

## (6) 婦人活動

当地域の農業の作物生産活動、すなわち耕起整地、播種施肥、農薬散布、除草、収穫など全般に亘り、婦人の労働力の提供が大きく依存している。婦人の果たすこれらの役割については事業完了後の将来も大きな変化は予想されないと考えられるが、作物収量が家計支出を十分に賄えるようになり、南部に流出した若年労働力が帰農することになれば農業婦人の果たす役割も改善に向かうことになろう。

さらに、事業実施により婦人グループの育成強化、農業普及サービスへの直接参加、あるいは夫からの営農情報の伝達などを通して婦人の現場の改善がなされることが期待できる。

## 8.4 環境に対する考察

一般的にダム灌漑事業は、環境資源に変化をもたらすものと考えられる。本事業によって引き起こされると予想される環境に対する影響は以下の様に要約される。

### 1) 肯定因子

#### a) ダム建設による影響

- ブ川の流出の安定化
- 下流域の地下水ポテンシャルの増大
- 内水面漁業開発の機会の創出
- 家畜への水飲み場の提供

#### b) 灌漑開発による影響

- 作物生産量の増加
- 調整池建設による水飲み場の提供
- 農道並びに橋梁の建設による地域の経済活動の強化

### 2) 否定因子

#### a) ダム建設による影響

- 森林の減少
- 野生動物の減少
- 一部の農地の水没
- マラリア、住血吸虫病などの水に起因する病気の発生

#### b) 灌漑開発による影響

- 森林の破壊
- 農薬によるブ川の水質汚濁
- 放牧に対する障害
- マラリア、住血吸虫病などの水に起因する病気の発生

本事業は国家のみならず、この地域へも多大な直接的あるいは間接的な恩恵を与える。一方、環境影響の否定因子は以下に述べる配慮並びに対策を講ずることによって最小限に押さえられるであろう。

- a) 自然の草木の伐採に対する現行の規則の強化及び植林を促進すること
- b) 環境特性を配慮して建設工事に伴う土取場、土捨て場を選定すること
- c) 灌漑農業における化学肥料ならびに農薬の適切な施用を農民に指導すること
- d) 住血吸虫病やマラリアを根絶させるために周辺住民に対する保健教育を含む公衆衛生の長期的な改善を行なうこと
- e) 牛の放牧ができるように シラソ 郡南西部のツェツェ蠅の撲滅を行なうこと
- f) 農民と放牧民との間の紛争を回避するために彼らの間で必要な話し合いを行なうこと

## 第9章 結論及び勧告

### 9.1 結論

第4章で述べたように不安定な気候と肥沃度の低い土壌のため、サバンナ地域における農業の生産性は極めて低い。一方肥沃な森林地帯でも増大する人口圧力のため、利用可能な土地が急速に減少している。このため、「象」国政府はサバンナ地域の農業開発をその重要施策として取り上げている。

経済評価の結果では、本計画の経済的内部収益率(EIRR)は7.4%であり、あまり高くない値を示している。しかしながらこのブ川沿岸地域はサバンナ地域における灌漑開発にとって最適の地域であり、また本計画は北部地域における農業開発のモデルとしても期待されている。さらにこの計画は、米及びその他の食用作物の生産を通じてこの国の食糧自給に大きく貢献するものであり、また本計画の実施によって多くの間接便益や社会経済的インパクトが期待される。

同国の農業の現状、特にサバンナ地域における低い農家収入及び計画地域の高い開発可能性を受けて、ブ川沿岸農業開発計画は早急に実施に移されるべきものと考えられる。

### 9.2 勧告

この計画を成功させるためには開発事業の実施に関連して、下記に掲げるような施策が「象」国政府ならびに関係諸機関によって実施される必要がある。

#### 1) 農業信用を含むこの計画を実施するための財政的措置

この計画の経済的内部収益率はあまり高くない為、事業実施のためには出来るだけ低い利子率の資金を調達する必要がある。また農業信用を含む入植農民に対する財政的支援は、建設工事の実施とならんでこの計画を成功させるために重要である。農業開発銀行(BNDA)がその機能を果たしていない現状では、CIDTが国内あるいは国際的な資金を導入することにより、農民に対するこの種サービスを行なうことが望ましい。

#### 2) 事業調整官の設置

この計画の実施に当たって最も重要なことの一つはDCGTxによる建設工事の進捗と、CIDTによる農民の入植との工程の調整である。よってこの業務を実施するため、この事業の主管省である農業畜産省の中に事業調整官を設置することが望ましい。

#### 3) 水利組合(灌漑農民の団体)の設立

完成された灌漑排水施設の管理運営については、その二次支線以下の部分についてはこれを受益農民に実施させることとしている。そこで水管理及び施設の維持を円滑に行なうため、受益農民による水利組合を結成する必要がある。

4) 保健・衛生施設の整備

貯水池や灌漑組織の建設は、一方で水に起因するマラリアや住血吸虫などの病気を増殖させることになるということは避けられない。よって保健所の増設や農民に対する衛生教育を含む公衆衛生整備計画が関係当局によって推進されることが望ましい。

5) 教育施設の整備

この開発計画の実施に伴い、就学児童の数も増加することが予想される。よってこの地域における教育施設（小・中学校）の整備が必要である。

6) 植林の実施

開発対象地域及び貯水池敷内の森林は事業の実施に伴い減少あるいは消滅することとなる。一方人口の増加による薪炭林の需要は増大することが予想される。よって開発地域周辺に植林を行ない、これに対処することが必要である。

7) 農業と牧畜の協調

農業と放牧民の牧畜牛のより良い共存のために、以下のことを開発事務所並びに関係省庁の協力の下に実施することが望まれる。

- － 農民、フラニー族及び開発事務所間の三者懇談を実施する
- － 灌漑地区内における放牧を禁止する
- － 計画貯水池周辺での牧草植え付けを行なう
- － 飼料樹木の植え付けを促進する
- － 農業副産物の家畜飼料への利用を行なう
- － 放牧可能性の拡大を図る



付 表



表1.5.1 調査団員名簿

<u>氏 名</u>	<u>分 野</u>
1. 小田 親	団長／総括
2. 武田 健策	副総括／かんがい・排水
3. 影山 和義	水文・気象
4. Jean PRERRIN	ダム／地質
5. 佐々木 昭彦	農業／土壌
6. 坂戸 謙介	畜産
7. Craig V. OLSON	社会／経済
8. 松永 伸一	農村インフラ
9. 中牟田 亮	構造物設計／積算
10. 鈴木 隆文	事業評価



表.3.3.1 シラソ郡の人口

集落名	1975			1988		
	男	女	計	男	女	計
シラソ町に属する集落						
KATIELE				16	14	30
NAGREKAHA	166	135	301	147	149	296
PELETIEMENE	29	29	58	33	42	75
SIRASSO	1,346	1,233	2,579	2,206	2,200	4,406
SOMON	102	91	193	76	88	164
シラソ町 計	1,643	1,488	3,131	2,462	2,479	4,941
シラソ町以外の集落						
BADON	12	5	17			
BODO	108	101	209	61	51	112
DAGBA	862	866	1,728	842	906	1,748
DIELIKAHA	68	57	125	66	82	148
DOKOHA	122	103	225	115	139	254
GAMA	476	466	942	382	441	823
KAFONGO				59	69	128
KANORABA	1,383	1,350	2,733	1,624	1,739	3,363
KAZIOMON	9	5	14	12	6	18
KIERE	413	419	832	586	622	1,208
KOKO	242	262	504	214	213	427
KOLOKAHA	181	167	348	172	202	374
LOPIN	69	60	129	46	55	101
M'BALLA	727	627	1,354	648	613	1,261
NAFOUN	1,341	1,326	2,667	1,233	1,403	2,636
NOUFRE	137	101	238	146	131	277
NOUHOVO	132	118	250	161	178	339
ODIA	910	923	1,833	881	988	1,869
SAKPELE	450	404	854	558	614	1,172
SAMBOKAHA	355	387	742	340	418	758
SEDIKAHA	35	35	70	46	44	90
SEGUEBE	215	213	428	160	161	321
SEGUETIELEPLE	46	37	83	58	49	107
SINDIA	40	26	66	51	61	112
SOLOBOHO	71	62	133	93	91	184
TALLERE	894	901	1,795	665	719	1,384
ZANGAHA	808	796	1,604	523	558	1,081
計	10,106	9,817	19,923	9,742	10,553	20,295
シラソ郡合計	11,749	11,305	23,054	12,204	13,032	25,236

出典: Recensement 1975 & 1988.

表 3.7.1 既存灌漑施設の概要

(1) ナフォンダム	
一型式:	ライライ
一堤高:	15 m
一堤敷巾:	100 m
一天端幅:	4 m
一堤長:	871 m
一築堤土量:	230.000 m <sup>3</sup>
一上流側法勾配:	2.5/1
一下流側法勾配:	1.6/1; 2/1; 2.5/1
(2) 貯水池	
一集水面積:	162 km <sup>2</sup>
一満水面積:	1,200 ha
一最大貯水容量:	60 Mm <sup>3</sup>
一死水容量:	4 Mm <sup>3</sup>
一有効貯水容量:	56 Mm <sup>3</sup>
一年平均流入水量:	30 Mm <sup>3</sup>
一年平均利用可能水量:	25 Mm <sup>3</sup>
(3) 洪水吐	
一10年確率降水流量:	118 m <sup>3</sup> /s
一異常降水流量:	236 m <sup>3</sup> /s
一主余水吐流量 (既存):	28 m <sup>3</sup> /s
一非常用余水吐流量 (工事中):	15 m <sup>3</sup> /s
(4) 幹線用水路 (既存)	
1) 延長:	9.52 km
2) 諸元:	
一台形区間:	法勾配 1:1
一短形区間:	(ライライ部分)
一底巾:	1.1 m
一最大水深:	1.4 m
一縦断勾配:	0.6; 0.5 %
一縦断流量:	1.8 m <sup>3</sup> /sec
(5) 構造物 (鉄筋コンクリート)	
1) 取水工:	1
2) 分水工:	3
3) 水路余水吐:	3

表 3.7.2 ブ・シラソ灌漑事業の概要

(1) ナフォンダム		
- 非常用余水吐		
(2) 灌漑用水路		
1) 幹線用水路	延長	9 km
- 流量		1.1~0.9 m <sup>3</sup> /s
- 構造物		11ヶ所
2) 二次水路		
- 新設	延長	5,890 m
- 改修	延長	20,000 m
- 合計	延長	25,890 m
3) 三次水路		
- 新設	延長	4,740 m
- 改修	延長	6,630 m
- 合計	延長	11,370 m
(3) 排水組織		
- 排水路		
- 河川改修		
(4) 開田		182 ha
(5) 農道		32.4 km
(6) 倉庫 (1ヶ所 60 m <sup>2</sup> )		4ヶ所
(7) 乾燥場 (1ヶ所 100 m <sup>2</sup> )		40ヶ所

表 4.2.1. 最適開発規模の検討結果

作付け計画		ケース 3	ケース 2	ケース 1I
1 米二期作		100%	50%	20%
2 綿花 - 畑作		0%	50%	80%
最大灌漑可能面積(ha)		2,200	2,200	2,200
貯水池の規模による灌漑面積 (ha)				
利用可能水量 (M m3)				
A	90	1,480	2,060	2,680
B	70	1,370	1,890	2,470
C	40	990	1,370	1,770
経済価格による建設費(MCFA)				
A	ダム	1,170	1,170	1,170
(90 M m3)	灌漑施設 / 農地開発	6,832	9,509	10,155
	その他	2,485	2,862	2,927
	合計	10,487	13,541	14,252
B	ダム	1,073	1,073	1,073
(70 M m3)	灌漑施設 / 農地開発	6,324	8,724	10,155
	その他	2,425	2,775	2,917
	合計	9,822	12,572	14,145
C	ダム	904	904	904
(40 M m3)	灌漑施設 / 農地開発	4,570	6,324	8,170
	その他	2,232	2,408	2,701
	合計	7,706	9,636	11,775
単位面積当たりの便益 (1,000 CFA/ha)				
米二期作		396	396	396
綿花 - 畑作		603	603	603
単位面積当たりの経済便益 (1000 CFA/ha)		396	499	561
総便益 (M CFA)				
	A	586	1,029	1,235
	B	543	944	1,235
	C	392	684	993
経済内部収益率 (%)				
	A	4.10	6.35	7.43
	B	3.97	6.21	7.49
	C	3.19	5.67	7.09

#1 A-1とB-1は最大開発可能面積2,200 haを越えているので貯水容量に若干の余裕がある。

表 5.1.1 農産物及び農業投入資機材の庭先価格

資材／農産物	(単位：FCFA)	
	財務価格	経済価格
生産物 (kg当たり)		
籾	60	66
綿花 (2級品平均)	95	161
綿 (繊維平均) #1	104	190
トウモロコシ	40	40
落花生	160	160
たまねぎ	100	100
トマト	80	80
こしょう	80	80
肥料 (kg当たり)		
- 尿素	129	102
- NPK (10-18-18)	133	105
- 硫酸カリウム	100	79
除虫剤 (kg当たり)		
- Furadan 5G	980	676
- Thioral	2,800	1,932
- Pour coton (fourni CIDT)	0	
- Manèbe	1,300	897
- Daconil	4,605	3,177
- Décis	3,730	2,574
- Dythane M.45	1,855	1,280
除草剤 (kg当たり)		
- Cotodon	3,605	2,487
- Ronstar	6,090	4,202
- Tamariz	2,825	1,949
- Herbazol	2,865	1,977
- Primagram	2,900	2,001
農機具		
- Pulvérisateur (Berthoud C8)	8,875	6,745
- Pulvérisateur (BIRKY)	29,650	22,534
- Multiculteur ARARA	125,000	101,250
- Multiculteur ARCOMA	125,000	101,250
- Semoir Super Eco	105,000	85,050
- Charrette bovine de 1 tonne	140,000	113,400
- herse Zig Zag à 2 éléments	45,000	36,450
- Souleveuse	10,000	8,100
農耕牛	80,000	80,000
人夫	0	500

#1: 1991年1月現在の綿繊維価格の平均

表 5.2.1 畜産開発の問題点並びにその対策

現在の問題点	ブ川開発に伴う問題点	対策
<p>乾期における家畜飲用水の不足</p> <p>放牧地と水場との距離が遠い</p>	<p>ブ川に近付けなくなる (現在はブ川を水場として利用している)</p> <p>Pollution de l'eau du fleuve BOU 農薬によるブ川の汚染</p>	<p>水路の途中に建設する調整池の利用</p> <p>SODEPORA方式の小溜池の建設</p> <p>新しいブ貯水池は水飲み場としても利用可能となる</p>
<p>家畜の侵入による作物の被害</p>	<p>開発された農地には家畜は入れない (これまででは一部放牧地として利用された)</p>	<p>農民と放牧民との対話の促進</p> <p>ブ川を渡るルートの固定 (耕地への侵入を防ぐため)</p>
<p>雨期における家畜の移動が困難 (ブ川の橋はシラン橋だけ)</p>	<p>水路等が建設されるので家畜の移動が困難になる</p>	<p>ブ川及び水路橋断の為の橋の建設</p>
<p>乾期における牧草の不足</p>	<p>貯水池の建設農地の開発による放牧地の減少</p>	<p>ツエツエニ繩防衝により地区の南部に放牧地を拡大する</p> <p>新しい貯水池周辺に牧草を植える</p> <p>葉が飼料となる樹木を植える</p> <p>農業副産物を飼料として積極的に利用する</p>

表 5.3.1 ブ川計画ダム主要諸元

標高関係

ダム敷標高：	348.90 m
天端標高：	367.55 m
常時満水位：	364.00 m
最高水位：	366.00 m
非常用余水吐敷高標高：	366.00 m

貯水地

有効貯水容量：	90 Mm <sup>3</sup>
死水容量：	6 Mm <sup>3</sup>
サーチャージ容量 (1,000年洪水)：	47 Mm <sup>3</sup>
総貯水容量：	143 Mm <sup>3</sup>

ダム

平均堤高：	15.5 m
河床部からの堤高：	18.65 m
堤長：	1,092 m
天端巾：	5 m
底敷巾：	79 m
上流側法勾配：	1/2.5
下流側法勾配：	1/2.0
堤体積：	366,200 m <sup>3</sup>
盛土量：	330,200 m <sup>3</sup>
下流側フィルター：	10,600 m <sup>3</sup>
法先排水工：	2,200 m <sup>3</sup>
トランジション：	23,200 m <sup>3</sup>
法面保護工：	46,500 m <sup>2</sup>

常時余水吐

余水吐

溢流部延長：	9 m
溢流部敷高：	364.00
排水樋管脚面：	2 X 2 m
排水樋管延長：	60 m
流量：	29 m <sup>3</sup> /s

取水工

取水ゲート敷高標高：	356.00 m
	359.50 m
	363.00 m
取水工ゲ- 1 × 1,35 m：	6
取水樋管 (鋼管)：	2
樋管口径：	1,200 mm
樋管延長：	60 m
(バタフライ・バルブ、径1,200mm)：	2
予備放流管、径200mm：	2
(給水用放流バルブ、径100m)：	1

表 5.3.2

作物別粗灌溉用水量

月別	旬別	水稻	畑作物	加重平均	粗用水量
		(20%)	(80%)		
		l/sec/ha	l/sec/ha	l/sec/ha	cu.m/sec
Jan.	1st	0.00	0.00	0.00	0.00
	2nd	1.80	0.21	0.53	1.16
	3rd	2.79	0.44	0.91	2.00
Feb.	1st	3.44	0.87	1.38	3.04
	2nd	2.35	1.09	1.34	2.95
	3rd	2.10	1.34	1.49	3.28
Mar.	1st	2.12	1.40	1.54	3.40
	2nd	2.01	1.38	1.51	3.31
	3rd	2.14	1.64	1.74	3.83
Apr.	1st	2.12	1.67	1.76	3.87
	2nd	1.87	1.32	1.43	3.15
	3rd	1.47	0.58	0.76	1.67
May	1st	1.54	0.35	0.59	1.29
	2nd	1.28	-	0.26	0.56
	3rd	0.70	-	0.14	0.31
Jun.	1st	0.20	0.00	0.04	0.09
	2nd	-	0.00	-	-
	3rd	-	0.00	-	-
Jul.	1st	-	0.00	-	-
	2nd	0.31	0.00	0.06	0.14
	3rd	0.24	0.00	0.05	0.11
Aug.	1st	0.13	0.00	0.03	0.06
	2nd	0.00	0.00	-	-
	3rd	0.00	0.00	-	-
Sep.	1st	0.00	0.00	-	-
	2nd	0.26	0.00	0.05	0.11
	3rd	0.67	0.00	0.13	0.29
Oct.	1st	1.32	0.74	0.86	1.88
	2nd	1.53	1.10	1.19	2.61
	3rd	1.48	1.18	1.24	2.73
Nov.	1st	1.75	1.12	1.25	2.74
	2nd	1.76	0.61	0.84	1.85
	3rd	1.25	0.00	0.25	0.50
Dec.	1st	0.56	0.00	0.11	0.25
	2nd	-	0.00	-	-
	3rd	-	0.00	-	-



表 5.3.3 導水路並びに幹線水路の主要諸元 (1/2)

