7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

After a considerate review of the interventions and their respective impact in 16 schemes implemented during this project period the following points have been observed:

The technical interventions taken have resulted in

* blocking of tidal flooding otherwise causing serious salt intrusion on arable, productive plots
* imponding, for prolonged periods part of the areas in question
* allowing active watermanagement i.e. waterlevel regulations and draining on demand of the imponded area according growing stage of the crop

An intensive agricultural follow-up, concentrated solely on project areas has resulted in

* widespread acceptation of improved agricultural practices like direct- and animal drawn seeding
* growing awareness of the importance of the cultural calendar e.g. timely land preperation, weeding etc.
* introduction of high yielding varieties adapted to the changed conditions due to the aforementioned technical interventions

To keep the construction costs of the necessary infrastructure low, the project has opted for

- simple designs
- construction involving appropriate technologies with a maximum input of manual labour

However, low cost structures (often) go hand in hand with a higher risk with regards to safety and durability of the structures in question.

To assure the durability and sustainabilty of project interventions and to lower the risk as much as possible the project has embarked on the commitment of the direct beneficiaries to be involved and to participate in:

- planning and implementation (construction) of the infrastructure
- agricultural follow up
- scheme operation
- repair and maintenance work on a regular i.e. yearly basis

Experience gained during project execution has led to the following conclusions:

- the project has developed appropriate and low cost measures to improve the growing conditions for rice in traditional rainfed areas

- designs of the structures are sufficiently appropriate to allow an entirely manual construction

- the construction methods used entail regular maintenance

- designs are sufficiently adjusted to allow a minimum of interventions (operation) with regards to water management

- the success or failure of project interventions mainly depends on the rate of village participation which is strongly influenced by the incentive system offered

Project management has also come to the conclusion that the other factors, mentioned in Chapter 5. contributing to the success or failure of project interventions (e.g. environmental and design factors) are, compared to the rate of village participation of minor importance.

Relating these conclusions to the project objectives, as mentioned in section 3.1 one could conclude:

- that the project has met the target to:

  "develop and test a package of technical as well as agricultural measures to improve the growing conditions and thus production in traditional rainfed rice growing areas in the western part of The Gambia"

  Hereby fullfilling the project objective being:

  "Increase of rainfed rice production of small farms in the Western Division of The Gambia".

  and contributing, albeit limited to the project goal:

  "Self sufficiency in rice supply to rural households throughout the year is achieved"

7.2 Recommendations

Referring to the discussed implications of the critical factors on project execution and the subsequent conclusions the following recommendations are prsented for consideration.

Concerning village participation, emerged as the most critaical factor contributing to success or failure it is recommended:

- to establish a system whereby pre-project conditions are thoroughly assessed. Issues like socio-economic relations, land use and land tenure could provide clues whether a village is willing to commit themeselves to participate and cooperate for a prolonged period or not. The initial investement to sort this out certainly pays off later
- to reduce and eventually refrain from an incentive system
- to suspend interventions as soon village participation fails

Concerning design and construction of structures it is recommended:

- to incorporate detailed soil and hydrological studies to optimize designs
- to incorporate additional drop spillways in all schemes to lower the risk of damages

Concerning scheme operation and management it is recommended:

- for the building institution to bear the responsibilities of scheme operations and management for the first two years
- to developand test, in close colaboration with the farmers and the agronomy section a local management system gradually to be handed over, during these two years to a body at village level
- to incorporate a program of internal monitoring and evaluation including technical as well as socio-economic factors

General recommendations, also mentioned in other reports are:

- mapping of potential development sites in the various rice growing ecologies
- embark on a strongly interwoven agronomy - extension service

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CONTENT ANNEXES

ANNEX 1. PROJECT AGREEMENT (GAMBIAN-GERMAN)

Ministry of External Affairs,
The Quadrangle,
Banjul,
The Gambia.

REA/6125/Vol.8/(242-EAD)

Excellency,

I have the honour to acknowledge receipt of your letter dated 29th January 1985, referring to the Arrangement of 30th March 1981/13 July 1981, as well as to the Agreement of 5th March 1976 between our two Governments regarding Economic and Technical Co-operation and ~~has~~ proposes on behalf of the Government of the Federal Republic of Germany that the following Arrangement concerning the project "Advisory assistance in rice-growing techniques" be concluded.

1. The Government of the Federal Republic of Germany and the Government of the Republic of The Gambia shall continue their co-operation in the promotion of rice growing until the end of 1987. The aim of the project in accordance with this Arrangement is to develop and enable working units of the Ministry of Water Resources and the Environment and of the Ministry of Agriculture to

   - increase self-supply in rice
   - carry out activities for the production of rice dependent on precipitation, in projects involving small farmers or groups of farmers.

2. The Government of the Federal Republic of Germany shall make the following contributions:

(1) It shall

(a) second one expert in cultivation techniques and hydraulic works for up to 36 man/months and short-term experts in various fields for up to 6 man/months;

(b) supply a requisite amount of material necessary for carrying out the proposed activities.

(2) It is ready to provide further training in rice growing and the provision of advice for up to 3 months in an appropriate project or institute in West Africa for one staff member of the Gambian Ministry of Agriculture who shall be assigned to the project upon his return and advise the farmers on rice growing.

(3) It is also prepared to

(a) meet the cost of accommodation for the seconded expert and his family;

(b) meet the cost of official travel by the seconded expert within and outside the Republic of The Gambia;

(c) meet the cost of transport and insurance to the project site for the material referred to in sub-paragraph 1 (b) above (this shall not include payment of the charges and storage fees referred to in paragraph 3 (2) (a) below);

(d) make available an amount of DM 60,500 (sixty thousand five hundred Deutsche Mark) for the promotion of self-help activities connected with the project. Contributions for individual activities in this connection shall be limited to DM 10,000 (ten thousand Deutsche Mark). Eligibility for promotion shall be decided upon jointly by the Department of Water Resources and the expert seconded by the Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ).

3. The Government of the Republic of The Gambia shall make the following contributions:

(1) It shall make available

(a) four experts in cultivation techniques, surveying, planning and construction as well as two assistants for land improvement activities, immediately, if possible, or by 1 July 1985 at the latest;

(b) office space for the seconded adviser and his Gambian staff.

(2) It shall

(a) exempt the material supplied for the project on behalf of the Government of the Federal Republic of Germany from licences, harbour dues, import and export duties and other public charges, as well as storage fees, and ensure that the material is cleared by customs without delay. The aforementioned exemptions shall, at the request of the implementing agency, also apply to material procured in the Republic of The Gambia;

(b) afford the seconded experts any assistance they may require in carrying out the tasks assigned to them and make available all necessary records and documents;

(c) ensure the provision of the contributions required to implement the project, insofar as these are not provided by the Government of the Federal Republic of Germany pursuant to this Arrangement.

4. (1) The seconded expert and his Gambian counterparts shall have the following tasks:

- repair and maintenance of dykes insofar as technically and economically feasible,
- planning and implementation of land improvement activities on six pilot plots outside the area now thought to contain saline soil of sulphuric acidity,
- identification of further areas for rice growing suitable for improvement, and, where, necessary, implementation of the necessary activities,
- preparation and implementation of a long-term work and advisory programme for the Department of Water Resources,
- provision of advice to villages seeking assistance in questions of cultivation techniques.

(2) The seconded expert shall within the framework of the tasks described in paragraph 1 above work as a consultant for the Department of Water Resources.

5. The material supplied for the project on behalf of the Government of the Federal Republic of Germany shall become the property of the Republic of the Gambia on arrival in the Gambia. The material shall be at the unrestricted disposal of the assisted project and the seconded expert for the fulfilment of his tasks.

6. (1) The Government of the Federal Republic of Germany shall charge the Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ) GmbH, 6236 Eschborn, with the implementation of its contributions.

(2) The Government of the Republic of the Gambia shall charge the Department of Water Resources at the Ministry of Water Resources and the Environment with the implementation of the project.

(3) The agencies pursuant to sub-paragraphs 1 and 2 above may jointly agree on details of the implementation of the project in a plan of operations or in some other appropriate form, adapting them as necessary in line with the progress of the project.

7. In all other respects the provisions of the aforementioned Agreement of 5 March 1976, including the Berlin clause (Article 9), shall apply to the present Arrangement.

I have the pleasure to confirm on behalf of the Government of the Republic of The Gambia the foregoing arrangements and agree that Your Excellency's letter under reference and this reply shall constitute an Arrangement between our two Governments to enter into force on today's date.

Accept, Your Excellency, the assurance of my highest consideration.

L.K. JABANG
Minister of External Affairs

His Excellency
Dr. Norbert LANG
Ambassador of the Federal
Republic of Germany
Dakar
Republic of Senegal

cc: Secretary General
P.S.M.E.P.&.I.D.
P.S.M.Agriculture
Mrs Corr
G.H.C. Dakar

ANNEX 2. RICE ECOLOGIES IN THE GAMBIA

RICE ECOLOGY CLASSIFICATION: A DISCUSSION PAPER PREPARED FOR THE 4TH MEETING OF THE RICE RESEARCH TASK FORCE - 6TH APRIL, 1987.

BY A.P. JONES & J. POSNER

INTRODUCTION.

This paper sets out to: (i) clarify the definitions of rice ecologies presented to the task force on 2nd March, 1987,

(2) compare the task force's classification with those of previous studies, and

(3) present preliminary estimates of the area covered by each ecology.

1. DEFINITION OF RICE ECOLOGIES.

The rice task force classification sub-group has identified five ecologies namely; (i) saline swamps, (ii) fresh water swamps,(iii) transitional, (iv) upland and (v) pump irrigated. The principal criterion of differentiation is source of water supply. Each ecology's position on the toposequence is illustrated in figure 1.

(i) Saline swamps are those low lying areas close to the river Gambia and its tributaries, to the west of Carrol's Wharf (M.I.D.). These areas are subject to the intrusion of salt water during the dry season; their cultivation must therefore wait until after the rains and an increased flow of fresh water in the river has leached out the salt.

Saline swamps can be divided between those that are vulnerable to salt intrusion on a daily basis, due to tidal influences, and those only seasonally effected. These sub-divisions correspond to soil associations 14 and 16 respectively.[1] Daily flooded areas are rarely cultivated at present as reduced rainfall has resulted in increased salinity.

(ii) Fresh water swamps are the lowlying area along the river Gambia and its tributaries to the east of Carrol's Wharf. These can be divided between those that are mainly river flooded and those that are slightly higher and mainly rainfed. The rationale for this distinction is the hypothesis that river flooded areas have a more assured water supply (fouta Djalon watershed),than directly rainfed areas (run off from the immediate plateau areas).

Freshwater flooded areas can be sub-divided between those that flood daily due to tidal influence on the river, corresponding to soil associations 15, 16 and 17 in MID[2], and those that only flood during the rainy season. It is not possible to identify a soil association which corresponds specifically to this latter sub-division. Rather seasonally river flooded freshwater swamps share the slightly elevated soil associations of rainfed swamps namely no. 21, where the depth of water is less than 50cm., and no's. 18 and 22 where water depths equal or exceed 50cm. The rationale for the distinction between 'deep' and 'shallow' fresh water swamps is that this factor will influence varietal selection. They correspond to the local terms 'Gibafaro' and 'Bafaro' respectively.

(iii) Transitional ecologies are solely rainfed areas that are gentle slopes such as tributary valleys. They can be differentiated in terms of soil texture, which influences the ease with which they can be worked. For example, valley bottom soils tend to be finer and heavier than those further up the slope. This will affect varietal selection and the potential for introducing animal drawn implements to this ecology. Transitional areas correspond to soil association 13; they are spread throughout the country. 'Banta faro' appears to be the equivalent local term.

