○	
2014/2/21	○	○			6(Mar)
2014/3/2			○	○	
2014/3/9	△	△			
2014/3/18			○	○	
2014/3/25	△	○			
2014/4/3			○	○	
2014/4/10	△	△			7(Mar)
2014/4/19			○	○	
2014/4/26	△	△			
2014/5/5			△	△	
2014/5/12	△	○			8(Apr)
2014/5/21			△	△	
2014/5/28	△	△			

LANDSAT8_OLI

y/m/d	LC8_13				Mosaic sceanes
	4_044	4 045	3_044	3_045	
2015/10/6	×	×			
2015/10/15			△	△	1(Nov)
2015/10/22	△	△			
2015/10/31			×	×	
2015/11/7	○	○			
2015/11/16			○	○	2(Nov)
2015/11/23	○	○			
2015/12/2			×	×	
2015/12/9	△	△			3(Dec)
2015/12/18	4(Dec)		○	○	
2015/12/25	△	△			
2016/1/3			○	○	
2016/1/10	○	○			5(Jan)
2016/1/19			○	○	
2016/1/26	○	○			
2016/2/4			○	○	
2016/2/11	△	○			6(Feb)
2016/2/20			○	○	
2016/2/27	×	×			
2016/3/7			○	○	
2016/3/14	△	×			
2016/3/23			○	○	7(Mar)
2016/3/30	△	×			
2016/4/8			○	○	
2016/4/15	△	△			
2016/4/24			△	△	8(May)
2016/5/1	△	○			
2016/5/10			△	△	
2016/5/17	×	△			

Clould Cover ○: sunny to scattered clouds
Clould Cover △: ligntly to partly cloudy
Clould Cover ×: cloudy to mostly cloudy
* Mark boulded shows the upper most layer of mosaic scenes

2) Dark Subtraction

Dark subtraction is to remove the effects of atmospheric scattering from an image by subtracting a pixel value that represents a background signature from each band. It is conducted by Band Minimum Subtraction to gain a minimum DN (Digital Number) value of each spectral band.

3) Seamless Mosaic

Seamless mosaic was conducted by overlapping four (4) images with given priority to 4044 scene which covers larger project area than the others (4045, 3044, and 3045) as shown in Figure XI.3.2. Following the order, the individual bands were mosaicked with feathering technique to blend image boundaries with 15 pixel of distance.

Eight (8) mosaicked image were created for each year at almost one month interval from October to May. Finally, 24 periods of images were prepared for the analysis.

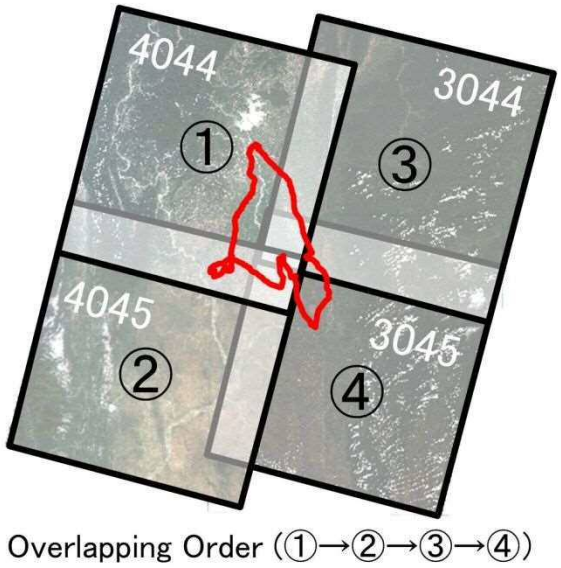


Figure XI.3.2 Mosaicking Order

XI.4 Calculation of NDVI and NDWI

Using 24 images obtained from calibration of three-year images, the Normalized Difference Vegetation Index (NDVI) and the Normalized Difference Water Index (NDWI) were calculated by surface reactance of Blue, Red, Near Infrared (NIR), and Short Wave Infrared (SWIR) band.

The result of NDVI was used for the measurement of primary productivity which worked for determining the cropping area and the paddy area, while NDWI was applied to detect the water body and the submersion area before transplanting or seeding. The outlines of NDVI and NDWI are as follows.

XI.4.1 NDVI

NDVI is sensitive to the active photosynthetic compounds and is therefore utilized for one way to measure the productivity of vegetation or greenness. NDVI is calculated by using the percent reflectance of two bands of the electromagnetic spectrum; the visible red (R: 0.4–0.7 μm) and the near-infrared (NIR: 0.7–1.1 μm)[3]. The difference between the spectral bands is divided by their sum. This calculation yields a value between -1 and 1 (Tucker and others, 1979, 1985).

As shown in Table XI.4.1, flowing formula is adopted with bands of OLI (2015/16, 20013/14) and TM (2008/2009), respectively.

NDVI = (NIR-Red) / (NIR+Red) ,

for Landsat 8(OLI)
= (band 5-band 4) / (band 5 +band 4) , or

for Landsat 5(TM)
= (band 4-band 3) / (band 4 +band 3)

Because NDVI is a spectral measurement of the photosynthesis in a defined spatial area, the value generally increases throughout the growing season and then decreases during the plants' senescent period. In addition, NDVI can change from year to year[4]. The analysis of NDVI imageries in different timeframes have to be done with the carefulness. In Figure XI.4.1, monthly change of NDVI is shown as an example of verification data to check-up the crop growing process in 2015/16 season.

XI.4.2 NDWI

The principle of NDWI is similar to NDVI. NDWI enhances the spectral reflectance of surface water bodies, which uses differences of two bands. In the analysis, Green and SWIR is applied with following formula (McFeeters, 1996) .

[3] To determine the density of green on a patch of land, the distinct colors (wavelengths) of visible and near-infrared sunlight reflected by the plants must be observed. As can be seen through a prism, many different wavelengths make the spectrum of sunlight. When sunlight strikes objects, certain wavelengths of this spectrum are absorbed and other wavelengths are reflected. The pigment of plant leaves, chlorophyll, strongly absorbs visible light (from 0.4 to 0.7 μm) for photosynthesis. The cell structure of the leaves, on the other hand, strongly reflects near-infrared light (from 0.7 to 1.1 μm). The more leaves a plant has, the more these wavelengths of light are affected. (http://earthobservatory.nasa.gov/Features/MeasuringVegetation/)

[4] NDVI is changed by annual environment such as the amount of rainfall or the temperatures in the prior seasons (Prasad and others, 2008).

NDWI = (Green-SWIR) / Green+SWIR) ,

for Landsat 8(OLI)

= NDWI = (band 3-band 6) / (band 3 +band 6) , or

for Landsat 5(TM)

= NDWI = (band 2-band 5) / (band 2 +band 5)

NDWI offers the mean value in order to assess water bodies and the submersion of paddy, which can be used in conjunction with NDVI images to assess the context of apparent changing areas. In the changes of NDWI, the submersion appears from March after canal open as shown in Figure XI.4.2.

Table XI.4.1 Spectral Band of Landsat 8 and 5 Applied for NDVI and NDWI Calculation

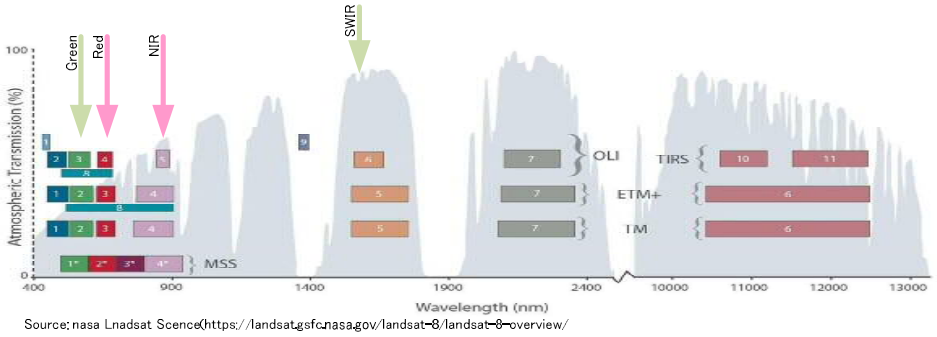
	Band Name	Landsat 8 (OLI/TIRS)		Landsat 5 (TM)	
		Band Number	Wavelength (μm)	Band Number	Wavelength (μm)
Landsat 8 Operational Land Imager (OLI) Compared to Landsat 5 Thamatic Mapper (TM)	Coastal Aerosol	1	0.433-0.453	N/A	-
	Blue	2	0.45-0.515	1	0.45-0.520
	Green	3	0.525-0.600	2	0.520-0.600
	Red	4	0.630-0.680	3	0.630-0.690
	Near Infrared (NIR)	5	0.845-0.885	4	0.750-0.900
	SWIR 1	6	1.560-1.166	5	1.550-1.l750
	SWIR 2	7	2.100-2.300	7	2.080-2.350
	Panchromatic	8	0.500-0.680	N/A	-
	Cirrus	9	1.360-1.390	N/A	-
	Thermal Infrared (TIRS) 1	10	10.30-22.30	6(spans both)	10.40-12.50
	Thermal Infrared (TIRS) 2	11	11.50-12.50	6(spans both)	10.40-12.50

NDVI and NDWI

LANDSAT 8 : NDVI(OLI)＝(Band5-Band4)/(Band5+Band4), NDWI(OLI)=(Band3-Band6)/(Band3+Band6)

LANDSAT 5 : NDVI(TM)＝(Band4-Band3)/(Band4+Band3), NDWI(TM)=(Band2-Band5)/(Band2+Band5)

Compares OLI spectral bands to Landsat 5/7′ s TM/ETM+ bands



Source: nasa Lnadsat Scence(https://landsat.gsfc.nasa.gov/landsat-8/landsat-8-overview/

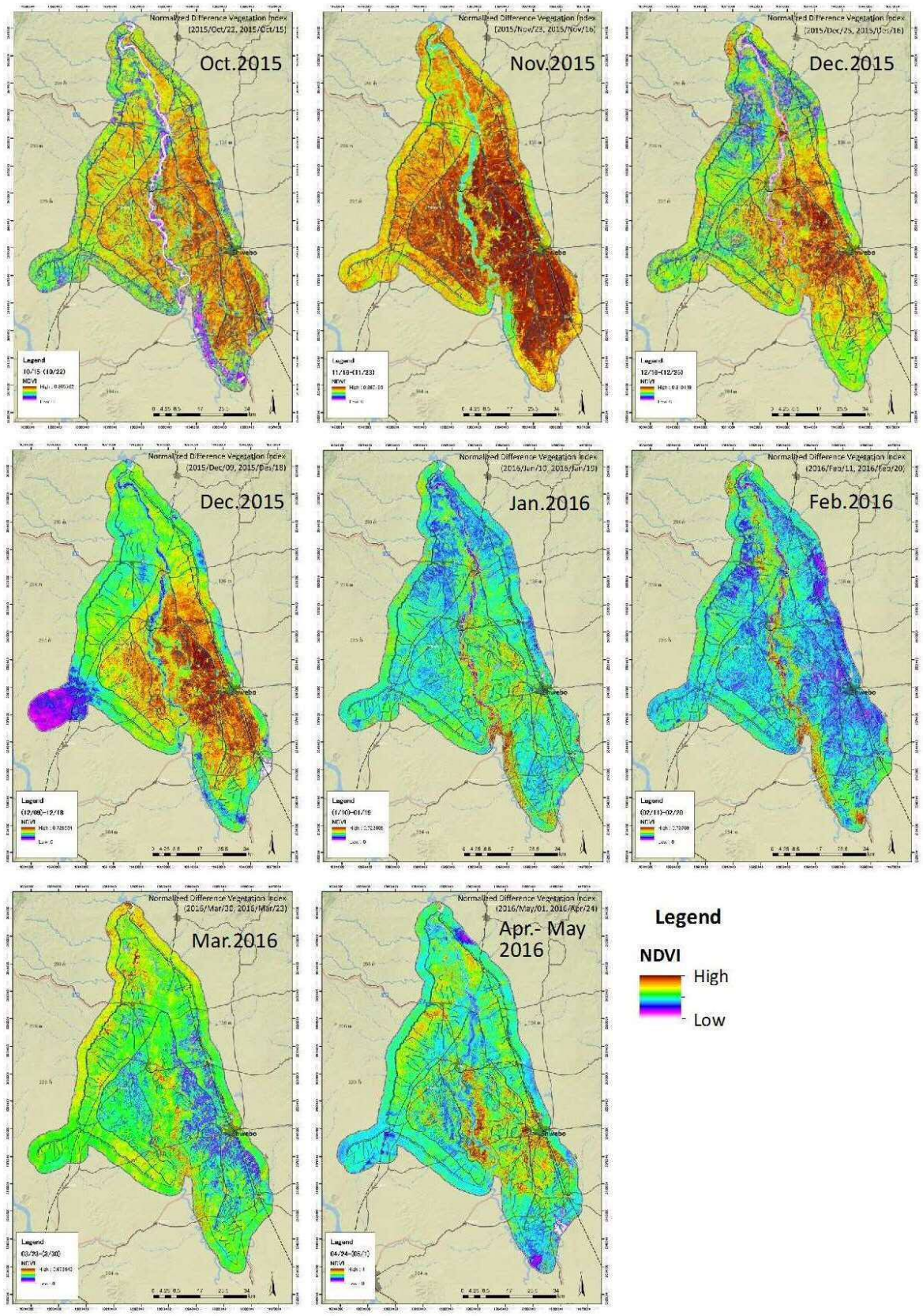


Figure XI.4.1 NDVI (Oct.2015 – May.2016)

