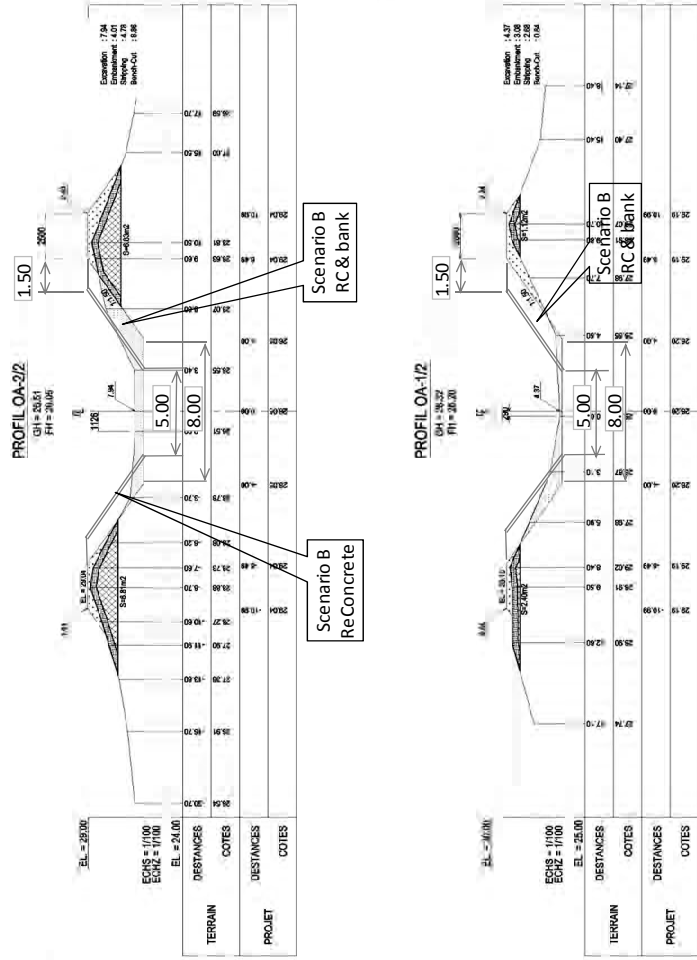


A4.9.1 OA 導水路の代表的な土工断面

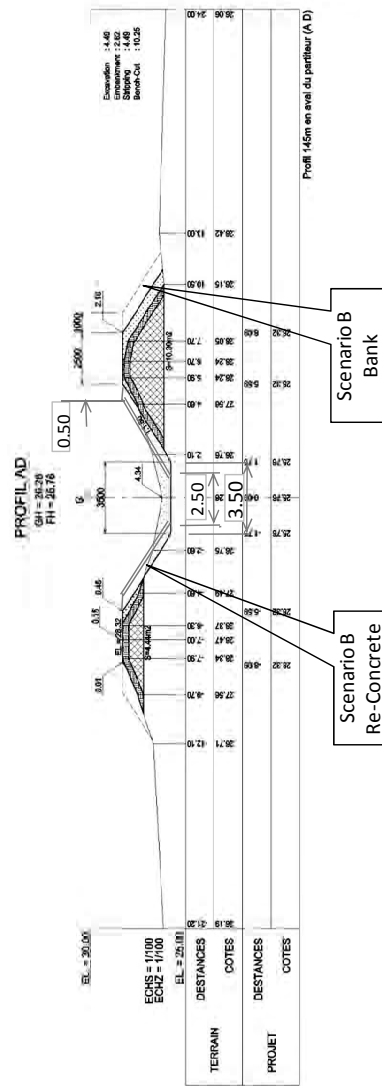
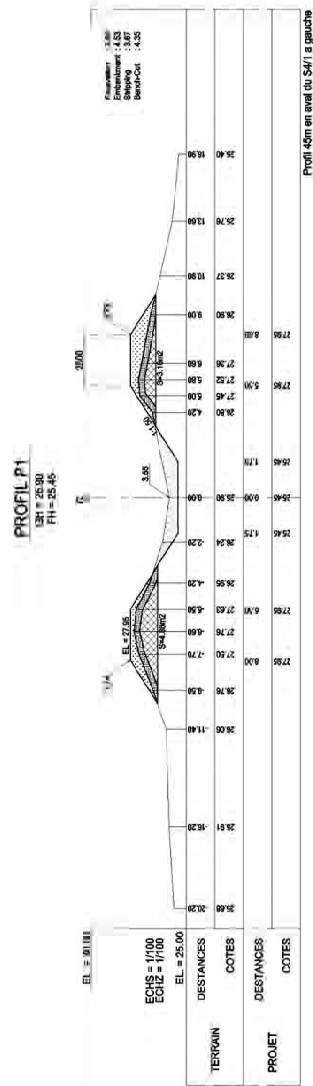
Typical Cross Section of OA



ISLAMIC REPUBLIC OF MAURITANIA
 SONNAGUER
 The Islamic Republic of Mauritania is a member of the
 International Commission for the Protection of the
 Danube River (ICPDR).
 Typical Cross Section of OA
 Scale: 1/100
 NTC INTERNATIONAL CO., LTD.

A4.9.2 AD, P1 水路の代表的な土工断面

Typical Cross Section of AD, P1

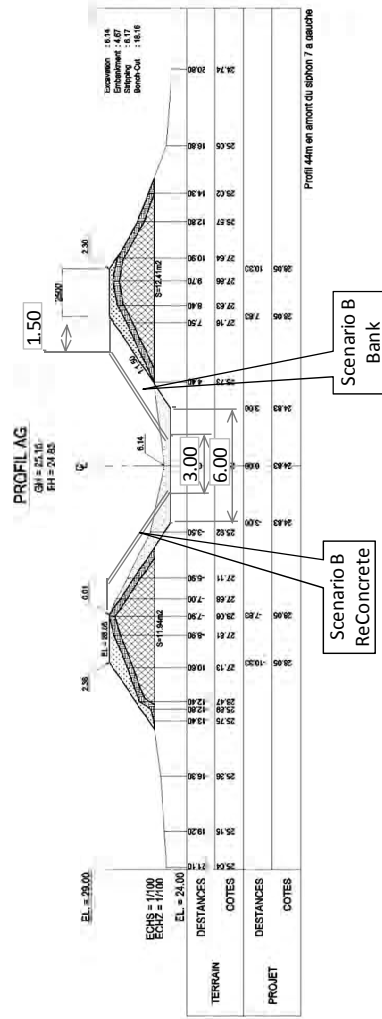
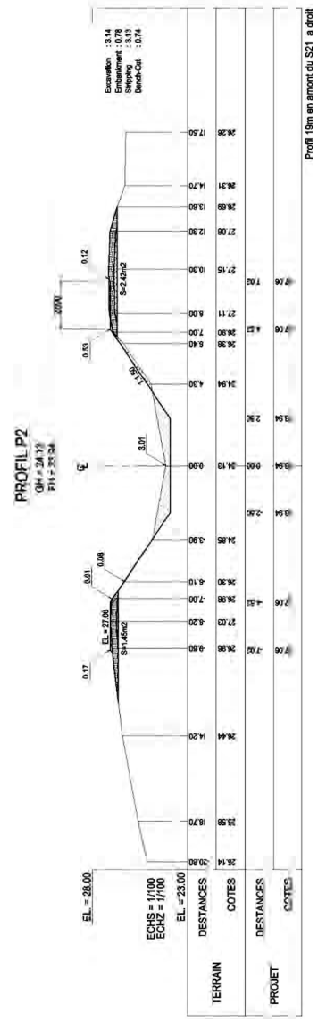


- Legende
- : Excavation
 - : Embankment
 - : Shipping
 - : Bank-Cut

ISLAMIC REPUBLIC OF MAURITANIA
 SOMMER
 The Development Study for the Project on Rehabilitation of
 Higher Agriculture in the Right Bank of River Gambia
 Typical Cross Section of AD, P1
 Scale : 1/100 | Date :
 NTC INTERNATIONAL CO., LTD.

A4.9.3 AG, P2 水路の代表的な土工断面

Typical Cross Section of AG.P2



- Legend
- Excavation
 - Embankment
 - Shoulder
 - Bench-Out

ISLAMIC REPUBLIC OF MAURITANIA
MINISTRE DE L'AMÉNAGEMENT DU TERRITOIRE
ET DE L'URBANISME

The Development Study for the Project on Reclamation of
Ingrate Agriculture in the Inguat Zone of Nouakchott

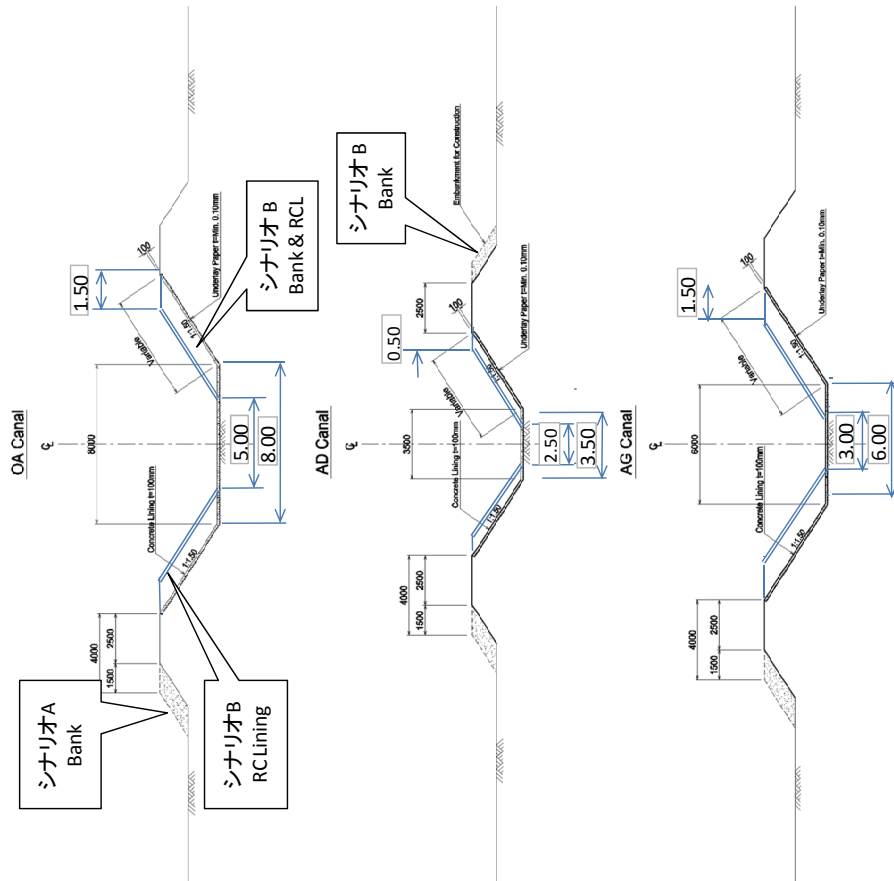
Typical Cross Section of AG.P2

Scale : 1/1100 Date :

NTI: INTERNATIONAL CO. LTD.

