

Table 18.1 Estimation of Standard Conversion Factors

Year	Total Import Value to Cambodia (CIF)	Total Export Value from Cambodia (FOB)	Import Subsidy /a	Import Tax /b	Export Subsidy /c	Export Tax	Standard Conversion Factor
	(Unit ; US\$ Million)						
	I	E	Is	It	Es	Et	SCF
1993	478.2	353	0	57.0		0	0.936
1994	841.8	490	0	109.3		0	0.924
1995	1,308.9	854	0	130.0		0	0.943
1996	1,181.1	644	0	130.3		0	0.933
1997	1,199.1	862	0	116.1	24.7	0	0.936
1998	1,156.9	913	0	99.7	22.4	0	0.944
1999	1,290.9	973	0	113.6	36.1	0	0.938
2000							
Average Standard Conversion Factor (SCF)							
1993-1999							0.936
1993-1997							0.935
<b>1995-1999</b>							<b>0.939</b>

Note :  $SCF = (I+E) / [(I-Is+It)+(E+Es-Et)]$

/a ; Import subsidy is accounted at the import tax exemption.

/b ; Custom duties are accounted.

/c ; Domestic subsidies (public enterprises and social sector) are considered as direct and indirect export subsidy.

Sources : Ministry of Economy and Finance, Cambodia Statistical Yearbook 2000

Table 18.2 Economic Price Estimate for Traded Goods

Rice/Paddy	Item	Import Parity Price			Export Parity Price		
		Operation	Unit	Price	Operation	Unit	Price
	1. Projected 2005 World Price (in 1990 price) /a		US\$/ton	263.6		US\$/ton	263.6
	2. Projected 2005 World Price (in 2001 price) /a		US\$/ton	286.8		US\$/ton	286.8
	3. Quality Adjustment	x	%	90	x	%	90
	4. CIF/FOB Price at Kompong Som Port /b	=	US\$/ton	258.1	=	US\$/ton	258.1
	5. Port Charge, Handling and Warehousing	+	US\$/ton	12.4	-	US\$/ton	12.4
	6. Price at Kompong Som Port	=	US\$/ton	270.5	=	Riel/kg	245.7
	Equivalent in Riel / kg /c	=	Riel/kg	1,037	=	Riel/kg	942
	7. Transportation Cost /d (Kampong Som-Phnom Penh)	+	Riel/kg	22			
	(Takeo-Kampong Som)				-	Riel/kg	16
	(Takeo-Phnom Penh)	-	Riel/kg	7			
	8. Ex-Mill /Wholesale Price in Takeo	=	Riel/kg	1,052	=	Riel/kg	926
	9. Milling Cost and Margin /d	-	Riel/kg	22	-	Riel/kg	22
	10. Processing Ratio	x	%	66	x	%	66
	11. By-Products through Processing /e	+	Riel/kg	51	+	Riel/kg	51
	12. Millgate Paddy Price	=	Riel/kg	731	=	Riel/kg	648
	13. Transport/Handling from Farmgate /d	-	Riel/kg	14	-	Riel/kg	14
	14. Farmgate Price	=	Riel/kg	717	=	Riel/kg	634
				50%			50%
	17. Weighted average economic farm gate price		Riel/kg	676			

Note : /a ; Based on the World Bank, Global Commodity Markets, May 2000

The projected prices in 1990 constant US\$ were adjusted by the factor of 1.088 (MUV) to allow for price escalation between 1990 and 2001.

Paddy : Thai, milled, 5% broken, FOB Bangkok

Maize : US No.2, Yellow, FOB Gulf Ports

/b ; Assumed at the same price at Bangkok port in Thailand

/c ; Exchange rate : US\$ = Riel 3,835

/d ; Adjusted with SCF of 0.94

/e ; Rice bran : ##### /kg of rice bran, 18% of paddy weight

### Fertilizer

(1) Urea	Item	Import Parity Price		
		Operation	Unit	Price
	1. Projected 2005 World Price (in 1990 price) /a		US\$/ton	100.4
	2. Projected 2005 World Price (in 2001 price) /a		US\$/ton	109.2
	3. International Shipping and Handling	+	US\$/ton	40.0
	4. CIF Price at Kompong Som Port	=	US\$/ton	149.2
	5. Port Charge, Handling and Warehousing	+	US\$/ton	17.4
	6. Price at Kompong Som Port	=	US\$/ton	166.6
	Equivalent in Riel / kg /b	=	Riel/kg	639
	7. Transportation Cost /c (Kampong Som-Takeo)	+	Riel/kg	16
	8. Trade Price in Takeo	=	Riel/kg	655
	9. Transport/Handling to Farmgate /c	+	Riel/kg	14
	10. Farmgate Price	=	Riel/kg	669
			Price of Nutrient (N:46%)	Riel/kg 1,454

Note : /a ; Based on the World Bank, Global Commodity Markets, May 2000

\* The projected prices in 1990 constant US\$ were adjusted by the factor of 1.088 (MUV) to allow for price escalation between 1990 and 2001.

Urea : Bagged, FOB Black Sea

/b ; Exchange rate : US\$ = Riel 0

/c ; Adjusted with SCF of US\$ = Riel

/d ; Potassium Chloride (Muriate of Potash)

/e ; Nutrient content is 46%, 46%(18-46-0), and 60%, respectively for Urea, DAP and KCL.

Table 18.3 Estimate of Shadow Wage Factor

Item	Operation	Unit	1998	2001	2010
1. Total Population in the Study Area		Person	165,580	177,690	214,430
(Population growth rate)		(%)		(2.38)	(2.11)
2. Labor Force Population		Person			
Total /b	(42.9%)		71,000	76,200	92,000
For agriculture			64,800	69,600	69,000
			(91.3%)	(91.3%)	(75.0%)
3. Annual Available Person-Day	242	P.day/year	15,681,600	16,843,200	16,698,000
	(P.day/person/year)				
4. Net Annual Available Person-Day for Agriculture	(50%)	P.day/year	7,840,800	<u>8,421,600</u>	<u>8,349,000</u>
5. Agricultural Labor Input /b		Distribution			
		P.day/year			
5.1 Present/Without Project Condition	(44,240ha)				
1) Wet season paddy (rainfed)	(39,560ha)	89.43%		3,164,800	3,164,800
2) Diversified crop (rainfed)					
Maize	(380ha)	0.86%		26,600	26,600
Groundnut	(130ha)	0.29%		7,800	7,800
Soybean	(130ha)	0.29%		6,500	6,500
Sesame	(0ha)	0.00%		0	0
Vegetables	(630ha)	1.43%		56,700	56,700
(1 + 2)	(40,830ha)	92.29%		3,262,400	3,262,400
3) Other farm works	(30% of cropping)			978,700	978,700
Total (1, 2, & 3)				<u>4,241,100</u>	<u>4,241,100</u>
5.2 Future/With Project Condition	(43,000ha)				
A. Upper Slakou & Small Reservoirs Area	(3,780ha)				
1) Wet season paddy (irrigated)	(3,780 ha)	100.00%			340,200
2) Diversified crop (irrigated)					
Maize	(110 ha)	2.86%			8,800
Groundnut	(190 ha)	5.00%			12,350
Soybean	(380 ha)	10.00%			20,900
Sesame	(190 ha)	5.00%			9,500
Vegetables	(540 ha)	14.29%			64,800
(1 + 2)	(5,190ha)	137.14%			456,550
3) Other farm works	(30% of cropping)				137,000
Total (1, 2, & 3)					593,550
B. Rainfed with Ponds Area	(39,220ha)				
1) Wet season paddy (irrigated)	(35,110 ha)	89.51%			2,808,800
2) Diversified crop (irrigated)					
Maize	(300 ha)	0.77%			21,000
Groundnut	(380 ha)	0.98%			29,260
Soybean	(760 ha)	1.95%			49,400
Sesame	(380 ha)	0.98%			22,800
Vegetables	(1,530 ha)	3.91%			201,960
(1 + 2)	(38,460ha)	98.11%			3,133,220
3) Other farm works	(30% of cropping)				940,000
Total (1, 2, & 3)					4,073,220
Total (A + B)					<u>4,666,770</u>
6. Shadow Wage Factors					
Without Project Condition				0.50	0.51
With Project Condition				0.55	0.56
7. Shadow Wage Rate					
(Standard conversion factor : 0.94 )					
Without Project Condition				0.47	0.48
With Project Condition				0.52	<b>0.53</b>

Note : /a ; Population growth rate (Takeo province) 1981-1998 1981-1994 1994 - 1998 1998-2001 2001-2010  
 %/year 2.38 2.11 3.25 (Estimated) (Estimated)  
 2.38 2.11

/b ; Percentage of economically active population aged 7 and over (rural in Takeo) 56.8 % (1)  
 Percentage of population aged 7 and over (rural in Takeo) ; 75.5 % (2)  
 Labor force population ratio ; (1 x 2) 42.9 %

/c ; Labor requirement per ha

Crops	Person-day/ha		
	Present	With Project	
		US & SR	Pond
Paddy			
Rainfed	80	-	80
Irrigated/with project	-	90	-
Maize	70	80	70
Groundnuts	60	65	77
Soybeans	50	55	65
Sesame	45	50	60
Vegetables	90	120	132

Table 18.4 Economic Crop Budget, Present/Without Project Condition (1/2)

Name of crops	Unit	Paddy (Impr. Local V.)			Paddy (H.Y.V)			Maize *1		
		Q'ty	Price (Riel)	Value (1000Riel)	Q'ty	Price (Riel)	Value (1000Riel)	Q'ty	Price (Riel)	Value (1000Riel)
<b>1. Gross Income</b>	<b>Riel</b>			<b>899</b>			<b>899</b>			<b>466</b>
Main products	kg	1,300	676	879	1,300	676	879	900	500	450
By-product	kg	1,300 (straw)	15	20	1,300 (straw)	15	20	1,080 (corn stalk)	15	16
<b>2. Production Cost</b>	<b>Riel</b>			<b>252</b>			<b>246</b>			<b>197</b>
<b>2.1 Inputs</b>	<b>Riel</b>			<b>84</b>			<b>78</b>			<b>56</b>
Seed	kg	65	376	24	50	376	19	20	1,880	38
Farm manure (wet)	ton	1	13,250	13	1	13,250	13	0	13,250	0
Fertilizer Urea	kg	30	669	20	30	669	20	20	669	13
DAP	kg	20	950	19	20	950	19	0	950	0
KCL	kg	0	687	0	0	687	0	0	687	0
Agro-chemicals	liter	0		0	0		0	0		0
Others (10% of the above)				8			7			5
<b>2.2 Labor</b>	<b>P-d</b>	<b>80</b>		<b>127</b>	<b>80</b>		<b>127</b>	<b>70</b>		<b>111</b>
Hired labor	P-d	8	1,590	13	8	1,590	13	0	1,590	0
Family labor	P-d	72	1,590	114	72	1,590	114	70	1,590	111
<b>2.3 Draft animal</b>	<b>Riel</b>			<b>30</b>			<b>30</b>			<b>22</b>
Land preparation	Ani-d	6.0		23	6		23			15
Plowing	Ani-d	5.0	3,710	19	5.0	3,710	19	4.0	3,710	15
Paddling	Ani-d	1.0	3,710	4	1.0	3,710	4	0.0	3,710	0
Transportation	Ani-d	2.0	3,710	7	2.0	3,710	7	2.0	3,710	7
<b>2.4 Tool/Equipment</b>	<b>Riel</b>			<b>11</b>			<b>11</b>			<b>8</b>
<b>3. Net Return (N.Return/P. Cost Ratio)</b>	<b>Riel</b>			<b>647</b>			<b>653</b>			<b>269</b>
				<b>2.57</b>			<b>2.65</b>			<b>1.37</b>