距離	付帯構造物			設計流量 (m <sup>3</sup> /sec)	水底幅 (m)	設計水深 (m)	堤高 (m)	水路勾配 I	設計流速 (m/sec)	水底標高 (m)	設計水位 (m)	堤頂標高 (m)
導水路												
0	始点			5.19	1	1.35	2.1	1/1,800	1.25	355.65	357.00	357.65
6,250	終点			5.19	1	1.35	2.1	1/1,800	1.25	352.18	353.53	354.28
右岸幹線用水路												
0	分水工	No.1	RSC-1	4.92	1.8	1.47	2.1	1/5,000	0.83	352.03	353.50	354.13
10	チェック	No.1		4.92	1.8	1.47	2.1	1/5,000	0.83	352.03	353.50	354.13
10				4.92	1.8	1.47	2.1	1/5,000	0.83	351.98	353.45	354.08
2,345	横断暗渠	No.1		4.92	1.8	1.47	2.1	1/5,000	0.83	351.56	353.03	353.66
2,820	分水工	No.2	R-0-1A & -1B	4.92	1.8	1.47	2.1	1/5,000	0.83	351.47	352.94	353.57
2,830	チェック	No.2		4.92	1.8	1.47	2.1	1/5,000	0.83	351.46	352.93	353.56
2,830				4.80	1.8	1.46	2.1	1/5,000	0.83	351.42	352.88	353.52
4,060	分水工	No.3	R-0-2	4.80	1.8	1.46	2.1	1/5,000	0.83	351.23	352.69	353.33
6,750	横断暗渠	No.2		4.80	1.8	1.46	2.1	1/5,000	0.83	350.69	352.15	352.79
7,130	分水工	No.4	R-0-3	4.80	1.8	1.46	2.1	1/5,000	0.83	350.61	352.07	352.71
8,200	余水吐	No.1		4.80	1.8	1.46	2.1	1/5,000	0.83	350.40	351.86	352.50
8,300	分水工		LHC	4.80	1.8	1.46	2.1	1/5,000	0.83	350.38	351.84	352.48
8,300				1.79	1.2	1.02	1.7	1/5,000	0.65	350.32	351.34	352.02
8,320	分水工	No.5	RSC-2	1.79	1.2	1.02	1.7	1/5,000	0.65	350.82	351.84	352.52
8,330	チェック	No.3		1.79	1.2	1.02	1.7	1/5,000	0.65	350.81	351.83	352.51
8,330				1.47	1	0.97	1.7	1/5,000	0.62	350.81	351.78	352.51
11,080	分水工	No.6	R-0-4	1.47	1	0.97	1.7	1/5,000	0.62	350.31	351.28	352.01
11,090	チェック	No.4		1.47	1	0.97	1.7	1/5,000	0.62	350.31	351.28	352.01
11,090				1.42	1	0.95	1.7	1/5,000	0.61	350.28	351.23	351.98
12,000	横断暗渠	No.3		1.42	1	0.95	1.7	1/5,000	0.61	350.15	351.10	351.85
13,390	分水工	No.7	R-0-5A & -5B	1.42	1	0.95	1.7	1/5,000	0.61	349.87	350.82	351.57
13,400	チェック	No.5		1.42	1	0.95	1.7	1/5,000	0.61	349.87	350.82	351.57
13,400				1.32	1	0.92	1.7	1/5,000	0.60	349.85	350.77	351.55
14,370	カルバート	No.1		1.32	1	0.92	1.7	1/5,000	0.60	349.71	350.63	351.41
14,370				1.32	1	0.92	1.7	1/5,000	0.60	348.90	349.82	350.60
14,510	分水工	No.8	R-0-6	1.32	1	0.92	1.7	1/5,000	0.60	349.68	350.60	351.38
14,850	余水吐	No.2		1.32	1	0.92	1.7	1/5,000	0.60	348.81	349.73	350.51
15,210	分水工	No.9	R-0-7	1.32	1	0.92	1.7	1/5,000	0.60	348.73	349.65	350.43
15,220	チェック	No.6		1.32	1	0.92	1.7	1/5,000	0.60	349.54	350.46	351.24
15,220				1.23	1	0.89	1.5	1/5,000	0.59	348.76	349.65	350.26
15,280	カルバート	No.2		1.23	1	0.89	1.5	1/5,000	0.59	348.70	349.59	350.20
15,280				1.23	1	0.89	1.5	1/5,000	0.59	348.65	349.54	350.15
16,300	横断暗渠	No.4		1.23	1	0.89	1.5	1/5,000	0.59	348.50	349.39	350.00
17,130	カルバート	No.3		1.23	1	0.89	1.5	1/5,000	0.59	348.33	349.22	349.83
17,130				1.23	1	0.89	1.5	1/5,000	0.59	348.28	349.17	349.78
17,510	分水工	No.10	R-0-8	1.23	1	0.89	1.5	1/5,000	0.59	348.25	349.14	349.75
17,970	分水工	No.11	R-0-9	1.23	1	0.89	1.5	1/5,000	0.59	348.16	349.05	349.66
17,980	チェック	No.7		1.23	1	0.89	1.5	1/5,000	0.59	348.16	349.05	349.66
17,980				1.14	1	0.86	1.5	1/5,000	0.58	348.14	349.00	349.64
18,910	横断暗渠	No.5		1.14	1	0.86	1.5	1/5,000	0.58	348.00	348.86	349.50
19,840	横断暗渠	No.6		1.14	1	0.86	1.5	1/5,000	0.58	347.82	348.68	349.32
20,850	分水工	No.12	R-0-10	1.14	1	0.86	1.5	1/5,000	0.58	347.62	348.48	349.12
20,860	チェック	No.8		1.14	1	0.86	1.5	1/5,000	0.58	347.61	348.47	349.11
20,860				1.11	1	0.84	1.5	1/5,000	0.57	347.58	348.42	349.08
22,630	横断暗渠	No.7		1.11	1	0.84	1.5	1/5,000	0.57	347.28	348.12	348.78
23,485	分水工	No.13	RSC-3	1.11	1	0.84	1.5	1/5,000	0.57	347.11	347.95	348.61
23,495	チェック	No.9		1.11	1	0.84	1.5	1/5,000	0.57	347.11	347.95	348.61
23,495				0.81	1	0.73	1.5	1/5,000	0.53	347.17	347.90	348.67
25,730	調整池	流入工		0.81	1	0.73	1.5	1/5,000	0.53	346.77	347.50	348.27
25,730	調整池	流出工		1.23	1	0.89	1.5	1/5,000	0.59	345.81	346.70	347.31
27,080	分水工	No.14		1.23	1	0.89	1.5	1/5,000	0.59	345.54	346.43	347.04
27,090	チェック	No.10		1.23	1	0.89	1.5	1/5,000	0.59	345.54	346.43	347.04
27,090				1.23	1	0.89	1.5	1/5,000	0.59	345.49	346.38	346.99
27,630	余水吐	No.3		1.23	1	0.89	1.5	1/5,000	0.59	345.38	346.27	346.88
27,700	サイホン	No.1		1.23	1	0.89	1.5	1/5,000	0.59	345.36	346.25	346.86
27,900				1.23	1	0.89	1.5	1/5,000	0.59	345.16	346.05	346.66
28,090	分水工	No.15		1.23	1	0.89	1.5	1/5,000	0.59	345.13	346.01	346.63
29,070	分水工	No.16		1.23	1	0.89	1.5	1/5,000	0.59	344.93	345.82	346.43
29,080	チェック	No.11		1.23	1	0.89	1.5	1/5,000	0.59	344.93	345.82	346.43
29,080				0.53	0.8	0.53	1.2	1/5,000	0.48	345.24	345.77	346.44
30,420	余水吐	No.4		0.53	0.8	0.53	1.2	1/5,000	0.48	344.97	345.50	346.17
30,480	サイホン	No.2		0.53	0.8	0.53	1.2	1/5,000	0.48	344.96	345.49	346.16
30,680				0.53	0.8	0.53	1.2	1/5,000	0.48	344.11	344.64	345.31
31,740	分水工	No.17		0.53	0.8	0.53	1.2	1/5,000	0.48	343.90	344.43	345.10
32,580	分水工	No.18		0.53	0.8	0.53	1.2	1/5,000	0.48	343.73	344.26	344.93

表 5.3.3

導水路並びに幹線水路の主要諸元 (2/2)

距離	付帯構造物		設計流量 (m <sup>3</sup> /sec)	水路底幅 (m)	設計水深 (m)	堤高 (m)	水路勾配 I	設計流速 (m/sec)	水路底標高 (m)	設計水位 (m)	堤頂標高 (m)
左岸幹線水路											
0	分水工		3.08	1.6	1.32	2	1/7,000	0.65	349.98	351.30	351.98
10	チェック	No.1	3.08	1.6	1.32	2	1/7,000	0.65	349.98	351.30	351.98
10			3.08	1.6	1.32	2	1/7,000	0.65	349.93	351.25	351.93
675	サイホン	No.1	3.08	1.6	1.32	2	1/7,000	0.65	349.83	351.15	351.83
695			3.08	1.6	1.32	2	1/7,000	0.65	349.63	350.95	351.63
1,130	分水工	No.1	3.08	1.6	1.32	2	1/7,000	0.65	349.57	350.89	351.57
1,140	チェック	No.2	3.01	1.6	1.32	2	1/7,000	0.65	349.57	350.89	351.57
1,140			3.01	1.6	1.30	2	1/7,000	0.65	349.54	350.84	351.54
1,980	横断暗渠	No.1	3.01	1.6	1.30	2	1/7,000	0.65	349.42	350.72	351.42
2,790	分水工	No.2	3.01	1.6	1.30	2	1/7,000	0.65	349.30	350.60	351.30
3,480	分水工	No.3	3.01	1.6	1.30	2	1/7,000	0.65	349.21	350.51	351.21
3,490	チェック	No.3	3.01	1.6	1.30	2	1/7,000	0.65	349.20	350.50	351.20
3,490			2.93	1.6	1.29	2	1/7,000	0.64	349.16	350.45	351.16
4,180	カルバート	No.1	2.93	1.6	1.29	2	1/7,000	0.64	349.07	350.36	351.07
4,180			2.93	1.6	1.29	2	1/7,000	0.64	349.02	350.31	351.02
4,770	余水吐	No.1	2.93	1.6	1.29	2	1/7,000	0.64	348.93	350.22	350.93
5,680	分水工	No.4	2.93	1.6	1.29	2	1/7,000	0.64	348.80	350.09	350.80
5,690	チェック	No.4	2.93	1.6	1.29	2	1/7,000	0.64	348.80	350.09	350.80
5,690			2.90	1.6	1.28	2	1/7,000	0.64	348.76	350.04	350.76
6,400	横断暗渠	No.2	2.90	1.6	1.28	2	1/7,000	0.64	348.66	349.94	350.66
6,830	カルバート	No.2	2.90	1.6	1.28	2	1/7,000	0.64	348.60	349.88	350.60
6,830			2.90	1.6	1.28	2	1/7,000	0.64	348.55	349.83	350.55
7,590	分水工	No.5	2.90	1.6	1.28	2	1/7,000	0.64	348.44	349.72	350.44
7,600	チェック	No.5	2.90	1.6	1.28	2	1/7,000	0.64	348.44	349.72	350.44
7,600			2.51	1.6	1.19	2	1/7,000	0.62	348.48	349.67	350.48
9,890	横断暗渠	No.3	2.51	1.6	1.19	2	1/7,000	0.62	348.15	349.34	350.15
9,940	カルバート	No.3	2.51	1.6	1.19	2	1/7,000	0.62	348.14	349.33	350.14
9,940			2.51	1.6	1.19	2	1/7,000	0.62	348.09	349.28	350.09
10,550	分水工	No.6	2.51	1.6	1.19	2	1/7,000	0.62	348.01	349.20	350.01
10,970	分水工	No.7	2.51	1.6	1.19	2	1/7,000	0.62	347.95	349.14	349.95
11,460	横断暗渠	No.4	2.51	1.6	1.19	2	1/7,000	0.62	347.88	349.07	349.88
11,930	分水工	No.8	2.51	1.6	1.19	2	1/7,000	0.62	347.81	349.00	349.81
11,940	チェック	No.6	2.51	1.6	1.19	2	1/7,000	0.62	347.81	349.00	349.81
11,940			2.46	1.6	1.18	2	1/7,000	0.62	347.77	348.95	349.77
12,750	カルバート	No.4	2.46	1.6	1.18	2	1/7,000	0.62	347.65	348.83	349.65
12,750			2.46	1.6	1.18	2	1/7,000	0.62	347.60	348.78	349.60
13,530	カルバート	No.5	2.46	1.6	1.18	2	1/7,000	0.62	347.49	348.67	349.49
13,530			2.46	1.6	1.18	2	1/7,000	0.62	347.44	348.62	349.44
14,050	分水工	No.9	2.46	1.6	1.18	2	1/7,000	0.62	347.37	348.55	349.37
14,060	チェック	No.7	2.46	1.6	1.18	2	1/7,000	0.62	347.36	348.54	349.36
14,060			2.12	1.4	1.14	1.8	1/7,000	0.59	347.35	348.49	349.15
15,970	カルバート	No.6	2.12	1.4	1.14	1.8	1/7,000	0.59	347.08	348.22	348.88
15,970			2.12	1.4	1.14	1.8	1/7,000	0.59	347.03	348.17	348.83
16,480	調整池	No.1	2.12	1.4	1.14	1.8	1/7,000	0.59	346.96	348.10	348.76
16,480			2.01	1.2	1.01	1.8	1/5,000	0.66	345.89	346.90	347.69
17,390	分水工	No.10	2.01	1.2	1.01	1.8	1/5,000	0.66	345.71	346.72	347.51
17,400	チェック	No.8	2.01	1.2	1.01	1.8	1/5,000	0.66	345.70	346.71	347.50
17,400			2.01	1.2	1.01	1.8	1/5,000	0.66	345.65	346.66	347.45
17,580	カルバート	No.7	2.01	1.2	1.01	1.8	1/5,000	0.66	345.62	346.63	347.42
17,580			2.01	1.2	1.01	1.8	1/5,000	0.66	345.57	346.58	347.37
18,620	分水工	No.11	2.01	1.2	1.01	1.8	1/5,000	0.66	345.56	346.57	347.36
18,630	チェック	No.9	2.01	1.2	1.01	1.8	1/5,000	0.66	345.56	346.57	347.36
18,630			1.80	1	1.07	1.8	1/5,000	0.65	345.25	346.32	347.05
19,210	横断暗渠	No.5	1.80	1	1.07	1.8	1/5,000	0.65	345.13	346.20	346.93
19,470	カルバート	No.8	1.80	1	1.07	1.8	1/5,000	0.65	345.08	346.15	346.88
19,470			1.80	1	1.07	1.8	1/5,000	0.65	345.03	346.10	346.83
21,160	分水工	No.12	1.80	1	1.07	1.8	1/5,000	0.65	344.89	345.76	346.49
21,170	チェック	No.10	1.80	1	1.07	1.8	1/5,000	0.65	344.89	345.76	346.49
21,170			1.67	1	1.03	1.8	1/5,000	0.64	344.68	345.55	346.28
23,710	横断暗渠	No.6	1.67	1	1.03	1.8	1/5,000	0.64	344.17	345.20	345.97
25,650	分水工	No.13	1.67	1	1.03	1.8	1/5,000	0.64	343.78	344.81	345.58
25,660	チェック	No.11	1.67	1	1.03	1.8	1/5,000	0.64	343.78	344.81	345.58
25,660			1.62	1	1.02	1.8	1/5,000	0.63	343.74	344.76	345.54
27,160	横断暗渠	No.7	1.62	1	1.02	1.8	1/5,000	0.63	343.44	344.46	345.24
28,360	分水工	No.14	1.62	1	1.02	1.8	1/5,000	0.63	343.20	344.22	345.00
28,370	チェック	No.12	1.62	1	1.02	1.8	1/5,000	0.63	343.20	344.22	345.00
28,370			1.59	1	1.01	1.8	1/5,000	0.63	343.16	344.17	344.96
29,070	横断暗渠	No.8	1.59	1	1.01	1.8	1/5,000	0.63	343.02	344.03	344.82
29,990	分水工	No.15	1.59	1	1.01	1.8	1/5,000	0.63	342.84	343.85	344.64
30,000	チェック	No.13	1.59	1	1.01	1.8	1/5,000	0.63	342.83	343.84	344.63
30,000			1.29	1	0.91	1.6	1/5,000	0.60	342.88	343.79	344.48
30,810	カルバート	No.9	1.29	1	0.91	1.6	1/5,000	0.60	342.72	343.63	344.32
30,810			1.29	1	0.91	1.6	1/5,000	0.60	342.67	343.58	344.27
31,520	分水工	No.16	1.29	1	0.91	1.6	1/5,000	0.60	342.53	343.44	344.13
31,530	チェック	No.14	1.29	1	0.91	1.6	1/5,000	0.60	342.53	343.44	344.13
31,530			1.05	0.8	0.88	1.6	1/5,000	0.57	342.51	343.39	344.11
33,720	分水工	No.17	1.05	0.8	0.88	1.6	1/5,000	0.57	342.07	342.95	343.67
33,730	チェック	No.15	1.05	0.8	0.88	1.6	1/5,000	0.57	342.07	342.95	343.67
33,730			0.89	0.8	0.81	1.6	1/5,000	0.54	342.09	342.90	343.69
34,620	調整池	No.2	0.89	0.8	0.81	1.6	1/5,000	0.54	341.91	342.72	343.51
34,620			0.89	0.8	0.81	1.6	1/5,000	0.54	340.71	341.52	342.31
34,700	分水工	No.18	0.89	0.8	0.81	1.6	1/5,000	0.54	340.69	341.50	342.29
34,710	チェック	No.16	0.89	0.8	0.81	1.6	1/5,000	0.54	340.69	341.50	342.29
34,710			0.94	0.8	0.83	1.6	1/5,000	0.55	340.62	341.45	342.22
35,590	分水工	No.19	0.94	0.8	0.83	1.6	1/5,000	0.55	340.45	341.28	342.05

表 5.3.4 導水路、幹線水路並びに  
二次水路付帯構造物一覧

構造物	導水路	右岸幹線水路	左岸幹線水路	二次水路	合計
分水工	0	21	21	90	132
水位調節施設	0	10	12	36	58
落差工	0	0	0	36	36
樋門	0	0	1	0	1
カルバート	0	2	10	36	48
左右岸分水工	0	1	0	0	1
潮整地流入工	0	1	2	0	3
潮整地流出工	0	1	2	0	3
余水吐	1	5	8	36	49
横断排水工	3	7	10	41	58
サイホン	0	3	2	2	7
橋梁 (水没式)	0	3	2	3	8
合計	4	54	70	280	404

表 6.3.1 (1/2) 事業費の要約 (外貨分に対する税金を含まない場合)

(単位：百万 FCFA)

項目	外貨分	内貨分	合計
I. 直接工事費			
- ダム	776	659	1,435
- 灌漑施設等			
準備工事	556	612	1,168
導水路	332	489	821
右岸幹線水路	1,181	1,234	2,415
左岸幹線水路	1,645	2,075	3,720
二次水路	600	655	1,255
三次水路	665	832	1,497
農地造成	1,067	769	1,836
二次排水路	34	18	52
農道	37	46	83
小計 I	6,893	7,389	14,282
II. 農地基盤整備等	226	303	529
小計 II	226	303	529
III. 維持管理機械調達費	194	4	198
IV. 技術費	981	537	1,518
V. 事業管理費 (技術料の10%)	98	54	152
小計 III+IV+V	1,273	595	1,868
合計 I+ II+ III+ IV + V	8,392	8,287	16,679
VI. 工事予備費 (I+ II+ III+ IV + Vの10%)	839	829	1,668
VII. 物価予備費 (外貨分及び内貨分の年率5%)	1,176	1,119	2,295
合計	10,407	10,235	20,642

表 6.3.1(2/2) 事業費の要約 (外貨分に対する税金を含む場合)

(単位:百万 FCFA)

項目	外貨分	内貨分	合計
I. 直接工事費			
- ダム	787	659	1,446
- 灌漑施設等	6,236	6,730	12,966
準備工事	556	612	1,168
導水路	332	489	821
右岸幹線水路	1,181	1,234	2,415
左岸幹線水路	1,645	2,075	3,720
二次水路	600	655	1,255
三次水路	665	832	1,497
農地造成	1,067	769	1,836
二次排水路	34	18	52
農道	37	46	83
(灌漑施設の輸入税)	119	0	119
小計 I	7,023	7,389	14,412
II. 農村基盤整備等	227	303	530
小計 II	227	303	530
III. 維持管理機械調達費	242	4	246
IV. 技術費	981	537	1,518
V. 事業管理費	98	54	152
(技術費の10%)			
小計 III+IV+V	1,321	595	1,916
合計I+II+III+IV+V	8,571	8,287	16,679
VI. 工事予備費	857	829	1,686
(I+II+III+IV+Vの10%)			
VII. 物価予備費	1,198	1,119	2,317
(外貨分及び内貨分の年率5%)			
合計	10,626	10,235	20,861

表 6.3.2 事業費の年次別支出計画

項目	Total		1ère année		2ème année		3ème année		4ème année		5ème année	
	DE	ML	DE	ML	DE	ML	DE	ML	DE	ML	DE	ML
	(単位百万 CFA)											
1 灌漑排水施設 ダム 灌漑排水施設	6 893	7 389	14 282	0	0	856	3 108	3 776	2 002	1 669	1 113	1 088
	776	659	1 435	0	0	94	429	415	255	150		
	6 117	6 730	12 847	0	0	578	2 679	3 361	1 747	1 519	1 113	1 088
2 維持管理機械	194	4	198	0	0	0	0	0	194	4	0	0
3 農村基盤施設 (小計 I: 1+2+3)	226	303	529	0	0	0	61	81	86	116	79	106
4 技術費	7 313	7 696	15 009	670	856	3 169	3 857	2 282	1 789	1 192	1 192	1 194
5 事業管理費 (技術費の 10%)	981	537	1 518	141	125	234	81	184	60	73	73	26
	98	54	152	15	12	23	8	18	6	7	7	3
(小計 II: 1+2+3+4+5)	8 392	8 287	16 679	156	137	3 426	3 946	2 484	1 855	1 272	1 272	1 223
6 工事予備費 (10%) (計: II+6)	839	829	1 668	16	14	105	113	343	248	185	127	122
	9 231	9 116	18 347	172	151	3 769	4 341	2 732	2 040	1 399	1 399	1 345
7 物価予備費 (外貨、内貨に対して年率 5%)	1 176	1 119	2 295	0	0	58	386	445	431	322	301	290
8 合計	10 407	10 235	20 642	172	151	4 155	4 786	3 163	2 362	1 700	1 700	1 635

注: DE: 外貨分  
ML: 内貨分

表 6.3.3 維持管理費

年間維持管理費

(単位：千CFA)

項目	Item Calculation	費用
1. 人件費	下表参照	39,949
調査費	調査員 4,000人・日×1,000CFA	4,000
2. 事務所経費	300,000CFA×12ヶ月	3,600
3. 機械管理費	下表参照	9,051
4. 施設維持管理費	直接工事費の0.2%	28,600
5. 予備費	項目1から4の合計の3%	2,560
Total		87,760
(Cost per ha)		(40)

管理事務所人員

(単位：千CFA)

Staff	必要人数	年間給与	費用
- 事務所長	1	8,524	8,524
- 課長	3	2,949	8,847
- 重機オペレーター	5	1,266	6,330
- 機械修理士	1	1,464	1,464
- ゲート操作員	8	1,266	10,128
- 事務員	2	1,789	3,578
- 雑役	1	1,078	1,078
Total			39,949

維持管理用機械運転費

(単位：千CFA)

Equipment	台数	年間稼働時間	時間当り 運転費用	費用
1. プルトーサー(11トン)	1	190	3,852	732
2. バックホウ(0.35m <sup>3</sup> )	1	220	2,558	563
3. ホイローダ(1.5m <sup>3</sup> )	1	190	3,410	648
4. ダンプトラック(8トン)	1	300	4,057	1,217
5. クレーン付きカーゴトラック(6トン)	1	180	1,588	286
6. ミニトラック(2トン)	3	250	1,844	1,383
7. モーターグレーダ(3m)	1	170	2,206	375
8. タンク(80kg)	2	200	321	128
1 1 フェーズの発電機(10KVA)	2	220	559	246
1 2 モーターバイク	6	720	804	3,473
Total				9,051

表 6.3.4 施設更新費

項目	耐用年数 (年)	施設更新費		計 (千CFA)
		外貸分 (千CFA)	内貸分 (千CFA)	
I. 施設				
a. ダム				
－ パワライバル	30	7,714	406	8,120
－ スカースゲート	30	16,245	855	17,100
－ 鋼構造物	30	1,171	2,897	4,068
－ コルゲートシート	30	231	77	308
b. かんがい施設				
－ ゲート	30	124,941	5,726	130,667
計		<u>150,302</u>	<u>9,961</u>	<u>160,263</u>
II. 維持管理機械				
計	10	193,750	3,875	197,625
		<u>193,750</u>	<u>3,875</u>	<u>197,625</u>



表 8.1.1 事業費の経済価格の年次別支出計画

(単位：百万FCFA)

項目	Total	1st year	2nd year	3rd year	4th year	5th year
1 灌漑排水施設	11,325	0	1,182	5,374	3,003	1,766
ダム	1,170	0	147	678	345	0
灌漑排水施設	10,155	0	1,035	4,696	2,658	1,766
2 維持管理機械調達	196	0	0	0	196	0
3 技術費	1,304	216	496	283	220	89
4 事業管理費 (技術費の10%)	131	22	50	28	22	9
(小計 :1+2+3+4)	12,956	238	1,728	5,685	3,441	1,864
5 工事予備費 (10%)	1,296	24	173	569	344	186
6 合計	14,252	262	1,901	6,254	3,785	2,050

表 8.2.1 キャッシュフロー (資本動態)