A4.9.4 鉄筋コンクリートライニングの代表的な土工断面

Typical Cross Section of Lining Canal
S = 1/100



鉄筋コンクリート(RC)ライニング導水路の比較案

シナリオ A (黒線)
水路断面は1984年竣工時の断面に原形復旧し、RCライニングを設置する案。

シナリオ B (青線)
粗度係数の改善に基づき水路断面を縮減した上でRCライニングを設置する案。

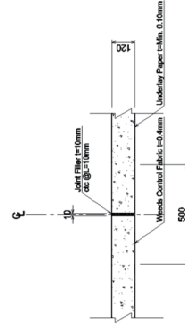
水路とRCライニング水路の粗度係数(n)はそれぞれ0.0277及び0.015とした(K=36及び66.7)。

水深はScenario A, B等しく、OA, AD, AGそれぞれ2.24, 2.49, 1.85mとした。

堤頂は砂利混じりラテライト舗装とする(幅3m、厚さ10cm)。ライニングの上部には幅20cmのシヨルダーをつける。

0.50
単位：m

Detail of Construction Joint
S = 1/10



ISLAMIC REPUBLIC OF MAURITANIA SONALDEF
The Development Study for the Project on Rehabilitation of Irrigation Agriculture in the Inguine Zone of Fatick District
Typical Cross Section of Lining Canal
Scale : 1/100
Date :
NTC INTERNATIONAL CO., LTD.

A4.11 リハビリテーション工事の財務・経済コスト

Work Item	Cost (mMO)	Cost+PC (mMO)	FEX rate %	FEX (mMO)	LEX (mMO)	Econ. LEX (mMO)	First year %	FY FEX (mMO)	FY LEX (mMO)	FY Total (mMO)	2ndY FEX (mMO)	2ndY LEX (mMO)	2Y total (mMO)	G. Total (mMO)
Rehabilitation Work														
Preparatory work	241.2	265.3	72.0	191.0	74.3	65.0	90.0	171.9	58.5	230.4	19.1	6.5	25.6	256.1
Irrigation canal	3,147.1	3,461.8	42.3	1,464.3	1,997.4	1,747.8	80.0	1,171.5	1,398.2	2,569.7	292.9	349.6	642.4	3,212.1
Related structures	123.8	136.2	31.4	42.8	93.5	81.8	80.0	34.2	65.4	99.6	8.6	16.4	24.9	124.6
Farm road	84.4	92.8	60.0	55.7	37.1	32.5	60.0	33.4	19.5	52.9	22.3	13.0	35.3	88.2
Drainage canal	151.0	166.1	60.0	99.7	66.5	58.2	60.0	59.8	34.9	94.7	39.9	23.3	63.1	157.8
Miscellaneous work	177.9	195.7	60.0	117.4	78.3	68.5	60.0	70.4	41.1	111.5	47.0	27.4	74.4	185.9
Urgent additional work	294.5	323.9	60.0	194.4	129.6	113.4	60.0	116.6	68.0	184.6	77.7	45.4	123.1	307.7
Sub total	4,219.9	4,641.9	46.6	2,165.3	2,476.6	2,167.0		1,657.9	1,685.6	3,343.5	507.4	481.4	988.8	4,332.3
Physical contingency (PC) 10%	422.0													
Total	4641.9									167.2			101.4	268.5
Price contingency (5%/year)	268.5													
Grand total excluding tax and custom duty	4,910.4													

Cost of water supply for 4500 people (MO 38.5 million) by water roly and for the existing pump station to Base Vie at S20 (MO 80 million) are included in the Preparatory Work.
The foreign exchange rate (FEX) in APD2 is applied.
The conversion factor of 0.875 (average of 0.85 for common labor and 0.90 for others in APD2) is applied to the Local Exchange (LEX) rate.
Proportion of the first year construction cost is estimated from the construction schedule.
Physical contingency of 10% in APD2 is applied.
Price escalation factor of 5% per annum is estimated and applied on the basis of the IMF project to both FEX and LEX portions.

A4.11(2) Financial and Economic Cost for Four Gleita Irrigation Rehabilitation Project (Allocated by 1950/3600 ha)

Work Item	Cost (mMO)	Cost+PC (mMO)	FEX rate %	FEX (mMO)	LEX (mMO)	Econ. LEX (mMO)	First year %	FY FEX (mMO)	FY LEX (mMO)	FY Total (mMO)	2ndY FEX (mMO)	2ndY LEX (mMO)	2Y total (mMO)	G. Total (mMO)
Rehabilitation Work														
Preparatory work	241.2	265.3	72.0	191.0	74.3	65.0	90.0	171.9	58.5	230.4	19.1	6.5	25.6	256.1
Irrigation canal	1,853.3	2,038.6	42.3	862.3	1,176.3	1,029.2	80.0	689.9	823.4	1,513.2	172.5	205.8	378.3	1,891.6
Related structures	123.8	136.2	31.4	42.8	93.5	81.8	80.0	34.2	65.4	99.6	8.6	16.4	24.9	124.6
Farm road	84.4	92.8	60.0	55.7	37.1	32.5	60.0	33.4	19.5	52.9	22.3	13.0	35.3	88.2
Drainage canal	151.0	166.1	60.0	99.7	66.5	58.2	60.0	59.8	34.9	94.7	39.9	23.3	63.1	157.8
Miscellaneous work	177.9	195.7	60.0	117.4	78.3	68.5	60.0	70.4	41.1	111.5	47.0	27.4	74.4	185.9
Urgent additional work	159.5	175.5	60.0	105.3	70.2	61.4	60.0	63.2	36.8	100.0	42.1	24.6	66.7	166.7
Sub total	2,791.1	3,070.2	48.0	1,474.2	1,596.0	1,396.5		1,122.9	1,079.6	2,202.5	351.3	316.9	668.3	2,870.7
Physical contingency (PC) 10%	279.1													
Total	3070.2													

A4.12 概算工事費

Tableau recapitulative

New quantity and New Rate unallocated

A4.12.1 フーム・グレイタ リハビリテーション工事費①

Désignation		Total HT/HD (UM)
Série 10	準備工(現場設営費等、施工前測量等、現場管理費)	241,220,000
Série 20	灌漑水路リハビリテーション	3,147,054,700
	導・幹線水路	2,822,826,100
	二次水路	267,588,600
	三次水路	56,640,000
Série 30	灌漑水路付帯構造物のリハビリテーション及び新設	123,848,200
	導・幹線水路	117,334,600
	二次水路	1,203,600
	三次水路	5,310,000
Série 40	農道及び圃場整備	84,370,000
	農道	84,370,000
	圃場均平、畦畔築立	0
Série 50	排水路のリハビリテーション	151,040,000
	幹線・二次排水路の堆砂除去及び整形	92,040,000
	三次排水路	59,000,000
Série 60	雑工事	177,885,000
	導・幹線水路	36,285,000
	圃場	141,600,000
Série 70	緊急追加工事	294,481,600
	導・幹線水路(サイホン、水路橋、フェンス、ラジアルゲートのリハビリ)	
合計		4,219,899,500

工事費明細書					
フームグレイタ灌漑地区					
準備工					
N° des prix	調達内容(単価に諸税・関税は含まず)	単位	Qté	PU HT/HD (UM)	Total partiel en UM (HT/HD)
10.00	現場基地設営	Ft	1	70,800,000	70,800,000
10.02	支払線基準測量及び施工設計作成費	Ft	1	44,840,000	44,840,000
10.03	農村飲料水4500人のタンクローリー2台x15ヶ月	Ft	1	38,500,000	38,500,000
	既設水道(S20)への仮設送水施設	Ft	1	80,000,000	80,000,000
10.04	維持管理事務所建設、備品設置、管理補修	U	1	7,080,000	7,080,000
TOTAL SERIE 10					241,220,000

A4.12.2 フーム・グレイタ リハビリテーション工事費②

灌漑水路のリハビリテーション工事					
N° des prix	調達内容(単価に諸税・関税は含まず)	Unité	Qté	PU HT/HD (UM)	Total partiel en UM (HT/HD)
導・幹線水路					
20.02	普通掘削(灌漑導・幹線水路)	m3	313,700	1,534	481,215,800
20.04	盛土(灌漑導・幹線水路)	m3	369,791	2,500	924,477,500
20.06	導水路コンクリートライニング	m3	12,863	106,200	1,366,050,600
20.12	幹線の横断工の建設	m3	450	112,100	50,445,000
20.14	横断構造物内の堆砂除去				
20.14.02	全てのパイプ横断構造物の堆砂除去	U	0	11,800	-
20.16	取水口の補修				
20.16.02	全ての問題の解決	U	0	23,600	-
20.18	サイホン等の堆砂除去				
20.18.02	Siphons SF 7	Ens	1	11,800	11,800
20.18.04	Siphon SF 8	Ens	1	11,800	11,800
20.18.06	Siphon SF 9	Ens	1	11,800	11,800
20.18.08	Aqueduct	Ens	1	11,800	11,800
20.20	道路・水路橋の堆砂除去等 (L=60m ゴルゴル川)				
20.20.02	2連 boxculvert	Ens	1	590,000	590,000
二次水路					
20.02	普通掘削	m3	55,000	1,534	84,370,000
20.04	盛土	m3	45,000	1,416	63,720,000
20.08	二次水路付帯構造物上下流のRCライニング	m3	1000	112,100	112,100,000
20.12	二次排水路横断工新規建設	m3	50	112,100	5,605,000
20.14	全てのパイプ横断構造物の堆砂除去	U	52	11,800	613,600
20.16	二次水路取水ゲート部の補修	U	50	23,600	1,180,000
三次水路					
20.10	三次水路の復旧	ml	120,000	472	56,640,000
TOTAL SERIE 20					3,147,054,700

灌漑水路関連構造物のリハビリテーション工事及び整備					
N° des prix	調達内容(単価に諸税・関税は含まず)	Unité	Qté	PU HT/HD (UM)	Total partiel en UM (HT/HD)
30.02	水利施設(調達、輸送、設置、試験等含む)				
三次水路					
30.02.02	三次水路分水ゲートX2、30 l/s	Unité	10	59,000	590,000
30.02.04	三次水路分水ゲートX2、60 l/s	Unité	10	118,000	1,180,000
30.02.06	三次水路分水ゲートX2、90 l/s	Unité	10	165,200	1,652,000
30.10	三次水路取水部の整備	U	60	29,500	1,770,000
30.04	水位標の調達設置	ml	10	11,800	118,000
二次水路					
30.08	二次水路取水部の整備	U	23	47,200	1,085,600
30.04	水位標の調達設置	ml	10	11,800	118,000
導・幹線水路					
30.02.08	円形分水工の整備	Unité	50	35,400	1,770,000
30.04					
30.06	ダム下流の制水ゲートの修理	Ens	1	236,000	236,000
30.08		Secondaires			
30.10		Tertiaires			
30.12	構造物コンクリート	m3	50	118,000	5,900,000
30.14	Concrete clean	m3	80	82,600	6,608,000
30.16	鉄筋	Kg	4800	472	2,265,600
30.18	空石積み	m3	250	11,800	2,950,000
30.20	練り石積み	m3	500	9,440	4,720,000
30.22	鉄線蛇かご	m3	50	17,700	885,000
30.24	休憩所(鉄筋コンクリート)	Unité	40	2,300,000	92,000,000
TOTAL SERIE 30					123,848,200

A4.12.3 フーム・グレイタ リハビリテーション工事費③

道路、堤防、圃場の均平					
N° des prix	調達内容(単価に諸税・関税は含まず)	Unité	Qté	PU HT/HD (UM)	Total partiel en UM (HT/HD)
農道					
40.02	幹線、支線農道の再表面修復	m2	100,000	472	47,200,000
40.04	農道の新設	m2	35,000	1,062	37,170,000
圃場					
40.06	圃場の均平				
40.06.02	圃場の均平(600ha)	ha	0	141,600	-
40.06.04	畦畔築立(8000m)	ml	0	354	-
TOTAL SERIE 40					84,370,000