Name of crops	Unit	Soybean *2			Groundnut			Sesame		
		Q'ty	Price (Riel)	Value (1000Riel)	Q'ty	Price (Riel)	Value (1000Riel)	Q'ty	Price (Riel)	Value (1000Riel)
<b>1. Gross Income</b>	<b>Riel</b>			<b>471</b>			<b>541</b>			<b>513</b>
Main products	kg	500	926	463	450	1,187	534	300	1,692	508
By-product	kg	500 (stem and waste bean)	15	8	450 (stem and waste nuts)	15	7	300 stems	15	5
<b>2. Production Cost</b>	<b>Riel</b>			<b>281</b>			<b>286</b>			<b>127</b>
<b>2.1 Inputs</b>	<b>Riel</b>			<b>162</b>			<b>153</b>			<b>29</b>
Seed	kg	80	1,692	135	30	4,230	127	8	2,350	19
Farm manure (wet)	ton	0	13,250	0	0	13,250	0	0	13,250	0
Fertilizer Urea	kg	10	669	7	10	669	7	10	669	7
DAP	kg	5	950	5	5	950	5	0	950	0
KCL	kg	0	687	0	0	687	0	0	687	0
Agro-chemicals	liter	0		0	0		0	0		0
Others (10% of the above)				15			14			3
<b>2.2 Labor</b>	<b>P-d</b>	<b>50</b>		<b>80</b>	<b>60</b>		<b>95</b>	<b>45</b>		<b>72</b>
Hired labor	P-d	0	1,590	0	0	1,590	0	0	1,590	0
Family labor	P-d	50	1,590	80	60	1,590	95	45	1,590	72
<b>2.3 Draft animal</b>	<b>Riel</b>			<b>21</b>			<b>21</b>			<b>21</b>
Land preparation	Ani-d			15			15			15
Plowing	Ani-d	4.0	3,710	15	4.0	3,710	15	4.0	3,710	15
Paddling	Ani-d	0.0	3,710	0	0.0	3,710	0		3,710	0
Transportation	Ani-d	1.5	3,710	6	1.5	3,710	6	1.5	3,710	6
<b>2.4 Tool/Equipment</b>	<b>Riel</b>			<b>18</b>			<b>17</b>			<b>5</b>
<b>3. Net Return (N.Return/P. Cost Ratio)</b>	<b>Riel</b>			<b>190</b>			<b>255</b>			<b>386</b>
				<b>0.68</b>			<b>0.89</b>			<b>3.04</b>

Name of crops	Unit	Cucumber *3			String-bean *3			Tomato *3		
		Q'ty	Price (Riel)	Value (1000Riel)	Q'ty	Price (Riel)	Value (1000Riel)	Q'ty	Price (Riel)	Value (1000Riel)
<b>1. Gross Income</b>	<b>Riel</b>			<b>1,510</b>			<b>2,261</b>			<b>1,697</b>
Main products	kg	4,000	376	1,504	3,000	752	2,256	3,000	564	1,692
By-product	kg	400 waste fruits	15	6	300 stems, waste beans	15	5	300 waste fruits	15	5
<b>2. Production Cost</b>	<b>Riel</b>			<b>375</b>			<b>393</b>			<b>264</b>
<b>2.1 Inputs</b>	<b>Riel</b>			<b>189</b>			<b>205</b>			<b>88</b>
Seed	kg	3.0	32,900	99	30	3,760	113	0.3	24,440	7
Farm manure (wet)	ton	2	13,250	27	2	13,250	27	2	13,250	27
Fertilizer Urea	kg	40	669	27	40	669	27	40	669	27
DAP	kg	20	950	19	20	950	19	20	950	19
KCL	kg	0	687	0	0	687	0	0	687	0
Agro-chemicals	liter			0			0			0
Others (10% of the above)				17			19			8
<b>2.2 Labor</b>	<b>P-d</b>	<b>90</b>		<b>143</b>	<b>90</b>		<b>143</b>	<b>90</b>		<b>143</b>
Hired labor	P-d	0	1,590	0	0	1,590	0	0	1,590	0
Family labor	P-d	90	1,590	143	90	1,590	143	90	1,590	143
<b>2.3 Draft animal</b>	<b>Riel</b>			<b>22</b>			<b>22</b>			<b>22</b>
Land preparation	Ani-d			15			15			15
Plowing	Ani-d	4.0	3,710	15	4.0	3,710	15	4.0	3,710	15
Paddling	Ani-d		3,710	0	0.0	3,710	0		3,710	0
Transportation	Ani-d	2.0	3,710	7	2.0	3,710	7	2.0	3,710	7
<b>2.4 Tool/Equipment</b>	<b>Riel</b>			<b>21</b>			<b>23</b>			<b>11</b>
<b>3. Net Return (N.Return/P. Cost Ratio)</b>	<b>Riel</b>			<b>1,135</b>			<b>1,868</b>			<b>1,433</b>
				<b>3.03</b>			<b>4.75</b>			<b>5.43</b>

Note \*: Cucumber, string-bean and tomato are substitutes of all suitable vegetables in the area.  
Average Net Return per ha of vegetables Riel '000 **1,479**

Table 18.4 Economic Crop Budget, With Project Condition (2/2)

## I. USP and SRP Area

Name of crops	Unit	Paddy (Impr. Local V.)			Paddy (H.Y.V)			Maize *1		
		Q'ty	Price (Riel)	Value (1000Riel)	Q'ty	Price (Riel)	Value (1000Riel)	Q'ty	Price (Riel)	Value (1000Riel)
<b>1. Gross Income</b>	<b>Riel</b>			<b>1,935</b>			<b>2,273</b>			<b>1,036</b>
Main products	kg	2,800	676	1,893	3,300	676	2,231	2,000	500	1,000
By-product	kg	2,800	15	42	2,800	15	42	2,400	15	36
		(straw)			(straw)			(corn stalk)		
<b>2. Production Cost</b>	<b>Riel</b>			<b>433</b>			<b>428</b>			<b>366</b>
<b>2.1 Inputs</b>	<b>Riel</b>			<b>234</b>			<b>229</b>			<b>195</b>
Seed	kg	65	376	24	50	376	19	20	1,880	38
Farm manure (wet)	ton	3	13,250	40	3	13,250	40	0	13,250	0
Fertilizer Urea	kg	120	669	80	120	669	80	120	669	80
DAP	kg	50	950	48	50	950	48	40	950	38
KCL	kg	30	687	21	30	687	21	30	687	21
Agro-chemicals	liter	0		0	0		0	0		0
Others (10% of the above)				21			21			18
<b>2.2 Labor</b>	<b>P-d</b>	<b>90</b>		<b>143</b>	<b>90</b>		<b>143</b>	<b>80</b>		<b>127</b>
Hired labor	P-d	9	1,590	14	9	1,590	14	4	1,590	6
Family labor	P-d	81	1,590	129	81	1,590	129	76	1,590	121
<b>2.3 Draft animal</b>	<b>Riel</b>			<b>30</b>			<b>30</b>			<b>22</b>
Land preparation	Ani-d	6.0		23	6.0		23	4.0		15
Plowing	Ani-d	5.0	3,710	19	5.0	3,710	19	4.0	3,710	15
Paddling	Ani-d	1.0	3,710	4	1.0	3,710	4	0.0	3,710	0
Transportation	Ani-d	2.0	3,710	7	2.0	3,710	7	2.0	3,710	7
<b>2.4 Tool/Equipment</b>	<b>Riel</b>			<b>26</b>			<b>26</b>			<b>22</b>
<b>3. Net Return (N.Return/P. Cost Ratio)</b>	<b>Riel</b>			<b>1,502</b>			<b>1,845</b>			<b>670</b>
				<b>3.47</b>			<b>4.31</b>			<b>1.83</b>

Name of crops	Unit	Soybean *2			Groundnut			Sesame		
		Q'ty	Price (Riel)	Value (1000Riel)	Q'ty	Price (Riel)	Value (1000Riel)	Q'ty	Price (Riel)	Value (1000Riel)
<b>1. Gross Income</b>	<b>Riel</b>			<b>941</b>			<b>1,022</b>			<b>1,366</b>
Main products	kg	1,000	926	926	850	1,187	1,009	800	1,692	1,354
By-product	kg	1,000	15	15	850	15	13	800	15	12
		(stem and waste bean)			(stem and waste nuts)			stems		
<b>2. Production Cost</b>	<b>Riel</b>			<b>398</b>			<b>404</b>			<b>248</b>
<b>2.1 Inputs</b>	<b>Riel</b>			<b>261</b>			<b>252</b>			<b>133</b>
Seed	kg	80	1,692	135	30	4,230	127	8	2,350	19
Farm manure (wet)	ton	0	13,250	0	0	13,250	0	0	13,250	0
Fertilizer Urea	kg	50	669	33	50	669	33	50	669	33
DAP	kg	50	950	48	50	950	48	50	950	48
KCL	kg	30	687	21	30	687	21	30	687	21
Agro-chemicals	liter	0		0	0		0	0		0
Others (10% of the above)				24			23			12
<b>2.2 Labor</b>	<b>P-d</b>	<b>55</b>		<b>88</b>	<b>65</b>		<b>104</b>	<b>50</b>		<b>79</b>
Hired labor	P-d	3	1,590	5	3	1,590	5	2	1,590	3
Family labor	P-d	52	1,590	83	62	1,590	99	48	1,590	76
<b>2.3 Draft animal</b>	<b>Riel</b>			<b>21</b>			<b>21</b>			<b>21</b>
Land preparation	Ani-d	4.0		15	4.0		15	4.0		15
Plowing	Ani-d	4.0	3,710	15	4.0	3,710	15	4.0	3,710	15
Paddling	Ani-d	0.0	3,710	0	0.0	3,710	0	0.0	3,710	0
Transportation	Ani-d	1.5	3,710	6	1.5	3,710	6	1.5	3,710	6
<b>2.4 Tool/Equipment</b>	<b>Riel</b>			<b>28</b>			<b>27</b>			<b>15</b>
<b>3. Net Return (N.Return/P. Cost Ratio)</b>	<b>Riel</b>			<b>543</b>			<b>618</b>			<b>1,118</b>
				<b>1.36</b>			<b>1.53</b>			<b>4.51</b>

Name of crops	Unit	Cucumber *3			String-bean *3			Tomato *3		
		Q'ty	Price (Riel)	Value (1000Riel)	Q'ty	Price (Riel)	Value (1000Riel)	Q'ty	Price (Riel)	Value (1000Riel)
<b>1. Gross Income</b>	<b>Riel</b>			<b>3,775</b>			<b>4,521</b>			<b>5,090</b>
Main products	kg	10,000	376	3,760	6,000	752	4,512	9,000	564	5,076
By-product	kg	1,000	15	15	600	15	9	900	15	14
		waste fruits			stems, waste beans			waste fruits		
<b>2. Production Cost</b>	<b>Riel</b>			<b>660</b>			<b>581</b>			<b>500</b>
<b>2.1 Inputs</b>	<b>Riel</b>			<b>404</b>			<b>347</b>			<b>259</b>
Seed	kg	3	32,900	99	30	3,760	113	0.3	24,440	7
Farm manure (wet)	ton	4	13,250	53	4	13,250	53	2	13,250	27
Fertilizer Urea	kg	150	669	100	100	669	67	150	669	100
DAP	kg	70	950	67	50	950	48	70	950	67
KCL	kg	70	687	48	50	687	34	50	687	34
Agro-chemicals	liter	0		0	0		0	0		0
Others (10% of the above)				37			32			24
<b>2.2 Labor</b>	<b>P-d</b>	<b>120</b>		<b>191</b>	<b>110</b>		<b>175</b>	<b>120</b>		<b>191</b>
Hired labor	P-d	6	1,590	10	5	1,590	8	6	1,590	10
Family labor	P-d	114	1,590	181	105	1,590	167	114	1,590	181
<b>2.3 Draft animal</b>	<b>Riel</b>			<b>22</b>			<b>22</b>			<b>22</b>
Land preparation	Ani-d	4.0		15	4.0		15	4.0		15
Plowing	Ani-d	4.0	3,710	15	4.0	3,710	15	4.0	3,710	15
Paddling	Ani-d	0.0	3,710	0	0.0	3,710	0	0.0	3,710	0
Transportation	Ani-d	2.0	3,710	7	2.0	3,710	7	2.0	3,710	7
<b>2.4 Tool/Equipment</b>	<b>Riel</b>			<b>43</b>			<b>37</b>			<b>28</b>
<b>3. Net Return (N.Return/P. Cost Ratio)</b>	<b>Riel</b>			<b>3,115</b>			<b>3,940</b>			<b>4,590</b>
				<b>4.72</b>			<b>6.78</b>			<b>9.18</b>

Note \*: Cucumber, string-bean and tomato are substitutes of all suitable vegetables in the area.