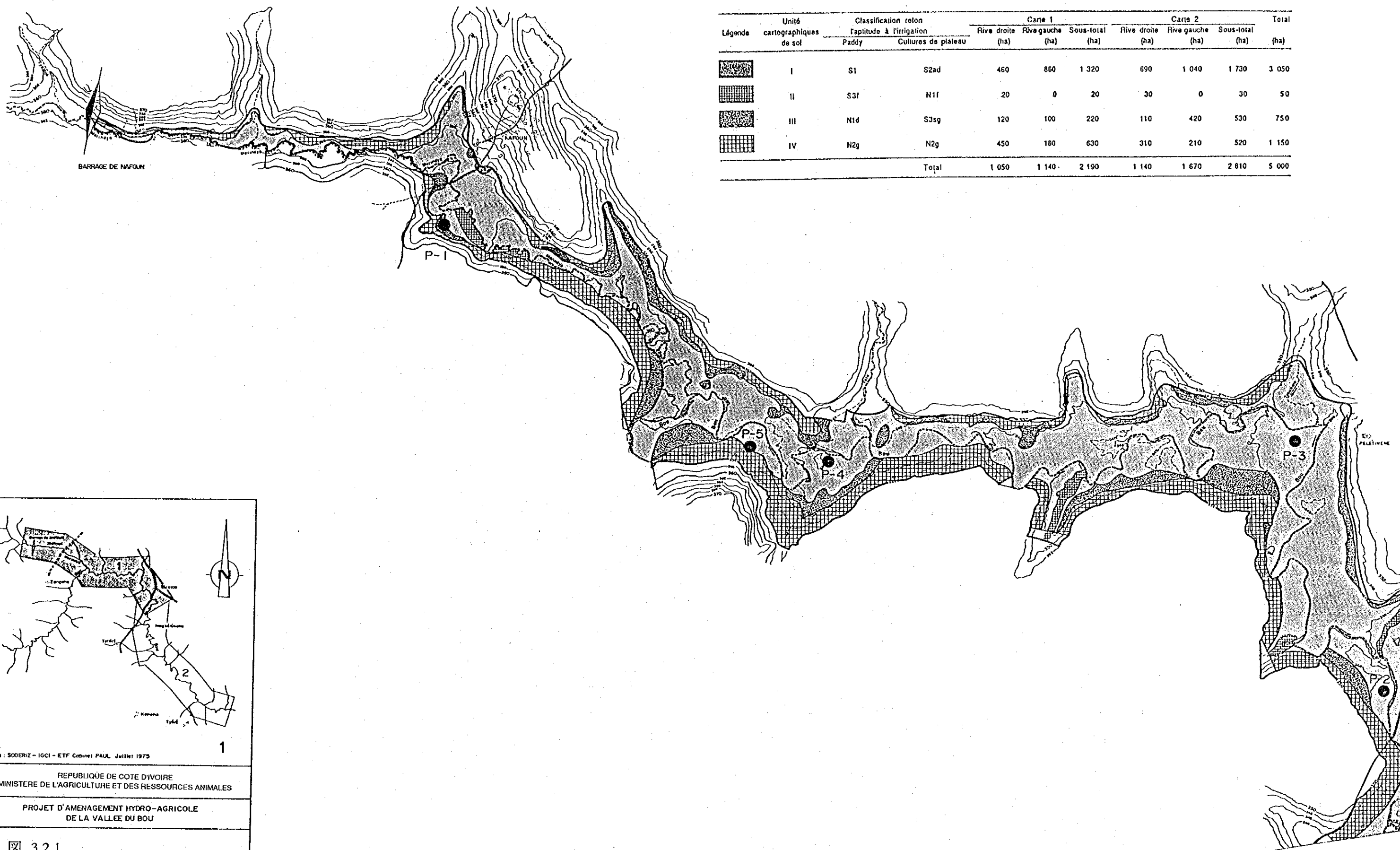
(UNIT: 百万 JPY)

Year in order	Year (tentative)	CASH OUTFLOW						CASH INFLOW				BALANCE
		CAPITAL COST		REPAYMENT	REPLACEMENT	O & M	TOTAL	CONSTRUCTION FUND		WATER GOVERNMENT	TOTAL	
		FC	LC	PRINCIPAL SERVICE CHARGE	COST	COST	COST	FC	LC	CHARGE	SUBSIDY	
1	1991	172	151	0	1	0	324	172	151	1	324	0
2	1992	1,217	1,301	0	10	0	2,528	1,217	1,301	10	2,528	0
3	1993	4,155	4,786	0	42	88	9,071	4,155	4,786	26	104	9,071
4	1994	3,163	2,362	0	65	88	5,678	3,163	2,362	57	97	5,678
5	1995	1,700	1,635	0	78	88	3,501	1,700	1,635	88	78	3,501
6	1996	0	0	0	78	88	166	0	0	88	78	166
7	1997			0	78	88	166			88	78	166
8	1998			0	78	88	166			88	78	166
9	1999			0	78	88	166			88	78	166
10	2000			0	78	88	166			88	78	166
11	2001			104	77	88	269			88	181	269
12	2002			104	76	88	269			88	181	269
13	2003			104	76	88	268			88	180	268
14	2004			104	75	198	88	465		88	377	465
15	2005			104	74	88	266			88	178	266
16	2006			104	73	88	265			88	177	265
17	2007			104	73	88	265			88	177	265
18	2008			104	72	88	264			88	176	264
19	2009			104	71	88	263			88	175	263
20	2010			104	70	88	262			88	174	262
21	2011			312	68	88	468			88	380	468
22	2012			312	66	88	466			88	378	466
23	2013			312	63	88	463			88	375	463
24	2014			312	61	198	88	659		88	571	659
25	2015			312	59	88	459			88	371	459
26	2016			312	56	88	456			88	368	456
27	2017			312	54	88	454			88	366	454
28	2018			312	52	88	452			88	364	452
29	2019			312	49	88	449			88	361	449
30	2020			312	47	88	447			88	359	447
31	2021			312	44	88	445			88	357	445
32	2022			312	42	160	88	602		88	514	602
33	2023			312	40	88	440			88	352	440
34	2024			312	37	198	88	636		88	548	636
35	2025			312	35	88	435			88	347	435
36	2026			312	33	88	433			88	345	433
37	2027			312	30	88	431			88	343	431
38	2028			312	28	88	428			88	340	428
39	2029			312	26	88	426			88	338	426
40	2030			312	23	88	424			88	336	424
41	2031			312	21	88	421			88	333	421
42	2032			312	19	88	419			88	331	419
43	2033			312	16	88	417			88	329	417
44	2034			312	14	198	88	612		88	524	612
45	2035			312	12	88	412			88	324	412
46	2036			312	9	88	410			88	322	410
47	2037			312	7	88	407			88	319	407
48	2038			312	5	88	405			88	317	405
49	2039			312	2	88	403			88	315	403
50	2040			312	0	88	400			88	312	400
51	2041			0	0	88	88			88	0	88

Remarks : Service charge : 0.75% of loan amount.  
 Repayment period : 50 years including 10 years grace period.  
 Repayment schedule : 1% of total loan amount per annum for first 10 years and 3% for last 30 years.



付 図



Légende	Unité cartographiques de sol	Classification selon l'aptitude à l'irrigation		Carte 1			Carte 2			Total (ha)
		Paddy	Cultures de plateau	Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	
[Pattern 1]	I	S1	S2ad	460	860	1 320	690	1 040	1 730	3 050
[Pattern 2]	II	S3f	N1f	20	0	20	30	0	30	50
[Pattern 3]	III	N1d	S3sg	120	100	220	110	420	530	750
[Pattern 4]	IV	N2g	N2g	450	180	630	310	210	520	1 150
Total				1 050	1 140	2 190	1 140	1 670	2 810	5 000

Source : SODERIZ - IGCI - ETF Cabinet PAUL, Juillet 1973

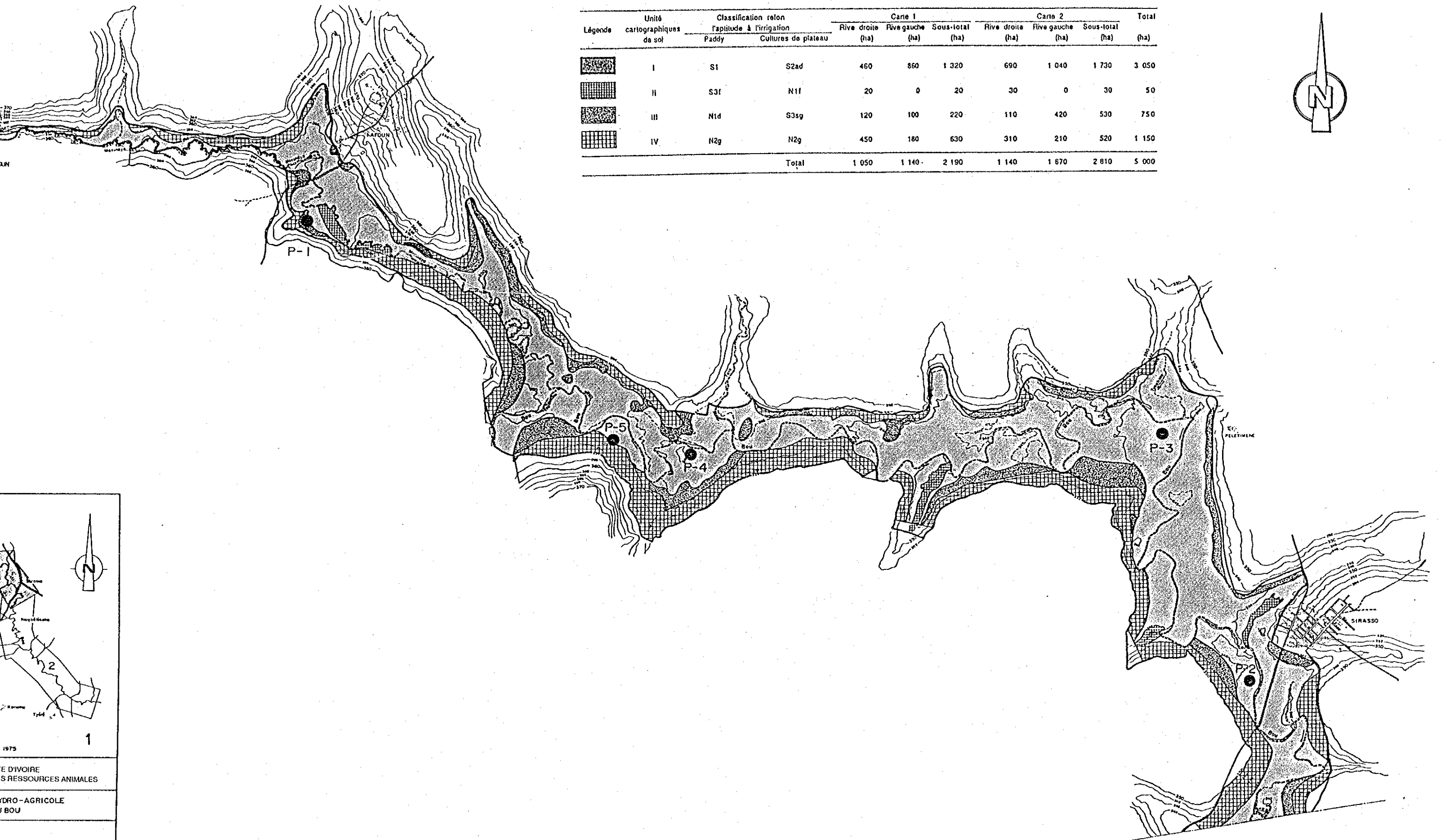
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PROJET D'AMENAGEMENT HYDRO-AGRICOLE  
 DE LA VALLEE DU BOU

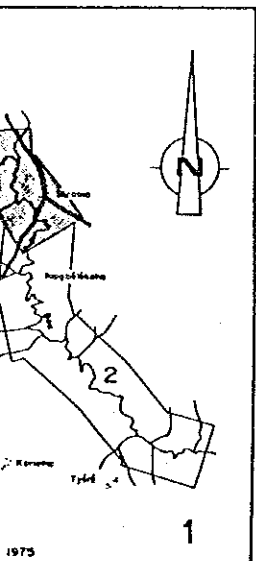
TITRE  
 3.2.1  
 土壤・土地分級図 (1/2)

AGENCE JAPONAISE DE COOPERATION  
 INTERNATIONALE





Légende	Unité cartographiques da sol	Classification selon l'aptitude à l'irrigation		Carte 1			Carte 2			Total (ha)
		Paddy	Cultures de plateau	Rive droite	Rive gauche	Sous-total	Rive droite	Rive gauche	Sous-total	
				(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	
	I	S1	S2ad	460	860	1 320	690	1 040	1 730	3 050
	II	S3f	N1f	20	0	20	30	0	30	50
	III	N1d	S3sg	120	100	220	110	420	530	750
	IV	N2g	N2g	450	180	630	310	210	520	1 150
Total				1 050	1 140	2 190	1 140	1 670	2 810	5 000

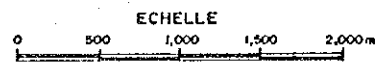


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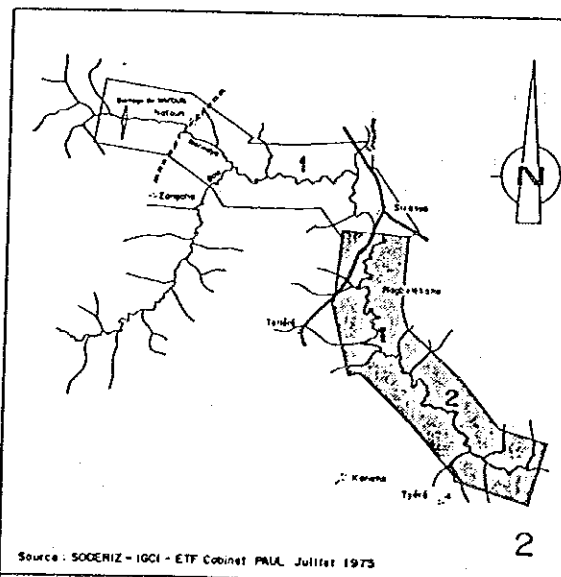
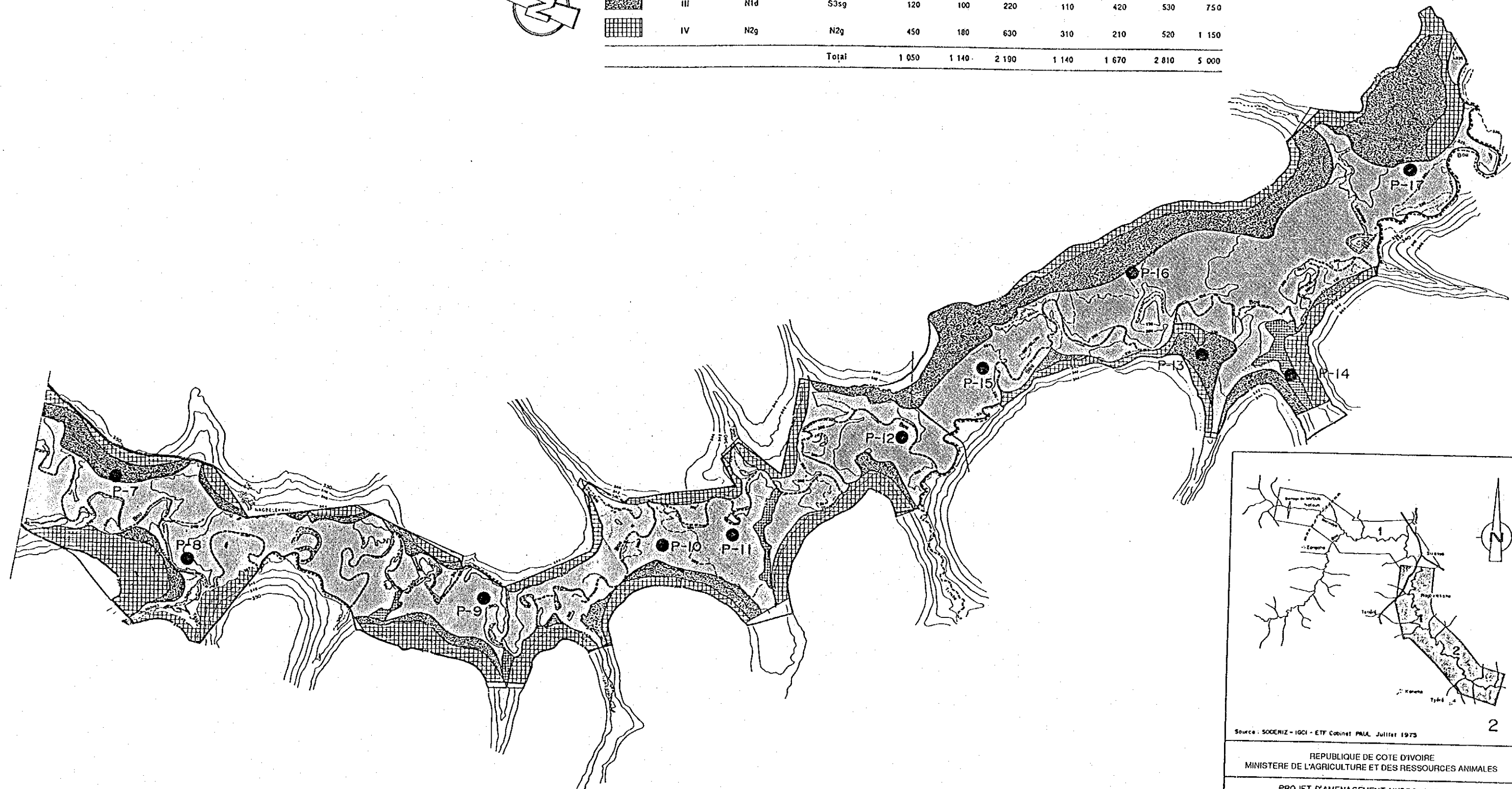
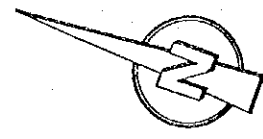
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COOPERATION

ONALE



Légende	Unités cartographiques de sol	Classification selon l'aptitude à l'irrigation		Carte 1			Carte 2			Total (ha)
		Paddy	Cultures de plateau	Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	
	I	S1	S2ad	460	860	1 320	690	1 040	1 730	3 050
	II	S3f	N1f	20	0	20	30	0	30	50
	III	N1d	S3sg	120	100	220	110	420	530	750
	IV	N2g	N2g	450	180	630	310	210	520	1 150
Total				1 050	1 140	2 190	1 140	1 670	2 810	5 000



Source: SOGÉNIZ-IGCI - ET/ Cabinet PAUL, Juillet 1973

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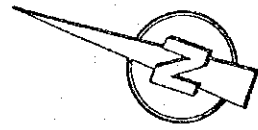
PROJET D'AMÉNAGEMENT HYDRO-AGRICOLE  
DE LA VALLÉE DU BOU

TITRE

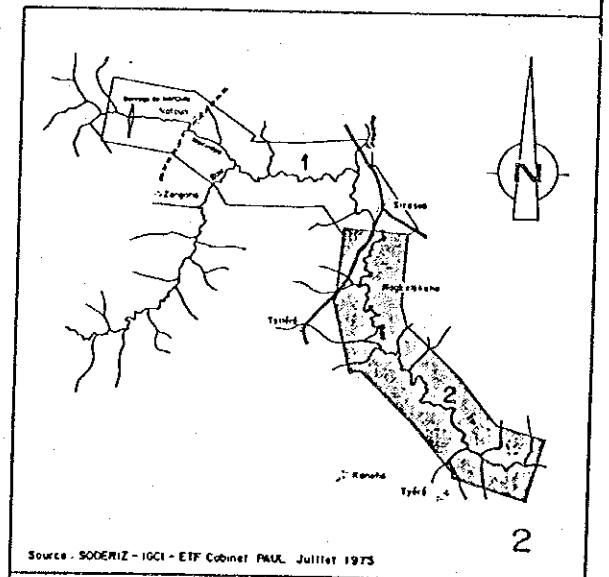
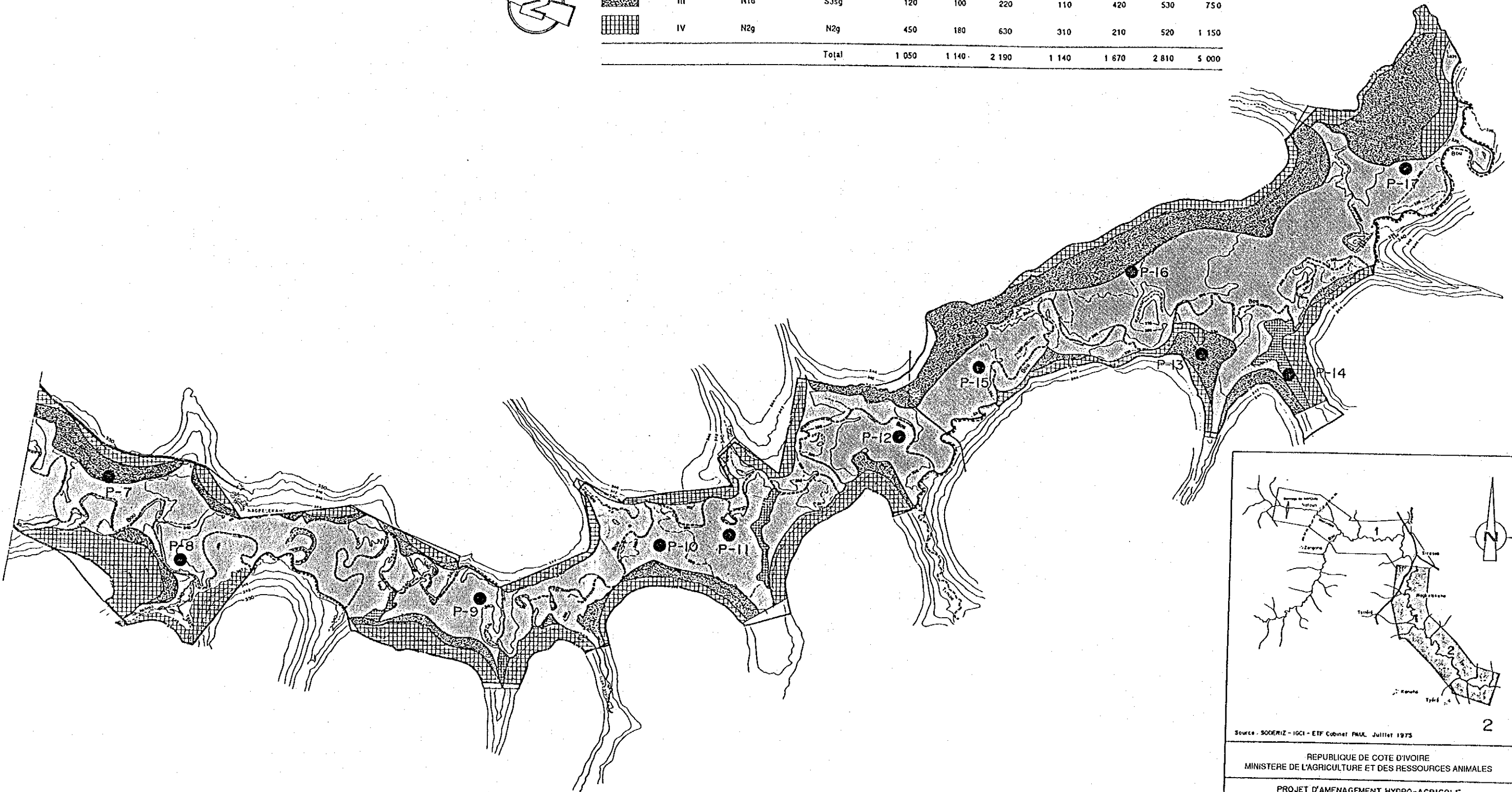
图 3.2.1  
土壤・土地分級図 (2/2)