排水路ネットワークのリハビリテーション					
N° des prix	調達内容(単価に諸税・関税は含まず)	Unité	Qté	PU HT/HD (UM)	Total partiel en UM (HT/HD)
排水路					
50.02	幹線・二次排水路の堆砂除去及び整形	m 3	150,000	472	70,800,000
50.04	盛土工	m 3	60,000	354	21,240,000
三次排水路					
50.06	三次排水路				
50.06.02	三次排水路(台形)	ml	200,000	295	59,000,000
TOTAL SERIE 50					151,040,000

雑工事					
N° des prix	調達内容(単価に諸税・関税は含まず)	Unité	Qté	PU HT/HD (UM)	Total partiel en UM (HT/HD)
圃場					
60.02	いばらの除去	ha	1000	141,600	141,600,000
導・幹線水路					
60.04	円形分水工のフェンス	ml	0	14,020	-
60.06	その他の雑工事単価				
60.06.02	コンクリート工				
60.06.02.02	現場打ち250 kg HRS 無筋	m3	50	112,100	5,605,000
60.06.02.04	現場打ち300 kg HRS 鉄筋込み	m3	50	118,000	5,900,000
60.06.02.06	現場打ち350 kg HRS 鉄筋込み	m3	50	141,600	7,080,000
60.06.02.08	プレキャスト400 kg HRS 鉄筋込み	m3	50	177,000	8,850,000
60.06.04	モルタル工				
60.06.04.02	M1: 防水モルタル、混合比500kg、添加剤込み	m2	50	47,200	2,360,000
60.06.04.04	M2: 通常防水モルタル、混合比400kg	m2	50	41,300	2,065,000
60.06.04.06	M3: 貧防水モルタル、混合比300kg	m2	50	35,400	1,770,000
60.06.04.08	M4: 非防水モルタル	m2	50	5,900	295,000
60.06.04.10	M5: プラスター仕上げモルタル	m2	50	5,900	295,000
60.06.06	目地モルタルを含む練石積み	m3	50	11,800	590,000
60.06.08	ショベル形掘削機	h	50	11,800	590,000
60.06.10	トラック	h	50	11,800	590,000
60.06.12	石工	j	50	3,540	177,000
60.06.14	普通作業員	j	50	2,360	118,000
TOTAL SERIE 60					177,885,000

緊急追加工事					
N° des prix	調達内容(単価に諸税・関税は含まず)	Unité	Qté	PU HT/HD (UM)	Total partiel en UM (HT/HD)
導・幹線水路関連施設					
70.02	サイホンSF7 (AG右導水路)	Ens	1	13,216,000	13,216,000
.70.04	水路橋修復 (P1幹線水路)	Ens	1	2,265,600	2,265,600
	OA導水路の排水横断カルバート新設	Ens	0	318,600	-
.70.06	フェンス(導・幹線水路の保護)	ml	50,000	5,000	250,000,000
	家畜水飲み場	Unité	0	949,900	-
	洗濯場	Unité	0	1,424,850	-
.70.08	ダム取水ラジアルゲート及び角落し修復 (OA導水路始点)	Ens	1	29,000,000	29,000,000
TOTAL SERIE 60					294,481,600

ANNEX 4

ATTACHMENT 参加型で改修可能な末端灌漑施設

灌漑地区は二期に分けて完成している。即ち、

a. 第一次開発(1984年共用開始)

北側 P1 幹線用水路末端の S9-S10 分水掛かりと南側 P2 幹線末端の S27 分水掛かりは 1984 年に完成し、供用が開始された。しかし、S9(140ha)は現在、灌漑水が到達しておらず、灌漑農業は殆ど行われていない。一方、S27/1(137ha)は地区内で最も灌漑農業が盛んで現況灌漑面積が最大の地域である。

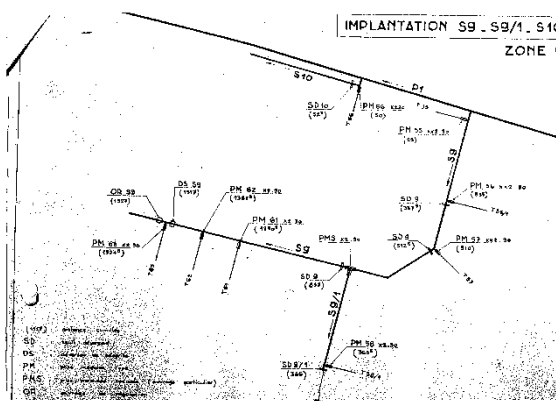
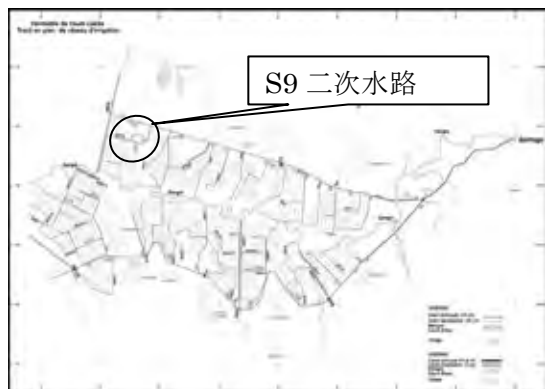
b. 第二次開発(1990年共用開始)

北側 P1 幹線用水路の S1-S8 分水掛かりと南側 P2 幹線の S16-S26 分水掛が第一次開発に続いて 1989 年に建設され、供用が開始された。

末端施設が農民の参加型で実施可能であるかを判断するため JICA 調査団による末端施設調査は、上記、第一次開発による古い施設である S9 及び S27-1 二次-三次水路の施設について行われた。地区内では最も古く、老朽化している施設であるが、結論として、堆砂と堤防の劣化は著しいものの、コンクリート構造物の状態は良く、鋼製流量調整のゲート(堰)、分水ボックスおよびその周辺の堤防の補修など今後、参加型でこまめな補修が行なわれれば、十分に機能を維持できると判断した。このため、第二次開発の施設も同様であると想定できる。

(1) S9 二次水路施設

S9 二次水路システムと施設配置図は以下の通りである。



以下、各水路施設の状態を写真により報告する。

a. S9 幹線水路分水



S9 幹線分水堰と余水吐（右岸側）



S9 幹線分水工(左岸側)

b. S9-1 二次水路



三次水路分水工(Module Amasuk)



三次水路分水ボックス



四次水路分水工(堆砂除去、盛土、鉄板ゲートが必要)

c. S9.2 二次水路分水(+337.5m)



落差工兼分水位調整堰



三次水路分水工(Module Amasuk)



三次水路分水ボックス

d. S9.3 二次水路分水(+512.5m)



分水位調整堰



三次水路分水工(Module Amasuk)

d. S9.4 二次水路分水(+857m)



分水位調整堰



三次水路分水工(Module Amasuk)

e. S9.5 二次水路分水(+1250.5m)



二次水路分水工



三次水路分水工(Module Amasuk)

f. S9.6 二次水路分水(+1387.5m)



二次水路分水工



三次水路の道路横断工

g. S9.7 二次水路分水(+m)



二次水路分水工



二次水路余水吐



三次水路分水工(Module Amasuk)



二次水路末端分水工

h. その他の構造物



二次水路沿い農道



農地のヤブ化

i. S9/1 二次水路施設



落差工兼分水位調整堰



三次水路分水工(Module Amasuk)



三次水路への分水工



四次水路への分水工



二次水路末端に沿う農道



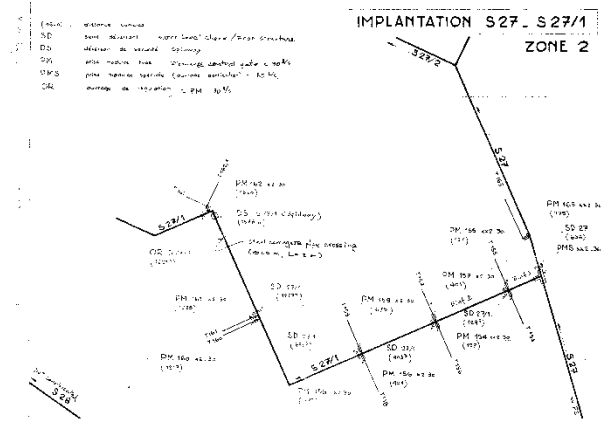
農道横断暗渠

以上、S-9 二次水路（第一ステージで 1984 年完成）においては農民参加による軽易な維持補修（堆砂やヤブの除去、ゲートのペンキ塗り、潤滑油の補給など）により、殆どの施設が十分に機能すると調査団は判断した。

なお、P1 幹線最末端の S10 二次水路は、永く灌漑水が到達しておらず、砂に埋もれているが、PM（鋼製流量調整堰）は殆どが存在しており、使用可能である。

(2) 末端施設調査 S27/1 二次水路施設 (2009年11月5日)

末端調査は施設配置図が存在する S27/1 二次水路派線においておこなった。位置は図に示すとおり P2 幹線水路再末端の S27 分土工掛りの三派線の最上流で、分土工から 636m 下流の水位調整堰の直上流から左岸側に分水する。この S27/1 二次派線地区は P2 幹線の最末端に位置しているが、フォームグレイタ全 27 分水区中で最も活発に大部分の灌漑面積で耕作が行われている。



調査結果は以下の通りであるが、結論としては、ほぼ全構造物がその機能を果たしており、水路の堆砂除去、堤防の修復、雑草の除去、コンクリートの法面保護工の裏込め、三次水路の分水ボックスの鉄板ゲートと戸当りの修復など農民参加で可能な軽易な作業が必要である。

- a. S27 二次水路の P2 幹線からの取水門は地区内では唯一の 2 本スピンドルゲート (その他は全て 1 本) であるが、内 1 本は現在修理中である。636m の二次水路は堆砂と堤防劣化が著しいが、ガマは殆どなく、ブッシュ (Toffelhena) のみである。



P2 幹線 S27 分土工



S27 分土工と下流二次水路

- b. S27 二次水路から S27/1 派線への分土工は、チェックゲートと大型 PM (Prise Modulee:流量調整ゲート : 5,10,15,30,30,45,45 l/s=180 l/s: 純幅員 180cm) からなっており、特段の支障はない。



S27 二次水路分水上流から

S27/1 二次派線への大型 PM

- c. 二次派線総延長は約 2km であり、灌漑面積は 137ha であるが、現在その大部分で灌漑耕作が行われている。派線は 5 箇所に分水工、コルゲートパイプの道路横断暗渠（直径 1.05m、延長 12m）、余水吐を有している。分水工は水位調整堰とその直上流の PM(5,10,15 l/s 等)分水ゲートからなっている。これらの分水工は構造物の裏込め土と上下流端への蛇籠など、農民による保守が実施されれば今後も機能上は問題がないと判断した。横断暗渠、余水吐についても問題はない。水路の堆砂除去、雑草の除去についても農民組合で対応が可能である。



677m 地点の分水工チェック堰



1620m 地点の分水 PM



1578m 地点の余水吐



余水吐上流約 200m の道路横断暗渠

- d. 三次水路系統も殆どが機能しているが、分水ボックスの多くは分水ゲート（鉄板製）と戸当たりが紛失または破損している。分水は流量ではなく時間ローテーションで行っていることから、ありあわせの鉄板や土により順番に全閉、全開を行っており、当面、実用上は大きな支障となっていない（SONADER 土木部、農民談）。