Average Net Return per ha of vegetables Riel '000 **3,882**

Table 18.5 Economic Investment Cost

Description	Financial Cost			Conversion Factors	Economic Cost										
	F/C	L/C	Total		Total	2002	2003	2004	2005	2006	2007	2008	2009	2010	
1. Preparatory Works	1,702.9	722.8	2,425.7	0.77	1,865.4		746.2	373.0	746.2						
2. Direct Cost															
1) Tumnap Lok Reservoir	7,810.6	2,630.5	10,441.1	0.79	8,223.7				434.8	7,788.9					
2) Diversion Canal	5,047.2	1,906.6	6,953.8	0.76	5,303.1				265.2	5,037.9					
3) Kpob Trobek Reservoir	7,292.6	2,815.1	10,107.7	0.78	7,901.1		7,901.1								
4) Irrigation Canal System	13,027.8	4,627.3	17,655.1	0.77	13,520.0		811.2	1,312.8	6,837.6	4,558.4					
5) Tertiary Development	880.2	2,475.8	3,356.0	0.70	2,359.8		168.5	202.2	1,011.4	977.7					
3. O&M Equipment	306.8	0.0	306.8	0.74	227.0			227.0							
4. Institutional Development Cost	288.4	535.4	823.8	0.83	683.4	68.4	68.4	102.5	136.6	157.1	82.0	34.2	20.5	13.7	
5. Cost for Relocation	1.4	44.6	46.0	0.78	36.0				36.0						
6. Administration Cost	318.3	2,002.2	2,320.5	0.84	1,939.2	310.3	310.3	155.1	232.7	271.5	194.0	155.1	155.1	155.1	
7. Engineering Services	3,428.9	452.2	3,881.1	0.93	3,606.8	288.6	360.7	901.7	793.5	721.3	360.7	180.3			
Total (1 to 7)	40,105.1	18,212.5	58,317.6	0.78	45,665.5	667.3	1,485.6	10,640.1	4,160.0	21,825.7	6,172.8	369.6	175.6	168.8	
8. Physical Contingen(10% of 1 to 7)	4,010.5	1,821.3	5,831.8		4,566.6	66.7	148.6	1,064.0	416.0	2,182.6	617.3	37.0	17.6	16.8	
Grand Total	44,115.6	20,033.8	64,149.4		50,232.1	734.0	1,634.2	11,704.1	4,576.0	24,008.3	6,790.1	406.6	193.2	185.6	

Table 18.6 Economic Annual O&amp;M Cost

(1) Economic Annual O&M Cost at Full Stage				(2) Annual Disbursement of Economic O&M Cost			
Item	Financial Cost (Riel Million)	Conversion Factor	Economic Cost (Riel Million)	Year in Order	Year	Area under Irrigation (ha)	Annual O&M Cost (Riel Million)
1. Materials	209	0.84	176	1	2002		
2. Equipment	176	0.75	132	2	2003		
3. Labor	608	0.53	322	3	2004	200	11.8
4. O&M Staff	169.2	0.85	143.8	4	2005	550	32.5
				5	2006	1,200	70.9
				6	2007	3,500	206.8
				7	2008	3,500	206.8
				8	2009	3,500	206.8
				9	2010	3,500	206.8
				10	2011	3,500	206.8
				11	2012	3,500	206.8
				12	2013	3,500	206.8
				13	2014	3,500	206.8
				14	2015	3,500	206.8
				15	2016	3,500	206.8
Total (3,500 ha) Per ha (Riel)	268.5		206.8 <u>59,086</u>				

Table 18.7 Economic Replacement Cost

(1) Economic Replacement Cost by Item					(2) Annual Replacement Cost					(Lit.: Riel Million)						
Item	Useful Life (year)	Financial Cost (Riel Million)	Conversion Factor	Economic Cost (Riel Million)	Year in Order	Year	With 5 Years'	With 10 Years'	With 25 Years'	Total	Year in Order	Year	With 5 Years'	With 10 Years'	With 25 Years'	Total
1. Project Facilities					1	2002				26	2027	322				322
1) Tumnap Lok Reservoir					2	2003				27	2028					
- Gate	25	44.6	0.79	35.2	3	2004				28	2029	73	103.5	110.8		
- Wooden stop log	5	2.3	0.79	1.8	4	2005				29	2030	6.7	63.2	69.9		
2) Diversion Canal					5	2006				30	2031	35.8	351.2	387.0		
- Wooden stop log	5	0.9	0.76	0.7	6	2007				31	2032	32.2	305.5	337.7		
3) Kpob Trobek Reservoir					7	2008				32	2033					
- Gate	25	65.2	0.78	50.9	8	2009	7.3			33	2034	7.3	227.0	234.3		
- Wooden stop log	5	2.3	0.78	1.8	9	2010	6.7			34	2035	6.7		6.7		
4) Irrigation Canal System					10	2011	35.8			35	2036	35.8		35.8		
- Gate	25	957.5	0.77	737.3	11	2012	32.2			36	2037	32.2		32.2		
- Wooden stop log	5	17.3	0.77	13.3	12	2013				37	2038					
5) Tertiary development					13	2014	7.3	227.0	234.3	38	2039	7.3		7.3		
- Wooden stop log	5	92.0	0.70	64.4	14	2015	6.7			39	2040	6.7		6.7		
2. O&M Equipment					15	2016	35.8			40	2041	35.8		35.8		
					16	2017	32.2			41	2042	32.2		32.2		
					17	2018				42	2043					
					18	2019	7.3			43	2044	7.3	227.0	234.3		
					19	2020	6.7			44	2045	6.7		6.7		
					20	2021	35.8			45	2046	35.8		35.8		
					21	2022	32.2			46	2047	32.2		32.2		
					22	2023				47	2048					
					23	2024	7.3	227.0	234.3	48	2049	7.3		7.3		
					24	2025	6.7			49	2050	6.7		6.7		
					25	2026	35.8			50	2051	35.8		35.8		

Table 18.8 Economic Cost and Benefit Stream

EIRR : 10.79%

<b>Net Present Value (Riel Million)</b>	<i>Benefit</i>	<i>Cost</i>
( 6.50 % discount rate)	64,044	40,780

(Unit : Riel Million)

Year in Order	Year	Economic Cost				Economic Benefit			Net Cash Flow
		Project Investment	O&M	Replacement	Total	Irrigation & Drainage	Production Foregone (Negative Benefit)	Total	
1	2002	734.0			734.0			0.0	-734.0
2	2003	1,634.2			1,634.2			0.0	-1,634.2
3	2004	11,704.1	11.8		11,715.9	207.2	-0.2	207.0	-11,508.9
4	2005	4,576.0	32.5		4,608.5	656.1	-0.6	655.5	-3,953.0
5	2006	24,008.3	70.9		24,079.2	1,532.4	-1.2	1,531.2	-22,548.0
6	2007	6,790.1	206.8		6,996.9	4,286.4	-3.6	4,282.8	-2,714.1
7	2008	406.6	206.8		613.4	5,447.7	-3.6	5,444.1	4,830.7
8	2009	193.2	206.8	7.3	407.3	6,043.3	-3.6	6,039.7	5,632.4
9	2010	185.6	206.8	6.7	399.1	6,043.3	-3.6	6,039.7	5,640.6
10	2011		206.8	35.8	242.6	6,043.3	-3.6	6,039.7	5,797.1
11	2012		206.8	32.2	239.0	6,043.3	-3.6	6,039.7	5,800.7
12	2013		206.8		206.8	6,043.3	-3.6	6,039.7	5,832.9
13	2014		206.8	234.3	441.1	6,043.3	-3.6	6,039.7	5,598.6
14	2015		206.8	6.7	213.5	6,043.3	-3.6	6,039.7	5,826.2
15	2016		206.8	35.8	242.6	6,043.3	-3.6	6,039.7	5,797.1
16	2017		206.8	32.2	239.0	6,043.3	-3.6	6,039.7	5,800.7
17	2018		206.8		206.8	6,043.3	-3.6	6,039.7	5,832.9
18	2019		206.8	7.3	214.1	6,043.3	-3.6	6,039.7	5,825.6
19	2020		206.8	6.7	213.5	6,043.3	-3.6	6,039.7	5,826.2
20	2021		206.8	35.8	242.6	6,043.3	-3.6	6,039.7	5,797.1
21	2022		206.8	32.2	239.0	6,043.3	-3.6	6,039.7	5,800.7
22	2023		206.8		206.8	6,043.3	-3.6	6,039.7	5,832.9
23	2024		206.8	234.3	441.1	6,043.3	-3.6	6,039.7	5,598.6
24	2025		206.8	6.7	213.5	6,043.3	-3.6	6,039.7	5,826.2
25	2026		206.8	35.8	242.6	6,043.3	-3.6	6,039.7	5,797.1
26	2027		206.8	32.2	239.0	6,043.3	-3.6	6,039.7	5,800.7
27	2028		206.8		206.8	6,043.3	-3.6	6,039.7	5,832.9
28	2029		206.8	110.8	317.6	6,043.3	-3.6	6,039.7	5,722.1
29	2030		206.8	69.9	276.7	6,043.3	-3.6	6,039.7	5,763.0
30	2031		206.8	387.0	593.8	6,043.3	-3.6	6,039.7	5,445.9
31	2032		206.8	337.7	544.5	6,043.3	-3.6	6,039.7	5,495.2
32	2033		206.8		206.8	6,043.3	-3.6	6,039.7	5,832.9
33	2034		206.8	234.3	441.1	6,043.3	-3.6	6,039.7	5,598.6
34	2035		206.8	6.7	213.5	6,043.3	-3.6	6,039.7	5,826.2
35	2036		206.8	35.8	242.6	6,043.3	-3.6	6,039.7	5,797.1
36	2037		206.8	32.2	239.0	6,043.3	-3.6	6,039.7	5,800.7
37	2038		206.8		206.8	6,043.3	-3.6	6,039.7	5,832.9
38	2039		206.8	7.3	214.1	6,043.3	-3.6	6,039.7	5,825.6
39	2040		206.8	6.7	213.5	6,043.3	-3.6	6,039.7	5,826.2
40	2041		206.8	35.8	242.6	6,043.3	-3.6	6,039.7	5,797.1
41	2042		206.8	32.2	239.0	6,043.3	-3.6	6,039.7	5,800.7
42	2043		206.8		206.8	6,043.3	-3.6	6,039.7	5,832.9
43	2044		206.8	234.3	441.1	6,043.3	-3.6	6,039.7	5,598.6
44	2045		206.8	6.7	213.5	6,043.3	-3.6	6,039.7	5,826.2
45	2046		206.8	35.8	242.6	6,043.3	-3.6	6,039.7	5,797.1
46	2047		206.8	32.2	239.0	6,043.3	-3.6	6,039.7	5,800.7
47	2048		206.8		206.8	6,043.3	-3.6	6,039.7	5,832.9
48	2049		206.8	7.3	214.1	6,043.3	-3.6	6,039.7	5,825.6
49	2050		206.8	6.7	213.5	6,043.3	-3.6	6,039.7	5,826.2
50	2051		206.8	35.8	242.6	6,043.3	-3.6	6,039.7	5,797.1

Table 18.9 Farm Economy (Farm Budget) Assessment, Median Size Farmer (0.8 ha)