AGENCE JAPONAISE DE COOPÉRATION INTERNATIONALE





Légende	Unité cartographiques de sol	Classification selon l'aptitude à l'irrigation		Carte 1			Carte 2			Total (ha)
		Paddy	Cultures de plateau	Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	
	I	S1	S2ad	460	860	1 320	690	1 040	1 730	3 050
	II	S3f	N1f	20	0	20	30	0	30	50
	III	N1d	S3sg	120	100	220	110	420	530	750
	IV	N2g	N2g	450	180	630	310	210	520	1 150
Total				1 050	1 140	2 190	1 140	1 670	2 810	5 000



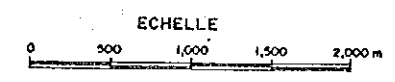
Source : SOERIZ - IGCI - ETR Cabinet PAUL, Juillet 1975

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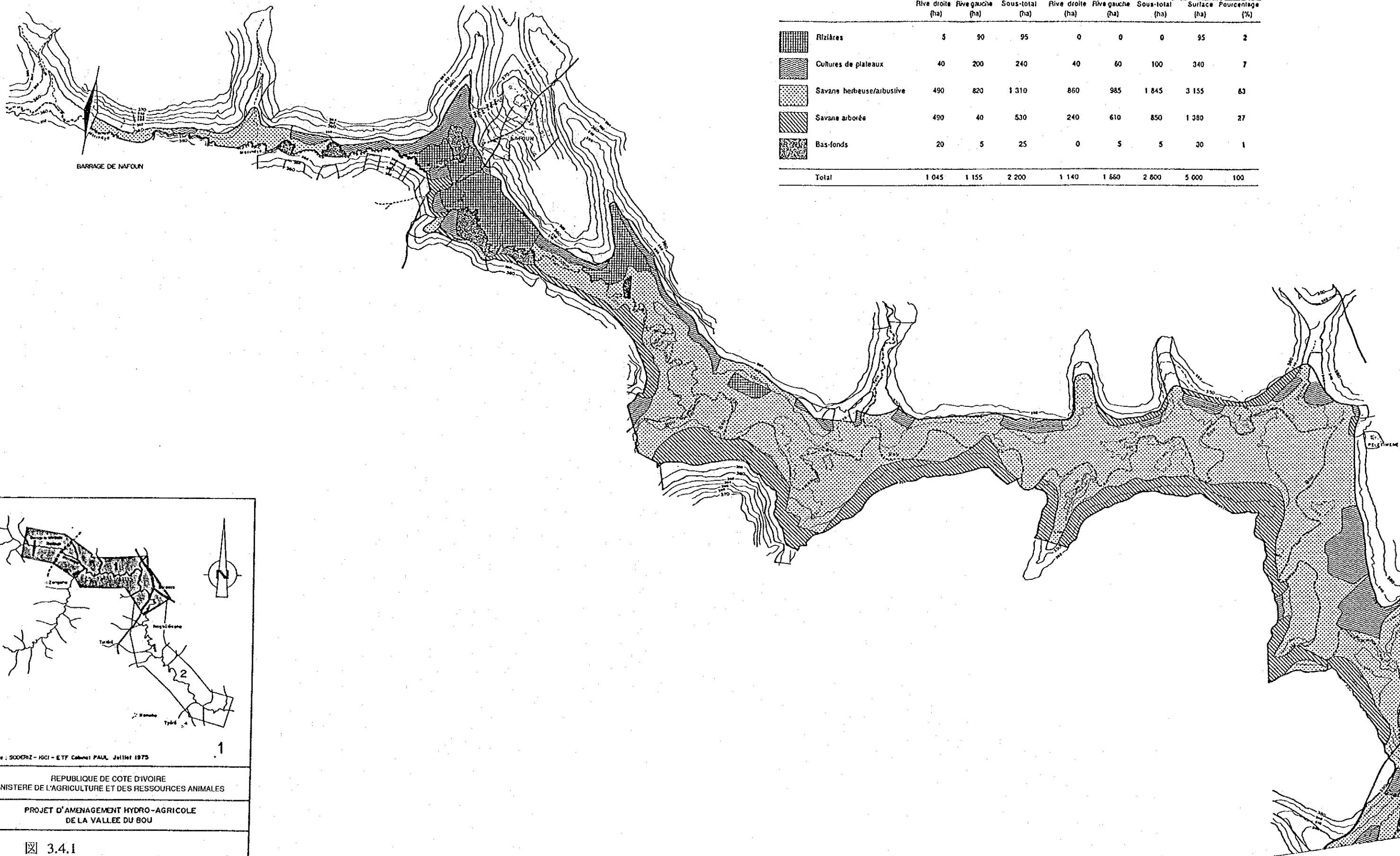
PROJET D'AMENAGEMENT HYDRO-AGRICOLE  
 DE LA VALLEE DU BOU

TITRE  
 图 3.2.1  
 土壤・土地分級図 (2/2)

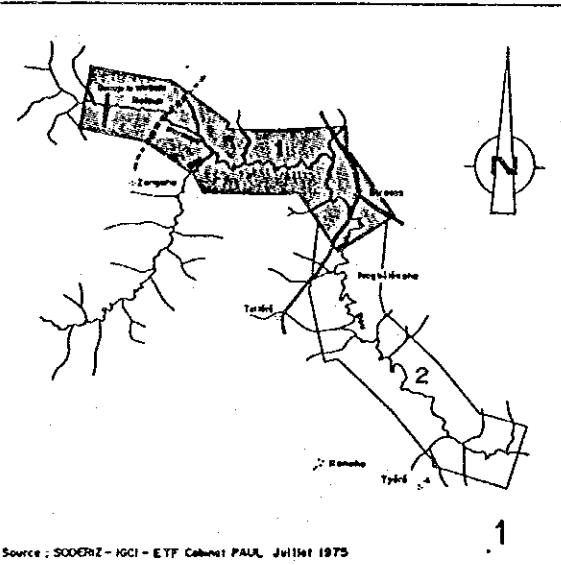
AGENCE JAPONAISE DE COOPERATION  
 INTERNATIONALE







Légende	Types de cultures	Carte 1			Carte 2			Total	
		Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	Surface (ha)	Pourcentage (%)
[Cross-hatch pattern]	Rizières	5	90	95	0	0	0	95	2
[Wavy line pattern]	Cultures de plateaux	40	200	240	40	60	100	340	7
[Dotted pattern]	Savane herbeuse/arbusive	490	820	1 310	860	985	1 845	3 155	63
[Diagonal line pattern]	Savane arborée	490	40	530	240	610	850	1 380	27
[Stippled pattern]	Bas-fonds	20	5	25	0	5	5	30	1
Total		1 045	1 155	2 200	1 140	1 660	2 800	5 000	100



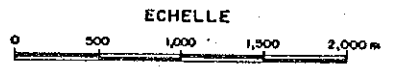
Source : SOERZ - IGC1 - ETP Cabinet PAUL, Juillet 1975

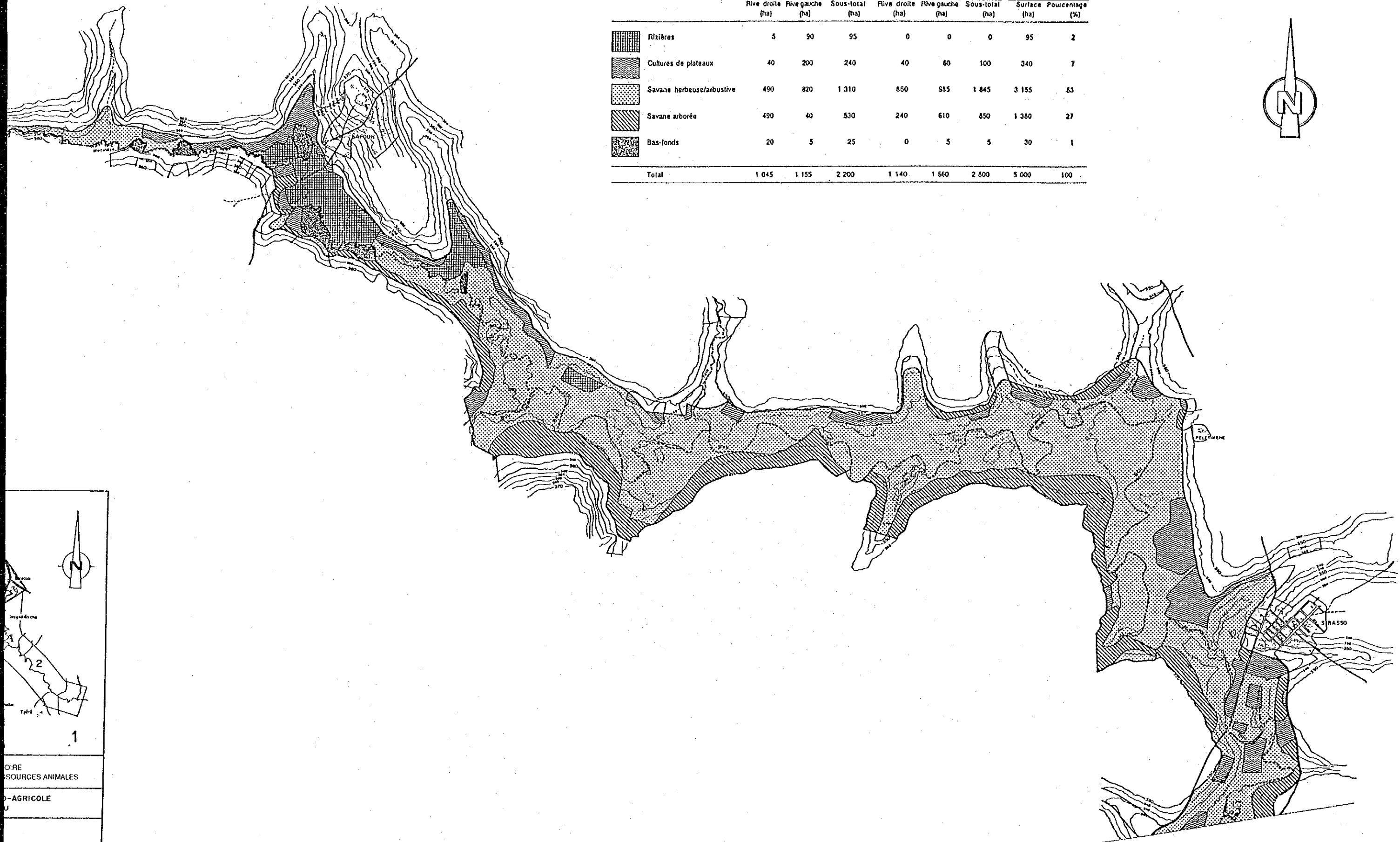
REPUBLIQUE DE COTE D'IVOIRE  
 MINISTERE DE L'AGRICULTURE ET DES RESSOURCES ANIMALES

PROJET D'AMENAGEMENT HYDRO-AGRICOLE  
 DE LA VALLEE DU BOU

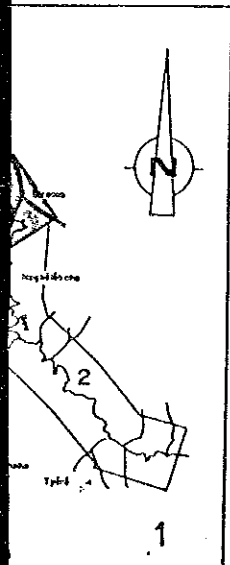
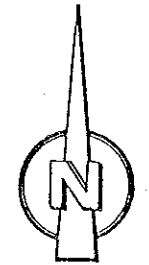
TITRE  
 図 3.4.1  
 現況土地利用図 (1/2)

AGENCE JAPONAISE DE COOPERATION  
 INTERNATIONALE

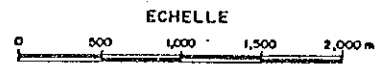




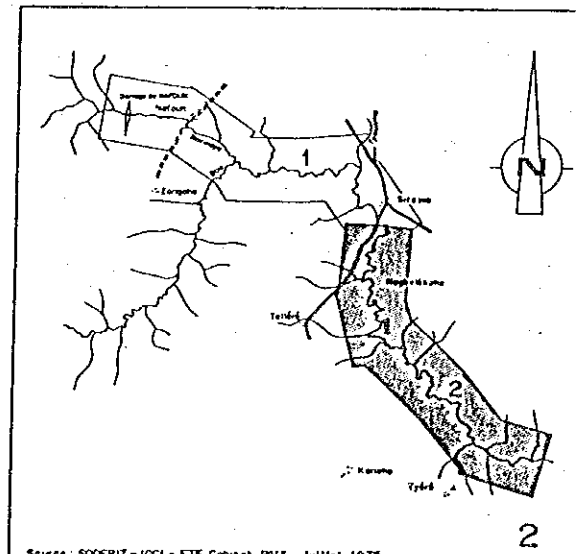
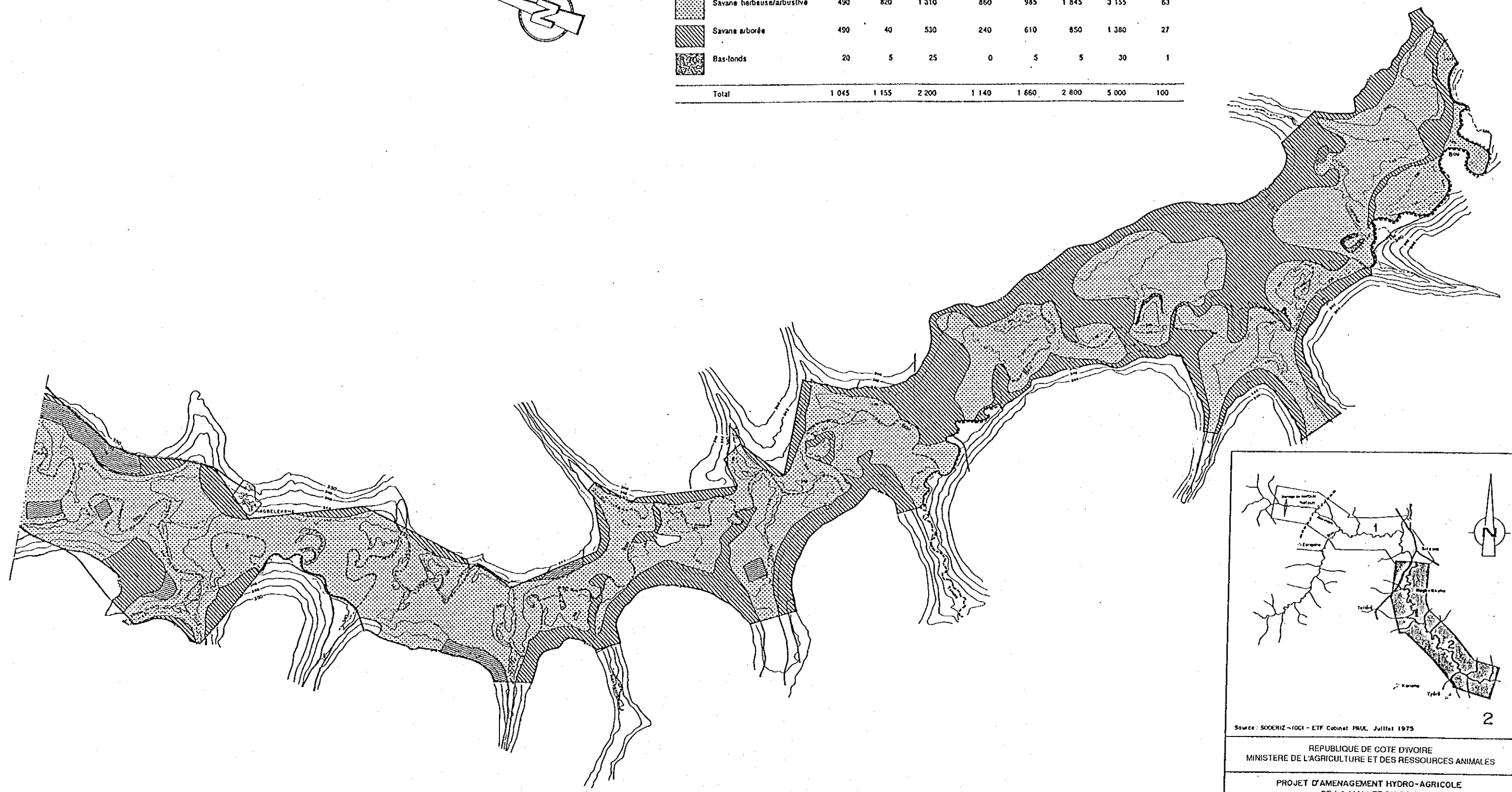
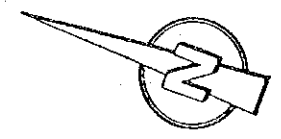
Légende	Types de cultures	Carte 1			Carte 2			Total	
		Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	Surface (ha)	Pourcentage (%)
	Rizières	5	90	95	0	0	0	95	2
	Cultures de plateaux	40	200	240	40	60	100	340	7
	Savane herbeuse/arbustive	490	820	1 310	860	985	1 845	3 155	63
	Savane arborée	490	40	530	240	610	850	1 380	27
	Bas-fonds	20	5	25	0	5	5	30	1
Total		1 045	1 155	2 200	1 140	1 660	2 800	5 000	100



OIRE  
 SOURCES ANIMALES  
 D-AGRICOLE  
 U  
 (1/2)  
 OPERATION



Légende	Types de cultures	Carte 1			Carte 2			Total	
		Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	Surface (ha)	Pourcentage (%)
	Rizières	5	90	95	0	0	0	95	2
	Cultures de plateaux	40	200	240	40	60	100	340	7
	Savane herbeuse/arbustive	490	820	1 310	860	985	1 845	3 155	63
	Savane arborée	490	40	530	240	610	850	1 380	27
	Bas-fonds	20	5	25	0	5	5	30	1
Total		1 045	1 155	2 200	1 140	1 660	2 800	5 000	100



Source : SOGERIZ-1001 - ETF Cabinet PAUL, Juillet 1975

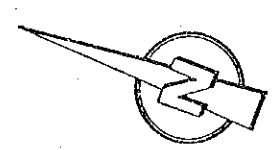
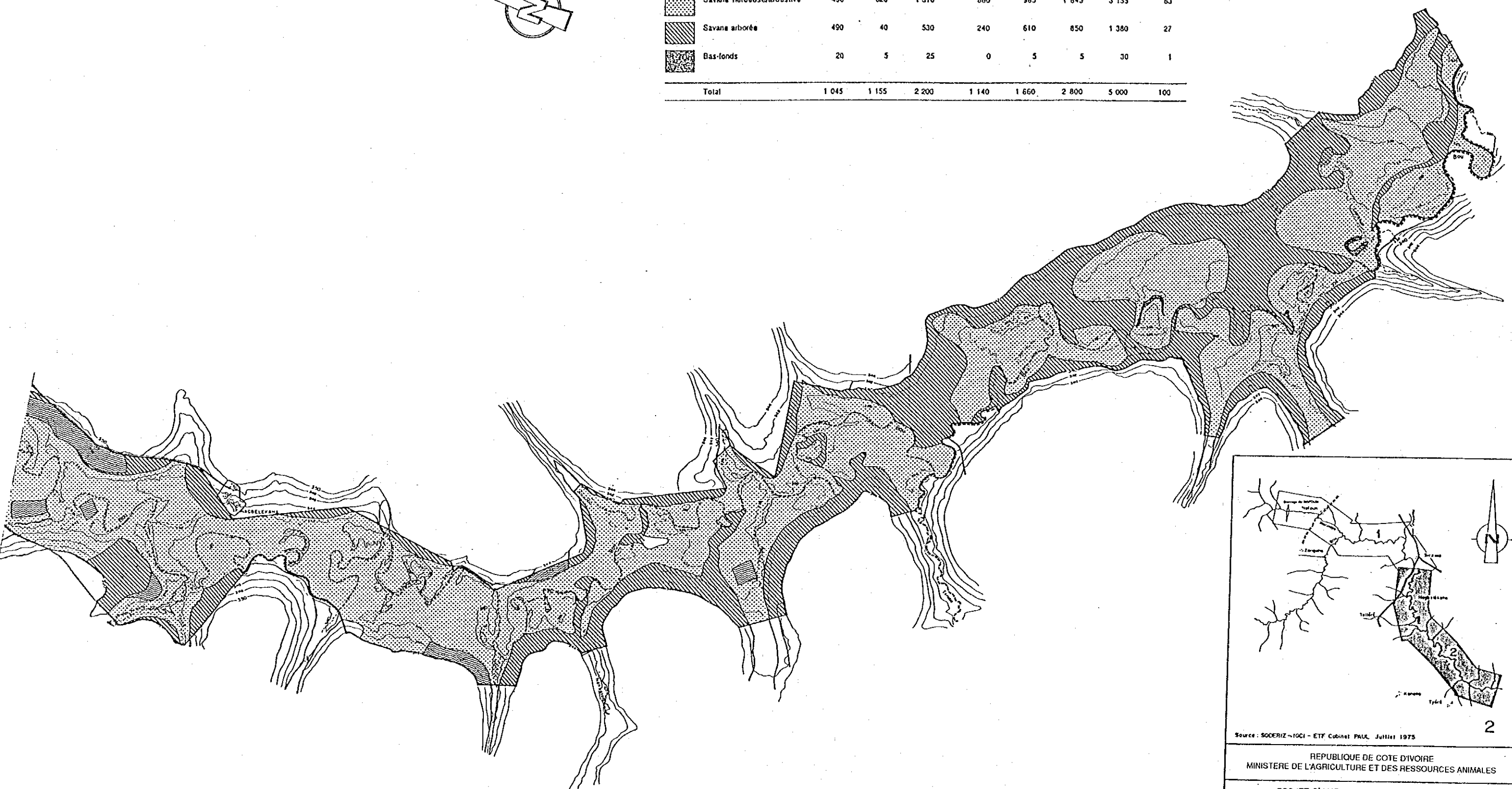
REPUBLIQUE DE COTE D'IVOIRE  
 MINISTERE DE L'AGRICULTURE ET DES RESSOURCES ANIMALES

PROJET D'AMENAGEMENT HYDRO-AGRIQUE  
 DE LA VALLEE DU BOU

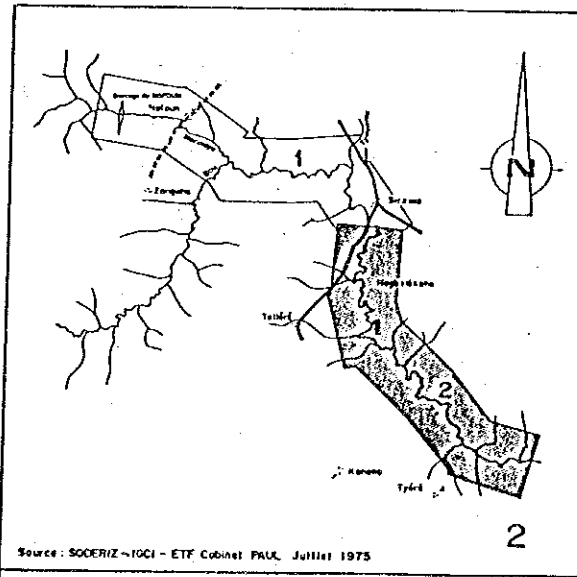
TITRE  
 図 3.4.1  
 現況土地利用図 (2/2)

