ANNEX-I

COST ESTIMATE

ANNEX - I

COST ESTIMATE

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ANNEX - I COST ESTIMATE

1. INTRODUCTION

This Annex presents the implementation plan for the project works. The organizational structure of GIDA, technical support and construction methods proposed for successful execution of this implementation are also given in this Annex.

Based on the quantities derived in Annex-H, the project cost is estimated in detail, and is allocated to about two years in line with the implementation schedule. Costs for purchase of O&M equipment and technical support are also included in the project cost.

2. IMPLEMENTATION

2.1 Basic Considerations

This study has highlighted the following rehabilitation and extension works for the five projects.

(1) Ashaiman project

(a) Rehabilitation of main canal, lateral canals, and related structures.
(b) Rehabilitation of main drain, lateral drains, and related structures.
(c) Improvement of main farm road and rehabilitation of lateral roads.
(d) Construction of buildings such as lecture hall, dormitories for offices and farmers, and sorter house.

(2) Aveyime project

(a) Rehabilitation of pump station including replacement of new pumps and accessories.
(b) Construction of booster pump station including new pumps and accessories.
(c) Rehabilitation of main canal, lateral canals, and related structures.
(d) Rehabilitation of main drain, lateral drains, and related structures.
(e) Installation of pipeline and sprinkler system for Extension Area-3.
(f) Improvement of main farm road and rehabilitation of lateral roads.
(g) Construction of buildings such as O & M office, storehouse, sorter house, dry yard and garage.

(3) Kpando-Torkor project

(a) Construction of pump station including replacement of new pumps and accessories.
(b) Installation of pipeline and sprinkler system.
(c) Construction of collector drain and intercepting drain with a green belt.
(d) Improvement of main farm road and rehabilitation of lateral roads.

(e) Construction of buildings such as O & M office, storehouse, sorter house, dry yard and garage.

(4) Mankessim project

(a) Rehabilitation of pump station including replacement of new pumps and accessories, for Existing Area and Extension Area-1
(b) Construction of pump station including installation of new pumps and accessories, for Extension Area-2.
(c) Installation of pipeline and sprinkler system.
(d) Construction of collector drain and intercepting drain with a green belt.
(e) Improvement of main farm road and rehabilitation of lateral roads.
(f) Construction of buildings such as O & M office, storehouse, sorter house, dry yard and garage.

(5) Okyereko project

(a) Construction of intake weir.
(b) Construction of pump station including replacement of new pumps and accessories, as supplemental water source.
(c) Rehabilitation of main canal, lateral canals, and related structures.
(d) Rehabilitation of main drain, lateral drains, and related structures.
(e) Improvement of main farm road and rehabilitation of lateral roads.
(f) Construction of buildings such as O & M office, lecture hall, storehouse, sorter house, dry yard and garage.

2.2 Implementation Schedule

The five projects will be implemented project by project. The works of each project could be completed in one year, judging from the nature of the works, work quantities, and workable days. The total construction period will require two years by dividing the five projects into two groups. Thus, the required implementation timeincluding project appraisal, financial arrangement, survey, design, tendering and its evaluation, is about 3 years from June. 1997 to October, 2000. On grouping of them, it is proposed that the first group shall include Ashaiman project, Okyereko project and Mankessim project, and the second group Aveyime project and Kpando-Torkor project, considering importance of early implementation of Ashaiman project due to execution of farmers' training for all five projects and easy and effective control of construction by close location of Mankessim and Okyereko projects., and also by making reference with the economic evaluation result mentioned in Annex-J. Table I-1 presents the implementation schedule for the project works. The implementation schedule of each project is briefly explained below:

(1) Ashaiman Project

Ashaiman project will launch into construction work in December, 1998. Rehabilitation of irrigation system will be started preferentially because it shall be mostly executed in the dry season. In parallel to irrigation system, farm roads will be rehabilitated. After these construction works, rehabilitation of drainage system will be started and completed by August, 1999. Buildings such as lecture hall, dormitories for offices and

farmers, and sorter house will be newly constructed for about 6 months from June to November, 1999.

(2) Aveyime Project

Aveyime project which will be developed in the second group, will start for construction work in November 1999. Rehabilitation work will be commenced from pump and pump station, irrigation canal and road which shall be carried out in the dry season. After completion of them, drainage system will be rehabilitated and completed by September, 2000. Also, buildings such as store house, sorter house dry yard and garage will be newly constructed by August, 2000.

(3) Kpando-Torkor Project

Kpando-Torkor project will also be developed in the second group. The project will be divided into Block-A and Block-C. Construction of both blocks will be carried out concurrently. Rehabilitation work will be commenced from pump and pump station, pipeline and road in November, 1999 and completed by October, 2000. Drainage system including green belt will be started for construction work in January, 2000. One O & M office, 2 store houses, 2 sorter houses, 2 dry yards and 2 garages will be newly constructed by October, 2000. All these works are scheduled to be completed by October, 2000.

(4) Mankessim Project

Mankessim project will be developed in the first group. Development of the project will be started from construction of pump station, pipeline and road, and will be completed by August, 1999. After development of these works, drainage system and buildings will be newly constructed by October, 1999.

(5) Okyereko Project

Okyereko project will be developed in the first group since it plays an important role of farmers training together with Ashaiman project. The intake weir, head race and a pump station which will serve as supplemental water source, will enter into construction in December, 1998 and be completed by June, 1999. In parallel to development of this supplemental water source, irrigation system and road system will be constructed by August, 1999. In succession, rehabilitation of drainage system will be commenced in August, 1999 and completed by September, 1999. And also, buildings such as O & M office, lecture hall, store house, sorter house, dry yard and garage will be newly constructed for 3 months from August to November, 1999.

2.3 Organization and Management

The Ghana Irrigation Development Authority (GIDA) shall be responsible for implementation of all five projects. Department of Project Development of GIDA is incharge of design and construction of project works. Construction of project works will be directly controlled and supervised by the Project Office subordinated to the Department of Project Development of GIDA, although one civil engineer is required to be assigned for this purpose. During construction time, the Project Office will arrange and promote the farmers'

participation to the construction works aiming to deepen the farmers' understanding on the works and to make smooth execution of the coming O & M works by farmers themselves. Figure I -1 shows the organization chart of GIDA for construction supervision.

The Project Office will execute construction supervision in cooperation with the consultant. In order to keep close communication among the Project Office, the consultant and the contractor, it is proposed to hold a tripartite meeting once a week. In addition, it is proposed that a monthly tripartite meeting shall be held at the GIDA's head office under attendance of Chief Executive and Deputy Chief Executive, to grasp the actual work progress and to settle the problems encountered on time.

2.4 Construction Method

2.4.1 Earthworks

It is envisaged that all earthworks will be undertaken by machines for efficient operation, and to provide the proper compaction specified in the technical specifications. Canal and drain sections will be excavated by excavators, and trimming will be made manually. Generally, embankment work will be carried out using the excavated materials, but additional material if required for the embankment will be taken from borrow areas. All embankments will be compacted in layers using water tanker and proper compaction equipment which will be selected judging from soil characteristics and work scale. Final trimming of embankment and box cutting will be done by hand. All earthworks will normally be executed during the dry season from November through March.

For the gravel roads, suitable material will be collected from the approved quarry sites, transported to site, and finally compacted with vibrating roller. Similarly boulders for gabion protection and slope protection works will have to be collected from the approved quarry sites, and transported to the site.

For the laterite paved roads, material will be taken from the borrow areas which shall be approved by the Project Office prior to use. The laterite collected will be spread and compacted layer by layer using the proper compaction equipment in the same manner with the embankment work.

Excavation for structures will be executed as shown on the relevant drawings in order to avoid unnecessary excavation. Backfilling for structures will be carefully made using the approved materials, and its compaction work will be carried out by portable compactor so as not to give any damages to structures.

2.4.2 Structures

Lots of structures will be required for irrigation and drainage system. Out of them, pump stations for Aveyime, Kpando-Torkor, Mankessim and Okyereko projects are comparatively large-scaled, but other structures are small. These structures will be constructed in-situ. The numerous small concrete flumes are proposed to be built by pre-

casting at a centrally situated yard preferably within the contractor's work yard. This will provide an efficient production method and ease of quality control.

3. COST ESTIMATE

3.1 Basic Conditions and Assumption for Cost Estimate

The project cost comprises direct construction cost, administration cost, engineering services, and physical and price contingencies. Following basic conditions and assumption are made for the estimate of the project cost:

(a) The unit prices are based on the 1996 prices for the cost estimate.

(b) The exchange rate used in the cost estimate is US$1.00 = Cedi 1,700 =¥110 as of December, 1996.

(c) Construction works will be executed by full contract basis through competitive bidding. The construction machinery and equipment required for construction will be provided by the contractor himself. Thus, depreciation cost of machinery and equipment are considered in the estimate of construction unit rates.

(d) The unit rates of the works are divided into the foreign and local currency portions. The respective currency portions basically include the following costs:

Local currency portion	: local labour cost, cost of local materials, machinery cost, inland transportation cost, etc.
Foreign currency portion	: foreign labour cost, cost of imported materials, machinery cost, contractor's general expenses

(e) The unit rates of the works are estimated at the December 1996 price on the basis of the current prices prevailing in Ghana and data obtained from the similar projects such as the Dawhenya Irrigation Project, and Kpon Irrigation Project.

(f) Engineering services cost is estimated at 15 % of the direct construction cost. Administration cost of the implementing agency is estimated at 5 % of the direct construction cost. The physical contingency estimated at 10% of the direct construction cost

(g) The price contingency is calculated on the basis of the annual escalation rate of 2.5 % for the foreign and 25 % for the local currency portions (see Table I-14). The calculated escalation rates to respective yeras from FY1996 are as follows:

	Local Currency	Foreign Currency
FY1997	25.0%	2.5%
FY1998	56.3%	5.1%
FY1999	95.3%	7.7%
FY2000	144.1%	10.4%

3.2 Construction Unit Rates of Major Works

The construction rates for the project works are prepared by making reference with the contract rates the similar projects such as Kpong Irrigation Project, Dawhenya Irrigation Project, unit rates prepared by the Ghana Highways Authority and schedule of unit rates prepared by Architectural and Engineering Services Corporation. The unit rates developed for major construction works including the foreign and local currency portions are presented in Table I-2. The price list of basic construction materials used in the estimate is presented in Table I-3.

3.3 Project Cost

The costs for respective projects are made based on the quantities estimated in Annex - H. The construction cost for respective projects are estimated as shown in Tables I-4 to I-8. The cost of O & M equipment and agricultural supporting equipment is given in Table I-9. Total project cost is given in Table I-10, and summarised below:

Summary of Project Cost

(Unit:10^6 Cedi)

Item	Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko	Total
1 Direct Construction Cost*	887	1,852	4,400	2,350	1,761	11,250
2 O & M Equipment**	319	113	176	150	148	906
3 Engineering Services***	133	278	660	353	264	1,688
4 Administrarion Cost****	44	93	220	118	88	563
Sub-Total	1,383	2,336	5,456	2,971	2,261	14,407
5 Physical Contingency*****	89	185	440	235	176	1,125
Sub-Total	1,472	2,521	5,896	3,206	2,437	15,532
6 Price Contingency	490	1,055	1,896	671	759	4,871
Total	1,962	3,576	7,792	3,877	3,196	20,403
Cost per ha in 10^3 Cedi	35,036	37,642	50,271	45,081	39,457	43,135
Cost per ha in US$	20,609	22,142	29,571	26,518	23,210	25,374

* : Cost of training facility is included in Ashaiman and Okyereko projects.
** : Cost of bus and backhoe is included in Ashaiman project only.
*** : 15% of direct construction cost.
**** : 5% of direct construction cost.
***** : 10 % of direct construction cost.

3.4 Annual Disbursement Schedule

The project works are assumed to be implemented over 3 year period. The annual disbursement schedule for the project implementation is based on the implementation schedule presented in Table I-1, and given in Table I-11. The following table shows the summary of the annual disbursement schedule for respective projects:

Summary of Annual Disbursement Schedule

(Unit:10^6 Cedi)

Fiscal Year	Ashaiman	Aveyime	K.-Torkor	Mankessim	Okyereko	Total
FY1997	41	85	203	109	81	519
FY1998	1,092	59	139	2,273	1,584	5,147
FY1999	829	2,332	4,366	1,495	1,531	10,553
FY2000	0	1,100	3,084	0	0	4,184
Total	1,962	3,576	7,792	3,877	3,196	20,403

3.5 Replacement Costs

Some of the facilities, especially the mechanical works have a shorter useful life than the project life and will require replacement during the proposed 50 year life of the project. The main replacement costs will therefore relate to pumps and accessories, pipes, sprinklers, canal gates, valves and O&M equipment. These costs and the useful life are given in Table I-12.

3.6 O & M Costs

The O & M costs for the project operated facilities broadly consists of (1) administration cost such as salary of project staff concerned and operation cost of office, (2) operation and maintenance of pump station, (3) operation and maintenance of command area like cost for running, repair and maintenance of O & M equipment, labor cost for repair and maintenance works, material cost for repair and maintenance works, and contract cost for repair which could not be made by farmers' organization. These costs are estimated for respective projects as shown in Table I-13, and summarized below:

O & M Cost

(Unit :1000 Cedi)

Description	Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko
1.Administration Cost	4,200	4,200	4,200	4,200	4,200
2.O & M of Pump	-	23,800	62,100	32,800	14,200
3.O & M Command Area	3,629	4,326	4,575	2,759	3,309
Total	7,829	32,326	70,875	39,759	21,709
Cost per ha in Cedi	139,800	340,300	457,300	462,300	268,000
Cost per ha in US$	82	200	269	272	158

3.7 Cost Comparison with Other Similar Projects

As mentioned in Annex-H, rehabilitation works have been conducted for the Dawhenya Irrigation Project commanding 200ha. The executed works are construction of pump station, main canals, lateral channels, access road, field drains, additiona building, etc, which are similar to the Aveyime project and Okyereko project. The direct construction cost for the Dawhenya Irrigation Project is Cedi 421.6 million equivalent to US$ 2.0million at 1988 price. According to the inflation indices (G5 MUV index) prepared by the World Bank, the rate of 1988 to 1996 is about 1.36. This means that the US$ 2.0 million of construction cost for the Dawhenya Irrigation Project at 1988 price is updated at US$ 2.7 million equivalent to US$ 13,500/ha at 1996 price. On the other hand, the direct construction costs per ha for Aveyime and Okyereko projects are US$ 11,500/ha and US$ 12,800/ha, respectively, which are about 5 to 15 % lower than that of Dawhenya Irrigation Project.

Most of the existing facility will be replaced by new ones due to severe deterioration of them. All the five projects are therefore regarded as new projects from viewpoints of scale of required works and construction volume. The report entitled Ghana Irrigation Subsector Review prepared by the World Bank in 1986 presents the capital cost of small- scaled projects such as the Weija Irrigation Project, Dawhenya Irrigation Project and Vea Irrigation Project at 1985 price, which are similar to the selected five projects. The cost comparison of the selected five projects with them is as follows:

Cost Comparison with Similar Projects

Item	Similar Projects			Selected Priority Projects				
	Weija	Dahhenya	Vea	Ashaiman	Aveyime	K-Torkor	Mankes.	Okyereko
1 Irrigable area	220ha	200ha	850ha	56ha	95ha	155ha	86ha	81ha
2 Irrigation system	P+S	P+G	G	G	P+G	P+S	P+S	P+G
3 Required works								
Pump	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Canal system	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Others	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4 Capital Cost/ha								
(US$ at 1985 price)	39,000	10,000	14,000	-	-	-	-	-
5 Capital Cost/ha								
(US$ at 1996 price)	67,000	17,300	24,200	15,500	15,610	22,400	21,900	17,700

Note:

(1) P= Pump, S=Sprinkler irrigation, G=Gravity irrigation.

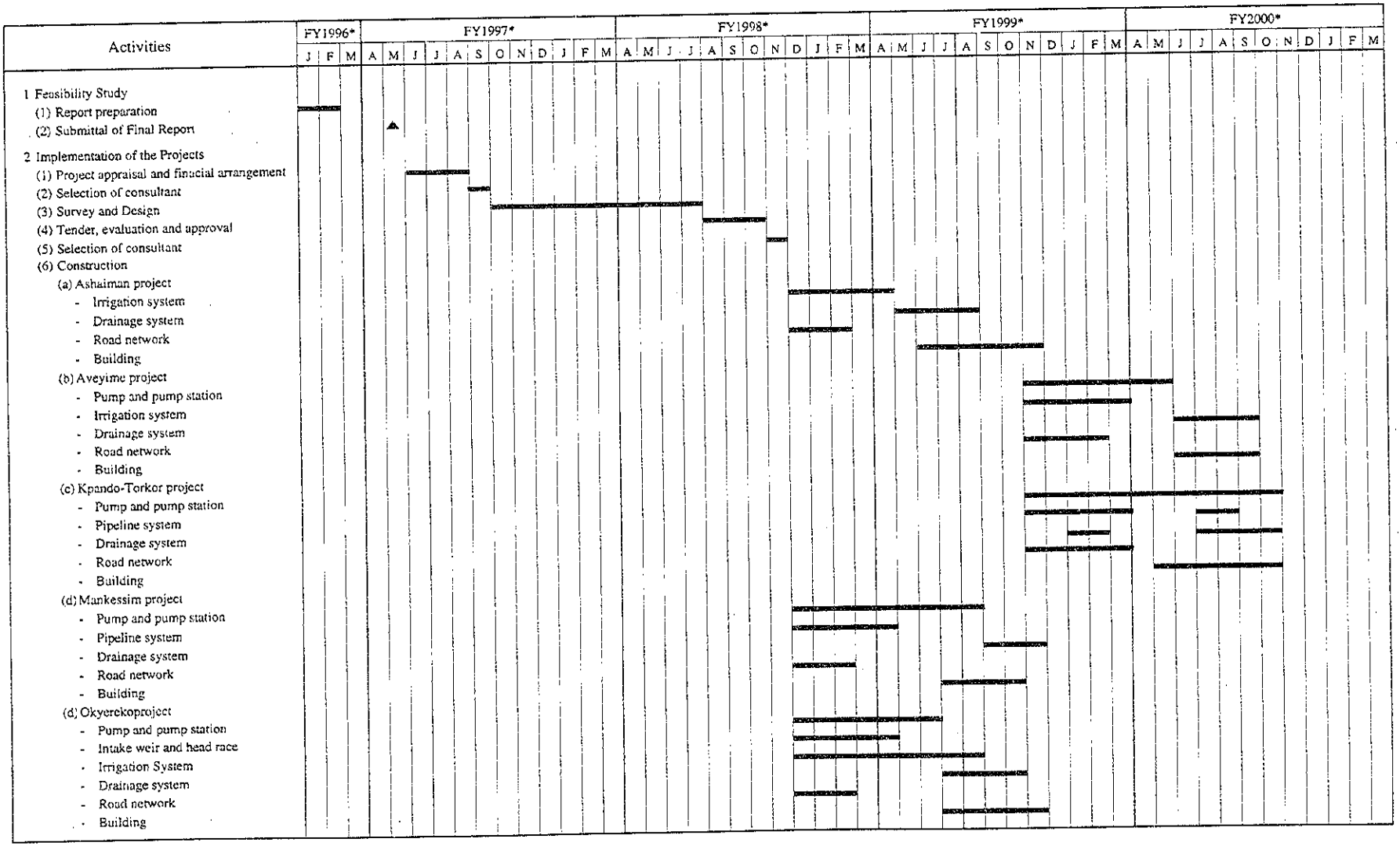
(2) The cost is updated using the G5 MUV index prepared by the World Bank (1996/1985 = 118.52/68.61=1.73).

(3) The capitalcost for the selected priority projects includes purchase of O & M equipment, engineering service, administration cost and physical contingency.

As can be seen in this table, the costs for the selected priority projects would be at lower side as compared with those for the similar projects.

TABLES

Table I-1 Implementation Schedule



* Japanese fiscal year

Note: Construction of five projects will be carried out by dividing them into two groups: 1st group=Ashiman project, Mankessim project and Okyereko project and 2nd group=Kpando-Torkor project and Aveyime project. This grouping is made considering the need of early implementation of Ashaiman project due to execution of farmers' training and easy and effective control of construction of Mankessim and Okyereko projects due to close location.

Table I-2 Unit Rates for Major Construction Works

(Unit : Cedi)

Work Item	Unit	Local Currency	Foreign Currency	Total
1 Earthworks				
- Clearing	m2	130	159	289
- Stripping work (0.15m)	m2	191	234	425
- Excavation of exisiting canal and drain including hauling of less than 250 m	m3	3,400	3,400	6,800
- Excavation of new canal and drain including hauling of less than 250 m	m3	2,295	2,805	5,100
- Excavation for structure	m3	1,989	2,431	4,420
- Embankment including supply, place & compact incl.hauling of 200 to 500 m	m3	4,208	5,143	9,351
- Backfill	m3	2,550	1,700	4,250
- Scafifying, regrading & compaction of Road	m3	340	510	850
- Provision, laying & compacting of gravel base material including 1 km	m3	22,950	28,050	51,000
- Provision, laying & compacting of laterite base material including 1 km	m3	7,650	9,350	0 17,000
- Sod facing work	m2	85	0	85
2 Concrete works				
- Reinforced concrete	m3	83,640	55,760	139,400
- Plain concrete	m3	69,360	46,240	115,600
- Reinforcement bar	ton	136,000	1,224,000	1,360,000
- Form	m2	8,160	2,040	10,200
- Concrete block (0.15 m thick)	m2	6,630	4,420	11,050
- Dismantling of concrete structure	m3	9,180	11,220	20,400
3 Stone masonry works				
- Dry stone pitching (10 cm thick)	m2	2,718	1,812	4,530
- Dry stone pitching (15 cm thick)	m2	4,080	2,720	6,800
- Dry stone pitching (30 cm thick)	m2	8,160	5,440	13,600
- Dry stone pitching with gravel (35cm thick in total)	m2	8,670	5,780	14,450
- Gabion mattress (30 cm thick)	m3	31,620	21,080	52,700
- Gabion mattress (50 cm thick)	m3	45,390	30,260	75,650
4 Metal works	m2			
- Slide gate (W400 x H350)	no.	32,980	296,820	329,800
- Slide gate (W400 x H400)	no.	37,400	336,600	374,000
- Slide gate (W500 x H450)	no.	45,050	405,450	450,500
- Slide gate (W600 x H550)	no.	47,260	425,340	472,600
- Slide gate (W700 x H700)	no.	58,820	529,380	588,200
- Slide gate (W700 x H750)	no.	62,940	629,400	692,340
- Slide gate (W1100 x H1000)	no.	69,870	628,830	698,700
- Slide gate (W1100 x H1100:4tightness)	no.	340,000	3,060,000	3,400,000
5 Others				
- Electric line (11kv)	km	7,650,000	17,850,000	25,500,000
- Transformer 50KVA	no.	867,000	2,023,000	2,890,000
- Transformer 100KVA	no.	1,224,000	2,856,000	4,080,000
- Transformer 200KVA	no.	1,581,000	3,689,000	5,270,000
- Transformer 315KVA	no.	2,703,000	6,307,000	9,010,000
- Transformer 500KVA	no.	3,366,000	7,854,000	11,220,000
- Asbestos cement	m2	8,160	5,440	13,600
- Wood	m3	476,000	204,000	680,000
- Fencing work	m	22,440	33,660	56,100

Table I-3 Material and Labour Costs

(Unit : Cedi)

Work Item	Unit	Local Currency	Foreign Currency	Total
1 Construction materals				
- Cement	ton	93,000	62,000	155,000
- Gravel	m3	25,600	6,400	32,000
- Sand	m3	6,400	1,600	8,000
- Concrete block	no.	390	260	650
- Boulder	m3	13,500	1,500	15,000
- Reiforcement bar	ton	60,000	540,000	600,000
- Plain concrete pipe (D=300mm)	m	7,280	3,120	10,400
- Plain concrete pipe (D=400mm)	m	12,950	5,550	18,500
- Plain concrete pipe (D=500mm)	m	10,738	4,602	15,340
- Plain concrete pipe (D=600mm)	m	12,558	5,382	17,940
- Reinforced concrete pipe (D=300mm)	m	13,800	9,200	23,000
- Reinforced concrete pipe (D=600mm)	m	26,910	17,940	44,850
- Reinforced concrete pipe (D=700mm)	m	37,830	25,220	63,050
- Reinforced concrete pipe (D=800mm)	m	50,700	33,800	84,500
- Reinforced concrete pipe (D=900mm)	m	65,520	43,680	109,200
- Reinforced concrete pipe (D=1000mm)	m	79,950	53,300	133,250
- Reinforced concrete pipe (D=1200mm)	m	108,810	72,540	181,350
- Steel pipe (Length = 6m, D=25mm)	m	5,500	49,500	55,000
- Steel pipe (Length = 6m, D=40mm)	m	8,000	72,000	80,000
- Steel pipe (Length = 6m, D=50mm)	m	8,500	76,500	85,000
- Steel pipe (Length = 6m, D=75mm)	m	10,000	90,000	100,000
- Steel pipe (Length = 6m, D=100mm)	m	12,000	108,000	120,000
- Steel pipe (Length = 6m, D=150mm)	m	18,000	162,000	180,000
- Steel pipe (Length = 6m, D=200mm)	m	40,000	360,000	400,000
- Steel pipe (Length = 6m, D=250mm)	m	50,000	450,000	500,000
- Steel pipe (Length = 6m, D=300mm)	m	75,000	675,000	750,000
- Steel pipe (Length = 6m, D=350mm)	m	84,000	756,000	840,000
- Steel pipe (Length = 6m, D=400mm)	m	95,000	855,000	950,000
- Steel pipe (Length = 6m, D=450mm)	m	114,000	1,026,000	1,140,000
- Petrol	m2	33	637	670
- Diesel oil	m3	31	589	620
- Lubricant	m3	140	2,660	2,800
2 Labour				
- Labour	day	3,000	0	3,000
- Foreman	day	6,000	0	6,000
- Carpenter	day	4,000	0	4,000
- Mason	day	4,000	0	4,000
- Painter	day	4,000	0	4,000
- Steel fixer/bender	day	4,000	0	4,000
- Plumber	day	5,000	0	5,000
- Operator	day	5,000	0	5,000
- Driver	day	5,000	0	5,000

Table I-4 Breakdown of Direct Construction Cost for Ashaiman Project (1/2)