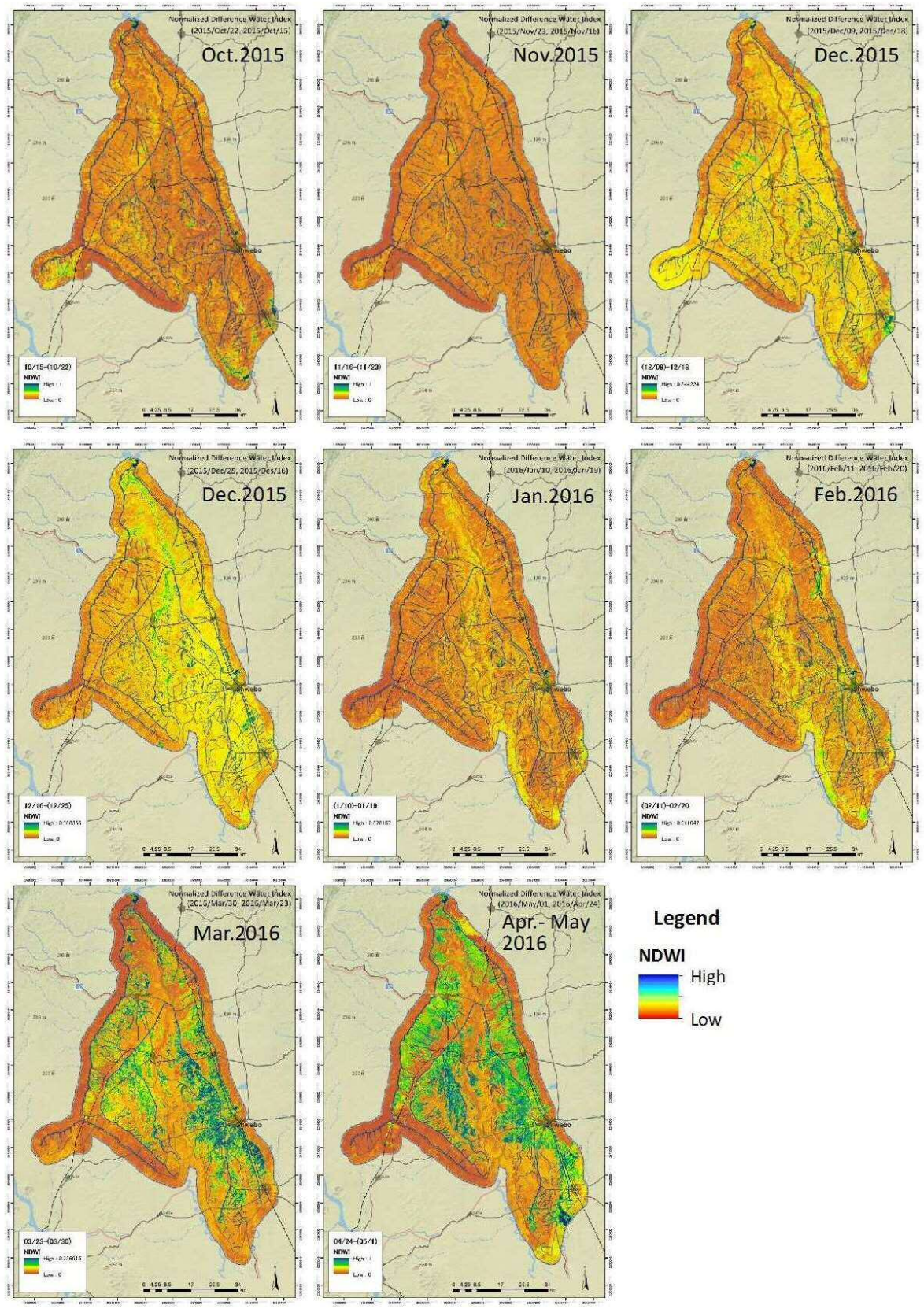


Figure XI.4.2 NDWI (Oct.2015 – May.2016)

XI.5 Algorism for Identifying Paddy and Crops Area

In the analysis, Landsat OLI and TM images were applied to the landscape-scale interpretation. The images were acquired for three (3) years from October to May at Path of 133-134 and Row of 44-45. This area covers Thapanzeik dam irrigation system in Sagaing Region including 10 townships with the elevation which varies from 75 to 140 m. Mu river runs through the analysis area. Other surface water bodies include reservoirs, floodplain and agriculture middle of ponds.

XI.5.1 Farmland Type Classification and Cropping Pattern

In view of land cover type classification for the area in 2015/16, approximately 91% (300,360 ha) of a total area (328,699 ha) is occupied by farmland and remaining 9 % (28,339ha) is classified as non-farming area including open water and residential area, as shown in Table XI.5.1.

Table IX.5.1 Area of Farmland Type (Classified from NDVI from 2015 Oct to 216 May), ha

District	Township	1_Non-farming area(1)	2_Upland (semi-cultivated)	3_Upland (cultivated area)	4_Sub Total (2+3)	5_Lowland (semi-irrigable area)	6_Lowland (irrigable paddy area)	7_Sub Total (5+6)	8_Total of Farming Area (4+7)	9_Total of Project Area (1+8)	% Farmland (8/9)
Monywa	Ayadaw	1,952	1,679	3,110	4,789	4,202	557	4,759	9,547	11,500	83%
Monywa	Budalin	1,153	2,046	3,155	5,201	1,471	247	1,718	6,918	8,071	86%
Kanbalu	Kanbalu	2,729	2,318	5,267	7,585	11,446	7,492	18,938	26,524	29,253	91%
Shwebpo	Khin U	3,019	2,285	3,046	5,331	11,360	15,526	26,886	32,217	35,235	91%
Sagaing	Sagaing	159	649	993	1,641	2,049	85	2,134	3,776	3,934	96%
Shwebpo	Shwebo	3,430	2,644	3,945	6,589	10,992	25,626	36,618	43,207	46,637	93%
Shwebo	Tabayin	3,904	4,238	10,025	14,263	29,144	13,164	42,308	56,572	60,476	94%
Shwebo	Taze	6,999	5,031	9,611	14,642	12,248	8,968	21,215	35,857	42,856	84%
Shwebpo	Wetlet	1,525	2,267	4,440	6,707	18,423	22,185	40,607	47,315	48,840	97%
Shwebo	Ye-U	3,470	3,844	9,236	13,080	17,643	7,705	25,347	38,427	41,897	92%
	Total	**28,339**	**27,001**	**52,827**	**79,828**	**118,977**	**101,555**	**220,531**	**300,360**	**328,699**	**91%**

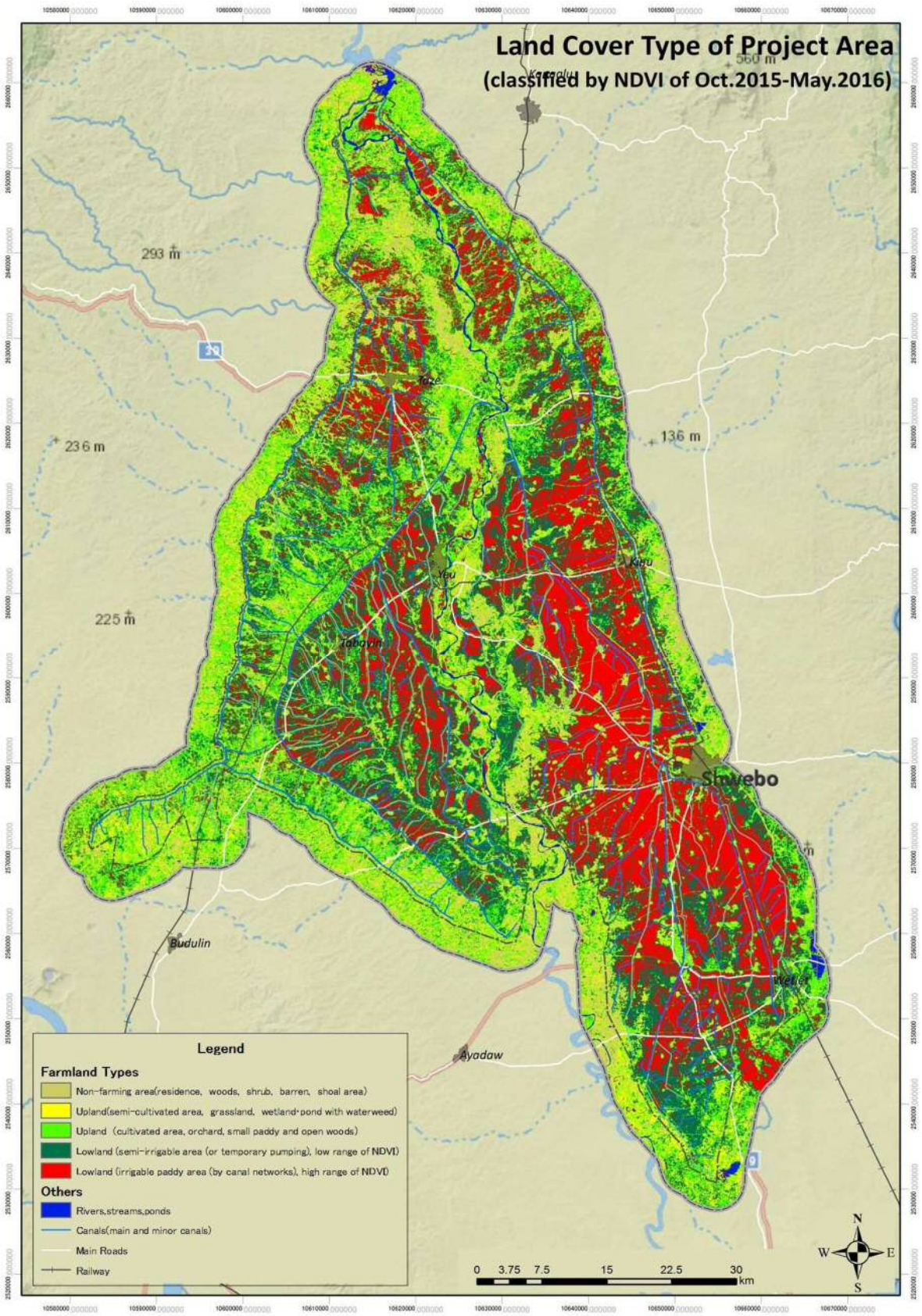
Note 1 Non-farming area (residence, woods, shrub, barren, shoal area)
2 Upland (semi-cultivated area, grassland, wetland·pond with waterweed)
3 Upland (cultivated area, orchard, small paddy and open woods)
5 Lowland (semi-irrigable area (or temporary pumping), low range of NDVI)
6 Lowland (irrigable paddy area (by canal networks), high range of NDVI)

Agriculture in the Project area is dominated by double or triple cropping patterns consisting of monsoon paddy, winter crops, and summer paddy or summer crops. According to farmland type derived from Landsat OLI image showed in Figure XI.5.1, lowland (indicated as red color) which contained summer and monsoon paddy fields is intensively developed and centered upon irrigation canals. While the upland (indicated as light-green) consisting of crops and vegetables is located far from canals and is isolated from irrigation area.

In the lowland area, monsoon paddy is generally re-planted (replaced) by winter crops, summer crops, or summer paddy. In ordinary year, sowing of summer paddy commences at one (1) month later after canal-open which is annually scheduled in February. Even in seed-bed nurseries, the transplanting is completed at least by the end of April. After seeding or transplanting, it grows over for three (3) to four (4) months until the harvest in July.

Simultaneously, in the upland area, summer crops are seeded from February to April and are re-planted (re-placed) in August by monsoon rice with short drainage/dry periods.

Along with flooding plain, orchards and commercial vegetables are cultivated through seasons.



Souse: Study team, delineated from Landsat OLI (Oct2015/May16)

Figure IX.5.1 Farmland Type (Oct.2015 - May.2016)

Taking consideration of farmland classification and related cycle of crops, the cropping pattern is simplified for the analysis (refer to Section "3.3 Agriculture in the Project Area" in Main Report). In Figure XI.5.2, cropping pattern for the analysis is shown with acquired timing of Landsat images and NDVI changes.