(iv) The only truly upland ecology is known locally as 'tendaco', (meaning newly cleared). It is found mainly in W.D., which has the highest divisional rainfall, in natural depressions. These areas correspond to soil associations 4 and 5 in W.D. 'Tendaco' is a shifting cultivation system: one or two years of cultivation are followed by four to six years fallow; it is entirely rainfed. The fallow requirements of this system inhibit the expansion of upland rice cultivation on a sustainable basis. Because none of these stumps are removed, in order to help maintain soil fertility, the use of animal traction is inappropriate.

(v) Pump irrigated areas are a sub-set of freshwater swamps located in MID and URD. These areas are the result of specific project interventions; they have already benefited from a great deal of agronomic research :

2. COMPARISON OF RICE ECOLOGY CLASSIFICATIONS.

There are essentially two alternative classification systems for rice ecologies: they are (i) the system used by PPMU in the NASS, and (ii) those that are based on LRS22 soil associations.

In the NASS, PPMU present production statistics for rice ecologies classified as either: irrigated, upland or swamp. It is difficult for the research task force to utilise the NASS data to influence research priorities. The main difficulty here is that the PPMU'S classification swamp rice, aggregates three seperate ecologies. In addition, there are some inherent difficulties in collecting rice production data.[3] Despite these qualifications, the NASS provides the only source of data on the area of rice cultivation per year. By taking divisional estimates, it is possible to estimate area cultivated for the five main ecologies identified in part 1. This is done in part 3.

There are three classifications of rice ecologies based directly on LRS22 soil associations: that of LRS 22, FAO 1983 and Euro-consultant 1986. Essentially, these classifications represent attempts to improve a common set of definitions. The definitions adopted by the task force are the next step in this process, taking the best features of the existing systems as a starting point. For example, by following FAO 1983's lead in combining transitional and tributary valleys as a single category, and by following the Euroconsultant report in differentiating between seasonally and tidally flooded fresh water swamps.

The pre-existing classification systems provided the basis for allocating soil association numbers to the ecologies defined by the task force, which in turn are the basis for calculating the potential area for each ecology. Upland ecologies proved to be the major problem here; FAO 1983 defined them in terms of parts of soil associations 1 and 2.[4] After discussions, it was decided that the hydromorphic soils or associations 4 and 5 are more representative of the ecology. They have therefore been used to calculate the potential area of the upland ecology.

3. ESTIMATES OF CULTIVATABLE AREA FOR EACH ECOLOGY.

As noted above, allocated soil associations provide the basis for estimating the potential area of each rice ecology; other information used here include: the extent of salt water penetration upstream during the dry season, and inter-division variations in rainfall. The resulting ecology area estimates are summarised for the whole country in Table 1, and for farming systems focus areas in Table 2. Only seasonally flooded saline swamps were not available in the farming systems focus areas.

The figures in the tables must be treated with extreme caution; they do not represent cultivated areas. For example, nationally saline swamp daily flooded is the largest ecology but almost none of it is actually cultivated at present. Upland ecologies cover an estimated 25,000ha. but due to its fallow requirements, only a fraction of this will actually be cultivated. PPMU data indicates that on average, total rice cultivated area was 21,000ha. between 1974 and 1985.[3] Broken down into the constituent ecologies, the means and co-efficient of variations are as follows: Saline swamps mean 5,000 ha.cv 46%
Fresh water swamps mean 9,200ha. cv 47%
Transitional mean 3,600ha. cv 25%
Upland mean 1,500ha. cv 52%
Pump irrigated 1,900ha. cv 41% (Table 3)

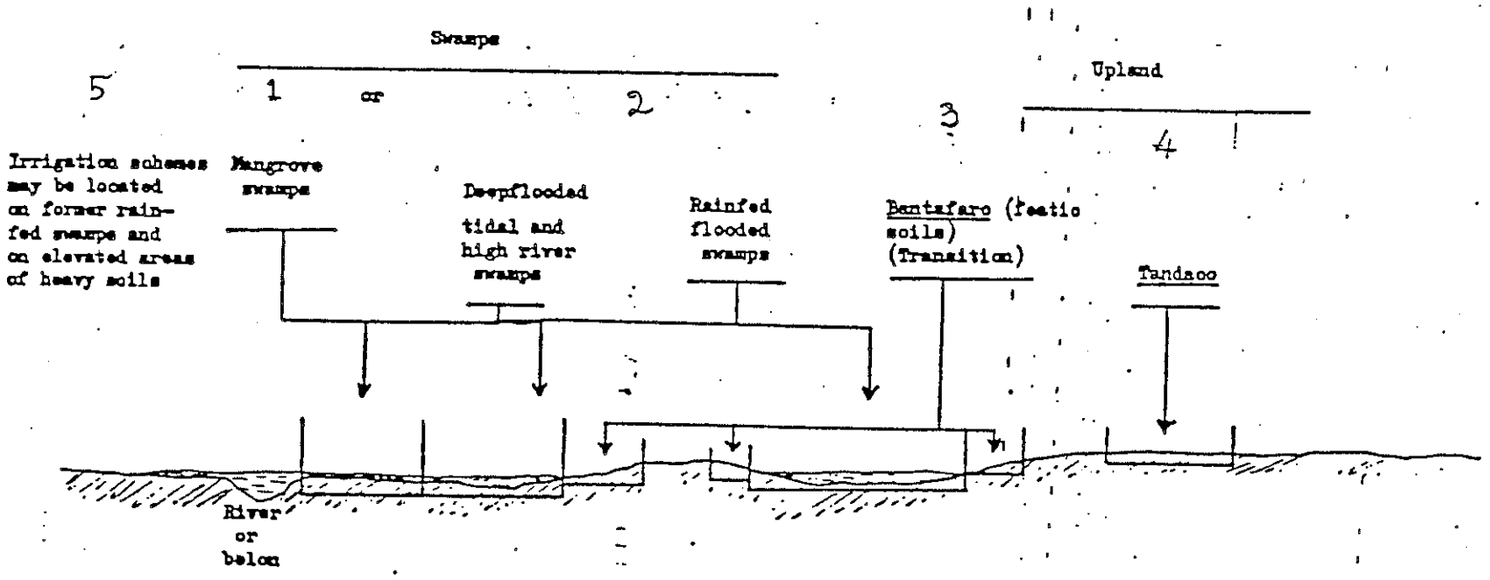
It is not possible to identify long term trends in cultivated area. Inter year variations in cultivated area reflect those in precipitation.

CONCLUSION:

Of all the rice ecologies outlined in part 1, only seasonally flooded saline swamps are not included in the 1986 Farming systems focus areas. Selection of a site in this ecology, possibly close to Jenoi Agricultural Station should therefore be considered. Priority should be given to research on fresh water swamp and transitional rice ecologies, as these combine to cover half the potential rice growing area and are apparently under-utilised at present.

Footnotes:
[1] LRS 22; The Agricultural development of the Gambia.,197
[2] Euroconsultant: Assessement of the possibilities for tidal irrigation along the Gambia Riverl
[3] OMVG. Technical document 3. The Gambia in graphs, 1986.
[4] FAO. The rice industry in the Gambia, Vol.2. Technical Annexures 1983

Figure 1: Schematic Diagram of Main Rice Production Systems



1/ Mangrove swamps (Rhizophora spp.) which are subject to more irregular saline tidal inundation are variously suffering from acid sulphate toxicity. These are called Lec swamps in The Gambia.

2/ Deepflooded freshwater swamps are located close to the river in those reaches beyond the saline tidal flows in both the wet and dry season, i.e. beyond Carroll's Wharf, often supplemented by rainfall, especially early in the season.

3/ Rainfed flooded swamps are located on the periphery of river flooded areas and rely almost entirely on rainfall, or may be shallow depressions further inland entirely dependent on rainfall catchment runoff, supplemented in some areas by local flooding from tributary streams.

Source: FAO: 1983

TABLE 1. THE POTENTIAL AREA OF RICE ECOLOGIES DEFINED BY RICE RESEARCH TASK FORCE - 1987.

ECOLOGY	SUB-CATEGORY	SOIL ASSOCIATION [1]	LOCATION	AREA (000Ha) [2]	%	COMMENTS
Saline Swamp	Daily flooding	14	WD,NBD,LRD,MID	99	36%	Rarely cultivated in recent years. These soil associations are unsuitable for cultivation in LRS 22,P241
	Seasonally flooding	16	NBD, LRD	14	5%	
Fresh Water Swamp	River flooded — Tidal	15,16,17	MID	33	12%	Euroconsultant report 1986 estimates 28700ha is potentially tidal irrigable,1600 in the near future2700ha ha the potential to be double cropped.
	River flooded — Seasonal					
	Rainfed — depth<50cm.	21	MID, URD.	22	8%	'Giba faro'
	Rainfed — depth>50cm.	18,22		14	5%	'Bafaro'
Transitional	By soil texture	13	Nationwide	70	25%	'Banta faro'
Upland		4,5	WD	25	9%	'Tendaco'. WD has the highest average annual rainfall among the Divisions; 1974-85=840mm per year
Pump irrigated		subset of 18,22	MID, URD	2.5	1%	Approximately 15000ha is currently cultivated, 600ha by the Jahally Pacharr Project.
				277		Euroconsultant report 1986

1] Defined in LRS22;1976, pp.238-9
2] Area given are potential maximums. FAO 1983 estimates 28,000ha to be the area of rice actually cultivated. p.60

TABLE 2. THE POTENTIAL AREA FO RICE ECOLOGIES IN THE FARMING SYSTEMS FOCUS AREAS-1986

ECOLOGY	SOIL ASSOCIATION	Farming system focus area: WD SOMITA Area (000ha)	%	NBD C. BADIBU Area (000ha)	%	MID FULADU WEST Area (000ha)	%	URD FULADU EAST Area (000ha)	%
Saline swamp – daily flooded	14	11	6.8%	4.1	82%				
Saline swamp – seasonally flooded	16								
Fresh water swamp – River flooded – Tidal	15,16,17					1.7	12%		
Fresh water swamp – River flooded – Seasonal									
Fresh water swamp – Rainfed – depth<50cm.	21					0.5	4%	7.8	57%
Fresh water swamp – Rainfed – depth>50cm.	18,22					6.1	49%	2.6	19%
Transitional	13	2.5	15%	0.9	18%	4.1	33%	3.3	24.1%
Upland	4,5	2.6	16%						
	TOTALS:	16.1	100	5	100	12.4	100	13.7	

Table 3. Method used to disaggregate PPMU classifications to comply with those of the rice research task force

PPMU Classification	Western Division	North Bank Division	Lower River Division	McCarthy I.Division and Upper R.Divisi
Swamp	Transi-tional	50% Salt water swamp 50% transi-tional	Salt water swamp	Fresh water swamp
Upland	Tendaco	Transi-tional	Transi-tional	Transitional
Irrigated	-	-	-	Irrigated

