

Table 3.6-6 Results of Socio-economic Survey for Wat Loung Rehabilitation Sub-project

Results of Socio-economic Survey	
Farming Constraints (agronomic)	Major agronomic and farm management constraints responded by sample farmers are: i) low yield of paddy ; followed by ii) poor soil conditions & iii) crop losses due to pest & disease & difficulty in purchasing fertilizers..
Farming Constraints (physical)	Major physical (irrigation & drainage) constraints responded are: i) irrigation water shortage in wet season ; followed by ii) irrigation water shortage in dry season & iii) drainage problem.
Marketing Constraints	Major marketing constraints are: i) unstable market prices of paddy/rice ; followed by ii) low market prices of paddy/rice and iii) unstable market prices of livestock.
Reasons for Low Yield of Rice	Major reasons reported include: i) drought in wet season ; followed by ii) poor soil conditions and iii) water shortage in dry season.
Activities Implemented to Improve Rice Productivity in Past 3 Years	Activities implemented by respondents include: i) increased fertilizer doses ; followed by ii) applied manure/composts & iii) of quality seed (local variety).
Necessary Activities to Improve Rice Productivity	Activities necessary to improve rice productivity raised by sample farmers are: i) use of adequate doses of fertilizers, ii) improvement of farming practices & iii) use of quality seed (local variety).
Necessary Physical Works to Improve Rice Productivity	Activities necessary to improve rice productivity responded are: i) irrigation water supply in wet season ; followed by ii) irrigation water supply in dry season and iii) drainage improvement.
Expectations for Improvement: Agronomy	Farmers expectations for improvement of farming conditions (agronomic & farm management) are: i) most expected: productivity improvement of wet season rice , ii) 2nd most expected: productivity improvement of dry season rice and iii) productivity improvement of field crops.
Expectations for Improvement: Farming System	Farmers expectations for farming system to be adopted are: i) most expected: double cropping of rice ; ii) multiple farming (crop + livestock etc.) & iii) 3rd most expected: stable single cropping of rice.
Expectations for Improvement: Physical Works	Farmers expectations for physical works for improvement are: i) most expected: adequate irrigation water supply in wet season ; ii) 2nd most expected: adequate irrigation water supply in dry season and iii) drainage improvement.
Expectations for Improvement: Extension Services	Agricultural support services required for improvement of agricultural productivity responded by sample farmers are: i) most required: field extension services (demonstration/field guidance) , ii) 2nd required: provision of quality seed and iii) farmer training (technical & post-harvest operation).

1/: Results of Socio-economic Survey, 2007, JICA Study Team

Table 3.6-7 Inventory Survey Results of Project Facilities at Wat Loung Rehabilitation Sub-Project

Description	Number or Quantity	Existing Condition	Description	Judgment
1 Irrigation area				
- Potential	7,400 Ha			
- Existing	120 Ha			
2 Headworks	1 nos.		Completely washed away	
- Type				
- Width	120.0 m			
- Height	5.0 m			
- Gate	10 nos.	None	5(w)x6(h)x10(nos.)	
- Fish Ladder	- nos.			
- Settling Basin	- nos.			
3 Intake	1 nos.		Completely washed away	
(1) Gate	nos.	None		
(2) Measuring Device	- nos.			
(3) Trash Rack (Screen)	- nos.			
4 Irrigation and Drainage Systems				
(1) Canal				
(a) Main	17.0 km	Poor	Earth canal, sedimentation, water level is lower than ground surface	To be rehabilitated
(b) Secondary	3.0 km	Poor	3 nos., Earth canal, sediment, lower water level is lower than ground surf	To be rehabilitated
(c) Tertiary	- km			
(2) Drainage System				
(a) Main	- km			
(b) Secondary	- km			
(c) Tertiary	- km			
(d) Collector	- km			
5 Irrigation Related Structures				
(1) Syhone	nos.			
(2) Aqueduct				
(a) Main	- nos.			
(b) Secondary	2 nos.			
(3) Road Crossing Culvert				
(a) Main	- nos.			
(b) Secondary	- nos.			
(4) Drop				
(a) Main	- nos.			
(b) Secondary	- nos.			
(5) Chute				
(a) Main	- nos.			
(b) Secondary	- nos.			
(6) Diversion	nos.			
(a) Main	- nos.			
(b) Secondary	- nos.			
(7) Off-take	nos.			
(a) Main	- nos.			
(b) Secondary	- nos.			
(8) Check (Cross Regulator)	nos.			
(a) Main	1 nos.	Poor		
(b) Secondary	1 nos.	Poor		
(9) Measuring Device				
(a) Main	- nos.			
(b) Secondary	- nos.			
(10) Spillway/Waste Way				
(a) Main	- nos.			
(b) Secondary	- nos.			
(10) Bridge				
(a) Main	1 nos.	Fair		
(b) Secondary	1 nos.	Fair		
(11) Culvert				
(a) Main	- nos.			
(b) Secondary	- nos.			
(c) Others	nos.			
6 Farm Road				
(1) Connection from Main Road	- km			
(2) Within the Command Area				
(a) Main	- km			
(b) Secondary	- km			
(c) Tertiary	- km			
7 Project Buildings and Agriculture Support Facilities				
(1) Office	- nos.			
(2) Storage	- nos.			-
(3) Garage	- nos.			-
(4) Dry Yard	- nos.			-
(5) Sorter House	- nos.			-
8 Others				
(1) Dyke	- km			