1300m 付近の派線沿い三次水路



三次ボックスのあり合わせ鉄板ゲート



三次から四次水路への取水パイプ

- e. 農道については派線沿いに幅最低 3m の道路が設置されており、ブッシュの除去が行われれば、小型トラックによる収出荷に支障はない。



500m 付近の派線沿い農道



1300m 付近の農道

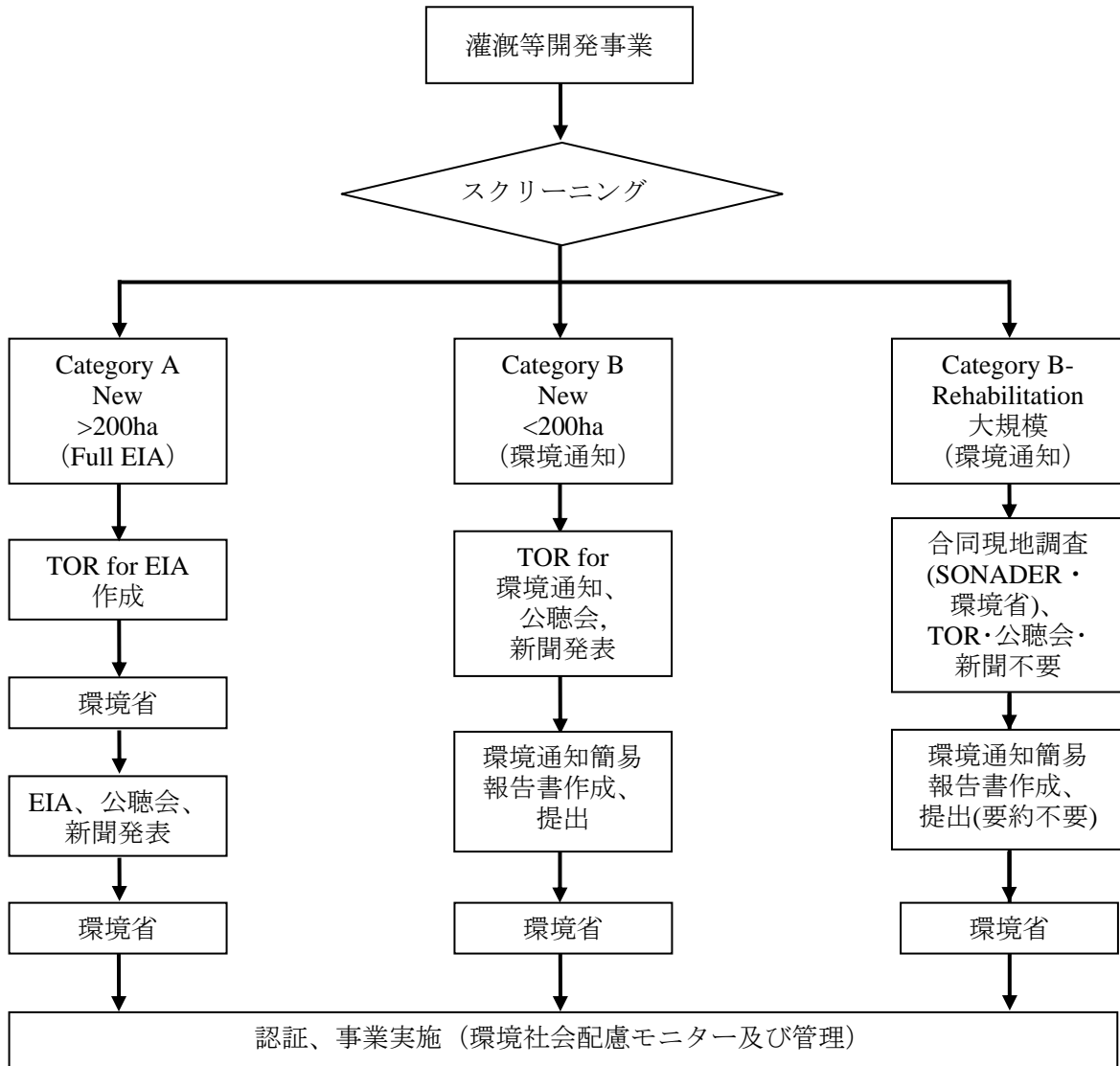
- f. 末端施設の堆砂除去の土捨て場は圃場、道路の周辺で可能である。ブッシュも周辺で、乾燥後焼却が可能であると判断した。

ANNEX 5 環境配慮

A5.1 環境社会配慮の審査手続き

(1) 環境社会配慮調査の流れ

本文に示した通り、EIA と環境通知(Environmental Notice: IEE 相当)の手続きの流れは以下の通りである。



SONADER によると、リハビリ事業は完成当初の状況に修復するのが目的である為、環境社会配慮審査は適用されないとのことである。この為、類似地区のリハビリ事業は環境省との協議を行わずにリハビリを実施している。しかし、フォーム・グレイタについては2010年9月2日の環境省とSONADERの局長レベルの協議に基づき簡易な環境通知を作成し、環境省の認証を受けることで合意が成立した。SONADERの総裁から調査団には「資金源がもう少し明確になった時点で早急に環境通知の認証を受ける」とのことであった。なお、SONADERの環境報告書は完了している。

(2) EIA の手続き (カテゴリーA)

改訂総理府令に基づく環境・社会インパクトスタディ・通知に関する諸手続きは以下のとおりである。

- 開発行為者は EIA または環境通知の TOR を作成して環境省に提出する。この提出から 14 日以内に開発行為者とその管轄官庁を召集し、TOR の妥当性を審査し、承認する(13 条)。
- EIA の実施に際しては政府関係者、地元住民、NGO などの参加を呼びかけ、意見を聴取する(17 条)。
- EIA 完成後、要約を新聞発表し、この日から 30 日間求めがあれば全ての関係者に情報を開示する(22 条)。
- この 30 日間の経過後、7 日間はコメントの受付を行う(23 条)
- コメントの調査検討は 5 日間で行う (24 条) 。
- 15 日間で調査検討の結果をレポートにまとめ、開発の是非を提案する (25 条) 。
- このレポートは環境大臣に送付され、大臣は 5 日間以内にレポートを管轄大臣と地元民に送付する。(26 条) 。
- 環境大臣は EIA または環境通知に関する調査レポートを受け取った日から 20 日後に開発事業の妥当性に関し、アドバイスを発出する。この発出日以降アドバイスは有効となる (31 条) 。
- 開発の実施に際しては環境管理計画書に基づき環境省及び管轄官庁が環境社会配慮モニタリングを実施する (32 条)

(3) フーム・グレイタ修復工事の環境通知手続き (簡易なカテゴリーB)

- 2010年9月、SONADERの局長 (Director for Study and Work) と環境省の局長 (Director Control) の会議が行われ、本件は大規模ではあるが、リハビリテーションであることから、カテゴリーBにより審査手続きの簡素化が適用されることとなった。両者協議の結果、環境省のExpert (1-2名) とSONADERのExpertsにより2-3日のJoint surveyが現地で行われ、その後、1週間でレポートを作成・提出 (20-30ページ) の後、更に1週間程度で環境省の認証が得られることで双方合意した。なを、フーム・グレイタの場合は、TORの作成承認、レポート要約、公聴会の実施等は必要としないことも合意された。
- この報告を受け、SONADER総裁は、財源がもう少し明確になった段階で、速やかに環境通知を作成・提出して、認証を得ることを同日、調査団に伝えた。

A5.2 フーム・グレイタ周辺の自然社会環境

a) ゴルゴル州の面積、気象、人口、産業 (本文参照)

ゴルゴル州全国12州のひとつで面積は13,891km²、人口は約30万人でありその75%が農村部に居住している。産業は農業(63%)と畜産(10%)で73%を占める。

気象については、月平均の最高温度が42℃ (カエディ、5月)、最低気温は17℃ (同1月)、スーダン気候帯の影響を受け、2月から5月にはハルマッタン (熱波) がしばしば発生する。

年間降雨量は250-300mmで、7-9月が月平均90mm程度である。雨期は6-10月でそれ以外は乾期で

ある。月平均相対湿度は最高が63%(8月、カエディ)、最低が20% (2月、カエディ) である。

b) フーム・グレイタ地区の概要、組合、人種、教育、保健

フーム・グレイタ灌漑地区の受益者の住む村の人口は約2万人である。地区には男性組合45 (組合員数1,300)、女性組合が49 (組合員2,700)、連合組合3連合 (男1、女2) が設立されているが、最近では活発な組合が減少している。この人々はプラー (アフリカン) とモール (アラビアン) が大勢を占める。地区の関係10ヵ村には小学校があり、保健所はフーム・グレイタ中央村に1ヵ所、その支所がDakhra (Bachat) にある。中央村の保健所は保健士2名、女性用保健士1名で、照明はソーラー、薬品用冷蔵庫はガス発電である。診察費用は無料であるが、薬は処方箋に基づき薬屋で別途購入 (補助金により安価) するシステムである。州内各郡の半径5km以内の保健所へのアクセシビリティはカエディが人口の90%に対し、当地区の所属するムブート郡は59%で4郡中最低である。フーム・グレイタの主な水系伝染病と罹病率 (保健所に来た全患者数に対する比率は以下のとおりである。

表A5.1 フーム・グレイタの水系伝染病の罹病率 (%)

水系伝染病	2001	2007
マラリア	25	29
住血吸虫	14	6

Source: Etude sanitaire des mesures concretes d'attenuation des impacts environnemetaux du PDIAIM

マラリアは微増しているが、住血吸虫症は減少している。この理由は飲料水源である水路での放尿の禁止が徹底しつつあることが理由であるとの保健士の説明があった。なお、今回は水路と溜まり水でボーフラと中間宿主のミヤイリ貝を調査したが死骸すらも発見できなかった。なお、飲料水によるギニアウォームは日本を含む国際機関の支援により、過去3年間の発症例がゼロとなった。

リフトバレー熱、オンコセルカ、象皮病などの灌漑水系伝染病も発症例は無い。



フーム・グレイタの保健所

c) 社会インフラ (交通、水資源、電気、水道)

フーム・グレイタへは拡幅中の国道カエディ-ムブート線のSiliwaから約10kmである。沙漠道であり、途中のワディ (涸れ川) の横断は雨期には数日待つことがある。水資源はフーム・グレイタダム4億m³があるが、水路からの送水路は1本のみでほとんど無処理に近く安全な水ではない。2

ヶ村で地下水汲み上げペダルポンプが水利局で建設されているが他の7ヶ村では飲料水施設はなく、水路から水を汲んでいる。電気はない。Commune事務所によると配電の計画は現在、将来ともに無いとのことである。ダムには10kVAのミニ hidro 施設が設置してあるが10年以上修理されていない。商店ではソーラー発電で携帯電話のバッテリーチャージのみを行っている。