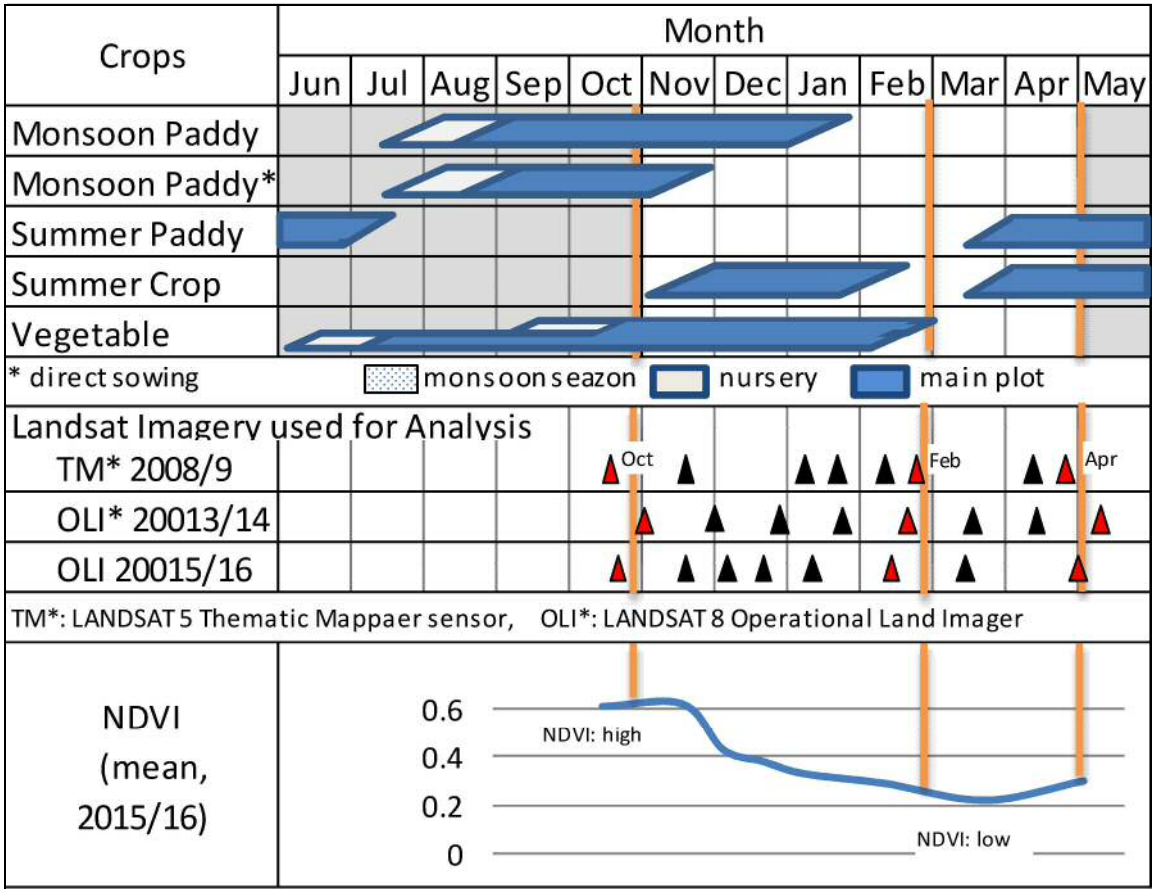


Figure XI.5.2 Cropping Pattern and Available Landsat Images

XI.5.2 Procedure of Detecting Planting Area

According to the above cropping pattern and available Landsat images, the procedure to detect planting area is introduced for the respective crops as follows.

Monsoon paddy: NDVI of monsoon paddy reaches its maximum in November and abruptly decreases in December or January after its harvesting. The rice planting area is thus detected by the difference between before and after harvesting (October and February). The difference of NDVI between them indicates its planting area with the threshold; 'mean - 1xσ' which resulted in the ground truth survey, i.e. the field survey mentioned in Chapter 6. (σ: Standard Deviation of the difference of NDVI)

Winter crops: Winter crops are not cultivated by canal water and are exclusively planted in flooding plain along with Mu River and in groundwater utilization area which is mainly located at the border and southern part of the Project area. Winter crops are distributed especially in February because of lower level of the distribution of other crops (monsoon/ summer paddy and summer crops). Based on the ground truth survey and histogram pattern of NDVI, threshold is obtained as '0.39'.

Summer paddy: The area of summer paddy is characterized by submersion condition with irrigation water. The submersion of summer paddy starts in February together with canal-open and

continues at least until May. The end of the submersion can be recognized by closing water surface by rice canopy. Its plating area is detected by calculating NDWI in April (or May). The threshold is determined as NDWI = - 0.08 by the ground truth survey.

Summer crops: Summer crops are planted in March to April which is same period as those of summer paddy. To detect its planted area, as first step, total area of summer crops and paddy is once obtained by image-difference of NDVI between April (or May) and February. Then, it is reduced by the area of summer paddy. Threshold is obtained as 'mean + 0.66 x σ' by verification survey in filed.

Figure XI.5.3 shows the applied algorism for calculation of planting area of paddy and crops, which was resulted by the ground truth survey conducted in January to February 2017.

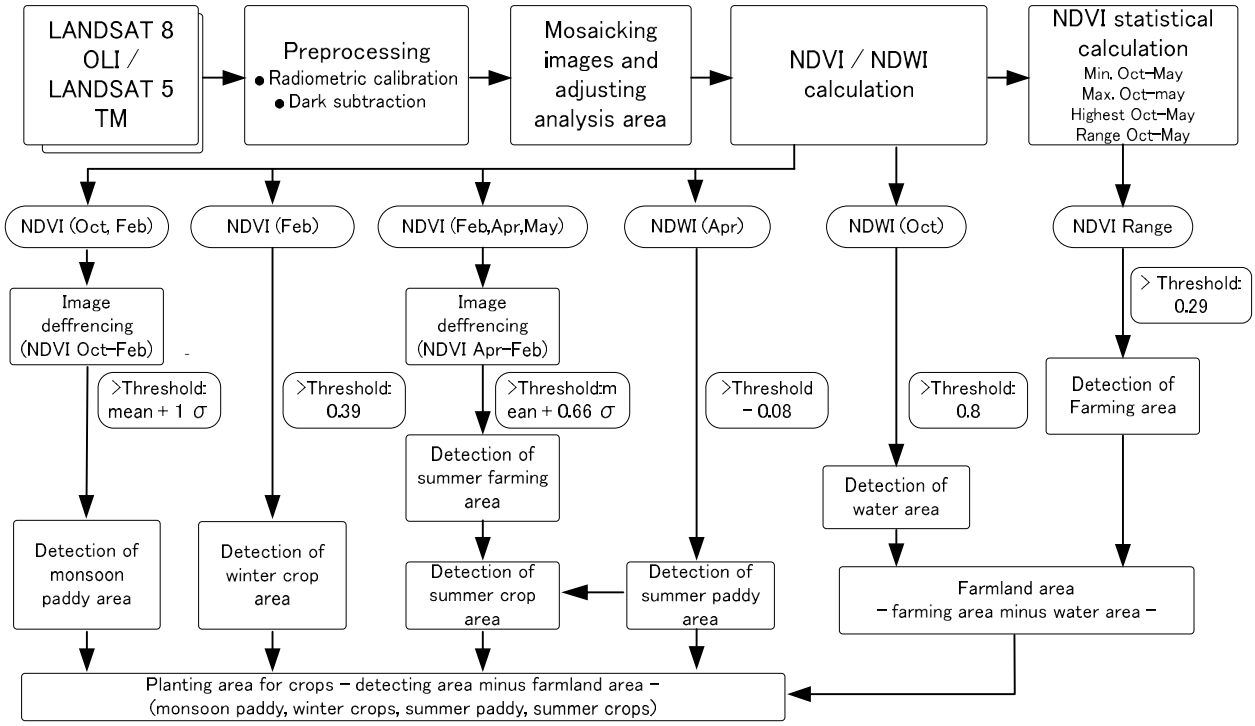


Figure XI.5.3 Algorism for Identifying Paddy and Crop Area

Because of limited acquisition of Landsat data compared to the congested farming activity in the season, a constant value may not be applied as threshold for all the cases which covers some years and seasons. In accordance with the susceptible condition of the satellites image, the statistical approach is better to be applied with the standard deviation of the mean of the values for explaining the annual variation of farming area.

In the case of monsoon and summer crops, seasonal and annual change in NDVI occurs in large portion of the Project area. The distribution of the pixel values indicated as skews, so that the threshold (a coefficient multiply standard deviation) was empirically adjusted through a comparative works in the field survey.

XI.6 Field Survey

The ground truth survey was carried out in January 2017. Prior to the survey, the daft map of farmland area was prepared by NDVI statistical analysis. The map had been verified through comparative works to current status at the selected points as respective farmlands.

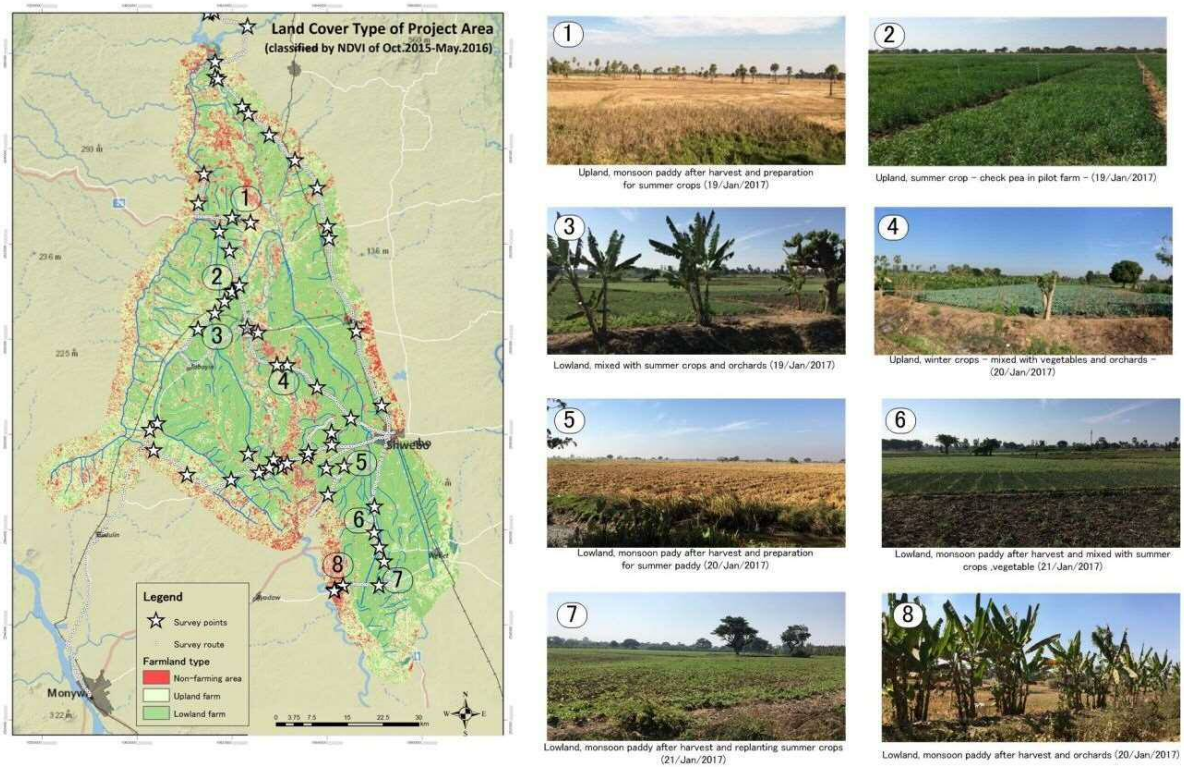


Figure IX.6.1 Field Survey Points and Area Landscape in Jan – Feb 2017

At each survey point, the local farmers were interviewed about the current land-use and recent farming activity, e.g. crop types and their planting/harvesting date. The number of survey points were about 70, which covered the analyzed area and respective farmland types as shown in Figure XI.6.1.

Through this comparative survey, threshold for non-farming area was determined as 0.29 for the range of NDVI (maximum change of image-difference in eight (8) month from October to May). The information of farming activity was also collected to determine aforesaid thresholds for image-differencing changes to detect planting area for respective crops.

In following sub-sections, relationship between NDVI, NDWI and field condition is described.

XI.6.1 NDVI Changes and Cropping Cycle

During the field survey, farmers were interviewed about planted timing and its cultivated period especially of 2015/2016. Through the survey, the Team collected information about the cropping pattern in the typical cropping area as follows:

Cropping Pattern	Survey Point (see Figure XI.6.2)
a) Monsoon paddy (shwebo-posan) →Summer crops,	2,3,7
b) Monsoon paddy (shwebo-posan) →Summer paddy,	5,6
c) Monsoon paddy (other variety) →Winter crop →Summer crop,	1,8
d) Monsoon paddy (other variety) →Summer crop	4
e) Monsoon paddy (other variety or shwebo-posan)	-

To confirm relationship between cropping pattern and NDVI value, changes of NDVI at survey points

was delineated in Figure XI.6.2. The temporal trend of NDVI fluctuated and had clear peaks at monsoon, winter, and summer season. They are correlated to as three (3) growing season; monsoon paddy (October to January), winter crop (January to March) and summer crop and summer paddy (March to May) in the survey area.