Item	Present Condition				Future/With Project Condition							
					Project A and E				Project C			
	Area (ha)	Yield (kg/ha)	Price (Riel/kg)	Amount (Riel'000)	Area (ha)	Yield (kg/ha)	Price (Riel/kg)	Amount (Riel'000)	Area (ha)	Yield (kg/ha)	Price (Riel/kg)	Amount (Riel'000)
1. Total Income				<u>789.2</u>				<u>2,011.6</u>				<u>923.1</u>
1.1 Farm Income				<u>631.7</u>				<u>1,854.1</u>				<u>765.6</u>
- Impro.Local Paddy	0.64	1,300	370	307.8	0.55	2,800	370	569.8	0.64	1,300	370	307.8
- H.Y.V Paddy	0.08	1,300	330	34.3	0.25	3,300	330	272.3	0.08	1,300	330	34.3
- Maize	0.01	900	600	5.4	0.02	2,000	600	24.0	0.01	900	600	5.4
- Soybean	0.002	500	1,200	1.2	0.04	1,000	1,200	48.0	0.02	800	1,200	19.2
- Groundnut	0.002	450	1,300	1.2	0.08	850	1,300	88.4	0.01	680	1,300	8.8
- Sesame	0	300	1,800	0	0.04	800	1,800	57.6	0.01	640	1,800	11.5
- Vegetables	0.01	3,330	580	19.3	0.11	8,330	580	531.5	0.03	6,670	580	116.1
- Livestock				250.4				250.4				250.4
- Fruits				12.1				12.1				12.1
1.2 Non-farm Income				<u>157.5</u>				<u>157.5</u>				<u>157.5</u>
2. Total Expenditure				<u>784.6</u>				<u>1,081.6</u>				<u>804.4</u>
				<u>Production Cos (Riel'000/ha)</u>				<u>Production Cos (Riel'000/ha)</u>				<u>Production Cos (Riel'000/ha)</u>
2.1 Production Cos				<u>259.8</u>				<u>556.8</u>				<u>279.6</u>
- Impro.Local Paddy	0.64		201	128.6	0.55		416	228.8	0.64		201	128.6
- H.Y.V Paddy	0.08		193	15.4	0.25		410	102.5	0.08		193	15.4
- Maize	0.01		114	1.1	0.02		300	6.0	0.01		114	1.1
- Soybean	0.002		233	0.5	0.04		364	14.6	0.02		308	6.2
- Groundnut	0.002		222	0.4	0.08		353	28.2	0.01		297	3.0
- Sesame	0		77	0	0.04		211	8.4	0.01		156	1.6
- Vegetables	0.01		264	2.6	0.11		519	57.1	0.03		415	12.5
- Others				111.2				111.2				111.2
2.2 Living Expenditure				<u>524.8</u>				<u>524.8</u>				<u>524.8</u>
- Rice												
Home consumption				205.3	/1			271.9				205.3
Purchase				66.6				0				66.6
- Other foods				30.0				30.0				30.0
- Others				222.9				222.9				222.9
3. Net Reserve				4.6				930.0				118.7

Note: 60% of paddy products consumed at home



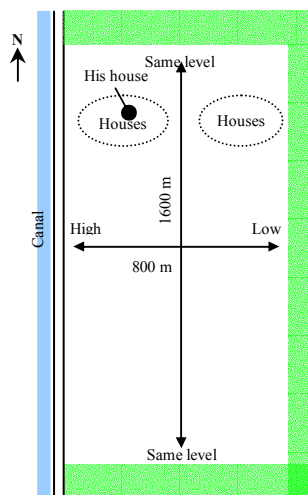
Table 19.1 Sample of Report for Results of RRA (1/4)

**1 Key Informant Interview**

1-1 AA Village

1-1-1 Topography and Socio-cultural Data

- Interviewee: Mr. AA (Village Chief)
- Date: 6 March 2001
- Location for interview: under his house
- Location of interviewee's house: AA Village/ BB Commune/ CC District/ DD Province
- Population: 316 (Male 142, and Female 174, Female ration 55 %):  
1998 Population Census.
- Household: 68: 1998 Population Census.  
63: Village Chief.
- Average family size: 4.6: 1998 Population Census.
- Female-headed household: 25: 1998 Population Census.
- Total area: 180 ha: Commune Office.
- Paddy field: 85 ha: Commune Office and Village Chief.
- Secondary crop field: n.a.: Commune Office.
- Location Map:



- Others: Public transportation: 2 times/day.  
No school. No temple. No electricity.

1-1-2 Agriculture, Livestock and Fisheries

- Crops: Paddy
- Vegetables: watermelon: Some farmer plant after paddy cultivation.  
Only for self-consumption.  
Sweet potato, cassava: Some farmer.  
Banana, palm tree, coconut.
- Cropping pattern: Paddy in wet season.
- Average yield: 700 - 1,000 kg/ha on average (400 kg/ha on drought).  
1.5 ton/ha before 1991.
- Soils: Most of soil in the village is sandy soil; No good soil,  
Need much fertilizer.
- Water source: Only rainwater for paddy.  
They never use irrigation water in canal and pond water for paddy.  
Small pond only for garden vegetable.
- Livestock: 80 % of villagers have livestock.

Table 19.1 Sample of Report for Results of RRA (2/4)

-	Market:	Cheang Tong market: about 7 km along.
-	Fertilizers:	50 kg/ha of DAP for paddy. Some farmer use Urea. Rich farmer use 200 kg/ha of DAP for paddy. They buy it near the village. Manure for seedbed (no fertilizers for seed bed).
-	Insecticides:	No insect.
-	Problems:	Seed is not enough. Agricultural land is not enough. Water shortage.
-	Agricultural Practices:	Plowing: 1 time. 1st application of fertilizer is just after plowing. 2nd application of fertilizer is 1 month later after transplanting. 3rd application is 2 - 3 months later. Amount of application of fertilizer is every one-third for every application. Weeding is 3 - 4 times/year by hand.
-	Labor:	Some rich use labor. 2,500 Riel/day for one labor.
-	Land holding:	1 ha/hh. on average. Village chief has 1.5 ha.
-	Others:	Most of villagers go to mountain to collect firewood. (no regulation)

## 2 Individual Informant Interview

2-1 Small-scale rice cultivation farmer

2-1-1 Basic Information

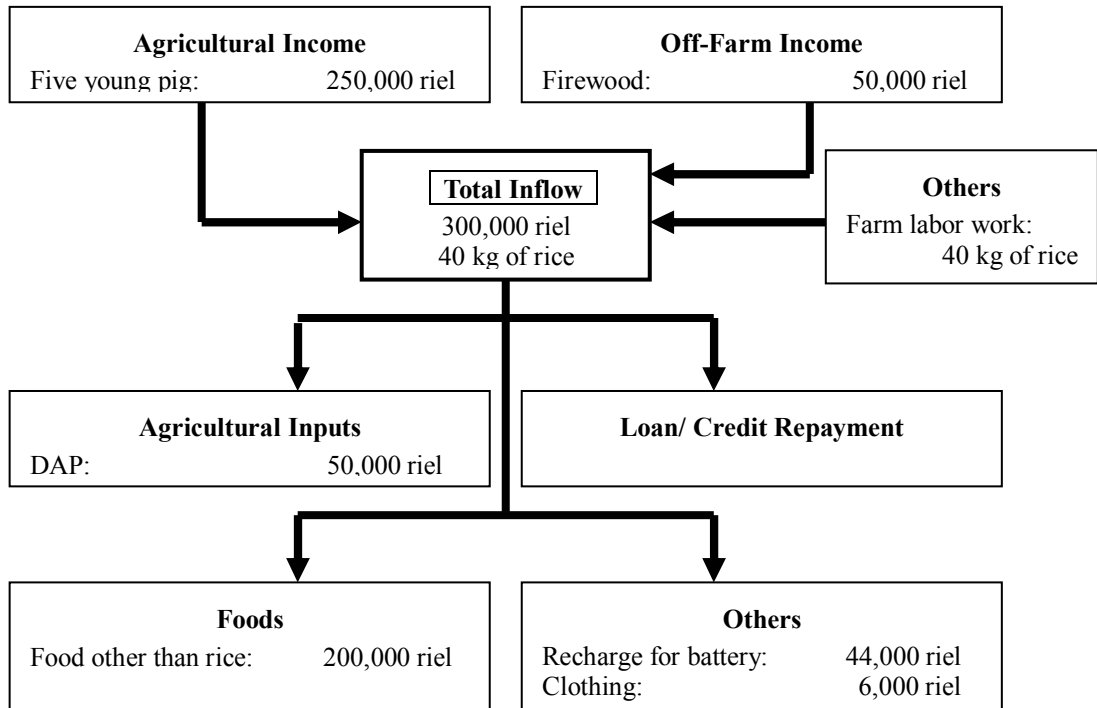
-	Interviewee:	Mr. aa (Head of household: Husband)
-	Date:	6 March 2001
-	Characteristic	Small-scale rice cultivation farmer.
-	Location for interview:	in his house
-	Location of interviewee's house:	AA village/ BB Commune His house is along the ADB road.
-	Number of family:	8
-	Family structure:	Husband (34), Wife (39) Daughter (17), son (15) and daughter (12) are born with previous husband. Son (7), daughter (5), daughter (1) Total children: 6 (Boy 2 and Girl 4)
-	Marriage:	in 1989 (12 years ago)
-	Parents of this couple:	Parents of husband live in Povsat District. Parents of wife already died (Father: 34 years ago, Mother: 5 years ago)
-	Education:	Elder daughter and son gave up primary school. Other children and this couple have no education: Primary school is far (3 km) from here.
-	Health condition:	Good
-	Main activity:	Rice cultivation
-	Migrant work:	Husband goes to border area of Vietnam to help

Table 19.1 Sample of Report for Results of RRA (3/4)

		transplanting every year.
-	Other work:	Gathering firewood: Elder daughter and son
2-1-2	Agriculture	
-	Land holding:	Only paddy field.
-	Chemicals:	No application: no damage by insects. Some damage by mouse.
-	Fertilizers:	1 bag of DAP
-	Seed:	60 kg
-	Production:	Only for 4 months' self-consumption.
-	Work inputs:	Only this couple.
2-1-3	Livestock	
-	Cow:	1 He will rent one more cow for plowing.
-	Pig:	Parent: 1 Young: 6 Owner of all pigs is other person. He will share selling price.
-	Chicken:	Parent: 1 Young: 2 He had 4 parents chicken, but already died of illness. Chickens are only for self-consumption.
-	Feed:	Rice for chicken and rice straw for pig.
2-1-4	Debt	
-	Amount:	Debt 1: 60,000 riel Debt 2: Rice for 8 months
-	Interest:	Debt 1: 10 % per month, but he pay back as farm labor work. Debt 2: No
-	Repayment:	Debt 1: Debt 2: Cash after harvesting or collected firewood.
2-1-5	Other Information	
-	House and land inherited from wife's parent.	
-	All of all children were born in this house. Midwife come from in this village with 1,000 to 2,000 riel or 2 kg of rice.	
-	A radio-cassette recorder with battery is the only luxuries. He bought it at market with 15,000 riel (secondhand).	
-	He worked at wages of 4,000 riel a day for ADB road (in front of his house) construction.	
-	He never goes to Phnom Penh because he is stranger in there.	
2-1-6	Impressions and Findings	
-	He has land along the secondary canal. Other farmer cultivates vegetables on next land. The farmer draws water from the canal to their vegetable land. This farmer is negative to vegetable cultivation because of no money for seed and no experience of vegetable farming.	