(Unit :10^3 Cedi)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Toatl
1 Pump Station							
(1) Pump	no(s).	0	0	0	0	0	0
(2) Pump house							
(a) Stripping (t=0.15m)	m2	0	0	0	0	0	0
(b) Excavation	m3	0	0	0	0	0	0
(c) Backfill	m3	0	0	0	0	0	0
(d) Embankment	m3	0	0	0	0	0	0
(e) Reinforced concrete	m3	0	0	0	0	0	0
(f) Plain concrete	m3	0	0	0	0	0	0
(g) Reinforcement bar	kg	0	0	0	0	0	0
(h) Form	m2	0	0	0	0	0	0
(i) Others		0	0	0	0	0	0
Total					0	0	0
2 Irrigation System							
(1) Open canal system							
(a) Stripping (t=0.15m)	m2	21,000	191	234	4,011	4,914	8,925
(b) Excavation	m3	700	3,400	3,400	2,380	2,380	4,760
(c) Backfill	m3	5,000	3,060	3,740	15,300	18,700	34,000
(d) Embankment	m3	2,300	4,208	5,143	9,678	11,829	21,507
(e) Reinforced concrete	m3	900	83,640	55,760	75,276	50,184	125,460
(f) Reinforcement bar	kg	34,100	136	1,224	4,638	41,738	46,376
(g) Form	m2	13,800	8,160	2,040	112,608	28,152	140,760
(h) Dismantling of concrete lining	m3	300	9,180	11,220	2,754	3,366	6,120
(i) Others		0	0	0	0	0	0
Sub-Total					226,645	161,263	387,908
(2) Pipeline system							
(a) Steel pipe D=350	m	0	0	0	0	0	0
(b) Steel pipe D=300	m	0	0	0	0	0	0
(c) Steel pipe D=250	m	0	0	0	0	0	0
(d) Steel pipe D=200	m	0	0	0	0	0	0
(e) Steel pipe D=150	m	0	0	0	0	0	0
(f) Steel pipe D=100	m	0	0	0	0	0	0
(g) Sprinkler system	set	0	0	0	0	0	0
(h) Others		0	0	0	0	0	0
Sub-Total					0	0	0
Total					226,645	161,263	387,908
3 Dainage System							
(a) Clearing	m2	24,100	130	159	3,133	3,832	6,965
(b) Excavation	m3	3,800	3,400	3,400	12,920	12,920	25,840
(c) Backfill	m3	0	3,060	3,740	0	0	0
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	0	83,640	55,760	0	0	0
(f) Reinforcement bar	kg	0	136	1,224	0	0	0
(g) Form	m2	0	8,160	2,040	0	0	0
(h) Dismantling of concrete lining	m3	0	9,180	11,220	0	0	0
(i) Others		0	0	0	0	0	0
Total					16,053	16,752	32,805
4 Farm Road							
(a) Stripping (t=0.15m)	m2	900	191	234	172	211	383
(b) Embankment	m3	0	3,978	4,862	0	0	0
(c) Laterite pavement	m3	200	3,978	4,862	796	972	1,768
(d) Gravel pavement	m3	500	22,950	28,050	11,475	14,025	25,500
(e) Grading and compaction	m2	18,900	340	510	6,426	9,639	16,065
(f) Others		0	0	0	0	0	0
Total					18,869	24,847	43,716

- To be continued -

Table I-4 Breakdown of Direct Construction Cost for Ashaiman Project (2/2)

(Unit :10^3 Cedi)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Toatl
5 Related Structures							
(a) Stripping (t=0.15m)	m2	1,573	191	234	300	368	668
(b) Excavation	m3	1,390	1,989	2,431	2,765	3,379	6,144
(c) Backfill	m3	903	2,550	1,700	2,303	1,535	3,838
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	139	83,640	55,760	11,626	7,751	19,377
(f) Plain concrete	m3	65	69,360	46,240	4,508	3,006	7,514
(g) Reinforcement bar	kg	4,099	136	1,224	557	5,017	5,574
(h) Form	m2	1,730	8,160	2,040	14,117	3,529	17,646
(i) Dismantling of concrete structure	m3	11	9,180	11,220	101	123	224
(j) Slide gate (400 x 350)	no(s)	0	0	0	0	0	0
(k) Slide gate (400 x 450)	no(s)	24	37,400	336,600	898	8,078	8,976
(l) Slide gate (500 x 450)	no(s)	0	0	0	0	0	0
(m) Slide gate (700 x 750)	no(s)	0	0	0	0	0	0
(n) Gabion mattress 30cm thick	m2	700	31,620	21,080	22,134	14,756	36,890
(n) Others					5,924	3,736	9,660
Total					65,233	51,278	116,511
6 Buildings							
(a) O & M Office	no(s)	0	67,830	45,220	0	0	0
(b) Dormitory for officers	no(s)	2	15,504	10,336	31,008	20,672	51,680
(c) Dormitory for farmers	no(s)	1	101,939	67,959	101,939	67,959	169,898
(d) Lecture hall	no(s)	1	12,403	8,269	12,403	8,269	20,672
(e) Dining hall	no(s)	1	14,851	9,901	14,851	9,901	24,752
(f) Store	no(s)	0	9,766	6,098	0	0	0
(g) Garage	no(s)	0	8,492	5,268	0	0	0
(h) Dry yard	no(s)	0	8,139	5,196	0	0	0
(i) Sorter house	no(s)	1	6,932	4,396	6,932	4,396	11,328
(j) Fence for office	no(s)	1	11,220	16,830	11,220	16,830	28,050
Total					178,353	128,027	306,380
7 Others							
(1) Electricity line	km	0	21,559	50,397	0	0	0
(2) Green belt	km	0	29,807	21,395	0	0	0
(3) Supplementary water supply system					0	0	0
(a) Stripping (t=0.15m)	m2	0	191	234	0	0	0
(b) Excavation for existing canal	m3	0	3,400	3,400	0	0	0
(c) Excavation for structure	m3	0	2,295	2,805	0	0	0
(d) Backfill	m3	0	2,550	1,700	0	0	0
(e) Embankment	m3	0	4,208	5,143	0	0	0
(f) Reinforced concrete	m3	0	83,640	55,760	0	0	0
(g) Plain concrete	m3	0	69,360	46,240	0	0	0
(g) Reinforcement bar	kg	0	136	1,224	0	0	0
(h) Form	m2	0	8,160	2,040	0	0	0
(i) Slide gate (1100 X 1100)	no(s)	0	69,870	628,830	0	0	0
(j) Slide gate (700 X 700)	no(s)	0	58,820	529,380	0	0	0
(k) Gabion mattress 30 cm thick	m2	0	31,620	21,080	0	0	0
(l) Others		0			0	0	0
(4) Miscellaneous		0			0	0	0
Total					0	0	0
Grand Total					505,153	382,167	887,320

Table I-5 Breakdown of Direct Construction Cost for Aveyime Project (1/2)

(Unit :10^3 Cedi)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Toatl
1 Pump Station							
(1) Pump	no(s).	5			50,074	450,653	500,727
(2) Pump house							
(a) Stripping (t=0.15m)	m2	570	191	234	109	133	242
(b) Excavation	m3	1,720	2,295	2,805	3,947	4,825	8,772
(c) Backfill	m3	760	2,550	1,700	1,938	1,292	3,230
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	63	83,640	55,760	5,269	3,513	8,782
(f) Plain concrete	m3	34	69,360	46,240	2,358	1,572	3,930
(g) Reinforcement bar	kg	4,580	136	1,224	623	5,606	6,229
(h) Form	m2	405	8,160	2,040	3,305	826	4,131
(i) Others					4,970	17,164	22,134
Total					72,593	485,584	558,177
2 Irrigation System							
(1) Open canal system							
(a) Stripping (t=0.15m)	m2	37,700	191	234	7,201	8,822	16,023
(b) Excavation	m3	1,900	3,400	3,400	6,460	6,460	12,920
(c) Backfill	m3	7,000	3,060	3,740	21,420	26,180	47,600
(d) Embankment	m3	7,800	4,208	5,143	32,822	40,115	72,937
(e) Reinforced concrete	m3	1,500	83,640	55,760	125,460	83,640	209,100
(f) Reinforcement bar	kg	66,000	136	1,224	8,976	80,784	89,760
(g) Form	m2	25,900	8,160	2,040	211,344	52,836	264,180
(h) Dismantling of concrete lining	m3	800	9,180	11,220	7,344	8,976	16,320
(i) Others		0	0	0	0	0	0
Sub-Total					421,027	307,813	728,840
(2) Pipeline system							
(a) Steel pipe D=350	m	0	0	0	0	0	0
(b) Steel pipe D=300	m	0	0	0	0	0	0
(c) Steel pipe D=250	m	0	0	0	0	0	0
(d) Steel pipe D=200	m	0	0	0	0	0	0
(e) Steel pipe D=150	m	540	7,554	34,057	4,079	18,391	22,470
(f) Steel pipe D=100	m	670	5,442	23,803	3,646	15,948	19,594
(g) Sprinkler system	set	7	862,580	7,763,220	6,038	54,343	60,381
(h) Others					303	2,718	3,021
Sub-Total					14,066	91,400	105,466
Total					435,093	399,213	834,306
3 Dainage System							
(a) Clearing	m2	9,000	130	159	1,170	1,431	2,601
(b) Excavation	m3	3,800	3,400	3,400	12,920	12,920	25,840
(c) Backfill	m3	0	3,060	3,740	0	0	0
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	0	83,640	55,760	0	0	0
(f) Reinforcement bar	kg	0	136	1,224	0	0	0
(g) Form	m2	0	8,160	2,040	0	0	0
(h) Dismantling of concrete lining	m3	0	9,180	11,220	0	0	0
(i) Others					0	0	0
Total					14,090	14,351	28,441
4 Farm Road							
(a) Stripping (t=0.15m)	m2	12,100	191	234	2,311	2,832	5,143
(b) Embankment	m3	1,300	3,978	4,862	5,171	6,321	11,492
(c) Laterite pavement	m3	1,900	3,978	4,862	7,558	9,238	16,796
(d) Gravel pavement	m3	900	22,950	28,050	20,655	25,245	45,900
(e) Grading and compaction	m2	20,800	340	510	7,072	10,608	17,680
(f) Others					0	0	0
Total					42,767	54,244	97,011

- To be continued -

Table I-5 Breakdown of Direct Construction Cost for Aveyime Project (2/2)

(Unit :10^3 Cedi)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Toatl
5 Related Structures							
(a) Stripping (t=0.15m)	m2	1,507	191	234	288	353	641
(b) Excavation	m3	861	1,989	2,431	1,713	2,093	3,806
(c) Backfill	m3	664	2,550	1,700	1,693	1,129	2,822
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	123	83,640	55,760	10,288	6,858	17,146
(f) Plain concrete	m3	31	69,360	46,240	2,150	1,433	3,583
(g) Reinforcement bar	kg	5,415	136	1,224	736	6,628	7,364
(h) Form	m2	1,839	8,160	2,040	15,006	3,752	18,758
(i) Dismantling of concrete structure	m3	41	9,180	11,220	376	460	836
(j) Slide gate (400 x 350)	no(s)	36	37,400	336,600	1,346	12,118	13,464
(k) Slide gate (400 x 450)	no(s)	2	37,400	336,600	75	673	748
(l) Slide gate (500 x 450)	no(s)	36	45,050	405,450	1,622	14,596	16,218
(m) Slide gate (700 x 750)	no(s)	2	62,940	566,460	126	1,133	1,259
(n) Gabion mattress 30cm thick	m2	0	31,620	21,080	0	0	0
(n) Others					4,977	2,990	7,967
Total					40,396	54,216	94,612
6 Buildings							
(a) O & M Office	no(s)	1	67,830	45,220	67,830	45,220	113,050
(b) Dormitory for officers	no(s)	0	15,504	10,336	0	0	0
(c) Dormitory for farmers	no(s)	0	101,939	67,959	0	0	0
(d) Lecture hall	no(s)	0	12,403	8,269	0	0	0
(e) Dining hall	no(s)	0	14,851	9,901	0	0	0
(f) Store	no(s)	1	9,766	6,098	9,766	6,098	15,864
(g) Garage	no(s)	1	8,492	5,268	8,492	5,268	13,760
(h) Dry yard	no(s)	1	8,139	5,196	8,139	5,196	13,335
(i) Sorter house	no(s)	1	6,932	4,396	6,932	4,396	11,328
(j) Fence for office	no(s)	0	11,220	16,830	0	0	0
Total					101,159	66,178	167,337
7 Others							
(1) Electricity line							
(a) Electricity line	km	2.55	7,650,000	17,850,000	19,508	45,518	65,026
(b) Transformer, 100KVA	no(s)	1	1,224,000	2,856,000	1,224	2,856	4,080
(c) Transformer, 50KVA	no(s)	1	867,000	2,023,000	867	2,023	2,890
(2) Green belt	km	0	29,807	21,395	0	0	0
(3) Supplementary water supply system					0	0	0
(a) Stripping (t=0.15m)	m2	0	191	234	0	0	0
(b) Excavation for existing canal	m3	0	3,400	3,400	0	0	0
(c) Excavation for structure	m3	0	2,295	2,805	0	0	0
(d) Backfill	m3	0	2,550	1,700	0	0	0
(e) Embankment	m3	0	4,208	5,143	0	0	0
(f) Reinforced concrete	m3	0	83,640	55,760	0	0	0
(g) Plain concrete	m3	0	69,360	46,240	0	0	0
(g) Reinforcement bar	kg	0	136	1,224	0	0	0
(h) Form	m2	0	8,160	2,040	0	0	0
(i) Slide gate (1100 X 1100)	no(s)	0	69,870	628,830	0	0	0
(j) Slide gate (700 X 700)	no(s)	0	58,820	529,380	0	0	0
(k) Gabion mattress 30 cm thick	m2	0	31,620	21,080	0	0	0
(l) Others		0			0	0	0
(4) Miscellaneous		0			0	0	0
Total					21,599	50,397	71,996
Grand Total					727,697	1,124,183	1,851,880

Table I-6 Breakdown of Direct Construction Cost for Kpando-Torkor Project (1/2)

(Unit :10^3 Cedi)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Toatl
1 Pump Station							
(1) Pump	no(s).	6			125,181	1,126,635	1,251,816
(2) Pump house							
(a) Stripping (t=0.15m)	m2	6,000	191	234	1,146	1,404	2,550
(b) Excavation	m3	21,700	2,295	2,805	49,802	60,869	110,671
(c) Backfill	m3	4,100	2,550	1,700	10,455	6,970	17,425
(d) Embankment	m3	3,400	4,208	5,143	14,307	17,486	31,793
(e) Reinforced concrete	m3	1,712	83,640	55,760	143,192	95,461	238,653
(f) Plain concrete	m3	114	69,360	46,240	7,907	5,271	13,178
(g) Reinforcement bar	kg	131,100	136	1,224	17,830	160,466	178,296
(h) Form	m2	3,960	8,160	2,040	32,314	8,078	40,392
(i) Others					9,641	58,331	67,972
Total					411,775	1,540,971	1,952,746
2 Irrigation System							
(1) Open canal system							
(a) Stripping (t=0.15m)	m2	0	191	234	0	0	0
(b) Excavation	m3	0	3,400	3,400	0	0	0
(c) Backfill	m3	0	3,060	3,740	0	0	0
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	0	83,640	55,760	0	0	0
(f) Reinforcement bar	kg	0	136	1,224	0	0	0
(g) Form	m2	0	8,160	2,040	0	0	0
(h) Dismantling of concrete lining	m3	0	9,180	11,220	0	0	0
(i) Others		0	0	0	0	0	0
Sub-Total					0	0	0
(2) Pipeline system							
(a) Steel pipe D=350	m	640	21,081	135,646	13,492	86,813	100,305
(b) Steel pipe D=300	m	730	19,118	121,683	13,956	88,829	102,785
(c) Steel pipe D=250	m	380	13,910	83,137	5,286	31,592	36,878
(d) Steel pipe D=200	m	1,180	11,312	67,594	13,348	79,761	93,109
(e) Steel pipe D=150	m	3,250	7,554	34,057	24,551	110,685	135,236
(f) Steel pipe D=100	m	10,020	5,442	23,803	54,529	238,506	293,035
(g) Sprinkler system	set	66	862,580	7,763,220	56,930	512,373	569,303
(h) Others					2,847	25,619	28,466
Sub-Total					184,939	1,174,178	1,359,117
Total					184,939	1,174,178	1,359,117
3 Dainage System							
(a) Stripping (t=0.15m)	m2	7,000	191	234	1,337	1,637	2,974
(b) Excavation	m3	2,800	2,295	2,805	6,426	7,854	14,280
(c) Backfill	m3	0	3,060	3,740	0	0	0
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	910	83,640	55,760	76,112	50,742	126,854
(f) Reinforcement bar	kg	37,360	136	1,224	5,081	45,729	50,810
(g) Form	m2	8,800	8,160	2,040	71,808	17,952	89,760
(h) Dismantling of concrete lining	m3	0	9,180	11,220	0	0	0
(i) Others					0	0	0
Total					160,764	123,914	284,678
4 Farm Road							
(a) Stripping (t=0.15m)	m2	36,400	191	234	6,953	8,516	15,469
(b) Embankment	m3	3,300	3,978	4,862	13,127	16,045	29,172
(c) Laterite pavement	m3	6,300	3,978	4,862	25,061	30,631	55,692
(d) Gravel pavement	m3	1,000	22,950	28,050	22,950	28,050	51,000
(e) Grading and compaction	m2	32,000	340	510	10,880	16,320	27,200
(f) Others					0	0	0
Total					78,971	99,562	178,533

- To be continued -

Table I-6 Breakdown of Direct Construction Cost for Kpando-Torkor Project (2/2)

(Unit :10^3 Cedi)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Toal
5 Related Structures							
(a) Stripping (t=0.15m)	m2	550	191	234	105	129	234
(b) Excavation	m3	900	1,989	2,431	1,790	2,188	3,978
(c) Backfill	m3	600	2,550	1,700	1,530	1,020	2,550
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	118	83,640	55,760	9,870	6,580	16,450
(f) Plain concrete	m3	143	69,360	46,240	9,918	6,612	16,530
(g) Reinforcement bar	kg	1,215	136	1,224	165	1,487	1,652
(h) Form	m2	1,000	8,160	2,040	8,160	2,040	10,200
(i) Dismantling of concrete structure	m3	0	9,180	11,220	0	0	0
(j) Reinforced concrete pipe D=800	m	80	55,770	37,180	4,463	2,974	7,437
(k) Reinforced concrete pipe D=1000	m	60	79,950	53,300	4,797	3,198	7,995
(l) Slide gate (500 x 450)	no(s)	0	45,050	405,450	0	0	0
(m) Slide gate (700 x 750)	no(s)	0	62,940	566,460	0	0	0
(n) Gabion mattress 50cm thick	m2	0	45,390	30,260	0	0	0
(n) Others					0	0	0
Total					40,798	26,228	67,026
6 Buildings							
(a) O & M Office	no(s)	1	67,830	45,220	67,830	45,220	113,050
(b) Dormitory for officers	no(s)	0	15,504	10,336	0	0	0
(c) Dormitory for farmers	no(s)	0	101,939	67,959	0	0	0
(d) Lecture hall	no(s)	0	12,403	8,269	0	0	0
(e) Dining hall	no(s)	0	14,851	9,901	0	0	0
(f) Store	no(s)	2	9,766	6,098	19,532	12,196	31,728
(g) Garage	no(s)	2	8,492	5,268	16,984	10,536	27,520
(h) Dry yard	no(s)	2	8,139	5,196	16,278	10,392	26,670
(i) Sorter house	no(s)	2	6,932	4,396	13,864	8,792	22,656
(j) Fence for office	no(s)	0	11,220	16,830	0	0	0
Total					134,488	87,136	221,624
7 Others							
(1) Electricity line							
(a) Electricity line	km	8	7,650,000	17,850,000	61,200	142,800	204,000
(b) Transformer, 310KVA	no(s)	1	2,703,000	6,307,000	2,703	6,307	9,010
(c) Transformer, 200KVA	no(s)	1	1,581,000	3,689,000	1,581	3,689	5,270
(2) Green belt	km	0	29,807	21,395	0	0	0
(a) Sod facing	m2	23,950	85	0	2,036	0	2,036
(b) Excavation	m3	3,856	2,295	2,805	8,850	10,816	19,666
(c) Dry stone pitching	m2	6,698	8,670	5,780	58,072	38,714	96,786
(3) Supplementary water supply system					0	0	0
(a) Stripping (t=0.15m)	m2	0	191	234	0	0	0
(b) Excavation for existing canal	m3	0	3,400	3,400	0	0	0
(c) Excavation for structure	m3	0	2,295	2,805	0	0	0
(d) Backfill	m3	0	2,550	1,700	0	0	0
(e) Embankment	m3	0	4,208	5,143	0	0	0
(f) Reinforced concrete	m3	0	83,640	55,760	0	0	0
(g) Plain concrete	m3	0	69,360	46,240	0	0	0
(g) Reinforcement bar	kg	0	136	1,224	0	0	0
(h) Form	m2	0	8,160	2,040	0	0	0
(i) Slide gate (1100 X 1100)	no(s)	0	69,870	628,830	0	0	0
(j) Slide gate (700 X 700)	no(s)	0	58,820	529,380	0	0	0
(k) Gabion mattress 30 cm thick	m2	0	31,620	21,080	0	0	0
(l) Steel pipe D=300	m	0	19,118	121,683	0	0	0
(m) Others		0			0	0	0
(4) Miscellaneous		0			0	0	0
Total					134,442	202,326	336,768
Grand Total					1,146,177	3,254,315	4,400,492

Table I-7 Breakdown of Direct Construction Cost for Mankessim Project (1/2)

(Unit :10^3 Cedi)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Toatl
1 Pump Station							
(1) Pump	no(s).	5			68,726	618,934	687,660
(2) Pump house							
(a) Stripping (t=0.15m)	m2	720	191	234	138	168	306
(b) Excavation	m3	150	2,295	2,805	344	421	765
(c) Excavation for structure	m3	700	1,989	2,431	1,392	1,702	3,094
(d) Backfill	m3	150	2,550	1,700	383	255	638
(e) Embankment	m3	0	4,208	5,143	0	0	0
(f) Reinforced concrete	m3	125	83,640	55,760	10,455	6,970	17,425
(g) Plain concrete	m3	75	69,360	46,240	5,202	3,468	8,670
(h) Reinforcement bar	kg	9,500	136	1,224	1,292	11,628	12,920
(i) Form	m2	750	8,160	2,040	6,120	1,530	7,650
(j) Others					3,481	4,154	7,635
Total					97,533	649,230	746,763
2 Irrigation System							
(1) Open canal system							
(a) Stripping (t=0.15m)	m2	0	191	234	0	0	0
(b) Excavation	m3	0	3,400	3,400	0	0	0
(c) Backfill	m3	0	3,060	3,740	0	0	0
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	0	83,640	55,760	0	0	0
(f) Reinforcement bar	kg	0	136	1,224	0	0	0
(g) Form	m2	0	8,160	2,040	0	0	0
(h) Dismantling of concrete lining	m3	0	9,180	11,220	0	0	0
(i) Others		0	0	0	0	0	0
Sub-Total					0	0	0
(2) Pipeline system							
(a) Steel pipe D=350	m	0	21,081	135,646	0	0	0
(b) Steel pipe D=300	m	1,130	19,118	121,683	21,603	137,502	159,105
(c) Steel pipe D=250	m	360	13,910	83,137	5,008	29,929	34,937
(d) Steel pipe D=200	m	100	11,312	67,594	1,131	6,759	7,890
(e) Steel pipe D=150	m	2,340	7,554	34,057	17,676	79,693	97,369
(f) Steel pipe D=100	m	5,520	5,442	23,803	30,040	131,393	161,433
(g) Sprinkler system	set	36	862,580	7,763,220	31,053	279,476	310,529
(h) Others					1,571	14,135	15,706
Sub-Total					108,082	678,887	786,969
Total					108,082	678,887	786,969
3 Dainage System							
(a) Stripping (t=0.15m)	m2	10,200	191	234	1,946	2,389	4,335
(b) Excavation	m3	3,900	2,295	2,805	8,951	10,940	19,891
(c) Backfill	m3	0	3,060	3,740	0	0	0
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	1,350	83,640	55,760	112,914	75,276	188,190
(f) Reinforcement bar	kg	52,020	136	1,224	7,075	63,672	70,747
(g) Form	m2	10,860	8,160	2,040	88,618	22,154	110,772
(h) Dismantling of concrete lining	m3	0	9,180	11,220	0	0	0
(i) Others					0	0	0
Total					219,504	174,431	393,935
4 Farm Road							
(a) Stripping (t=0.15m)	m2	28,700	191	234	5,482	6,716	12,198
(b) Embankment	m3	500	3,978	4,862	1,989	2,431	4,420
(c) Laterite pavement	m3	7,100	3,978	4,862	28,244	34,520	62,764
(d) Gravel pavement	m3	200	22,950	28,050	4,590	5,610	10,200
(e) Grading and compaction	m2	2,400	340	510	816	1,224	2,040
(f) Others					0	0	0
Total					41,121	50,501	91,622

- To be continued -

Table I-7 Breakdown of Direct Construction Cost for Mankessim Project (2/2)

(Unit :10^3 Cedi)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Toatl
5 Related Structures							
(a) Stripping (t=0.15m)	m2	300	191	234	59	69	128
(b) Excavation	m3	600	1,989	2,431	1,193	1,459	2,652
(c) Backfill	m3	500	2,550	1,700	1,275	850	2,125
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	26	83,640	55,760	2,175	1,450	3,625
(f) Plain concrete	m3	40	69,360	46,240	2,774	1,850	4,624
(g) Reinforcement bar	kg	1,540	136	1,224	209	1,885	2,094
(h) Form	m2	500	8,160	2,040	4,080	1,020	5,100
(i) Dismantling of concrete structure	m3	0	9,180	11,220	0	0	0
(j) Reinforced concrete pipe D=800	m	112	55,770	37,180	6,246	4,164	10,410
(k) Reinforced concrete pipe D=1000	m	0	79,950	53,300	0	0	0
(l) Slide gate (500 x 450)	no(s)	0	45.050	405.450	0	0	0
(m) Slide gate (700 x 750)	no(s)	0	62,940	566,460	0	0	0
(n) Gabion mattress 50cm thickness	m2	0	45,390	30,260	0	0	0
(o) Others					0	0	0
Total					18,011	12,747	30,758
6 Buildings							
(a) O & M Office	no(s)	1	67,830	45,220	67,830	45,220	113,050
(b) Dormitory for officers	no(s)	0	15,504	10,336	0	0	0
(c) Dormitory for farmers	no(s)	0	101,939	67,959	0	0	0
(d) Lecture hall	no(s)	0	12,403	8,269	0	0	0
(e) Dining hall	no(s)	0	14,851	9,901	0	0	0
(f) Store	no(s)	1	9,766	6,098	9,766	6.098	15,864
(g) Garage	no(s)	1	8,492	5,268	8,492	5,268	13,760
(h) Dry yard	no(s)	1	8,139	5,196	8,139	5,196	13,335
(i) Sorter house	no(s)	1	6,932	4,396	6,932	4,396	11,328
(j) Fence for office	no(s)	0	11,220	16,830	0	0	0
Total					101,159	66,178	167,337
7 Others							
(1) Electricity line							
(a) Electricity line	km	3.5	7,650,000	17,850,000	26,775	62,475	89,250
(b) Transformer, 50KVA	no(s)	1	867,000	2,023,000	867	2,023	2,890
(c) Transformer, 200KVA	no(s)	1	1,581,000	3,689.000	1,581	3,689	5,270
(2) Green belt	km	0	29,807	21,395	0	0	0
(a) Sod facing	m2	6,250	85	0	531	0	531
(b) Excavation	m3	1,000	2,295	2.805	2,295	2,805	5,100
(c) Dry stone pitching	m2	1,750	8,670	5,780	15,173	10,115	25,288
(3) Supplementary water supply system					0	0	0
(a) Stripping (t=0.15m)	m2	0	191	234	0	0	0
(b) Excavation for existing canal	m3	0	3,400	3,400	0	0	0
(c) Excavation for structure	m3	0	2,295	2,805	0	0	0
(d) Backfill	m3	0	2,550	1,700	0	0	0
(e) Embankment	m3	0	4,208	5,143	0	0	0
(f) Reinforced concrete	m3	0	83,640	55,760	0	0	0
(g) Plain concrete	m3	0	69,360	46,240	0	0	0
(g) Reinforcement bar	kg	0	136	1,224	0	0	0
(h) Form	m2	0	8,160	2,040	0	0	0
(i) Slide gate (1100 X 1100)	no(s)	0	69,870	628,830	0	0	0
(j) Slide gate (700 X 700)	no(s)	0	58,820	529.380	0	0	0
(k) Gabion mattress 30 cm thick	m2	0	31,620	21,080	0	0	0
(l) Steel pipe D=300	m	0	19,118	121,683	0	0	0
(m) Others		0			0	0	0
(4) Minor repair for dam crest	m3	500	3,978	4,862	1,989	2,431	4,420
Total					49,211	83,538	132,749
Grand Total					634,621	1,715,512	2,350,133