Prepared by JICA Study Team based on Inventory Survey 2006

Table 3.7-1 Agro-demographic Features of the Project Communes: Wat Chre 1/

Commune	No. of Households		Crop Producing Households (% to Total Households)		Wet Season Rice Producing Households (% to Total Households)		Landless Households (% to Total Households)		Households with less than 10 a (% to Total Households)		Households with more than 3ha (% to Total Households)		Cropped Area of Wet Season Rice in 2003	Cropped Area of Wet Season Rice per Crop Producing Household	Irrigated Area	Irrigated Area per Crop Producing Household
	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(ha)	(ha)	(ha)	(ha)
Boeng Khnar (major) 2/	2,344	2,092	89	2,092	100	252	11	0	0	198	8	2,564	1.2	0	0.0	
Me Tuek (partly) 2/	2,443	2,326	95	2,126	91	117	5	120	5	320	13	3,411	1.5	250	0.1	
Ou Ta Paong (partly) 2/	2,877	2,708	94	2,708	100	169	6	65	2	825	29	5,115	1.9	350	0.1	
Sub-total	7,664	7,126	93	6,926	97	538	7	185	2	1,343	18	11,090	1.6	600	0.1	

1/: Project communes - communes located in the sub-project area Source: Commune Survey on Crops and Livestock, 2003, MAFF
2/: Major - commune occupies majority of the sub-project area; partly - commune occupies part of the sub-project area

Table 3.7-2 Rice Cropped Area, Production & Yield in the Project Communes: Wat Chre 1/

Commune	Year	Wet-season Rice Production						Dry-season Rice Production						
		Cultivated Area (ha.)			Harvested Area (ha)	Yield (t/ha)	Production (t)	Cultivated Area (ha.)			Harvested Area (ha)	Yield (t/ha)	Production (t)	
		Total	Rain-fed	Irrigated				Total	Recession	Irrigated				
Boeng Khnar (major) 2/	2007	5,400	5,400	0	5,400									
	2006	3,401	3,401	0	3,401	1.5	5,102	0	0	0	0			0
	2005	2,988	2,988	0	2,988			17	0	17	7	2.4	17	
	2004	2,346	2,346	0	2,346									
	2003	2,564	2,564	0	2,564	1.3	3,386	0	0	0	0			0
	Average	3,340	3,340	0	3,340	1.4	4,244	6	0	6	2	2.4	6	
Me Tuek (partly) 2/	2007	4,200	4,200	0	4,200									
	2006	4,110	4,110	0	4,110	1.3	5,343	235	0	235	235	2.0	470	
	2005	2,101	2,101	0	2,101			90			85	2.5	213	
	2004	3,365	3,365	0	2,363									
	2003	3,411	3,411	0	3,411	1.1	3,721	0	0	0	0		0	
	Average	3,437	3,437	0	3,237	1.2	4,532	108	0	118	107	2.1	228	
Ou Ta Paong (partly) 2/	2007	6,400	6,400	0	6,400									
	2006	6,000	4,500	1,500	6,000	1.5	9,000	250	50	200	250	2.5	625	
	2005	3,713	3,713	0	3,713			210			206	3.7	762	
	2004	5,060	5,060	0	4,037									
	2003	5,115	5,115	0	5,115	1.1	5,760	0	0	0	0		0	
	Average	5,258	4,958	300	5,053	1.3	7,380	153	25	100	152	3.0	462	

1/: Project communes - communes located in the sub-project area
2/: Major - commune occupies majority of the sub-project area; partly - commune occupies part of the sub-project area
Source: 2003 - Commune Survey on Crops and Livestock 2003, MAFF, 2004; 2004, 05 & 07 - DAO Bakan; 2006 - Dept. of Planning, Pursat

Table 3.7-3 Rice Production Features in the Project Communes: SEILA Data Base: Wat Chre

Commune	Year	Wet Season				Dry Season				Rice Area (ha)
		Cropped Area (ha)		Production (ton)	Yield (ton/ha)	Cropped Area (ha)		Production (ton)	Yield (ton/ha)	
		Rainfed	Irrigated			Irrigated	Recession			
Boeng Khnar (major) 1/	2002	4,350	175	4,595	1.0	25	25	62	1.2	4,525
	2003	3,140	80	2,503	0.8	-	-	-	-	3,220
	2004	3,321	80			-	-	-	-	3,401
	2005	3,401	-	3,630	1.1	-	-	-	-	3,401
	Average	3,553	84	3,576	1.0	6	6	16	1.2	3,637
Me Tuek (partly) 1/	2002	4,150	250	6,600	1.5	250	250	250	0.5	4,400
	2003	3,000	1,400	4,400	1.0	263	-	789	3.0	4,400
	2004	3,870	530	7,740	1.8	250	320	800	1.4	4,400
	2005	4,000	212	9,688	2.3	200	200	800	2.0	4,412
	Average	3,755	598	7,107	1.6	241	193	660	1.5	4,403
Ou Ta Paong (partly) 1/	2002	6,344	-	76,128	12.0	300	1,065	450	0.3	6,344
	2003	4,320	2,024	475	0.1	317	-	63	0.2	6,344
	2004	4,320	2,024	475	0.1	317	-	63	0.2	6,344
	2005	5,994	250	12,600	2.0	250	-	875	3.5	6,344
	Average	5,245	1,075	22,420	3.5	296	266	363	0.6	6,344