ANNEX 3. ANTI SALT DIKE AND CONTOURBUND

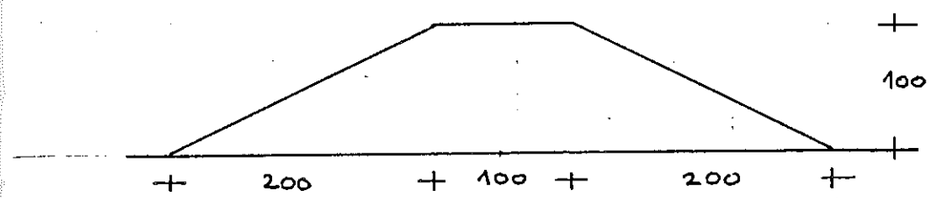


Fig 1.: Cross section Anti Salt Dike

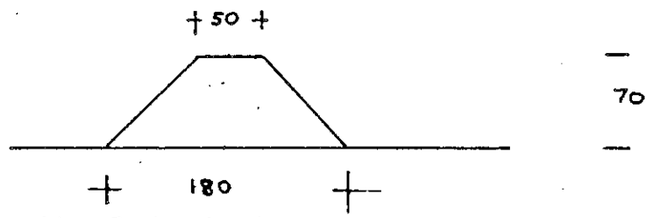


Fig 2.: Cross section Contourbund

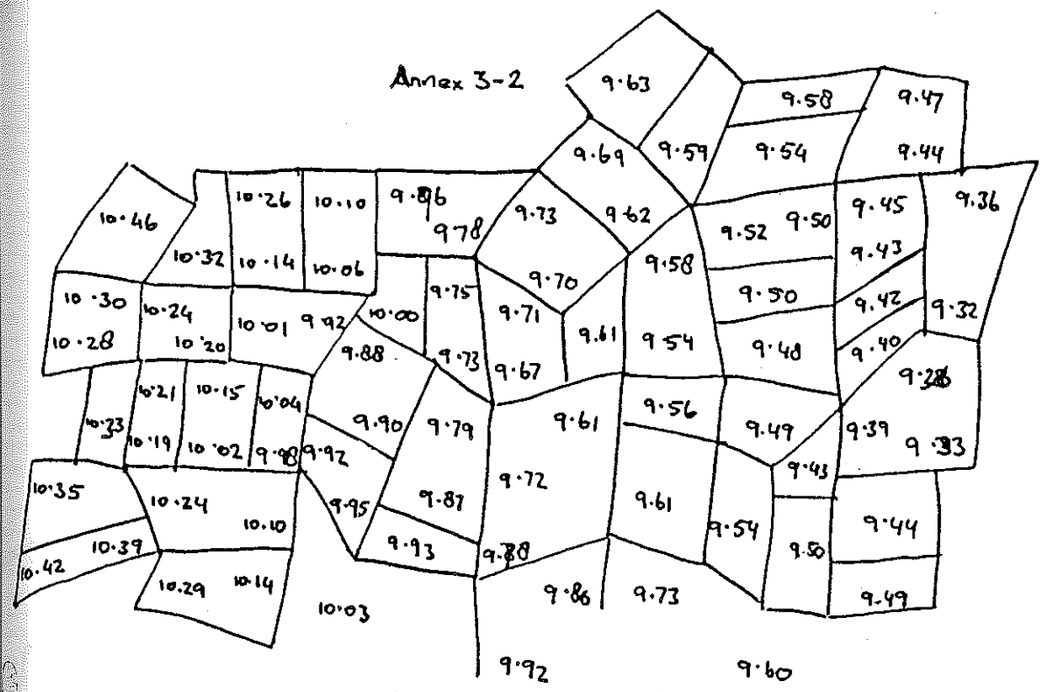


Fig. 1.: Plot boundaries and fieldlevels; mapped according topo-survey

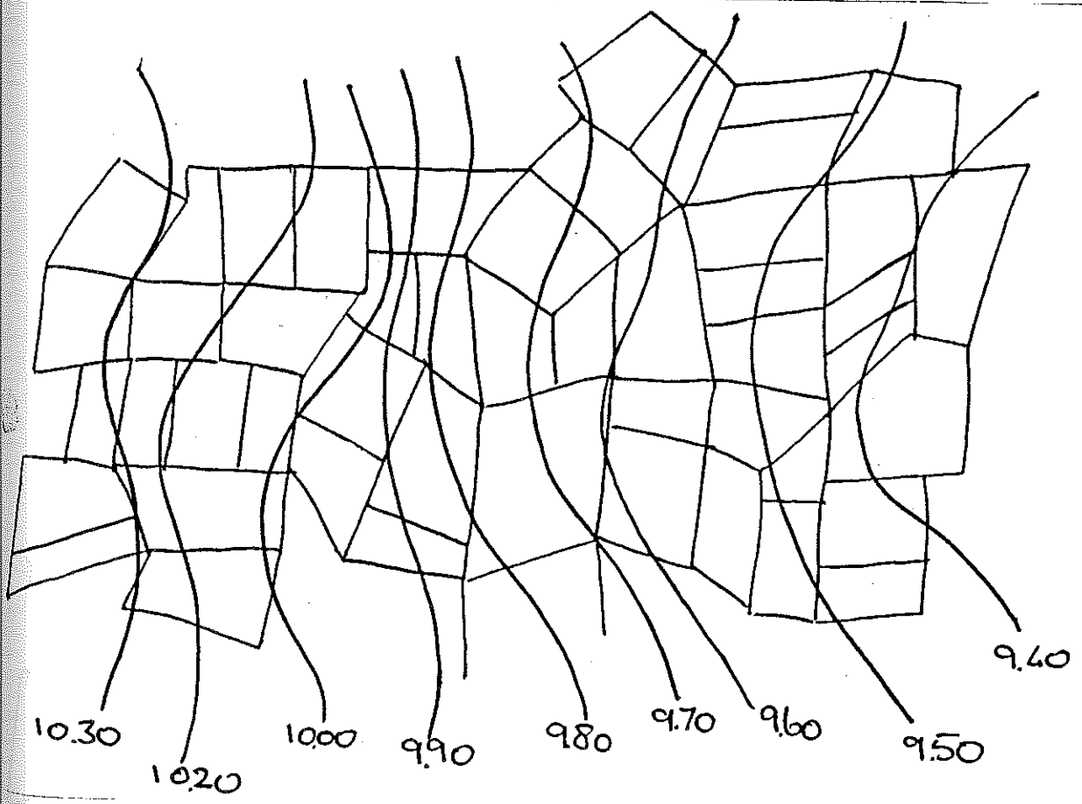


Fig. 2.: Natural contours

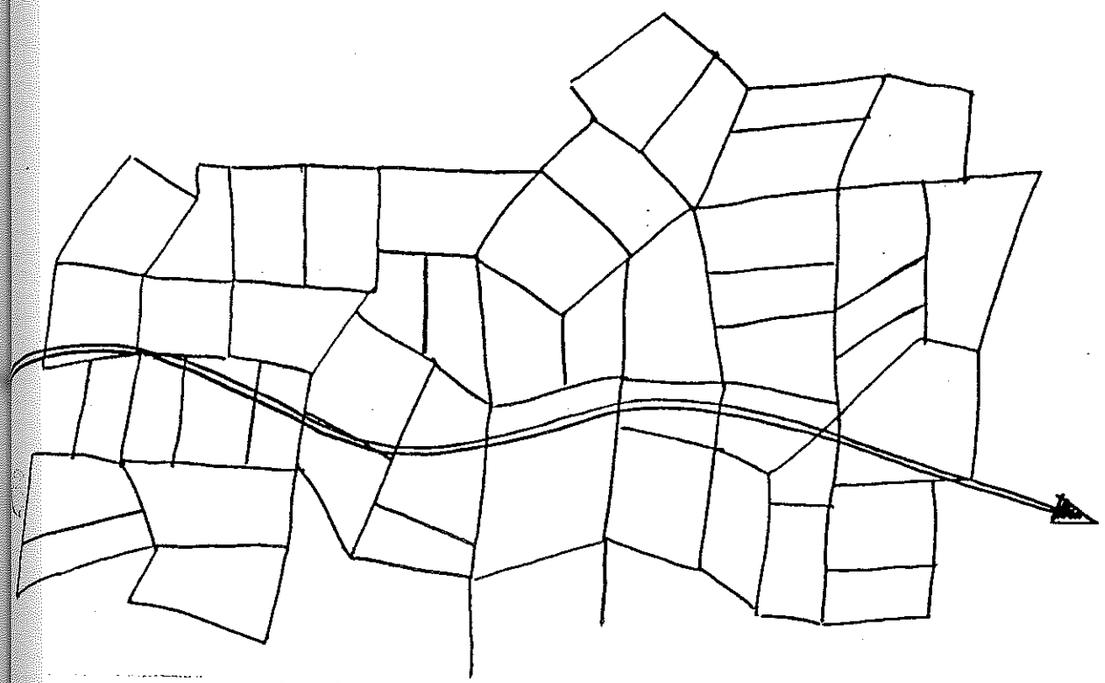


Fig 3.: Natural drainage-way

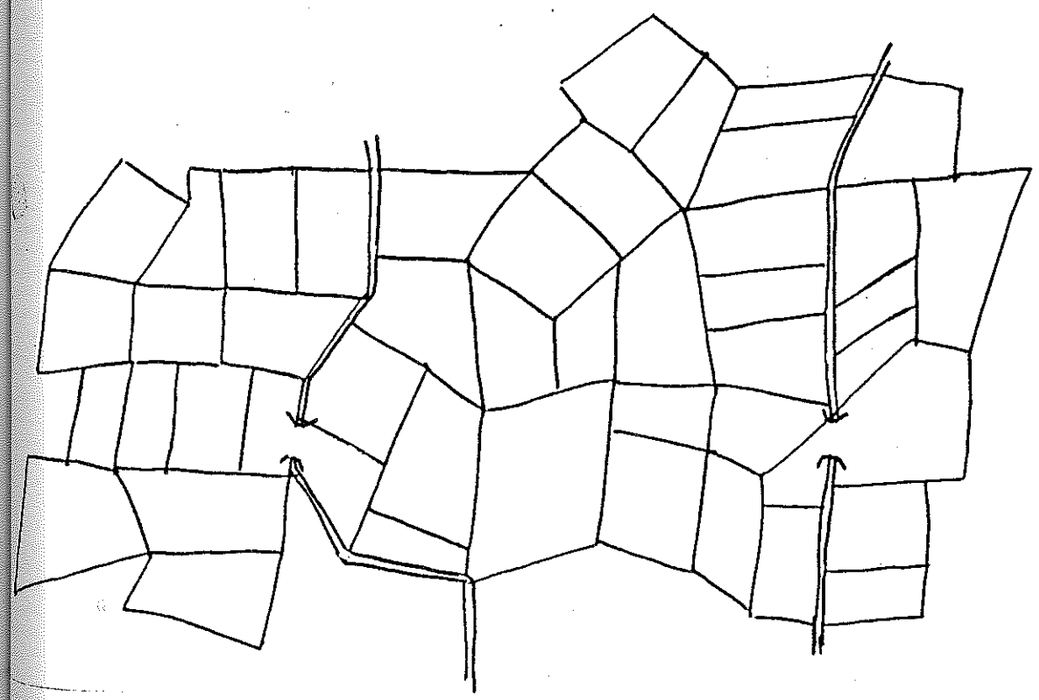


Fig. 4.: Lay-out contourbunds plus location spillways

ANNEX 4. TYPICAL DESIGNS OF SLUICE GATES AND SPILLWAY