Table I-8 Breakdown of Direct Construction Cost for Okyereko Project (1/2)

(Unit :10^3 Cedi)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Toatl
1 Pump Station							
(1) Pump	no(s).	2	12,773,000	114,959,000	25,546	229,918	255,464
(2) Pump house							
(a) Stripping (t=0.15m)	m2	400	191	234	76	94	170
(b) Excavation	m3	300	2,295	2,805	689	842	1,531
(c) Backfill	m3	110	2,550	1,700	281	187	468
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	27	83,640	55,760	2,258	1,506	3,764
(f) Plain concrete	m3	18	69,360	46,240	1,248	832	2,080
(g) Reinforcement bar	kg	2,000	136	1,224	272	2,448	2,720
(h) Form	m2	210	8,160	2,040	1,714	428	2,142
(i) Others					1,537	1,990	3,527
Total					33,621	238,245	271,866
2 Irrigation System							
(1) Open canal system							
(a) Stripping (t=0.15m)	m2	25,800	191	234	4,928	6,037	10,965
(b) Excavation	m3	1,700	3,400	3,400	5,780	5,780	11,560
(c) Backfill	m3	5,700	3,060	3,740	17,442	21,318	38,760
(d) Embankment	m3	6,100	4,208	5,143	25,669	31,372	57,041
(e) Reinforced concrete	m3	1,200	83,640	55,760	100,368	66,912	167,280
(f) Reinforcement bar	kg	50,200	136	1,224	6,827	61,445	68,272
(g) Form	m2	20,300	8,160	2,040	165,648	41,412	207,060
(h) Dismantling of concrete lining	m3	1,700	9,180	11,220	15,607	19,073	34,680
(i) Others		0	0	0	0	0	0
Sub-Total					342,269	253,349	595,618
(2) Pipeline system							
(a) Steel pipe D=350	m	0	0	0	0	0	0
(b) Steel pipe D=300	m	0	0	0	0	0	0
(c) Steel pipe D=250	m	0	0	0	0	0	0
(d) Steel pipe D=200	m	0	0	0	0	0	0
(e) Steel pipe D=150	m	0	7,554	34,057	0	0	0
(f) Steel pipe D=100	m	0	5,442	23,803	0	0	0
(g) Sprinkler system	set	0	862,580	7,763,220	0	0	0
(h) Others					0	0	0
Sub-Total					0	0	0
Total					342,269	253,349	595,618
3 Dainage System							
(a) Clearing	m2	18,800	130	159	2,444	2,989	5,433
(b) Excavation	m3	4,800	3,400	3,400	16,320	16,320	32,640
(c) Backfill	m3	0	3,060	3,740	0	0	0
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	0	83,640	55,760	0	0	0
(f) Reinforcement bar	kg	0	136	1,224	0	0	0
(g) Form	m2	0	8,160	2,040	0	0	0
(h) Dismantling of concrete lining	m3	0	9,180	11,220	0	0	0
(i) Others					0	0	0
Total					18,764	19,309	38,073
4 Farm Road							
(a) Stripping (t=0.15m)	m2	11,600	191	234	2,216	2,714	4,930
(b) Embankment	m3	0	3,978	4,862	0	0	0
(c) Laterite pavement	m3	3,100	3,978	4,862	12,332	15,072	27,404
(d) Gravel pavement	m3	700	22,950	28,050	16,065	19,635	35,700
(e) Grading and compaction	m2	22,200	340	510	7,548	11,322	18,870
(f) Others					0	0	0
Total					38,161	48,743	86,904

- To be continued -

Table I-8 Breakdown of Direct Construction Cost for Okyereko Project (2/2)

(Unit :10^3 Cedi)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Toatl
5 Related Structures							
(a) Stripping (t=0.15m)	m2	2,522	191	234	482	590	1,072
(b) Excavation	m3	1,004	1,989	2,431	1,997	2,441	4,438
(c) Backfill	m3	687	2,550	1,700	1,752	1,168	2,920
(d) Embankment	m3	0	4,208	5,143	0	0	0
(e) Reinforced concrete	m3	93	83,640	55,760	7,779	5,186	12,965
(f) Plain concrete	m3	17	69,360	46,240	1,179	786	1,965
(g) Reinforcement bar	kg	3,966	136	1,224	539	4,854	5,393
(h) Form	m2	1,430	8,160	2,040	11,669	2,917	14,586
(i) Dismantling of concrete structure	m3	19	9,180	11,220	174	213	387
(j) Slide gate (400 x 350)	no(s)	0	37,400	336,600	0	0	0
(k) Slide gate (400 x 450)	no(s)	38	37,400	336,600	1,421	12,791	14,212
(l) Slide gate (500 x 450)	no(s)	0	45,050	405,450	0	0	0
(m) Slide gate (700 x 750)	no(s)	0	62,940	566,460	0	0	0
(n) Gabion mattress 50cm thick	m2	1,200	45,390	30,260	54,468	36,312	90,780
(n) Others					3,596	2,212	5,808
Total					85,056	69,470	154,526
6 Buildings							
(a) O & M Office	no(s)	1	67,830	45,220	67,830	45,220	113,050
(b) Dormitory for officers	no(s)	0	15,504	10,336	0	0	0
(c) Dormitory for farmers	no(s)	0	101,939	67,959	0	0	0
(d) Lecture hall	no(s)	1	12,403	8,269	12,403	8,269	20,672
(e) Dining hall	no(s)	0	14,851	9,901	0	0	0
(f) Store	no(s)	1	9,766	6,098	9,766	6,098	15,864
(g) Garage	no(s)	1	8,492	5,268	8,492	5,268	13,760
(h) Dry yard	no(s)	1	8,139	5,196	8,139	5,196	13,335
(i) Sorter house	no(s)	1	6,932	4,396	6,932	4,396	11,328
(j) Fence for office	no(s)	0	11,220	16,830	0	0	0
Total					113,562	74,447	188,009
7 Others							
(1) Electricity line							
(a) Electricity line	km	8	7,650,000	17,850,000	61,200	142,800	204,000
(b) Transformer, 100KVA	no(s)	0	1,224,000	2,856,000	0	0	0
(c) Transformer, 50KVA	no(s)	1	867,000	2,023,000	867	2,023	2,890
(2) Green belt	km	0	29,807	21,395	0	0	0
(3) Supplementary water supply system					0	0	0
(a) Stripping (t=0.15m)	m2	777	191	234	148	182	330
(b) Excavation for existing canal	m3	300	3,400	3,400	1,020	1,020	2,040
(c) Excavation for structure	m3	643	2,295	2,805	1,476	1,804	3,280
(d) Backfill	m3	772	2,550	1,700	1,969	1,312	3,281
(e) Embankment	m3	250	4,208	5,143	1,052	1,286	2,338
(f) Reinforced concrete	m3	166	83,640	55,760	13,884	9,256	23,140
(g) Plain concrete	m3	55	69,360	46,240	3,815	2,543	6,358
(g) Reinforcement bar	kg	8,030	136	1,224	1,092	9,829	10,921
(h) Form	m2	675	8,160	2,040	5,508	1,377	6,885
(i) Slide gate (1100 X 1100)	no(s)	1	69,870	628,830	70	629	699
(j) Slide gate (700 X 700)	no(s)	1	58,820	529,380	59	529	588
(k) Gabion mattress 30 cm thick	m2	350	31,620	21,080	11,067	7,378	18,445
(l) Steel pipe D=300	m	800	19,118	121,683	15,294	97,346	112,640
(m) Others		0			14,370	13,882	28,252
(4) Miscellaneous		0			0	0	0
Total					132,891	293,196	426,087
Grand Total					764,324	996,759	1,761,083

Table I-9 Cost of O & M Equipment and Agriculture Supporting Equipment

(Unit :10^3Cedi)

Equipment	Unit	Ashaiman (56 ha)		Aveyime (95 ha)		Kpando-Torkor (155 ha)		Mankessim (86 ha)		Okyereko (81 ha)	
		Q'ty	Amount	Q'ty	Amount	Q'ty	Amount	Q'ty	Amount	Q'ty	Amount
1 O & M Equipment											
(1) Pick-up (4 x 4)	35,000	1	35,000	1	35,000	1	35,000	1	35,000	1	35,000
(2) Tractor (60Hp)	62,000	1	62,000	1	62,000	2	124,000	1	62,000	1	62,000
(3) Backhoe (0.3 m3)*	146,000	1	17,400	-	29,300	-	47,800	-	26,500	-	25,000
(4) Grasscutter	1,700	3	5,100	3	5,100	4	6,800	3	5,100	3	5,100
(5) Radio communication	3,000	1	3,000	1	3,000	1	3,000	1	3,000	1	3,000
Sub-total			122,500		134,400		216,600		131,600		130,100
2 Agriculture Supporting Equipment											
(1) Rotary mineograph	1,500	1	1,500	1	1,500	1	1,500	1	1,500	1	1,500
(2) Photocopy machine	2,500	1	2,500	1	2,500	1	2,500	1	2,500	1	2,500
(3) Bus*	60,000	1	7,100	-	12,000	-	19,700	-	10,900	-	10,300
Sub-total			11,100		16,000		23,700		14,900		14,300
3 Office Equipment and facility	3,400	1	3,400	1	3,400	1	3,400	1	3,400	1	3,400
Total			137,000		153,800		243,700		149,900		147,800
Total**			318,500		112,500		176,200		112,500		112,500

** : Purchasing cost is allocated to each project on the area basis since it is used for not only Ashaiman project but also other projects although being kept in ashaiman project.*

*** : Purchasing cost of backhoe and bus is included in Ashaiman project only.*

Table I-10 Project Cost

(Unit :10^6 Cedi)

Item	Ashaiman	Aveyime	Kpando-Torkor	Mankessim	Okyreko	Total
1 Development Area	56 ha	95 ha	155 ha	86 ha	81 ha	473 ha
2 Direct Construction Cost						
(1) Pump station	0	558	1,953	747	272	3530
(2) Irrigation system						
(a) Canal	388	729	0	0	595	1712
(b) Pipeline	0	106	1,360	787	0	2253
(3) Drainage system	33	28	285	394	38	778
(4) Farm road	44	97	178	92	87	498
(5) Related structures	116	95	67	31	155	464
(6) Building*	306	167	221	167	188	1049
(7) Supplimental water supply facility	0	0	0	0	219	219
(8) Green belt	0	0	118	31	0	149
(9) Electric line	0	72	218	97	207	594
(10 Minor repairing of dam crest	0	0	0	4	0	4
Total of Item 2	887	1,852	4,400	2,350	1,761	11,250
3 O & M Equipment**	319	113	176	150	148	906
4 Engineering Services***	133	278	660	353	264	1688
5 Administration Cost****	44	93	220	118	88	563
Total of Item 2 to5	1,383	2,336	5,456	2,971	2,261	14,407
6 Physical Contingency*****	89	185	440	235	176	1125
Total of Item 2 to6	1,472	2,521	5,896	3,206	2,437	15,532
(Cost per ha in 10^3 Cedi)	26,286	26,537	38,039	37,279	30,086	32,837
(Cost per ha in US$)	15,462	15,610	22,376	21,929	17,698	19,316
7 Price Contingency******	490	1,055	1,896	671	759	4871
Total of Item 2 to 7	1,962	3,576	7,792	3,877	3,196	20,403
Total in 10^3 US$	1,154	2,104	4,584	2,281	1,880	12,002
Cost per ha in 10^3 Cedi	35,036	37,642	50,271	45,081	39,457	43,135
Cost per ha in US$	20,609	22,142	29,571	26,518	23,210	25,374

* : Cost of training facility such as lecture hall, domitories and dining hall is included in Ashaiman project, and cost of lecture hall is also included in Okyereko project.

** : Purchasing cost of backhoe and bus which will be used for all projects, is included in Ashaiman project.

*** : 15% of direct construction cost.

**** : 5% of dorect construction cost.

***** : 10% of direct construction cost.

****** : annual escalation rate of 2.5% for Foreign currency and 25.0% for local currency (see Table I-14).

Table I-11 Annual Disbursement Schedule

(unit: 10^6 Cedi)

Item	Total			FY1997			FY1998			FY1999			FY2000		
	L/C	F/C	Amount	L/C	F/C	Amount	L/C	F/C	Amount	L/C	F/C	Amount	L/C	F/C	Amount
1 Ashaiman Project															
(1) Direct construction cost*	505	382	887	0	0	0	253	191	444	252	191	443	0	0	0
(2) O & M equipment**	0	319	319	0	0	0	0	319	319	0	0	0	0	0	0
(3) Engineering services (15%of F/C of (1))	0	133	133	0	40	40	0	67	67	0	26	26	0	0	0
(4) Administration cost (5% of (1))	25	19	44	0	0	0	12	10	22	12	10	22	0	0	0
Sub-total	530	853	1,383	0	40	40	265	587	852	264	227	491	0	0	0
(5) Physical contingency (10% of (1))	51	38	89	0	0	0	26	19	45	25	19	44	0	0	0
Sub-total	581	891	1,472	0	40	40	291	606	897	289	246	535	0	0	0
(6) Price contingency	439	51	490	0	1	1	164	31	195	275	19	294	0	0	0
Total	1,020	942	1,962	0	41	41	455	637	1,092	564	265	829	0	0	0
2 Aveyime Project															
(1) Direct construction cost	728	1,124	1,852	0	0	0	0	0	0	510	787	1,297	218	337	555
(2) O & M equipment	0	113	113	0	0	0	0	0	0	0	113	113	0	0	0
(3) Engineering services (15%of F/C of (1))	0	278	278	0	83	83	0	56	56	0	83	83	0	56	56
(4) Administration cost (5% of (1))	36	57	93	0	0	0	0	0	0	26	39	65	10	18	28
Sub-total	764	1,572	2,336	0	83	83	0	56	56	536	1,022	1,558	228	411	639
(5) Physical contingency (10% of (1))	73	112	185	0	0	0	0	0	0	51	79	130	22	33	55
Sub-total	837	1,684	2,521	0	83	83	0	56	56	587	1,101	1,688	250	444	694
(6) Price contingency	919	136	1,055	0	2	2	0	3	3	559	85	644	360	46	406
Total	1,756	1,820	3,576	0	85	85	0	59	59	1,146	1,186	2,332	610	490	1,100
3 Kpando-Torkor Project															
(1) Direct construction cost	1,146	3,254	4,400	0	0	0	0	0	0	688	1952	2,640	458	1302	1,760
(2) O & M equipment	0	176	176	0	0	0	0	0	0	0	176	176	0	0	0
(3) Engineering services (15%of F/C of (1))	0	660	660	0	198	198	0	132	132	0	198	198	0	132	132
(4) Administration cost (5% of (1))	57	163	220	0	0	0	0	0	0	34	98	132	23	65	88
Sub-total	1,203	4,253	5,456	0	198	198	0	132	132	722	2,424	3,146	481	1,499	1,980
(5) Physical contingency (10% of (1))	115	325	440	0	0	0	0	0	0	69	195	264	46	130	176
Sub-total	1,318	4,578	5,896	0	198	198	0	132	132	791	2,619	3,410	527	1,629	2,156
(6) Price contingency	1,513	383	1,896	0	5	5	0	7	7	754	202	956	759	169	928
Total	2,831	4,961	7,792	0	203	203	0	139	139	1,545	2,821	4,366	1,286	1,798	3,084
4 Mankessim Project															
(1) Direct construction cost	635	1,715	2,350	0	0	0	381	1,029	1,410	254	686	940	0	0	0
(2) O & M equipment	0	150	150	0	0	0	0	150	150	0	0	0	0	0	0
(3) Engineering services (15%of F/C of (1))	0	353	353	0	106	106	0	177	177	0	70	70	0	0	0
(4) Administration cost (5% of (1))	32	86	118	0	0	0	19	52	71	13	34	47	0	0	0
Sub-total	667	2,304	2,971	0	106	106	400	1,408	1,808	267	790	1,057	0	0	0
(5) Physical contingency (10% of (1))	63	172	235	0	0	0	38	103	141	25	69	94	0	0	0
Sub-total	730	2,476	3,206	0	106	106	438	1,511	1,949	292	859	1,151	0	0	0
(6) Price contingency	525	146	671	0	3	3	247	77	324	278	66	344	0	0	0
Total	1,255	2,622	3,877	0	109	109	685	1,588	2,273	570	925	1,495	0	0	0
5 Okyereko Project															
(1) Direct construction cost***	764	997	1,761	0	0	0	382	499	881	382	498	880	0	0	0
(2) O & M equipment	0	148	148	0	0	0	0	148	148	0	0	0	0	0	0
(3) Engineering services (15%of F/C of (1))	0	264	264	0	79	79	0	132	132	0	53	53	0	0	0
(4) Administration cost (5% of (1))	38	50	88	0	0	0	19	25	44	19	25	44	0	0	0
Sub-total	802	1,459	2,261	0	79	79	401	804	1,205	401	576	977	0	0	0
(5) Physical contingency (10% of (1))	76	100	176	0	0	0	38	50	88	38	50	88	0	0	0
Sub-total	878	1,559	2,437	0	79	79	439	854	1,293	439	626	1,065	0	0	0
(6) Price contingency	665	94	759	0	2	2	247	44	291	418	48	466	0	0	0
Total	1,543	1,653	3,196	0	81	81	686	898	1,584	857	674	1,531	0	0	0
6 Grand Total	8,405	11,998	20,403	0	519	519	1,826	3,321	5,147	4,682	5,871	10,553	1,896	2,288	4,184

* : including common trainning facility such as domitories, lecture hall and dining hall (160,201,000 Cedi under L/C and 106,801,000 Cedi under F/C).
** : including common O & M equipment such as Backhoe and bus (209,000,000 Cedi under F/C).
*** : including common training facility of lecture hall (12,403,000 Cedi under LC and 8,269,000 Cedi under F/C).

Table I-12 Replacement Cost

(Unit: 1000 Cedi)

Item	Useful Life	Ashiaman (56 ha)			Aveyime (95 ha)			Kpandor-Torkor (155 ha)		
		L/C	F/ C	Total	L/C	F/ C	Total	L/C	F/ C	Total
1 Pump and accessories	15	-	-	-	50,074	450,653	500,727	125,181	1,126,635	1,251,816
2 Steel pipe	20	-	-	-	4,335	39,015	43,350	58,908	530,175	589,083
3 Sprinkler system	15	-	-	-	6,340	57,060	63,400	59,777	537,992	597,769
4 Steel gate	20	898	8,078	8,976	3,169	28,520	31,689	680	6,120	6,800
5 Intake valve	20	560	5,040	5,600	-	-	-	-	-	-
6 O & M equipment	10	0	137,000	137,000	0	153,800	153,800	0	243,700	243,700

(Unit: 1000 Cedi)

Item	Useful Life	Mankessim (86 ha)			Okyereko (81 ha)		
		L/C	F/ C	Total	L/C	F/ C	Total
1 Pump and accessories	15	68,726	618,538	687,264	25,546	229,918	255,464
2 Steel pipe	20	35,852	322,665	358,517	12,500	112,500	125,000
3 Sprinkler system	10	32,606	293,450	326,056	-	-	-
4 Steel gate	20	-	-	-	1,550	13,949	15,499
5 Intake valve	20	-	-	-	-	-	-
6 O & M equipment	10	0	149,900	149,900	0	147,800	147,800

Table I-13 Operation and Maintenance Cost

(Unit : 1000 Cedi)

Description	Ashaiman	Aveyime	Kpndo-Torkor	Mankessim	Okyereko
1 Development Area	56 ha	95 ha	155 ha	86 ha	81 ha
2 Administration Cost					
(1) Salary of project staff	3,700	3,700	3,700	3,700	3,700
(2) Operarion cost of office	500	500	500	500	500
Sub-total	4,200	4,200	4,200	4,200	4,200
3 O & M of Pump and Pump Station					
(1) Operation cost (Cedi 49/kWH)	-	8,300	20,400	12,100	7,800
(2) Maintenance cost*	-	15,500	41,700	20,700	6,400
Sub-total	-	23,800	62,100	32,800	14,200
4 O & M of Command Area					
(1) O & M equipment	1,003	1,142	1,464	1,148	1,176
(2) Labour cost**	678	1,086	551	516	783
(3) Material cost***	778	839	1,024	438	693
(4) Contract for repair****	1,170	1,259	1,536	657	657
Sub-total	3,629	4,326	4,575	2,759	3,309
Total	7,829	32,326	70,875	39,759	21,709
Cost per ha in Cedi	139,804	340,274	457,258	462,314	268,012
Cost per ha in US$	82	200	269	272	158

* : 5 % of pump and accessories costs per year.

** : 10 man-day per km for irrigation canal, drainage canal, green-belt and road (Cedi 3000/man-day).

*** : 0.08 % of direct construction cost excluding pump and pump station.

**** : 0.12 % of direct construction cost excluding pump and pump station.

Table I-14 Price Contingency

Year	G-5 Manufacturing Unit Value Index*1		Price Contingency for Foreign Currency *2		Combined Consumer Price Index - National*3		Price Contingency for Local Currency *4	
	(1990=100)	(%)	(1996=100)	(%)	(1977=100)	(%)	(1996=100)	(%)
1985	68.61	-0.95	-	-	3,647.2		-	-
1986			-	-	4,543.1	24.56	-	-
1987			-	-	6,352.0	39.82	-	-
1988			-	-	8,343.9	31.36	-	-
1989			-	-	10,449.3	25.23	-	-
1990	100.00	7.83	-	-	14,341.5	37.25	-	-
1991	102.23	2.23	-	-	16,927.4	18.03	-	-
1992	106.64	4.31	-	-	18,629.8	10.06	-	-
1993	106.33	-0.29	-	-	23,279.7	24.96	-	-
1994	110.21	3.65	-	-	29,069.4	24.87	-	-
1995	115.18	4.51	-	-			-	-
1996	118.52	2.90	100.0	-			100.0	-
1997	120.91	2.02	102.5	2.5			125.0	25.0
1998	123.48	2.13	105.1	2.5			156.3	25.0
1999			107.7	2.5			195.3	25.0
2000	129.26	2.31	110.4	2.5			244.1	25.0
2001			113.2	2.5			305.2	25.0
2002			116.0	2.5			381.5	25.0
2003			118.9	2.5			476.8	25.0
2004			121.9	2.5			596.0	25.0
2005	144.31	2.23	124.9	2.5			745.1	25.0

*1 Unit value index of manufactured exports from developed to developing countries.
Source: Commodity Markets and the Developing Countries, A World Bank Quarterly, August 1996.

*2 Apply the manufacturing unit value index to the price contingency for foreign currency (F.C.).

*3 Source: Quarterly Digest, Ministry of Food and Agriculture, March 1995.

*4 Price contingency for local currency (L.C.) was estimated at 25% per annum on the basis of an average combined consumer price index from 1985 to 1994.

FIGURE

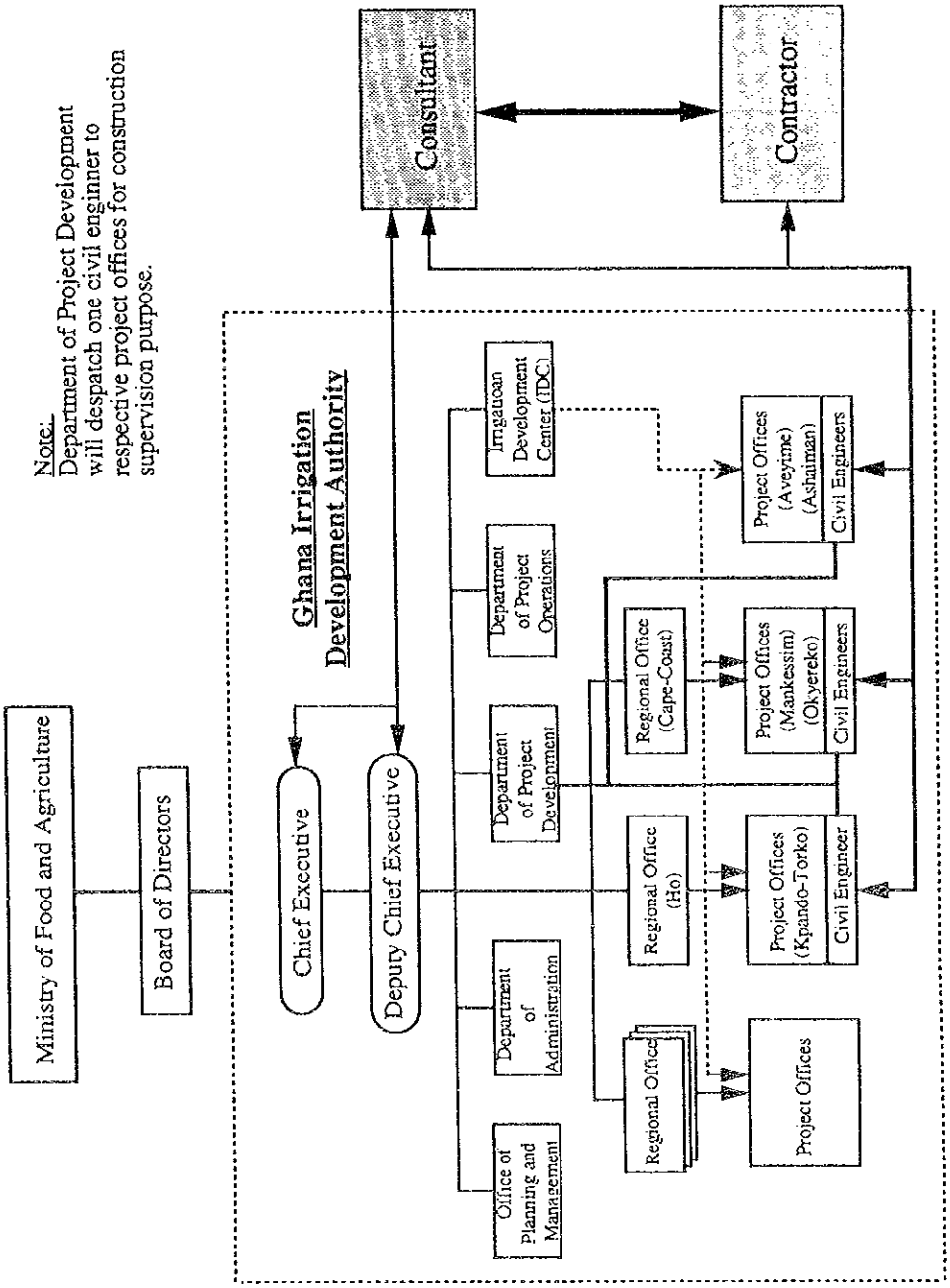


Figure I-1

Organization Chart of GIDA at Construction Time

THE STUDY ON THE REHABILITATION OF IRRIGATION PROJECTS IN THE REPUBLIC OF GHANA

Japan International Cooperation Agency

ANNEX-J

PROJECT EVALUATION

ANNEX - J

PROJECT EVALUATION

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ANNEX - J PROJECT EVALUATION

1. GENERAL

The objective of the project evaluation is to assess the economic and financial feasibility of the Rehabilitation of Irrigation Projects in the Republic of Ghana. For the economic evaluation, three measures of project worth, namely, economic internal rate of return (EIRR), benefit-cost ratio (B/C) and benefit minus cost (B-C) were examined. In addition, a sensitivity analysis in terms of EIRR was made to evaluate the economic viability of the Project against possible changes in project costs, benefits and build-up period. For the financial evaluation, the financial capability of the farmers societies and the capacity to pay of the farmers were analysed. The indirect benefits and socio-economic effects, which would impact on the regional and national economy, were also studied briefly.