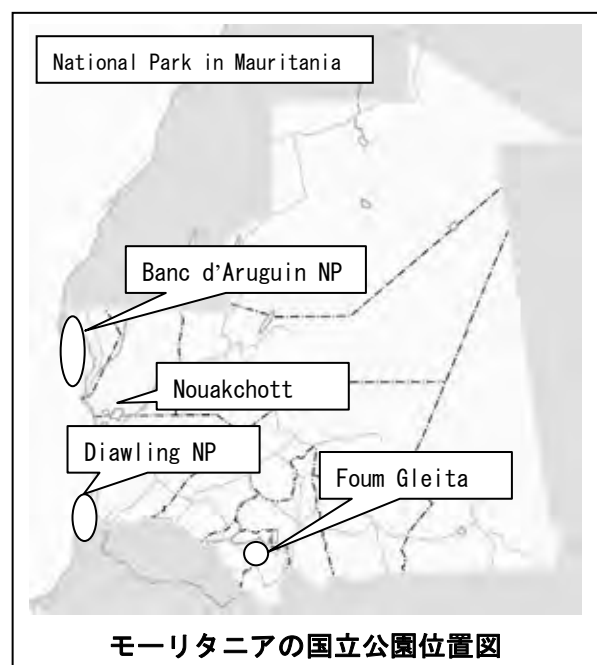
d) 農業、土壌、土地利用

本地区は水稲二期作を目標に開発され、1990年には二期作が始まったが、その後、がま (Tipha) の繁茂、畜害による堤防全線の劣化などにより水路の通水能力が減少して2008年には水稲作付け面積が350haまで落ち込んでいる (1989年の開発面積は1950ha)。

e) 国立公園など

モーリタニアには沿岸地区北部 (図 2.3.1参照削除) のバンダルガン (Banc d'Aruguin) 国立公園とセネガル河河口部のディアウリン (Diawling) 国立公園がある。前者は多種の魚類、Dolphin、鳥類など生態学的多様性に富み、国際的に著名であり、ラムサール条約に登録されている干潟地帯である。後者はRosso下流のAftout es Saheli (coastal zone) 内にあり、マングローブ、鳥類特に西アフリカで唯一の小フラミンゴ (Phoenicopterus minor) やピンクフラミンゴ (Phoenicopterus ruber) で著名なショットブル(Chott Boul)湿地を含む。しかし、ディアウリン国立公園からフーム・グレイタまでは直線距離で400kmあり、生態区分が異なることから環境面での関連はない (右図参照)。

なお、国内で最も貧困なゴルゴル州には国立公園はないが、400-1800haの森林保全地区がセネガル河右岸に沿って5カ所分布している。フーム・グレイタ地区はこれら森林保全地区からも最低数十km以上は離れており、関連性はない。



f) 生態系

対象地区は基本的には農村と農耕地として開発され、使用されている土地であり、貴重種は報告されていない。動物は牛、馬、ラバ、羊、山羊、らくだが優勢であり、植物は栽培されている農産物（コメ、野菜、豆）を除くと砂漠、農地の末端部や水路際で組合の手の届かないところに自生する灌木や雑草、茨が優勢である。茨はアカシア科の鋭いトゲのあるもの(Balanites)と、トゲのないブッシュ(アラビア語のToufelhenna)が群生し始めており、水利施設へのアクセスを困難にし、水路堤崩壊の原因にもなっている。樹高 1.5m までのものは Acacia Senegalsis であり、4-5m に達するものはハッサニア語で Balborigie と呼ばれている。地元で大きな葉 (Big leaf) と呼ばれる灌木もある。これらは参加型で農民による除去が予想される。ガマ(Typha)は水路に繁茂して通水能力を減少させている。淡水魚は鯉、なまずなどであるがダム湖ではテラピアが日本の協力で行われている。



フーム・グレイタ灌漑地区ゴルゴル川左岸側

g) 沙漠化

ゴルゴル川支流黒ゴルゴルと白ゴルゴルは地区北方の Assaba 州と Tagant 州の低い山地が水源であり、両支川はダムのある Wa-Wa 山脈 (標高 150m) に沿い、とも南に流下し、黒ゴルゴルはダムに流入し、ダムから対象地区の中央を西に流下して黒白ゴルゴル川合流点、Lexeiba を経て、カエディ市においてセネガル河に右岸から合流する流域面積 21,000km² の河川である。1983 年のダム完成以前の乾期は涸れ川であったが現在はダムからの補給水により、通年流水がある。流域は主に土漠と石礫沙漠であり、砂丘、特に移動性砂丘は存在していない。

A5.3 初期環境調査 (IEE)

本調査では実証調査を行うが、既存の圃場や水路を使つての営農技術及び参加型維持管理の実証であるため、環境への負の影響は無い。

また、今後本件が実施される場合は既存灌漑施設の復旧であり、工事の実施に伴い、騒音、振動などが発生する可能性はあるが、人家から離れた距離でのリハビリテーション事業であることから、大きな負の影響は想定されない。

初期環境調査については、SONADER と協議し、世銀レポートなどを参考に、調査団でドラフトを作成し、SONADER に提出した。

IEE: Initial Environmental Examination

(1) Framework for Initial Environmental Examination for Draft Action Plan

The main objectives of the initial environmental examination (IEE) are to identify potential negative environmental impacts caused by implementation of proposed program/project components of the Action Plan and to suggest mitigation measures and monitoring methods in order to avoid and/or mitigate the potential negative impacts.

The framework of the IEE study is shown in the following figure. After the screening of the program/project components of the Action Plan, IEEs are implemented for selected program /project components which need to be examined. The potential impacts are examined on the basis of the activities of the program/project components. In addition, the mitigation measures and monitoring methods are preliminarily proposed. On the other hand, the impacts that would result without implementation of any activities of the Action Plan was also examined based on the current condition. The Result is compared with the impacts that would result with implementation of selected projects/program.

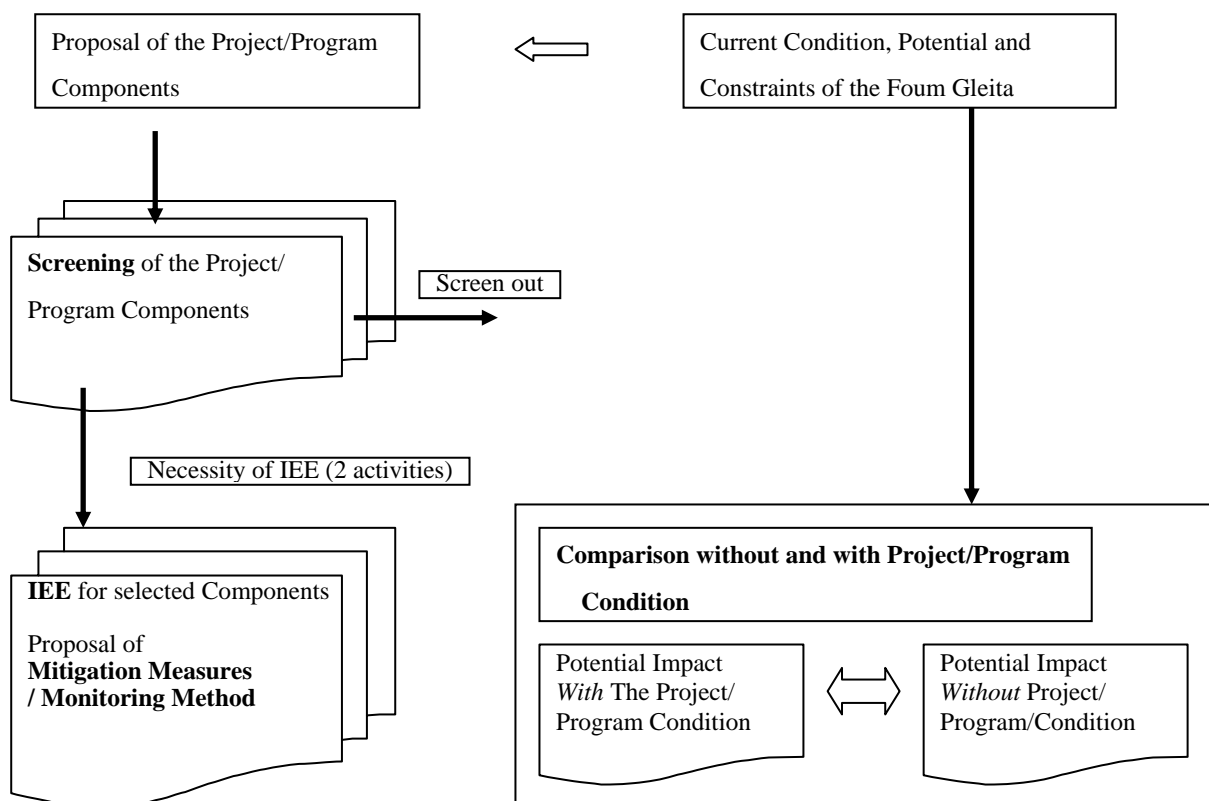


Fig. A5.3.11.1 Framework for IEE for the Proposed Project/Program

(2) Screening of Project/Program Components

a. Result of Screening of Project/Program Components

The results of the screening of the proposed program/project components are summarized below.

TableA5.1 Summary of Result of Screening of the Project/Program Components

Program/Project	Program/Project Component	Screening	Remarks
Institutional Development Program (Participatory Water Management)	1. Strengthening of SONADER (FG & Kaedi)	Screened Out	Capacity Development and Training
	2. Strengthening of Cooperative & Union	Screened Out	Capacity Development and Training
Improvement of Farm Management Techniques	Agriculture input and credit, and marketing	IEE	Fertilizer and Agriculture Input
Rehabilitation of Irrigation and Drainage System	Rehabilitation project	IEE	Removal of sediment & vegetation, recovery of dike and repair of structures, and construction of fence

Note: Screening result is categorized into two groups; i) project/program component needs Initial Environmental Examination which is stated as IEE in the table and ii) project/ program component is screened out and no IEE is required.

b. Screening of Project/Program Components in Action Plan

Future program/project components proposed in this study have been screened from view-points of environment and social consideration. Two-step screenings have been carried out hereunder and finally tentative “Environmental and Social Issues to be Noted” have been prepared for future actions.

Environmental and Social Consideration
On the Development Study on Reactivation of Irrigated Agriculture Project in Foum Gleita

1. Proposed Project/Program

Future project/program components proposed in the Study have been screened from view-points of environment and social consideration. **Two-step** screenings have been carried out hereunder:

1-1 Preliminary Screening of Proposed Project/Program Components

A5.3 Preliminary Screening of Proposed Project/Program Components

Project Component in the Proposed Project/Program	Outline of the Component	Necessity of the Component	Main Activity of the Component	Preliminary Environmental Screening
<p>A. Improvement of Farm Management Techniques</p>	<p>This program component aims at recovery of productivity and quality of agricultural produce through application of the existing farming techniques, strengthening of extension services, agriculture credit, marketing and farmers cooperative, and sustainable linkage with research institute. Especially, it is necessary to keep a close communication among them in order to develop applicable farming techniques. Only the existing techniques and know-how will be employed in the proposed project.</p>	<p>Improvement of farm management system needs to focus on the following areas:</p> <ol style="list-style-type: none"> 1. Proper cropping plan, and linkage among farmers, extension service and research, 2. Provision of timely financial assistance for procurement of agriculture input, and agriculture machineries, 3. Extension of farming technology, 4. Shipping and storage of agricultural produce, 5. Constraints by animal, bird, bush, typha, etc. which invade farm land and reduce produce. 	<p>For improvement of productivity and quality of crops, the following activities will be strengthened:</p> <ol style="list-style-type: none"> 1. Organization of workshop for research and extension staffs for the better linkage, 2. Reinforcement of credit line, market information, crop calendar, etc. 3. Dissemination of farming technology such as seeds, agricultural inputs and mechanization 4. Training program for farmers cooperative through workshop and visit of progressive similar sites 	<ol style="list-style-type: none"> (1) The activities in this program component will be carried out in existing research areas, existing farmlands or in offices. (2) Construction of new infrastructure is not included. <p>Accordingly, it is judged to be “Screened Out”, in general for rehabilitation and improvement activities in this project component. However, it is necessary to proceed to further screening because the present development study is categorized as “B” by JICA.</p>