Source: SEILA Data Base 2002 - 2005 1/: Major - commune occupies majority of the sub-project area; partly - commune occupies part of the sub-project area

Table 3.7-4 Rice Planting Areas by Plowing & Planting Method in the Project Communes: Wat Chre

District/Commune	Year	Plowing Method (ha.)			Planting Method (ha) 1/		
		Cattle	Tractor	Total	Transplanting	Direct Sowing	Total
Bakan							
Boeng Khnar	2/	2,727	531	3,258	2,825	305	3,129
Me Tuek	2/	2,050	2,249	4,299	1,669	405	2,073
Ou Ta Paong	2/	3,566	2,708	6,274	2,398	1,040	3,438
Total		8,343	5,487	13,830	6,892	1,749	8,640
		60%	40%	100%	80%	20%	100%

1/: Not including floating rice area 2/: Average of 2004 to 2007 Source: DAO Bakan & PDA Pursat

Table 3.7-5 Results of Socio-economic Survey for Wat Chre Rehabilitation Sub-project

Results of Socio-economic Survey	
Farming Constraints (agronomic)	Major agronomic and farm management constraints responded by sample farmers are: i) low yield of paddy ; followed by ii) poor soil conditions.
Farming Constraints (physical)	Major physical (irrigation & drainage) constraints responded are: i) irrigation water shortage in dry season ; followed by ii) irrigation water shortage in wet season & iii) drainage problem.
Marketing Constraints	Major marketing constraints are: i) unstable market prices of paddy/rice ; followed by ii) low market prices of paddy/rice and iii) unstable market prices of livestock./poultry.
Reasons for Low Yield of Rice	Major reasons reported include: i) drought in wet season ; followed by ii) poor soil conditions & iii) water shortage in dry season.
Activities Implemented to Improve Rice Productivity in Past 3 Years	Activities implemented by respondents include: i) increased fertilizer doses ; followed by ii) applied compost/manure & iii) use of quality seed (local variety).
Necessary Activities to Improve Rice Productivity	Activities necessary to improve rice productivity raised by sample farmers are: i) improvement of farming practices, ii) use of quality seed (high yielding variety) & iii) use of adequate doses of
Necessary Physical Works to Improve Rice Productivity	Activities necessary to improve rice productivity responded are: i) irrigation water supply in wet season ; followed by ii) irrigation water supply in dry season and iii) drainage improvement.
Expectations for Improvement: Agronomy	Farmers expectations for improvement of farming conditions (agronomic & farm management) are: i) most expected: productivity improvement of wet season rice , ii) 2nd most expected: productivity improvement of dry season rice and iii) productivity improvement of field crops.
Expectations for Improvement: Farming System	Farmers expectations for farming system to be adopted are: i) most expected: double cropping of rice ; ii) multiple farming (crop + livestock etc.) & iii) 3rd most expected: stable single cropping of rice.
Expectations for Improvement: Physical Works	Farmers expectations for physical works for improvement are: i) most expected: adequate irrigation water supply in wet season ; ii) 2nd most expected: adequate irrigation water supply in dry season and iii) drainage improvement.
Expectations for Improvement: Extension Services	Agricultural support services required for improvement of agricultural productivity responded by sample farmers are: i) most required: field extension services (demonstration/field guidance) , ii) 2nd required: provision of quality seed and iii) farmer training (technical & post-harvest operation).

1/: Results of Socio-economic Survey, 2007, JICA Study Team

Table 3.7-6 Inventory Survey Results of Project Facilities at Wat Chre Rehabilitation Sub-Project

Description	Number or Quantity	Existing Condition	Description	Judgment
1 Irrigation area				
- Potential	1,500 Ha			
- Existing	1020 Ha			
2 Headworks	1 nos.		Completely washed away	To be constructed
- Type				
- Width	60.0 m			
- Height	2.7 m			
- Gate	3 nos.	None	2(w)x2.7(h)x3(nos.)	
- Fish Ladder	- nos.			
- Settling Basin	- nos.			
3 Intake	1 nos.		Completely washed away	To be constructed
(1) Gate	1 nos.	None	Size: 1.5(w)x2.5(h)x2(no.), completely washed away	
(2) Measuring Device	- nos.			
(3) Trash Rack (Screen)	- nos.			
4 Irrigation and Drainage Systems				
(1) Canal				
(a) Main-1	3.5 km	Poor	Earth canal, sedimentation, water level is lower than ground surface	To be rehabilitated
Main-2	- km			
(b) Secondary	8.7 km	Poor	Earth canal, sediment, lower water level is lower than ground surface	To be rehabilitated
(c) Tertiary	- km			
(2) Drainage System				
(a) Main	- km			
(b) Secondary	- km			
(c) Tertiary	- km			
(d) Collector	- km			
5 Irrigation Related Structures				
(1) Syhone	nos.			
(2) Aqueduct				
(a) Main	- nos.			
(b) Secondary	- nos.			
(3) Road Crossing Culvert				
(a) Main	- nos.			
(b) Secondary	- nos.			
(4) Drop				
(a) Main	- nos.			
(b) Secondary	- nos.			
(5) Chute				
(a) Main	- nos.			
(b) Secondary	- nos.			
(6) Diversion	nos.			
(a) Main	- nos.			
(b) Secondary	- nos.			
(7) Off-take	nos.			
(a) Main	2 nos.	Poor		
(b) Secondary	- nos.			
(8) Check (Cross Regulator)	nos.			
(a) Main	- nos.			
(b) Secondary	- nos.			
(9) Measuring Device				
(a) Main	- nos.			
(b) Secondary	- nos.			
(10) Spillway/Waste Way				
(a) Main	1 nos.	Poor		
(b) Secondary	- nos.			
(10) Bridge				
(a) Main	1 nos.	Fair		
(b) Secondary	- nos.			
(11) Culvert				
(a) Main	- nos.			
(b) Secondary	- nos.			
(c) Others	nos.			
6 Farm Road				
(1) Connection from Main Road	- km			
(2) Within the Command Area				
(a) Main	- km			
(b) Secondary	- km			
(c) Tertiary	- km			
7 Project Buildings and Agriculture Support Facilities				
(1) Office	- nos.			
(2) Storage	- nos.			
(3) Garage	- nos.			
(4) Dry Yard	- nos.			
(5) Sorter House	- nos.			
8 Others				
(1) Dyke	- km			