The project evaluation was based on the following basic conditions and assumptions:

1) The useful life of the Project was taken as 50 years from project implementation;

2) For the calculation of EIRR, only direct benefits were counted, and no indirect and intangible benefits were taken into account;

3) The exchange rate of Ghanaian Cedi to US. Dollar (US$) was taken to be Cedis.1,700 equivalent to US$ 1.00 (as of December 1996);

4) Constant prices at 1996 level were used in the economic evaluation;

5) For the financial evaluation, no land acquisition cost was estimated in the project cost; and

6) The financial project cost includes all labour costs required for the construction works, and no consideration was paid to adopt the farmers' participatory system which does not pay labour charge.

For the item 5) mentioned above, GIDA has laid down a rule that lands required for the installation of project facilities such as pump stations and pipe line should be provided by the beneficiaries and no land compensation to those lands will be paid by the executing agency (GIDA). On the other hand, it was confirmed at the public meeting that the farmers in the project areas have accepted to provide those lands.

For the farmers' participatory system mentioned above 6), the farmers in the project areas stated at the public meeting that they could participate to construction works without reward. Although this is assessed highly in view of beneficiaries' self-reliance, its adoption into the construction is not practical. The progress of the construction by such volunteers' works will often delay, while the construction under the contract base to be applied to the Project should be finalised within the contract period. Therefore, it was assumed that the project offices or contractors would not adopt the farmers' participatory works, though it is proposed to hire the beneficiaries as many as possible.

2. ECONOMIC EVALUATION

2.1 Project Costs

The project costs for economic evaluation consist of construction costs, annual operation and maintenance (O&M) costs and replacement costs of equipment, and these economic costs can be obtained by applying standard conversion factors (SCF) and specific conversion factors to the financial costs. The factors used to convert financial costs into economic costs are presented in Table J-1, and the financial costs are estimated as shown in Tables J-2 to J-4.

The economic construction costs of the Project includes (i) direct construction cost, (ii) procurement cost of O&M equipment, (iii) engineering services cost, (iv) administration cost, and (v) physical contingency. These total costs are summarised below, and the details are presented in Table J-5. The construction costs for training facilities and O&M equipment used in the whole project were divided among the five projects according to each project size.

Summary of Economic Construction Costs

	Total Economic Costs (Cedis Million)	Economic Costs per Ha (US$/ha)
Ashaiman	810	8,500
Avcyime	2,163	13,400
Kpando-Torkor	4,983	18,900
Mankessim	2,712	18,500
Okyereko	2,057	14,900
Total	12,725	15,800

Note: 1996 Constant Prices US$ = Cedis 1,700

The economic O&M costs for project facilities were estimated as shown in Table J-6. The O&M costs includes (i) administration cost, (ii) operation cost of pumps, (iii) cost for O&M equipment, and (iv) materials and labour, etc. In the administration cost, the service cost of the PM offices is also included. To the farmers and the societies in the project areas, the PM offices will provide various supporting services such as agricultural extension and guidance for O&M of irrigation facilities. The O&M cost would be initially disbursed from the second year when operation would commence after the rehabilitation works.

Regarding the economic replacement cost, the steel gates, pump and O&M equipment installed in the project facilities would be replaced several times during the entire period of the project life. Their useful lives were estimated to be 20, 15 and 10 years, respectively (see Table J-7).

Price contingency were excluded from the project economic costs. Since EIRR of the Project is measured at constant prices, provision for price contingency was excluded from the project costs.

2.2 Project Benefits

2.2.1 Economic Prices of Farm Inputs and Outputs

Economic prices of farm inputs and outputs were estimated in order to evaluate the expected project benefits. Economic prices of trade goods such as rice, maize and fertilisers were estimated on the basis of the projected world market prices of these commodities as forecast by the World Bank[1] in the long term range for the period from 2000 to 2005. The details are shown in Table J-8. Non-trade goods such as vegetables and yam were valued at financial prices which were estimated on the basis of current market or farm gate prices prevailing in the

[1] The World Bank, Commodity Markets and the Developing Countries - World Bank Quarterly, August 1996.

project areas in December 1996. As for farm unskilled labour, it was valued at a shadow wage rate which is estimated at 0.5 (see Table J-1).

2.2.2 Project Benefits

The project benefits consist of irrigation benefits and negative benefits. The irrigation benefits will accrue primarily from increased crop production owing to stable irrigation water supply. Negative benefits will occur on lands to be occupied by the project facilities.

(1) Irrigation Benefits

The irrigation benefits are defined as the difference in net return from crops between the future with and the future without project conditions. The net return per ha for each crop under the future with and the future without project conditions was estimated as shown in Tables J-9 and J-10. Applying the net return per ha for each crop to the harvested area, the total net return to accrue from crop production was calculated for both the future with and without project conditions. The harvested areas of crops in the project areas are presented in Tables J-11 and J-12. The annual irrigation benefit at full development stage for each project are summarised as follows, and the details are shown in Table J-13. The benefits would start to accrue from the second year after completion of the rehabilitation works, and would gradually increase up to the 5th year.

Summary of Incremental Benefits

	Total Benefits (Cedis Million)	Benefits per Ha (US$/ha)
Ashaiman	275	2,890
Aveyime	486	3,010
Kpando-Torkor	1,212	4,600
Mankessim	565	3,860
Okyereko	357	2,590
Total	2,895	3,600

It was assumed that total net return under the future without project condition would remain at the present level. The present low yields are due mainly to water shortage. This problem in the area could not be solved radically without the implementation of the rehabilitation works. Moreover, almost no change in cultivated area of crops would be expected under the future without project condition, because it would be difficult to expand further the area from the present level without rehabilitation of existing irrigation facilities.

(2) Negative Benefits

The opportunity cost of the lands required for construction of project facilities was evaluated for the economic evaluation. These negative benefits had already been counted in the estimate of the irrigation benefit by deducting these areas from the paddy field under the future with project condition. Regarding the bush and grass lands, no opportunity cost in a national economic sense was evaluated, since there was no potential alternative.

2.3 Economic Evaluation

2.3.1 Internal Rate of Return

In order to compute the EIRR, B/C and B-C, the annual economic costs and benefits flows were firstly prepared as shown in Table J-14. From this table, the EIRRs of the projects

were estimated to be from 13.0 to 23.2%. The Ashaiman project indicates the highest EIRR followed by Kpando-Torkor project. In addition, the B/C and B-C at a discount rate of 10% were also estimated (see Table J-14) and the result are summarised below:

Economic Internal Rate of Return

Projects	EIRR (%)	B/C *1	B-C *1 (Cedis Million)
Ashaiman	23.2	2.46	1,112
Aveyime	15.7	1.53	1,041
Kpando-Torkor	16.9	1.61	2,849
Mankessim	14.5	1.38	1,065
Okyereko	13.0	1.28	530
Whole Project	16.0	1.55	6,597

*1 Discount rate: 10%

2.3.2 Sensitivity Analysis

Project sensitivity in terms of the EIRR was analysed in respect of changes in project costs and benefits. The result of analysis is summarised below.

(Unit: %)

Cost Increased	Benefit Decreased			Benefit 1 Year Delayed	Benefit 1 Year Delayed & Decreased	
	0%	-10%	-20%		-10%	-20%
Ashaiman						
0%	23.2	21.2	19.2	19.9	18.4	16.7
+10%	21.5	19.7	17.8	18.6	17.1	15.6
+20%	20.1	18.3	16.5	17.4	16.1	14.6
Aveyime						
0%	15.7	14.1	12.5	13.8	12.5	11.2
+10%	14.4	13.0	11.5	12.8	11.6	10.3
+20%	13.4	12.0	10.6	11.9	10.8	9.5
Kpando-Torkor						
0%	16.9	15.2	13.5	14.7	13.3	11.9
+10%	15.5	14.0	12.3	13.6	12.3	10.9
+20%	14.4	12.9	11.4	12.7	11.5	10.1
Mankessim						
0%	14.5	13.0	11.3	12.8	11.5	10.1
+10%	13.3	11.9	10.3	11.8	10.5	9.2
+20%	12.3	10.9	9.5	10.9	9.7	8.5
Okyereko						
0%	13.0	11.6	10.3	11.6	10.5	9.3
+10%	11.9	10.7	9.4	10.7	9.6	8.5
+20%	11.0	9.8	8.6	9.9	8.9	7.8
Whole Project						
0%	16.0	14.4	12.8	14.0	12.7	11.3
+10%	14.7	13.2	11.7	13.0	11.8	10.4
+20%	13.6	12.2	10.8	12.1	10.9	9.7

As seen of the above table, Ashaiman project is still marginal if the costs increase 20% and the benefits decrease 20%, while Okyereko project has less marginal under the same condition with the Ashaiman.

3. FINANCIAL EVALUATION

3.1 Financial Analysis of O&M by the Societies

After the completion of the project, O&M of all irrigation facilities will be handed over to the societies except for Kpando-Tokor project, and the costs of O&M will be bored from the irrigation service fees collected from the farmers. For Kpando-Tokor project, O&M will be shared between the PM Office and the farmers' society. The former office is responsible for O&M of the pump stations, and the latter society carry out O&M of the facilities below the pump stations. But O&M cost of all facilities including pump stations are covered by the irrigation service fees as well as other projects, except for personnel cost of pump attendants. In order to grasp the financial possibility for these O&M by the farmers' societies, the financial analysis was studied by preparing cash flow statements on the basis of an annual O&M costs, replacement costs and anticipated project revenue.

(1) O&M Costs

The annual O&M costs of the projects include (i) administration cost of the PM offices, (ii) operation and maintenance of pump stations, (iii) O&M of irrigation facilities in command areas. These annual OM costs are estimated as follows.

Annual O&M Costs

(Unit: Cedis 1,000)

	Ashaiman		Aveyime		K-Torkor		Mankessim		Okyereko	
	Gov.	Society	Gov.	Society	Gov.	Society	Gov.	Society	Gov.	Society
Administration cost*1	4,200	0	4,200	0	4,200	0	4,200	0	4,200	0
- Salary of project staff in PM office	3,700	-	3,700	-	3,700	-	3,700	-	3,700	-
- Operation of office	500	-	500	-	500	-	500	-	500	-
Pump operation	0	0	0	23,800	0	62,100	0	32,800	0	14,200
- Operation cost	-	-	-	8,300	-	20,400	-	12,100	-	7,800
- Maintenance cost	-	-		15,500	-	41,700	-	20,700	-	6,400
O&M of command areas	0	2,951	0	3,240	4,575	4,575	2,795	2,795	3,309	3,309
- O&M equipment	-	1,003	-	1,142	-	1,464	-	1,148	-	1,176
- Labour cost	-	*2	-	*2	-	*2	-	*2	-	*2
- Material cost	-	778	-	839	-	1,024	-	438	-	693
- Contract for repair	-	1,170	-	1,259	-	1,536	-	657	-	657
Management cost of societies	-	*3	-	*3	-	*3	-	*3	-	*3
Total	4,200	2,951	4,200	27,040	4,200	66,124	4,200	35,043	4,200	16,726
Irrigable area (ha)		56		95		155		86		81
(Cedis 1,000/ha)	75	53	44	285	27	427	49	407	52	206
(US$/ha)	44	31	26	168	16	251	29	239	31	121

*1 The government bears the administration cost of the PM Offices.
*2 Communal works by the beneficiaries
*3 The societies will requires some management costs such as business travelling of leaders and office supplies. These costs balance with the handling charge obtained from society's activities including cooperative purchasing of farm inputs, etc.
Note: US$1.00 = Cedis 1,700 1996 Constant prices

The estimation of these O&M costs was made under the following conditions.

1) After the implementation of rehabilitation works, the PM office will have powerful supporting services including extension works and guidance of O&M to the farmers. The Government would bear these administration costs. The remaining costs would be covered by the farmers' societies.

2) The beneficiaries would participate the maintenance works of irrigation systems and roads without reward, and the societies would manage such communal works. The labour cost is therefore not included in the O&M costs.

3) The societies will requires some management costs such as business travelling of leaders and office supplies. These costs balance with the handling charge obtained from society's activities including co-operative purchasing of farm inputs, etc.

4) Because the societies do not employ the full-time staff and all of society's activities are carried out by volunteers come from the beneficiaries, no personnel expense for the society's activities is included in the annual O&M costs.

(2) Replacement Costs

The steel gates, pump and O&M equipment would be replaced several times during the entire period of the project life. These costs are estimated in the following table.

Replacement Costs

(Unit: Cedis 1,000)

Items	(Years)	Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko
Procurement Cost						
- Pump & Accessories	15	-	501,000	1,252,000	687,000	255,000
- Steel Gate	20	9,000	32,000	7,000	-	15,000
- Intake Valve	20	6,000	-	-	-	-
- Steel Pipe	20	-	43,000	589,000	359,000	125,000
- Sprinkler System	10	-	63,000	598,000	326,000	-
- O&M Equipment	10	137,000	154,000	244,000	150,000	148,000
Annual Cost*1						
- Pump & Accessories		-	33,400	83,470	45,800	17,000
- Steel Gate		450	1,600	350	-	750
- Intake Valve		300	-	-	-	-
- Steel Pipe		-	2,150	29,450	17,950	6,250
- Sprinkler System		-	6,300	59,800	32,600	-
- O&M Equipment		13,700	15,400	24,400	15,000	14,800
Total		14,450	58,850	197,470	111,350	38,800
Area	(ha)	56	95	155	86	81
Annual Cost per Ha	(Cedis/ha)	258,000	619,500	1,274,000	1,294,800	479,000
	(US$/ha)	(152)	(364)	(749)	(762)	(282)

*1 Procurement cost / Useful life
Note: US$1.00 = Cedis 1,700 1996 Constant prices

(3) Project Revenue

As for the anticipated project revenue, this will accrue from irrigation service fees. In general, it is understood that irrigation service fee will be imposed on water users (farmers), and the collected fees will be spent for payment of O&M expenditure and replacement costs. The farmers' societies will manage these project revenue.

(4) Cash Flow Statement

The cash flow statements of the farmers' societies are presented in Table J-15. The analysis was made under the following condition: (i) all of the O&M and replacement costs are covered by the irrigation service fees collected by the farmers, and no subsidy is provided by the Government; and (ii) constant prices at 1996 level were used in the analysis of cash flow statement.

As the result of analyses, the societies in the project areas will require a considerable amount of annual O&M and replacement costs, which are estimated to be Cedis 17 - 263 million

as shown in the following table.

Annual Amount of Irrigation Service Fees to be Collected from the Farmers

(Unit: Cedis 1,000)

Projects	No. of Farmers	Annual O&M Costs Total	Annual O&M Costs Per Farmer	Annual Replacement Costs Total	Annual Replacement Costs Per Farmer	Total*2
Ashaiman	120	3,000	24 *1	14,400	120	144
Aveyime	95	27,000	284	58,900	620	904
K-Torkor	388	66,100	170	197,500	509	679
Mankessim	216	35,000	162	111,400	516	678
Okyereko	135	16,700	124	38,800	287	411

*1 IDC pays O&M costs of 2 ha.
*2 Amount of irrigation service fees to be collected from the farmers.
Note: 1996 Constant Prices

The societies collect these costs from the farmers as the irrigation service fees, and those annual amounts per farmer are estimated to be Cedis 140,000 - 900,000/year/farmer.

3.2 Capacity to Pay of Farmers

In order to assess the capacity to pay of farmers for the irrigation services fees, the analysis of their farm budget was made under the future with project condition. The result of analysis is as follows:

Farm Budget - With Project

(Unit: Cedis 1,000/farmer)

Items	Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko
(Holding Size: ha/farmer)	(0.45)	(1.00)	(0.40)	(0.40)	(0.60)
1) Gross Income	4,761	9,037	5,221	4,243	5,730
- Farm Income	3,398	7,139	4,208	3,596	4,505
- Non farm income*1	1,003	702	694	365	536
- Loans	360	1,196	319	282	689
2) Gross Outgoing	4,478	5,989	4,002	3,487	4,955
- Production Cost*2	695	1,962	703	555	1,219
- Living Expenses*3	3,355	2,604	2,919	2,596	2,916
- Loan Repayment	428	1,423	380	336	820
3) Capacity to Pay	283	3,048	1,219	756	775
Annual Repayment of Irrigation Service Fees					
Annual O&M Cost*4	24	284	170	162	124
Annual Replacement Cost*5	120	620	509	516	287
Total	144	904	679	678	411
% to Capacity to Pay					
Annual O&M Cost	8%	9%	14%	21%	16%
Annual Replacement Cost	42%	20%	42%	68%	37%
Total	51%	30%	56%	90%	53%

*1 50% decrease from present condition.
*2 Excluding family labour force.
*3 30% up from present condition.
*4 Excluding O&M cost of the PM Offices.
*5 Procurement cost / Useful life
Note: 1996 Constant Prices

The capacity to pay or net reserve of farmers would increase remarkably from the present condition to the future with project condition. As seen in the above table, the annual irrigation service fees occupy 30-50% of their capacity to pays, except for Mankessim project. From the result of the above farm budget analyses, it may be concluded that the payment of annual irrigation service fees after implementation of the project is possible for the farmers in the four (4) projects excluding Mankessim. In case of Mankessim project, the payment of irrigation service fees will check the further improvement and growth of their living standard, though its amount is within their capacity to pays. It will be necessary to give some subsidy to them in Mankessim project.

In addition, the farmers' capacity to pay of the irrigation service fees was studied on the

basis of their intention on its paying amount. At the public meeting, the following amounts were accepted by the farmers.

Allowable Amount of Irrigation Service Fees
accepted by the Farmers at Public Meeting

	Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko
Amounts accepted by the farmers at public meeting*					
Cedis/ha/season	100,000	263,500	375,000	250,000	100,000
Cedis/year/farmer	90,000	527,000	300,000	200,000	120,000
Holding size of a farmer (ha)	0.45	1.00	0.40	0.40	0.60

* November 1996

As seen in the above table, all irrigation service fees estimated by the project over the amounts accepted by the farmers. Although the result of farm budget analyses shows a possibility to pay full amount of irrigation services fees by all farmers, the societies will have a difficulty to collect fully these fees from the farmers. Therefore, it will be necessary to fill a gap between them by the government subsidy.

3.3 Case Study for the Government Subsidy

As discussed in the preceding sections (Sections 3.1 and 3.2), it will be necessary that the Government gives some subsidy to the farmers' societies. However, the Government has a limitation in its budget for providing of a big subsidy. In order to estimate reasonable amount of irrigation service fees and the government's subsidy from the standpoint of the capacity to pay of farmers, farmers' intention and the government's development budget, the following case studies were made:

Case-1: All replacement costs are subsidised by the Government, and farmers pay only annual O&M costs.
Case-2: Farmers pay their allowable amount accepted by the public meeting
Case-3: Farmers pay annual O&M costs and 30% of replacement costs
Case-4: Farmers pay annual O&M costs and 50% of replacement costs

The annual irrigation service fees per a farmer for each case is estimated as follows.

Annual Irrigation Service Fees for Each Case

(Unit: Cedis 1,000/year/farmer)

	Proportion		Paying Amount of Farmers				
	Farmers	Subsidy	Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko
Base Amount							
- Annual O&M Costs	100%	0%	24	284	170	162	124
- Annual Replacement Costs*1	100%	0%	120	620	509	516	287
- Total			144	904	679	678	411
Case-1							
- Annual O&M Costs	100%	0%	24	284	170	162	124
- Annual Replacement Costs*1	0%	100%	0	0	0	0	0
- Total			24	284	170	162	124
Case-2							
- Allowable amount*2			90	527	300	200	120
Case-3							
- Annual O&M Costs	100%	0%	24	284	170	162	124
- Annual Replacement Costs*1	30%	70%	36	186	153	155	86
- Total			60	470	323	317	210
Case-4							
- Annual O&M Costs	100%	0%	24	284	170	162	124
- Annual Replacement Costs*1	50%	50%	60	310	255	258	144
- Total			84	594	425	420	268

*1 Procurement cost / Useful Life
*2 Amount accepted by the farmers at public meeting.

Note: 1996 Constant Prices

On the basis of the above irrigation service fees for each case, the farm budget analyses were made as follows:

Case Study for Irrigation Service Fees

(Unit: Cedis 1,000/year/farmer)

	Farmers		Subsidy						
	O&M	R.C.*1	O&M	R.C.*1	Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko
(Holding Size: ha/farmer)					(0.45)	(1.00)	(0.40)	(0.40)	(0.60)
Capacity to pays of farmers					283	3,048	1,219	756	775
Irrigation Service Fees for Each Case									
Base	100%	100%	0%	0%	144	904	679	678	411
Case-1	100%	0%	0%	100%	24	284	170	162	124
Case-2	(Amounts accepted by farmers)				90	527	300	200	120
Case-3	100%	30%	0%	70%	60	470	323	317	210
Case-4	100%	50%	0%	50%	84	594	425	420	268
Proportion to Farmers' Capacity to Pays									
Base	100%	100%	0%	0%	51%	30%	56%	90%	53%
Case-1	100%	0%	0%	100%	8%	9%	14%	21%	16%
Case-2	(Amounts accepted by farmers)				32%	17%	25%	26%	15%
Case-3	100%	30%	0%	70%	21%	15%	26%	42%	27%
Case-4	100%	50%	0%	50%	30%	19%	35%	56%	35%

*1 Annual Replacement Cost (Procurement Cost / Useful Life)

As seen in the above table, the farmers in Aveyime project have a high capacity to pay the irrigation services fees, while the Mankessim farmers has a small capacity. The Aveyime farmers can pay its full amount, and the Mankessim farmers will require a considerable amount of the government's subsidy. For other three projects, some subsidy will be required.

On the other hand, the government' subsidy for each case is estimated as follows. The details are shown in Table J-16.

Year*1	Government Subsidy (Cedis Million) 1996 Constant Prices				Government's Development Expenditure*2 (Cedis Million) 1994 Constant Prices		Proportion of Government Subsidy to Agriculture*4			
	Case-1	Case-2	Case-3	Case-4	Agriculture*3	Whole*4	Case-1	Case-2	Case-3	Case-4
1	-	-	-	-	5,600	88,800	-	-	-	-
2	-	-	-	-	5,600	88,800	-	-	-	-
:	:	:	:	:	:	:	:	:	:	:
:	:	:	:	:	:	:	:	:	:	:
13	-	-	-	-	5,600	88,800	-	-	-	-
14	761	585	223	59	5,600	88,800	13.6%	10.4%	4.0%	1.1%
15	1,059	289	213	-	5,600	88,800	18.9%	5.2%	3.8%	-
16	-	-	-	-	5,600	88,800	-	-	-	-
17	-	-	-	-	5,600	88,800	-	-	-	-
18	-	-	-	-	5,600	88,800	-	-	-	-
19	942	901	716	363	5,600	88,800	16.8%	16.1%	12.8%	6.5%
20	1,753	1,349	1,369	761	5,600	88,800	31.3%	24.1%	24.4%	13.6%
21	-	-	-	-	5,600	88,800	-	-	-	-
22	-	-	-	-	5,600	88,800	-	-	-	-
23	-	-	-	-	5,600	88,800	-	-	-	-
24	1,275	1,156	1,012	828	5,600	88,800	22.8%	20.6%	18.1%	14.8%
25	1,730	1,363	1,346	1,089	5,600	88,800	30.9%	24.3%	24.0%	19.4%
26	-	-	-	-	5,600	88,800	-	-	-	-
:	:	:	:	:	:	:	:	:	:	:
:	:	:	:	:	:	:	:	:	:	:
33	-	-	-	-	5,600	88,800	-	-	-	-
34	1,703	1,543	1,214	880	5,600	88,800	30.4%	27.6%	21.7%	15.7%
35	2,812	2,078	2,043	1,530	5,600	88,800	50.2%	37.1%	36.5%	27.3%
36	-	-	-	-	5,600	88,800	-	-	-	-

*1 Year in order after commencement of the rehabilitation projects.
*2 Indicate annual development expenditure for economic services.
Source: (1) Quarterly Digest, Ministry of Food and Agriculture, March 1995
(2) The State of the Ghanaian Economy in 1994, University of Ghana, July 1995.
*3 Including agriculture, forestry and fishing, and indicate an average amount from 1992 to 1994.
*4 Indicate total amount of economic services, and an average amount from 1992 to 1994.

In case of Case-1, the government subsidy amounts to Cedis 760 - 2,810 million/year which account for 13 - 50% of the development expenditures for agriculture (including forestry and fishing) on the level of 1992-1994. The details of development expenditure are presented in Table J-17. Although the amount of subsidy should be decided by the Government of Ghana, it seems that there is a difficulty for investment of such big amounts which occupy about 50% of the development expenditure for agriculture. The Case-4 shows relatively small investment among the cases, and the estimated amounts of subsidy are below 30% of the expenditure. From the recent government policy like restructuring plan, such subsidy is desirable as small as possible, and the Case-4 is better than other cases.

As a result, it will be recommended to adopt the following subsidy to each project, taking into account the farmers' capacity to pay, amounts accepted by the farmers and the development budget of the government.

	Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko
Holding Size (ha/farmer)	0.45	1.00	0.40	0.40	0.60
Capacity to Pay of Farmers (Cedis 1,000/year/farmer)	283	3,048	1,219	756	775
Cases Adopted	Case-4	Base	Case-4	Case-3	Case-4
Proportion of Subsidy					
Farmers					
O&M Cost	100%	100%	100%	100%	100%
Replacement Cost	50%	100%	50%	30%	50%
Subsidy					
O&M Cost	0%	0%	0%	0%	0%
Replacement Cost	50%	0%	50%	70%	50%
Irrigation Service Fees (Cedis 1,000/year/farmer)					
O&M Cost	24	284	170	162	124
Replacement Cost	60	620	255	155	144
Total	84	904	425	317	268
% to Capacity to Pays	30%	30%	35%	42%	35%
Allowable Amounts of Farmers *1 (Cedis 1,000/year/farmer)	90	527	300	200	120

*1 Amounts accepted by farmers at public meeting. Note: 1996 Constant Prices

The farmers in Aveyime project will have a big payment capacity after implementation of the rehabilitation project, while the Mankessim farmers will have a small capacity. It is recommended that full amount of irrigation service fees including annual O&M costs and replacement costs is imposed on the farmers in Aveyime project, and a considerable amount of subsidy is provided to the farmers in Mankessim. As for the other three (3) projects, a half of replacement costs is subsidised by the Government in order to secure successful O&M by the societies.