Project Component in the Proposed Project/Program	Outline of the Component	Necessity of the Component	Main Activity of the Component	Preliminary Environmental Screening
<p>B. Participatory Water Management (Strengthening of SONADER, Union and Farmers Cooperatives)</p>	<p>This program component aims at recovery of function of existing institution through workshop and training program.</p>	<p>Constraints of the existing system are poor transparency in financial management of union cooperatives, limited delegation of SONADER, default of obligation (SONADER) and loan repayment (farmers), stagnant of personnel (union cooperative), lack of communication, credibility gap, etc. Accordingly, it is essential to recover the function for provision of efficient and effective management services to farmers based on the fund paid by farmers.</p>	<p>Major activities of this component are capacity development of staff of water master (SONADER), and training of the cooperative staff in dissemination techniques and knowledge of water management and exposure visits to advanced area and focus on the following items:</p> <ol style="list-style-type: none"> 1. Capacity development of staff of extension services and water master in SONADER 2. Training of the cooperative and union staff in dissemination of participatory approach. 3. Transparency in finance, strengthening of SONADER, fulfillment of mandatory, periodical erection of cooperative and union staff, close communication and recovery of trust. 4. Monitoring and Evaluation 	<ul style="list-style-type: none"> • The activities in this program component are staff capacity development, strengthening of function of existing institution. <p>Accordingly, it is judged to be “Screened Out” in this program component. No further screening or discussion of this component will be made hereinafter.</p>

Project Component in the Proposed Project/Program	Outline of the Component	Necessity of the Component	Main Activity of the Component	Preliminary Environmental Screening
<p>C. Rehabilitation of the existing Irrigation and Drainage System</p>	<p>This project component aims at rehabilitation of the existing irrigation and drainage system of the Fom Gleita Irrigation Project area with a irrigation area of 1950 ha at the time of completion in 1984 and 1989.</p>	<p>The present irrigation area has been reduced to only 400ha or less due to the reduction in canal capacity from 10.7 m³/s in 1989 to only 1.2 m³/s at present mainly because of bottom sediment, degradation of canal dike damaged by livestock and excessive vegetation. It is, therefore, essential to rehabilitate/improve existing irrigation and drainage systems.</p>	<p>Major activities of this component are rehabilitation/repair of existing irrigation and drainage system</p> <p>By these activities, the following will be attained;</p> <ol style="list-style-type: none"> 1 Existing irrigation systems will be rehabilitated and upgraded. 2. Irrigation area will be recovered from present 400ha to the initial 1950ha. 3. Function of irrigation and drainage facilities for 1950ha will be recovered. 4. Agriculture production will increase through sufficient irrigation water supply and drainage. 	<ul style="list-style-type: none"> • Rehabilitation and improvement activities in this component will be carried out in existing irrigation and drainage systems. <p>Accordingly, it is judged to be “Screened Out”, in general for rehabilitation and improvement activities in this project component. However, <u>it is necessary to proceed to further screening because the present development study is categorized as “B” by JICA.</u></p>

The results of the above preliminary screening of all the project components are summarized below:

Considering the environmental category “B” given by JICA, only **(B) Participatory Water Management (Capacity development of SONADER, Union and Farmers Cooperatives)** in the project/program components have been screened out through the preliminary screening, and following project/program components are selected for the Initial Environmental Examination:

(A) **Improvement of Farm Management Techniques**

(C) **Rehabilitation of the existing Irrigation and Drainage System**

1-2 Result of Initial Environment Examination

(1) Summary of Initial Environmental Examination

In accordance with the results of preliminary screening of all the project/program components, the following project components have been further assessed hereafter:

- (A) **Improvement of Farm Management Techniques, and**
 (C) **Rehabilitation of the existing Irrigation and Drainage System Project**

Impact matrix has been prepared for the above 2 activities of the project/program components. In the matrix, the following screening toward potential impacts and phase-wise impacts has been carried out.

Initial environment examination is conducted by adoption of Impact Matrix as follow:

Table A5.4

Remarks in Impact Matrix	
Potential impacts towards a) social environment, b) natural environment and c) pollution were studied in each separated phase, i.e. i) designing phase, ii) construction phase, and iii) operation phase. The mark in the table means categories of impact.	
Left-side of each cell represents a direction of impact and right-side represents a magnitude of impact as follows:	
Left side;	++: Positive impact --: Negative Impact =: Neutral Impact
Right side;	A : relatively significant impact, B : relatively medium-size impact, C : relatively small impact, D : unknown as of now, * : No impact or no corresponding impact

Table A5.5 Summary of Initial Environmental Examination of the Project/Program Component

Potential Impacts		Improvement of Farm Management Techniques	Rehabilitation of the existing Irrigation and Drainage System	Notes
Social Environment				
1	Involuntary Resettlement	*	*	
2	Local economy (employment, livelihood, etc)	++/B	++/B	
3	Land use and utilization of local resources	++/B	++/B	
4	Social institutions (social infrastructure & local decision-making institution)	++/C	++/B	
5	Existing social infrastructures and services	*	++/C	
6	The poor, indigenous and ethnic people	++/B	++/B	
7	Misdistribution of benefit and damage	++/B	++/B	
8	Cultural heritage	*	*	
9	Local conflict of interests	++/B	++/B	
10	Water Usage or water rights and communal rights	*	++/B	
11	Sanitation	*	++/C	
12	Hazards (Risk), Infectious diseases as HIV/AIDS	*	=/C	
Natural Environment				
13	Topography & Geographical features	*	*	
14	Soil Erosion	*	++/B	
15	Groundwater	*	++/C	
16	Hydrological Situation	*	*	
17	Coastal Zone	*	*	
18	Flora, Fauna and Biodiversity	*	*	
19	Meteorology	*	*	
20	Landscape	*	*	
21	Global Warming	*	*	
Pollution				
22	Air Pollution	*	*	
23	Water Pollution	--/C	*	
24	Soil Contamination	--/C	*	
25	Waste	--/C	*	
26	Noise and Vibration	*	*	
27	Ground Subsidence	*	*	
28	Offensive Odor	*	*	
29	Bottom sediment	*	*	
30	Accidents	*	--/C	

(1) Improvement of Farm Management Techniques

This work consists of ①Dissemination of farming technology such as seeds, agricultural inputs and mechanization, ②Reinforcement of credit line, market information, crop calendar, etc., ③ Training program for farmers' cooperative through workshop and visit of progressive similar sites, ④Organization of workshop for research and extension staffs for the better linkage

A5.6 Impact Matrix for Improvement of Farm Management Techniques

Activity		Improvement of Farm Management Techniques			
		Designing	Const- ruction	Opera- tion	Comments
Potential Impact					
Social Environment					
1	Involuntary Resettlement	*	*	*	
2	Local economy (employment, livelihood, etc)	*	*	++/B	Local economy will be reactivated. Farmers engaged in migratory working in the outside will return to their families for cultivation.
3	Land use and utilization of local resources	*	*	++/B	Abandoned farm land will be reactivated.
4	Social institutions (social infrastructure & local decision-making institution)	*	*	++/C	Strengthening of farmers' cooperatives and union cooperatives.
5	Existing social infrastructures and services	*	*	*	
6	The poor, indigenous and ethnic people	*	*	++/B	Beneficiaries are mostly small and marginal farmers.
7	Misdistribution of benefit and damage	*	*	++/B	Fair water distribution from 400ha to 1950ha
8	Cultural heritage	*	*	*	
9	Local conflict of interests	*	*	++/B	Irrigation water will be satisfied.
10	Water Usage or water rights and communal rights	*	*	*	
11	Sanitation	*	*	*	
12	Hazards (Risk), Infectious diseases as HIV/AIDS	*	*	*	
Natural Environment					
13	Topography & Geographical features	*	*	*	
14	Soil Erosion	*	*	*	
15	Groundwater	*	*	*	
16	Hydrological Situation	*	*	*	
17	Coastal Zone	*	*	*	
18	Flora, Fauna and Biodiversity	*	*	*	
19	Meteorology	*	*	*	
20	Landscape	*	*	*	
21	Global Warming	*	*	*	
Pollution					
22	Air Pollution	*	*	*	
23	Water Pollution	*	*	--/C	Aiming at low input and high return
24	Soil Contamination	*	*	--/C	
25	Waste	*	*	--/C	
26	Noise and Vibration	*	*	*	
27	Ground Subsidence	*	*	*	
28	Offensive Odor	*	*	*	
29	Bottom sediment	*	*	*	
30	Accidents	*	*	*	

Remarks: Left side; ++: Positive impact --: Negative Impact =: Neutral Impact
 Right side; A: relatively significant impact, B: relatively medium-size impact, C: relatively small impact, D: unknown as of now, *: No impact or no corresponding impact
 No comments means 'not applicable'

A5.7 Potential Negative Impacts and Possible Mitigation Measure of Improvement of Farm Management Techniques

	Potential Impact	Phase	Rating	Impact Cause/Severity	Mitigation Measure/Monitoring Method	Action Time for Avoidance/Mitigation
23	Water Pollution	Operation	C	Fertilizer & chemical input/Less	Less application/SONADER monitoring	Operation at field/Mitigation
24	Soil Contamination	Operation	C	Fertilizer & chemical input/Less	Less application/SONADER monitoring	Operation at field/Mitigation
25	Waste	Operation	C	Residual waste of vegetable & fruit/Less	Livestock feed & compost/Extension worker	Operation at field & market/Mitigation

Note: A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now

Conclusion:

Effort of on-going application of less input & high return will be continued by lessons obtained from the verification trial in the present study. Effective use of vegetable waste has been practiced at the field and market. Accordingly, significant negative impacts are not predicted with proper management during operation phase. The proposed mitigation measures are expected to minimize the negative impact.

(2) Rehabilitation of Irrigation and Drainage Facilities

This work consists of rehabilitation of irrigation and drainage facilities for the irrigation area of 1950ha.

Table A5.8 Impact Matrix for Rehabilitation of Irrigation and Drainage Facilities

Potential Impact	Activity	Rehabilitation of Irrigation and Drainage Facilities			
		Design ing	Const-ruction	Opera-tion	Comments
Social Environment					
1	Involuntary Resettlement	*	*	*	
2	Local economy (employment, livelihood, etc)	*	*	++/B	Local economy will be reactivated. Farmers engaged in migratory working outside will return to their families. Subsidy or employment is available during construction.
3	Land use and utilization of local resources	*	*	++/B	Abandoned farm land will be reactivated. Illegal off-takers along principal canals will return to the irrigation area
4	Social institutions (social infrastructure & local decision-making institution)	*	*	++/B	Strengthening of farmers' cooperatives and union cooperatives.
5	Existing social infrastructures and services	*	*	++/C	Existing irrigation & drainage related facilities will be rehabilitated.
6	The poor, indigenous and ethnic people	*	*	++/B	Beneficiaries are mostly small and marginal farmers.
7	Misdistribution of benefit and damage	*	*	++/B	Fair water distribution from 400ha to 1950ha
8	Cultural heritage	*	*	*	
9	Local conflict of interests	*	*	++/B	Irrigation water will be satisfied.
10	Water Usage or water rights and communal rights	*	*	++/B	Fair water distribution may be expected by sufficient water discharge.
11	Sanitation	*	*	++/C	Expected increase in farm income will

Activity		Rehabilitation of Irrigation and Drainage Facilities			
		Designing	Construction	Operation	Comments
					enhance livelihood and sanitation.
12	Hazards (Risk), Infectious diseases as HIV/AIDS	*	*	=/C	Number of vectors and hosts may increase with irrigation and decrease with drainage improvement.
Natural Environment					
13	Topography & Geographical features	*	*	*	
14	Soil Erosion	*	*	++/B	Paddy field dike will mitigate soil erosion
15	Groundwater	*	*	++/C	Groundwater will be recharged by paddy irrigation
16	Hydrological Situation	*	*	*	
17	Coastal Zone	*	*	*	
18	Flora, Fauna and Biodiversity	*	*	*	
19	Meteorology	*	*	*	
20	Landscape	*	*	*	
21	Global Warming	*	*	*	
Pollution					
22	Air Pollution	*	*	*	
23	Water Pollution	*	*	*	
24	Soil Contamination	*	*	*	
25	Waste	*	*	*	
26	Noise and Vibration	*	*	*	
27	Ground Subsidence	*	*	*	
28	Offensive Odor	*	*	*	
29	Bottom sediment	*	*	*	
30	Accidents	*	--/C	*	During construction, some accident may occur.