A. Sluice gate/Spillway Pirang

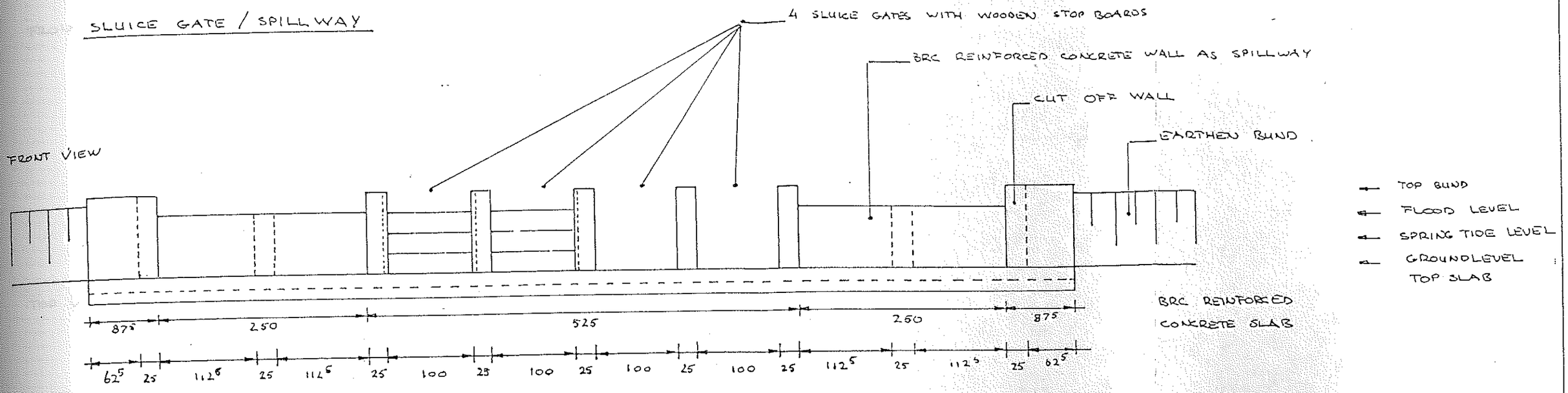
B. Sluice gate/Spillway Brefet

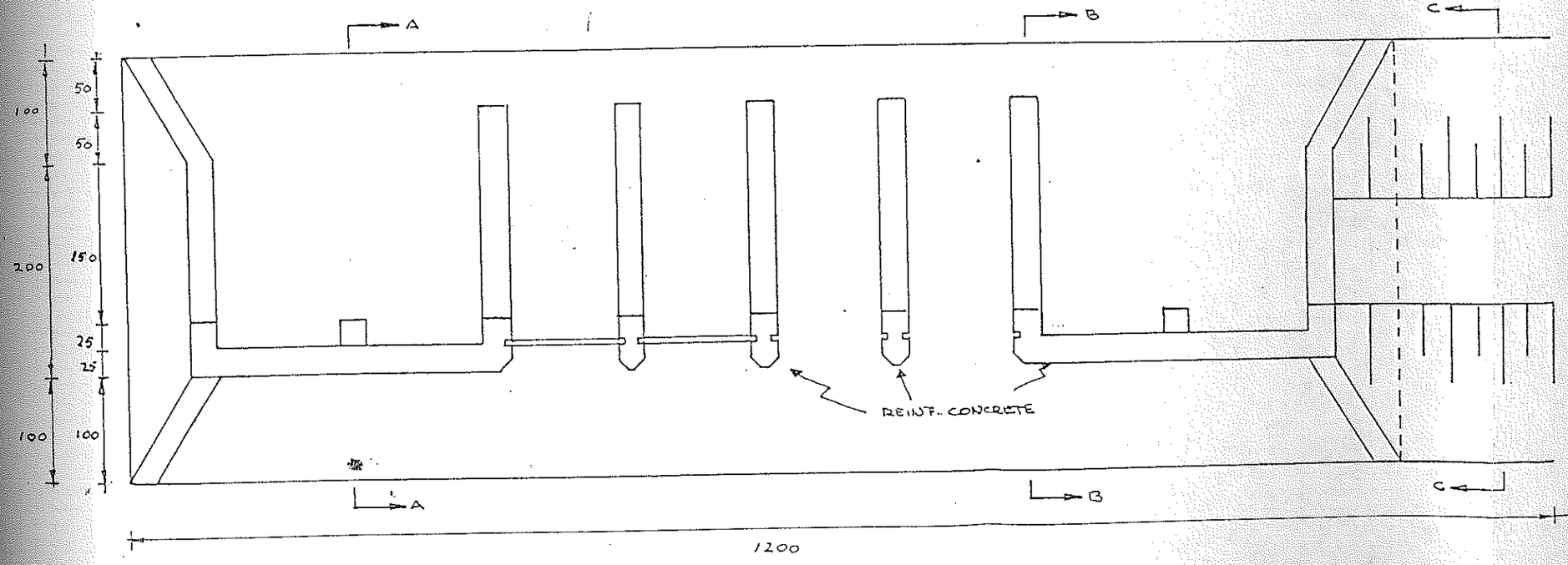
C. Sluice gate Bwiam

D. Spillway

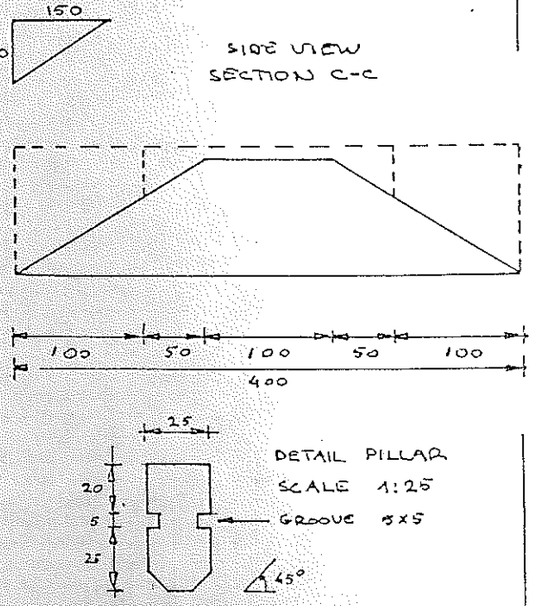
SLUICE GATE / SPILLWAY

FRONT VIEW



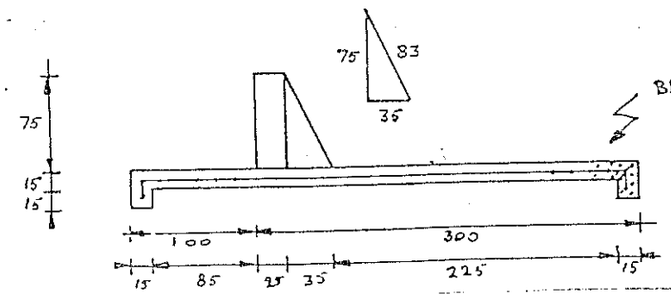


TOP VIEW

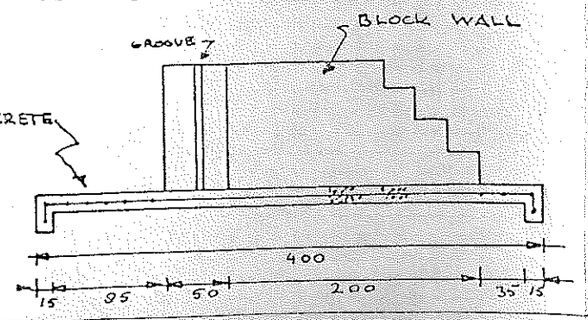


SIDE VIEWS

SECTION A-A

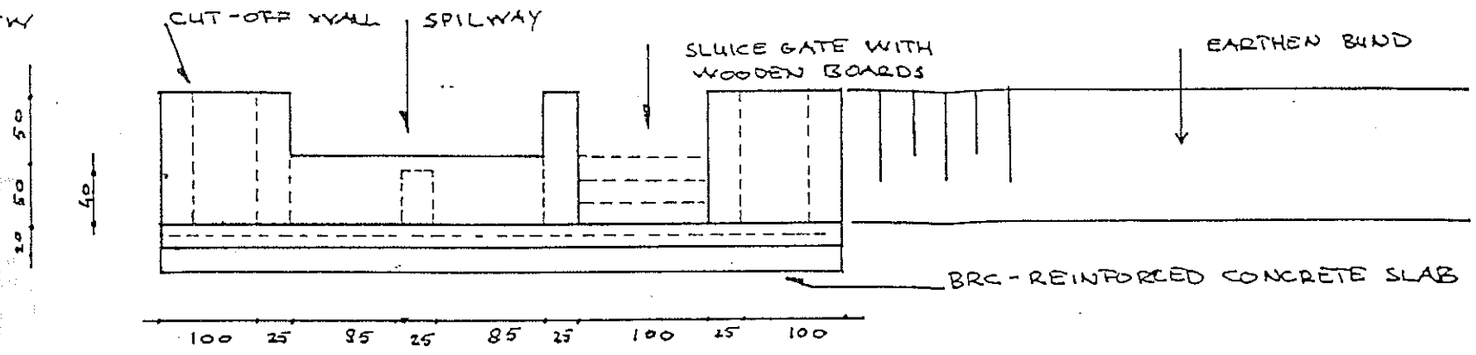


SECTION B-B



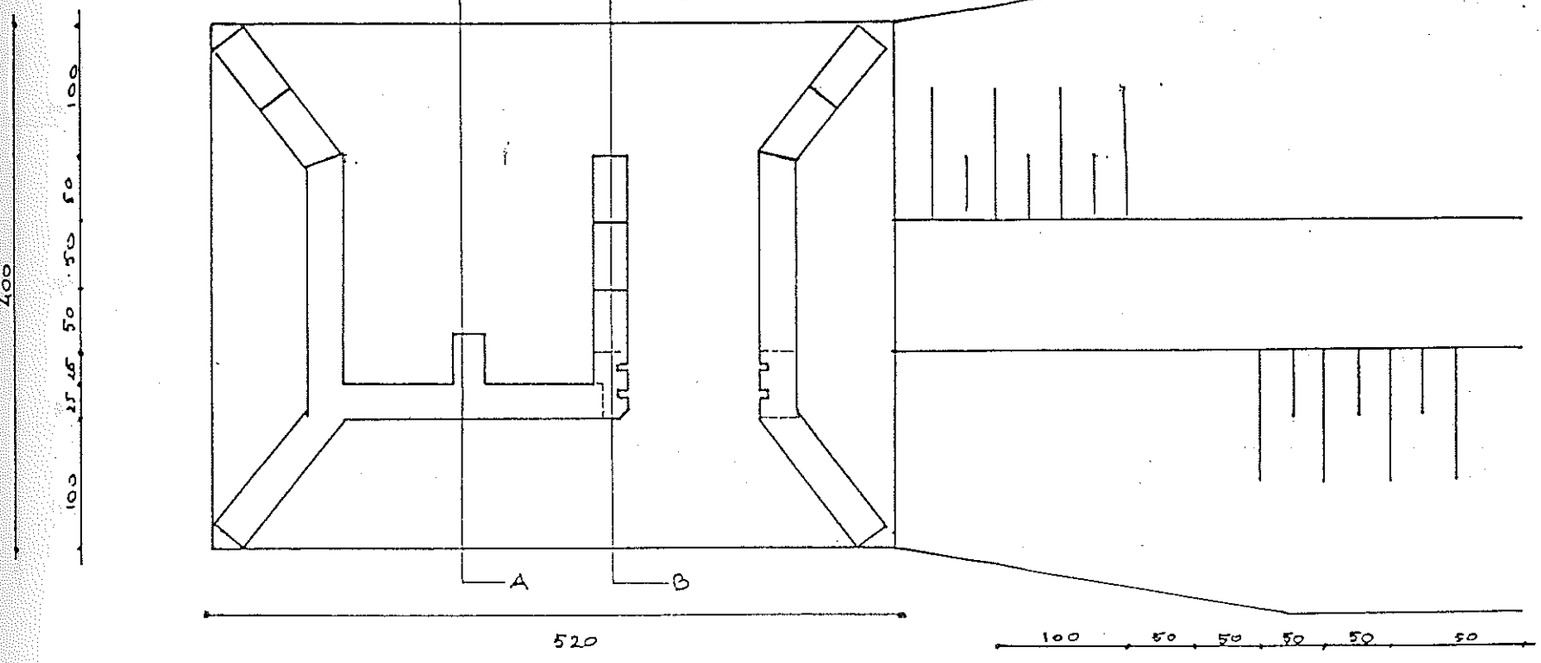
DEPARTMENT OF WATER RESOURCES -GTZ- SWAMP EMPROVE MENT	
PROJECT	PIRANG - SWAMP
SCALE	1:50 (IN CENTIMETERS)
DATE	MARCH 1985
DESIGN/ CHECKED	