Table 19.1 Sample of Report for Results of RRA (4/4)

2-1-7 Cash Flow



2-1-8 Cropping Calendar

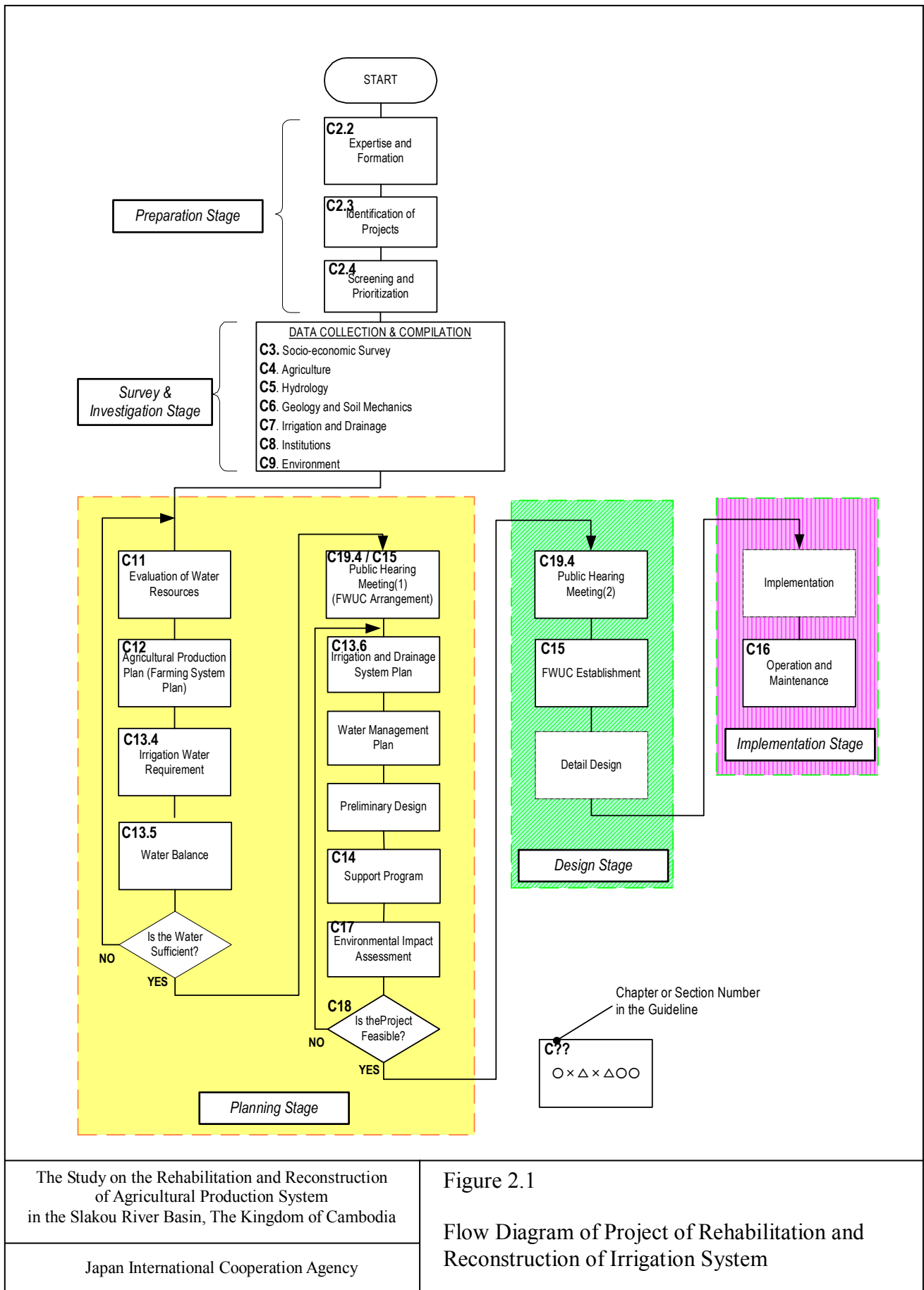
Crops	Variety	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	
Paddy	Non-glutinous rice							Plowing/Nursery											
										Transplanting									
																	Harvesting		
	Glutinous rice								Plowing/Nursery										
											Transplanting								
																	Harvesting		

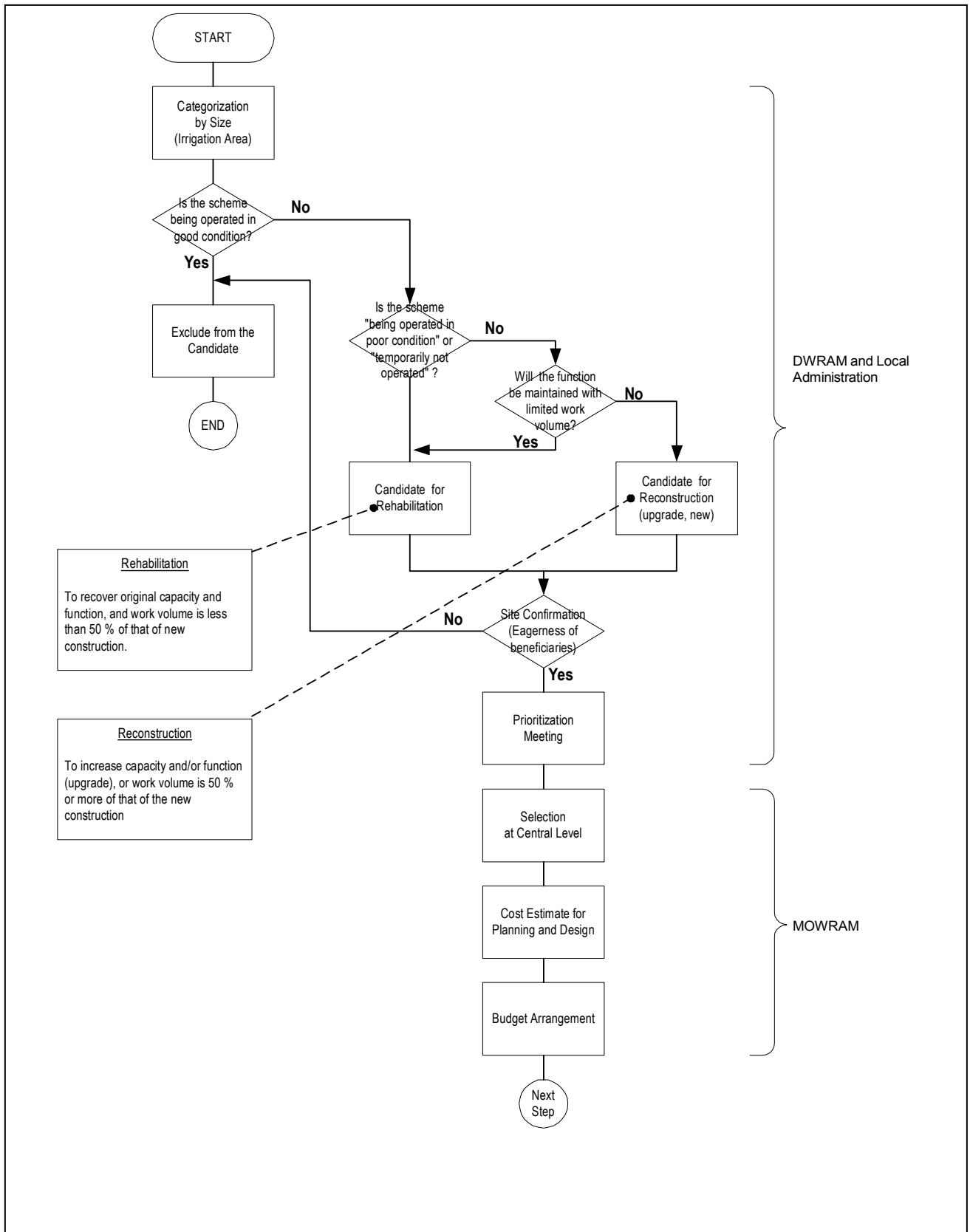
Table 19.2 Typical Project Design Matrix (PDM)

Name of project: The Rehabilitation and Reconstruction of Agricultural Production System in the Slakou River Basin. Project period: July 2002 ~ June 2007 Date of making: 30 September 2001

Project Summary		Verifiable Indicators		Means of Verification		Important Assumptions	
<b>Overall Goal</b> Implementation of rehabilitation and reconstruction project by Cambodia Government.							
<b>Project Purpose</b>							
1	Increase of farm products.	Paddy yield /ha. Volume of vegetable production.		Farm household economy survey.		No fall in the price of farm products.	
2	Improvement of living standard.	Amount of gross income.		Farm household economy survey.		Beneficiaries reinvest to agriculture.	
<b>Outputs</b>							
1	Stable and enough irrigation water in rain season.	Water volume in the canal.		Measurement of height of irrigation water in canal.		Normal rainfall.	
2	Vegetable production in limited area in dry season.	Production of vegetables.		Farm household economy survey.		No serious damage by rats/insects.	
<b>Activities</b>				<b>Inputs</b>			
1	Rehabilitation of Tumnap Lok Reservoir	Engineers	100 M/M	Construction machines	50 nos.	<b>Pre-conditions</b> Japanese Government adapts this project.	
2	Rehabilitation of Kpob Trobek Reservoir	Assistant Engineers	200 M/M	Construction equipment	500 nos.		
3	Construction/Rehabilitation of canals	Draftsman	24 M/M	Car (Four wheel drive)	2 nos.		
4	Rehabilitation of Ang 160 Reservoir	Secretary	12 M/M	Car (Pickup)	3 nos.		
5	Rehabilitation of Kamsei Reservoir	Security	24 M/M	Project Office	1 nos.		
6	Construction of small ponds	Foreman	100 M/M	Fuel	1,000 lit.		
7	Improvement of rural/farm road	Laborers	2,000 M/M				
8	Establishment of FWUCs						
9	Establishment of VDCs						
10	Establishment of FGs						
11	Agricultural supporting program						
12	Institutional development program						
				Total Cost: 100,000 Million Riel			

## *FIGURES*





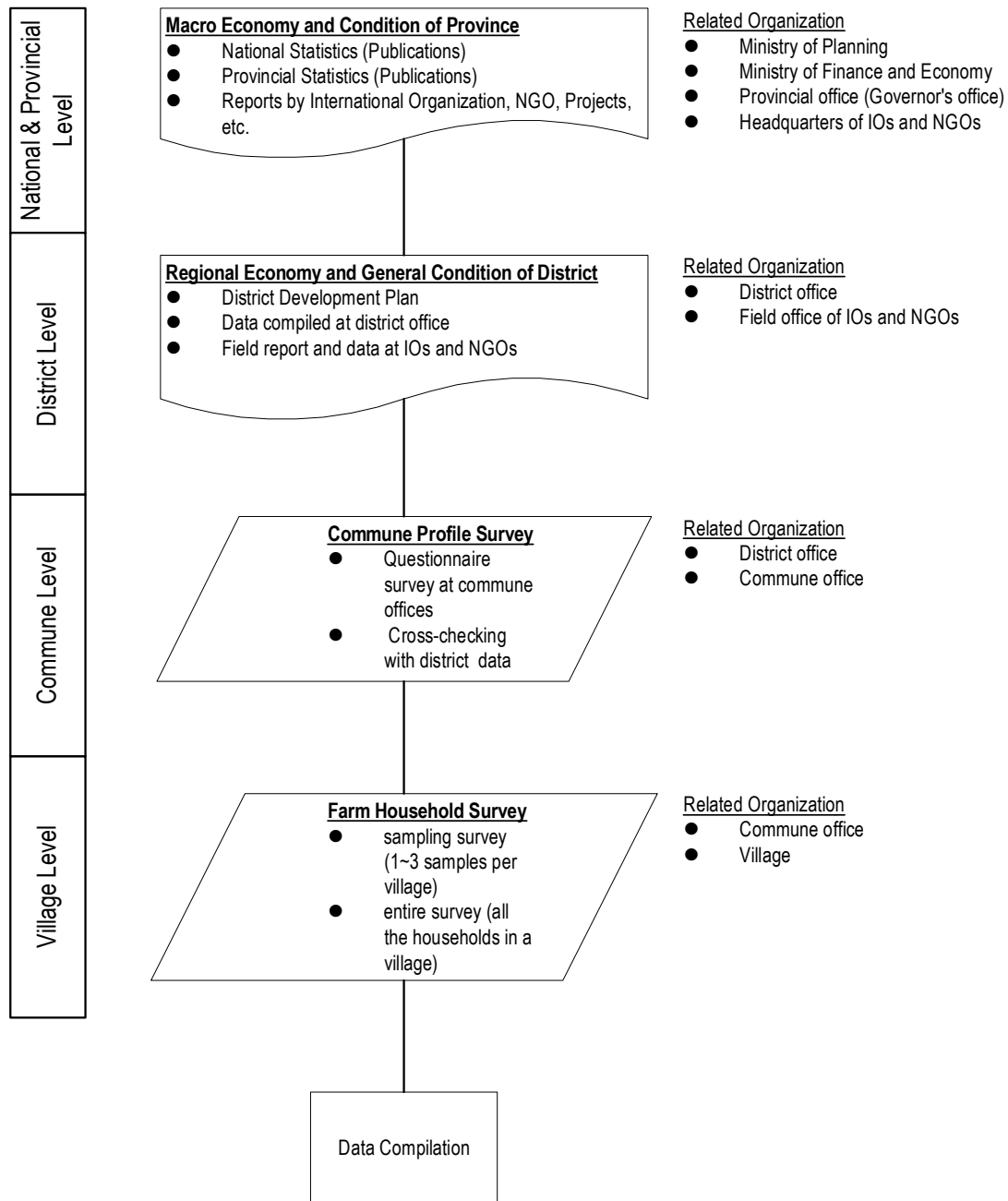
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Figure 2.2