Besides, even in the same season, NDVI level is classified into two parts. First, in the case of monsoon paddy, there is a correlation between higher NDVI and Shwebo Powsan cultivated area, while lower NDVI in general corresponds to the early ripening paddy variety (e.g. IR 747 at point 4). As for winter and summer season, plots of summer crops (green gram, sesame, etc.) are identified as higher NDVI than that of paddy field.

The minimum range of NDVI (max.-min.value) calculated by survey points was about 0.3, which is the same level as threshold (i.e.0.29) of non-farming / farming area.

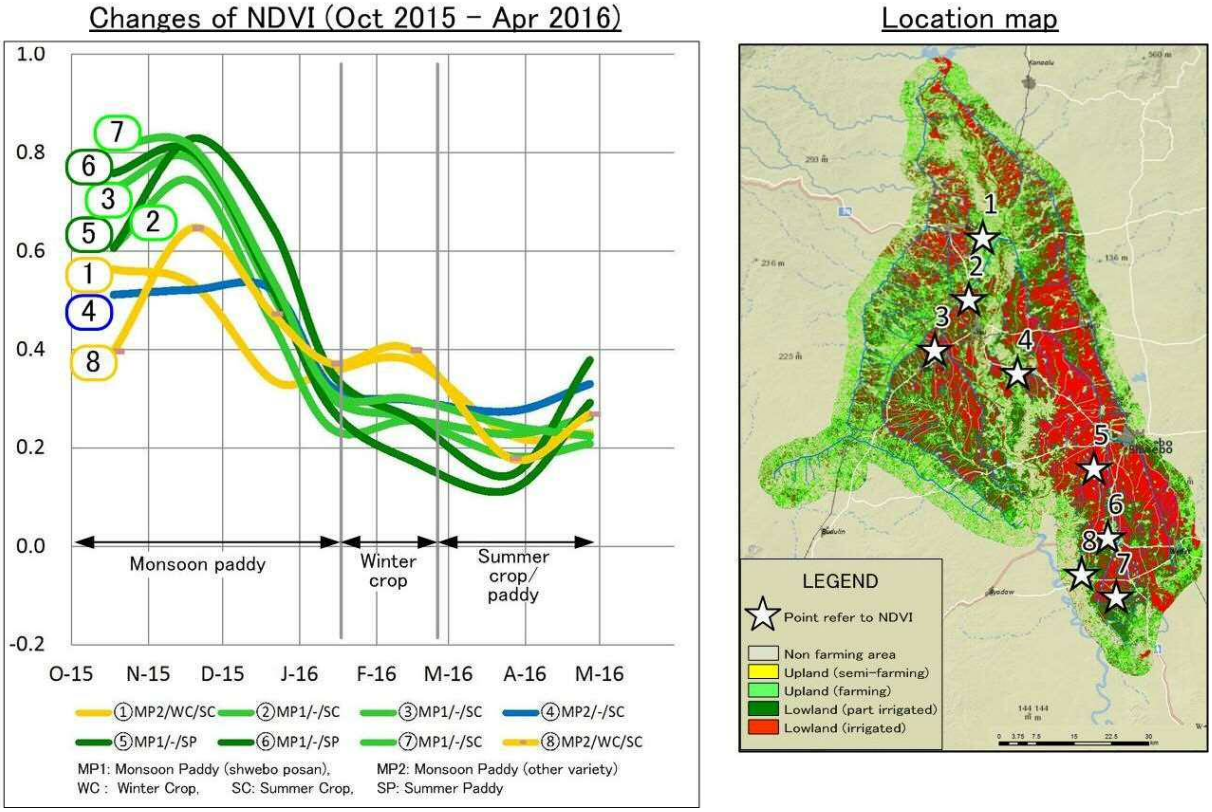


Figure IX.6.2 NDVI Changes and Cropping Cycle

XI.6.2 Spatial Distribution of NDVI with Multiple Peaks

In the case of monsoon paddy in 2015/16 season, northwestern part of the survey area includes lots of early-harvesting plots for coming cropping. On the other hand, at the same period, the southeastern part still remains in growing stage, i.e. one to two month before harvesting. Also in summer season, paddy and other crops were simultaneously planted, however, their growing peaks and harvesting times were different each other. In this condition, the spatial distribution of NDVI was not monotonous for all the survey area, so that it probably describes compound curves with multiple NDVI peaks. The condition also presented as various shapes of NDVI histogram in Figure XI.6.3.

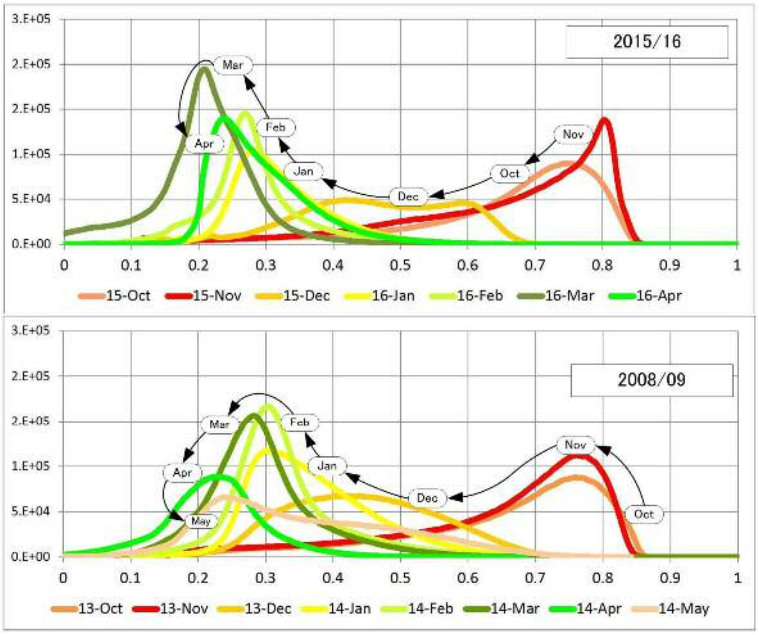


Figure IX.6.3 NDVI Histogram (2015/16 and 2008/09)

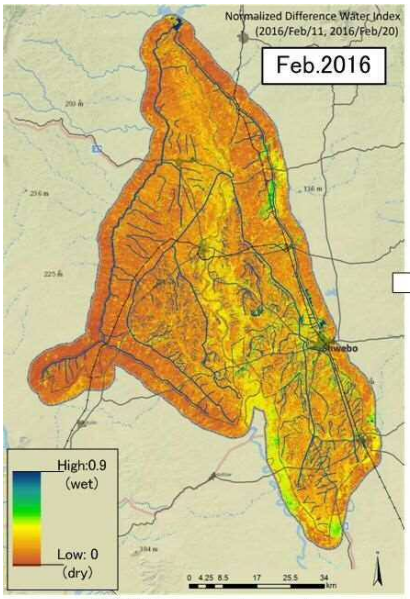
Out of histograms drawn for October to May, only two month, February to March, were regarded as the normal distribution reflected by a quiet period of sowing and transplanting stage. Toward growing period, they grew into the non-normal distribution and skewed further until harvesting. Besides, the changes between different years were also huge due to climate condition and other factors.

As a result of field survey correlated with NDVI, a routine method which applies a constant threshold to NDVI data is hard to be employed for an estimation of cropping area especially over multiple years. Instead, statistical approach for image-difference (e.g. before/after harvesting) is judged to be applied for the analysis.

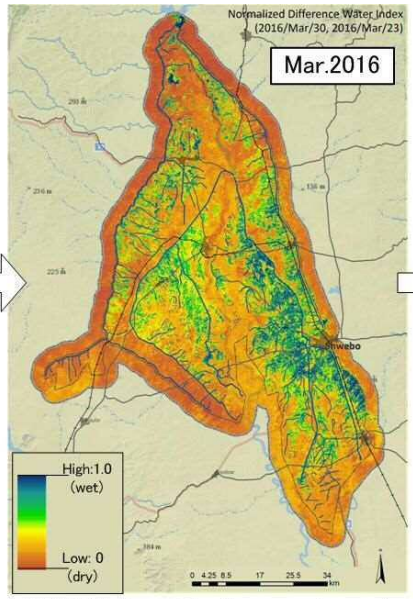
XI.6.3 Spatial Distribution of NDWI and Summer Paddy

Thapanseik reservoir releases irrigation water from the beginning of February every year. After canal opening, irrigation water gradually flows down and spreads over irrigable area by the end of March. Crop planting then commences from the middle of February and in general terminates by the end of April. Regarding the summer cropping area located in downstream of canal network, the irrigation water is just once supplied to plots for seeding time and is interrupted in growing period. On the other hand, for summer paddy located nearby main canals, irrigation water is supplied continuously beyond March.

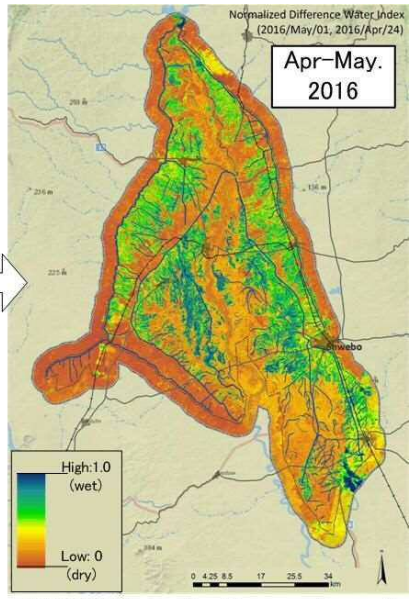
Spatial distribution of NDWI shows the range of water distribution after canal open (see Figure XI.6.4). In the field survey, higher rage of NDWI in April (indicated as “green color”) was judged as correlative key to submersion area of summer paddy. The threshold was determined through cross-checking between NDWI value and actual location of paddies at survey points.



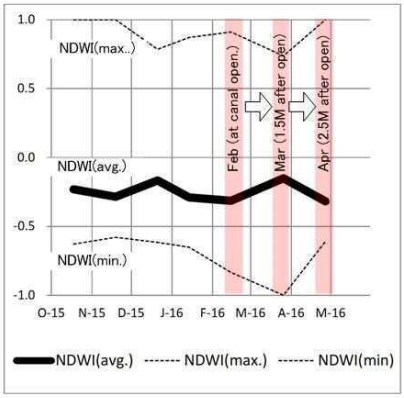
NDWI (at canal open)



NDWI (1.5 month after canal open)



NDWI (2.5 month after canal open)



Chane of NDWI (Oct 2015–May2016)

Figure IX.6.4 Spatial Distribution and Changes of NDWI (2015/16)

XI.7 Quantitative Evaluation of Paddy and Crops

Quantitative evaluation was done for three (3) years, i.e. 2008/09, 2013/14 and 2015/16 with following steps, 1) detection of farming area, 2) detection of planting area of respective crops and paddy 3) statistical analysis by administration boundary. The details of quantitative evaluation are described in following subsections.

XI.7.1 Detection of Farming Area

Farming area was detected by NDVI and NDWI of a season. As for NDVI, the difference between October and May was calculated. The exceeding range was extracted with threshold of 0.29. The exceeding area was once extracted as a 'temporary farmland' which may include water area such as lakes, ponds, and rivers other than farming area.

While NDWI was applied for extraction of 'water area', Applying 0.8 of threshold, higher part than threshold value was regarded as 'water area'.

Farming area is then obtained by subtracting 'water area' from 'temporary farmland' which is previously obtained from NDVI image.

In Figure XI.7.1, the spread of farming area in 2015/16 and the calculation process with histograms of NDVI and NDWI is shown.

XI.7.2 Detection of Planting Area of Crops and Paddy

Crop planting area was calculated based on algorism determined by local farming condition of cropping pattern and the climate (see Figure XI.5.3). As described in Chapter 5, the area of monsoon paddy was estimated based on the change detection method between pre-harvest (October) and post-harvest (February). For summer paddy, planting area is regarded as higher range of NDWI which reflects a liquid water content of paddy just after sowing or transplanting. As for area of summer crops, it was clarified by comparison of NDVI values between two dates, i.e. pre-planting (February) and post-planting or glowing stage (May). Firstly, the cropping area was obtained by the difference of NDVI, and it was then subtracted by area of summer paddy. The distribution of crops and paddy in 2008/09, 2013/14, and 2015/16 are as follows.