FRONT VIEW

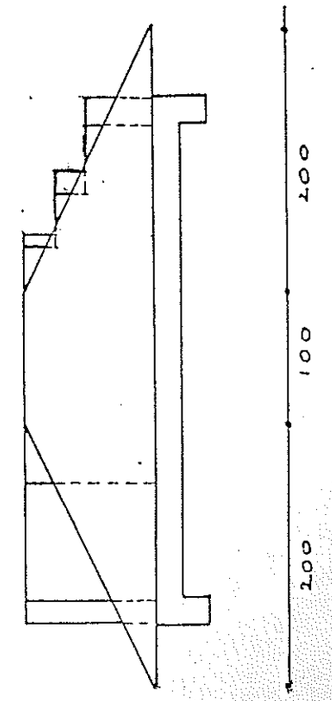


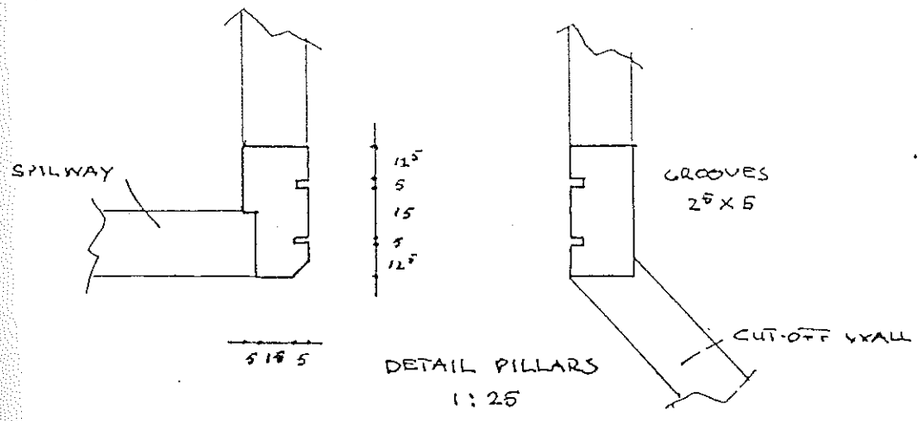
— TOP BUND
— SPILLWAY - LEVEL
— SPRING TIDE LEVEL
— GROUND LEVEL

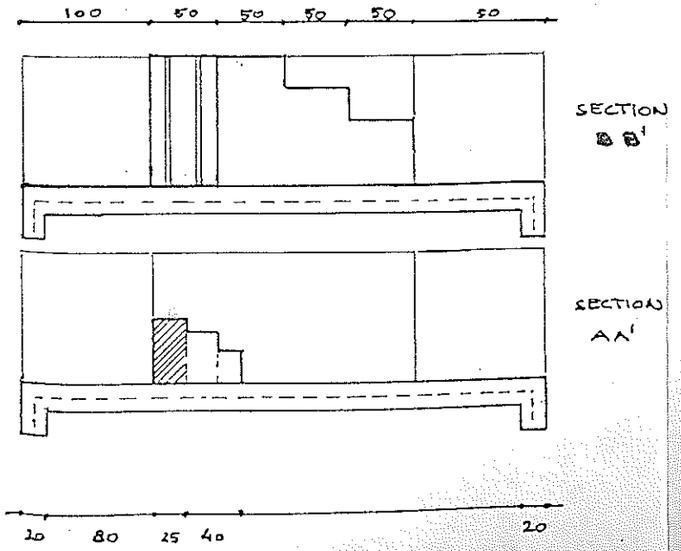
TOP VIEW



SIDE VIEW

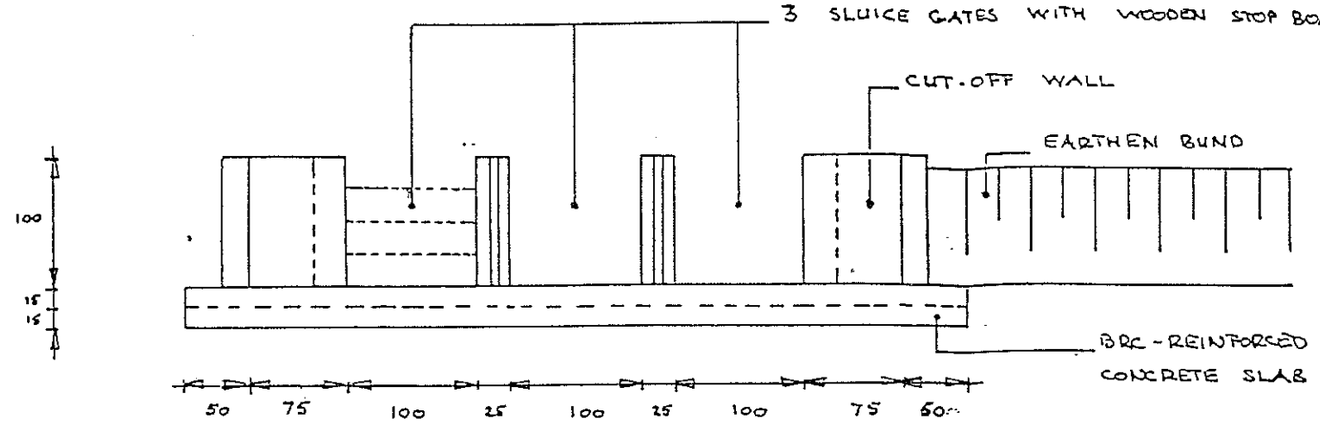






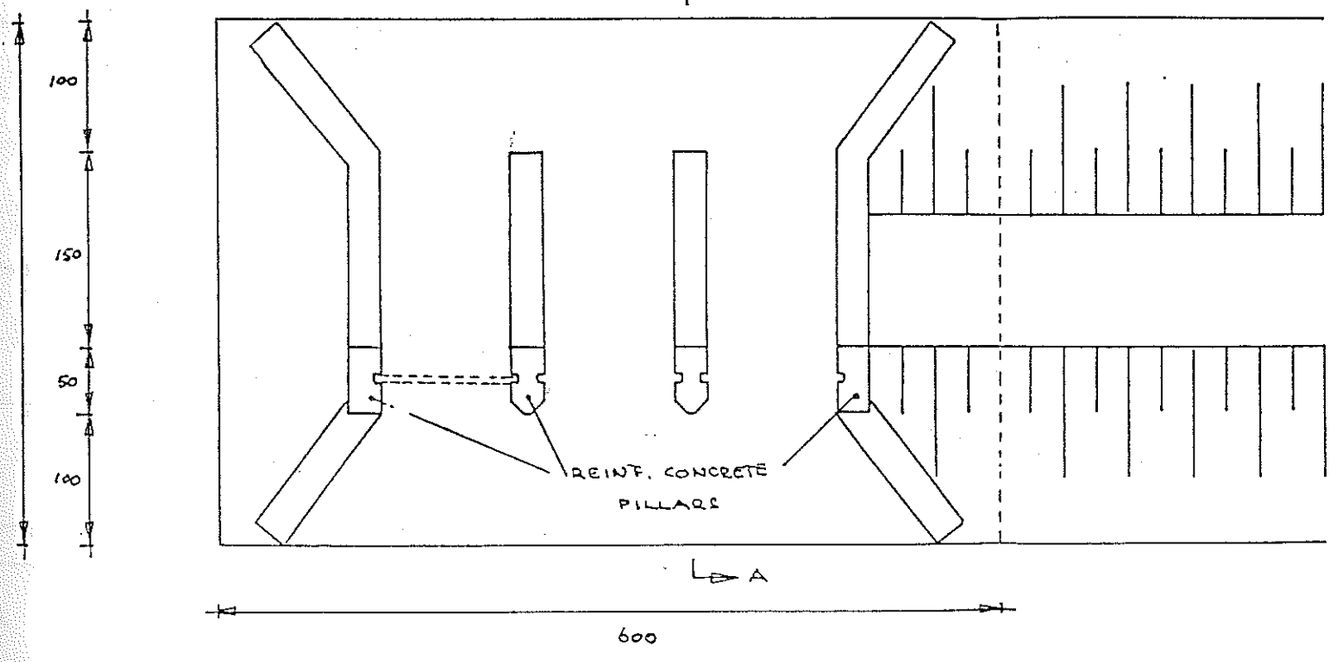
DEPARTMENT OF WATER RESOURCES -GTZ- SWAMP IMPROVEMENT SLUICE-GATE + SPILWAY	
PROJECT	BRETET (LW-D)
SCALE	1 : 50
DATE	NOV. 87
....	.....