AGENCE JAPONAISE DE COOPERATION  
 INTERNATIONALE

ECHELLE  
 0 500 1,000 1,500 2,000m



Légende	Types de cultures	Carte 1			Carte 2			Total	
		Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	Rive droite (ha)	Rive gauche (ha)	Sous-total (ha)	Surface (ha)	Pourcentage (%)
	Rizières	5	90	95	0	0	0	95	2
	Cultures de plateaux	40	200	240	40	60	100	340	7
	Savane herbeuse/arbusive	490	820	1 310	860	985	1 845	3 155	63
	Savane arborée	490	40	530	240	610	850	1 380	27
	Bas-fonds	20	5	25	0	5	5	30	1
Total		1 045	1 155	2 200	1 140	1 660	2 800	5 000	100



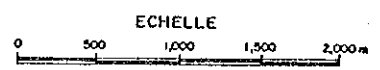
Source : SOGERIZ-IGCI - ETf Cabinet PAUL, Juillet 1975

REPUBLIQUE DE COTE D'IVOIRE  
MINISTÈRE DE L'AGRICULTURE ET DES RESSOURCES ANIMALES

PROJET D'AMENAGEMENT HYDRO-AGRICOLE  
DE LA VALLEE DU BOU

TITRE  
図 3.4.1  
現況土地利用図 (2/2)

AGENCE JAPONAISE DE COOPERATION  
INTERNATIONALE





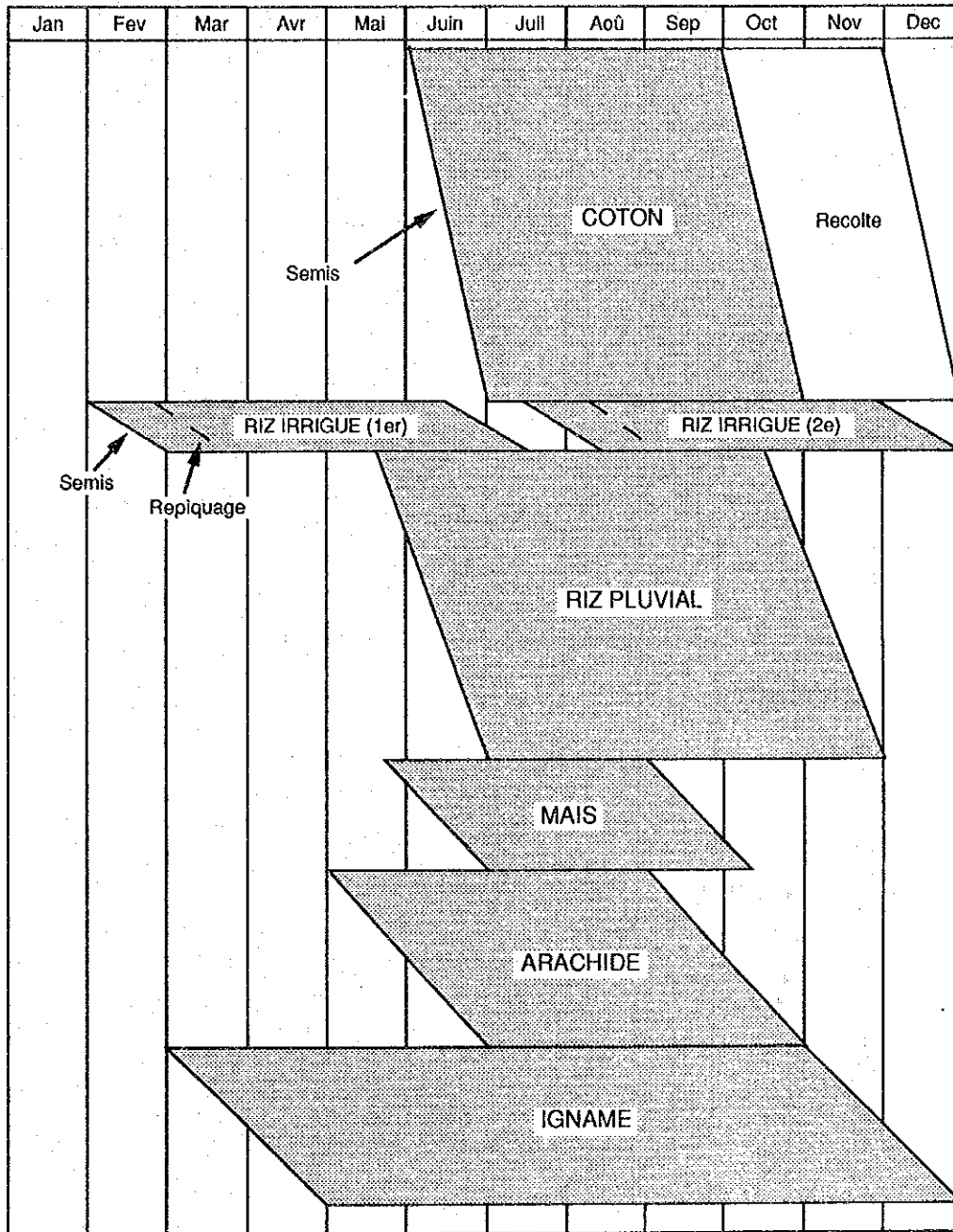


図 3.4.2. 現況作付体系



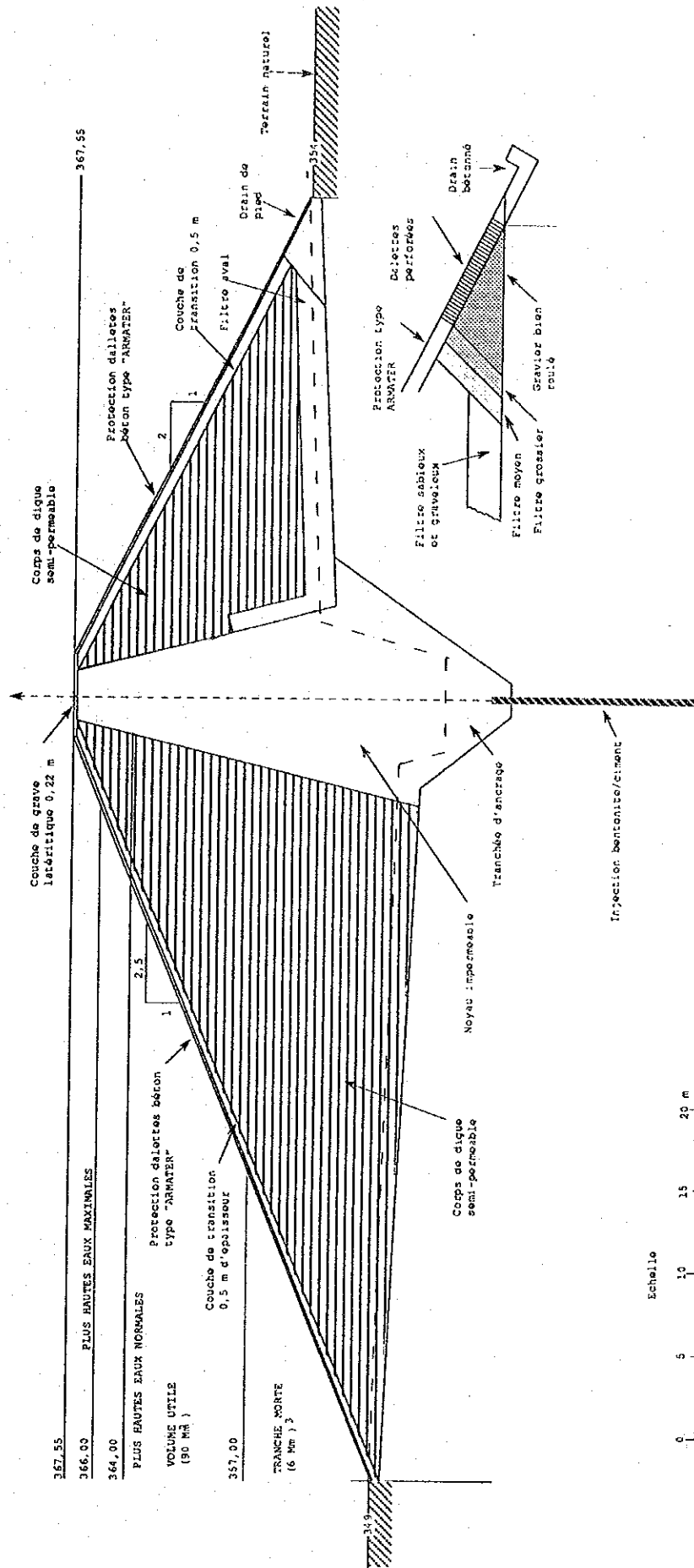
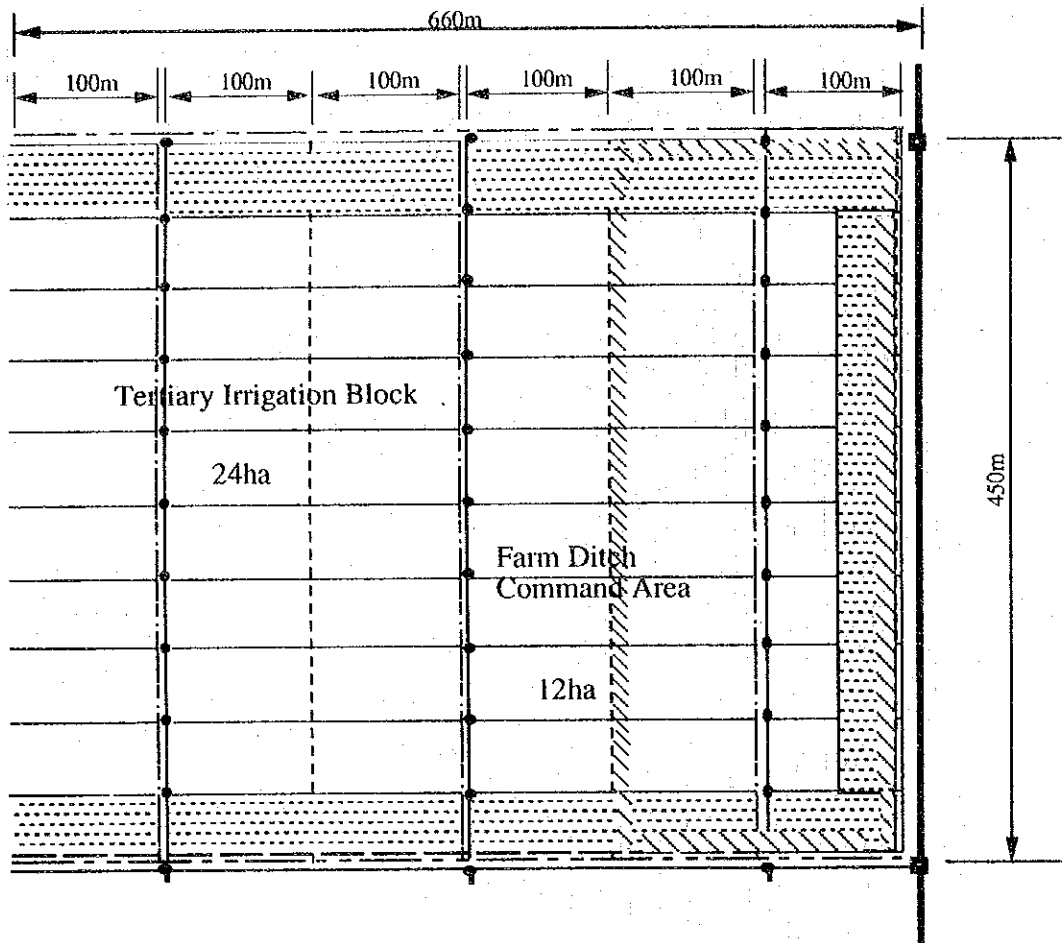


図 53.1 プ川ダムの計画断面図

REPUBLIQUE DE LA COTE D'IVOIRE  
 PROJET D'AMENAGEMENT  
 HYDRO-AGRICOLE  
 DE LA VALLEE DU BOU  
 AGENCE JAPONAISE DE  
 COOPERATION INTERNATIONALE





LEGEND:







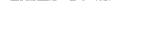
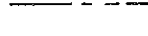
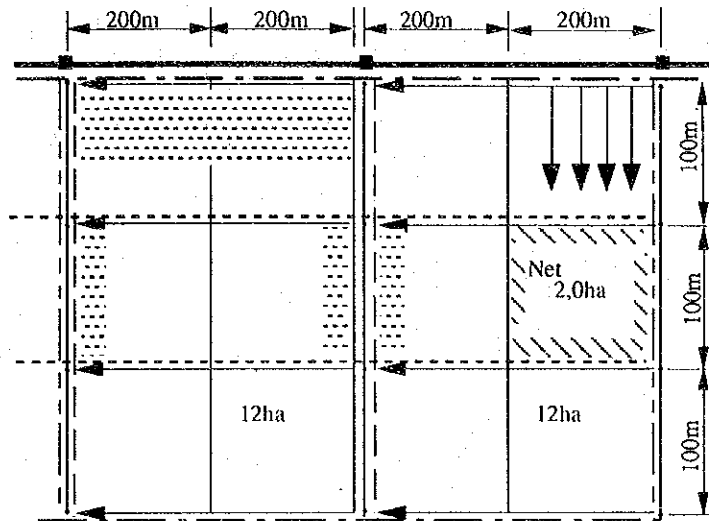
-  Secondary Irrigation Canal & Turnout
-  Tertiary Irrigation Canal & Division Box
-  Farm Ditch & Farm Outlet
-  Secondary Drain
-  Collector Drain
-  Secondary Farm Road
-  Tertiary Farm Road
-  Field Road

图 5.3.2 水田標準区画

REPUBLIQUE DE LA COTE D'IVOIRE
PROJET D'AMENAGEMENT HYDRO-AGRICOLE DE LA VALLEE DU BOU
AGENCE JAPONAISE DE COOPERATION INTERNATIONALE



LEGEND:



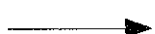


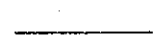
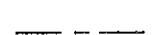


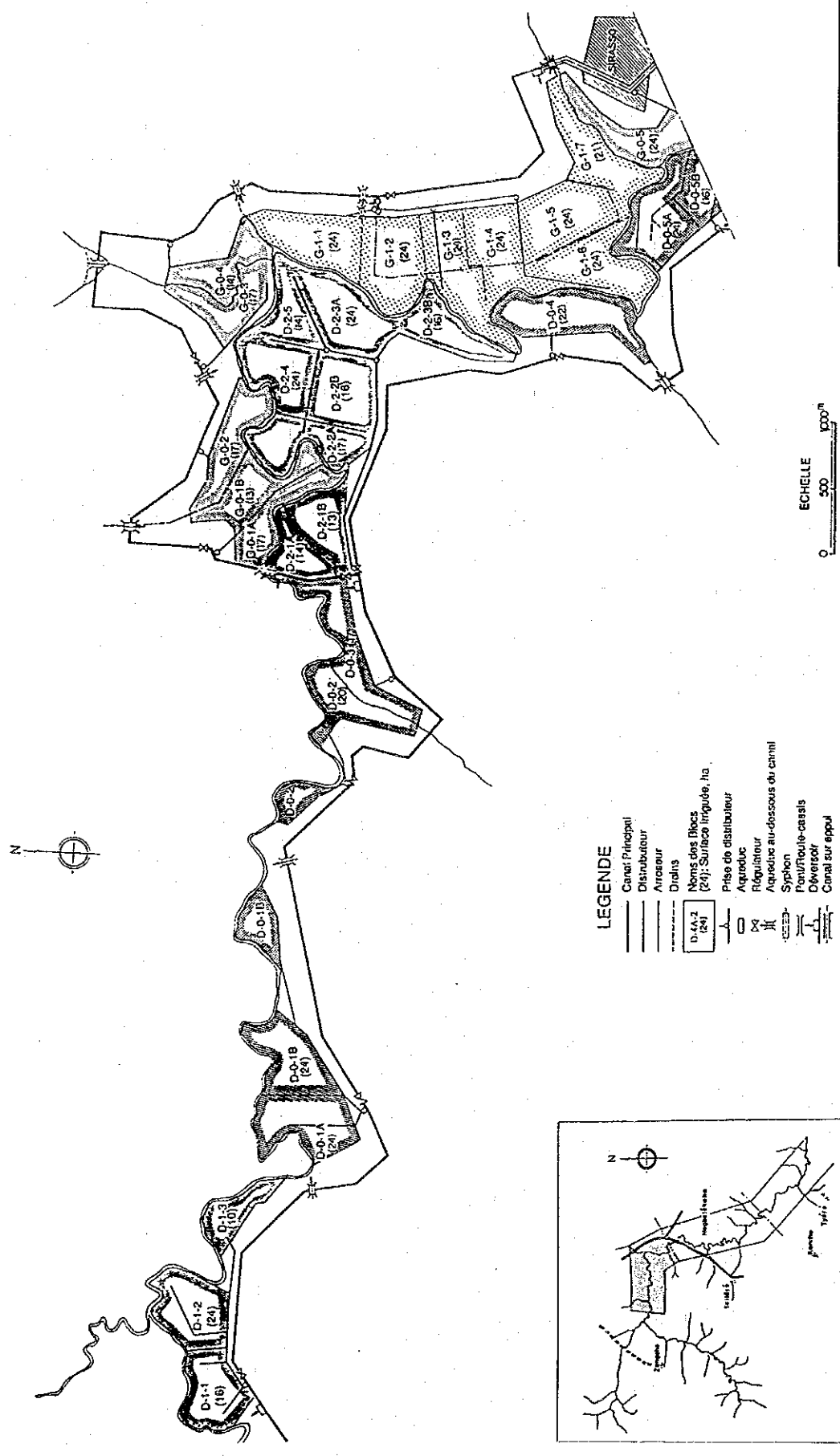
-  Secondary Irrigation Canal & Turnout
-  Tertiary Irrigation Canal & Division Box
-  Farm Road
-  Secondary Drain
-  Tertiary Drain
-  Field Drain
-  Secondary Farm Road
-  Tertiary Farm Road
-  Boundary of Irrigation Block

图 5.3.3 畑地標準区画

REPUBLIQUE DE LA COTE D'IVOIRE
PROJET D'AMENAGEMENT HYDRO-AGRICOLE DE LA VALLEE DU BOU
AGENCE JAPONAISE DE COOPERATION INTERNATIONALE



ECHELLE  
 0 500 1000m

LEGENDE

- Canal Principal
- Distributeur
- Arroseur
- Drains
- Noms des filices (24): Surface irriguée, ha
- Prise de distributeur
- Aqueduc
- Régulateur
- Aqueduc au-dessous du terrain
- Siphon
- Pont/ficelle-caissis
- Déversoir
- Canal sur appui

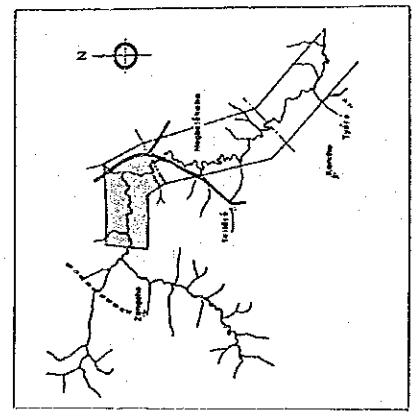
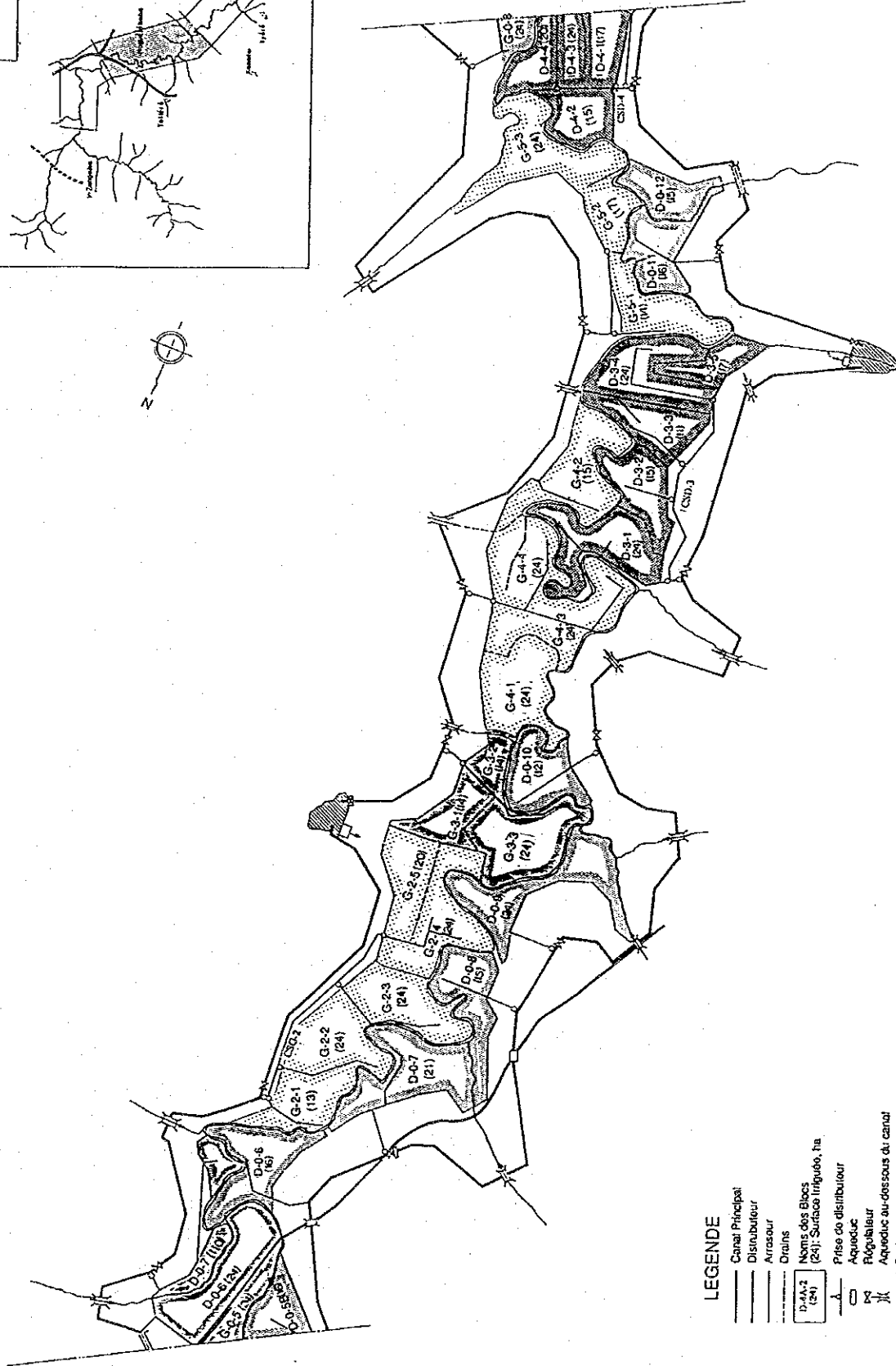
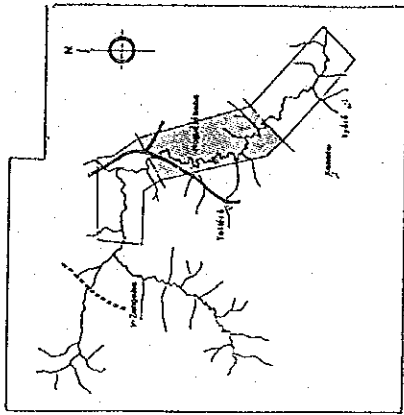