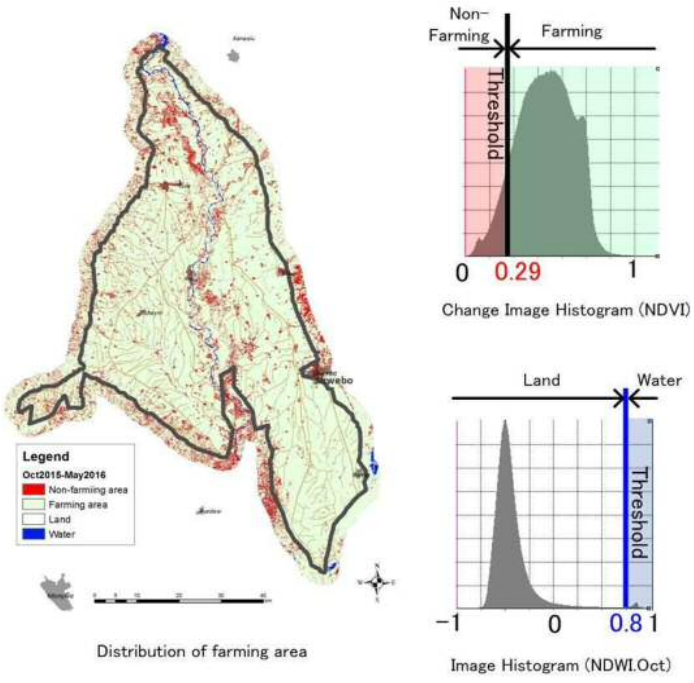


Figure IX.7.1 Farming Area in 2015/16 w/ Histogram of NDVI/NDWI

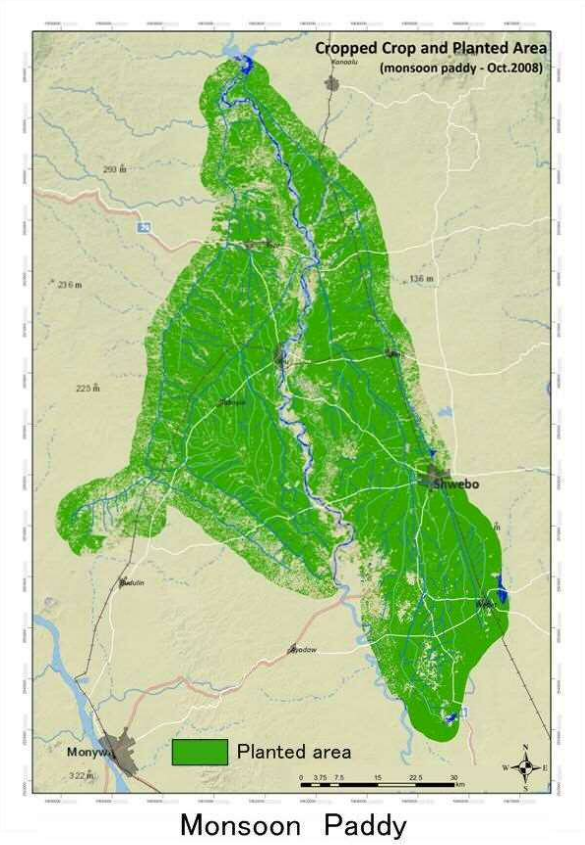
2008/09 (refer to Table XI.7.2): 2008/09 season had normal rain fall of 1,200 mm. Monsoon paddy was extended to 272,630 ha (673,683 acre) without narrow strip of floodplains of Mu River. On the other hand, 11,842 ha (29,263 acre) of winter crops are limitedly detected along Mu River and southern area of the Project area, depending on rainwater and river runoff in/after monsoon season. In summer season, paddy area covers 154,876 ha (382,706 acre) of 78% of

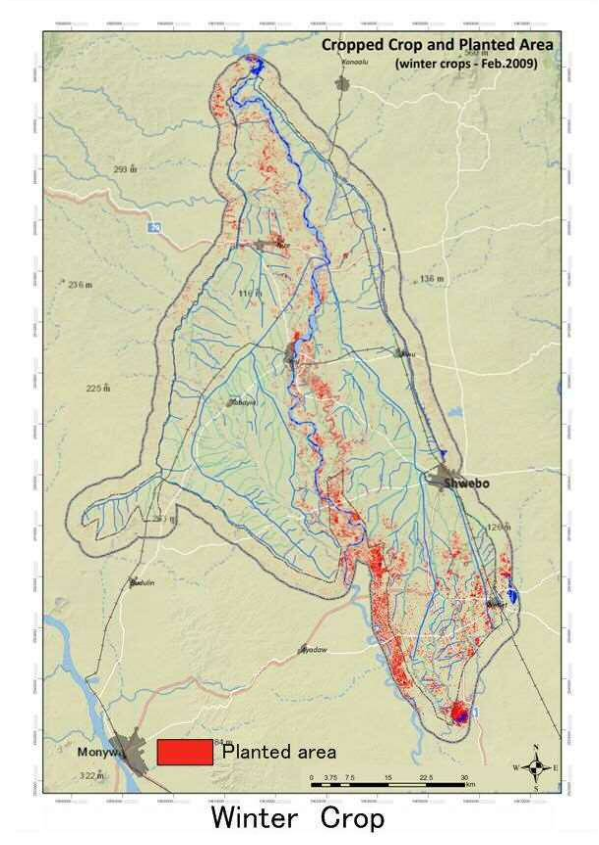
Thapanzeik dam irrigation area, while summer crops laid sporadically along Old Mu canal and southern area and its area is small as 11,446ha (28,284 acre).

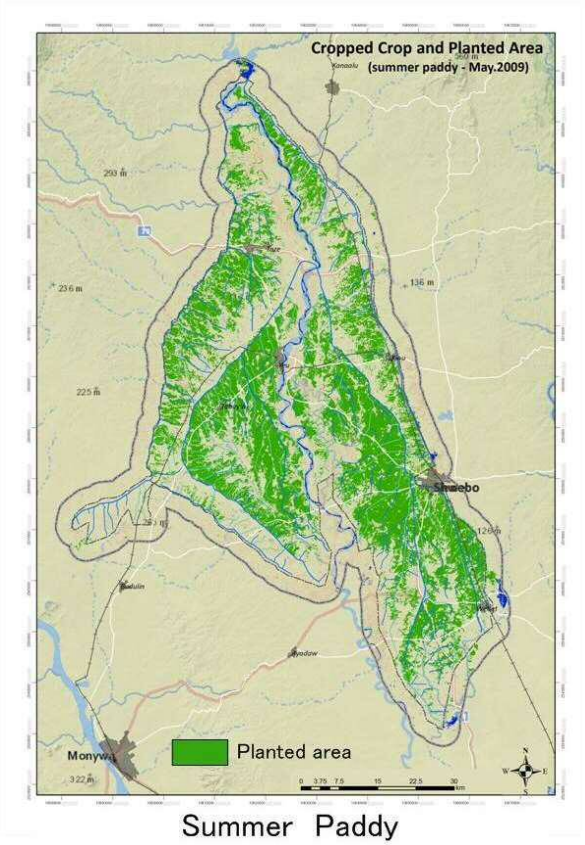
20013/14 (refer to Table XI.7.3): This season stood for a long draught succeeded from previous year of 2012, and had water shortage as was about 60 % of average rainfall, so that cropping pattern was different from normal years'. Due to insufficient rainwater in particular north part of the analysis area, monsoon paddy decreased to 249,906 ha (617,532 acre). It was predicted that monsoon paddy was re-planted earlier by winter crops nearby Mu River and ground water sources (see southern end of the analysis area in Figure XI.7.3). Summer paddy was also laid on limited area because of insufficient water from Thapanzeik dam. The irrigated area was 105,590 ha (260,919 acre). Summer crops were detected as 25,501 ha (63,014 acre).

2015/16(refer to Table XI.7.4): This season received sufficient rainfall more than 160 % of average year's, so that monsoon paddy was extended to 266,895 ha (659,512 acre). At the rest of monsoon paddy, the area of winter crops was brought up to 29,659 ha (73,288 acre) which is centered upon Mu River. As for irrigated land in summer season, 108,822 ha (268,904 acre) of summer paddy were re-planted after monsoon paddy (or some winter crops). In the detached area from canals system, summer crops were cultivated in 37,048 ha (91,546 acre). This may be caused by insufficient irrigation supply.

In Figure XI7.2 to XI.7.4, spatial distribution of monsoon paddy, winter crops, summer crops and summer paddy are shown respectively.







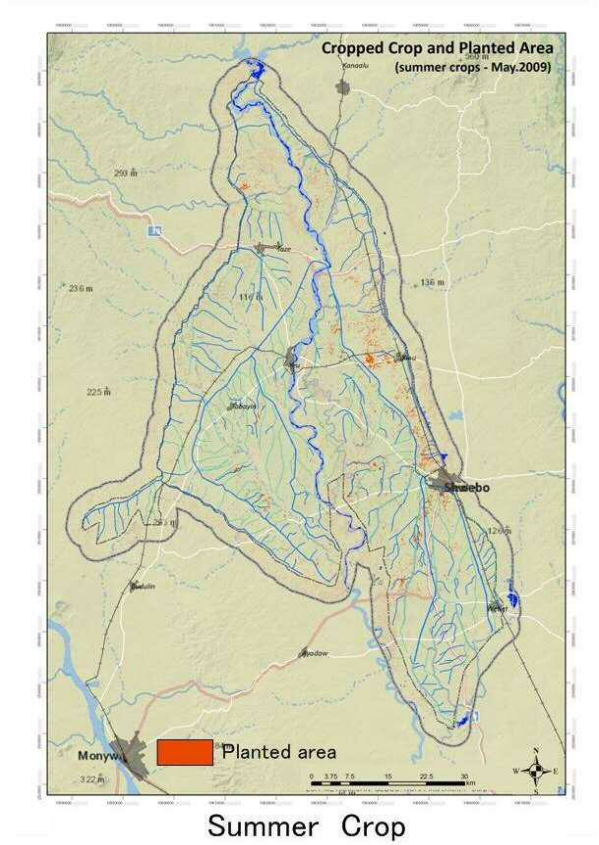
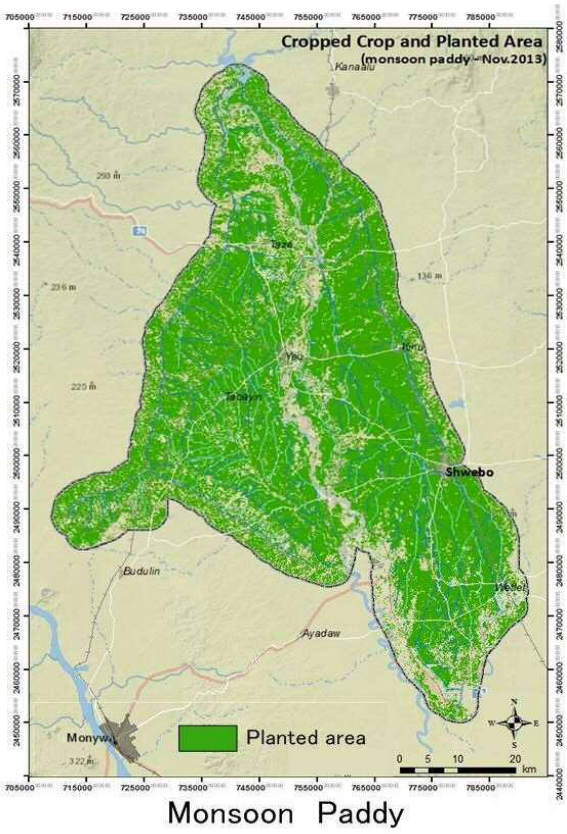
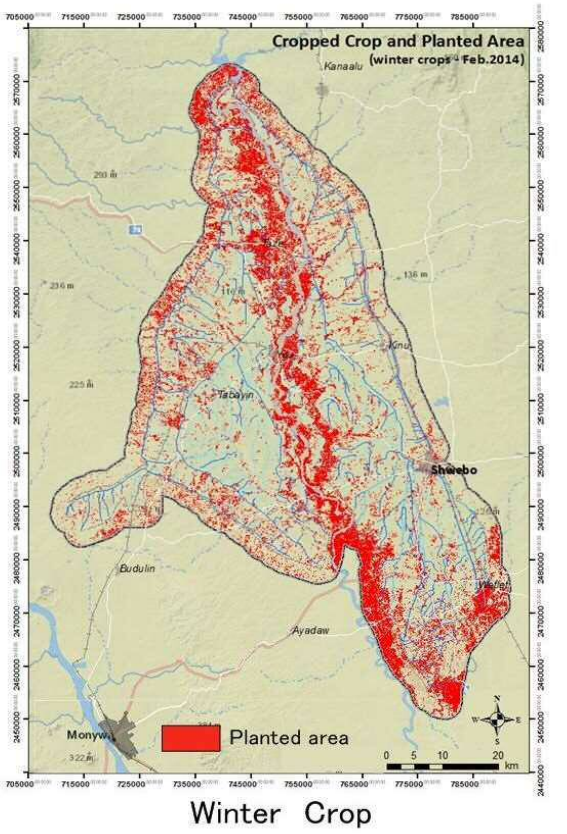