Prepared by JICA Study Team based on Inventory Survey 2006

Table 3.8-1 Agro-demographic Features of the Project Communes: Lum Hach 1/

District/Commune	No. of Households	Crop Producing Households (% to Total Households)		Wet Season Rice Producing Households (% to Crop Producing Households)		Landless Households (% to Total Households)		Households with less than 10 a (% to Total Households)		Households with more than 3ha (% to Total Households)		Cropped Area of Wet Season Rice in 2003	Cropped Area of Wet Season Rice per Rice Producing Household 2/	Irrigated Area	Irrigated Area per Crop Producing Household
	(No.)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(ha)	(ha)	(ha)	(ha)
Boribo															
Anhchanh Rung (major) 3/	1,037	1,037	100	1,037	100	0	0	0	0	26	3	-	-	0	0
Phsar (Major) 3/	1,109	1,054	95	331	30	55	5	0	0	0	0	1,565	-	0	0
Tuek Phos															
Krang Skear (limited) 3/	2,246	2,096	93	2,096	93	150	7	0	0	80	4	3,337	1.6	155	0.07
Sub-total	4,392	4,187	95	3,464	79	205	5	0	0	106	2	4,902	-	155	0
Pech Changvar	700	660	94	660	94	40	6	0	0	6	1	1,145	1.7	0	0
Popel	922	899	98	899	98	23	2	33	4	0	0	1,065	1.2	0	0

1/: Project communes - communes located in the sub-project area

Source: Commune Survey on Crops and Livestock, 2003, MAFF

2/: Average cropped area of wet season rice per farm is estimated to be 1.4 ha/farm from data of neighboring communes

3/: Major - commune occupies majority of the sub-project area; limited - the sub-project area includes limited extent of the subject commune

Table 3.8-2 Rice Cropped Area, Production & Yield in the Project Communes: Lum Hach 1/

District/Commune	Year	Wet Season Rice Production				Dry Season Rice Production				Annual Rice Production			
		Cultivated Area (ha)	Harvested Area (ha)	Yield (t/ha) 2/	Production (t)	Cultivated Area (ha)	Harvested Area (ha)	Yield (t/ha) 2/	Production (t)	Cultivated Area (ha)	Harvested Area (ha)	Yield (t/ha) 1/	Production (t)
Boribo													
Anhchanh Rung (major) 3/	2007	4,172	4,172	1.9	7,905	0	0	0	0	4,172	4,172	1.9	7,905
	2006	4,460	4,460	1.7	7,595	0	0	0	0	4,460	4,460	1.7	7,595
	2005	4,075	4,075	1.2	5,037	0	0	0	0	4,075	4,075	1.2	5,037
	2004	4,141	4,112	1.2	5,017	0	0	0	0	4,141	4,112	1.2	5,017
	2003	3,540	3,484	1.3	4,540	0	0	0	0	3,540	3,484	1.3	4,540
	Average	4,078	4,061	1.5	6,019	0	0	0	0	4,078	4,061	1.5	6,019
Pech Changvar (major) 3/	2007	1,454	1,454	1.8	2,683	0	0	0	0	1,454	1,454	1.8	2,683
	2006	1,503	1,503	1.8	2,711	0	0	0	0	1,503	1,503	1.8	2,711
	2005	1,458	1,458	1.0	1,397	0	0	0	0	1,458	1,458	1.0	1,397
	2004	1,495	1,480	0.9	1,379	0	0	0	0	1,495	1,480	0.9	1,379
	2003	1,145	1,092	1.4	1,653	0	0	0	0	1,145	1,092	1.4	1,653
	Average	1,411	1,397	1.4	1,965	0	0	0	0	1,411	1,397	1.4	1,965
Popel (partly) 3/	2007	1,215	1,215	2.3	2,843	0	0	0	0	1,215	1,215	2.3	2,843
	2006	1,215	1,215	1.9	2,367	0	0	0	0	1,215	1,215	1.9	2,367
	2005	1,215	1,215	1.0	1,244	0	0	0	0	1,215	1,215	1.0	1,244
	2004	1,214	1,194	1.0	1,227	0	0	0	0	1,214	1,194	1.0	1,227
	2003	1,065	1,008	1.4	1,515	0	0	0	0	1,065	1,008	1.4	1,515
	Average	1,185	1,169	1.6	1,839	0	0	0	0	1,185	1,169	1.6	1,839
Phsar (limited) 3/	Average	1,858	1,843	1.5	2,854	233	222	2.8	656	2,091	2,065	1.7	3,510
Tuek Phos													
Krang Skear	Average	3,442	3,311	1.7	5,794	0	0	0	0	3,442	3,311	1.7	5,794