FRONT VIEW

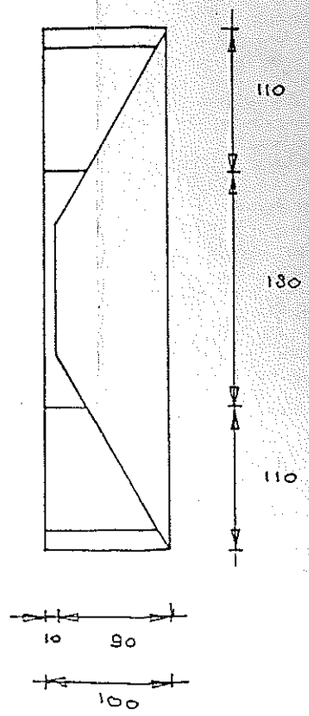


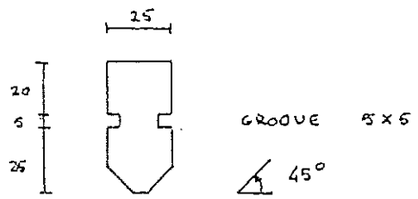
— TOP BUND
— FLOOD LEVEL
— SPRING TIDE LEVEL
— GROUNDLEVEL + TOP SLAB

TOP VIEW



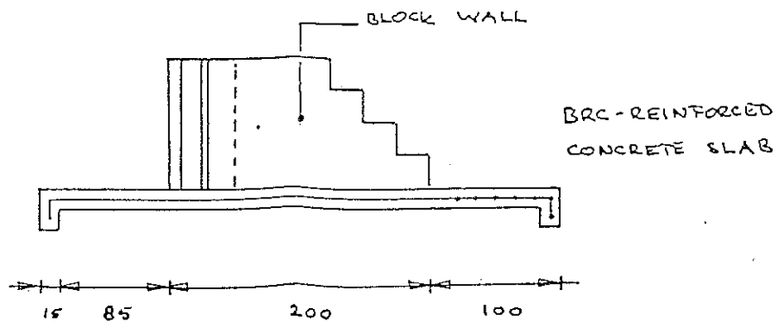
SIDE VIEW





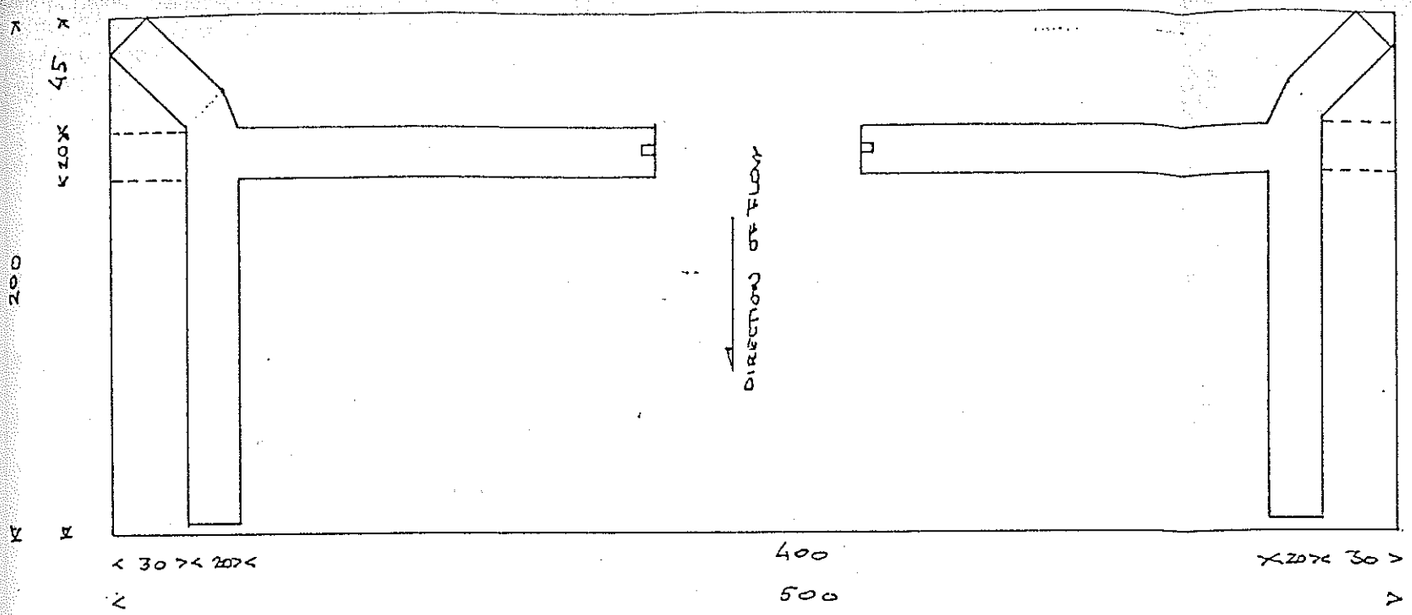
DETAIL PILLAR
SCALE 1:25

SECTION AA

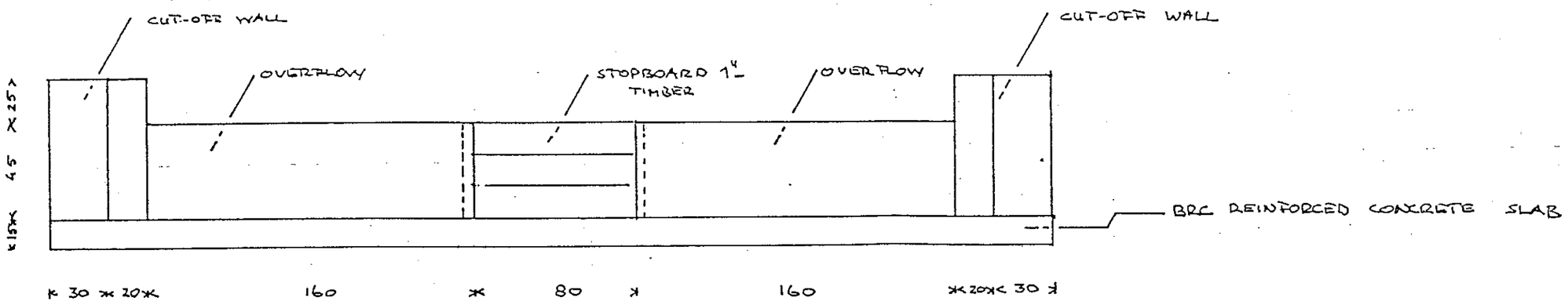


DEPARTMENT OF WATER RESOURCES -GTZ- SWAMP IMPROVEMENT	
PROJECT	BWIAM-SWAMP
SCALE	1:50 (IN CENTIMETERS)
DATE	MAY 1985
DESIGN/ CHECKED	