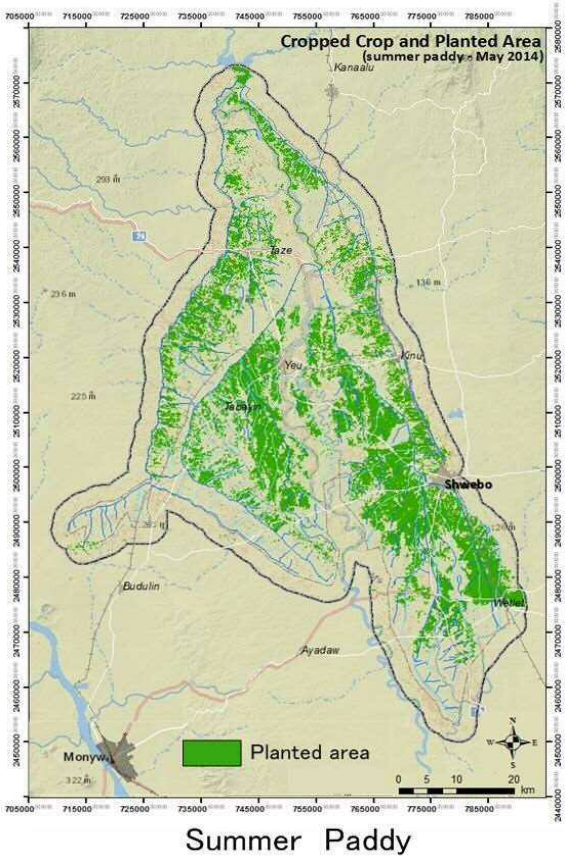
Figure XI.7.2 Crop Planted Area (2008-09)



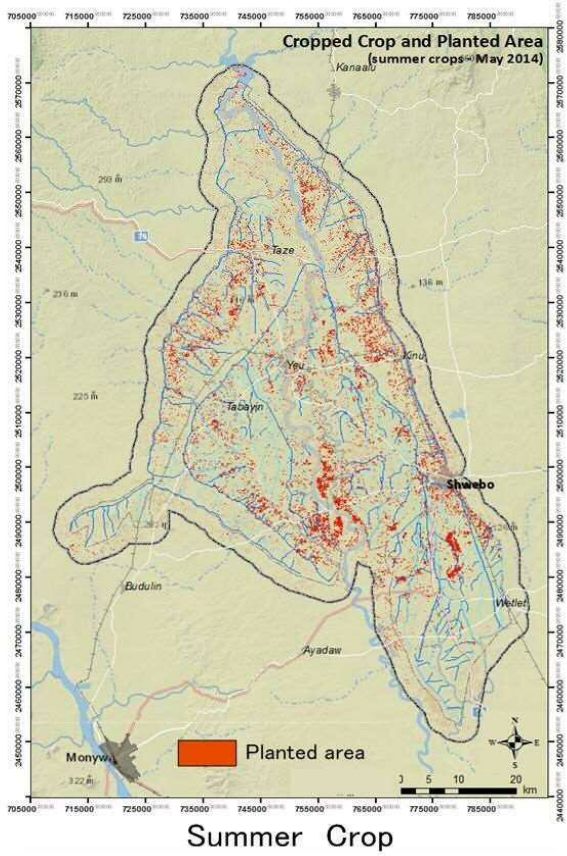
Monsoon Paddy



Winter Crop

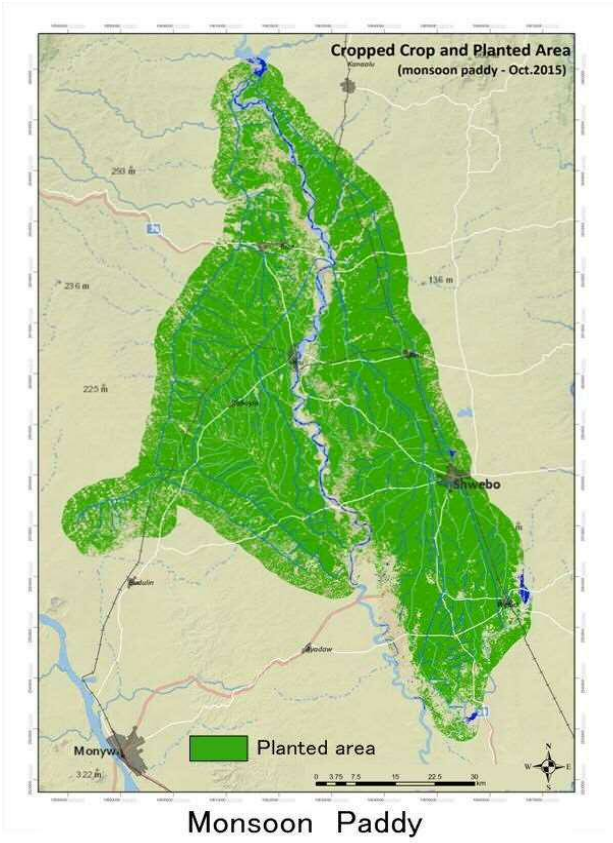


Summer Paddy

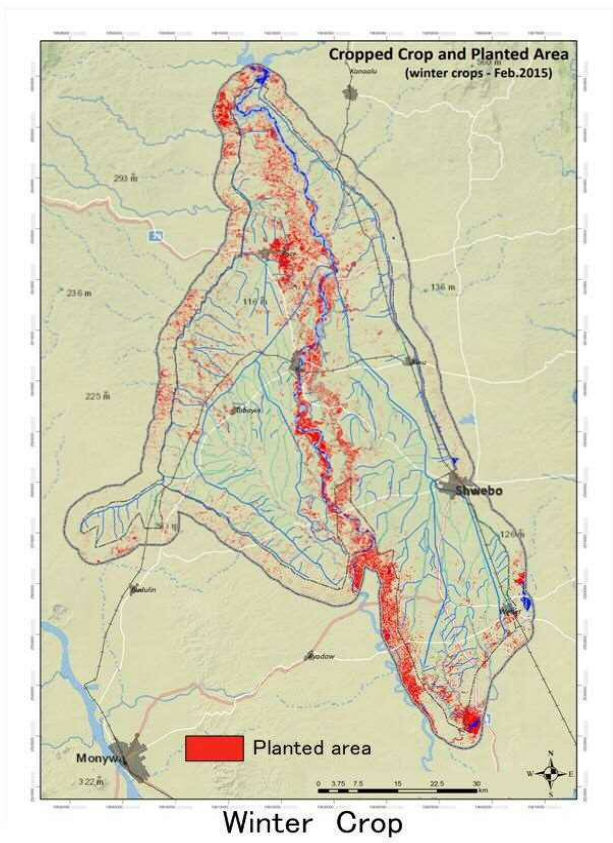


Summer Crop

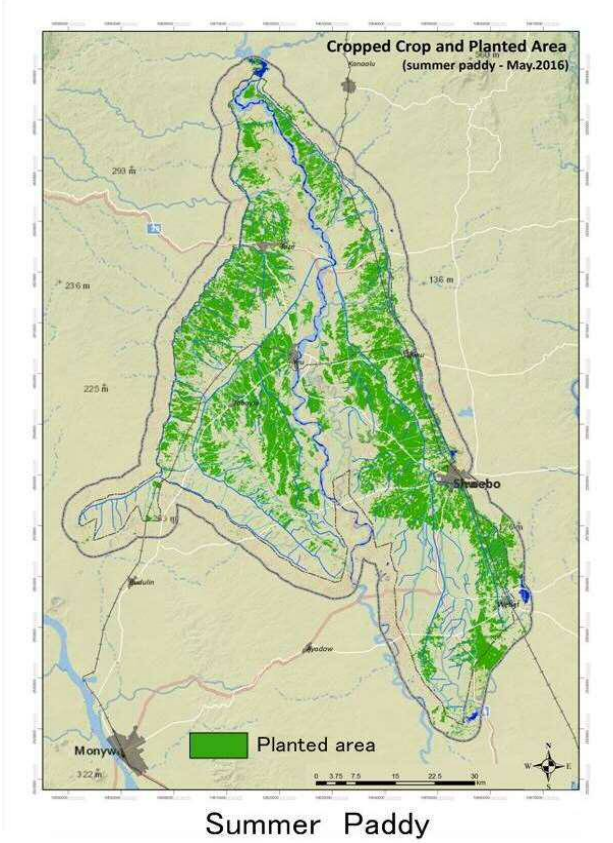
Figure XI.7.3 Crop Planted Area (2013-14)



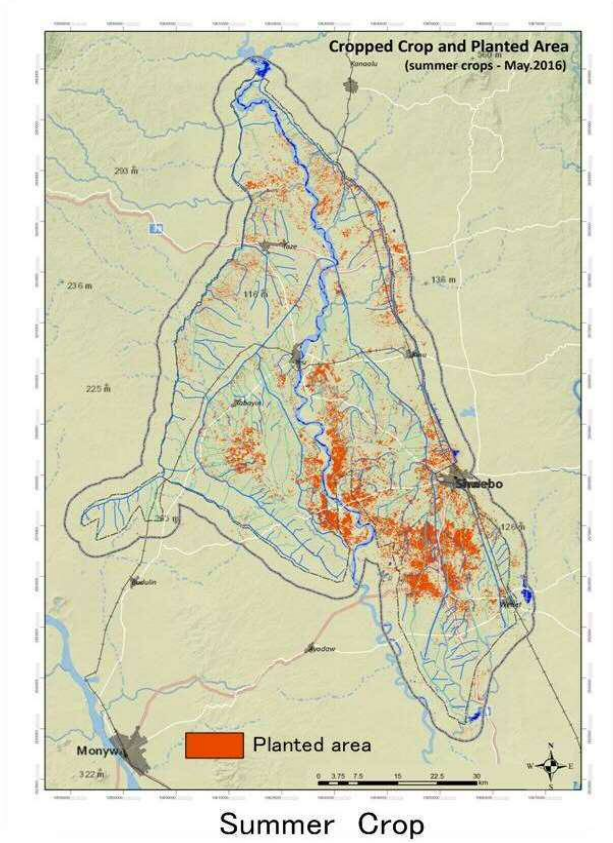
Monsoon Paddy



Winter Crop



Summer Paddy



Summer Crop

Figure XI.7.4 Planted Areas of Crops (2015-16)

XI.7.3 Statistical Analysis with Administration Boundary

Source: Myanmar Information Management Unit, 10-May-2010)

Figure XI.7.5 Village and Township Boundary

The planting area estimated by binary change detection was classified with administration boundaries. With village tracts and townships boundary as shown in Figure XI.7.5, the area enclosed by each boundary was calculated to compare itself to the existing agriculture statistics prepared by IWUMD, MOALI.

Since the statistical information, as for the irrigation area of Thapanzeik dam, is solely available, the correlation between the analysis' and the statistics data had to be based on whole the analysis area as shown in Table XI.7.1, XI.7.2, XI.7.3 and XI.7.4.

XI.7.3.1 Evaluation of Analysis Result

There are four (4) cropping areas distinguished by Landsat imagery in the analysis (or irrigation) area as aforesaid. However, in the existing agriculture statistics, two (2) cropping areas, i.e. winter crop and a part of monsoon paddy which is planted outside of the irrigation area is not complied.

Therefore the two (2) cropping areas of summer paddy and summer crop was compared. As a result of the comparison, the difference remained at 1% to 11 % even in a variation of hydrological condition for three (3) years, i.e. 9% in normal rainfall (2008/09), 11% in dry year(2013/14) and 2% in wet year(2015/16) respectively.

Table XI.7.1 Cropping Area and Comparison B/T Analysis and Statistics

Comparison between study and agriculture statistic (DOA)							Unit: ha		
Year	2008/2009			2013/2014			2015/2016		
Source	a) Study	b) DOA	a/b	a) Study	b) DOA	a/b	a) Study	b) DOA	a/b
Monsoon paddy	272,630	197,016	138%	249,906	197,715	126%	266,895	198,296	135%
Winter crop	11,842	0		44,248	0	-	29,659	0	-
Summer crop	11,446	0		25,501	-	-	37,048	37,714	98%
Summer paddy	154,876	141,791	109%	105,590	119,242	89%	108,822	108,138	101%
Comparison between study and agriculture statistic (DOA)							**Unit: acre**		
Year	2008/2009			2013/2014			2015/2016		
Source	a) Study	b) DOA	a/b	a) Study	b) DOA	a/b	a) Study	b) DOA	a/b
Monsoon paddy	673,683	486,836	138%	617,532	488,565	126%	659,512	490,001	135%
Winter crop	29,263	0		109,340	0	-	73,288	0	-
Summer crop	28,284	0		63,014	0	-	91,546	93,193	98%
Summer paddy	382,706	350,372	109%	260,919	294,654	89%	268,904	267,216	101%

Table XI.7.2 (1/2) Cropping Area in Each Township in 2008-2009 (unit: ha)