Screening and Prioritization of Candidate Scheme



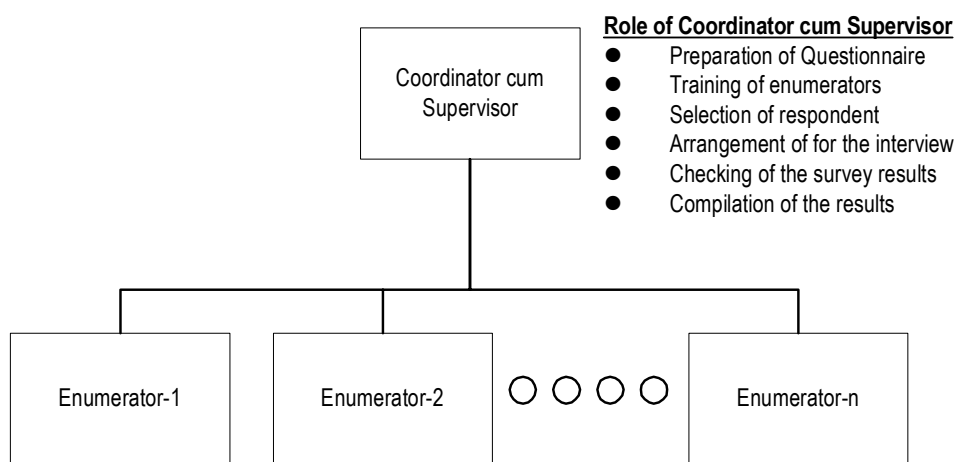


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Figure 3.1

Socio-economic Data Collection by Administration Level



**Role of Coordinator cum Supervisor**

- Preparation of Questionnaire
- Training of enumerators
- Selection of respondent
- Arrangement of for the interview
- Checking of the survey results
- Compilation of the results

**Role of Enumerators**

- Interpretion of the Questionnaire
- Interview to the respondent
- Checking of the results

**Number of Enumerators**

- One enumerator should cover about 50 respondents

**Period Required**

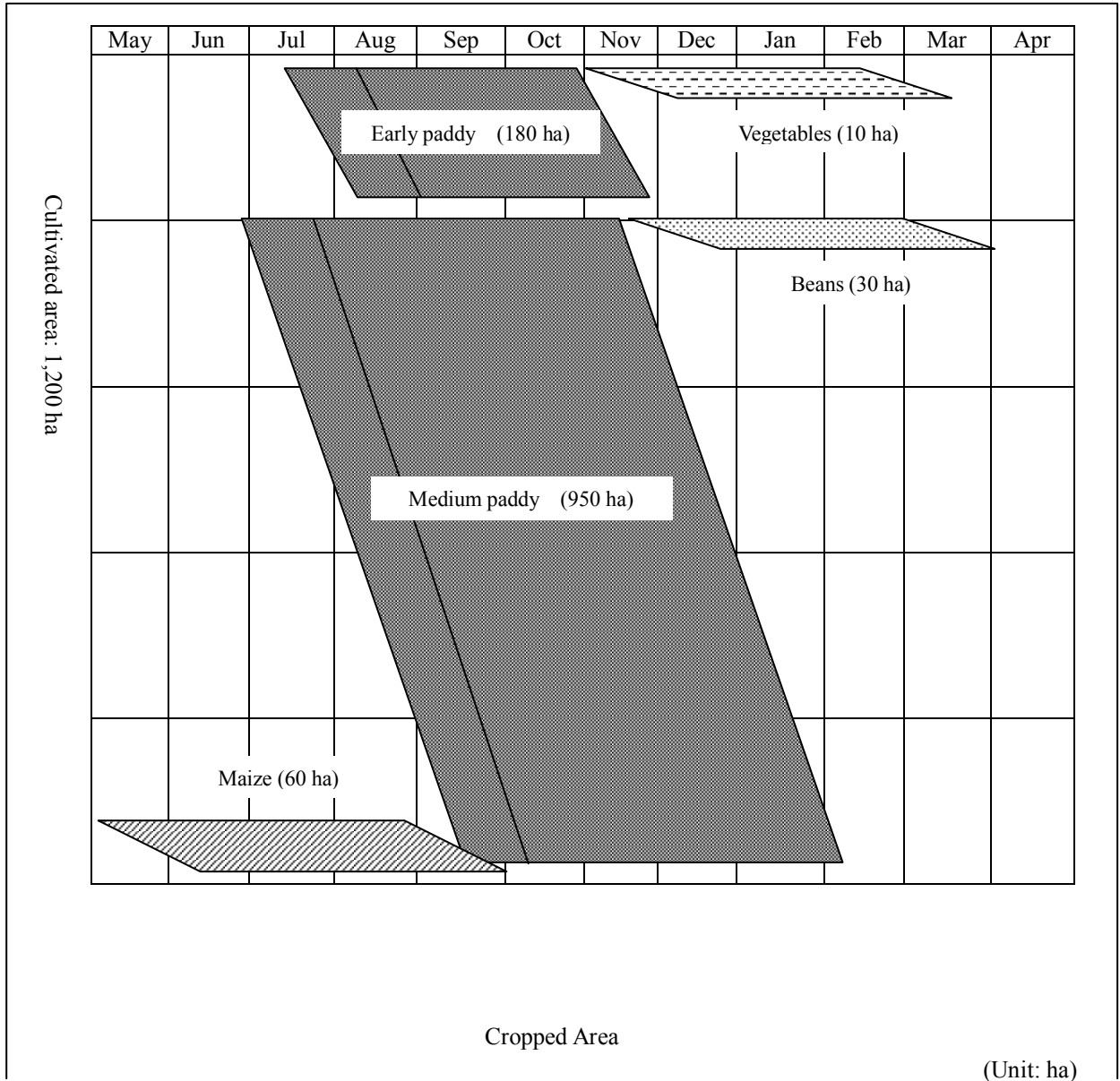
- One enumerator should get 5 samples a day

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Figure 3.2

Formation of Survey Team for Farm household Survey



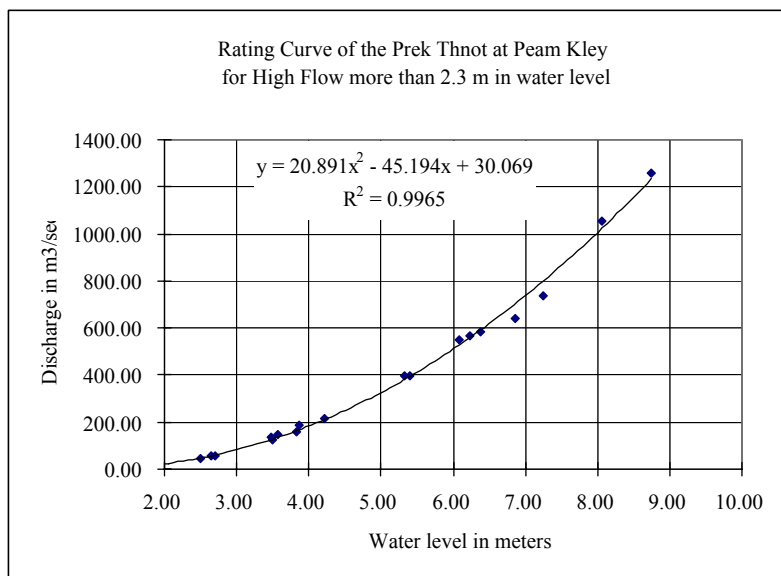
Crop	Planted area	Crop	Planted area
Paddy		Diversified crops	
Paddy Local	950	Maize	60
Paddy HYV	180	Beans	30
	-	Vegetables	10
Total	1,130	Total	100

Cultivated area (ha)	Planted area (ha)	Cropping intensity (%)
1,200	1,230	103 %

The Study on The Rehabilitation and Reconstruction of Agricultural Production System In The Slakou River Basin, The Kingdom of Cambodia Japan International Cooperation Agency	Figure 4.1
	Present Cropping Pattern

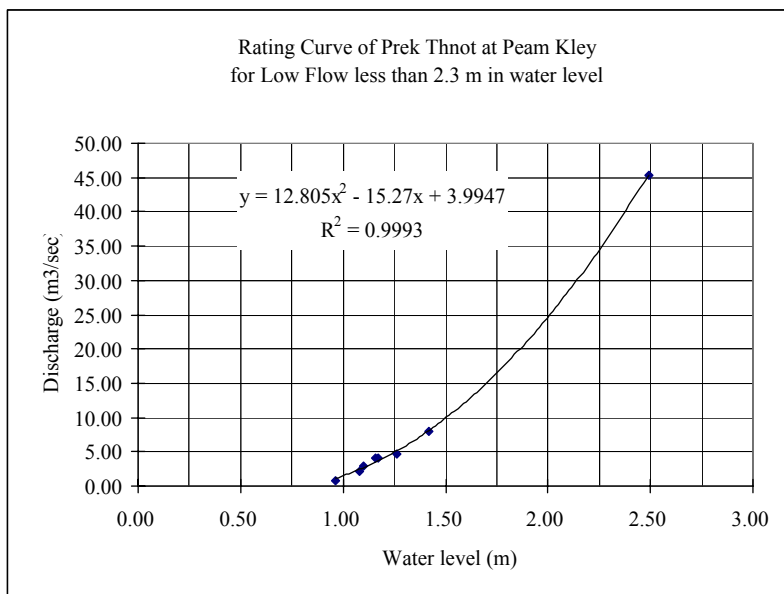
Flow Measurement Records

N	Date	H=m	Q=m <sup>3</sup> /sec
1	16-Jan-98	0.96	0.83
2	28-Feb-01	1.08	2.05
3	15-Dec-97	1.10	3.00
4	21-Feb-97	1.16	4.04
5	28-Jan-97	1.17	4.15
6	15-Jan-97	1.26	4.69
7	1-Mar-97	1.42	7.88
8	30-Aug-96	2.49	45.39
9	2-Sep-96	2.64	56.10
10	4-Dec-96	2.70	58.85
11	12-Sep-96	3.50	126.73
12	16-Oct-96	3.48	136.04
13	10-Sep-96	3.57	147.35
14	18-Oct-96	3.82	159.66
15	9-Sep-96	3.86	186.22
16	24-Oct-96	4.22	217.93
17	7-Nov-96	5.33	394.81
18	7-Apr-96	5.40	395.00
19	29-Oct-99	6.08	551.84
20	28-Oct-99	6.24	567.72
21	5-Nov-96	6.37	583.17
22	4-Nov-99	6.85	639.89
23	2-Nov-99	7.24	739.62
24	18-Oct-00	8.06	1054.86
25	17-Oct-00	8.75	1260.84