1/: Project communes - communes located in the sub-project area 2/: Yield to cropped area

Source: 2003 - 2006 PDA Kampung Chhnang; 2007 DAO Boribo

3/: Major - commune occupies majority of the sub-project area; partly - commune occupies part of the sub-project area;

limited - the sub-project area includes limited extent of the subject commune

Table 3.8-3 Rice Production Features in the Project Communes: SEILA Data Base: Lum Hach

District/Commune	Year	Wet Season				Dry Season				Rice Area (ha)
		Cropped Area (ha)		Production (ton)	Yield (ton/ha)	Cropped Area (ha)		Production (ton)	Yield (ton/ha)	
		Rainfed	Irrigated			Irrigated	Recession			
Boribo										
Anhchanh Rung (major) 1/	2002	3,981	-	5,175	1.3	0	0	0	-	3,981
	2003	3,540	-	1,584	0.4	0	0	0	-	1,981
	2004	4,000	-	4,800	1.2	0	0	0	-	4,646
	2005	4,646	-	3,252	0.7	0	0	0	-	4,646
	Average	4,042	-	3,703	0.9	0	0	0	-	3,814
Pech Changvar (partly) 1/	2002	1,650	-	2,145	1.3	0	0	0	-	1,650
	2003	1,650	-	1,980	1.2	0	0	0	-	1,650
	2004	1,650	-	2,145	1.3	0	0	0	-	1,650
	2005	1,650	-	2,145	1.3	0	0	0	-	1,650
	Average	1,650	-	2,104	1.3	0	0	0	-	1,650
Popel (partly) 1/	2002	1,215	-	1,823	1.5	0	0	0	-	1,215
	2003	1,065	57	1,387	1.2	0	0	0	-	1,215
	2004	1,215	-	2,430	2.0	0	0	0	-	1,215
	2005	1,215	-	1,762	1.5	0	0	0	-	1,215
	Average	1,178	14	1,850	1.6	0	0	0	-	1,215
Phsar (limited) 1/	Average	1,304	-	1,240	1.0	210	210	424	1.0	2,599
District Total (Avg. of 2002 - 2005)		15,264	619	16,621	1.0	1,723	1,291	4,962	1.6	22,696
Tuek Phos (limited) 1/										
Krang Skear (Avg. of 2002 - 2005)		2,837	5	4,033	1.4	0	0	0	-	2,933

1/: Major - commune occupies majority of the sub-project area; partly - commune occupies part of the sub-project area;

limited - the sub-project area includes limited extent of the subject commune

Source: SEILA Data Base 2002 - 2005

Table 3.8-4 Results of Socio-economic Survey for Lum Hach Rehabilitation Sub-project

Results of Socio-economic Survey	
Farming Constraints (agronomic)	Major agronomic and farm management constraints responded by sample farmers are: i) low yield of paddy ; followed by ii) poor soil conditions & iii) labor shortage.
Farming Constraints (physical)	Major physical (irrigation & drainage) constraints responded are: i) irrigation water shortage in dry season ; followed by ii) irrigation water shortage in wet season & iii) drainage problem.
Marketing Constraints	Major marketing constraints are: i) unstable market prices of paddy/rice ; followed by ii) low market prices of paddy/rice and iii) low market prices of livestock.
Reasons for Low Yield of Rice	Major reasons reported include: i) drought in wet season ; followed by ii) poor soil conditions & iii) water shortage in dry season.
Activities Implemented to Improve Rice Productivity in Past 3 Years	Activities implemented by respondents include: i) increased fertilizer doses ; followed by ii) applied compost/manure & iii) use of quality seed (high yielding variety).
Necessary Activities to Improve Rice Productivity	Activities necessary to improve rice productivity raised by sample farmers are: i) improvement of farming practices , ii) use of quality seed (high yielding variety) & iii) use of quality seed (local variety).
Necessary Physical Works to Improve Rice Productivity	Activities necessary to improve rice productivity responded are: i) irrigation water supply in wet season ; followed by ii) irrigation water supply in dry season and iii) drainage improvement.
Expectations for Improvement: Agronomy	Farmers expectations for improvement of farming conditions (agronomic & farm management) are: i) most expected: productivity improvement of wet season rice , ii) 2nd most expected: productivity improvement of field crops and iii) 3rd most expected: productivity improvement of dry season rice.
Expectations for Improvement: Farming System	Farmers expectations for farming system to be adopted are: i) most expected: double cropping of rice ; ii) multiple farming (crop + livestock etc.) & iii) 3rd most expected: stable single cropping of rice.
Expectations for Improvement: Physical Works	Farmers expectations for physical works for improvement are: i) most expected: adequate irrigation water supply in wet season ; ii) 2nd most expected: adequate irrigation water supply in dry season and iii) drainage improvement.
Expectations for Improvement: Extension Services	Agricultural support services required for improvement of agricultural productivity responded by sample farmers are: i) most required: field extension services (demonstration/field guidance) , ii) 2nd required: provision of quality seed and iii) farmer training (technical & post-harvest operation).