District	Township	Total of Farming Area (2008/09)	Monsoon paddy (Oct/2008)	% in Total Farming Area	Winter crop (Feb/2009)	% in Total Farming Area	Summer crop (May/2009)	% in Total Farming Area	Summer paddy (May/2009)	% in Total Farming Area	Total
Monywa	Ayadaw	9,097	8,243	91%	64	1%	179	2%	1,177	13%	9,664
Monywa	Budalin	2,075	2,004	97%	0	0%	2	0%	34	2%	2,039
Kanbalu	Kanbalu	25,523	23,797	93%	362	1%	1,161	5%	10,673	42%	35,994
Shwebo	Kin U	32,324	30,557	95%	1,356	4%	2,638	8%	18,123	56%	52,673
Sagaing	Sagaing	3,881	3,401	88%	486	13%	1	0%	336	9%	4,225
Shwebo	Shwebo	43,264	42,118	97%	1,400	3%	2,811	6%	31,380	73%	77,708
Shwebo	Tabayin	53,858	52,541	98%	917	2%	1,488	3%	33,049	61%	87,995
Shwebo	Taze	34,865	30,605	88%	2,010	6%	1,129	3%	14,661	42%	48,406
Shwebo	Wetlet	46,671	43,849	94%	4,326	9%	918	2%	25,772	55%	74,865
Shwebo	Ye-U	37,153	35,516	96%	920	2%	1,119	3%	19,671	53%	57,226
Total		288,710	272,630	94%	11,842	4%	11,446	4%	154,876	54%	450,795
Total(DOA)			197,016		0		0		141,791		338,806
Deference b/t DOA & Survey			75,615		11,842		11,446		13,085		111,989
% of Survey/DOA's			138%		-		-		109%		133%

Note: Total farming area is estimated by analysis of Landsat Imageries acquired from Oct. 2008-May.2009

Table XI.7.2 (2/2) Cropping Area in Each Township in 2008-2009 (unit: acre)

District	Township	Total of Farming Area (2008/09)	Monsoon paddy (Oct/2008)	% in Total Farming Area	Winter crop (Feb/2009)	% in Total Farming Area	Summer crop (May/2009)	% in Total Farming Area	Summer paddy (May/2009)	% in Total Farming Area	Total
Monywa	Ayadaw	22,480	20,369	91%	159	1%	443	2%	2,909	13%	23,880
Monywa	Budalin	5,127	4,951	97%	1	0%	4	0%	84	2%	5,040
Kanbalu	Kanbalu	63,068	58,804	93%	895	1%	2,869	5%	26,375	42%	88,944
Shwebo	Kin U	79,874	75,507	95%	3,350	4%	6,518	8%	44,782	56%	130,158
Sagaing	Sagaing	9,591	8,405	88%	1,202	13%	3	0%	830	9%	10,440
Shwebo	Shwebo	106,907	104,076	97%	3,459	3%	6,945	6%	77,541	73%	192,022
Shwebo	Tabayin	133,085	129,831	98%	2,266	2%	3,677	3%	81,666	61%	217,441
Shwebo	Taze	86,154	75,627	88%	4,967	6%	2,790	3%	36,229	42%	119,614
Shwebo	Wetlet	115,327	108,353	94%	10,691	9%	2,269	2%	63,683	55%	184,997
Shwebo	Ye-U	91,806	87,762	96%	2,274	2%	2,766	3%	48,608	53%	141,411
Total		713,419	673,683	94%	29,263	4%	28,284	4%	382,706	54%	1,113,938
Total(DOA)			486,836		0		0		350,372		837,208
Deference b/t DOA & Survey			186,847		29,263		28,284		32,334		276,730
% of Survey/DOA's			138%		-		-		109%		133%

Note: Total farming area is estimated by analysis of Landsat Imageries taken Oct. 2008-May.2009

Table XI.7.3 (1/2) Cropping Area in Each Township in 2013-2014 (unit: ha)

District	Township	Total of Farming Area (2013/14)	Monsoon paddy (Oct/2013)	% in Total Farming Area	Winter crop (Feb/2014)	% in Total Farming Area	Summer crop (May/2014)	% in Total Farming Area	Summer paddy (May/2014)	% in Total Farming Area	Total
Monywa	Ayadaw	9,828	7,824	80%	1,038	11%	842	9%	568	6%	10,271
Monywa	Budalin	6,166	4,456	72%	249	4%	10	0%	55	1%	4,771
Kanbalu	Kanbalu	25,934	23,115	89%	2,845	11%	2,992	12%	7,169	28%	36,121
Shwebo	Kin U	32,216	28,937	90%	4,186	13%	4,119	13%	13,173	41%	50,415
Sagaing	Sagaing	3,146	1,734	55%	1,439	46%	0	0%	1	0%	3,174
Shwebo	Shwebo	43,358	40,275	93%	5,769	13%	4,996	12%	23,824	55%	74,865
Shwebo	Tabayin	54,549	45,999	84%	5,226	10%	4,662	9%	19,890	36%	75,777
Shwebo	Taze	35,634	26,704	75%	10,223	29%	2,116	6%	9,529	27%	48,572
Shwebo	Wetlet	46,057	38,569	84%	8,132	18%	2,901	6%	17,153	37%	66,756
Shwebo	Ye-U	37,106	32,293	87%	5,140	14%	2,862	8%	14,227	38%	54,523
Total		293,993	249,906	85%	44,248	15%	25,501	9%	105,590	36%	425,246
Total(DOA)			197,715		0		0		119,242	0	354,671
Deference b/t DOA/Survey			52,191		44,248		25,501		-13,652		70,574
% of Survey/DOA's			126%		-		-		89%		120%

Note: Total farming area is estimated by analysis of Landsat Imageries acquired from Oct. 2013-May.2014

Table XI.7.3 (2/2) Cropping Area in Each Township in 2013-2014 (unit: acre)

District	Township	Total of Farming Area (2015/16)	Monsoon paddy (Oct/2015)	% in Total Farming Area	Winter crop (Feb/2014)	% in Total Farming Area	Summer crop (May/2016)	% in Total Farming Area	Summer paddy (May/2016)	% in Total Farming Area	Total
Monywa	Ayadaw	24,286	19,334	80%	2,564	11%	2,080	9%	1,403	6%	25,382
Monywa	Budalin	15,237	11,011	72%	616	4%	26	0%	137	1%	11,791
Kanbalu	Kanbalu	64,084	57,118	89%	7,031	11%	7,393	12%	17,716	28%	89,259
Shwebo	Kin U	79,607	71,505	90%	10,345	13%	10,177	13%	32,552	41%	124,580
Sagaing	Sagaing	7,774	4,285	55%	3,555	46%	1	0%	2	0%	7,844
Shwebo	Shwebo	107,139	99,522	93%	14,256	13%	12,346	12%	58,871	55%	184,996
Shwebo	Tabayin	134,794	113,667	84%	12,913	10%	11,521	9%	49,149	36%	187,250
Shwebo	Taze	88,053	65,986	75%	25,262	29%	5,229	6%	23,547	27%	120,025
Shwebo	Wetlet	113,808	95,305	84%	20,096	18%	7,169	6%	42,386	37%	164,958
Shwebo	Ye-U	91,692	79,799	87%	12,702	14%	7,072	8%	35,156	38%	134,729
Total		726,473	617,532	85%	109,340	15%	63,014	9%	260,919	36%	1,050,805
Total(DOA)			488,565		0		0		294,654		876,412
Deference b/t DOA/ Survey			128,967		109,340		63,014		-33,736		174,393
% of Survey/DOA's			126%		-		-		89%		120%

Note: Total farming area is estimated by analysis of Landsat Imageries taken Oct. 2013-May.2014

Table XI.7.4 (1/2) Cropping Area in Each Township in 2015-2016 (unit: ha)

District	Township	Total of Farming Area (2015/16)	Monsoon paddy (Oct/2015)	% in Total Farming Area	Winter crop (Feb/2016)	% in Total Farming Area	Summer crop (May/2016)	% in Total Farming Area	Summer paddy (May/2016)	% in Total Farming Area	Total
Monywa	Ayadaw	9,547	8,345	87%	483	5%	198	2%	520	5%	9,546
Monywa	Budalin	6,918	5,214	75%	146	2%	33	0%	222	3%	5,615
Kanbalu	Kanbalu	26,524	23,376	88%	1,778	7%	2,698	10%	9,668	36%	37,520
Shwebo	Kin U	32,217	29,889	93%	2,716	8%	2,472	8%	16,605	52%	51,682
Sagaing	Sagaing	3,776	1,911	51%	1,293	34%	11	0%	133	4%	3,348
Shwebo	Shwebo	43,207	41,536	96%	2,416	6%	10,196	24%	21,559	50%	75,707
Shwebo	Tabayin	56,572	52,731	93%	4,289	8%	5,938	10%	19,368	34%	82,326
Shwebo	Taze	35,857	26,616	74%	8,098	23%	2,920	8%	13,729	38%	51,363
Shwebo	Wetlet	47,315	43,406	92%	3,602	8%	11,013	23%	10,808	23%	68,829
Shwebo	Ye-U	38,427	33,871	88%	4,838	13%	1,568	4%	16,209	42%	56,486
Total		300,360	266,895	89%	29,659	10%	37,048	12%	108,822	36%	442,424
Total(DOA)			198,296		0		37,714		108,138	0	344,149
Deference b/t DOA & Survey			68,599		29,659		-666		684		98,275
% of Survey/DOA's			135%		-		98%		101%		129%

Note: Total farming area is estimated by analysis of Landsat Imageries acquired from Oct. 2015-May.2016

Table XI.7.4 (2/2) Cropping Area in Each Township in 2015-2016 (unit: acre)

District	Township	Total of Farming Area (2015/16)	Monsoon paddy (Oct/2015)	% in Total Farming Area	Winter crop (Feb/2016)	% in Total Farming Area	Summer crop (May/2016)	% in Total Farming Area	Summer paddy (May/2016)	% in Total Farming Area	Total
Monywa	Ayadaw	23,592	20,621	87%	1,193	5%	489	2%	1,286	5%	23,590
Monywa	Budalin	17,096	12,883	75%	360	2%	81	0%	549	3%	13,874
Kanbalu	Kanbalu	65,542	57,763	88%	4,393	7%	6,667	10%	23,891	36%	92,715
Shwebo	Kin U	79,609	73,858	93%	6,711	8%	6,109	8%	41,033	52%	127,712
Sagaing	Sagaing	9,330	4,723	51%	3,196	34%	27	0%	328	4%	8,275
Shwebo	Shwebo	106,767	102,639	96%	5,969	6%	25,196	24%	53,274	50%	187,079
Shwebo	Tabayin	139,791	130,302	93%	10,599	8%	14,673	10%	47,860	34%	203,435
Shwebo	Taze	88,605	65,769	74%	20,011	23%	7,216	8%	33,924	38%	126,921
Shwebo	Wetlet	116,917	107,258	92%	8,900	8%	27,214	23%	26,708	23%	170,081
Shwebo	Ye-U	94,955	83,696	88%	11,956	13%	3,874	4%	40,052	42%	139,579
Total		742,204	659,512	89%	73,288	10%	91,546	12%	268,904	36%	1,093,251
Total(DOA)			490,001		0		93,193		267,216		850,410
Deference b/t DOA & Survey			169,511		73,288		-1,647		1,688		242,841
% of Survey/DOA's			135%		-		98%		101%		129%

Note: Total farming area is estimated by analysis of Landsat Imageries taken Oct. 2015-May.2016

As for a comparison of monsoon paddy, about 270,000 ha (670,000 acre) has been cultivated in normal hydrological year. It exceeded the figure of the existing statistics and accounted for 125 % to 140%. 12,000 to 44,000 ha (30,000 to 110,000 acre) of winter crop was calculated in the three (3) analysis years.

XI.7.3.2 Planted Area of Each Village Tract

Planted area of crops and paddy was calculated by village tracts. There are more than 300 village tracts in the analysis area. In the monsoon season, the paddy field extensively spreads over every village. 85 to 94 % of their farmland was recognized as the monsoon paddy (85 % in dry year of 2013/14 and 94 % of wet year of 2015/16). After the monsoon season, a second crop is planted and farmers shift to dual (or triple in part) cropping. However, due to available water source, its spatial and time-series distribution had been changed as shown in Figure XI.7.6. The annual cropping patterns with village tract based distribution can be described as follows.

1) 2008/09 (Normal Year)

The cropping pattern in 2008/09 was a monotype. Farmers in most village tracts were engaged in dual cropping consisting of monsoon paddy and summer paddy. In the village tracts located at the end of canal system, single cropping of monsoon paddy is dominant due to insufficient irrigation water in dry season.

2) 2013/14 (Dry Year)

Because of dry year, cropping pattern was different from the other years. The winter crops occupied the large portion of the central strip along with Mu River and border area. The rest of the area located near canals shows the same dual cropping pattern with monsoon and summer paddy as that of 2008/09. In some area which supplement water sources such as groundwater and seepage water from rivers or their tributaries, triple cropping consisting of monsoon paddy, winter crops and summer paddy had been observed.

3) 2015/16 (Wet Year)

The tendency of 2015/16 was the same as those of the other years. The monsoon paddy was laid widely on every village tracts and covered 89% of farmland. Besides, the four (4) types of cropping pattern were recognized.