With the exception of Aveyime project, all estimated irrigation service fees over the allowable amounts accepted by the farmers at the public meeting, but these are negotiable amounts with farmers. They have judged these allowable amounts mainly based on the crop incomes obtained from the present irrigation farming in the project areas. However, the Projects will provide complete and upgraded irrigation system with powerful extension services to the farmers, and their crop incomes under the projects will increase over the farmers' estimates made on the basis of the present condition. The project executing agency should explain them to take their full understanding on these irrigation service fees.

If the above government subsidy will be provided to the projects, its total amount is estimated in the following table. The estimated amounts account for 3-20% of the government's development expenditures for agriculture (including forestry and fishing) or 0.2-1.2% of total development expenditures for economic services (see Table J-17), and it may be possible for the investment of these amount by the Government.

Government Subsidy to be Required

(Unit: Cedis Million)

Year*1	Government Subsidy (1996 Constant Prices)						Government's Development Expenditure*2 1994 Constant Prices		Proportion of Subsidy
	Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko	Total	Agriculture*3	Whole*4	
	Case-4	Base	Case-4	Case-3	Case-4				(%)
1	-	-	-	-	-	-	5,600	88,800	-
:	:	:	:	:	:	:	:	:	:
:	:	:	:	:	:	:	:	:	:
13	-	-	-	-	-	-	5,600	88,800	-
14	59	-	-	108	-	166	5,600	88,800	3%
15	-	-	-	-	-	-	5,600	88,800	-
16	-	-	-	-	-	-	5,600	88,800	-
17	-	-	-	-	-	-	5,600	88,800	-
18	-	-	-	-	-	-	5,600	88,800	-
19	-	-	-	520	91	611	5,600	88,800	11%
20	-	-	513	-	-	513	5,600	88,800	9%
21	-	-	-	-	-	-	5,600	88,800	-
22	-	-	-	-	-	-	5,600	88,800	-
23	-	-	-	-	-	-	5,600	88,800	-
24	81	-	-	668	191	939	5,600	88,800	17%
25	-	-	944	-	-	944	5,600	88,800	17%
26	-	-	-	-	-	-	5,600	88,800	-
:	:	:	:	:	:	:	:	:	:
:	:	:	:	:	:	:	:	:	:
33	-	-	-	-	-	-	5,600	88,800	-
34	66	-	-	828	208	1,102	5,600	88,800	20%
35	-	-	1,106	-	-	1,106	5,600	88,800	20%
36	-	-	-	-	-	-	5,600	88,800	-

*1 Year in order after commencement of the rehabilitation projects.
*2 Indicate annual development expenditure for economic services.
Source: (1) Quarterly Digest, Ministry of Food and Agriculture, March 1995
(2) The State of the Ghanaian Economy in 1994, University of Ghana, July 1995.
*3 Includs agriculture, forestry and fishing, and indicate an average amount from 1992 to 1994.
*4 Indicate total amount of economic services, and an average amount from 1992 to 1994.

4. INDIRECT BENEFITS AND SOCIO-ECONOMIC IMPACTS

After implementation of the Project, various indirect benefits and socio-economic impacts are expected as mentioned below.

(1) Employment Opportunities

The Project would create a demand for farm labours due to the increased farming activity, more intensive use of land and higher agricultural production. In addition, the construction of the Project would increase employment opportunities in each project area. During the construction stage, the majority of workers would be unskilled labourers, and most of whom would come from farmers and ordinary labourers in and around the project area. The labour employment under the construction stage will be expected to reach over 32,000 man-days in total. All these would contribute to activate regional economy.

Further, the employees will gain more experience, technical know-how, and skill in various working fields and that would be applied to the future development in the rural area.

(2) Farmers' Income

After implementation of the Project, income of farmers estimated at 950 households is expected to increase considerably as a direct result of the increase in crop production. Such increase in income would contribute to improving farmers' living standards. Moreover, it is expected that farmers' purchasing power would increase along with improvement of their living standards, and this increased purchasing power would benefit the development of the regional economy.

(3) Marketing of Farm Inputs and Outputs

Future marketing in the area is likely expand as compared with the present condition. With anticipated higher agricultural production, more farm products could be marketed by the farmers and the proportion of sales would also increase relative to consumption. The merchants would have a larger turnover which could increase their incomes.

Marketing functions would be influenced by not only agricultural outputs but also farm input. It is estimated that when agricultural production develops as a result of the Project, the project area would be a good market for farm supplies. The farmers need to operate with farm supplies such as tools, equipment and bags. Both ends of marketing channels could, therefore, expect substantial beneficial impacts from the Project.

(4) Demonstration Effects and Development Supports to Other Irrigation Projects

The Project will include not only rehabilitation of the existing project facilities such as pumps, sprinklers, pipelines, concrete flumes, roads and buildings, but also development of adjacent area to the existing one mainly from viewpoints of effective use of limited water and land sources. This approach and also the well-planned irrigation, drainage and road systems for the Project will be useful for formulation of rehabilitation plan of other similar existing irrigation projects.

GIDA will hand over O & M of the project facilities to the farmers' society through transition period of 5 years. During this period, GIDA would learn many relevant matters on handing-over jobs, and such lessons learned will be reflected upon other projects, to realise smooth execution of hand-over jobs.

As mentioned above, 950 households would benefit from the development of the Project. Since family number in the project area is 6.8 persons on an average, about 6,500 persons would be benefited by development of the Project.

TABLES

Table J-1 Summary of Conversion Factors from Financial to Economic Values

1. Standard Conversion Factor (SCF)*1	93.5%
2. Specific Conversion Factors*1	
(1) Diesel	49.0%
(2) Heavy equipment	85.0%
(3) Pump	89.0%
(4) Agro-chemicals	78.0%
(5) Skilled labour*2	93.5%
(6) Unskilled labour*2	47.0%
(7) Farm machinery survices*3	71.5%
3. Conversion Factors for Project Cost	
(1) Construction Cost*3	
- Dam and intake	79.6%
- Irrigation system	79.6%
- Drainage system,	79.6%
- Related structure	79.6%
- Farm road	79.6%
- Buildings and other works	79.6%
(2) O&M equipment	85.0%
(3) Engineering services*4	93.5%
(4) Administration cost*4	93.5%
4. Conversion Factors for O&M Cost	
(1) Administration cost*4	93.5%
(2) Pump operation	
- Operation (Electricity)	89.0%
- Maintenance	89.0%
(3) O&M equipment	89.0%
(4) Material and labour, etc.	79.6%
5. Conversion Factors for Replacement Cost	89.0%

Remarks:

*1 Source: (1) Agricultural Sector Investment Project, The World Bank, November, 1993.
(2) Feasibility Report on Okyereko Small-Scale Pilot Irrigation Scheme, November 1991, GIDA.

*2 Skilled : Opportunity cost 100% x SCF 93.5%
Unskilled : Opportunity cost 50% x SCF 93.5%

*3 Conversion factors of farm machinery services and project cost were estimated as follows.

Farm Machinery	Component	Specific Factors	Accumulated
Equipment	50.0%	85.0%	42.5%
Diesel	40.0%	49.0%	19.6%
Operator	10.0%	93.5%	9.4%
Total	100.0%		71.5%

Project Cost	Component	Specific Factors	Accumulated
Material cost	70.0%	93.5%	65.5%
Labour cost	30.0%	47.0%	14.1%
Total	100.0%		79.6%

Table J-2 Financial Construction Costs

(unit: Cedis Million)

Items	Total	FY1997	FY1998	FY1999	FY2000
1 Ashaiman Project					
(1) Direct construction cost*1	887	0	444	443	0
(2) O & M equipment*2	319	0	319	0	0
(3) Engineering services (15%of F/C of (1))	133	40	67	26	0
(4) Administration cost (5% of (1))	44	0	22	22	0
Sub-total	1,383	40	852	491	0
(5) Physical contingency (10% of (1))	89	0	45	44	0
Total	1,472	40	897	535	0
2 Aveyime Project					
(1) Direct construction cost	1,852	0	0	1,297	555
(2) O & M equipment	113	0	0	113	0
(3) Engineering services (15%of F/C of (1))	278	83	56	83	56
(4) Administration cost (5% of (1))	93	0	0	65	28
Sub-total	2,336	83	56	1,558	639
(5) Physical contingency (10% of (1))	185	0	0	130	55
Total	2,521	83	56	1,688	694
3 Kpando-Torkor Project					
(1) Direct construction cost	4,400	0	0	2,640	1,760
(2) O & M equipment	176	0	0	176	0
(3) Engineering services (15%of F/C of (1))	660	198	132	198	132
(4) Administration cost (5% of (1))	220	0	0	132	88
Sub-total	5,456	198	132	3,146	1,980
(5) Physical contingency (10% of (1))	440	0	0	264	176
Total	5,896	198	132	3,410	2,156
4 Mankessim Project					
(1) Direct construction cost	2,350	0	1,410	940	0
(2) O & M equipment	150	0	150	0	0
(3) Engineering services (15%of F/C of (1))	353	106	177	70	0
(4) Administration cost (5% of (1))	118	0	71	47	0
Sub-total	2,971	106	1,808	1,057	0
(5) Physical contingency (10% of (1))	235	0	141	94	0
Total	3,206	106	1,949	1,151	0
5 Okyereko Project					
(1) Direct construction cost*3	1,761	0	881	880	0
(2) O & M equipment	148	0	148	0	0
(3) Engineering services (15%of F/C of (1))	264	79	132	53	0
(4) Administration cost (5% of (1))	88	0	44	44	0
Sub-total	2,261	79	1,205	977	0
(5) Physical contingency (10% of (1))	176	0	88	88	0
Total	2,437	79	1,293	1,065	0
6 Grand Total	15,532	506	4,327	7,849	2,850

*1 Including common training facility such as dormitories, lecture hall and dining hall (267,002,000 Cedis) in Ashaiman and Okyereko projects.

*2 Including common O & M equipment such as Backhoe and bus (209,000,000 Cedis).

*3 Including common training facility of lecture hall (20,672,000 Cedis).

Table J-3 Financial O&M Costs

(Unit: Cedis Thousand)

Items		Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko
Irrigable area (ha)	(ha)	56	95	155	86	81
(1) Administration cost		4,200	4,200	4,200	4,200	4,200
- Salary of project staff in PM office		3,700	3,700	3,700	3,700	3,700
- Operation cost of office		500	500	500	500	500
(2) Pump operation		-	23,800	62,100	32,800	14,200
- Operation cost		-	8,300	20,400	12,100	7,800
- Maintenance cost		-	15,500	41,700	20,700	6,400
(3) O&M of command areas		3,629	4,326	4,575	2,795	3,309
- O&M equipment		1,003	1,142	1,464	1,148	1,176
- Labour cost		678	1,086	551	516	783
- Material cost		778	839	1,024	438	693
- Contract for repair		1,170	1,259	1,536	657	657
Total		7,829	32,326	70,875	39,759	21,709
Cost per ha	(Cedis 1,000/ha)	140	340	457	462	268
	(US$/ha)	82	200	269	272	158

Remarks: US$1.00 = Cedis 1,700

Table J-4 Financial Replacement Costs

(Unit: Cedis Million)

Items	(Years)	Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko
(1) Pump & Accessories	15	-	501	1,252	687	255
(2) Steel Gate	20	9	32	7	-	15
(3) Intake Valve	20	6	-	-	-	-
(4) Steel Pipe	20	-	43	589	359	125
(5) Sprinkler System	10	-	63	598	326	-
(6) O&M Equipment	10	137	154	244	150	148

Table J-5 Economic Construction Costs

(unit: Cedis Million)

Items	Total	FY1997	FY1998	FY1999	FY2000
1 Ashaiman Project					
(1) Direct construction cost*	521	0	353	168	0
(2) O & M equipment*	115	0	115	0	0
(3) Engineering services (15%of F/C of (1))	91	27	46	18	0
(4) Administration cost (5% of (1))	31	0	21	10	0
Sub-total	758	27	535	196	0
(5) Physical contingency (10% of (1))	52	0	35	17	0
Total	810	27	570	213	0
2 Aveyime Project					
(1) Direct construction cost	1,520	0	0	1,032	488
(2) O & M equipment	132	0	0	132	0
(3) Engineering services (15%of F/C of (1))	269	80	54	80	54
(4) Administration cost (5% of (1))	90	0	0	61	29
Sub-total	2,011	80	54	1,305	571
(5) Physical contingency (10% of (1))	152	0	0	103	49
Total	2,163	80	54	1,408	620
3 Kpando-Torkor Project					
(1) Direct construction cost	3,577	0	0	2,101	1,476
(2) O & M equipment	207	0	0	207	0
(3) Engineering services (15%of F/C of (1))	630	189	126	189	126
(4) Administration cost (5% of (1))	210	0	0	123	87
Sub-total	4,625	189	126	2,621	1,689
(5) Physical contingency (10% of (1))	358	0	0	210	148
Total	4,983	189	126	2,831	1,837
4 Mankessim Project					
(1) Direct construction cost	1,912	0	1,122	790	0
(2) O & M equipment	160	0	160	0	0
(3) Engineering services (15%of F/C of (1))	337	101	169	66	0
(4) Administration cost (5% of (1))	112	0	65	47	0
Sub-total	2,521	101	1,517	903	0
(5) Physical contingency (10% of (1))	191	0	112	79	0
Total	2,712	101	1,629	982	0
5 Okyereko Project					
(1) Direct construction cost*	1,424	0	701	723	0
(2) O & M equipment	156	0	156	0	0
(3) Engineering services (15%of F/C of (1))	252	75	126	50	0
(4) Administration cost (5% of (1))	83	0	41	42	0
Sub-total	1,915	75	1,025	815	0
(5) Physical contingency (10% of (1))	142	0	70	72	0
Total	2,057	75	1,095	887	0
6 Grand Total	12,725	472	3,474	6,322	2,457

Note: * Common economic costs for O & M equipment such as Backhoe and Bus and training facility including dormitories, lecture hall in the Ashaiman and Okyereko areas were divided up among the five (5) projects according to each project size.

Table J-6 Economic O & M Costs

(Unit: Cedis Thousand)

Item		Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko
Irrigable area	(ha)	56	95	155	86	81
(1) Administration cost		3,927	3,927	3,927	3,927	3,927
(2) Pump operation		-	21,182	55,269	29,192	12,638
- Operation cost		-	7,387	18,156	10,769	6,942
- Maintenance cost		-	13,795	37,113	18,423	5,696
(3) O&M of command areas		2,983	3,550	3,780	2,305	2,745
- O&M equipment		893	1,016	1,303	1,022	1,047
- Labour cost		540	864	439	411	623
- Material cost		619	668	815	349	552
- Contract for repair		931	1,002	1,223	523	523
Total		6,910	28,659	62,976	35,424	19,310
Cost per ha	(Cedis 1,000/ha)	123	302	406	412	238
	(US$/ha)	72	178	239	242	140

Remarks: US$1.00 = Cedis 1,700

Table J-7 Economic Replacement Costs

(Unit: Cedis Million)

Item	(Year)	Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko
(1) Pump & accessories	15	-	446	1,114	611	227
(2) Gate	20	8	28	6	-	13
(3) Valve	20	5	-	-	-	-
(4) Pipeline	20	-	38	524	320	111
(5) Sprinkler set	10	-	56	532	290	-
(6) O & M equipment	10	122	137	217	134	132

Table J-8 Economic Price Structure (1/2)

Items	Import Parity Operation		US$/ton	Cedis/kg
Rice				
(1) Thai 5% broken, FOB Bangkok, 2005 (Constant 1990 price)*1*3			241	
(2) Adjusted to 1996 constant price	118.5%		286	
(3) Freight and insurance (Bangkok-Tema)		+	48	
(4) CIF at Tema port			334	
(5) Conversion to Cedi *2				567
(6) Port handling at 1% of CIF	1%	+		6
(7) Transportation (port to wholesaler)	2.5%	+		8
(8) Import margin at 2% of CIF	2%	+		7
(9) Ex-wholesaler				588
(10) Transport from Tema to Accra		+		29
(11) Wholesalers margin	3%	+		19
(12) Wholesale price at Accra				636
(13) Retailer margin at 4% of wholesale price	4%	+		25
(14) Retailer price at Accra				661
(15) Milling cost		-		20
(16) Conversion to paddy	65%			417
(16) Transportation (farm to mill)		-		10
(17) Economic farm gate price				407
Maize				
(1) Export price, FOB Gulf ports, 2005 (Constant 1990 price)*4			87	
(2) Adjusted to 1996 constant price	118.5%		103	
(3) Freight and insurance (Gulf ports-Tema)		+	48	
(4) CIF at Tema port			151	
(5) Conversion to Cedi *2				257
(6) Port handling at 1% of CIF	1%	+		3
(7) Transportation (port to wholesaler)	2.5%	+		4
(8) Import margin at 2% of CIF	2%	+		3
(9) Ex-wholesaler				267
(10) Transport from Tema to Accra		+		13
(11) Wholesalers margin	3%	+		8
(12) Wholesale price at Accra				288
(13) Retailer margin at 4% of wholesale price	4%	+		12
(14) Retailer price at Accra				300
(15) Local transportation		-		10
(16) Economic farm gate price				290

Remarks: *1 Projected price in 2005 at constant 1990 price
Source: The World Bank, Commodity Markets and the Developing Countries - A World Bank Quarterly, August 1996.
*2 Exchange rate: US$ 1.00 = Cedis 1,700
*3 Thai, white, milled, 5% broken, government standard, Board of Trade-posted price, FOB Bangkok.
*4 US, No. 2, yellow, FOB Gulf ports.

Table J-8 Economic Price Structure (2/2)

Items	Operation		Import Parity US$/ton	Import Parity Cedis/kg
Urea				
(1) Export price FOB Europe (1990 constant), bagged *1			130	
(2) Adjusted to 1996 constant price	118.5%		154	
(3) Freight and insurance		+	39	
(4) CIF at Tema port			193	
(5) Conversion to Cedi *2				328
(6) Port handling at 1% of CIF	1%	+		3
(7) Transportation (port to wholesaler)		+		8
(8) Import margin at 2% of CIF	2%	+		4
(9) Ex-wholesaler				343
(10) Transport from Tema to Accra		+		24
(11) Wholesalers margin	3%	+		11
(12) Wholesale price at Accra				378
(13) Retailer margin at 4% of wholesale price	4%	+		15
(14) Retailer price at Accra				393
(16) Transport from Accra to farmgate		+		10
(17) Economic farm gate price				403
(18) Nitrogen (46%)				876
TSP				
(1) Export price (1990 constant), FOB US Gulf, bulk *1			109	
(2) Adjusted to 1996 constant price	118.5%		129	
(3) Freight and insurance		+	39	
(4) CIF at Tema port			168	
(5) Conversion to Cedi *2				286
(6) Port handling at 1% of CIF	1%	+		3
(7) Transportation (port to wholesaler)		+		8
(8) Import margin at 2% of CIF	2%	+		3
(9) Ex-wholesaler				300
(10) Transport from Tema to Accra		+		24
(11) Wholesalers margin	3%	+		10
(12) Wholesale price at Accra				334
(13) Retailer margin at 4% of wholesale price	4%	+		13
(14) Retailer price at Accra				347
(16) Transport from Accra to farmgate		+		10
(17) Economic farm gate price				357
(18) Phosephate (45%)				793
Muriate of Potash				
(1) Export price (1990 constant), FOB Vancouver, bulk *1			94	
(2) Adjusted to 1996 constant price	118.5%		111	
(3) Freight and insurance		+	39	
(4) CIF at Tema port			150	
(5) Conversion to Cedi *2				256
(6) Port handling at 1% of CIF	1%	+		3
(7) Transportation (port to wholesaler)		+		8
(8) Import margin at 2% of CIF	2%	+		3
(9) Ex-wholesaler				270
(10) Transport from Tema to Accra		+		24
(11) Wholesalers margin	3%	+		9
(12) Wholesale price at Accra				303
(13) Retailer margin at 4% of wholesale price	4%	+		12
(14) Retailer price at Accra				315
(16) Transport from Accra to farmgate		+		10
(17) Economic farm gate price				325
(18) Potash (60%)				542
Compound Fertilizer	N	15%		131
	P2O5	15%		119
	K2O	15%		81
		Total		331
Ammonium Sulphate	N	20.5%		180

Remarks: *1 Projected price in 2005 at constant 1990 price
Source: The World Bank, Commodity Markets and the Developing Countries - A World Bank Quarterly, August 1995.
*2 Exchange rate: US$ 1.00 = Cedis 1,700

Table J-9 Economic Net Return per Hectare - Without Project (1/3)

Projects:		Ashaiman						Aveyime						Kpando							
		Maize		Paddy		Okra		Cassava		Maize		Hot Pepper		Cassava		Yam		Maize		Okra	
1. Gross Income																					
(1) Unit Yield	(t/ha)		0.6		3.7		6.0		4.1		0.6		0.5		7.0		4.1		2.0		10.0
(2) Unit Price	(CD/kg)		290		407		360		190		290		1,500		100		530		290		630
(3) Gross Income	(CD1,000)		174		1,506		2,160		779		174		750		700		2,173		580		6,300
		Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)
2. Gross Outgoing																					
(1) Seed	(kg)	25	14	121	46	7	61	600	39	18	8	6	38	1,015	23	506	100	30	20	24	114
(2) Fertilizers																					
Urea	(kg)	-	-	98	39	18	7	-	-	14	6	-	-	-	-	-	-	29	12	29	12
Ammonium sulfate	(kg)	-	-	93	17	32	6	-	-	6	1	-	-	-	-	-	-	83	15	262	47
Compound fertilizers	(kg)	42	14	212	70	211	70	20	7	20	7	-	-	-	-	-	-	74	24	262	87
(3) Agro-chemicals																					
Herbicide	(lit.)	-	-	5.29	35	-	-	-	-	-	-	-	-	-	-	-	-	0.33	4	0.29	3
Insecticide	(lit.)	-	-	1.47	16	7.75	90	-	-	-	-	-	-	-	-	-	-	0.13	2	22.35	272
Fungicide	(lit.)	-	-	-	-	0.25	1	-	-	-	-	-	-	-	-	-	-	-	-	2.47	18
(4) Farm Machinery	(hr)	8.33		11.76		7.06		1.71		2.02		20.00		2.50		2.35		4.21		5.06	
Own machine	(hr)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.58	6	-	-
Hired machine	(hr)	8.33	29	11.76	66	7.06	49	1.71	29	2.02	26	20.00	134	2.50	14	2.35	11	3.63	31	5.06	36
(5) Labour Requirement		25.2		103.9		164.8		95.9		78.4		365.0		94.8		124.4		111.5		361.4	
Family	(man-day)	15.8	27	35.2	60	48.3	82	86.2	112	78.0	101	305.0	394	56.8	70	48.5	60	73.0	90	193.4	239
Exchange	(man-day)	-	-	0.7	1	4.0	7	-	-	-	-	-	-	8.0	10	-	-	3.7	5	13.2	16
Hired	(man-day)	9.4	16	68.0	116	112.5	192	9.7	12	0.4	0	60.0	78	30.0	37	75.9	94	34.8	43	154.8	191
(6) Miscellaneous	5%		5		23		28		10		7		32		8		13		13		52
(7) Irrigation Service Fees			-		45		45		-		-		-		-		-		-		231
Total			105		534		638		209		156		676		162		278		265		1,318
3. Net Return			69		972		1,522		570		18		74		538		1,895		315		4,982

Source: Farm interview survey and field investigation by the Study Team and data obtained from the PM Offices.

Table J-9 Economic Net Return per Hectare - Without Project (2/3)

Projects:		Mankessim															
		Cassava		S. Potatoes		Maize		Egg Plant		Okra		Hot Pepper		Tomatoes		Water Melon		Sugarcane	
1. Gross Income																			
(1) Unit Yield	(t/ha)		16.0		10.0		1.9		12.80		4.83		1.0		2.2		7.67		62.5
(2) Unit Price	(CD/kg)		130		250		290		290		380		2,500		140		300		13
(3) Gross Income	(CD1.000)		2,080		2,500		551		3,712		1,835		2,500		308		2,301		813
		Q'ty	Value (CD1.000)	Q'ty	Value (CD1.000)	Q'ty	Value (CD1.000)	Q'ty	Value (CD1.000)	Q'ty	Value (CD1.000)	Q'ty	Value (CD1.000)	Q'ty	Value (CD1.000)	Q'ty	Value (CD1.000)	Q'ty	Value (CD1.000)
2. Gross Outgoing																			
(1) Seed	(kg)	500	13	375	99	23	14	0.5	18	2.2	31	1.0	14	0.3	6	1.0	34	563	49
(2) Fertilizers																			
Urea	(kg)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonium sulfate	(kg)	-	-	-	-	-	-	101	18	77	14	50	9	-	-	69	12	-	-
Compound fertilizers	(kg)	-	-	-	-	-	-	110	36	77	25	50	17	-	-	75	25	31	10
(3) Agro-chemicals																			
Herbicide	(lit.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Insecticide	(lit.)	-	-	-	-	-	-	2.55	23	3.22	20	1.63	9	0.09	1	2.84	30	-	-
Fungicide	(lit.)	-	-	-	-	-	-	0.64	19	0.36	35	-	5	0.14	1	2.57	22	-	-
(4) Farm Machinery	(hr)	-		14.69		2.67		11.11		15.00		8.75		5.45		10.28		-	
Own machine	(hr)	-	-	-	-	0.49	3	-	-	-	-	-	-	-	-	-	-	-	-
Hired machine	(hr)	-	-	14.69	29	2.18	13	11.11	41	15.00	43	8.75	31	5.45	14	10.28	24	-	-
(5) Labour Requirement		81.6		81.9		117.1		174.4		312.9		265.3		145.0		134.0		60.1	
Family	(man-day)	13.3	16	51.9	61	48.1	56	83.5	98	211.9	249	88.4	104	78.6	92	79.0	93	28.8	34
Exchange	(man-day)	-	-	-	-	2.9	4	-	-	25.5	30	-	-	7.3	9	1.2	1	-	-
Hired	(man-day)	68.3	80	30.0	35	66.1	78	90.9	107	75.5	89	176.9	208	59.1	70	53.8	63	31.3	37
(6) Miscellaneous	5%		5		11		8		18		27		20		10		15		7
(7) Irrigation Service Fees			-		-		-		45		89		89		-		45		-
Total			114		235		176		423		652		506		203		364		137
3. Net Return			1,966		2,265		375		3,289		1,183		1,994		105		1,937		676

Source: Farm interview survey and field investigation by the Study Team and data obtained from the PM Offices.