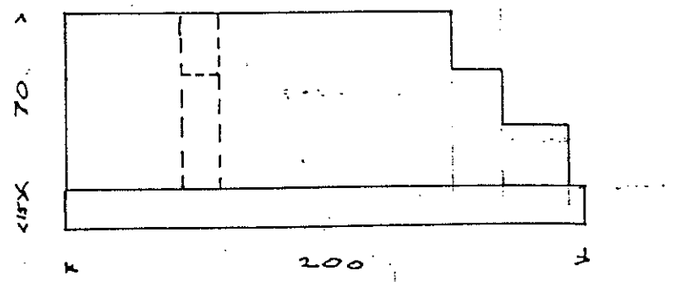
SPILWAY BAJANA



TOP VIEW

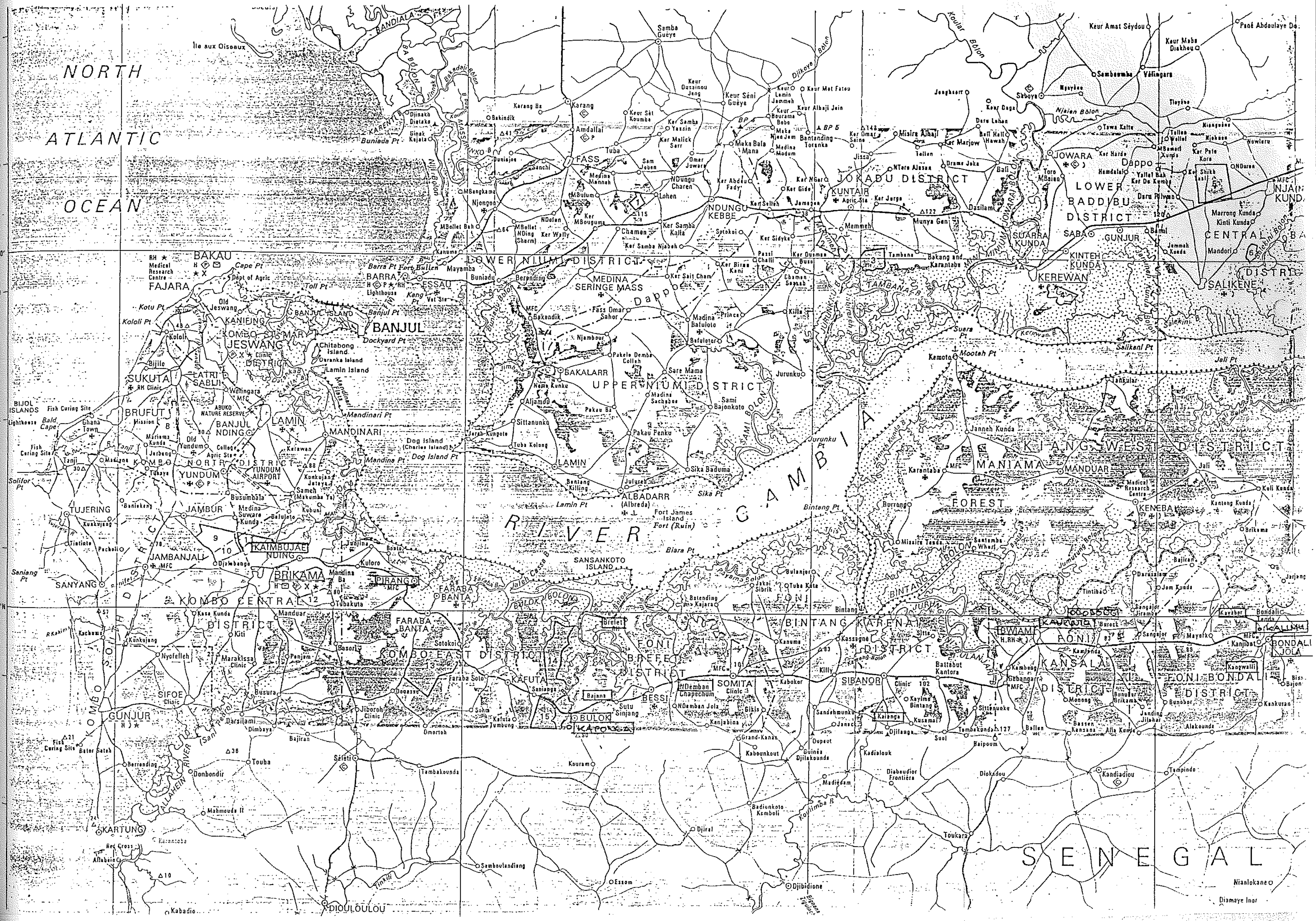


FRONT VIEW



SIDE VIEW

DEPARTMENT OF WATER RESOURCES - GTZ -	
SWAMP IMPROVEMENT	
PROJECT	BAJANA
SCALE	1 : 25
DRAWN	


NORTH
ATLANTIC
OCEAN
Ile aux Oiseaux
BANDIALA
BA BOLON
Bakadaji Bolon
Jinnak B
Djinakh Diatako
Ginak Kajata
KARENTI B
Buniada Pt
Nijî Bolon
MASSARINKO B
Samba Gueye
Keur Ousainou Jeng
Keur Séni Guèye
Keur Lamin Jammeh
Keur Mat Fatou
Keur Albaji Jain
Djikoye Bolon
Karang Ba
Karang
Bakindik
Keur Sàt Koumba
Ker Samba Yassin
Ker Malick Serr
Amdallai
Tuba
FASS
Dunisjoe
Sanchi
Sam Joben
Omar Jowara
Medina Mannah
MBulum
Lohen
NDungu Charen
Ker Abdou Fady
Keur Bourama Bobo
Maka Njeo Jam
Meka Bala Mana
Medina Modum
Bantanding Toranka
Ker Omar Saine
Jissa
Misira Alhaji
Ker Marjow
Tallen
Daru Lahan
Ball Hall Hawah
Keur Daga
Jeaghsarr
Saboya
Njaien Bolon
Koular Bolon
Keur Amat Séydou
Keur Mabs Diakhou
Sambeumba
Vélingara
Tiayène
Pané Abdoulaye Do
Tawa Kalle
NTero Alasan
Drame Joka
Bali
JOKADU DISTRICT
KUNTAIR
Agric Sta
Ker Jarga
Ker NGer
Ker Gide
Ker Selleh
Jamegan
NDUNGU KEBBE
MBangkama
Njongon
MBollet Bah
MBollet NDing Sharm
NDofan
Ker Wally
Ker MBouguma
Chamen
Ker Samba Kalla
Ker Samba Njabeh
Sotokoi
Ker Sidyke
Memmeh
Munya Gen
Dasilami
JOWARA
Toro MBaien
Ker Harde
Dappo
Hamdalai
Yallal Bah
Ker De Kumba
Daru Rilwan
MBamari Kunda
Tallen Wellel
Ker Pate Kora
Njahsan
Nowleru
NDuren
LOWER BADDIBU DISTRICT
SUARRA KUNDA
MINIMIJU JOWARA BOLON
SABA
GUNJUR
Bamal
Jammeh Kunda
Marrong Kunda
Kinti Kunda
CENTRAL BADDIBU DISTRICT
Mandori
Salekini Bolon
SALIKENE
NJAI KUNDA
KEREWAN
KINTEH KUNDA
Kanuma
Tambana
Bakang and Karantaba
Passi Challi
Ker Ousman Buso
LOWER NIUMI DISTRICT
Mayamba
Buniadu
Berending
MEDINA SERINGE MASS
Ker Sait Cham
Ker Biran Kani
Chamen Seesah
Dapp
Fass Omar Sahor
Bakendik
Buniadu Bolon
Madina Bafuloto
Bafuloto
Prince
Killa
JURUNKU B
TAMBANA B
Njambour
Pakele Dembe Colleh
BAKALARR
Nema Kunku
Sare Mama
UPPER NIUMI DISTRICT
Jimbana B
Aljamdu
Pakau Ba
Madina Sachabue
Sami Bajonkoto
SAMI BOLON
Jurunku
Sittanunko
Jerah Kungote
Tuba Kolong
Pakau Penku
LAMIN
Sika Baduma
Bintang Killing
Juluren
ALBADARR (Albreda)
Fort James Island
Fort (Ruin)
Lamin Pt
Sika Pt
Jurunku Pt
Suara Pt
Kerewan B
Salikeni Pt
Mootah Pt
Kemoto
Jali Pt
Tankular
RIVER GAMBIA
Bintang Pt
Biara Pt
SANSANKOTO ISLAND
BAKAU
RH
Medical Research Centre
FAJARA
Cape Pt
Dept of Agric
BARRA
Lighthouse
Barra Pt
Fort Bullen
ESSAU
Kang Pt
Vet Sta
Toll Pt
Kotu Pt
Kololi Pt
Old Jeswang
KANIFING
BANJUL ISLAND
Banjul Pt
BANJUL
Dockyard Pt
Kololi
KOMBO ST MARY DISTRICT
JESWANG
Clinic
Chitabong Island
Oaranka Island
Lamin Island
Bijilo
SUKUTA
RH Clinic
LATRI SABIJI
Wellingara
MFC
ABUKO NATURE RESERVE
Mandinari Flats
BIJOL ISLANDS
Fish Curing Site
Lighthouse
Bald Cape
Ghana Town
BRUFUT
Mission
BANJUL NDING
LAMIN
Mandinari Pt
MANDINARI
Dog Island (Charles Island)
Dog Island Pt
Mandina Pt
Mariama Kunda
Old Yundum
College
Agric Sta
Jarbang
Katawan
Tanji
Madiana
KOMBO NORTH DISTRICT
Tubaya
YUNDUM
YUNDUM AIRPORT
Konkujang Jataya
Solifor Pt
Sameh (Makumba Ya)
Busumbala
Kubuni
Banisenko
TUJERING
JAMBUR
Medina Suware Kunda
Bafuloto
Kunkujang
Tujering B
Tintinto
Pacholi
JAMBANJALI
KAIMBUJAE
NDING
Djalabanga
Jundina
Boato
Kuloro
Saniang Pt
SANYANG
BRIKAMA
Mandina Ba
PIRANGO
FARABA BANTA
Tubakuta
KOMBO CENTRAL DISTRICT
Kasa Kunda
Manduar
Kiti
Kachumu
Kunkujang
Nyofelleh
Maraklssa Clinic
Penjam
Basori
KOMBO SOUTH DISTRICT
KOMBO EAST DISTRICT
Sotokoi
Faraba Soto
KAFUTA
Saniang
SIFOE Clinic
Busura
Dogassu
GUNJUR
Darsilami
Dimbaya
Jiboroh Clinic
Sohm
Kafuta Jumbung
BULOK
KAPONGA
Bajana
Sutu Sinjang
Fish Curing Site
Batos Sateh
Sani Pedro
Bajiran
Omortoh
Berrending
Donbondir
Touba
Séléti
Tambakounda
ALLAHEIN RIVER
Mahmouda II
KARTUNG
Karantaba
Red Cross
Allabein
Kabadio
DIOULOULOU
Tinkili
Samboulandiang
Essom
Kouram
Djiral
Djibidione
Jalah Cassa B
Faraba B
BULOK BOLON
Breiet
FONI BREFET DISTRICT
BESSI
NDemban Chapechum
NDemban Jola
SOMITA Clinic
Gikis
Kanjabina
Kaboker
Kanuma
Batending Kajara
Jakoi Sibrik
Tuba Kuta
Bulanjor
Payamo Bolon
Bintang
BINTANG KARENAI DISTRICT
Kassagne
Killy
SIBANOR
Sandehmunku
Janack
Kaienga
Djilanga
Grand-Kanaz
Kabounkout
Oupeut
Guinéa Djilakounda
Kadialouk
Madiédam
Badionkoto Kemboli
Koulimba B
Diabaudior Frontière
Clinic
Kayima Bintang
Kusamai
Suol
Battabut Kantora
Tambakunda
Baipoum
Sittenunku
Ballen
Diokadou
Toukara
Kandiadiou
Tampindo
SENEGAL
Nianlokane
Diamaye Inor
Burrong
Missira Tenda
BINTANG BOLON
Santamba Wharf
Janneh Kunda B
Janneh Kunda
Karantaba
MANIAMA
KIANG WEST DISTRICT
MANDUAR
Medical Research Centre
FOREST
KENEBA
Jali
Kantong Kunda
Koli Kunda
Brikama
Jumutung Bolon
Wurambang B
JURUNGUMANI BULANJARI
Bajican
Darusalam
Jom Kunda
Tintiba
Jarjang
Sangajor Jiramba
BWIAM
H.RH
KANSALA
FONI KANSALA DISTRICT
Burock
Sangajor
Kamfenda
Kambeng
Gebangarr
MFC
Monong
Bunular Brikama
Basten Kansana
Alla Kunda
Janding Jilahar
Bunobor
Alakounda
Kavabor
Mayork
Bondali Tenda
KALUMU
Kanjibat
BONDALI JOLA
Kangwalli
FONI BONDALI DISTRICT
Kankuran
Bajon
Nabaire
Ali Bolon

ANNEX 5.
========

SUMMARY of watercontrol structures constructed by the DWR - GTZ Project "Rainfed Rice Improvement in the Western Gambia", GTZ PN 80.2135.4-09.100 during the period January 1985 up to July 1988 and specified per project village.

The structures are subdivided in 2 groupes:

1. Anti-salt dikes and contourbunds

   Purpose : prevention of salt intrusion and water retention

   Construction: manually with compacted earth excavated from nearby pits or superficially excavated alongside the structure

2. Sluice gates and spillways (different types and combinations)

   Purpose : water level control

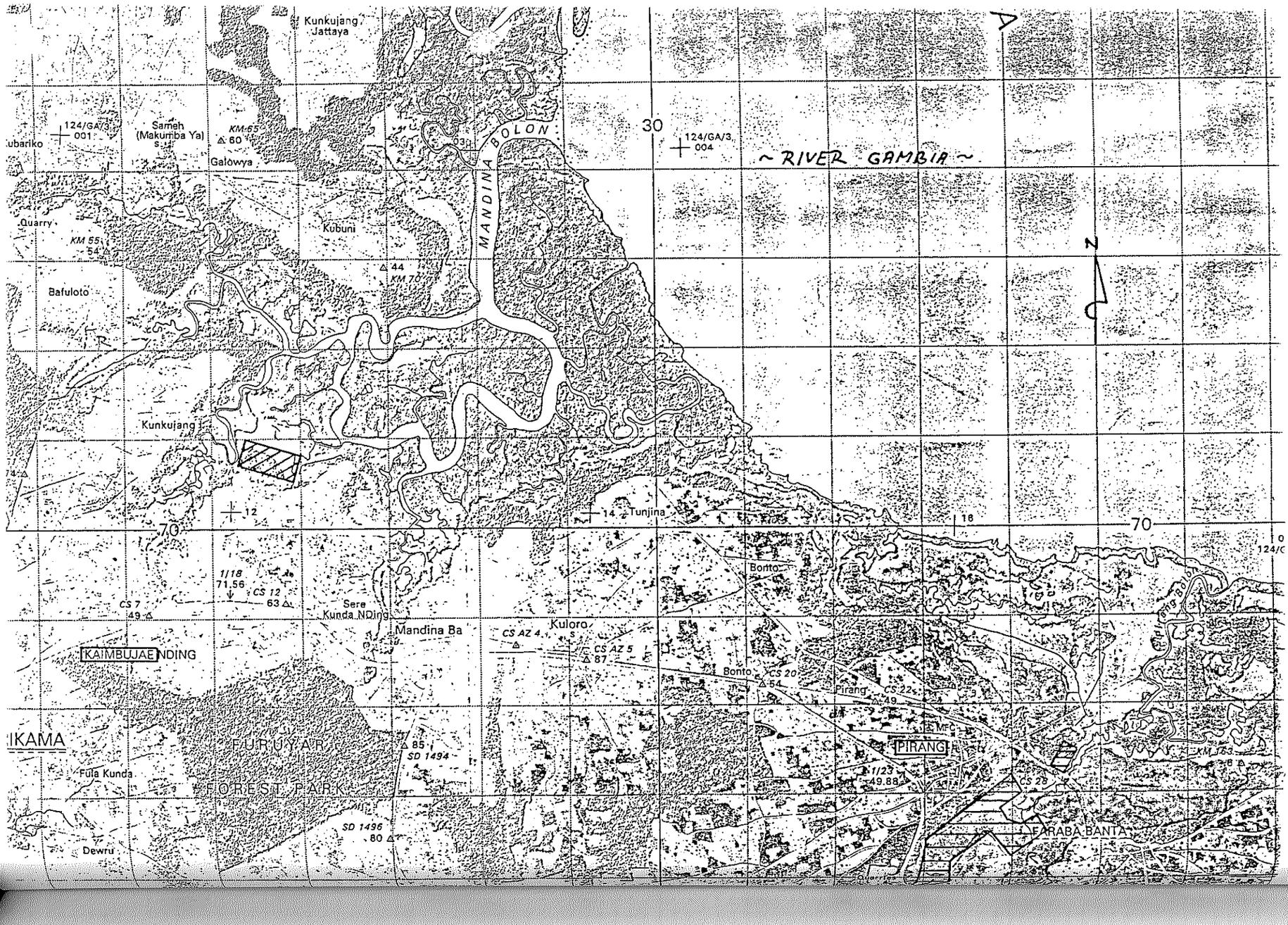
   Construction: blockwork on a casted reinforced concrete slab provided with wooden doors and/or stop-boards

Including a short description of the scheme with:

- location
- interventions
- village participation
- performance
- problems/solutions

Project villages from west to east:

1. Kaimbujae
2. Pirang
3. Bulock
4. Kaponga
5. Bajana
6. Brefet
7. Ndemban
8. Kayenga
9. Bwiam Santamba
10. Bwiam
11. Kankuntu
12. Dobong
13. Kayaborr
14. Kalimu
15. Kanwally
16. Bondali Jola


Kunkujang Jattaya
Sameh (Makumba Ya)
Galowya
MANDINA BOLON
~ RIVER GAMBIA ~
Kubuni
Quarry
Bafuloto
Kunkujang
Tunjina
Bonto
Sere Kunda NDing
Mandina Ba
Kuloro
KAIMBUJAE NDING
Pirang
PIRANG
FURUYAR FOREST PARK
Fula Kunda
Dewru
FARABA BANTA

1.

Village name : Kaimbujae/Kombo Central District/Western Div.

Approx. Population : 1900
Rice growing area involved: 20 ha
Village Participation : Excellent, women participate in constr.(majority)

Description	Finished	Quantity	Condition
Anti Salt Dike	June 87	600 m	good
Contour bund	March 88	560 m	good
Single Sluicegate	Febr. 88	2	good

The improved area is situated 2 Km north east of the village; intensively used for rice cultivation in the rainy season and for vegetables, irrigated from shallow hand dug wells in the dry season. Before project intervention a fringe of approx. 100 m was seriously affected by salt intrusion, most likely to continue spoiling more land. Earlier attempts to protect area; remnants of small bund still visible. Failed due to bad design and lack of maintenance.

Excellent participation from villagers, promoted and pushed by former chief. Sluice gate construction delayed. Draining of area in '87 by means of small trench cut through dike. Affected area ploughed before '88 cropping season. Formerly affected and abandoned area for the greater part brought back into cultivation. Satisfactory imponding by contourbund. However should be provided with preferably two spillways. Widely use of the variety 'Peking'. Good yields.

2.