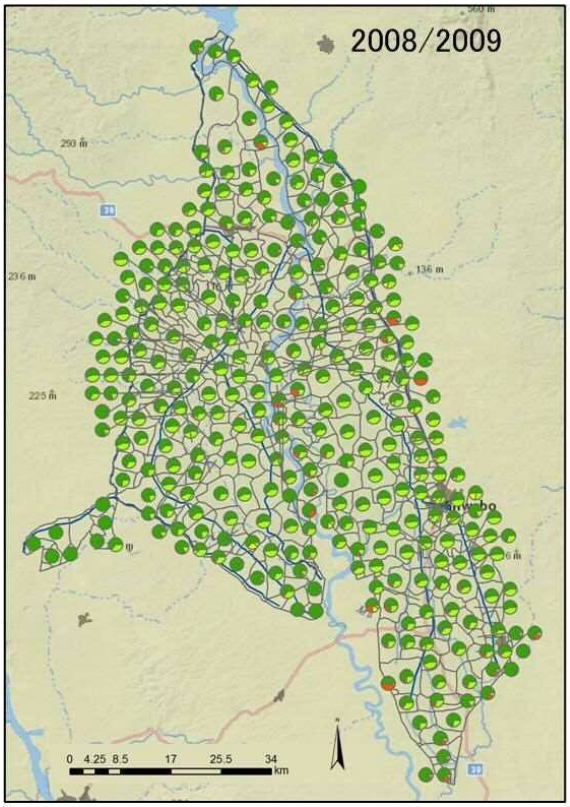
Single cropping: Only monsoon paddy was cultivated because of in-sufficient irrigation water. It lay at the end of right main canal (RMC) and the south-western part of the project area.

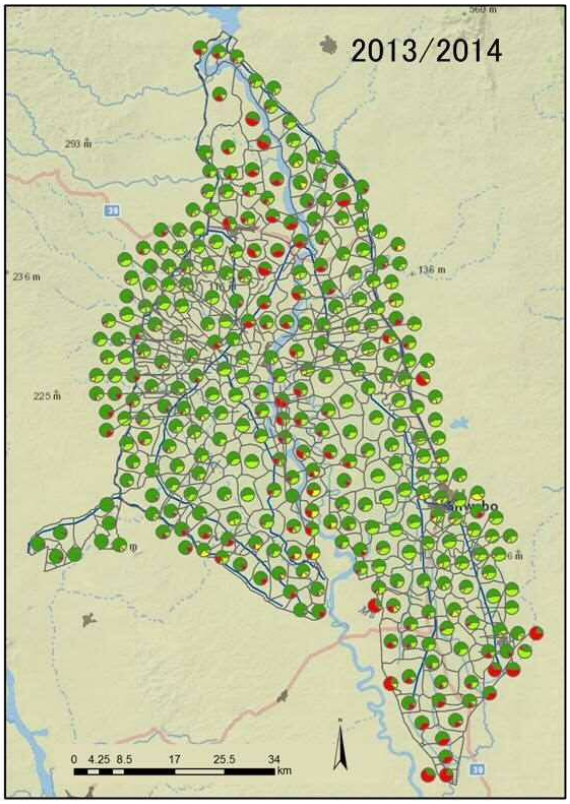
Dual cropping (monsoon paddy / summer paddy): This pattern occupied majority of the area and was observed nearby old mu canal (OMC) and the upper portion of Shwebo main canal (SMC), ye-U main canal (YMC), and right main canal (RMC). It accounted for about 60 % of the analysis area and has not been unchanged since 2008/09 because of the sufficient water for summer paddy until July.

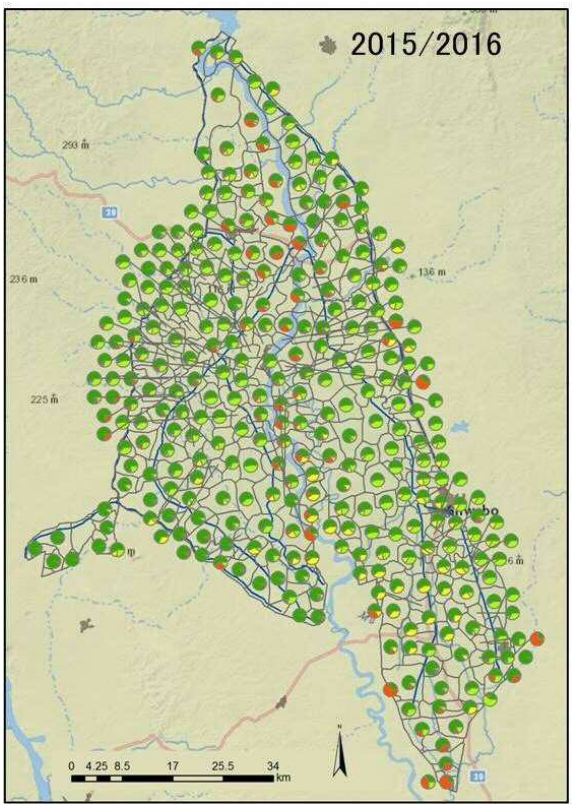
Dual cropping (monsoon paddy / summer crops): This area was centered upon Wetlet township and the west part of Shwebo township, which was located at the lower reach of Shwebo main canal (SMC) to left bank of Mu River. This area correlated with the fields where irrigation water was not supplied continuously but was interrupted at the begging of canal open period, i.e. February to March.

Triple or Dual cropping (monsoon paddy / wither crops / summer paddy): This area is limited to flooding area of Mu river located in the east part of Taze and the southwest part of Ye-U and Kin-U.

Through (3) three years analysis, above mentioned changes of cropping pattern may be regarded as being induced by various condition such as the availability of water recourses, the limitation by climate changes and also facility deterioration of 17 year-old irrigation system.







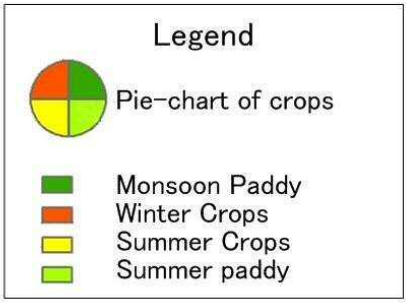


Figure XI.7.6 Annual Cropping Pattern of Village Tracts in 3 Years

XI.8. Detailed Work Procedures for the Analysis

The following table shows the detail of the procedure applied for the analysis.

Table XI.8.1 Detailed Work Procedure for Satellites Image Analysis

No	Category	Work Items	Contents	Work Steps and Procedure	Reference
1	Preparation	Preparation	Preparation for analysis tools Brush-up of work contents	①Brush-up of required work contents and necessary work flow ②Preparation of analysis tools and arranging analysis environment	-
2-1	Data Selection& Data acquisition	Landsat data	Acquisition of satellite imagery from Oct to May - Landsat-8 OL1/TIRS V1 - Landsat-5 TM	Downloading satellite image data located at row44-45 / path133-134 from LPDAAC@USGS (http://reverb.echo.nasa.gov/reverb/) ①Landsat-8 OL1(32 scenes(2013/14), 32 scenes(2015/169)) ②Landsat-5 TM (32 scenes(2008/2009))	Figure XI.3.1 LANDSAT Data Sets of the Project Area
2-2	- do -	Land cover type classification	Acquisition of GlobeCover V2.3	①Downloading ESA GlobeCover V.2.3（2009、10arc:300m pixel） from ESA (http://due.esrin.esa.int/page_globcover.php)	Figure XI.2.2 Land-cover Type Classification and Project Area
2-3	- do -	Administration boundary data	Acquisition of boundaries of region, state, district, township and village （GADM ver3.8)	① Downloading data of region, state, district, township from GADM database of Global Administrative Areas (http://www.gadm.org/country) ②Downloading data of village Tract boundary from Myanmar Information Management Unit(http://www.themimu.info/gis-resources-agency-maps)	Figure XI.7.5 Village and Township Boundary
2-4	- do -	Agricultural Statistics	Data collection of cropping area since 2001/2002	①Data collection of "Monsoon and Summer Crop Cultivated Area by 4 Main Canals of Thapanseik Dam" since 2001/2002 arranged in the Survey with MOALI data. ②Data collection of ”Cropping Calendar” arranged in the Survey with MOALI data. ③Field verification for "Cropping area" and "Cropping pattern" with comparison between preliminary map analyzed for 2015/16 and current condition surveyed in Jan 2017.	Table XI.7.1 Cropping Area and Comparison B/T Analysis and Statistics
3	Preparation of time-series of NDVI and NDWI data	NDVI and NDWI	Landsat 8: NDVI(band 4,5)/NDWI(band 3,6) Landsat 5:NDVI(band 4,3)/NDWI(band 2,5)	①Checking data quality for all the Landsat data for target duration. If cloud cover is found on the area, alternative data set is to be obtained. ②Conducting 'Radiometric Calibration' for selected Landsat data ③Conducting 'Dark subtraction ' for selected Landsat data ④Mosaicking four (4) scenes in order (4044→4045→3044→3045 from upper to lower) ⑤Calculating NDVI with band 4(Red) and band5(NIR) of Landsat 8, and with band 3(Red) and band6(NIR) of Landsat 5 ⑥Calculating band3(Green) and band6(SWIR 1) of Landsat 8,and with band 2(Green) and band5(SWIR1) of Landsat 5	Attached Maps: 1. NDVI-NDWI (Sep.2008 - May 2009) 2. NDVI-NDWI (Oct.2013 - May 2014) 3. NDVI-NDWI (Oct.2015 - May 2016)
4-1	Statistical analysis of NDVI and NDWI	Calculation of statistical value of NDVI and NDWI	Per-cell calculation applied for NDVI and NDWI data from Oct to May	①Calculating per-cell statistics for temporal NDVI data from Oct to May - Calculating Minimum value for each cell - Calculating Maximum value for each cell - Calculating Range value for each cell ②Calculating per-cell statistics for temporal NDWI data from Oct to May - Calculating Minimum value for each cell - Calculating Maximum value for each cell - Calculating Range value for each cell	- do -
4-2	- do -	Land cover type classification and determination of farmland area.	Preparation of farmland classification map	① Selecting NDVI Range data from Oct 2015(end of Monsoon paddy) to May 2016(Summer paddy season) ②Classifying farmland types under analysis of NDVI's histogram to make preliminarily (farmland type) map. ③Verification of preliminary (farmland type) map through field survey compared to actual condition.	Figure XI.5.1 Farmland Type (Oct.2015-May.2016)

				④Confirming farmland area including all the type of farmlands and determining threshold (0.29) between farmland and non-farmland.	
4-3	- do -	Determination of water body area	Detection of water body in the Survey area	①Selecting NDWI data in Oct (end of Monsoon paddy) as wettest condition in applied duration. ②Classifying water body area under analysis of NDWI's histogram. ③Verification of water body area through field survey comparing to actual condition. ④Confirming water body area and determination threshold (0.8) between water body and land area.	- do -
4-4	- do -	Clarifying agriculture area and estimation of maximum crop glowing timing	Determination of farmland area for each year	①Clarifying actual farmland area for each year by subtracting water body area(refer to 3-3) from farmland area (refer to3-2). ②Verification of actual farmland area through field survey comparing to actual condition and confirming them for each year.	- do -
5-1	Cropping area detection	Detection of monsoon paddy	Analysis for image differencing before/after harvesting	① Calculating NDVI difference between Oct (before harvesting) and Feb(after harvesting) ② Detecting cropping area by applying threshold (mean + 1σ) ③ Verified cropping area through the field survey and confirming a validity of threshold value and its arrearage.	Figure XI.7.2 Crop Planted Area (2008-09) Figure XI.7.3 Crop Planted Area (2013-14) Figure XI.7.4 Crop Planted Area (2015-16)
5-2	- do -	Detection of winter crop	Analysis for maximum NDVI in the year（Feb.)	① Selecting NDVI in Feb as being maximum glowing timing for winter crop. ② Detecting cropping area by applying threshold (0.39) to delineate its covering area exceeding threshold. ③ Verifying cropping area through the field survey and confirming a validity of threshold value and obtained its acreage.	- do -
5-3	- do -	Detection of summer paddy	Analysis for NDWI (April or May)	① Selecting NDWI in Apr (or May) indicating submersion condition with irrigation water for summer paddy. ② Detecting cropping area by applying threshold (-0.08) to delineate its covering area exceeding threshold. ③ Verifying cropping area through the field survey and confirming a validity of threshold value and obtained its acreage.	- do -
5-4	- do -	Detection of summer paddy	Analysis for image differencing after sowing until Apr.	① Calculating NDVI difference between Feb (before sowing) and Apr-May(glowing stage) ② Detecting mixed cropping area with paddy and land crop by setting threshold (mean + 0.66 x σ) ③ Calculating summer cropping area by subtracting summer paddy area form mixed cropping area. ③ Verifying summer cropping area through the field survey and confirming a validity of threshold value and its acreage.	- do -
6	Statistical analysis for cropping area	Statistical processing	Processing of cropping area for each township	①Preparation of cross tabulation by cropping area, crop and township ②Evaluating validity of existing agriculture statistics by comparison to the analysis result	Table XI.7.2 Cropping Area in Each Township in 2008-2009 Table XI.7.3 Cropping Area in Each Township in 2013-2014 Table XI.7.4 Cropping Area in Each Township in 2015-2016
7	Visualization of analysis result	Preparation of GIS data set	Inputting analysis result to GIS data set	①Preparation of GIS data including cropping area, distribution map of highest month of cropping, administration boundary. ②Visualization of analysis result as GIS theme map	Figure XI.7.6 Annual Cropping Pattern of Village Tracts in 3 Years