图 5.3.4 灌溉施設概略图



**LEGENDE**

- Canal Principal
- Distributeur
- Arrosoir
- Drains
- Noms des Blocs (24); Surface irriguée, ha.
- Prise de distributeur
- Aqueduc
- Régulateur
- Aqueduc au-dessous du canal
- Syphon
- Pont/Route-cassis
- Déversoir
- Canal sur appui

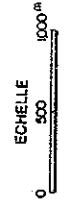
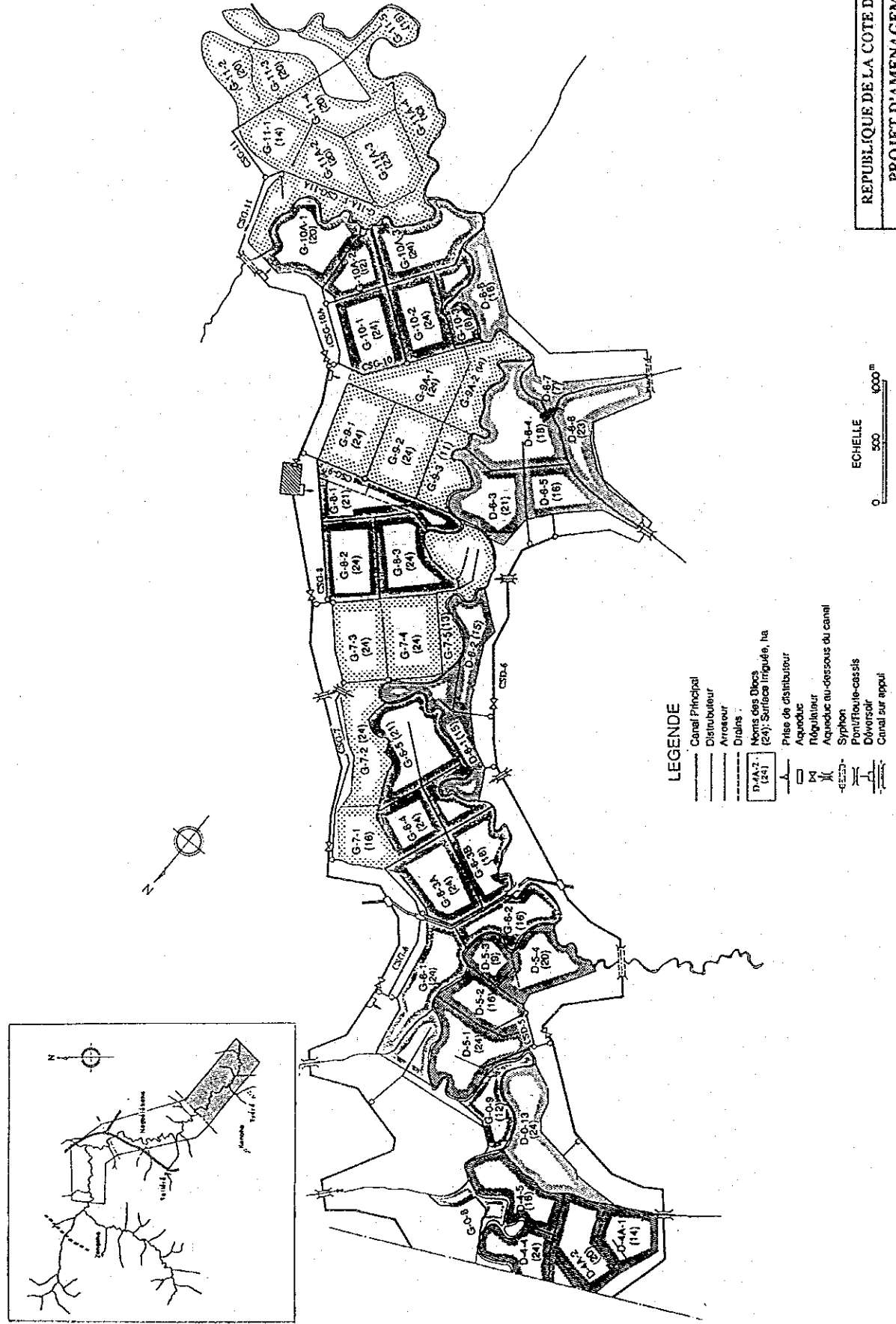


図 5.3.4 灌溉施設概略図

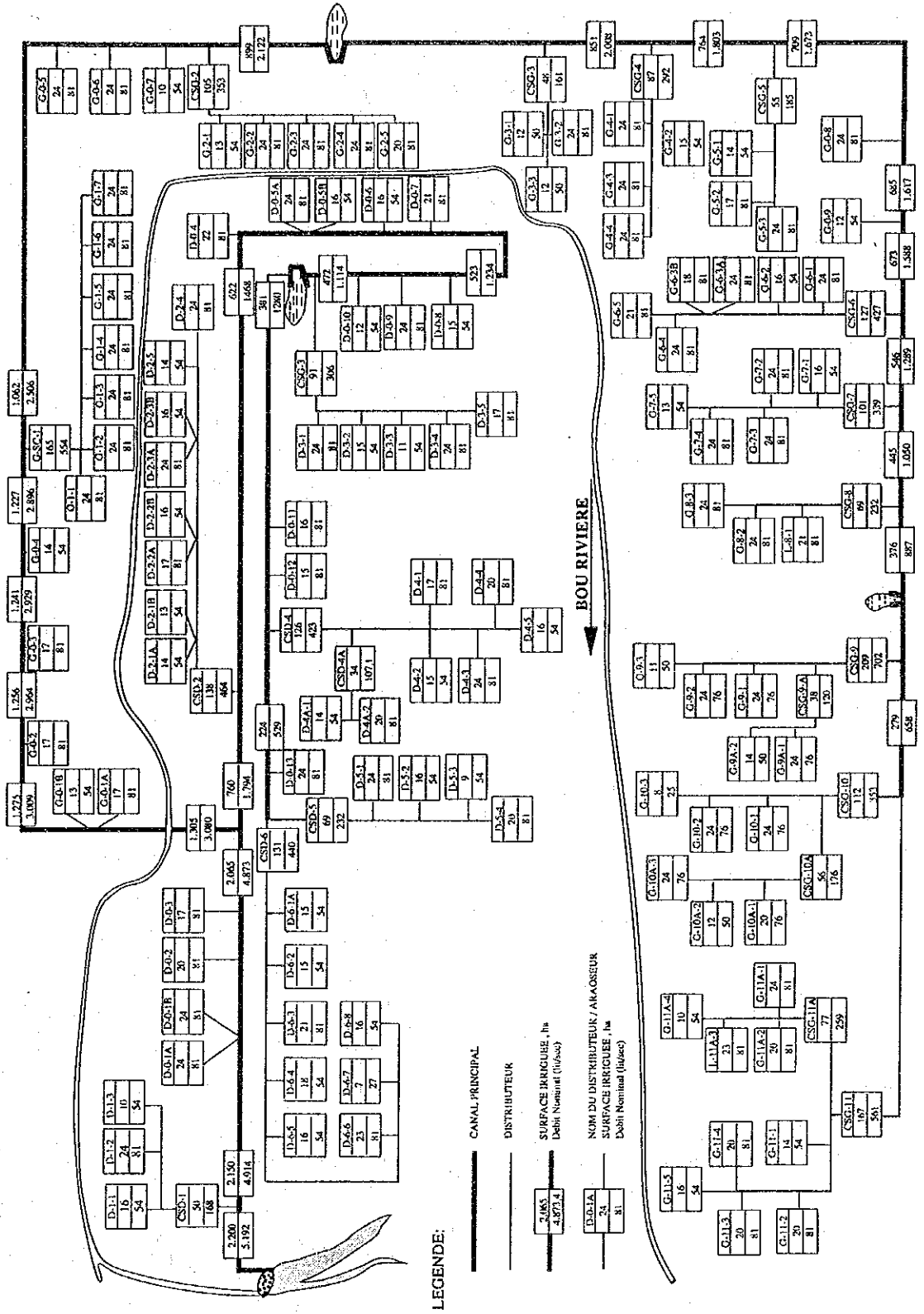
REPUBLIQUE DE LA COTE D'IVOIRE  
 PROJET D'AMENAGEMENT  
 HYDRO-AGRICOLE  
 DE LA VALLEE DU BOU  
 AGENCE JAPONAISE DE  
 COOPERATION INTERNATIONALE



- LEGENDE**
- Canal Principal
  - Distributeur
  - Arroseur
  - Distrib
  - Mars des Dues (24)
  - Surface irriguée, ha (24)
  - Prise de distributeur
  - Aqueduc
  - Régulateur
  - Aqueduc au-dessous du canal
  - Siphon
  - Pont/Route-cassis
  - Déversoir
  - Canal sur appui

図 5.3.4 灌溉施設概略図

図 5.3.5 計画用水系統図



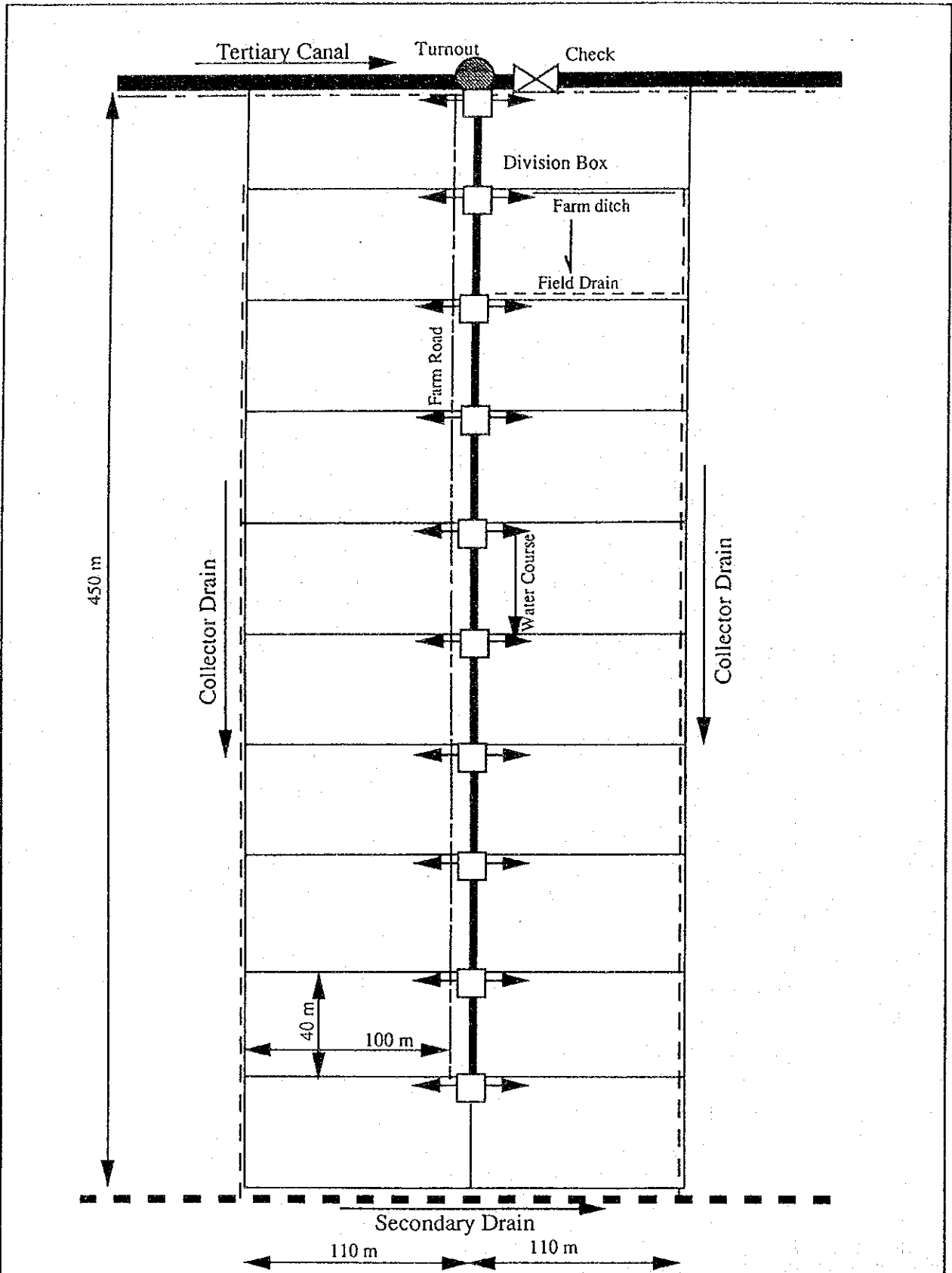


図 5.3.6 標準圃場整備図

REPUBLIQUE DE LA COTE D'IVOIRE
PROJET D'AMENAGEMENT HYDRO-AGRICOLE DE LA VALEE DU BOU
AGENCE JAPONAISE DE COOPERATION INTERNATIONALE

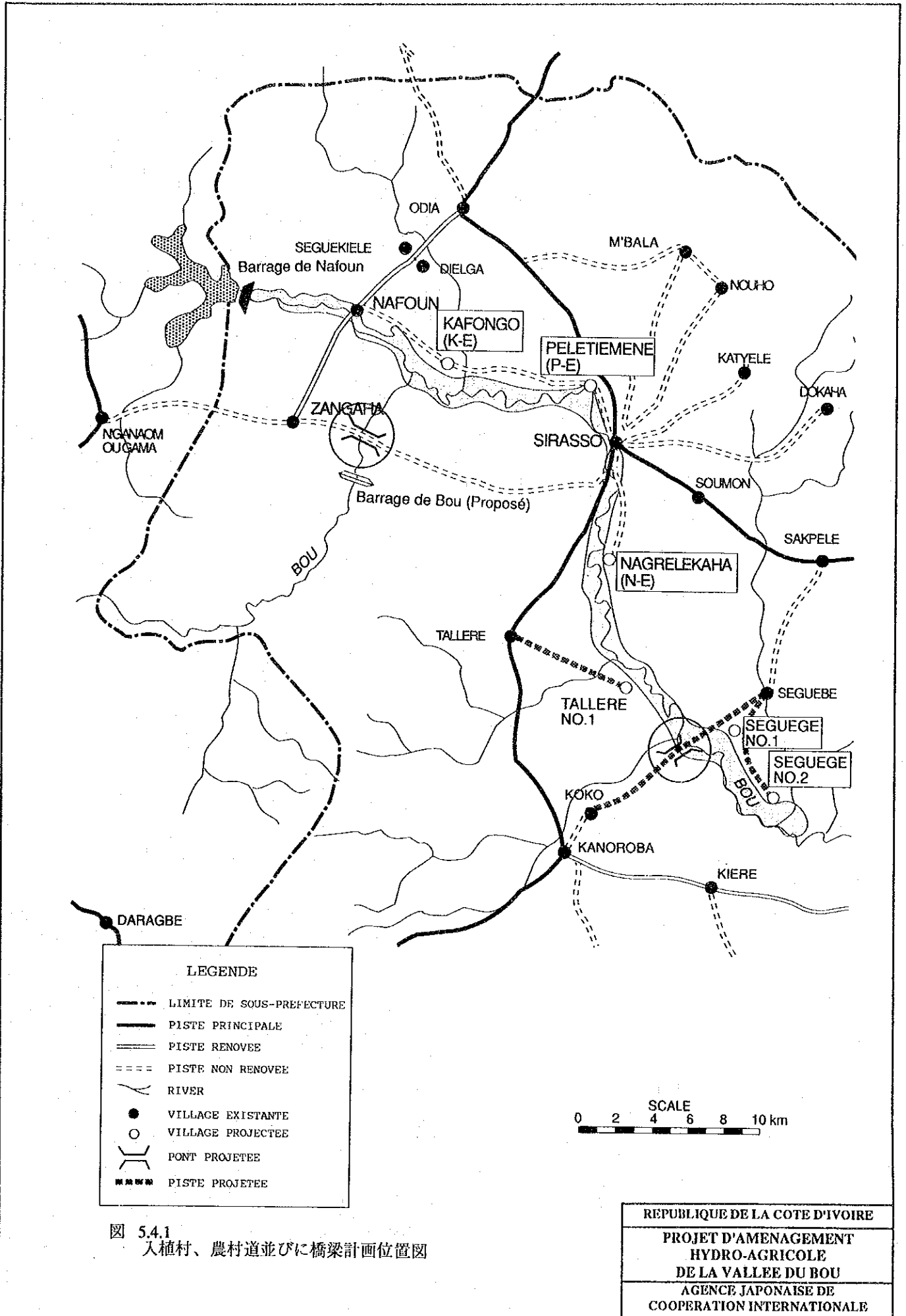


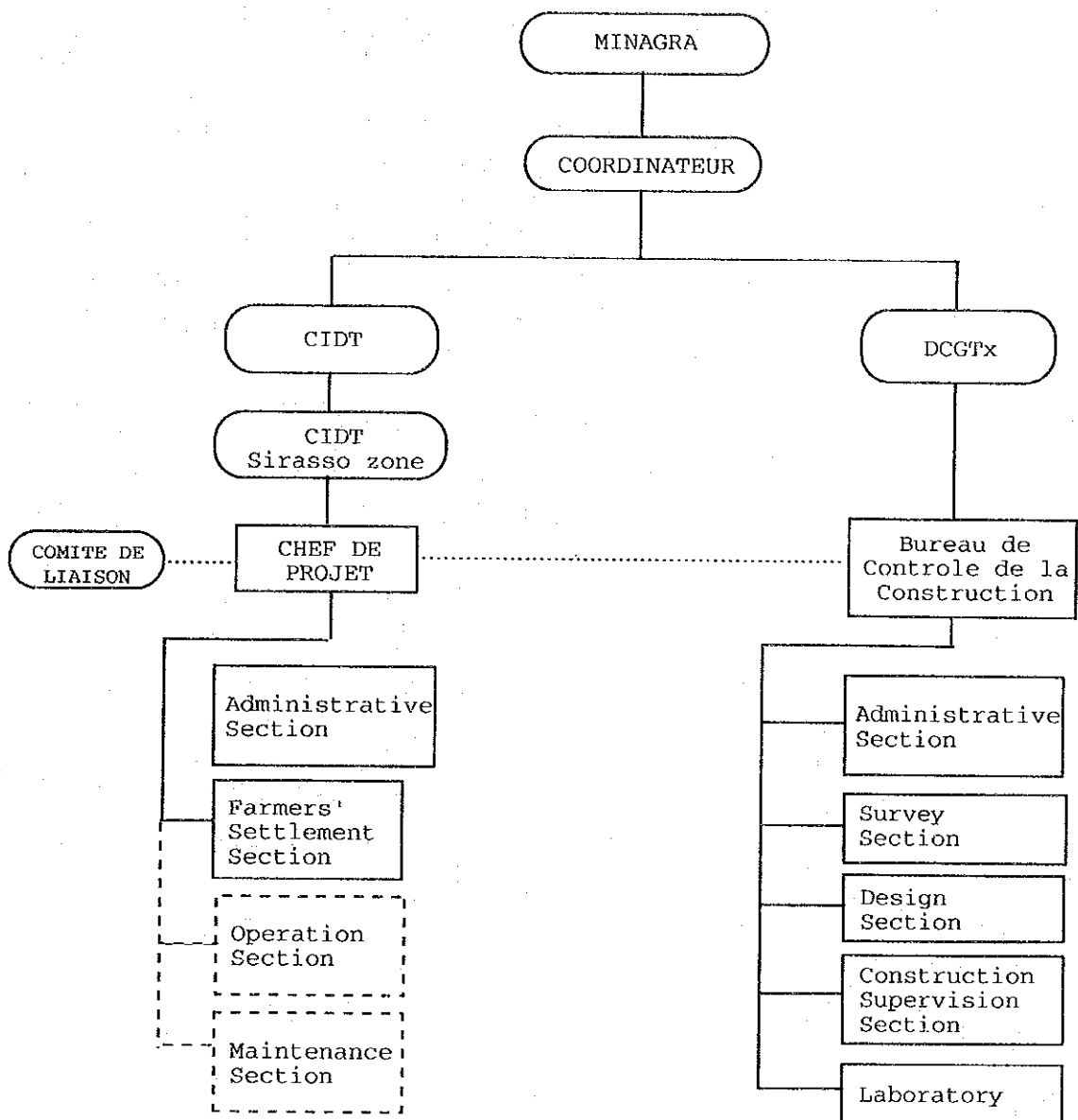
図 5.4.1  
入植村、農村道並びに橋梁計画位置図



	1st year	2nd year	3rd year	4th year	5th year
	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D
1. Project Preparation	XXXXXXXXXXXXXXXXXXXX				
2. Detailed Design & Preparation of Tender Document	XXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX			
3. Tendering		XXXXXXXXXX		XXXXXXX	
4. Construction					
1) Dam		XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	
2) Major irrigation canal		XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	
3) Minor irrigation & drainage canal		XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
4) Land leveling		XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
5. Procurement of O/M equipment				XXXXXXXXXX	
6. Rural Development Facilities					
1) Settlement villages			XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
2) Roads & bridges		XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
3) Rural water supply		XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX

REPUBLIQUE DE LA COTE D'IVOIRE  
 PROJET D'AMENAGEMENT  
 HYDRO-AGRICOLE  
 DE LA VALLEE DU BOU  
 AGENCE JAPONAISE DE  
 COOPERATION INTERNATIONALE