Remarks: Left side; ++: Positive impact --: Negative Impact =: Neutral Impact
Right side; A: relatively significant impact, B: relatively medium-size impact, C: relatively small impact, D: unknown as of now, *: No impact or no corresponding impact
No comments means 'not applicable'

Table A5.9 Potential Negative Impacts and Possible Mitigation Measure of Rehabilitation of Irrigation and Drainage Facilities

Potential Impact	Phase	Rating	Impact Cause/Severity	Mitigation Measure/Monitoring Method	Action Time for Avoidance/Mitigation
12 Hazards (Risk), Infectious diseases as HIV/AIDS	Operation	C	Vector and host may increase with irrigation and decrease with drainage improvement/ Less.	Mosquito-net, medicine, filter are effective for malaria and Guinea worm. Education is effectively on-going/ Health Center and Kaedi Hospital against bilharzias.	Operation/ Mitigation
30 Accidents	Construction	C	Some accident may occur/Less	Appropriate maintenance of machinery and vehicles and periodic caution to workers on disciplines for safety operation/ SONADER	Construction/ Mitigation

Note: A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now

Conclusion:

WFP's (World Food Program) food subsidy for farmers during rehabilitation was applied in Fom Gleita) project up to the beginning of 1990's, and some other projects. Common labor is needed by the Contractor during rehabilitation.

Illegal off-take along the upstream of canal will be improved through proper guidance and regulation by SONADER and union cooperatives in order to settle constraints of land use in the outside irrigation area.

Increase in farm income will accelerate the application of mitigation measures against water borne diseases.

The proposed mitigation measures are expected to minimize the negative impact.

1-3 Comparison between With and Without Proposed Project/Program

The following tables show the supposed conditions under the "Without the Project/Program" case compared with the "With the Project/Program" case. It is noted that in the case of "With Project/Program" mitigation measures are assumed to be implemented properly under Implementation of the Project/Program.

Table A5.10 Condition Without and With the Project/Program

Item	Without Project/Program	With Project/Program
Agriculture	Production increase and poverty eradication are not expected because farm income will continue to decline. Farm family may continue to leave for other area to find other job.	Production will increase through recovery of irrigated area, and quality and quantity of produce will be recovered through improvement of seeds, crop calendar, agriculture credit and marketing, and appropriate fertilizer application, chemical inputs and mechanization.
Irrigation Facilities	Present irrigation area (about 400ha) may reduce further by densely growing typha and heavy sediment & dike degradation being damaged by livestock.	Present irrigation area will increase toward 1950 ha (area in 1989) through rehabilitation of irrigation & drainage system such as removal of typha and sediment in major canal by heavy equipment and partly by concrete lining, and provision of fence to protect livestock encroachment.
Institution	Present opaque situation in finance, decision making, staff election, etc. remains unchanged. Accordingly, farmers' motivation to revitalization of irrigated agriculture is unable to realize.	SONADER and union cooperative will be strengthened through transparency in financial management and decision making, rejuvenation by periodic election, and farmers spontaneity by application of participatory approach.
Environmental Impact	Situations remain unchanged or worsen gradually.	Large social advantages can be expected through increase in farm income and most of negative impact can be mitigated through application of the proposed countermeasures.

(1) Examination of the Condition Without Project/Program

The following table shows potential negative impacts without implementation of the project/program.

Table A5.11 Potential Negative Impacts Without Project/Program

Potential Impacts	Impact cause/severity
Social Environment	
Local economy (employment, livelihood, etc)	Local economy, agricultural employment and livelihood will be farther declined by the malfunction of irrigation facilities under growing typha and canal dike damaged by livestock.
Land use and utilization of local resources	Once developed farm land will be deteriorated and will not be effectively used.
Existing social infrastructures and services	Irrigation and drainage canal, and farm road will not function nor activate.
The poor, indigenous and ethnic people	Most of the farmers cultivate only 0.5 ha of crop land, who require the double cropping to overcome the poverty.
Misdistribution of benefit and damage	Only less than 20 % of developed land (400ha/1950ha) receives irrigation water and the rest are unable to receive irrigation water due to deterioration of the irrigation system.
Local Conflicts of Interest	Irrigation water dispute between the upstream and downstream of canal system may occur.
Water Usage or water rights and communal rights	Irrigation water dispute between the water users in the cooperative and illegal water users outside of the cooperative.
Hazards (Risk), Infectious diseases as HIV/AIDS	There is no record of HIV/AIDS, but there are records for malaria and bilharzias which are under control by mosquito-net, medicine and customary practice.
Natural Environment	

(2) Examination of the Condition With Project/Program

The following table shows potential negative impacts with implementation of the project/program. As described above, the project/program is assumed to be implemented with appropriate environmental management activities in order to avoid and/or mitigate the negative impacts.

Table A5.12 Potential Negative Impacts with Project/Program

Potential Impacts	Impact cause/severity
Social Environment	
Land use and utilization of local resources	Once abandoned farm land to be re-irrigated and re-cultivated by the farmers who returned from migratory working, etc. is positive impact, however, careful and fair observation are required considering priority to be given to the poor and small scale cultivators.
Water Usage or water rights and communal rights	The recovery of water use, water rights and rights of common is positive impact, however, careful and fair distribution is required.
Hazards (Risk), Infectious diseases as HIV/AIDS	There is no record of HIV/AIDS, but there are records for malaria and bilharzias which are under control by mosquito-net, medicine and customary practice. Irrigation rehabilitation increase host & vector, and drainage rehabilitation reduce them.
Natural Environment	
Pollution	
Water Pollution	Water pollution by fertilizer and chemical input will be applied so as to realize "less input & high return"
Soil Contamination	Soil contamination by fertilizer and chemical input will be applied so as to realize "less input & high return"
Waste	Crop residue will increase, however it can be used for livestock feed.
Accidents	Traffic accident may increase in construction and operation stages, however such can be mitigated by traffic control.

(3) Result of Comparison

The result of comparison between with and without Project/Program conditions is shown in the following table.

Table A5.13

Potential Impact		Without Project/Program	With Project/Program
Social Environment			
1	Involuntary Resettlement	*	*
2	Local economy (employment, livelihood, etc)	--/B	++/B
3	Land use and utilization of local resources	--/B	++/B, --/C
4	Social institutions (social infrastructure & local decision-making institution)	*	++/B
5	Existing social infrastructures and services	--/C	++/C
6	The poor, indigenous and ethnic people	--/B	++/B
7	Misdistribution of benefit and damage	--/C	++/B
8	Cultural heritage	*	*
9	Local conflict of interests	--/C	++/B
10	Water Usage or water rights and communal rights	--/B	++/B, --/C
11	Sanitation	*	++/C
12	Hazards (Risk), Infectious diseases as HIV/AIDS	--/C	=/C
Natural Environment			
13	Topography & Geographical features	*	*
14	Soil Erosion	*	++/B
15	Groundwater	*	++/C
16	Hydrological Situation	*	*
17	Coastal Zone	*	*
18	Flora, Fauna and Biodiversity	*	*
19	Meteorology	*	*
20	Landscape	*	*
21	Global Warming	*	*
Pollution			
22	Air Pollution	*	*
23	Water Pollution	*	--/C
24	Soil Contamination	*	--/C
25	Waste	*	--/C
26	Noise and Vibration	*	*
27	Ground Subsidence	*	*
28	Offensive Odor	*	*
29	Bottom sediment	*	*
30	Accidents	*	--/C

Remarks: Left side; ++: Positive impact --: Negative Impact =: Neutral Impact
 Right side; A: relatively significant impact, B: relatively medium-size impact,
 C: relatively small impact, *: No impact or no corresponding impact

It is understood from above table that implementation of the Project/Program will bring about positive impacts with avoidance and/or mitigation measures against the negative impacts.

(4) Conclusion

The IEE study for Project/Program concludes as follows:

- Project/Program would have positive impacts for social environment, especially for local economy to encourage and social institution to strengthen. Project/Program also made consideration of poor, indigenous and ethnic group. Thus, it could be judged to be acceptable from an environmental view point.

- Implementation of Project/Program would not bring about serious social and natural negative environmental impacts and that impacts can be avoided/mitigated by proposed countermeasures.
- It is understood that implementation of the Project/Program will bring about positive impact with avoidance and/or mitigation measures against the negative impacts.

In accordance with the results of the IEE of the program/project components, a full scale Environmental Impact Assessment is not considered necessary if the proposed mitigation measures are concurrently carried out.

ANNEX 6 A/Pの事業評価

Table A6.1 Estimation of Household Annual Budgets for Producing Rice in Foug Gleita Before and After A/P Implementation

(UM/household/year, unless otherwise specified)

		Current	After A/P implementation	Difference	Remark
Area (ha/household/year)		0.75	0.75	0.00	1
Revenue	Yield (paddy, kg/ha)	1,600	5,000	3,400	2
	Production (paddy, kg)	1,200	3,750	2,550	
	Price (Paddy, UM/kg)	47	83	36	3
	Value of production	56,400	311,250	254,850	
Seeds	Quantity (kg/ha)	38	50	12	
	Price (UM/kg)	109	0		4
	Cost	3,107	0	-3,107	
Urea	Quantity (kg/ha)	198	300	102	5
	Price (UM/kg)	200	200		
	Cost	29,700	45,000	15,300	
TSP	Quantity (kg/ha)	11	100	89	5
	Price (UM/kg)	160	160		
	Cost	1,320	12,000	10,680	
Agricultural chemicals	Quantity (kg/ha)	0	9,000	9,000	6
	Water	0	12,375	12,375	7
Bags	Quantity (bags/ha)		90		
	Price (UM/kg)		120		
	Cost	2,799	8,100	5,301	
Machinery rental	0	27,000	27,000	8	
Transport	Quantity (bag/ha)		89		
	Price (UM/kg)		175		9
	Cost	4,286	11,681	7,396	
Total cost excluding labor		41,211	125,156	83,945	
Profit excluding labor		15,189	186,094	170,905	

Source: Agricultural household survey, conducted by the JICA study team (2009), unless otherwise specified

1. The median value among the respondents in Foug Gleita was 1.0 ha for the annual area of rice cultivation. However, to make the comparison between the situation before and after A/P implementation, the current area was set to be the same as the target area after A/P implementation (i.e., 0.75 ha [0.50 ha in rainy season + 0.25 ha in hot dry season]).
2. According to a CNRADA expert, the rice yield in the Senegal river basin is expected to be 5 ton/ha, if appropriate techniques are used.
3. The median value of the selling price of paddy was 83 UM/kg among the three respondents in Lexeiba. This value was set as the target price in Foug Gleita after A/P implementation.
4. In Lexeiba, the respondents did not buy rice seeds but used a part of their previous year's harvest that they saved. This is expected to be a situation in Foug Gleita after A/P implementation.
5. In Foug Gleita, it is recommended to use 300 kg/ha of urea and 100 kg/ha of TSP.
6. Estimated based on the data collected from the respondents in Lexeiba.
7. The current irrigation water fee of 16,500 UM/ha was assumed not to change after A/P implementation.
8. It was estimated that a farmer would hire once a year in rainy season a tractor (12,000 UM/ha) and a combine harvester (24,000 UM/ha).
9. [Transport cost from farm to storage place] + [Transport cost from storage to Foug Gleita market].