1/: Results of Socio-economic Survey, 2007, JICA Study Team

Table 3.8-5 Inventory Survey Results of Project Facilities at Lum Hach Rehabilitation Sub-Project

Description	Number or Quantity	Existing Condition	Description	Judgment
1 Irrigation area				
- Potential	3,100 Ha			Low elevation area is excluded
- Existing	Ha			Water level in the canal be raised
2 Headworks	1 nos.	None	Completely washed away	To be constructed
- Type	-		Unknown	
- Width	- m			
- Height	- m			
- Gate	- nos.			
- Fish Ladder	- nos.			
- Settling Basin	- nos.			
3 Intake	nos.			A new intake is to be reconstructed at Headworks site proposed
(1) Gate	nos.			
(2) Measuring Device	- nos.			
(3) Trash Rack (Screen)	- nos.			
4 Irrigation and Drainage Systems				
(1) Canal				
(a) Main	3.6 km	Poor	Earth canal, sedimentation, water level is lower than ground surface	To be rehabilitated
(b) Secondary	9.1 km	Poor	2 canals (0.5+8.6km), Earth canal, sediment, lower water level is lower	To be rehabilitated
(c) Tertiary	- km	None		
(2) Drainage System				
(a) Main	- km	None		
(b) Secondary	12 km	Fair	2 nos., the Boribo River sometimes flows into the drains when the water level is high.	
(c) Tertiary	- km	None		
(d) Collector	- km	None		
5 Irrigation Related Structures				
(1) Syhone	- nos.			
(2) Aqueduct				
(a) Main	- nos.			
(b) Secondary	- nos.			
(3) Road Crossing Culvert				
(a) Main	- nos.			
(b) Secondary	- nos.			
(4) Drop	nos.			
(a) Main	- nos.			
(b) Secondary	- nos.			
(5) Chute				
(a) Main	- nos.			
(b) Secondary	- nos.			
(6) Diversion				
(a) Main	- nos.			
(b) Secondary	- nos.			
(7) Off-take				
(a) Main	- nos.			
(b) Secondary	1 nos.	not function	No gates (BxHxnos.=1.0x2.0m x11nos.), Total width=21.0m, Too large, the gate sill is too high	To be reconstructed
(8) Check (Cross Regulator)				
(a) Main	1 nos.	not function	No gates (BxH=1.4x2.0m), structure is deteriorated.	
(b) Secondary	- nos.			
(9) Measuring Device				
(a) Main	- nos.			
(b) Secondary	- nos.			
(10) Spillway/Waste Way				
(a) Main	- nos.			
(b) Secondary	- nos.			
(10) Bridge				
(a) Main	- nos.			
(b) Secondary	2 nos.	Fair		
(11) Culvert				
(a) Main	- nos.			
(b) Secondary	6 nos.	Fair		
(c) Others	nos.			
6 Farm Road				
(1) Connection from Main Road	- km			
(2) Within the Command Area				
(a) Main	- km			
(b) Secondary	- km			
(c) Tertiary	- km			
7 Project Buildings and Agriculture Support Facilities				
(1) Office	- nos.			-
(2) Storage	- nos.			-
(3) Garage	- nos.			-
(4) Dry Yard	- nos.			-
(5) Sorter House	- nos.			-
8 Others				
(1) Dyke	- km			

Prepared by JICA Study Team based on Inventory Survey 2006

Table 5.2-1 Present/Without-project & With-project Crop Production: Ream Kom Rehabilitation Sub-project

Crop/Land Use Sub-category	A. Present/Without-project Crop Production															
	Early Wet Season (Direct Sowing)			Wet Season (Transplanting)			Wet Season (Direct Sowing)			Dry Season			Annual			
	Cropped Area (ha)	Cropping Intensity (%)	Yield (ton/ha)	Production (ton)	Cropped Area (ha)	Cropping Intensity (%)	Yield (ton/ha)	Production (ton)	Cropped Area (ha)	Cropping Intensity (%)	Yield (ton/ha)	Production (ton)		Cropped Area (ha)	Cropping Intensity (%)	Production (ton)
Rice:	0															
Normal Irrigation Paddy Field	50	50	2	2.5	125	20	1	2.2	44	30	1	1.5	45	100	5	214
Supplemental Irrigation Paddy Field	1,970	150	7	2.5	375	788	39	1.7	1,340	1,182	59	1.0	1,182	2,120	105	2,897
Rainfed Paddy Field 1/	2,020	200	10	2.5	500	808	40	1.7	1,384	1,212	60	1.0	1,227	2,220	110	3,111
Rice Total																
Upland Crops/Vegetables:	-	10	1	0.5	5									10	0.5	5
Upland Crops (mungbeans)	-															
Vegetables	-															
Upland Crops/Vegetables Total	-	10	0	-	5									10	0	5
Overall	-	210	10	-	-	808	40	-	-	1,212	60	-	-	2,230	110	-