图 6.2.1 事業実施計画



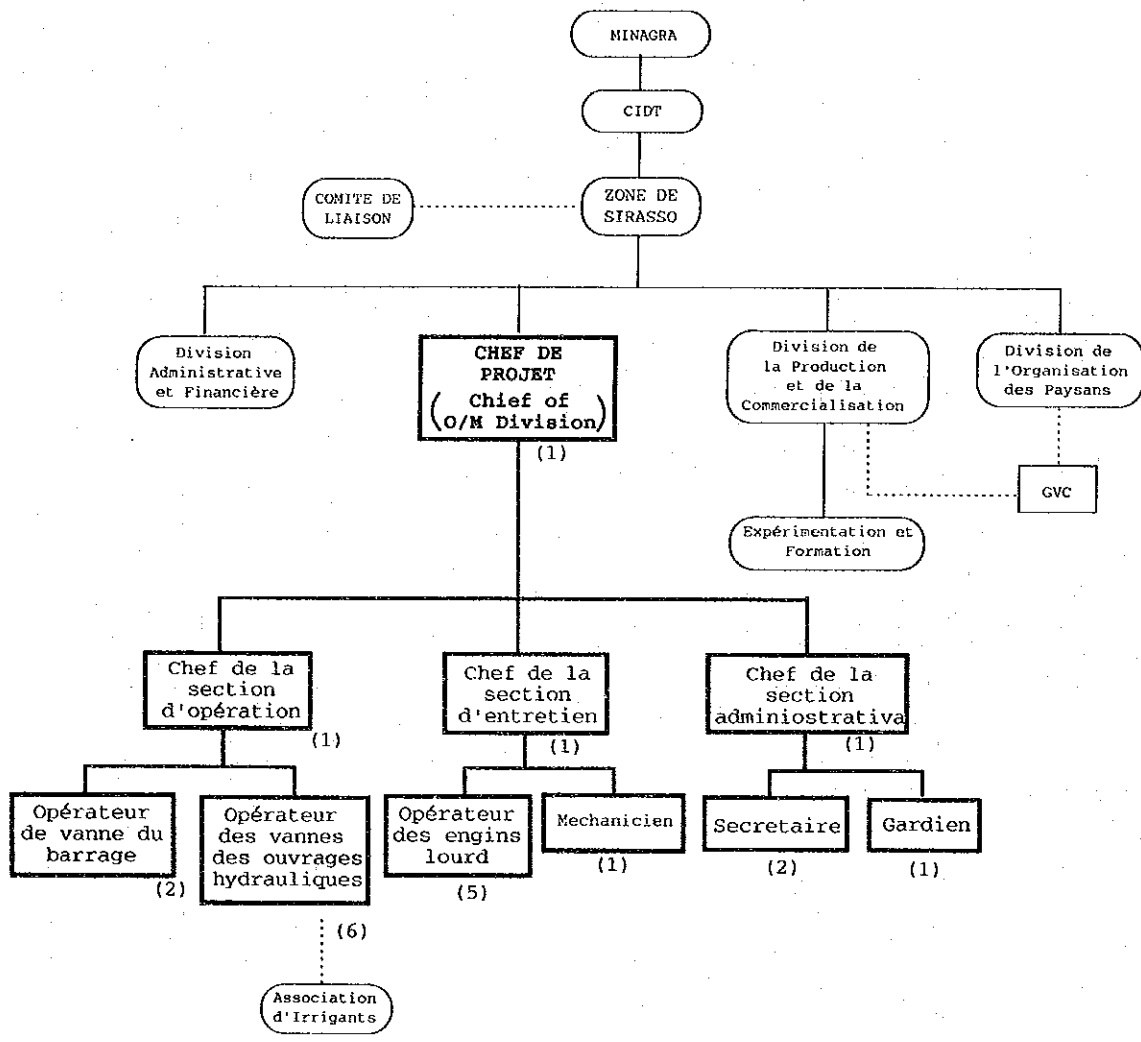
*Farmers' Settlement*

*Detailed Design & Construction Supervision*

- : Incorporation hiérarchique directe
- ..... : Ligne de coopération
- - - - - : To be created after partial completion of irrigation systems

図 7.2.1 計画事業実施組織図

REPUBLIQUE DE LA COTE D'IVOIRE
PROJET D'AMENAGEMENT HYDRO-AGRICOLE DE LA VALLEE DU BOU
AGENCE JAPONAISE DE COOPERATION INTERNATIONALE



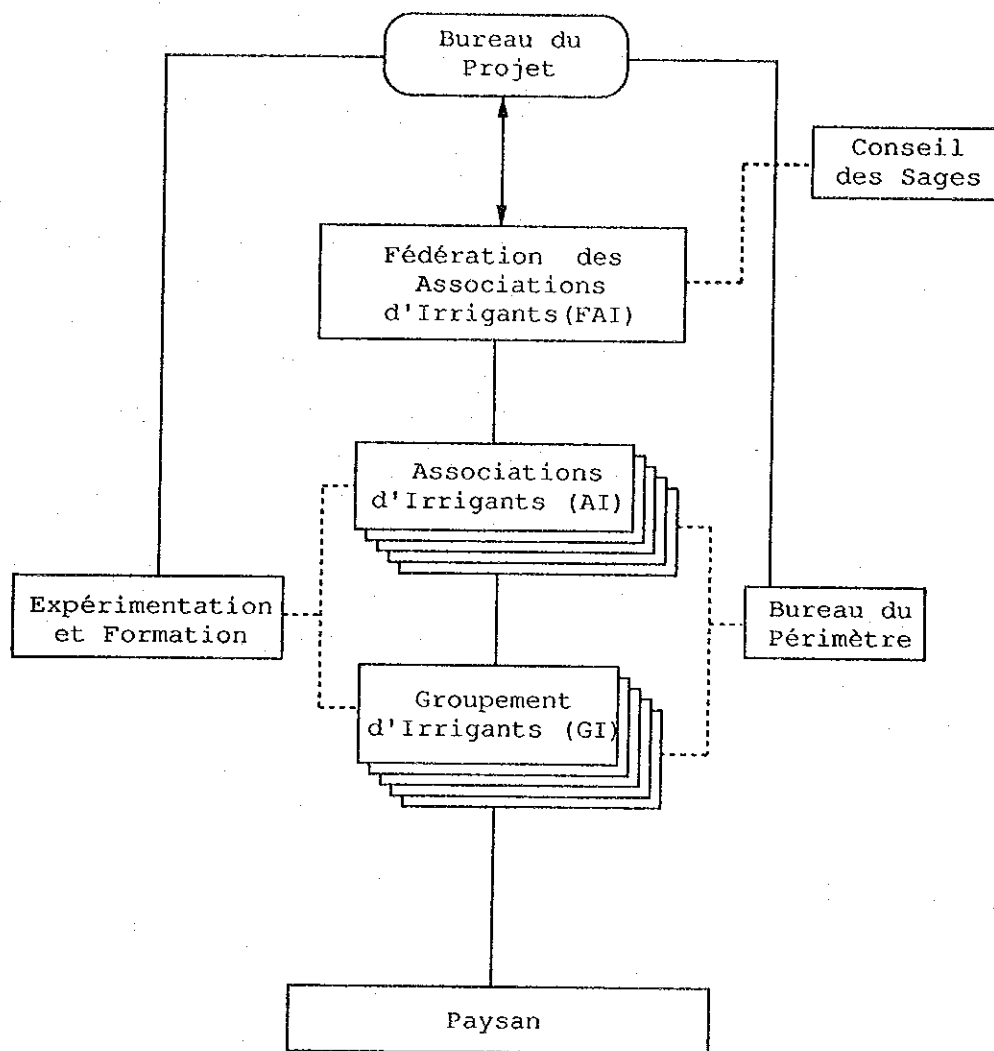
———— Incorporation hiérarchique directe

..... Ligune de coopération

Figures en parenthèses ( ) nombre de persannel requis

図 7.3.1. 計画維持管理組織図

REPUBLIQUE DE LA COTE D'IVOIRE
PROJET D'AMENAGEMENT HYDRO-AGRICOLE DE LA VALLEE DU BOU
AGENCE JAPONAISE DE COOPERATION INTERNATIONALE



——— Incoorporation hiérarchique directe  
 ..... Conseil de direction  
 ..... Ligne de concertation

图 7.5.1 水利組合計画組織図

REPUBLIQUE DE LA COTE D'IVOIRE  
 PROJET D'AMENAGEMENT  
 HYDRO-AGRICOLE  
 DE LA VALLEE DU BOU  
 AGENCE JAPONAISE DE  
 COOPERATION INTERNATIONALE



## 付属資料 - 1



SCOPE OF WORK  
FOR  
THE FEASIBILITY STUDY  
ON  
THE HYDRO-AGRICULTURAL DEVELOPMENT PROJECT IN THE VALLEY OF BOU  
IN  
THE REPUBLIC OF COTE D'IVOIRE

AGREED UPON BETWEEN

THE MINISTRY OF AGRICULTURE, WATER AND FORESTRY

AND

JAPAN INTERNATIONAL COOPERATION AGENCY



## I. INTRODUCTION

In response to the request of the Government of the Republic of COTE D'IVOIRE (hereinafter referred to as "the Government"), the Government of Japan decided to implement the feasibility study (hereinafter referred to as "the Study") on the Hydro-Agricultural Development Project in the Valley of Bou, (hereinafter referred to as "the Project").

Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, will undertake the Study, in close cooperation with La Direction et Contrôle des Grands Travaux (hereinafter referred to as "DCGTx").

The present document sets forth the Scope of Work for the Study.

## II. OBJECTIVES OF THE STUDY

The objectives of the Study are:

- 1/ To investigate development possibilities of the Study area and formulate an agricultural development plan in order to exploit the potentialities of the area for the economic and social improvement of the concerned population.
- 2/ To verify technical, economic and financial feasibility of the above-mentioned development project.

- 3/ To undertake on-the-job training and transfer the technology to the counterpart personnel of the Government in the course of the Study.

### III. OUTLINE OF THE STUDY

#### 1/ Study Area

The Study area covers approximately 5,000 ha of land along the Bou River, in sub-prefectures of Sirasso and Dikodougou (Korhogo Prefecture) and in the sub-prefecture of Boundiali (Boundiali Prefecture) in the Northern Region.

#### 2/ Scope of the Study

The Study includes the collection and review of all basic data of the area in order to implement a feasibility study.

##### (1) Complementary topographic maps

Existing topographic maps at 1/5000 scale will be used for the Study. Supplementary ground survey will be conducted in the Phase I Study, if necessary.

##### (2) Feasibility study

The study includes two phases. During the first phase, development possibilities of land and water resources and socio-economic situation will be investigated in order to obtain basic information for the formulation of an agricultural development plan.

During the second phase, an agricultural development plan will be formulated and its feasibility will be studied on the basis of the results of the first phase study.

1. First Phase

A. To collect and review existing data and information relevant to the Study on the following items:

- 1) Topography
- 2) Meteorology
- 3) Hydrology
- 4) Geology
- 5) Soil
- 6) Land use
- 7) Agronomy
- 8) Irrigation and drainage
- 9) Agro-economy
- 10) Socio-economy
- 11) Rural institutions and organizations
- 12) Rural infrastructure
- 13) Related development programs, and
- 14) Others

B. To conduct field survey and studies on the following items in order to supplement the data and information mentioned above.

- 1) Natural conditions
  - a) Hydro-meteorology
  - b) Geology
  - c) Soil
  - d) Topography

- 2) Agriculture and Animal Husbandry
  - a) Farming
  - b) Crop
  - c) Cropping pattern
  - d) Yield
  - e) Price
  - f) Land use
  - g) Land holding
  - h) Farm machinery
  - i) Animal husbandry
  - j) Others
  
- 3) Agro-economy
  - a) Marketing system
  - b) Farmer's income and productivity
  - c) Agricultural credit
  - d) Agricultural organization
  - e) Extension services
  - f) Agro-industry
  - g) Inland fisheries
  
- 4) Irrigation and drainage
  - a) Inventory on the existing facilities
  - b) Delineation of irrigation area
  - c) Preliminary route selection for main and secondary canals
  - d) Construction materials
  
- 5) Agricultural infrastructure
  - a) Farm roads
  - b) Storage facilities
  - c) Processing and marketing facilities

- 6) Socio-economy
  - a) Population and habitation
  - b) Social organization
  - c) Rural economy
  
- 7) Social infrastructure
  - a) Roads
  - b) Water supply
  - c) Health
  - d) Education
  - e) Electricity
  - f) Communication

C. To draft basic development concepts of the Project based on the results of the above study.

## 2. Second Phase

- A. To conduct supplementary data collection and field survey.
  
- B. To conduct topographic survey for major structures.
  
- C. To conduct analysis on the following items and formulate an optimum agricultural development plan:
  - 1) Water resources
  - 2) Land use
  - 3) Irrigation and drainage
  - 4) Farming and animal husbandry
  - 5) Settlement
  - 6) Preliminary design of irrigation and drainage facilities and related structures and plan for their construction methods

- 7) Operation and maintenance system of facilities
- 8) Implementation schedule
- 9) Estimation of costs and benefits
- 10) Economic and financial analysis
- 11) Project evaluation, and
- 12) Others

#### IV. STUDY SCHEDULE

The Study will be executed in accordance with tentative work schedule attached as Annex I.

#### V. REPORTS

JICA shall prepare and submit to the Government of Ivory Coast, the following reports in French language.

- 1) Inception report

Twenty (20) copies at the commencement of the field work of the first phase.

- 2) Progress report (I)

Twenty (20) copies at the end of the field work of the first phase.

3) Interim report

Twenty (20) copies at the commencement of the field work of the second phase.

4) Progress report (II)

Twenty (20) copies at the end of the field work of the second phase.

5) Draft final report

Twenty (20) copies within one (1) month after the end of the home office work of the second phase. DCGTx will provide its comments on the draft final report within two (2) months after its receiving.

6) Final report

Twenty (20) copies, including one (1) copy in a reproducible form, within two months after receiving the comments on the Draft Final Report.

VI. UNDERTAKING OF THE GOVERNMENT OF THE REPUBLIC OF COTE  
D'IVOIRE

1. To facilitate smooth conduct of the Study, the Government, through the Ministry of Agriculture, Water and Forestry, shall take necessary measures;

1) To secure the safety of the Japanese study team,

- 2) To permit the members of the Japanese study team to enter, leave and sojourn in COTE D'IVOIRE for the duration of their assignment therein, and exempt them from alien registration requirements and consular fees,
- 3) To exempt the members of the Japanese study team from taxes, duties, fees and other charges on equipment, machinery and other materials brought into COTE D'IVOIRE for the conduct of the Study,
- 4) To exempt the members of the Japanese study team from income tax and other charges of any kind imposed on or in connection with any emoluments or allowance paid to the members of the Japanese study team for their services in connection with the implementation of the Study,
- 5) To provide necessary facilities to the Japanese study team for remittances as well as utilization of the funds introduced into COTE D'IVOIRE from Japan in connection with the implementation of the Study,
- 6) To secure permission for entry into private properties or restricted areas for the conduct of the Study,
- 7) To secure permission to take all data and documents related to the Study including aerial photographs out of COTE D'IVOIRE to Japan by the Japanese study team,
- 8) To provide the medical services as needed. Its expenses shall be chargeable on the members of the Japanese study team, and



- 9) To provide the members of the Japanese Study team with identification certificates during their stay in COTE D'IVOIRE.
  
2. The Government, through the Ministry of Agriculture, Water and Forestry, shall bear claims, if any arises, against the members of the Japanese study team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Japanese study team.
  
3. DCGTx shall act on behalf of the Government as counterpart agency of the Japanese study team in order to ensure the smooth implementation of the Study.
  
4. DCGTx shall provide free of charge the Japanese study team with the following:
  - 1) available data and information related to the Study,
  - 2) counterpart personnel to participate in the Study to ensure the management and coordination of the Study,
  - 3) suitable office space with necessary equipment.

#### VIII. UNDERTAKING OF JICA

The Study shall be implemented free of charge by JICA and in particular:

1. JICA shall dispatch, at its own expense, to COTE D'IVOIRE a Study team composed of high level technicians qualified in the respective field of the Study.
2. JICA shall pursue technology transfer to the counterpart personnel of COTE D'IVOIRE during the execution of the Study.

IX. MISCELLANEOUS

1. JICA shall prepare the Inception Report on the basis of the Terms of Reference attached as Annex II.
2. The Ministry of Agriculture, Water and Forestry and JICA will consult with each other in respect of any matter that is not agreed upon in this document and that may arise from or in connection with this Scope of Work.

Abidjan,

Date:

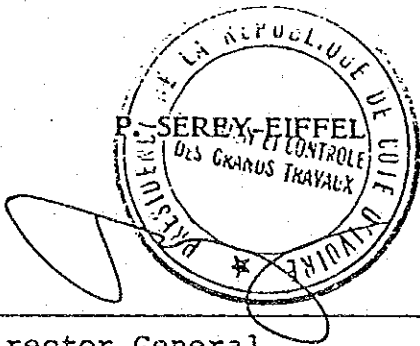


*V. P. Lokrou*  
V. P. LOKROU

Minister  
Ministry of Agriculture,  
Water and Forestry

*Suguru Nagai*

SUGURU NAGAI  
Managing Director  
Agriculture, Forestry and  
Fisheries Planning and Survey  
Department  
Japan International Cooperation  
Agency



February 7th, 1990

Director General  
La Direction et Contrôle  
des Grands Travaux



COOPERATION BETWEEN COTE D'IVOIRE AND JAPAN  
HYDRO-AGRICULTURAL DEVELOPMENT PROJECT IN THE VALLEY OF BOU

FEASIBILITY STUDY

TERMS OF REFERENCE

## I. STUDY AREA (figure 1)

The Study area covers approximately 5,000 ha of land along the Bou river, in sub-prefectures of Sirasso and Dikogougou (Prefecture of Korhogo) and in the sub-prefecture of Boundiali (Prefecture of Boundiali) in the Northern Region.

## II. SCOPE OF THE STUDY

Based on national, regional, physical and human realities and according to the yearnings of the Republic of COTE D'IVOIRE and its people for self-sufficiency and welfare, the objective of this feasibility study is to elaborate a final development plan for 5,000 ha of plain, peneplain, terrace, and plateau along the Bou river.

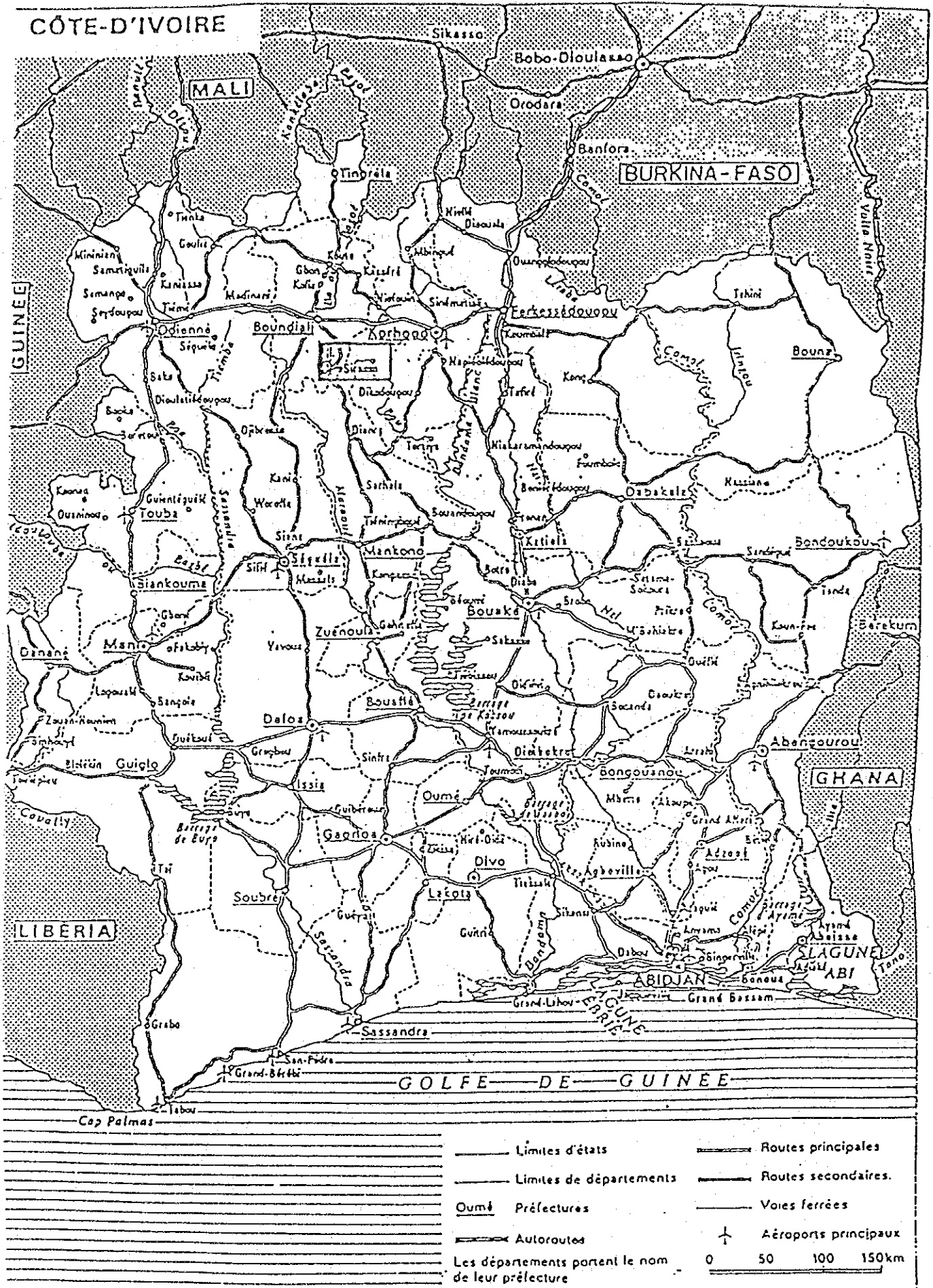
Particular consideration shall be given to the examination of past, present and future limiting factors and to development parameters in order to keep up and increase primary and secondary effects in the medium and long term.

Short, medium and long term projections shall be made taking into account the probable fluctuation of parameters, of limiting factors, of market conditions, ...

The Study team shall take this fluctuation into consideration in the project formulation and shall present the corresponding project versions. There shall be no restricted hypothesis which may lead to too limited and definitively unidirectional options.

Besides, the Study shall stick as much as possible to the natural and human environment; it shall be a technically reasonable

FIGURE 1  
LOCALISATION DE LA ZONE D'ETUDE



translation of local desires and the general development policy of COTE D'IVOIRE.

The perfect incorporation of the project into the regional and national surroundings shall be shown.

The presented project shall provide operations with a proper intensity in order to reach within the shortest possible time (5 years) a self-sufficiency, as well as measures to be taken in order to obtain, at medium and long term, a surplus income for the individual and for the community.

### III. SCOPE OF THE FEASIBILITY STUDY

This Study shall take place in two phases.

#### 3.1 FIRST PHASE (BRIEF ORIENTATION FEASIBILITY STUDY)

This study shall cover the inventory of land and water resources and the development possibilities, as well as the analysis of the actual social and economic situation.

The study shall be based on the collection and review of all existing data.

The following items shall be taken into account:

General information about the area (and position of the said area in its environment)

- physical elements: climate, vegetation, soil, water, etc...