Table A6.2 Estimation of Household Annual Budgets for Producing Onions in Foug Gleita Before and After A/P Implementation

(UM/household/year, unless otherwise specified)

		Current	After A/P implementation	Difference	Remark
Area (ha/household/year)		0.092	0.125	0.033	1
Revenue	Yield (kg/ha)	8,508	15,000	6,492	2
	Production (kg)	421	1,875	1,454	
	Price (UM/kg)	80	109	29	3
	Value of production	35,000	204,375	169,375	4
Seeds	Quantity (kg/ha)		4		5
	Price (UM/kg)		12,000		
	Cost	2,400	6,000	3,600	
Urea	Quantity (kg/ha)		250		5
	Price (UM/kg)		200		
	Cost	708	6,250	5,542	
TSP	Quantity (kg/ha)		300		5
	Price (UM/kg)		160		
	Cost	220	6,000	5,780	
Agricultural chemicals		0	7,375	7,375	6
Water		0	0	0	
Bags	Quantity (bags/ha)		261		
	Price (UM/kg)		120		
	Cost	878	3,915	3,037	
Transport	Quantity (bag/ha)		261		
	Price (UM/kg)		175		7
	Cost	1,280	5,709	4,429	
Total cost excluding labor		5,486	35,249	29,763	
Profit excluding labor		29,514	169,126	139,612	

Source: Agricultural household survey, conducted by the JICA study team (2009), unless otherwise specified

1. The cultivated area after A/P implementation (0.125 ha) is a targeted rather than estimated value.
2. The yield after A/P implementation was estimated based on the yield of onions obtained in the verification trials, conducted by the JICA study team.
3. Many farmers reported that the selling price of vegetables fluctuated much. Of the data collected from 23 respondents in Foug Gleita, the representative prices were as follows: (1) minimum: 30 UM/kg; (2) lower quartile: 68 UM/kg; (3) median: 80 UM/kg; (4) upper quartile: 109 UM/kg; and (5) maximum: 175 UM/kg. Based on this information and the time series price data of onions in major markets of Mauritania, obtained from the VISA (Valorisation de l'Irrigué pour la Souveraineté Alimentaire) project (conducted by the Spanish Agency for International Development Cooperation), it was estimated that after A/P implementation, the average selling price of onions among Foug Gleita farmers could reach the level of the current upper quartile (i.e., 109 UM/kg).
4. For the current revenue, area cultivated times yield times price does not equal value of production, because each of these values are the median for each variable among the respondents and the number of respondents who provided viable answers were different across the variables.
5. The data source is CNRADA.
6. The data source is CNRADA (potassium sulfate [200 kg/ha × 120 UM/kg] + herbicide [6 l/ha × 5,000 UM/l] + insecticide [0.5 l/ha × 5,000 UM/l] + pesticides [0.5 l/ha × 5,000 UM/l]).
7. [Transport cost from farm to storage place] + [Transport cost from storage to Foug Gletia market].

Table A6.3 Estimation of Household Annual Budgets for Producing Cabbages in Fom Gleita Before and After A/P Implementation

(UM/household/year, unless otherwise specified)

		Current	After A/P implementation	Difference	Remark
Area (ha/household/year)		0.063	0.050	-0.013	1
Revenue	Yield (kg/ha)	10,120	20,000	9,880	2
	Production (kg)	308	1,000	692	
	Price (UM/kg)	76	125	49	3
	Value of production	37,500	125,000	87,500	4
Seeds	Quantity (kg/ha)		2		5
	Price (UM/kg)	7,000	7,000		
	Cost	575	700	125	
Urea	Quantity (kg/ha)		150		5
	Price (UM/kg)		200		
	Cost	860	1,500	640	
TSP	Quantity (kg/ha)		300		6
	Price (UM/kg)		160		
	Cost	490	2,400	1,910	
Agricultural chemicals		0	2,950	2,950	6
Water		0	0	0	
Bags	Quantity (bags/ha)		348		
	Price (UM/kg)		120		
	Cost	643	2,088	1,445	
Transport	Quantity (bag/ha)		348		
	Price (UM/kg)		175		7
	Cost	938	3,045	2,107	
Total cost excluding labor		3,506	12,683	9,177	
Profit excluding labor		33,994	112,317	78,323	

Source: Agricultural household survey, conducted by the JICA study team (2009), unless otherwise specified

1. The cultivated area after A/P implementation (0.050 ha) is a targeted rather than estimated value.
2. The yield after A/P implementation was estimated based on the yield of cabbages obtained in the verification trials, conducted by the JICA study team.
3. Many farmers reported that the selling price of vegetables fluctuated much. Of the data collected from 17 respondents in Fom Gleita, the representative prices were as follows: (1) minimum: 35 UM/kg; (2) lower quartile: 43 UM/kg; (3) median: 76 UM/kg; (4) upper quartile: 125 UM/kg; and (5) maximum: 400 UM/kg. Based on this information and the time series price data of cabbages in major markets of Mauritania, obtained from the VISA (Valorisation de l'Irrigué pour la Souveraineté Alimentaire) project (conducted by the Spanish Agency for International Development Cooperation), it was estimated that after A/P implementation, the average selling price of cabbages among Fom Gleita farmers could reach the level of the current upper quartile (i.e., 125 UM/kg).
4. For the current revenue, area cultivated times yield times price does not equal value of production, because each of these values are the median for each variable among the respondents and the number of respondents who provided viable answers were different across the variables.
5. The data source is CNRADA.
6. Because of lack of information, it was assumed that cabbages need the same unit quantity of TSP and agricultural chemicals as onions.
7. [Transport cost from farm to storage place] + [Transport cost from storage to Fom Gletia market].

Table A6.4 Estimation of Household Annual Budgets for Producing Carrots in Foug Gleita Before and After A/P Implementation

(UM/household/year, unless otherwise specified)

		Current	After A/P implementation	Difference	Remark
Area (ha/household/year)		0.031	0.025	-0.006	1
Revenue	Yield (kg/ha)	13,352	30,000	16,648	2
	Production (kg)	144	750	606	
	Price (UM/kg)	148	206	58	3
	Value of production	24,703	154,500	129,797	4
Seeds	Quantity (kg/ha)		4		5
	Price (UM/kg)	10,800	10,800		
	Cost	600	1,080	480	
Urea	Quantity (kg/ha)		250		5
	Price (UM/kg)		200		
	Cost	400	1,250	850	
TSP	Quantity (kg/ha)		300		5
	Price (UM/kg)		160		
	Cost	280	1,200	920	
Agricultural chemicals		0	1,475	1,475	5
Water		0	0	0	
Bags	Quantity (bags/ha)		480		
	Price (UM/kg)		120		
	Cost	276	1,440	1,164	
Transport	Quantity (bag/ha)		480		
	Price (UM/kg)		175		6
	Cost	403	2,100	1,698	
Total cost excluding labor		1,959	8,545	6,587	
Profit excluding labor		22,745	145,955	123,210	

Source: Agricultural household survey, conducted by the JICA study team (2009), unless otherwise specified

1. The cultivated area after A/P implementation (0.025 ha) is a targeted rather than estimated value.
2. The yield after A/P implementation was estimated based on the yield of carrots obtained in the verification trials, conducted by the JICA study team.
3. Many farmers reported that the selling price of vegetables fluctuated much. Of the data collected from 20 respondents in Foug Gleita, the representative prices were as follows: (1) minimum: 55 UM/kg; (2) lower quartile: 94 UM/kg; (3) median: 148 UM/kg; (4) upper quartile: 206 UM/kg; and (5) maximum: 500 UM/kg. Based on this information and the time series price data of carrots in major markets of Mauritania, obtained from the VISA (Valorisation de l'Irrigué pour la Souveraineté Alimentaire) project (conducted by the Spanish Agency for International Development Cooperation), it was estimated that after A/P implementation, the average selling price of carrots among the Foug Gleita farmers could reach the level of the current upper quartile (i.e., 206 UM/kg).
4. For the current revenue, area cultivated times yield times price does not equal value of production, because each of these values are the median for each variable among the respondents and the number of respondents who provided viable answers were different across the variables.
5. Because of lack of information, the unit quantities were assumed to be the same as those for onions
6. [Transport cost from farm to storage place] + [Transport cost from storage to Foug Gletia market].

Table A6.5 Import Parity Price of Rice

	US\$	UM
Thailand, 100% broken A.1 Super, FOB Bangkok (/ton) *1	477.48	
Ocean freight and insurance *2	+ 52.13	
CIF price at Nouakchott	= 529.61	
UM equivalent (/ kg) (US\$1 = UM265.4)	=	140.56
Port charge, handling, and storage (10%) *2	+ 14.06	
Price at port gate	= 154.62	
Transport (project site – Nouakchott) *2	– 4.66	
Price at farm gate	= 149.96	
Milling charge *3	– 14.29	
Milling efficiency *3	× 0.7	
Price (paddy, /kg)	= 94.97	

Note: All the prices are adjusted to constant prices in 2010, using Consumer Price Indices derived from (1) the website of International Monetary Fund, World Economic Outlook Database, April 2010; and (2) Office National de la Statistique, March 2010.

*1 World Bank, Commodity price data, average Jan-May 2010

*2 Based on APD

*3 Based on data collected during the survey by JICA study team

Table A6.6 Import Parity Price of Urea

	US\$	UM
Urea, bulk, spot, FOB Black Sea (/ton) *1	337.37	
Ocean Freight and insurance *2	+ 33.05	
CIF price at Nouakchott	= 370.42	
UM equivalent (/ kg) (US\$1 = UM265.4)	=	98.31
Port charge, handling, and storage (10%) *3	+ 9.83	
Price at port gate	= 108.14	
Transport (project site – Nouakchott) *3	+ 4.66	
Price at farm gate	= 112.8	

Note: All the prices are adjusted to constant prices in 2010 using the Consumer Price Indices derived from (1) the website of International Monetary Fund, World Economic Outlook Database, April 2010; and (2) Office National de la Statistique, March 2010.

*1 World Bank, Commodity price data, average Jan-May 2010

*2 Based on APD, including estimation based on the available data

*3 Based on APD

Table A6.7 Import Parity Price of TSP

	US\$	UM
TSP, Tunisian, granular, FOB (/ton) *1	426.83	
Ocean Freight and insurance *2	+ 22.52	
CIF price at Nouakchott	= 449.35	
UM equivalent (/kg) (US\$1 = UM265.4)	=	119.26
Port charge, handling, and storage (10%) *3	+ 11.93	
Price at port gate	= 131.19	
Transport (project site – Nouakchott) *3	+ 4.66	
Price at farm gate	= 135.85	

Note: All the prices are adjusted to constant prices in 2010 using the Consumer Price Indices derived from (1) the website of International Monetary Fund, World Economic Outlook Database, April 2010; and (2) Office National de la Statistique, March 2010.

*1 World Bank, Commodity price data, average Jan-May 2010

*2 Based on APD, including estimation based on the available data

*3 Based on APD