1/: Rice production under pumping irrigation in early wet season

Crop/Land Use Sub-category	B. With-project Crop Production																
	Early Wet Season (Direct Sowing)			Wet Season (Transplanting)			Wet Season (Direct Sowing)			Dry Season			Annual				
	Cropped Area (ha)	Cropping Intensity (%)	Yield (ton/ha)	Production (ton)	Cropped Area (ha)	Cropping Intensity (%)	Yield (ton/ha)	Production (ton)	Cropped Area (ha)	Cropping Intensity (%)	Yield (ton/ha)	Production (ton)		Cropped Area (ha)	Cropping Intensity (%)	Production (ton)	
Rice:	1,610	905	48	3.0	2,715	400	21	3.5	1,400	605	32	2.8	1,694	1,910	101	5,809	
Normal Irrigation Paddy Field	280	175	9	3.0	525	70	4	3.5	245	105	6	2.8	294	350	19	1,064	
Pump Irrigation Field	1,890	1,080	57	3.0	3,240	760	40	2.8	2,138	1,130	60	2.1	2,408	2,970	157	7,786	
Rainfed Paddy Field 1/																	
Rice Total																	
Upland Crops/Vegetables:	-	128	7	1.0	128									70	4	1.0	198
Upland Crops (=70%) 2/	-	56	3	9.5	532									30	2	9.5	285
Vegetables (=30%) 3/	-	184	10	-	660									100	5	-	355
Upland Crops/Vegetables Total	-	1,264	67	-	1,320	760	40	-	-	1,130	60	-	-	100	5	-	1,015
Overall	-	1,264	67	-	1,320	760	40	-	-	1,130	60	-	-	100	5	-	1,015

1/: Cultivation of wet season rice under rainfed conditions

2/: Average of mungbeans & soybeans

3/: Average of watermelon & cucumber

Crop/Land Use Sub-category	C. Increment (With-project - Without-project)																
	Early Wet Season (Direct Sowing)			Wet Season (Transplanting)			Wet Season (Direct Sowing)			Dry Season			Annual				
	Cropped Area (ha)	Cropping Intensity (%)	Yield (ton/ha)	Production (ton)	Cropped Area (ha)	Cropping Intensity (%)	Yield (ton/ha)	Production (ton)	Cropped Area (ha)	Cropping Intensity (%)	Yield (ton/ha)	Production (ton)		Cropped Area (ha)	Cropping Intensity (%)	Production (ton)	
Rice:	1,610	905	48	2,715	400	21	3.5	1,400	605	32	2.8	1,694	1,910	101	5,809		
Normal Irrigation Paddy Field	280	175	9	525	70	4	3.5	245	105	6	2.8	294	350	19	1,064		
Pump Irrigation Field	-50	-50	-2	-125	-20	-1	-44	-45	-30	-1	-45	-45	-100	-5	-214		
Supplemental Irrigation Paddy Field	-1,970	-150	-7	-375	-788	-39	-1.7	-1,340	-1,182	-59	-1.0	-1,182	-2,120	-105	-2,897		
Rainfed Paddy Field 1/	-130	880	47	0.5	2,740	-48	0	1.1	754	-82	0	1.1	1,181	-1,410	-67	-1,984	
Rice Total																	
Upland Crops/Vegetables:	-	118	6	123									70	4	1.0	193	
Upland Crops	-	56	3	532									30	2	9.5	285	
Vegetables	-	174	9	-	655	0	-	-	0	-	-	-	100	5	-	355	
Upland Crops/Vegetables Total	-	1,054	56	-	1,320	760	40	-	-	1,130	60	-	-	100	5	-	1,015
Overall	-	1,054	56	-	1,320	760	40	-	-	1,130	60	-	-	100	5	-	1,015

Table 5.2-2 Summary of Irrigation and Drainage Plan of Six Sub-projects

No.	Description	Name of sub-project						Total
		Ream Kon	Por Canal	Damnak Ampil	Wat Loung	Wat Chre	Lum Hach	
1.	Sub-project area (Ha)	1,890	1,940	2,270	2,540	1,020	3,100	12,760
	(Pump irrigation area included above)	(280)	0	(500)	(800)	(400)	(410)	(2,390)
2.	Annual irrigation area (Ha)	<u>2,413</u>	<u>2,494</u>	<u>2,364</u>	<u>2,645</u>	<u>1,062</u>	<u>4,700</u>	<u>15,678</u>
	- Early wet season paddy (Ha)	1,180	1,220	94	105	42	1,300	3,941
	- Medium wet season paddy (Ha)	1,180	1,220	2,270	2,540	1,020	3,100	11,330
	- Dry season paddy (Ha)	53	54	0	0	0	300	407
3.	Major water source	Moung Russei River		Pursat River			Boribo River	
	- Name of headworks	Moung Russei (Reconstruction)		Damnak Ampil (Existing)		Wat Chre (Reconstruc.)	Lum Hach (Reconstruc.)	
	- Intake water level (EL. m)	15.50	15.00	17.00	17.00	13.00	36.00 - 38.00	
	- Diversion water requirement at intake (m ³ /sec)	2.66	2.74	7.93	3.45	1.39	6.60	
4.	Main canals (nos.)	2	2	1	1	1	1	8
	- Total length (km)	18.4	12.7	7.5	20.3	4.7	16.4	80
5.	Nos. of secondary canals	16	12	3	10	6	11	58
	- Total length (km)	12.9	15.8	17.6	31.1	14.7	42.4	135
6.	Number of Tertiary Blocks (No.)	47	42	50	54	27	67	287
	Total length of tertiary canals (km)	57	55	85	81	27	67	372
7.	Main drains	- Moung Russei, - Ou Anlong Rolus	- Moung Russei, - MD-1	Ou Bakan/Boeung Khnar River	Boeung Khnar R.	- Boeung Khnar R., - Ta Paong stream	Boribo River	
	- Total length (km)	7.2	9.3	-	-	-	-	17
	- Drainage water requirement from paddy field (lit/sec/ha)	7.17	7.17	6.32	6.32	6.32	6.83	
	- Drainage water requirement from other land (lit/sec/ha)	19~25	19~25	18~25	18~25	18~25	19~25	
8.	Secondary drains (nos.)	9	10	4	8	7	11	49
	- Total length of secondary drains (km)	25.1	14.8	28.2	37.7	14.8	53.9	175
9.	Collector drains (nos.)	3	2	0	0	0	0	5
	- Total length of collector drain (New, km)	19.4	10.0	0	0	0	0	29