Table J-9 Economic Net Return per Hectare - Without Project (3/3)

Projects:		Okyereko									
		Cassava		Maize		Paddy		Tomatoes		Groundnuts	
1. Gross Income											
(1) Unit Yield	(t/ha)		4.4		2.3		3.75		4.4		1.3
(2) Unit Price	(CD/kg)		130		290		407		250		260
(3) Gross Income	(CD1.000)		572		667		1,526		1,100		338
		Q'ty	Value (CD1.000)	Q'ty	Value (CD1.000)	Q'ty	Value (CD1.000)	Q'ty	Value (CD1.000)	Q'ty	Value (CD1.000)
2. Gross Outgoing											
(1) Seed	(kg)	558	32	24	15	60	17	1.5	15	45	40
(2) Fertilizers											
Urea	(kg)	-	-	-	-	13	5	-	-	-	-
Ammonium sulfate	(kg)	-	-	9	2	113	20	-	-	-	-
Compound fertilizers	(kg)	-	-	18	6	225	74	156	52	-	-
(3) Agro-chemicals											
Herbicide	(lit.)	-	-	-	-	-	-	-	-	-	-
Insecticide	(lit.)	-	-	-	-	-	-	3.13	69	-	-
Fungicide	(lit.)	-	-	-	-	-	-	-	-	-	-
(4) Farm Machinery	(hr)	2.50		8.10		10.85		5.00		2.05	
Own machine	(hr)	-	-	-	-	-	-	-	-	-	-
Hired machine	(hr)	2.50	17	8.10	38	10.85	46	5.00	44	2.05	19
(5) Labour Requirement		106.7		112.0		124.7		72.6		117.3	
Family	(man-day)	106.7	157	80.5	118	39.3	58	57.6	85	84.3	124
Exchange	(man-day)	-	-	-	-	-	-	-	-	-	-
Hired	(man-day)	-	-	31.5	47	85.4	126	15.0	23	33.0	49
(6) Miscellaneous	5%		10		11		17		14		12
(7) Irrigation Service Fees			-		-		45		-		-
Total			216		237		408		302		244
3. Net Return			356		430		1,118		798		94

Source: Farm interview survey and field investigation by the Study Team and data obtained from the PM Offices.

Table J-10 Economic Net Return per Hectare under With Project (1/4)

Items			Ashaiman													
			Wet Paddy		Okra		Tomato		Onion		Watermelon		Maize		Cowpea/ Groundnut	
1. Gross Income																
Unit Yield		(t/ha)		6.0		12.0		15.0		18.0		15.0		3.0		2.0
Unit Price		(CD/kg)		407		360		600		520		300		290		380
Gross Income		(CD)		2,442		4,320		9,000		9,360		4,500		870		760
2. Production Cost	Unit	Price (CD)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)
1) Seed	(kg)		100	41	10	13	1	19	11	493	1	34	25	7	50	19
2) Fertilizers																
- Compound	(kg)	331	400	132	300	99	400	132	300	99	300	99	150	50		-
- SA	(kg)	180		-	300	54	300	54	250	45	250	45	125	23		-
- Urea	(kg)	403	200	81		-		-		-		-		-		-
3) Agro Chemicals																
- Herbicide																
Basagran	(lit.)	14,700	5.0	74		-		-		-		-		-		-
- Insecticide																
Krate 2.5E	(lit.)	19,500	3.0	59		-	2.5	49		-	2.5	49	3.0	59	2.5	49
Dursban 4 E	(lit.)	14,700		-		-		-		-		-		-		-
Furadan	(kg)	3,000		-		-		-		-		-		-		-
Acteilic	(lit.)	16,100		-	5.0	81		-	2.5	40		-		-		-
- Fungicide																
Topsion	(lit.)	-		-		-		-		-		-		-		-
Diathane M45	(kg)	6,900		-	3.0	21	2.5	17	2.0	14	2.5	17		-		-
Kocide	(lit.)	9,800		-		-		-		-		-		-		-
- Rodenticide																
Yosodion	(kg)	9,800	5.0	49	1.0	10		-		-		-		-		-
4) Machinery Power																
- Land preparation	(ha)	26,800	3	80	2	54	2	54	2	54	2	54	2	54	2	54
- Carting	(bag)	370	95	35	20	7		-		-		-		-		-
5) Labour Requirement			115		181		170		363		147		27		52	
- Family Labour	(m-m)	1,690	39	66	53	90	92	155	103	174	87	147	17	29	5	8
- Exchange	(m-m)	1,690	1	2	4	7	13	22	45	76	1	2		-		-
- Hired Labour	(m-m)	1,690	75	127	124	210	65	110	215	363	59	100	10	17	47	79
6) Miscellaneous	(5%)			37		32		31		68		27		12		10
Total				783		678		643		1,426		574		251		219
4 Net Return				1,659		3,642		8,357		7,934		3,926		619		541

Table J-10 Economic Net Return per Hectare under With Project (2/4)

Items			Aveyime													
			Wet Paddy		Dry Paddy		Maize		Cowpea/ Groundnut		Tomato/ H. Pepper		Okra		Onion	
1. Gross Income																
Unit Yield		(t/ha)		6.0		6.0		3.0		2.0		14.0		12.0		18.0
Unit Price		(CD/kg)		407		407		290		380		600		250		520
Gross Income		(CD)		2,442		2,442		870		760		8,400		3,000		9,360
2. Production Cost	Unit	Price (CD)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)
1) Seed	(kg)		100	41	100	41	25	7	50	24	1	19	8	49	11	493
2) Fertilizers																
- Compound	(kg)	331	400	132	400	132	150	50		-	400	132	300	99	300	99
- SA	(kg)	180		-		-	125	23		-	300	54	300	54	250	45
- Urea	(kg)	403	200	81	200	81		-		-		-		-		-
3) Agro Chemicals																
- Herbicide																
Basagran	(lit.)	14,700	5.0	74	5.0	74		-		-		-		-		-
- Insecticide																
Krate 2.5E	(lit.)	24,400	3.0	73	3.0	73	3.0	73	2.5	61	2.5	61		-		-
Dursban 4 E	(lit.)	4,900		-		-		-		-		-		-		-
Furadan	(kg)	3,000		-		-		-		-		-		-		-
Actellic	(lit.)	16,100		-		-		-		-		-	5.0	81	2.5	40
- Fungicide																
Topsion	(lit.)	-		-		-		-		-		-		-		-
Diathane M45	(kg)	4,900		-		-		-		-	2.5	12	3.0	15	2.0	10
Kocide	(kg)	9,800		-		-		-		-		-		-		-
- Rodenticide																
Yosodion	(kg)	9,800	5.0	49	5.0	49		-		-		-	1.0	10		-
4) Machinery Power																
- Land preparation	(ha)	26,800	3	80	3	80	2	54	2	54	2	54	2	54	2	54
- Carting	(bag)	370		-		-		-		-		-		-		-
5) Labour Requirement			124		124		86		72		170		255		363	
- Family Labour	(m-m)	1,320	39	51	39	51	86	114	36	48	92	121	131	173	103	136
- Exchange	(m-m)	1,320	2	3	2	3		-		-	13	17	8	11	45	59
- Hired Labour	(m-m)	1,320	83	110	83	110	0	-	36	48	65	86	116	153	215	284
6) Miscellaneous	(5%)			35		35		16		12		28		35		61
Total				729		729		337		247		584		734		1,281
4 Net Return				1,713		1,713		533		513		7,816		2,266		8,079

Table J-10 Economic Net Return per Hectare under With Project (3/4)

Items	Kpando-Torkor												Mankessim															
			Okra		Tomato/ H. Pepper		Onion/ Shallot		Maize		Cowpea/ Groundnut				Watermelon		Egg Plant		Okra		Onion/ Shallot		Maize		Cowpea/ Groundnut		S. Potatoes	
1. Gross Income																												
Unit Yield		(t/ha)		12.0		15.0		18.0		3.0		2.0		(t/ha)		15.0		15.0		12.0		18.0		3.0		2.0		20.0
Unit Price		(CD/kg)		630		600		520		290		380		(CD/kg)		300		290		380		520		330		380		250
Gross Income		(CD)		7,560		9,000		9,360		870		760		(CD)		4,500		4,350		4,560		9,360		990		760		5,000
2. Production Cost	Unit	Price (CD)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Unit	Price (CD)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)
1) Seed	(kg)		24	114	1	19	11	493	25	7	50	19	(kg)		1	34	0.5	18	2.2	31	2.2	493	25	8	50	19	375	99
2) Fertilizers																												
- Compound	(kg)	331	300	99	400	132	300	99	150	50		-	(kg)	331	300	99	300	99	300	99	300	99	150	50		-	100	33
- SA	(kg)	180	300	54	300	54	250	45	125	23		-	(kg)	180	250	45	300	54	300	54	250	45	125	23		-		-
- Urea	(kg)	403		-		-		-		-		-	(kg)	403		-		-		-		-		-		-		-
3) Agro Chemicals																												
- Herbicide																												
Basagran	(lit.)	-		-		-		-		-		-	(lit.)	-		-		-		-		-		-		-		-
- Insecticide																												
Krate 2.5E	(lit.)	24,400		-	2.5	61		-	3.0	73	2.5	61	(lit.)	14,700	2.5	37	2.5	37	2.5	37		-	3.0	44	2.5	37		-
Dursban 4 E	(lit.)	-		-		-		-		-		-	(lit.)	-		-		-		-		-		-		-		-
Furadan	(kg)	-		-		-		-		-		-	(kg)	-		-		-		-		-		-		-		-
Actellic	(lit.)	19,500	5.0	98		-	2.5	49		-		-	(lit.)	19,500		-		-		-	2.5	49		-		-		-
- Fungicide																												
Topsion	(kg)	-		-		-		-		-		-	(kg)	-		-		-		-		-		-		-		-
Diathane M45	(kg)	5,900	3.0	18	2.5	15	2.0	12		-		-	(kg)	5,900		-		-		-	2.0	12		-		-		-
Kocide	(kg)	-		-		-		-		-		-	(kg)	9,800	5.0	49	5.0	49	3.0	29		-		-		-		-
- Rodenticide																												
Yosodion	(kg)	9,800	1.0	10		-		-		-		-	(kg)	9,800		-		-	1.0	10		-		-		-		-
4) Machinery Power																												
- Land preparation	(ha)	26,800	2	54	2	54	2	54	2	54	2	54	(ha)	26,800	2	54	2	54	2	54	2	54	2	54	2	54	2	54
- Carting	(bag)	360		-		-		-		-		-	(bag)	360		-		-		-		-		-		-		-
5) Labour Requirement			398		170		363		83		72				147		192		344		363		129		72		90	
- Family Labour	(m-m)	1,220	213	260	92	112	103	126	21	26	36	44	(m-m)	1,180	87	103	92	109	233	275	103	122	53	63	36	42	57	67
- Exchange	(m-m)	1,220	15	18	13	16	45	55		-		-	(m-m)	1,180	1	1		-	28	33	45	53	3	4		-		-
- Hired Labour	(m-m)	1,220	170	207	65	79	215	262	62	76	36	44	(m-m)	1,180	59	70	100	118	83	98	215	254	73	86	36	42	33	39
6) Miscellaneous	(5%)			47		27		60		15		11	(5%)			25		27		36		59		17		10		15
Total				979		569		1,255		324		233				517		565		756		1,240		349		204		307
4 Net Return				6,581		8,431		8,105		546		527				3,983		3,785		3,804		8,120		641		556		4,693

Table J-10 Economic Net Return per Hectare under With Project (4/4)

Items			Okyereko													
			Wet Paddy		Dry Paddy		Tomatoes		Okra		Onion		Maize		Cowpea/ Groundnut	
1. Gross Income																
Unit Yield		(t/ha)		6.0		6.0		15.0		12.0		18.0		3.0		2.0
Unit Price		(CD/kg)		407		407		250		380		520		290		380
Gross Income		(CD)		2,442		2,442		3,750		4,560		9,360		870		760
2. Production Cost	Unit	Price (CD)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)	Q'ty	Value (CD1,000)
1) Seed	(kg)		100	41	100	41	1	19	8	49	11	493	25	7	50	19
2) Fertilizers																
- Compound	(kg)	331	400	132	400	132	400	132	300	99	300	99	150	50		-
- SA	(kg)	180		-		-	300	54	300	54	250	45	125	23		-
- Urea	(kg)	403	200	81	200	81		-		-		-		-		-
3) Agro Chemicals																
- Herbicide																
Basagran	(lit.)	14,700	5.0	74	5.0	74		-		-		-		-		-
- Insecticide																
Krate 2.5E	(lit.)	19,500	3.0	59	3.0	59	2.5	49		-		-	3.0	59	2.5	49
Dursban 4 E	(lit.)	-		-		-		-		-		-		-		-
Furadan	(kg)	-		-		-		-		-		-		-		-
Actellic	(lit.)	16,100		-		-		-	5.0	81	2.5	40		-		-
- Fungicide																
Topsion	(lit.)	-		-		-		-		-		-		-		-
Diathane M45	(kg)	5,900		-		-	2.5	15	3.0	18	2.0	12		-		-
Kocide	(kg)	-		-		-		-		-		-		-		-
- Rodenticide																
Yosodion	(kg)	9,800	5.0	49	5.0	49		-	1.0	10		-		-		-
4) Machinery Power																
- Land preparation	(ha)	26,800	3.0	80	3.0	80	2.0	54	2.0	54	2.0	54	2.0	54	2.0	54
- Carting	(bag)	360		-		-		-		-		-		-		-
5) Labour Requirement			137		137		80		255		363		124		72	
- Family Labour	(m-m)	1,460	43	63	43	63	63	92	131	191	103	150	89	130	36	53
- Exchange	(m-m)	1,460		-		-		-	8	12	45	66		-		-
- Hired Labour	(m-m)	1,460	94	137	94	137	17	25	116	169	215	314	35	51	36	53
6) Miscellaneous	(5%)			36		36		22		37		64		19		11
Total				752		752		462		774		1,337		393		239
4 Net Return				1,690		1,690		3,288		3,786		8,023		477		521

Table J-11 Cropping Area under Without Project

(Unit: ha)

Projects	Ashaiman	Aveyime	K-Torkor	Mankessim	Okyereko	Total
1. Present Condition	148.0	150.0	356.0	256.0	111.0	1,021.0
(1) Developed Area	130.0	63.0	40.0	17.0	39.0	289.0
(2) Undeveloped Area	18.0	87.0	316.0	239.0	72.0	732.0
2. Area covered by the Rehabilitation Project	56.0	95.0	155.0	86.0	81.0	473.0
Existing	56.0	63.0	13.0	17.0	39.0	188.0
Expantion	0.0	32.0	142.0	69.0	42.0	285.0
3. Cultivated Area of Crops	66.2	43.2	41.1	43.3	60.6	254.4
(1) Developed Area*2	66.2	28.7	13.0	31.6	21.6	161.1
Irrigated	59.0	-	13.0	26.4	21.6	120.0
Okra	19.3	-	13.0	3.5	-	35.8
Egg Plant	-	-	-	10.8	-	10.8
Water melon	-	-	-	12.1	-	12.1
Hot Pepper	-	-	-	*4	-	*4
Paddy	39.7	-	-	-	21.6	61.3
Rainfed	7.2	28.7	-	5.2	-	41.1
Cassava	-	13.3	-	-	-	13.3
Sweet Potatoes	-	-	-	5.2	-	5.2
Maize	7.2	15.4	-	-	-	22.6
Tomatoes	-	-	-	*4	*4	*4
Hot pepper	-	*4	-	-	-	*4
(2) Undeveloped Area (Rainfed) *3	0.0	14.5	28.1	11.7	39.0	93.3
Cassava	-	6.7	3.7	0.8	4.8	16.0
Yam	-	-	3.2	-	-	3.2
Sweet Potatoes	-	-	-	2.0	-	2.0
Maize	-	7.8	21.2	5.4	22.2	56.6
Groundnuts	-	-	-	-	8.8	8.8
Tomatoes	-	-	-	1.5	3.2	4.7
Hot pepper	-	-	-	1.0	-	1.0
Sugarcane	-	-	-	1.0	-	1.0

*1 Figures in the Ashaiman area include crop cultivation areas in both the right and the left banks.
*2 Data obtained from PM Offices
*3 These figures were estimated on the basis of the topographic map (1/5000) prepared in 1996 and the result of farm interview survey carried out by the Survey Team in 1995.
*4 Negligibly small
Note: In addition to the crops mentioned in the above table, farmers have cultivated various crops in the out side project area under the rainfed condition.

Table J-12 Cropping Area under With Project

	Ashaiman*1	Aveyime	K-Torkor	Mankessim	Okyereko	Total
(1) Project Area (ha)	54.0	95.0	155.0	86.0	81.0	471.0
(2) Cropping Intensity (%)	200%	200%	200%	200%	200%	200%
(3) Cropping Area (ha)						
Wet Paddy	10.8	48.0	-	-	38.9	97.7
Dry Paddy	-	48.0	-	-	38.9	86.9
Okra	10.8	11.7	38.8	21.5	10.5	93.3
Tomato/Pepper	10.8	11.8	38.8	-	10.5	71.9
Egg Plant	-	-	-	21.5	-	21.5
Onion	10.8	23.5	77.4	21.5	21.1	154.3
Water melon	21.6	-	-	21.5	-	43.1
Sweet Potatoes	-	-	-	43.0	-	43.0
Maize	21.6	23.5	77.5	21.5	21.1	165.2
Cowpea/Groundnut	21.6	23.5	77.5	21.5	21.0	165.1
Total	108.0	190.0	310.0	172.0	162.0	942.0

*1 Two (2) ha of experimental farm in IDC were excluded.

Table J-13 Economic Benefits

Projects	Ashaiman			Aveyime			Kpando-Torkor			Mankessim			Okyereko		
	Area (ha)	N.R. (Cedis 10^3)	Value (Cedis 10^6)	Area (ha)	N.R. (Cedis 10^3)	Value (Cedis 10^6)	Area (ha)	N.R. (Cedis 10^3)	Value (Cedis 10^6)	Area (ha)	N.R. (Cedis 10^3)	Value (Cedis 10^6)	Area (ha)	N.R. (Cedis 10^3)	Value (Cedis 10^6)
1. Land Use															
1) Present	148			150			356			256			111		
Developed	130			63			40			17			40		
Undeveloped	18			87			316			239			71		
2) Without Project	148			150			356			256			121		
Developed	130			63			40			17			60		
Undeveloped	18			87			316			239			61		
3) With Project	148			150			356			256			111		
Irrigated	56			95			155			86			81		
Undeveloped	74			55			201			170			30		
			*1												
2. Benefit Without Project	66.2		68	43.2		12	41.1		80	43.3		87	60.6		40
1) Developed Area	66.2		68	28.7		8	13.0		65	31.6		75	21.6		24
Irrigated															
Okra	19.3	1,522	29	-	-	-	13.0	4,982	65	3.5	1,183	4	-	-	-
Egg Plant	-	-	-	-	-	-	-	-	-	10.8	3,289	36	-	-	-
Water melon	-	-	-	-	-	-	-	-	-	12.1	1,937	23	-	-	-
Hot Pepper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paddy	39.7	972	39	-	-	-	-	-	-	-	-	-	21.6	1,118	24
Rainfed															
Cassava	-	-	-	13.3	570	8	-	-	-	-	-	-	-	-	-
Sweet Potatoes	-	-	-	-	-	-	-	-	-	5.2	2,265	12	-	-	-
Maize	7.2	69	0	15.4	18	0	-	-	-	-	-	-	-	-	-
Tomatoes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot pepper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2) Undeveloped Area (Rainfed)	0.0		0	14.5		4	28.1		15	11.7		12	39.0		16
Cassava	-	-	-	6.7	570	4	3.7	538	2	0.8	1,966	2	4.8	356	2
Yam	-	-	-	-	-	-	3.2	1,895	6	-	-	-	-	-	-
Sweet Potatoes	-	-	-	-	-	-	-	-	-	2.0	2,265	5	-	-	-
Maize	-	-	-	7.8	18	0	21.2	315	7	5.4	375	2	22.2	430	10
Groundnuts	-	-	-	-	-	-	-	-	-	-	-	-	8.8	94	1
Tomatoes	-	-	-	-	-	-	-	-	-	1.5	105	0	3.2	798	3
Hot pepper	-	-	-	-	-	-	-	-	-	1.0	1,994	2	-	-	-
Sugarcane	-	-	-	-	-	-	-	-	-	1.0	676	1	-	-	-
			*2												
3. Benefit With Project	108.0		343	190.0		498	310.0		1,292	172.0		652	162.0		397
Wet Paddy	10.8	1,659	18	48.0	1,713	82	-	-	-	-	-	-	38.9	1,690	66
Dry Paddy	-	-	-	48.0	1,713	82	-	-	-	-	-	-	38.9	1,690	66
Okra	10.8	3,642	39	11.7	2,266	27	38.8	6,581	255	21.5	3,804	82	10.5	3,786	40
Tomato/Pepper	10.8	8,357	90	11.8	7,816	92	38.8	8,431	327	-	-	-	10.5	3,288	35
Egg Plant	-	-	-	-	-	-	-	-	-	21.5	3,785	81	-	-	-
Onion	10.8	7,934	86	23.5	8,079	190	77.4	8,105	627	21.5	8,120	175	21.1	8,023	169
Water melon	21.6	3,926	85	-	-	-	-	-	-	21.5	3,983	86	-	-	-
Sweet Potatoes	-	-	-	-	-	-	-	-	-	43.0	4,693	202	-	-	-
Maize	21.6	619	13	23.5	533	13	77.5	546	42	21.5	641	14	21.1	477	10
Cowpea/Groundnut	21.6	541	12	23.5	513	12	77.5	527	41	21.5	556	12	21.0	521	11
4. Incremental Benefit (Cedi Million)			275			486			1,212			565			357
(US$/ha)			2,889			3,009			4,600			3,865			2,593

*1 Include all benefits accrued from the right and the left bank areas.

*2 Include benefits only in the left bank area. All farmers in the right bank area transfer to the left bank area. area, and it was assumed that no farming activities are carried out in the right bank area.

Note: N.R. = Net Return per Hectare

Table J-14 Economic Internal Rate of Return

(Unit: Million Cedis)

Year		Ashaiman					Aveyime					Kpando-Torkor					Mankessim					Okyereko					Whole Project				
		(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
1997	1	27				-27	80				-80	189				-189	101				-101	75				-75	472				-472
1998	2	570				-570	54				-54	126				-126	1,629				-1,629	1,095				-1,095	3,474				-3,474
1999	3	213				-213	1,408				-1,408	2,831				-2,831	982				-982	887				-887	6,322				-6,322
2000	4		7		165	158	620				-620	1,837				-1,837		35		339	304		19		214	195	2,457	61		718	-1,800
2001	5		7		193	186		29		292	263		63		727	664		35		396	361		19		250	231		153		1,858	1,705
2002	6		7		220	213		29		340	311		63		848	785		35		452	417		19		286	267		153		2,146	1,993
2003	7		7		248	241		29		389	360		63		970	907		35		509	474		19		321	302		153		2,437	2,284
2004	8		7		275	268		29		437	408		63		1,091	1,028		35		565	530		19		357	338		153		2,725	2,572
2005	9		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2006	10		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2007	11		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2008	12		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2009	13		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2010	14		7	122	275	146		29		486	457		63		1,212	1,149		35	424	565	106		19	132	357	206		153	678	2,895	2,064
2011	15		7		275	268		29	193	486	264		63	749	1,212	400		35		565	530		19		357	338		153	942	2,895	1,800
2012	16		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2013	17		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2014	18		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2015	19		7		275	268		29		486	457		63		1,212	1,149		35	611	565	-81		19	227	357	111		153	838	2,895	1,904
2016	20		7		275	268		29	446	486	11		63	1,114	1,212	35		35		565	530		19		357	338		153	1,560	2,895	1,182
2017	21		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2018	22		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2019	23		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2020	24		7	135	275	133		29		486	457		63		1,212	1,149		35	744	565	-214		19	256	357	82		153	1,135	2,895	1,607
2021	25		7		275	268		29	259	486	198		63	1,279	1,212	-130		35		565	530		19		357	338		153	1,538	2,895	1,204
2022	26		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2023	27		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2024	28		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2025	29		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2026	30		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2027	31		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2028	32		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2029	33		7		275	268		29		486	457		63		1,212	1,149		35	1,035	565	-505		19	359	357	-21		153	1,516	2,895	1,226
2030	34		7	122	275	146		29		486	457		63	1,863	1,212	-714		35		565	530		19		357	338		153	2,502	2,895	240
2031	35		7		275	268		29	639	486	-182		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2032	36		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2033	37		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2034	38		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2035	39		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2036	40		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2037	41		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2038	42		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2039	43		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2040	44		7	135	275	133		29		486	457		63		1,212	1,149		35	744	565	-214		19	256	357	82		153	1,135	2,895	1,607
2041	45		7		275	268		29	259	486	198		63	1,279	1,212	-130		35		565	530		19		357	338		153	1,538	2,895	1,204
2042	46		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2043	47		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2044	48		7		275	268		29		486	457		63		1,212	1,149		35		565	530		19		357	338		153		2,895	2,742
2045	49		7		275	268		29		486	457		63		1,212	1,149		35	611	565	-81		19	227	357	111		153	838	2,895	1,904
2046	50		7		275	268		29	446	486	11		63	1,114	1,212	35		35		565	530		19		357	338		153	1,560	2,895	1,182
		EIRR				23.2%	EIRR				15.7%	EIRR				16.9%	EIRR				14.5%	EIRR				13.0%	EIRR				16.0%
		B/C (10%)				2.46	B/C (10%)				1.53	B/C (10%)				1.61	B/C (10%)				1.38	B/C (10%)				1.28	B/C (10%)				1.55
		B-C (10%)				1,112	B-C (10%)				1,041	B-C (10%)				2,849	B-C (10%)				1,065	B-C (10%)				530	B-C (10%)				6,597

Remarks: (1) Project Cost, (2) O&M Cost, (3) Replacement Cost, (4) Benefit, (5) Balance

Table J-15 Cash Flow Statement (1/3)

(Unit: Cedis Million)