- human elements: population and its distribution, temporary or permanent migrations, activities, motives,
- agricultural engineering, irrigation and drainage,
- health,
- socio-economy,
- rural institutions and organizations,
- management (state-owned companies, public industrial and commercial firms, semi-private companies),
- regional infrastructure (rural, industrial, road, public works, transportation, energy),
- development policy and program in progress

#### Traditional rural economy:

- traditional production systems,
- farming methods,
- land tenure,
- rain-fed agriculture (associated farming),
- irrigated agriculture,
- animal husbandry,
- agricultural employment, economic relations with the outside of the area, etc...

#### Environment:

- village water supply, rural electrification,
- urban infrastructure,
- traffic and transportation,
- relations with other areas or outside the country,
- accommodation,
- water supply for animals,
- storage infrastructure and processing of agricultural products,
- local or outside markets,

- social infrastructure (health, education), economic position of the area.

A detailed analysis, as acute as necessary, shall be made, especially on the following items:

### 3.1.1 Physical elements

#### Climate

Climate data concerning the study area and the neighbouring stations shall be collected and be analyzed with an objective of precisising crops and farming system most appropriate to the climate, through a research on risk evaluation.

The steps of the study shall be the following:

- collection of the climate data (ASECNA, ORSTOM, ...) related to pluviometry (height, frequency, period of dry seasons, characteristics of rain, abate coefficients), minimum and maximum temperature, relative humidity, "harmattan" periods, evapotranspiration,
- utilization of frequency analysis already carried out by research institutes and international organizations, in particular those locating phenomenon and their frequencies,
- adjustment of cropping cycles considering characteristics of the study area based on the above-said elements. Evaluation of farmer's risks in case of displacement of seeding dates,

- zone delimitation of areas with favorable locations for main crops according to agro-climate characteristics.

### Pedology

Two types of studies have been conducted on the valleys of the Bou river (and on its tributary, the Merindya river) as following:

- 1°) A morpho-pedological general study conducted by ORSTOM, at 1/200,000 scale.
- 2°) Two detailed studies conducted at 1/10,000 scale, on the left river bank of the Bou and the Merindya rivers, but limited to the overflowable alluvial plain.

- The first study was made by A.V.B. (Bandama Valley Development Authority) on an area of 350, downstream of the SIRASSO river.
- The second study was made by the Pedology Department of the DCGTx on an area of 1000 ha.

Taking into account the available data and importance of pedological data for agricultural development choice, the study shall be carried out on the basis of those existing documents confirmed by aerial photography and eventually by field checking (in particular on lower and higher parts of the slope, as well as on the plateau).

Pedological maps and soil aptitude maps shall be established if necessary as complementary items of existing documents.

## Geology

If a dam site is identified, a main line geological survey shall be conducted.

## Hydrography and hydrology

The study shall take stock of existing data and information, in particular ORSTOM, and shall collect available information from different administrations.

Data to be collected shall be related to:

- characteristics of the slope basin,
- hydrology of the Bou river and its tributaries, studies of the floods,
- data on the flood of slope basins that may be developed,
- delimitation of easily flooded areas and flooding frequencies,
- inventory of existing facilities and their main characteristics,
- inventory of sites liable to be developed by irrigation, by downstream runoff, by creation of reservoir, by pumping, by sprinkler,
- actual condition of water use and main problems related to this utilization,
- surface hydrology.

## Agricultural engineering, Drainage, Irrigation

Data to be collected shall in particular be related to:

- hydraulic characteristics of soils,
- in situ water contents,
- porosity (small and large),
- fading (flétrissement) curves (PF, PS...),
- retention curves,
- three-directional hydraulic conductivities,
- ground water levels, yearly and inter-yearly fluctuations,
- effective capacities (R.U.-R.F.U.),
- filtration speeds,
- grain size accumulation curves
- soil hydraulic balances,
- water demand for recharging the water table and to saturate the soil,
- infiltration tests,
- salt content tests,

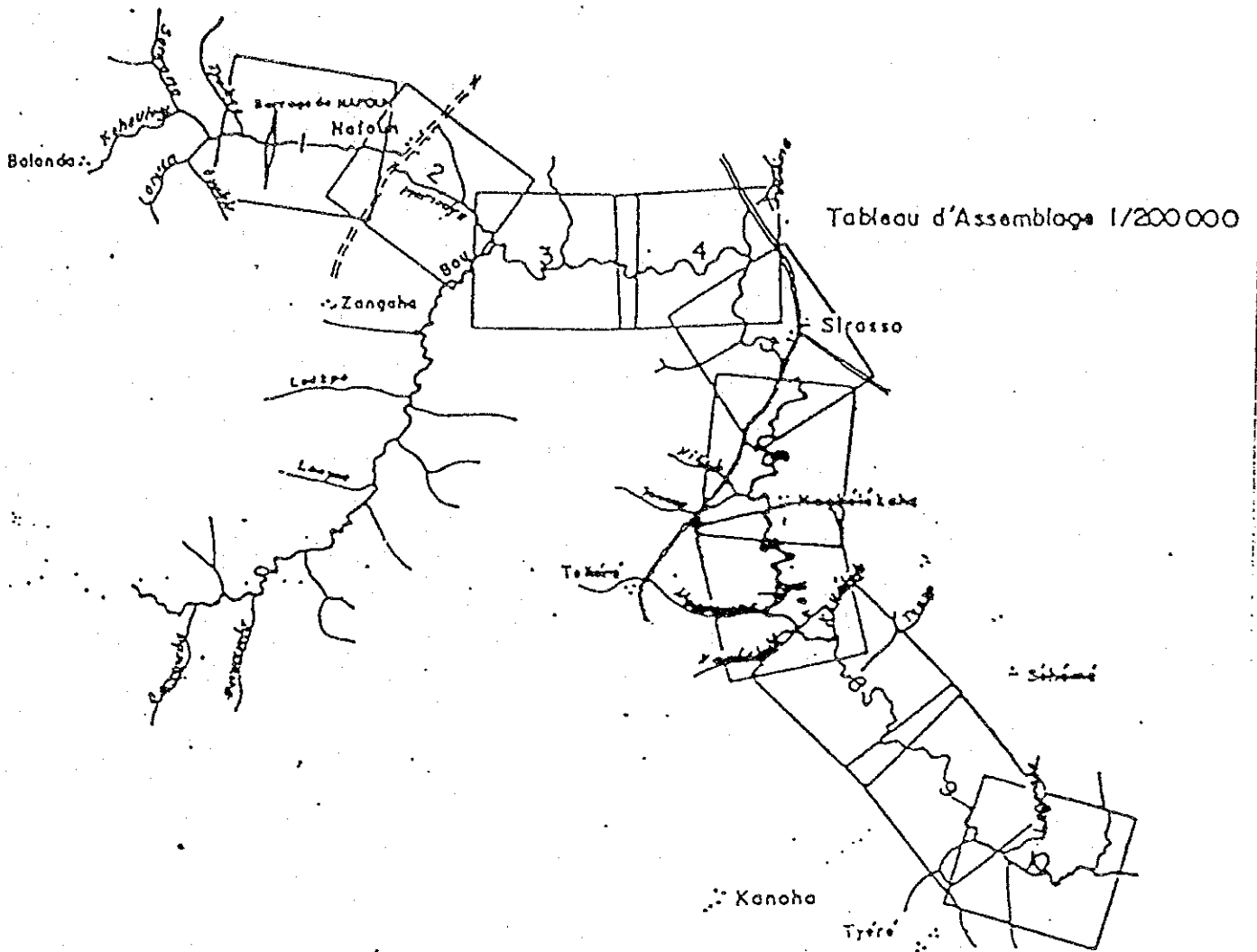
Existing topographic maps at 1/5000 scale will be used for the Study (figure 2).

In order to make a development plan, supplementary ground survey will be conducted, if necessary.

Layouts of hydro-agricultural facilities shall be drawn at 1/1000 or 1/2000 scale in order to determine with accuracy the volume of works to be done.

Irrigable areas shall be demarcated, plotted and classified according to their pedological, topographical, hydraulic value and to the adaptability of crops.

FIGURE 2



PLAINE DU BOU		Date: 26-10-87
		Echelle: 1/5000
Lévé photogramétrique 1/5000		PLAN N°
Source: SODERIZ - IGCI - ETF Cabinet PAUL Juillet 75		
<b>degta</b>		04 BP 845 Abidjan 84 Côte d'Ivoire tél. 442805

PRESIDENCE DE LA REPUBLIQUE / DIRECTION ET CONTROLE DES GRANDS TRAVAUX

## Vegetation

From the available data, an inventory of information shall be made about the type of the vegetation in different parts of the study area. Special attention shall be given:

- to the probable development of this vegetation without human action and the actual development with human (and domestic animals) action,
- to the relation between the vegetation and climatical elements: selection and behaviour of species, according to the total pluviometry, to rain distribution, to the "harmattan" density,
- to the relation between the vegetation and the soil characteristics (natural hardening of sediments and armoring, humidity consistency, etc.).

### 3.1.2 Human environment

Though it is probably out-of-date for some sectors, the 1975 national census shall be the basis of a demographic analysis.

For sectors with very dynamic demography, the development tendency and the resulting constraints shall be determined from local data (information from sub-prefectures, partial census, ...).

Particular attention shall be given to inter-region or inter-ethnic contact zones and to their population dynamics.

Problems related to seasonal or permanent migrations and their motives shall also be examined.

In some areas, the interaction between the rural environment and the urban environment is particularly close. The study shall examine the consequences of this imbrication on the agricultural development and propose a definition of specific programs in the outskirts of urban zones.

The problem of employment of people attending school or graduated from school shall be approached. The size of the concerned population shall be measured and foreseeable tendencies for the next coming years (1990 and 2000) shall be precised.

Studies by ORSTOM (LEROY, PELTRE, BONNEFONDS), by SEDES about "Migrations" and by I.G.T. shall be used.

In a general manner, classification of population motives shall be conducted in order to adapt subsequent actions and to avoid the waste of big investments which could not answer population needs. Results of investigations already carried out or in progress (cotton zones) shall especially be utilized.

Precise information about total population and agricultural population shall be given:

- size,
- sex-ratio,
- ethnical origin,
- age pyramid,
- settlement seniority,
- qualification,
- activities,
- national status.



### 3.1.3 Agriculture and agro-economy

The objective of this stage of study is to provide data on agricultural activities in the Study area and these must include:

- an inventory of agricultural investments, their intensification level, the surface area, their profitability,
- an analysis of agricultural production and zoning according to the main productions and the farming systems,
- determination of the employment level and constraints that may result. In particular the periods dedicated to rural works shall be determined and the cropping calendars and monthly labor balances shall justify the innovations of farming systems,
- an approach to farm incomes and their appropriation according to the main budget items.

The actual situation of agriculture in the area shall be detailed, at the level of development organizations and local Administrative Authorities and at the level of farmers, by means of agro-economic investigations in close relation with socio-demographic investigations.

Cross-checkings shall be made by examination of various types of information (soil occupancy, field investigations, running budget-consumption investigation, product marketing, etc...)

Past and actual actions for agricultural development shall be emphasized, as well as difficulties and effects of the actions on the rural environment:

- programs of management companies,
- modernization of agriculture, harness type farming,
- motorization and stabilization of crops,
- development of irrigated rice cultivation in relation with the existing infrastructure.

Animal husbandry development operations carried out by the Ministry of Animal Production (projects managed by SODEPRA) shall also be emphasized together with aquaculture development operations conducted by the Ministry of Agriculture, Water and Forestry.

#### 3.1.4 Organization elements

The study shall emphasize and give a critical analysis on the operation of the main structures in relation with agriculture in the area as to the following items:

- management and its diffusion,
- agricultural credit: types, volumes, clients, recovering,
- motorization and agricultural works,
- supply of farm inputs,
- product marketing and transportation,
- product processing and storage,
- cooperative type groups (G.V.C.).

Special attention shall be given to the methods of approach to the rural environment by the management or assistance organizations and to the satisfaction level of the real needs of the population. Proposals shall be made to integrate the project actions into the general actions in progress.

In particular, problems related to the marketing of the main agricultural products of the area (market, prices, marketed quantities, commercial networks, groups ...) shall be examined. Main constraints that may differ according to the types of products, traffic difficulties, organization of population, etc., shall be clearly shown.

Actual or potential needs that may be satisfied locally and the potential new markets outside the area shall be estimated. Conditions for supplying for these markets shall be examined (quality, delivery steadiness, previous processing, etc.). Investigations shall be made on the main public or private marketing organizations of the area and on manufacturers in order to define the purchase conditions.

### 3.1.5 Environment

The study shall index the existing facilities of the area and of the short-term on-going projects.

- circulation infrastructures,
- transportation: means, traffic, transported people, products  
....,
- health: dispensaries, maternity hospitals, hospitals, doctors,
- school attendance: primary, secondary, private and public schools,
- urban facilities: road works, water supply, electricity,
- handicrafts,
- agro-industry, slaughterhouses,
- main markets and commerces,
- cooling systems,

- storage means, warehouses, depots, stores,
- hydraulic infrastructure,
- and, in general, any facility related to the economic and agricultural development of the area.

The area shall be located into its general environment and into its relations with neighbouring areas or outside.

### 3.1.6 Actual situation of agricultural and hydro-agricultural development

Land clearings made in the area shall be estimated according to the utilized clearing means (manual, hoist, Motoragri).

The result of existing hydro-agricultural development shall be tabulated with their real utilization level compared to their total utilization capacity. In particular, agricultural modernization results of the different development shall be noted: line seedings diffusion, selected seed utilization, fertilizer utilization, stabilization of crops.

Livestock development realized in the area as well as forest and aquaculture operations (protection, exploitation, transfer, afforestation) shall also be evaluated.

## 3.2 SECOND PHASE

### 3.2.1 Project identification

After the completion of this first phase of investigations and analysis, the Study team shall elaborate the basic concept of the development project which shall appear as follows:

- adapted to the conditions of the different zones of the Study area and liable to bringing solutions to existing problems;
- mutually related,
- related to the total regional and national development policy.
- taking into account the hydro-agricultural development project of the Bou Sirasso plain (first stage financed by BOAD for a 400 hectares area, on-going), of which documents will be given to the Study team in time for the start of the Study.

The study on development projects shall be made by a multi-field team who shall precise the outlines of the possible programs in order to give a first estimate of costs and benefits: general design of operations with possible alternatives, contents of actions (technical, human, economic requirements), probable cost during the different stages, and for each alternative, capital coefficient, economic effects on farms and community.

Progressive effects of the proposed programs shall be taken into account: step-by-step increase of farm productivity, more or less speedy adoption of modernization theme, etc... Besides, proposed solutions and constraints resulting from the vertical integration of individual productions on one hand, and, on the other hand, the horizontal integration of agricultural activities, should be compatible.

Projects, alternative projects and their conceptions must be presented to the Administration of COTE D'IVOIRE by means of an Interim Report which will be examined by the DCGTx and the Ministry of Agriculture, Water and Forestry. Result of this examination will lead to the clear definition of the aims to be reached and the corresponding action programs.

The resulting document will contain, among others, detailed study programs necessary for the execution of the Study.

### 3.2.2 Feasibility study

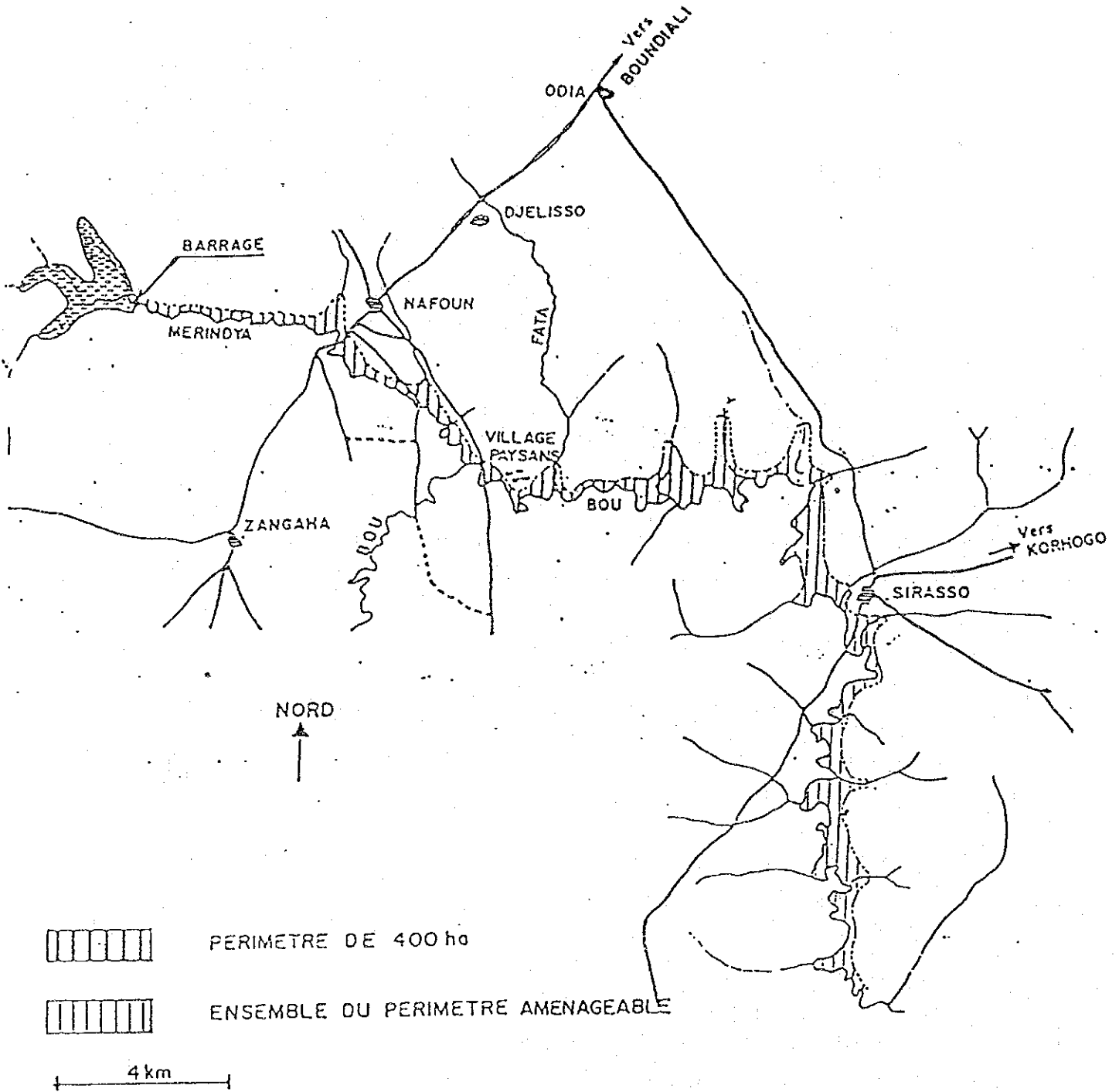
After the selection is completed, the study of conditions for the execution of the selected programs, eventually corrected according to observations, shall be notified to the person in charge of the Study, mentioning the location, contents, priorities of actions to be studied.

At this stage of the Study, the contents of technical, economic and financial feasibility reports shall be determined in particular with.:

- preliminary design and dimensions of irrigation and drainage facilities and of the concerned works,
- operation and maintenance of the facilities,
- implementation schedule - investment program,
- estimate of costs and benefits,
- economic and financial analysis,
- project evaluation,
- project organization,
- possible financial setting.

FIGURE 3

PLAN DE SITUATION



### 3.3 TRAINING

JICA shall, during its stay in the Republic of COTE D'IVOIRE, carry out the theoretical and practical training of engineers and technicians of COTE D'IVOIRE in all technical, financial and administrative fields approached during the Study.

Educational aims will be defined at the beginning of the Study.

### 3.4 STUDY REPORTS

The person in charge of the Study shall be in constant contact with representatives of the Administration of COTE D'IVOIRE to enable them to control correct development of the operation.

The person in charge of the Study shall write and submit to the Government the following reports in French language.

#### 3.4.1 Monthly activity report

Two (2) copies of a brief report shall be submitted monthly.

#### 3.4.2 Inception report

Twenty (20) copies shall be submitted at the commencement of the field work of the Phase I study.



#### 3.4.3 Progress report of Phase I Study

At the end of the field work, that is, five months after the date of the commencement of the Study, a progress report will be presented in twenty (20) copies. This report must contain all results of investigations, their treatments and the conclusions foreseen.

#### 3.4.4 Interim report

Within nine months from the date of the commencement of the Study, twenty (20) copies of the interim report shall be transmitted to the Administration. This report must include many alternative projects for development of the Bou Valley with all data and analysis results to enable the Administration to make a choice. The Administration requires one month to examine the document and to make, eventually, remarks and propositions on alternative projects and the Study team will have one month to take them into consideration.

Approval of the interim report will mark the starting of the feasibility study.

#### 3.4.5 Progress report of Phase II Study

Within three months from the date of the finalization of the interim report and at the end of the field work of the Phase II Study, twenty (20) copies of progress report shall be transmitted to the Administration.

#### 3.4.6 Draft final report

Within a month following the end of the Phase II Study, twenty (20) copies of the draft final report must be transmitted to the Administration.

This report must show detailed feasibility of the selected optional project.

The Government shall reserve two months from the date of the receipt of the draft final report to give its observations.

#### 3.4.7 Final report

The final report shall be the definitive version of the draft final report with all amendments.

Twenty (20) copies shall be transmitted within two months following the period for analysis defined in 3.4.6.

#### 3.4.8 Reproducible copy of reports

For the interim report and the final report, it is requested that one reproducible copy of all texts and figures must be transmitted to enable the Administration of COTE D'IVOIRE to exploit directly those reports.

### 3.5 PERSONNEL

JICA shall guarantee the perpetuity of the Study team in order to ensure the continuity of the work and of the proposed approaches.

### 3.6 SCHEDULE OF STUDY

The schedule of study proposed in the Scope of Work shall be precised if necessary, and in particular a detailed chronogram shall be established for each study expert.

### 3.7 STUDY PERIOD

The study shall be executed in a maximum time of sixteen (16) months to be counted from the commencement of the field work of Phase I.

## Composition of Inception Report

1. Introduction
  - 1.1 General
  - 1.2 Background
  - 1.3 Objective of the Study
  - 1.4 Study Area
  - 1.5 Scope of the Study
  
2. Basic Concept for the Study Implementation
  - 2.1 Basic Concept
  - 2.2 Major Remarks for the Study
  
3. Plan of Operation
  - 3.1 Phase I Study
    - (1) Field Work
    - (2) Home-Office Work
  
  - 3.2 Phase II Study
    - (1) Field Work
    - (2) Home Office Work
    - (3) Consultation of Draft Final Report and Final Report.
  
  - 3.3 Technology transfer
  
4. Organization of the Study Team and Assignment Schedule
  
5. Reports
  
6. Undertaking of the Government of COTE D'IVOIRE
  
7. Attachment