Table 5.2-3 Selection of Gate Type for Moung Russei Diversion Weir

Item	Slide Gate		Fixed Wheel Gate		Flap Gate (Steel)		Flap Gate (Rubber Textile)		Radial Gate	
	Charac-Teristic	Judge	Charac-Teristic	Judge	Charac-Teristic	Judge	Charac-teristic	Judge	Charac-teristic	Judge
Downstream water level	No influence	⊙	No influence	⊙	Influence	△	Influence	△	Influence	△
Operation	So difficult	△	Easy	⊙	Easy	⊙	Easy	○	Easy	⊙
Maintenance	Easy	⊙	Slightly difficult	○	Slightly difficult	○	Slightly difficult	○	Slightly difficult	○
Pier height	High	△	High	△	Low	⊙	Low	⊙	Low	⊙
Cost	Low	⊙	High	○	High	○	Moderate	○	High	○
Hoisting load	Large	△	Moderate	○	Large	△	Large	△	Light	⊙
Vibration	No	⊙	No	⊙	Moderate	○	Moderate	○	Occurence	△
Reliability	High	⊙	High	⊙	Low	△	Low	△	Low	△
Height/width ratio	No influence	⊙	No influence	⊙	Influence	△	Influence	△	Influence	△
Over-all Evaluation	Hoisting load becomes large for large sized gate leaf and operation will be difficult		Reliability is high and hoist load is relatively low for large sized gate		Reliability is low under influence of downstream water level/ back water of Lake Tonle Sap		Reliability is low under influence of downstream water level/ back water		Reliability is low under influence of downstream water level/ back water	
			⊙							

Prepared by JICA Study Team

Table 5.2-4 Summary of Irrigation Canal Design of Ream Kon Rehabilitation Sub-project

Irrigation Canal	Canal Length			Design				
	Total	Rehab.	New	Discharge Q (m ³ /s)	Bottom Width	Height	Left Bank Top Width	Right Bank Top Width
Main Canal 1	9,100	8,100	1,000					
Sec 1			1,000	2.66	3.2 m	1.9 m	4.0 m	1.5 m
Sec 2 - 10		8,100		1.16-0.08	7.0 m - 2.0 m	1.2 m - 2.4 m	4.0 m	1.5 m - 1.0 m
S1 - 1	700	400	300	0.09	0.7 m	0.8 m	1.0 m	4.0 m
S1 - 2	1,400	1,100	300	0.18	0.9 m	0.9 m	1.0 m	4.0 m
S1 - 3	2,000	600	1,400	0.31	1.1 m	1.0 m	1.0 m	4.0 m
S1 - 4	1,600	0	1,600	0.24	1.0 m	1.0 m	1.0 m	4.0 m
S1 - 5	700	700	0	0.11	0.7 m	0.9 m	1.0 m	4.0 m
S1 - 6	700	700	0	0.11	0.7 m	0.9 m	1.0 m	4.0 m
S1 - 7	700	700	0	0.09	0.7 m	0.8 m	1.0 m	4.0 m
Total of S1	7,800	4,200	3,600					
Main Canal 2	9,300	3,800	5,500					
Sec 1			1,400	1.48	2.6 m	1.7 m	4.0 m	1.5 m
Sec 2 - 4		1,800		1.31 - 1.06	2.6 m - 2.4 m	1.7 m - 1.6 m	4.0 m	1.5 m
Sec 5 - 7			4,100	0.80 - 0.41	2.2 m - 1.2 m	1.5 m - 1.4 m	4.0 m	1.0 m
Sec 8 - 9		2,000		0.35 - 0.10	1.2 m - 1.0 m	1.4 m - 1.3 m	4.0 m	1.0 m
S2L - 1	700	0	700	0.11	0.7 m	0.9 m	1.0 m	4.0 m
S2L - 2	500	0	500	0.14	0.8 m	0.9 m	1.0 m	4.0 m
S2L - 3	500	0	500	0.14	0.8 m	0.9 m	1.0 m	4.0 m
S2L - 4	500	0	500	0.14	0.8 m	0.9 m	1.0 m	4.0 m
S2L - 5	500	0	500	0.13	0.8 m	0.9 m	1.0 m	4.0 m
S2L - 6	500	500	0	0.13	0.8 m	0.9 m	1.0 m	4.0 m
S2L - 7	500	500	0	0.10	0.7 m	0.9 m	1.0 m	4.0 m
S2R - 1	700	0	700	0.11	0.7 m	0.9 m	4.0 m	1.0 m
S2R - 2	700	0	700	0.11	0.7 m	0.9 m	4.0 m	1.0 m
Total of S2	5,100	1,000	4,100					

Prepared by JICA Study Team

Table 5.2-5 Type and Number of Irrigation Related Structures of Ream Kon Rehabilitation Sub-project

Structure	nos.	Structure	nos.
Combined Regulator	1	Terminal Structure	18
Turnout	63	Road Culvert	7
Check	25	Bridge	6

Prepared by JICA Study Team