Year	Ashaiman Project									Aveyime Project								
	Cash Outflow				Cash Inflow					Cash Outflow				Cash Inflow				
	Capital Cost *1	Total O&M Cost*2	Replace-ment Cost	Total	Const-ruction Fund*1	Revenue*3 O&M	Revenue*3 Replace-ment*4	Govern-ment Subsidy	Total	Balance	Capital Cost *1	Total O&M Cost*2	Replace-ment Cost	Total	Const-ruction Fund*1	Revenue*3 O&M	Revenue*3 Replace-ment*4	Govern-ment Subsidy	Total	Balance
1	(40.0)	-	-	-	(40.0)	-	-	-	-	-	(83.0)	-	-	-	(83.0)	-	-	-	-	-
2	(897.0)	-	-	-	(897.0)	-	-	-	-	-	(56.0)	-	-	-	(56.0)	-	-	-	-	-
3	(535.0)	-	-	-	(535.0)	-	-	-	-	-	(1,688.0)	-	-	-	(1,688.0)	-	-	-	-	-
4	-	3.0	-	3.0	-	3.0	-	-	3.0	-	(694.0)	-	-	-	(694.0)	-	-	-	-	-
5	-	3.0	-	3.0	-	3.0	14.4	-	17.4	14.4	-	27.0	-	27.0	-	27.0	-	-	27.0	-
6	-	3.0	-	3.0	-	3.0	14.4	-	17.4	28.8	-	27.0	-	27.0	-	27.0	58.0	-	85.0	58.0
7	-	3.0	-	3.0	-	3.0	14.4	-	17.4	43.2	-	27.0	-	27.0	-	27.0	58.0	-	85.0	116.0
8	-	3.0	-	3.0	-	3.0	14.4	-	17.4	57.6	-	27.0	-	27.0	-	27.0	58.0	-	85.0	174.0
9	-	3.0	-	3.0	-	3.0	14.4	-	17.4	72.0	-	27.0	-	27.0	-	27.0	58.0	-	85.0	232.0
10	-	3.0	-	3.0	-	3.0	14.4	-	17.4	86.4	-	27.0	-	27.0	-	27.0	58.0	-	85.0	290.0
11	-	3.0	-	3.0	-	3.0	14.4	-	17.4	100.8	-	27.0	-	27.0	-	27.0	58.0	-	85.0	348.0
12	-	3.0	-	3.0	-	3.0	14.4	-	17.4	115.2	-	27.0	-	27.0	-	27.0	58.0	-	85.0	406.0
13	-	3.0	-	3.0	-	3.0	14.4	-	17.4	129.6	-	27.0	-	27.0	-	27.0	58.0	-	85.0	464.0
14	-	3.0	137.0	140.0	-	3.0	14.4	-	17.4	7.0	-	27.0	-	27.0	-	27.0	58.0	-	85.0	522.0
15	-	3.0	-	3.0	-	3.0	14.4	-	17.4	21.4	-	27.0	217.0	244.0	-	27.0	58.0	-	85.0	363.0
16	-	3.0	-	3.0	-	3.0	14.4	-	17.4	35.8	-	27.0	-	27.0	-	27.0	58.0	-	85.0	421.0
17	-	3.0	-	3.0	-	3.0	14.4	-	17.4	50.2	-	27.0	-	27.0	-	27.0	58.0	-	85.0	479.0
18	-	3.0	-	3.0	-	3.0	14.4	-	17.4	64.6	-	27.0	-	27.0	-	27.0	58.0	-	85.0	537.0
19	-	3.0	-	3.0	-	3.0	14.4	-	17.4	79.0	-	27.0	-	27.0	-	27.0	58.0	-	85.0	595.0
20	-	3.0	-	3.0	-	3.0	14.4	-	17.4	93.4	-	27.0	501.0	528.0	-	27.0	58.0	-	85.0	152.0
21	-	3.0	-	3.0	-	3.0	14.4	-	17.4	107.8	-	27.0	-	27.0	-	27.0	58.0	-	85.0	210.0
22	-	3.0	-	3.0	-	3.0	14.4	-	17.4	122.2	-	27.0	-	27.0	-	27.0	58.0	-	85.0	268.0
23	-	3.0	-	3.0	-	3.0	14.4	-	17.4	136.6	-	27.0	-	27.0	-	27.0	58.0	-	85.0	326.0
24	-	3.0	152.0	155.0	-	3.0	14.4	-	17.4	-1.0	-	27.0	-	27.0	-	27.0	58.0	-	85.0	384.0
25	-	3.0	-	3.0	-	3.0	14.4	-	17.4	13.4	-	27.0	292.0	319.0	-	27.0	58.0	-	85.0	150.0
26	-	3.0	-	3.0	-	3.0	14.4	-	17.4	27.8	-	27.0	-	27.0	-	27.0	58.0	-	85.0	208.0
27	-	3.0	-	3.0	-	3.0	14.4	-	17.4	42.2	-	27.0	-	27.0	-	27.0	58.0	-	85.0	266.0
28	-	3.0	-	3.0	-	3.0	14.4	-	17.4	56.6	-	27.0	-	27.0	-	27.0	58.0	-	85.0	324.0
29	-	3.0	-	3.0	-	3.0	14.4	-	17.4	71.0	-	27.0	-	27.0	-	27.0	58.0	-	85.0	382.0
30	-	3.0	-	3.0	-	3.0	14.4	-	17.4	85.4	-	27.0	-	27.0	-	27.0	58.0	-	85.0	440.0
31	-	3.0	-	3.0	-	3.0	14.4	-	17.4	99.8	-	27.0	-	27.0	-	27.0	58.0	-	85.0	498.0
32	-	3.0	-	3.0	-	3.0	14.4	-	17.4	114.2	-	27.0	-	27.0	-	27.0	58.0	-	85.0	556.0
33	-	3.0	-	3.0	-	3.0	14.4	-	17.4	128.6	-	27.0	-	27.0	-	27.0	58.0	-	85.0	614.0
34	-	3.0	137.0	140.0	-	3.0	14.4	-	17.4	6.0	-	27.0	-	27.0	-	27.0	58.0	-	85.0	672.0
35	-	3.0	-	3.0	-	3.0	14.4	-	17.4	20.4	-	27.0	718.0	745.0	-	27.0	58.0	-	85.0	12.0
36	-	3.0	-	3.0	-	3.0	14.4	-	17.4	34.8	-	27.0	-	27.0	-	27.0	58.0	-	85.0	70.0

*1 Capital funds of construction are arranged by the Government of Ghana.
*2 Annual O&M costs include operation of pump and O&M of command areas, and the service costs of the PM office are not included.
*3 Revenue from irrigation service fees to be collected from the beneficiaries.
*4 Replacement cost / useful life
Note: The constant prices at 1996 level were used in the analyses of the cash flow statement.

Table J-15 Cash Flow Statement (2/3)

(Unit: Cedis Million)

Year	Kpando-Torkor Project										Mankessim Project									
	Cash Outflow				Cash Inflow					Balance	Cash Outflow				Cash Inflow					Balance
	Capital Cost *1	Total O&M Cost*2	Replace-ment Cost	Total	Const-ruction Fund*1	Revenue*3 O&M	Revenue*3 Replace-ment*4	Govern-ment Subsidy	Total		Capital Cost *1	Total O&M Cost*2	Replace-ment Cost	Total	Const-ruction Fund*1	Revenue*3 O&M	Revenue*3 Replace-ment*4	Govern-ment Subsidy	Total	
1	(198.0)	-	-	-	(198.0)	-	-	-	-	-	(106.0)	-	-	-	(106.0)	-	-	-	-	-
2	(132.0)	-	-	-	(132.0)	-	-	-	-	-	(1,949.0)	-	-	-	(1,949.0)	-	-	-	-	-
3	(3,410.0)	-	-	-	(3,410.0)	-	-	-	-	-	(1,151.0)	-	-	-	(1,151.0)	-	-	-	-	-
4	(2,156.0)	-	-	-	(2,156.0)	-	-	-	-	-	-	35.0	-	35.0	-	35.0	-	-	35.0	-
5	-	66.1	-	66.1	-	66.1	-	-	66.1	-	-	35.0	-	35.0	-	35.0	111.3	-	146.3	111.3
6	-	66.1	-	66.1	-	66.1	197.0	-	263.1	197.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	222.6
7	-	66.1	-	66.1	-	66.1	197.0	-	263.1	394.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	333.9
8	-	66.1	-	66.1	-	66.1	197.0	-	263.1	591.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	445.2
9	-	66.1	-	66.1	-	66.1	197.0	-	263.1	788.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	556.5
10	-	66.1	-	66.1	-	66.1	197.0	-	263.1	985.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	667.8
11	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,182.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	779.1
12	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,379.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	890.4
13	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,576.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	1,001.7
14	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,773.0	-	35.0	476.0	511.0	-	35.0	111.3	-	146.3	637.0
15	-	66.1	842.0	908.1	-	66.1	197.0	-	263.1	1,128.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	748.3
16	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,325.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	859.6
17	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,522.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	970.9
18	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,719.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	1,082.2
19	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,916.0	-	35.0	687.0	722.0	-	35.0	111.3	-	146.3	506.5
20	-	66.1	1,252.0	1,318.1	-	66.1	197.0	-	263.1	861.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	617.8
21	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,058.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	729.1
22	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,255.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	840.4
23	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,452.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	951.7
24	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,649.0	-	35.0	835.0	870.0	-	35.0	111.3	-	146.3	228.0
25	-	66.1	1,438.0	1,504.1	-	66.1	197.0	-	263.1	408.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	339.3
26	-	66.1	-	66.1	-	66.1	197.0	-	263.1	605.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	450.6
27	-	66.1	-	66.1	-	66.1	197.0	-	263.1	802.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	561.9
28	-	66.1	-	66.1	-	66.1	197.0	-	263.1	999.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	673.2
29	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,196.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	784.5
30	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,393.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	895.8
31	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,590.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	1,007.1
32	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,787.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	1,118.4
33	-	66.1	-	66.1	-	66.1	197.0	-	263.1	1,984.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	1,229.7
34	-	66.1	-	66.1	-	66.1	197.0	-	263.1	2,181.0	-	35.0	1,163.0	1,198.0	-	35.0	111.3	-	146.3	178.0
35	-	66.1	2,094.0	2,160.1	-	66.1	197.0	-	263.1	284.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	289.3
36	-	66.1	-	66.1	-	66.1	197.0	-	263.1	481.0	-	35.0	-	35.0	-	35.0	111.3	-	146.3	400.6

*1 Capital funds of construction are arranged by the Government of Ghana.
*2 Annual O&M costs include operation of pump and O&M of command areas, and the service costs of the PM office are not included.
*3 Revenue from irrigation service fees to be collected from the beneficiaries.
*4 Replacement cost / useful life
Note: The constant prices at 1996 level were used in the analyses of the cash flow statement.

Table J-15 Cash Flow Statement (3/3)

(Unit: Cedis Million)

Year	Okyereko Project										Whole Projects									
	Cash Outflow				Cash Inflow						Cash Outflow				Cash Inflow					
	Capital Cost *1	Total O&M Cost*2	Replace-ment Cost	Total	Const-ruction Fund*1	Revenue*3 O&M	Revenue*3 Replace-ment*4	Govern-ment Subsidy	Total	Balance	Capital Cost *1	Total O&M Cost*2	Replace-ment Cost	Total	Const-ruction Fund*1	Revenue*3 O&M	Revenue*3 Replace-ment*4	Govern-ment Subsidy	Total	Balance
1	(79.0)	-	-	-	(79.0)	-	-	-	-	-	(506.0)	-	-	-	(506.0)	-	-	-	-	-
2	(1,293.0)	-	-	-	(1,293.0)	-	-	-	-	-	(4,327.0)	-	-	-	(4,327.0)	-	-	-	-	-
3	(1,065.0)	-	-	-	(1,065.0)	-	-	-	-	-	(7,849.0)	-	-	-	(7,849.0)	-	-	-	-	-
4	-	16.7	-	16.7	-	16.7	-	-	16.7	-	(2,850.0)	54.7	-	54.7	(2,850.0)	54.7	-	-	54.7	-
5	-	16.7	-	16.7	-	16.7	38.8	-	55.5	38.8	-	147.8	-	147.8	-	147.8	164.5	-	312.3	164.5
6	-	16.7	-	16.7	-	16.7	38.8	-	55.5	77.6	-	147.8	-	147.8	-	147.8	419.5	-	567.3	584.0
7	-	16.7	-	16.7	-	16.7	38.8	-	55.5	116.4	-	147.8	-	147.8	-	147.8	419.5	-	567.3	1,003.5
8	-	16.7	-	16.7	-	16.7	38.8	-	55.5	155.2	-	147.8	-	147.8	-	147.8	419.5	-	567.3	1,423.0
9	-	16.7	-	16.7	-	16.7	38.8	-	55.5	194.0	-	147.8	-	147.8	-	147.8	419.5	-	567.3	1,842.5
10	-	16.7	-	16.7	-	16.7	38.8	-	55.5	232.8	-	147.8	-	147.8	-	147.8	419.5	-	567.3	2,262.0
11	-	16.7	-	16.7	-	16.7	38.8	-	55.5	271.6	-	147.8	-	147.8	-	147.8	419.5	-	567.3	2,681.5
12	-	16.7	-	16.7	-	16.7	38.8	-	55.5	310.4	-	147.8	-	147.8	-	147.8	419.5	-	567.3	3,101.0
13	-	16.7	-	16.7	-	16.7	38.8	-	55.5	349.2	-	147.8	-	147.8	-	147.8	419.5	-	567.3	3,520.5
14	-	16.7	148.0	164.7	-	16.7	38.8	-	55.5	240.0	-	147.8	761.0	908.8	-	147.8	419.5	-	567.3	3,179.0
15	-	16.7	-	16.7	-	16.7	38.8	-	55.5	278.8	-	147.8	1,059.0	1,206.8	-	147.8	419.5	-	567.3	2,539.5
16	-	16.7	-	16.7	-	16.7	38.8	-	55.5	317.6	-	147.8	-	147.8	-	147.8	419.5	-	567.3	2,959.0
17	-	16.7	-	16.7	-	16.7	38.8	-	55.5	356.4	-	147.8	-	147.8	-	147.8	419.5	-	567.3	3,378.5
18	-	16.7	-	16.7	-	16.7	38.8	-	55.5	395.2	-	147.8	-	147.8	-	147.8	419.5	-	567.3	3,798.0
19	-	16.7	255.0	271.7	-	16.7	38.8	-	55.5	179.0	-	147.8	942.0	1,089.8	-	147.8	419.5	-	567.3	3,275.5
20	-	16.7	-	16.7	-	16.7	38.8	-	55.5	217.8	-	147.8	1,753.0	1,900.8	-	147.8	419.5	-	567.3	1,942.0
21	-	16.7	-	16.7	-	16.7	38.8	-	55.5	256.6	-	147.8	-	147.8	-	147.8	419.5	-	567.3	2,361.5
22	-	16.7	-	16.7	-	16.7	38.8	-	55.5	295.4	-	147.8	-	147.8	-	147.8	419.5	-	567.3	2,781.0
23	-	16.7	-	16.7	-	16.7	38.8	-	55.5	334.2	-	147.8	-	147.8	-	147.8	419.5	-	567.3	3,200.5
24	-	16.7	288.0	304.7	-	16.7	38.8	-	55.5	85.0	-	147.8	1,275.0	1,422.8	-	147.8	419.5	-	567.3	2,345.0
25	-	16.7	-	16.7	-	16.7	38.8	-	55.5	123.8	-	147.8	1,730.0	1,877.8	-	147.8	419.5	-	567.3	1,034.5
26	-	16.7	-	16.7	-	16.7	38.8	-	55.5	162.6	-	147.8	-	147.8	-	147.8	419.5	-	567.3	1,454.0
27	-	16.7	-	16.7	-	16.7	38.8	-	55.5	201.4	-	147.8	-	147.8	-	147.8	419.5	-	567.3	1,873.5
28	-	16.7	-	16.7	-	16.7	38.8	-	55.5	240.2	-	147.8	-	147.8	-	147.8	419.5	-	567.3	2,293.0
29	-	16.7	-	16.7	-	16.7	38.8	-	55.5	279.0	-	147.8	-	147.8	-	147.8	419.5	-	567.3	2,712.5
30	-	16.7	-	16.7	-	16.7	38.8	-	55.5	317.8	-	147.8	-	147.8	-	147.8	419.5	-	567.3	3,132.0
31	-	16.7	-	16.7	-	16.7	38.8	-	55.5	356.6	-	147.8	-	147.8	-	147.8	419.5	-	567.3	3,551.5
32	-	16.7	-	16.7	-	16.7	38.8	-	55.5	395.4	-	147.8	-	147.8	-	147.8	419.5	-	567.3	3,971.0
33	-	16.7	-	16.7	-	16.7	38.8	-	55.5	434.2	-	147.8	-	147.8	-	147.8	419.5	-	567.3	4,390.5
34	-	16.7	403.0	419.7	-	16.7	38.8	-	55.5	70.0	-	147.8	1,703.0	1,850.8	-	147.8	419.5	-	567.3	3,107.0
35	-	16.7	-	16.7	-	16.7	38.8	-	55.5	108.8	-	147.8	2,812.0	2,959.8	-	147.8	419.5	-	567.3	714.5
36	-	16.7	-	16.7	-	16.7	38.8	-	55.5	147.6	-	147.8	-	147.8	-	147.8	419.5	-	567.3	1,134.0

*1 Capital funds of construction are arranged by the Government of Ghana.
*2 Annual O&M costs include operation of pump and O&M of command areas, and the service costs of the PM office are not included.
*3 Revenue from irrigation service fees to be collected from the beneficiaries.
*4 Replacement cost / useful life
Note: The constant prices at 1996 level were used in the analyses of the cash flow statement.

Table J-16 Case Study for Government Subsidy (1/6)
(Ashaiman Farmers' Society)

Year	Case-1: Annual O&M Costs Only							Case-2: Allowable Amount accepted by Farmers							Case-3: O&M Cost + 30% of Replacement Cost							Case-4: O&M Cost + 50% of Replacement Cost						
	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance
	Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total	
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	7.8	3.0	-	3.0	6.7	-	6.7	3.7	3.0	-	3.0	10.1	-	10.1	7.1
5	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	15.6	3.0	-	3.0	6.7	-	6.7	7.4	3.0	-	3.0	10.1	-	10.1	14.2
6	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	23.4	3.0	-	3.0	6.7	-	6.7	11.1	3.0	-	3.0	10.1	-	10.1	21.3
7	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	31.2	3.0	-	3.0	6.7	-	6.7	14.8	3.0	-	3.0	10.1	-	10.1	28.4
8	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	39.0	3.0	-	3.0	6.7	-	6.7	18.5	3.0	-	3.0	10.1	-	10.1	35.5
9	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	46.8	3.0	-	3.0	6.7	-	6.7	22.2	3.0	-	3.0	10.1	-	10.1	42.6
10	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	54.6	3.0	-	3.0	6.7	-	6.7	25.9	3.0	-	3.0	10.1	-	10.1	49.7
11	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	62.4	3.0	-	3.0	6.7	-	6.7	29.6	3.0	-	3.0	10.1	-	10.1	56.8
12	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	70.2	3.0	-	3.0	6.7	-	6.7	33.3	3.0	-	3.0	10.1	-	10.1	63.9
13	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	78.0	3.0	-	3.0	6.7	-	6.7	37.0	3.0	-	3.0	10.1	-	10.1	71.0
14	3.0	137.0	140.0	3.0	137.0	140.0	-	3.0	137.0	140.0	10.8	51.2	62.0	-	3.0	137.0	140.0	6.7	96.3	103.0	-	3.0	137.0	140.0	10.1	58.9	69.0	-
15	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	7.8	3.0	-	3.0	6.7	-	6.7	3.7	3.0	-	3.0	10.1	-	10.1	7.1
16	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	15.6	3.0	-	3.0	6.7	-	6.7	7.4	3.0	-	3.0	10.1	-	10.1	14.2
17	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	23.4	3.0	-	3.0	6.7	-	6.7	11.1	3.0	-	3.0	10.1	-	10.1	21.3
18	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	31.2	3.0	-	3.0	6.7	-	6.7	14.8	3.0	-	3.0	10.1	-	10.1	28.4
19	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	39.0	3.0	-	3.0	6.7	-	6.7	18.5	3.0	-	3.0	10.1	-	10.1	35.5
20	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	46.8	3.0	-	3.0	6.7	-	6.7	22.2	3.0	-	3.0	10.1	-	10.1	42.6
21	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	54.6	3.0	-	3.0	6.7	-	6.7	25.9	3.0	-	3.0	10.1	-	10.1	49.7
22	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	62.4	3.0	-	3.0	6.7	-	6.7	29.6	3.0	-	3.0	10.1	-	10.1	56.8
23	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	70.2	3.0	-	3.0	6.7	-	6.7	33.3	3.0	-	3.0	10.1	-	10.1	63.9
24	3.0	152.0	155.0	3.0	152.0	155.0	-	3.0	152.0	155.0	10.8	74.0	84.8	-	3.0	152.0	155.0	6.7	115.0	121.7	-	3.0	152.0	155.0	10.1	81.0	91.1	-
25	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	7.8	3.0	-	3.0	6.7	-	6.7	3.7	3.0	-	3.0	10.1	-	10.1	7.1
26	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	15.6	3.0	-	3.0	6.7	-	6.7	7.4	3.0	-	3.0	10.1	-	10.1	14.2
27	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	23.4	3.0	-	3.0	6.7	-	6.7	11.1	3.0	-	3.0	10.1	-	10.1	21.3
28	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	31.2	3.0	-	3.0	6.7	-	6.7	14.8	3.0	-	3.0	10.1	-	10.1	28.4
29	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	39.0	3.0	-	3.0	6.7	-	6.7	18.5	3.0	-	3.0	10.1	-	10.1	35.5
30	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	46.8	3.0	-	3.0	6.7	-	6.7	22.2	3.0	-	3.0	10.1	-	10.1	42.6
31	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	54.6	3.0	-	3.0	6.7	-	6.7	25.9	3.0	-	3.0	10.1	-	10.1	49.7
32	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	62.4	3.0	-	3.0	6.7	-	6.7	29.6	3.0	-	3.0	10.1	-	10.1	56.8
33	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	70.2	3.0	-	3.0	6.7	-	6.7	33.3	3.0	-	3.0	10.1	-	10.1	63.9
34	3.0	137.0	140.0	3.0	137.0	140.0	-	3.0	137.0	140.0	10.8	59.0	69.8	-	3.0	137.0	140.0	6.7	100.0	106.7	-	3.0	137.0	140.0	10.1	66.0	76.1	-
35	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	7.8	3.0	-	3.0	6.7	-	6.7	3.7	3.0	-	3.0	10.1	-	10.1	7.1
36	3.0	-	3.0	3.0	-	3.0	-	3.0	-	3.0	10.8	-	10.8	15.6	3.0	-	3.0	6.7	-	6.7	7.4	3.0	-	3.0	10.1	-	10.1	14.2

*1 Annual O&M costs include operation of pump and O&M of command areas, and the service costs of the PM office are not included.

Note: The constant prices at 1996 level were used in the analyses of the cash flow statement.

*2 Revenue from irrigation service fees to be collected from the farmers.

		Case-1	Case-2	Case-3	Case-4
Irrigation service fees	(Cedis 1,000/year/farmer)	24	90	56	84
No. of farmer	(No.)	120	120	120	120
Total revenue of the society	(Cedis 1,000/year)	2,880	10,800	6,720	10,080

Table J-16 Case Study for Government Subsidy (2/6)
(Aveyime Farmers' Society)

Year	Case-1: Annual O&M Costs Only							Case-2: Allowable Amount accepted by Farmers							Case-3: O&M Cost + 30% of Replacement Cost							Case-4: O&M Cost + 50% of Replacement Cost						
	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance
	Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total	
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	23.1	27.0	-	27.0	44.7	-	44.7	17.7	27.0	-	27.0	56.4	-	56.4	29.4
6	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	46.2	27.0	-	27.0	44.7	-	44.7	35.4	27.0	-	27.0	56.4	-	56.4	58.8
7	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	69.3	27.0	-	27.0	44.7	-	44.7	53.1	27.0	-	27.0	56.4	-	56.4	88.2
8	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	92.4	27.0	-	27.0	44.7	-	44.7	70.8	27.0	-	27.0	56.4	-	56.4	117.6
9	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	115.5	27.0	-	27.0	44.7	-	44.7	88.5	27.0	-	27.0	56.4	-	56.4	147.0
10	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	138.6	27.0	-	27.0	44.7	-	44.7	106.2	27.0	-	27.0	56.4	-	56.4	176.4
11	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	161.7	27.0	-	27.0	44.7	-	44.7	123.9	27.0	-	27.0	56.4	-	56.4	205.8
12	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	184.8	27.0	-	27.0	44.7	-	44.7	141.6	27.0	-	27.0	56.4	-	56.4	235.2
13	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	207.9	27.0	-	27.0	44.7	-	44.7	159.3	27.0	-	27.0	56.4	-	56.4	264.6
14	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	231.0	27.0	-	27.0	44.7	-	44.7	177.0	27.0	-	27.0	56.4	-	56.4	294.0
15	27.0	217.0	244.0	27.0	217.0	244.0	-	27.0	217.0	244.0	50.1	-	50.1	37.1	27.0	217.0	244.0	44.7	22.3	67.0	-	27.0	217.0	244.0	56.4	-	56.4	106.4
16	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	60.2	27.0	-	27.0	44.7	-	44.7	17.7	27.0	-	27.0	56.4	-	56.4	135.8
17	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	83.3	27.0	-	27.0	44.7	-	44.7	35.4	27.0	-	27.0	56.4	-	56.4	165.2
18	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	106.4	27.0	-	27.0	44.7	-	44.7	53.1	27.0	-	27.0	56.4	-	56.4	194.6
19	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	129.5	27.0	-	27.0	44.7	-	44.7	70.8	27.0	-	27.0	56.4	-	56.4	224.0
20	27.0	501.0	528.0	27.0	501.0	528.0	-	27.0	501.0	528.0	50.1	348.4	398.5	-	27.0	501.0	528.0	44.7	412.5	457.2	-	27.0	501.0	528.0	56.4	247.6	304.0	-
21	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	23.1	27.0	-	27.0	44.7	-	44.7	17.7	27.0	-	27.0	56.4	-	56.4	29.4
22	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	46.2	27.0	-	27.0	44.7	-	44.7	35.4	27.0	-	27.0	56.4	-	56.4	58.8
23	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	69.3	27.0	-	27.0	44.7	-	44.7	53.1	27.0	-	27.0	56.4	-	56.4	88.2
24	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	92.4	27.0	-	27.0	44.7	-	44.7	70.8	27.0	-	27.0	56.4	-	56.4	117.6
25	27.0	292.0	319.0	27.0	292.0	319.0	-	27.0	292.0	319.0	50.1	176.5	226.6	-	27.0	292.0	319.0	44.7	203.5	248.2	-	27.0	292.0	319.0	56.4	145.0	201.4	-
26	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	23.1	27.0	-	27.0	44.7	-	44.7	17.7	27.0	-	27.0	56.4	-	56.4	29.4
27	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	46.2	27.0	-	27.0	44.7	-	44.7	35.4	27.0	-	27.0	56.4	-	56.4	58.8
28	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	69.3	27.0	-	27.0	44.7	-	44.7	53.1	27.0	-	27.0	56.4	-	56.4	88.2
29	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	92.4	27.0	-	27.0	44.7	-	44.7	70.8	27.0	-	27.0	56.4	-	56.4	117.6
30	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	115.5	27.0	-	27.0	44.7	-	44.7	88.5	27.0	-	27.0	56.4	-	56.4	147.0
31	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	138.6	27.0	-	27.0	44.7	-	44.7	106.2	27.0	-	27.0	56.4	-	56.4	176.4
32	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	161.7	27.0	-	27.0	44.7	-	44.7	123.9	27.0	-	27.0	56.4	-	56.4	205.8
33	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	184.8	27.0	-	27.0	44.7	-	44.7	141.6	27.0	-	27.0	56.4	-	56.4	235.2
34	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	207.9	27.0	-	27.0	44.7	-	44.7	159.3	27.0	-	27.0	56.4	-	56.4	264.6
35	27.0	718.0	745.0	27.0	718.0	745.0	-	27.0	718.0	745.0	50.1	487.0	537.1	-	27.0	718.0	745.0	44.7	541.0	585.7	-	27.0	718.0	745.0	56.4	424.0	480.4	-
36	27.0	-	27.0	27.0	-	27.0	-	27.0	-	27.0	50.1	-	50.1	23.1	27.0	-	27.0	44.7	-	44.7	17.7	27.0	-	27.0	56.4	-	56.4	29.4

*1 Annual O&M costs include operation of pump and O&M of command areas, and the service costs of the PM office are not included.

Note: The constant prices at 1996 level were used in the analyses of the cash flow statement.

*2 Revenue from irrigation service fees to be collected from the farmers.