Low Flow Records

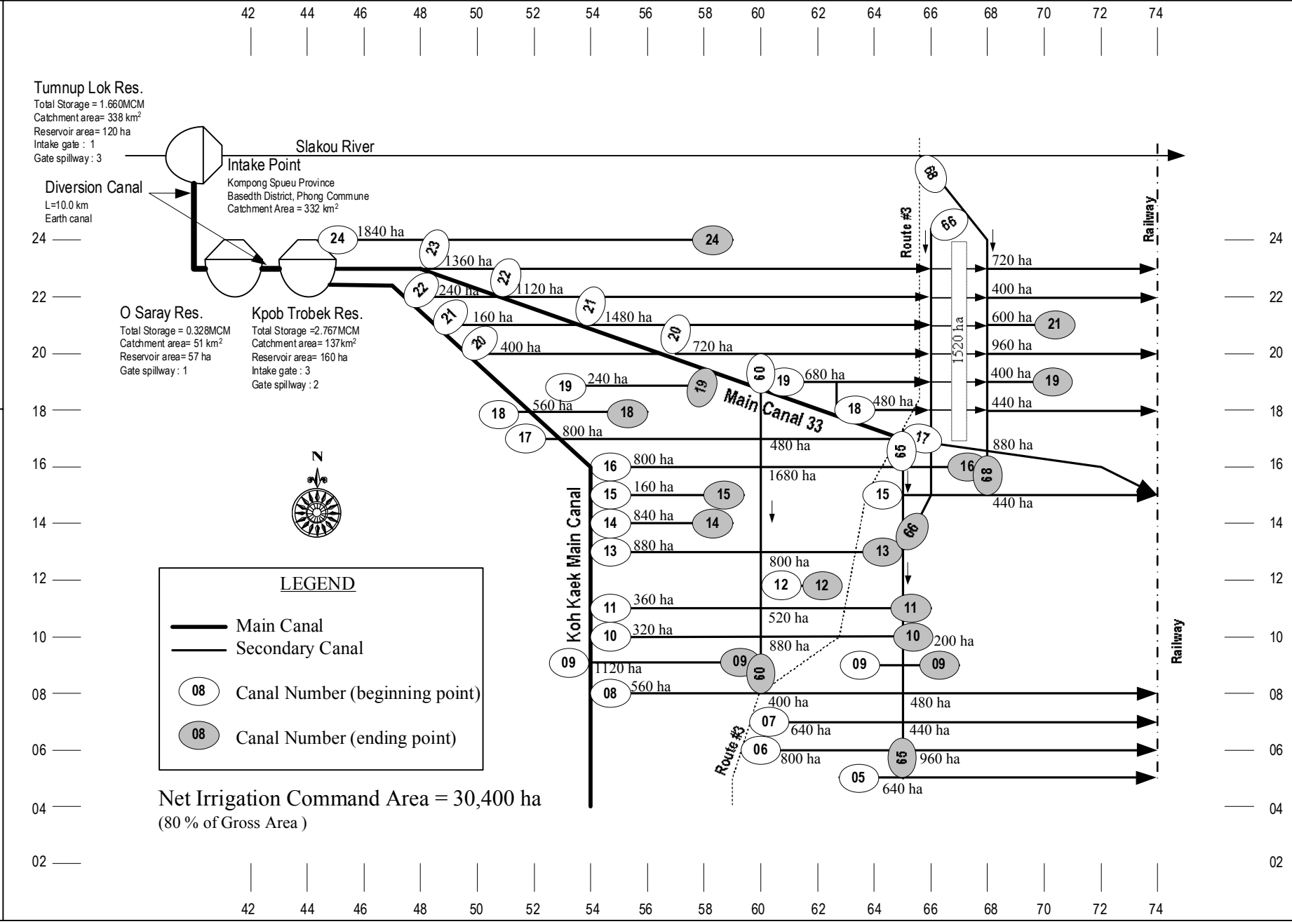
N	Date	H=m	Q=m <sup>3</sup> /sec
2	16-Jan-98	0.96	0.83
3	28-Feb-01	1.08	2.05
4	15-Dec-97	1.10	3.00
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6	28-Jan-97	1.17	4.15
7	15-Jan-97	1.26	4.69
8	1-Mar-97	1.42	7.88
9	30-Aug-96	2.49	45.39

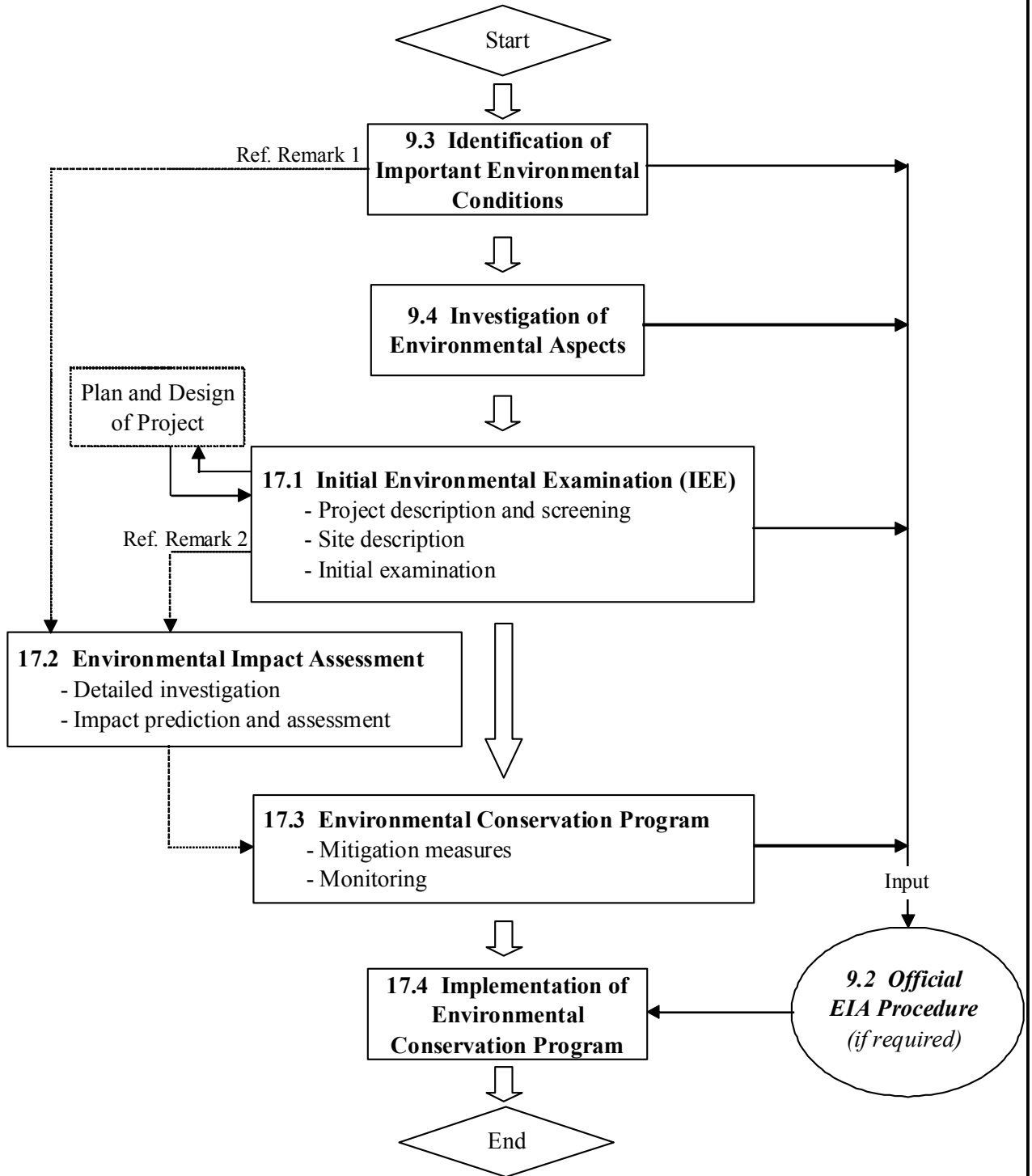


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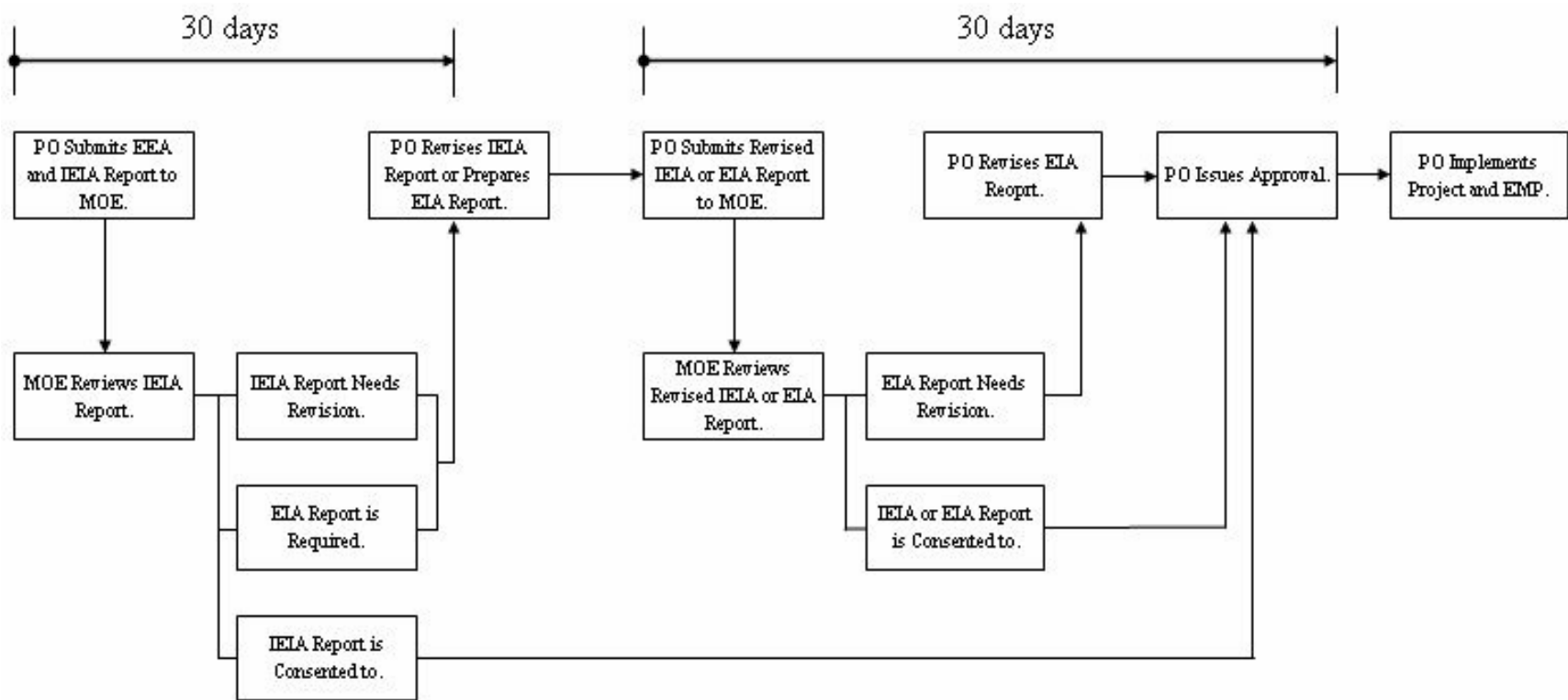
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Figure 5.1  
Rating Curve





Remark 1: In case that important environmental conditions are identified.  
 Remark 2: In case that high magnitude of environmental impacts is expected.