		Case-1	Case-2	Case-3	Case-4
Irrigation service fees	(Cedis 1,000/year/farmer)	284	527	470	594
No. of farmer	(No.)	95	95	95	95
Total revenue of the society	(Cedis 1,000/year)	26,980	50,065	44,650	56,430

Table J-16 Case Study for Government Subsidy (3/6)
(Kpando-Torkor Farmers' Societies)

Year	Case-1: Annual O&M Costs Only							Case-2: Allowable Amount accepted by Farmers							Case-3: O&M Cost + 30% of Replacement Cost							Case-4: O&M Cost + 50% of Replacement Cost						
	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance
	Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total	
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	50.3	66.1	-	66.1	125.3	-	125.3	59.2	66.1	-	66.1	164.9	-	164.9	98.8
6	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	100.6	66.1	-	66.1	125.3	-	125.3	118.4	66.1	-	66.1	164.9	-	164.9	197.6
7	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	150.9	66.1	-	66.1	125.3	-	125.3	177.6	66.1	-	66.1	164.9	-	164.9	296.4
8	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	201.2	66.1	-	66.1	125.3	-	125.3	236.8	66.1	-	66.1	164.9	-	164.9	395.2
9	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	251.5	66.1	-	66.1	125.3	-	125.3	296.0	66.1	-	66.1	164.9	-	164.9	494.0
10	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	301.8	66.1	-	66.1	125.3	-	125.3	355.2	66.1	-	66.1	164.9	-	164.9	592.8
11	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	352.1	66.1	-	66.1	125.3	-	125.3	414.4	66.1	-	66.1	164.9	-	164.9	691.6
12	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	402.4	66.1	-	66.1	125.3	-	125.3	473.6	66.1	-	66.1	164.9	-	164.9	790.4
13	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	452.7	66.1	-	66.1	125.3	-	125.3	532.8	66.1	-	66.1	164.9	-	164.9	889.2
14	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	503.0	66.1	-	66.1	125.3	-	125.3	592.0	66.1	-	66.1	164.9	-	164.9	988.0
15	66.1	842.0	908.1	66.1	842.0	908.1	-	66.1	842.0	908.1	116.4	288.7	405.1	0.0	66.1	842.0	908.1	125.3	190.8	316.1	0.0	66.1	842.0	908.1	164.9	-	164.9	244.8
16	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	50.3	66.1	-	66.1	125.3	-	125.3	59.2	66.1	-	66.1	164.9	-	164.9	343.6
17	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	100.6	66.1	-	66.1	125.3	-	125.3	118.4	66.1	-	66.1	164.9	-	164.9	442.4
18	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	150.9	66.1	-	66.1	125.3	-	125.3	177.6	66.1	-	66.1	164.9	-	164.9	541.2
19	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	201.2	66.1	-	66.1	125.3	-	125.3	236.8	66.1	-	66.1	164.9	-	164.9	640.0
20	66.1	1,252.0	1,318.1	66.1	1,252.0	1,318.1	-	66.1	1,252.0	1,318.1	116.4	1,000.5	1,116.9	0.0	66.1	1,252.0	1,318.1	125.3	956.0	1,081.3	-	66.1	1,252.0	1,318.1	164.9	513.2	678.1	0.0
21	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	50.3	66.1	-	66.1	125.3	-	125.3	59.2	66.1	-	66.1	164.9	-	164.9	98.8
22	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	100.6	66.1	-	66.1	125.3	-	125.3	118.4	66.1	-	66.1	164.9	-	164.9	197.6
23	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	150.9	66.1	-	66.1	125.3	-	125.3	177.6	66.1	-	66.1	164.9	-	164.9	296.4
24	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	201.2	66.1	-	66.1	125.3	-	125.3	236.8	66.1	-	66.1	164.9	-	164.9	395.2
25	66.1	1,438.0	1,504.1	66.1	1,438.0	1,504.1	-	66.1	1,438.0	1,504.1	116.4	1,186.5	1,302.9	0.0	66.1	1,438.0	1,504.1	125.3	1,142.0	1,267.3	-	66.1	1,438.0	1,504.1	164.9	944.0	1,108.9	-
26	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	50.3	66.1	-	66.1	125.3	-	125.3	59.2	66.1	-	66.1	164.9	-	164.9	98.8
27	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	100.6	66.1	-	66.1	125.3	-	125.3	118.4	66.1	-	66.1	164.9	-	164.9	197.6
28	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	150.9	66.1	-	66.1	125.3	-	125.3	177.6	66.1	-	66.1	164.9	-	164.9	296.4
29	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	201.2	66.1	-	66.1	125.3	-	125.3	236.8	66.1	-	66.1	164.9	-	164.9	395.2
30	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	251.5	66.1	-	66.1	125.3	-	125.3	296.0	66.1	-	66.1	164.9	-	164.9	494.0
31	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	301.8	66.1	-	66.1	125.3	-	125.3	355.2	66.1	-	66.1	164.9	-	164.9	592.8
32	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	352.1	66.1	-	66.1	125.3	-	125.3	414.4	66.1	-	66.1	164.9	-	164.9	691.6
33	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	402.4	66.1	-	66.1	125.3	-	125.3	473.6	66.1	-	66.1	164.9	-	164.9	790.4
34	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	452.7	66.1	-	66.1	125.3	-	125.3	532.8	66.1	-	66.1	164.9	-	164.9	889.2
35	66.1	2,094.0	2,160.1	66.1	2,094.0	2,160.1	-	66.1	2,094.0	2,160.1	116.4	1,591.0	1,707.4	0.0	66.1	2,094.0	2,160.1	125.3	1,502.0	1,627.3	-	66.1	2,094.0	2,160.1	164.9	1,106.0	1,270.9	-
36	66.1	-	66.1	66.1	-	66.1	-	66.1	-	66.1	116.4	-	116.4	50.3	66.1	-	66.1	125.3	-	125.3	59.2	66.1	-	66.1	164.9	-	164.9	98.8

*1 Annual O&M costs include operation of pump and O&M of command areas, and the service costs of the PM office are not included.

Note: The constant prices at 1996 level were used in the analyses of the cash flow statement.

*2 Revenue from irrigation service fees to be collected from the farmers.

		Case-1	Case-2	Case-3	Case-4
Irrigation service fees	(Cedis 1,000/year/farmer)	170	300	323	425
No. of farmer	(No.)	388	388	388	388
Total revenue of the society	(Cedis 1,000/year)	66,100	116,400	125,324	164,900

Table J-16 Case Study for Government Subsidy (4/6)
(Mankessim Farmers' Societies)

Year	Case-1: Annual O&M Costs Only							Case-2: Allowable Amount accepted by Farmers							Case-3: O&M Cost + 30% of Replacement Cost							Case-4: O&M Cost + 50% of Replacement Cost						
	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance
	Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total	
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	8.2	35.0	-	35.0	68.5	-	68.5	33.5	35.0	-	35.0	90.7	-	90.7	55.7
5	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	16.4	35.0	-	35.0	68.5	-	68.5	67.0	35.0	-	35.0	90.7	-	90.7	111.4
6	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	24.6	35.0	-	35.0	68.5	-	68.5	100.5	35.0	-	35.0	90.7	-	90.7	167.1
7	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	32.8	35.0	-	35.0	68.5	-	68.5	134.0	35.0	-	35.0	90.7	-	90.7	222.8
8	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	41.0	35.0	-	35.0	68.5	-	68.5	167.5	35.0	-	35.0	90.7	-	90.7	278.5
9	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	49.2	35.0	-	35.0	68.5	-	68.5	201.0	35.0	-	35.0	90.7	-	90.7	334.2
10	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	57.4	35.0	-	35.0	68.5	-	68.5	234.5	35.0	-	35.0	90.7	-	90.7	389.9
11	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	65.6	35.0	-	35.0	68.5	-	68.5	268.0	35.0	-	35.0	90.7	-	90.7	445.6
12	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	73.8	35.0	-	35.0	68.5	-	68.5	301.5	35.0	-	35.0	90.7	-	90.7	501.3
13	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	82.0	35.0	-	35.0	68.5	-	68.5	335.0	35.0	-	35.0	90.7	-	90.7	557.0
14	35.0	476.0	511.0	35.0	476.0	511.0	-	35.0	476.0	511.0	43.2	385.8	429.0	-	35.0	476.0	511.0	68.5	107.5	176.0	-	35.0	476.0	511.0	90.7	-	90.7	136.7
15	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	8.2	35.0	-	35.0	68.5	-	68.5	33.5	35.0	-	35.0	90.7	-	90.7	192.4
16	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	16.4	35.0	-	35.0	68.5	-	68.5	67.0	35.0	-	35.0	90.7	-	90.7	248.1
17	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	24.6	35.0	-	35.0	68.5	-	68.5	100.5	35.0	-	35.0	90.7	-	90.7	303.8
18	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	32.8	35.0	-	35.0	68.5	-	68.5	134.0	35.0	-	35.0	90.7	-	90.7	359.5
19	35.0	687.0	722.0	35.0	687.0	722.0	-	35.0	687.0	722.0	43.2	646.0	689.2	-	35.0	687.0	722.0	68.5	519.5	588.0	-	35.0	687.0	722.0	90.7	271.8	362.5	-
20	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	8.2	35.0	-	35.0	68.5	-	68.5	33.5	35.0	-	35.0	90.7	-	90.7	55.7
21	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	16.4	35.0	-	35.0	68.5	-	68.5	67.0	35.0	-	35.0	90.7	-	90.7	111.4
22	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	24.6	35.0	-	35.0	68.5	-	68.5	100.5	35.0	-	35.0	90.7	-	90.7	167.1
23	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	32.8	35.0	-	35.0	68.5	-	68.5	134.0	35.0	-	35.0	90.7	-	90.7	222.8
24	35.0	835.0	870.0	35.0	835.0	870.0	-	35.0	835.0	870.0	43.2	794.0	837.2	-	35.0	835.0	870.0	68.5	667.5	736.0	-	35.0	835.0	870.0	90.7	556.5	647.2	-
25	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	8.2	35.0	-	35.0	68.5	-	68.5	33.5	35.0	-	35.0	90.7	-	90.7	55.7
26	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	16.4	35.0	-	35.0	68.5	-	68.5	67.0	35.0	-	35.0	90.7	-	90.7	111.4
27	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	24.6	35.0	-	35.0	68.5	-	68.5	100.5	35.0	-	35.0	90.7	-	90.7	167.1
28	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	32.8	35.0	-	35.0	68.5	-	68.5	134.0	35.0	-	35.0	90.7	-	90.7	222.8
29	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	41.0	35.0	-	35.0	68.5	-	68.5	167.5	35.0	-	35.0	90.7	-	90.7	278.5
30	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	49.2	35.0	-	35.0	68.5	-	68.5	201.0	35.0	-	35.0	90.7	-	90.7	334.2
31	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	57.4	35.0	-	35.0	68.5	-	68.5	234.5	35.0	-	35.0	90.7	-	90.7	389.9
32	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	65.6	35.0	-	35.0	68.5	-	68.5	268.0	35.0	-	35.0	90.7	-	90.7	445.6
33	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	73.8	35.0	-	35.0	68.5	-	68.5	301.5	35.0	-	35.0	90.7	-	90.7	501.3
34	35.0	1,163.0	1,198.0	35.0	1,163.0	1,198.0	-	35.0	1,163.0	1,198.0	43.2	1,081.0	1,124.2	-	35.0	1,163.0	1,198.0	68.5	828.0	896.5	-	35.0	1,163.0	1,198.0	90.7	606.0	696.7	-
35	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	8.2	35.0	-	35.0	68.5	-	68.5	33.5	35.0	-	35.0	90.7	-	90.7	55.7
36	35.0	-	35.0	35.0	-	35.0	-	35.0	-	35.0	43.2	-	43.2	16.4	35.0	-	35.0	68.5	-	68.5	67.0	35.0	-	35.0	90.7	-	90.7	111.4

*1 Annual O&M costs include operation of pump and O&M of command areas, and the service costs of the PM office are not included.

Note: The constant prices at 1996 level were used in the analyses of the cash flow statement.

*2 Revenue from irrigation service fees to be collected from the farmers.

		Case-1	Case-2	Case-3	Case-4
Irrigation service fees	(Cedis 1,000/year/farmer)	162	200	317	420
No. of farmer	(No.)	216	216	216	216
Total revenue of the society	(Cedis 1,000/year)	34,992	43,200	68,472	90,720

Table J-16 Case Study for Government Subsidy (5/6)
(Okyereko Farmers' Society)

Year	Case-1: Annual O&M Costs Only							Case-2: Allowable Amount accepted by Farmers							Case-3: O&M Cost + 30% of Replacement Cost							Case-4: O&M Cost + 50% of Replacement Cost						
	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance
	Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total	
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	11.7	16.7	-	16.7	36.2	-	36.2	19.5
5	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	23.4	16.7	-	16.7	36.2	-	36.2	39.0
6	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	35.1	16.7	-	16.7	36.2	-	36.2	58.5
7	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	46.8	16.7	-	16.7	36.2	-	36.2	78.0
8	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	58.5	16.7	-	16.7	36.2	-	36.2	97.5
9	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	70.2	16.7	-	16.7	36.2	-	36.2	117.0
10	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	81.9	16.7	-	16.7	36.2	-	36.2	136.5
11	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	93.6	16.7	-	16.7	36.2	-	36.2	156.0
12	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	105.3	16.7	-	16.7	36.2	-	36.2	175.5
13	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	117.0	16.7	-	16.7	36.2	-	36.2	195.0
14	16.7	148.0	164.7	16.7	148.0	164.7	-	16.7	148.0	164.7	16.7	148.0	164.7	-	16.7	148.0	164.7	28.4	19.3	47.7	0.0	16.7	148.0	164.7	36.2	-	36.2	66.5
15	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	11.7	16.7	-	16.7	36.2	-	36.2	86.0
16	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	23.4	16.7	-	16.7	36.2	-	36.2	105.5
17	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	35.1	16.7	-	16.7	36.2	-	36.2	125.0
18	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	46.8	16.7	-	16.7	36.2	-	36.2	144.5
19	16.7	255.0	271.7	16.7	255.0	271.7	-	16.7	255.0	271.7	16.7	255.0	271.7	-	16.7	255.0	271.7	28.4	196.5	224.9	0.0	16.7	255.0	271.7	36.2	91.0	127.2	-
20	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	11.7	16.7	-	16.7	36.2	-	36.2	19.5
21	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	23.4	16.7	-	16.7	36.2	-	36.2	39.0
22	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	35.1	16.7	-	16.7	36.2	-	36.2	58.5
23	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	46.8	16.7	-	16.7	36.2	-	36.2	78.0
24	16.7	288.0	304.7	16.7	288.0	304.7	-	16.7	288.0	304.7	16.7	288.0	304.7	-	16.7	288.0	304.7	28.4	229.5	257.9	0.0	16.7	288.0	304.7	36.2	190.5	226.7	-
25	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	11.7	16.7	-	16.7	36.2	-	36.2	19.5
26	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	23.4	16.7	-	16.7	36.2	-	36.2	39.0
27	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	35.1	16.7	-	16.7	36.2	-	36.2	58.5
28	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	46.8	16.7	-	16.7	36.2	-	36.2	78.0
29	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	58.5	16.7	-	16.7	36.2	-	36.2	97.5
30	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	70.2	16.7	-	16.7	36.2	-	36.2	117.0
31	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	81.9	16.7	-	16.7	36.2	-	36.2	136.5
32	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	93.6	16.7	-	16.7	36.2	-	36.2	156.0
33	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	105.3	16.7	-	16.7	36.2	-	36.2	175.5
34	16.7	403.0	419.7	16.7	403.0	419.7	-	16.7	403.0	419.7	16.7	403.0	419.7	-	16.7	403.0	419.7	28.4	286.0	314.4	0.0	16.7	403.0	419.7	36.2	208.0	244.2	-
35	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	11.7	16.7	-	16.7	36.2	-	36.2	19.5
36	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	16.7	-	16.7	-	16.7	-	16.7	28.4	-	28.4	23.4	16.7	-	16.7	36.2	-	36.2	39.0

*1 Annual O&M costs include operation of pump and O&M of command areas, and the service costs of the PM office are not included.

Note: The constant prices at 1996 level were used in the analyses of the cash flow statement.

*2 Revenue from irrigation service fees to be collected from the farmers.

		Case-1	Case-2	Case-3	Case-4
Irrigation service fees	(Cedis 1,000/year/farmer)	124	124	210	268
No. of farmer	(No.)	135	135	135	135
Total revenue of the society	(Cedis 1,000/year)	16,740	16,740	28,350	36,180

Table J-16 Case Study for Government Subsidy (6/6)
(Whole Projects)

Year	Case-1: Annual O&M Costs Only							Case-2: Allowable Amount accepted by Farmers							Case-3: O&M Cost + 30% of Replacement Cost							Case-4: O&M Cost + 50% of Replacement Cost						
	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance	Cash Outflow			Cash Inflow			Balance
	Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total		Total O&M Cost*1	Replace-ment Cost	Total	Reve-nue*2	Govern-ment Subsidy	Total	
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	54.7	-	54.7	54.7	-	54.7	-	54.7	-	54.7	70.7	-	70.7	16.0	54.7	-	54.7	103.6	-	103.6	48.9	54.7	-	54.7	137.0	-	137.0	82.3
5	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	105.4	147.8	-	147.8	273.6	-	273.6	174.7	147.8	-	147.8	358.3	-	358.3	292.8
6	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	194.8	147.8	-	147.8	273.6	-	273.6	300.5	147.8	-	147.8	358.3	-	358.3	503.3
7	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	284.2	147.8	-	147.8	273.6	-	273.6	426.3	147.8	-	147.8	358.3	-	358.3	713.8
8	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	373.6	147.8	-	147.8	273.6	-	273.6	552.1	147.8	-	147.8	358.3	-	358.3	924.3
9	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	463.0	147.8	-	147.8	273.6	-	273.6	677.9	147.8	-	147.8	358.3	-	358.3	1,134.8
10	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	552.4	147.8	-	147.8	273.6	-	273.6	803.7	147.8	-	147.8	358.3	-	358.3	1,345.3
11	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	641.8	147.8	-	147.8	273.6	-	273.6	929.5	147.8	-	147.8	358.3	-	358.3	1,555.8
12	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	731.2	147.8	-	147.8	273.6	-	273.6	1,055.3	147.8	-	147.8	358.3	-	358.3	1,766.3
13	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	820.6	147.8	-	147.8	273.6	-	273.6	1,181.1	147.8	-	147.8	358.3	-	358.3	1,976.8
14	147.8	761.0	908.8	147.8	761.0	908.8	-	147.8	761.0	908.8	237.2	585.0	822.2	734.0	147.8	761.0	908.8	273.6	223.1	496.7	769.0	147.8	761.0	908.8	358.3	58.9	417.2	1,485.2
15	147.8	1,059.0	1,206.8	147.8	1,059.0	1,206.8	-	147.8	1,059.0	1,206.8	237.2	288.7	525.9	53.1	147.8	1,059.0	1,206.8	273.6	213.1	486.7	48.9	147.8	1,059.0	1,206.8	358.3	-	358.3	636.7
16	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	142.5	147.8	-	147.8	273.6	-	273.6	174.7	147.8	-	147.8	358.3	-	358.3	847.2
17	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	231.9	147.8	-	147.8	273.6	-	273.6	300.5	147.8	-	147.8	358.3	-	358.3	1,057.7
18	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	321.3	147.8	-	147.8	273.6	-	273.6	426.3	147.8	-	147.8	358.3	-	358.3	1,268.2
19	147.8	942.0	1,089.8	147.8	942.0	1,089.8	-	147.8	942.0	1,089.8	237.2	901.0	1,138.2	369.7	147.8	942.0	1,089.8	273.6	716.0	989.6	326.1	147.8	942.0	1,089.8	358.3	362.8	721.1	899.5
20	147.8	1,753.0	1,900.8	147.8	1,753.0	1,900.8	-	147.8	1,753.0	1,900.8	237.2	1,348.9	1,586.1	55.0	147.8	1,753.0	1,900.8	273.6	1,368.5	1,642.1	67.4	147.8	1,753.0	1,900.8	358.3	760.8	1,119.1	117.8
21	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	144.4	147.8	-	147.8	273.6	-	273.6	193.2	147.8	-	147.8	358.3	-	358.3	328.3
22	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	233.8	147.8	-	147.8	273.6	-	273.6	319.0	147.8	-	147.8	358.3	-	358.3	538.8
23	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	323.2	147.8	-	147.8	273.6	-	273.6	444.8	147.8	-	147.8	358.3	-	358.3	749.3
24	147.8	1,275.0	1,422.8	147.8	1,275.0	1,422.8	-	147.8	1,275.0	1,422.8	237.2	1,156.0	1,393.2	293.6	147.8	1,275.0	1,422.8	273.6	1,012.0	1,285.6	307.6	147.8	1,275.0	1,422.8	358.3	828.0	1,186.3	512.8
25	147.8	1,730.0	1,877.8	147.8	1,730.0	1,877.8	-	147.8	1,730.0	1,877.8	237.2	1,363.0	1,600.2	16.0	147.8	1,730.0	1,877.8	273.6	1,345.5	1,619.1	48.9	147.8	1,730.0	1,877.8	358.3	1,089.0	1,447.3	82.3
26	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	105.4	147.8	-	147.8	273.6	-	273.6	174.7	147.8	-	147.8	358.3	-	358.3	292.8
27	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	194.8	147.8	-	147.8	273.6	-	273.6	300.5	147.8	-	147.8	358.3	-	358.3	503.3
28	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	284.2	147.8	-	147.8	273.6	-	273.6	426.3	147.8	-	147.8	358.3	-	358.3	713.8
29	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	373.6	147.8	-	147.8	273.6	-	273.6	552.1	147.8	-	147.8	358.3	-	358.3	924.3
30	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	463.0	147.8	-	147.8	273.6	-	273.6	677.9	147.8	-	147.8	358.3	-	358.3	1,134.8
31	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	552.4	147.8	-	147.8	273.6	-	273.6	803.7	147.8	-	147.8	358.3	-	358.3	1,345.3
32	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	641.8	147.8	-	147.8	273.6	-	273.6	929.5	147.8	-	147.8	358.3	-	358.3	1,555.8
33	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	731.2	147.8	-	147.8	273.6	-	273.6	1,055.3	147.8	-	147.8	358.3	-	358.3	1,766.3
34	147.8	1,703.0	1,850.8	147.8	1,703.0	1,850.8	-	147.8	1,703.0	1,850.8	237.2	1,543.0	1,780.2	660.6	147.8	1,703.0	1,850.8	273.6	1,214.0	1,487.6	692.1	147.8	1,703.0	1,850.8	358.3	880.0	1,238.3	1,153.8
35	147.8	2,812.0	2,959.8	147.8	2,812.0	2,959.8	-	147.8	2,812.0	2,959.8	237.2	2,078.0	2,315.2	16.0	147.8	2,812.0	2,959.8	273.6	2,043.0	2,316.6	48.9	147.8	2,812.0	2,959.8	358.3	1,530.0	1,888.3	82.3
36	147.8	-	147.8	147.8	-	147.8	-	147.8	-	147.8	237.2	-	237.2	105.4	147.8	-	147.8	273.6	-	273.6	174.7	147.8	-	147.8	358.3	-	358.3	292.8

*1 Annual O&M costs include operation of pump and O&M of command areas, and the service costs of the PM office are not included.

*2 Revenue from irrigation service fees to be collected from the farmers.

Note: The constant prices at 1996 level were used in the analyses of the cash flow statement.

Table J-17 Central Government Accounts - Recurrent and Development Expenditures (Functional Classification)

(Unit: Cedis Million)

	Total Expenditures					Recurrent Expenditures					Development Expenditures				
	1990	1991	1992	1993	1994*	1990	1991	1992	1993	1994*	1990	1991	1992	1993	1994*
General Services															
General Public Services	33,376	41,732	60,710	78,116	168,188	27,787	34,113	46,861	71,488	134,878	5,589	7,619	13,849	6,628	33,310
Defence	9,006	15,230	18,201	26,600	36,147	8,334	14,750	16,783	24,712	31,883	672	480	1,418	1,888	4,264
Public Order and Safety	13,470	17,155	25,717	35,718	50,448	12,905	15,622	23,802	32,224	44,442	565	1,533	1,915	3,494	6,006
Total	55,852	74,117	104,628	140,434	254,783	49,026	64,485	87,446	128,424	211,203	6,826	9,632	17,182	12,010	43,580
Community and Social Services															
Education	64,835	78,801	119,383	158,119	213,901	58,139	74,452	113,814	151,345	208,864	6,696	4,349	5,569	6,774	5,037
Health	25,706	28,654	38,893	59,674	55,802	20,584	25,501	34,738	52,873	49,907	5,122	3,153	4,155	6,801	5,895
Social Security and Welfare Services	18,389	23,884	34,674	68,424	82,587	18,041	22,624	33,054	67,932	81,495	348	1,260	1,620	492	1,092
Housing and Community Amenities	6,607	7,481	9,242	11,136	33,326	1,516	1,894	2,189	3,351	3,133	5,091	5,587	7,053	7,785	30,193
Recreational, Cultural & Religious Services	6,872	7,810	9,648	16,151	17,343	4,054	5,159	6,867	12,426	12,721	2,818	2,651	2,781	3,725	4,622
Total	122,409	146,630	211,840	313,504	402,959	102,334	129,630	190,662	287,927	356,120	20,075	17,000	21,178	25,577	46,839
Economic Services															
Fuel and Energy	1,048	1,102	1,380	1,450	1,525	20	16	23	32	41	1,028	1,086	1,357	1,418	1,484
Agriculture, Forestry and Fishing	10,438	12,378	15,667	21,150	18,950	7,188	9,045	10,681	14,927	13,213	3,250	3,333	4,986	6,223	5,737
Mining, Manufacturing and Construction	2,625	3,186	4,950	8,123	29,761	1,952	2,008	3,264	4,317	2,889	673	1,178	1,686	3,806	26,872
Roads and Waterways	16,089	28,168	51,150	69,481	81,331	3,799	5,074	5,499	10,306	8,991	12,290	23,094	45,651	59,175	72,340
Other Transport and Communication	3,248	4,325	4,074	6,049	6,321	1,657	1,705	1,421	2,811	3,085	1,591	2,620	2,653	3,238	3,236
Other Economic Services	4,834	5,613	7,541	15,674	19,778	2,266	2,770	3,787	5,772	6,812	2,568	2,843	3,754	9,902	12,966
Total	38,282	54,772	84,762	121,927	157,666	16,882	20,618	24,675	38,165	35,031	21,400	34,154	60,087	83,762	122,635
Other Purposes															
Interest on Public Debt	27,318	42,828	61,004	135,904	230,146	27,318	42,828	61,004	135,904	230,146	0	0	0	0	0
Transfers to Other Levels of Government	2,633	6,151	9,475	6,138	44,759	2,633	6,151	9,475	6,138	6,460	0	0	0	0	38,299
NAM Capital Expenditure	0	6,443	0	0	0	0	0	0	0	0	0	6,443	0	0	0
Other - Special Efficiency Fund	7,980	9,320	27,106	43,004	50,998	0	0	0	0	0	7,980	9,320	27,106	43,004	50,998
Total	37,931	64,742	97,585	185,046	325,903	29,951	48,979	70,479	142,042	236,606	7,980	15,763	27,106	43,004	89,297
Grand Total	254,474	340,261	498,815	760,911	1,141,311	198,193	263,712	373,262	596,558	838,960	56,281	76,549	125,553	164,353	302,351

* Provisional

Source: (1) Quarterly Digest, Ministry of Food and Agriculture, March 1995.
(2) The State of the Ghanaian Economy in 1994, University of Ghana, July 1995.

Note: Includes current expenditure elements.