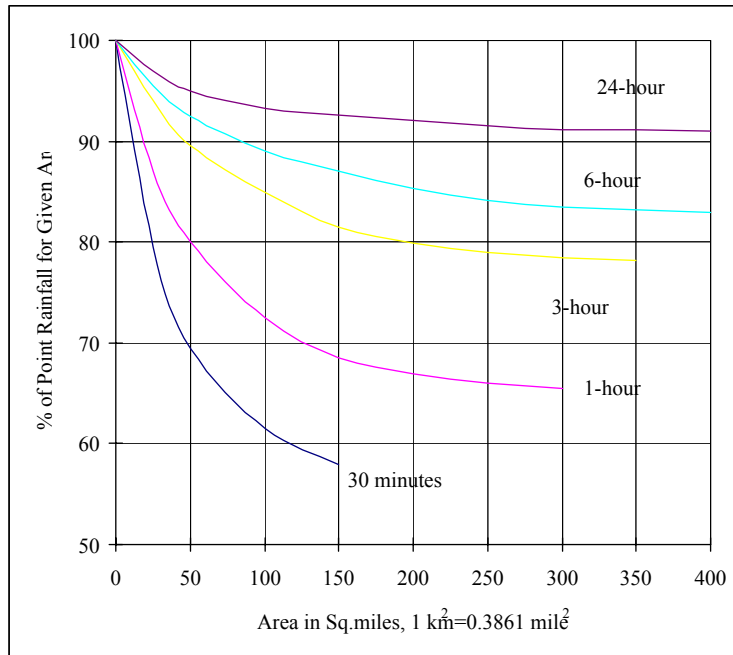
Note:  
 PO: Project's Owner  
 EIA: Environmental Impact Assessment  
 IELA: Initial Environmental Impact Assessment  
 EMP: Environmental Management Plan  
 EEA: Environmental Examination Application  
 MOE: Ministry of Environment

Source: Sub-decree on Environmental Impact Assessment Process, 1999

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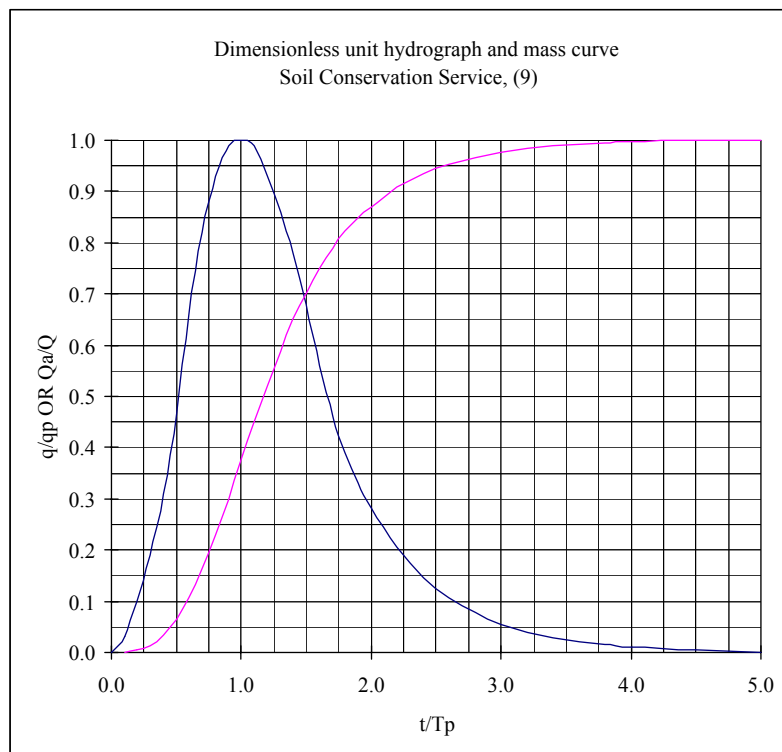
Figure 9.2  
 Official EIA Procedure

(1) Area - Depth Curves  
U.S. Weather Bureau, 1961



(2) Dimensionless Unit Hydrograph and Mass Curve

Time Ratios (t/Tp)	Discharge Ratios (q/qp)	Mass Curve Ratios (Qa/Q)
0.0	0.000	0.000
0.1	0.030	0.001
0.2	0.100	0.006
0.3	0.190	0.012
0.4	0.310	0.035
0.5	0.470	0.065
0.6	0.660	0.107
0.7	0.820	0.163
0.8	0.930	0.228
0.9	0.990	0.300
1.0	1.000	0.375
1.1	0.990	0.450
1.2	0.930	0.522
1.3	0.860	0.589
1.4	0.780	0.650
1.5	0.680	0.700
1.6	0.560	0.751
1.7	0.460	0.790
1.8	0.390	0.822
1.9	0.330	0.849
2.0	0.280	0.871
2.2	0.207	0.908
2.4	0.147	0.934
2.6	0.107	0.953
2.8	0.077	0.967
3.0	0.055	0.977
3.2	0.040	0.984
3.4	0.029	0.989
3.6	0.021	0.993
3.8	0.015	0.995
4.0	0.011	0.997
4.5	0.005	0.999
5.0	0.000	1.000



Derived from ARD Manual 1

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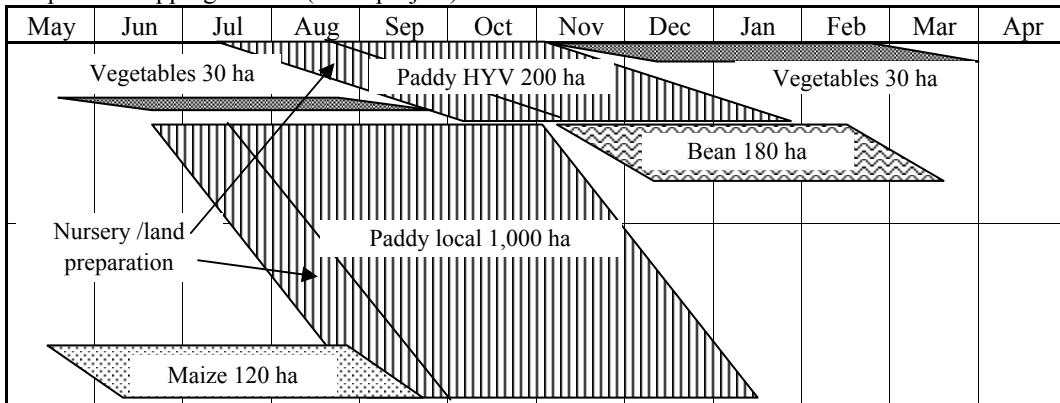
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Figure 11.1

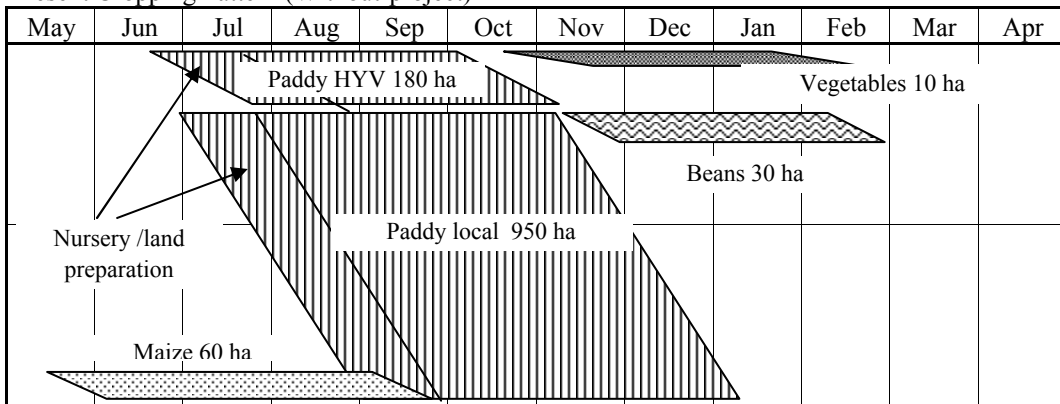
Area - Depth Curve and Dimensionless Unit Hydrograph and Mass Curve



Proposed Cropping Pattern (With-project)



Present Cropping Pattern (Without-project)



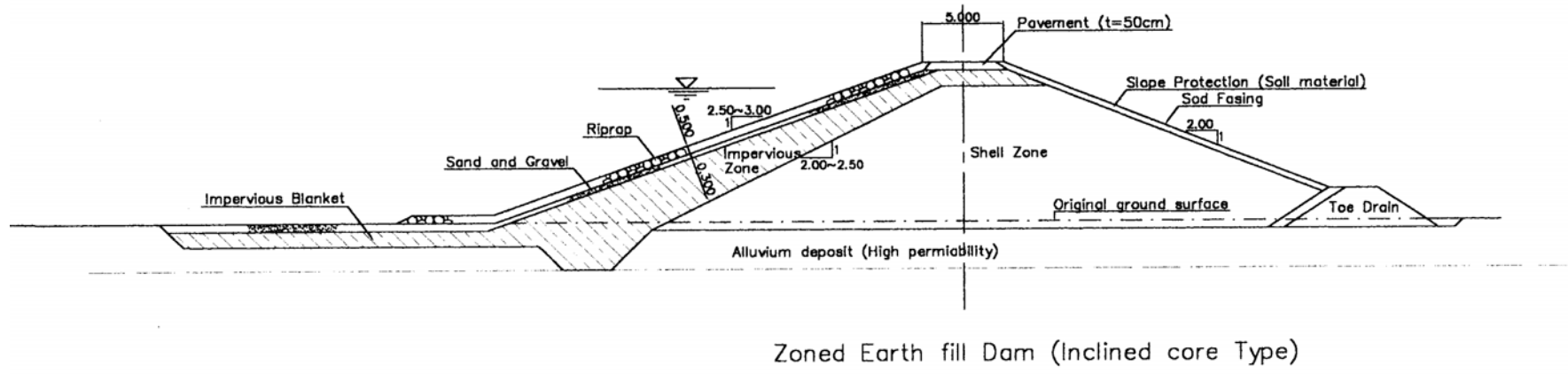
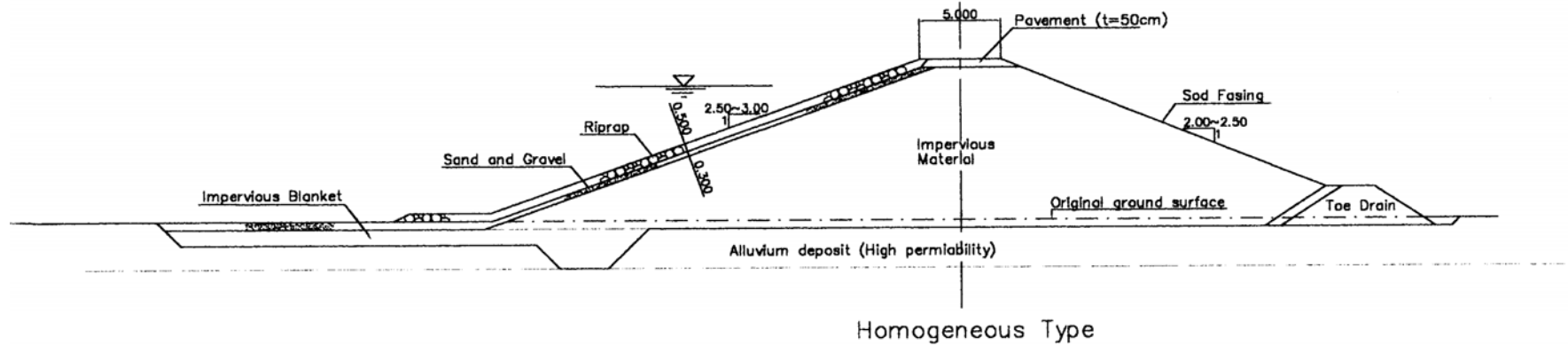
	Proposed With-project (Proposed)	Present Without project (Present)	Increment
Paddy local	1,000	950	50
Paddy HYV	200	180	20
Paddy total	1,200	1,130	70
Maize	120	60	60
Bean	180	30	150
Vegetables	60	10	50
Total	1,560	1,230	330
Project area	1,200	1,200	0
Cropping Intensity	130%	103%	28%

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Figure 12.1

A Sample of Proposed Cropping Pattern



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Figure 13.1

Typical Dike Section