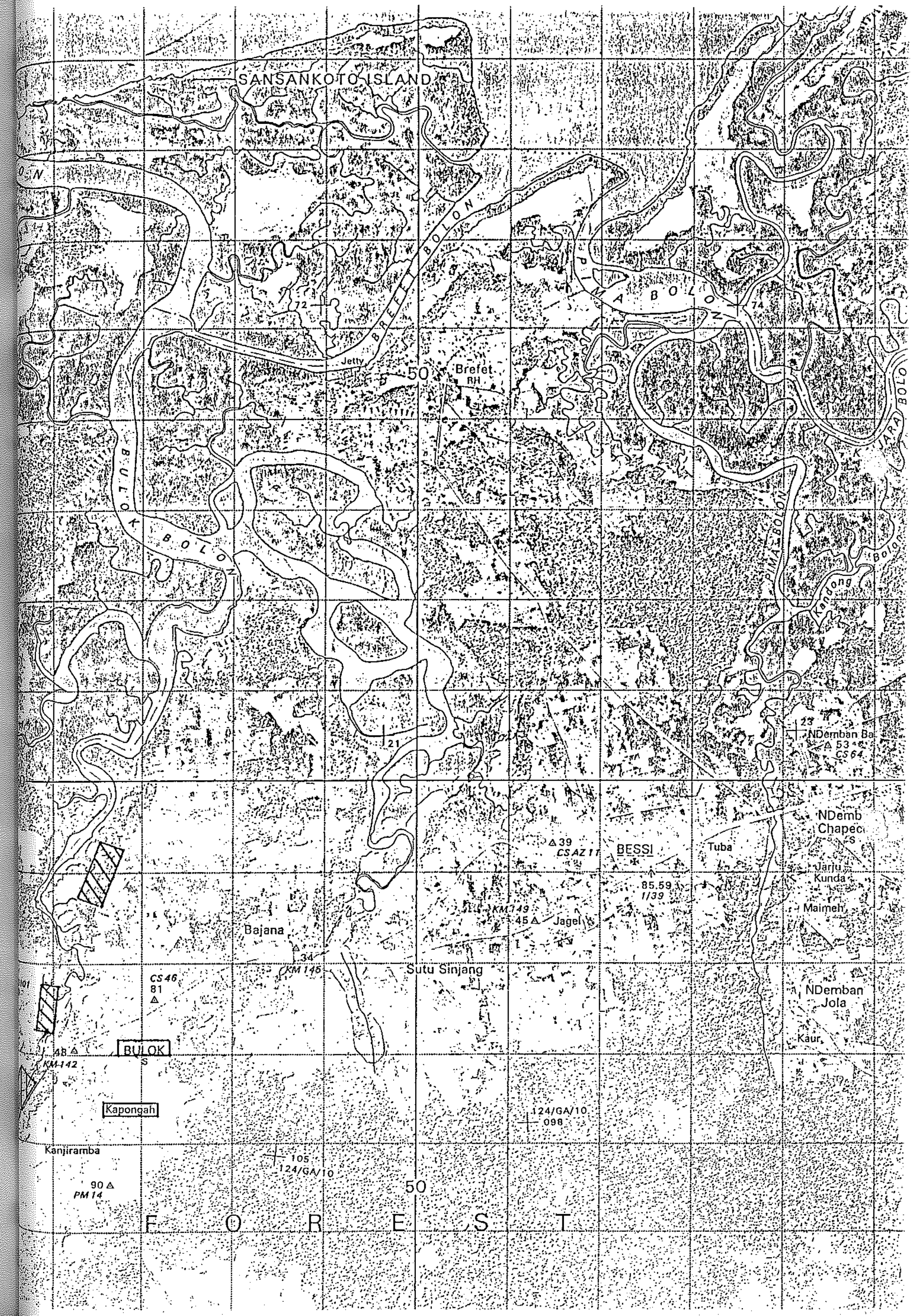
Village name : Pirang/Kombo East District/Western Div.

Approx. Population : 1200
Rice growing area involved: 75 ha
Village Participation : poor, women did not participate in construction

Description	Finished	Quantity	Condition
Anti Salt Dike	Feb 85	775 m	fair
	March 86	200 m	fair
Contour bund		-	
Single Sluicegate		1	good
Spillways/Sluicegate with 4 gates		2	fair

Rice growing area situated 500 m south east of the village. Broad (200/300 m) valley bottom with gullies as main drains. Lower parts affected by salt intrusion. Water retention in upper reaches poor. Valley bottom prolonged flooded, partly due to high groundwater table. Productive rice growing area in rainy season. Vegetable growing on parts with easy access to groundwater during the dry season.

Participation poor; weak village leadership. Construction executed mainly by 'Balantas' from Guinee-Bissau attracted by incentives offered. Maintenance on similar terms. Male population not available due to competative employment in nearby urban centres and at large scale shrimp breeding farm in Pirang. Contour bunds partly destroyed due to lack of spillways, forcefull run-off in gullies and absolute lack of interest among farmers, never rebuilt.


SANSANKOTO ISLAND
BREFET BOLON
PIMA BOLON
JARA BOLO
Jetty
50
Brefet
RH
BULOK BOLON
Kandong Bolo
NDemban Ba
NDemb
Chapec
Tuba
Jarju
Kunda
Maimeh
39
CS AZ 11
BESSI
85.59
1/39
KM 149
45
Jagel
Bajana
34
KM 146
Sutu Sinjang
CS 46
81
NDemban
Jola
Kaur
48
KM 142
BULOK
Kapongah
124/GA/10
098
105
124/GA/10
Kanjiramba
90
PM 14
50
F O R E S T

3.

Village name : Bulock/Foni Brefet District/Western Div.
=======
Approx. Population : 1050
Rice growing area involved: 14 + 6 ha
Village participation : poor, women participate in constr, (50/50)

Description	Finished	Quantity	Condition
Anti Salt Dike	Feb.86	600 m	poor
	March 86	275 m	fair
Contour bund		60 m	fair
Single Sluicegate		2	good

First area situated about 2 Km north of the village. Seriously affected by salt intrusion, poor water retention. Anti salt dike constructed with initially good participation. Problems arised due to fear of land users to loose land to the original owners. Afterwards contineous difficulties to mobilize farmers to participate in constr. and maintenance. Area not used (but suitable) for vegetable growing.

Salt intrusion effectively blocked and excellent water retention. Yields as high as 3.5 t/ha measured (1987). Dike in bad shape due to lack of maintenance. Narrow fringe; contourbunds not necessary. Watermanagement feasible provided good coordination among farmers. Bad experience with one farmer draining total area for land preperation while other fields planted.

Second area (6 ha) protected by single dike; no sluice gate. Area possibly affected by iron toxicity; no cultivation even after prolonged flooding. Good example of construction because of incentive offered. Project interference suspended.

4.

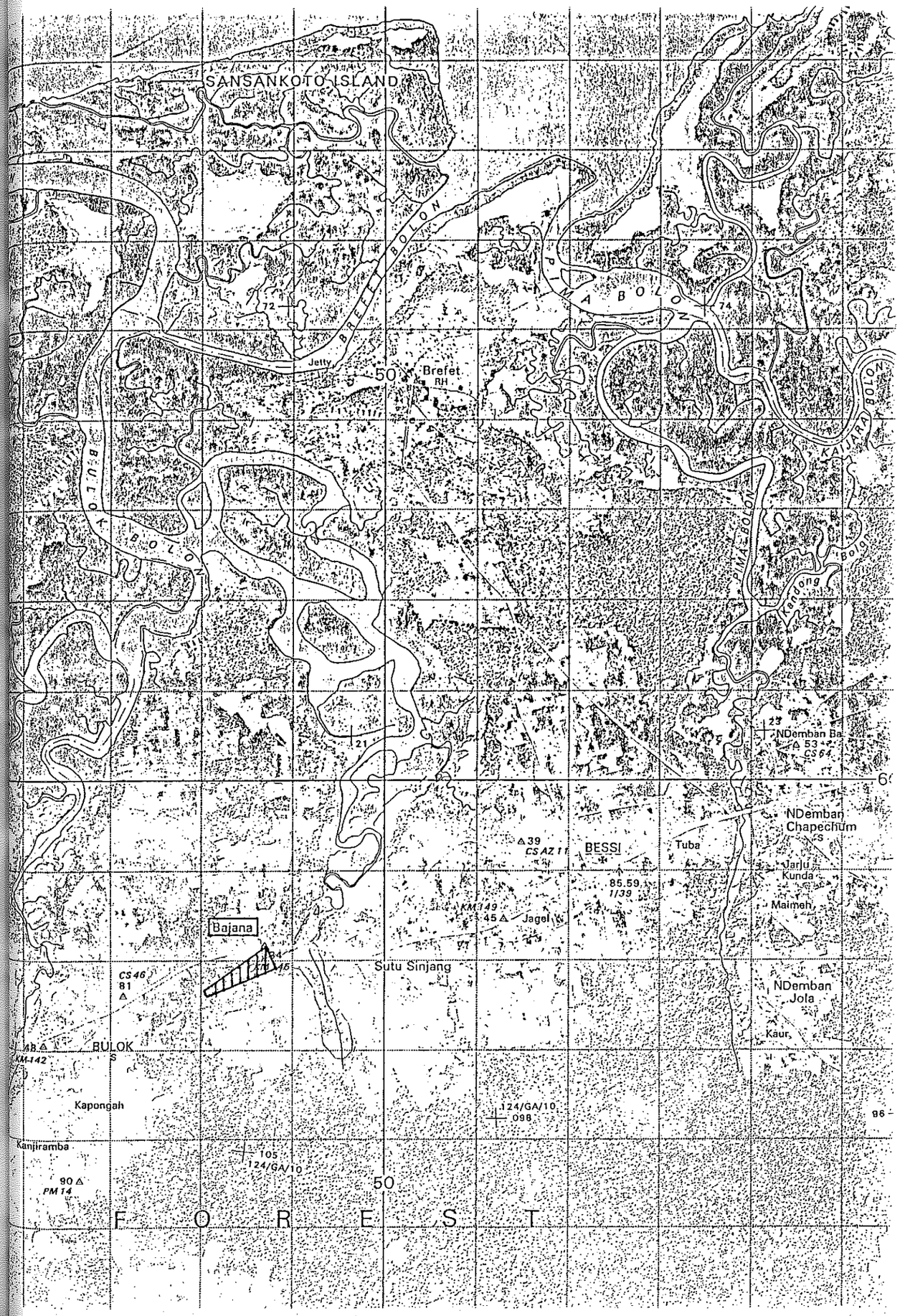
Village name : Kaponga/Foni Brefet District/Western Div.
=======

Approx. Population : 250
Rice growing area involved: 15 ha
Village participation : good, women participate in constr. (50/50)

Description	Finished	Quantity	Condition
Anti Salt Dike		-	
Contour bund	June 86	150 m	good
	April 87	150 m	
Spillways	March	6	good

Area situated in upper reaches of narrow valley approx. 1 Km west of the village. Sandy loam soils with high permeability. Six contourbunds constructed. Reasonable water retention but no prolonged standing water. Area heavily affected by siltation. Good cooperation from village thanks to active contact farmer. Area sparsely used for vegetables.

Initially no spillways. Contourbunds destroyed during '86 rainy season, rebuilt in '87 including spillways. Minor problems afterwards.


SANSANKOTO ISLAND
BREFET BOLON
PIMA BOLO
KAJARA BOLON
PIMA BOLON
BULOK BOLON
Tendong Bolon
Jetty
Brefet
RH
50
72
74
21
23
NDemban Ba
△53
CS64
NDemban
Chapechum
CS
△39
CS AZ 11
BESSI
Tuba
Jarju
Kunda
85.59
1/39
Maimeh
KM149
45△
Jagel
Bajana
CS46
81
△
Sutu Sinjang
NDemban
Jola
Kaur
48△
BULOK
S
KM142
Kapongah
124/GA/10
098
96
Kanjiramba
105
124/GA/10
90△
PM14
50
FOREST

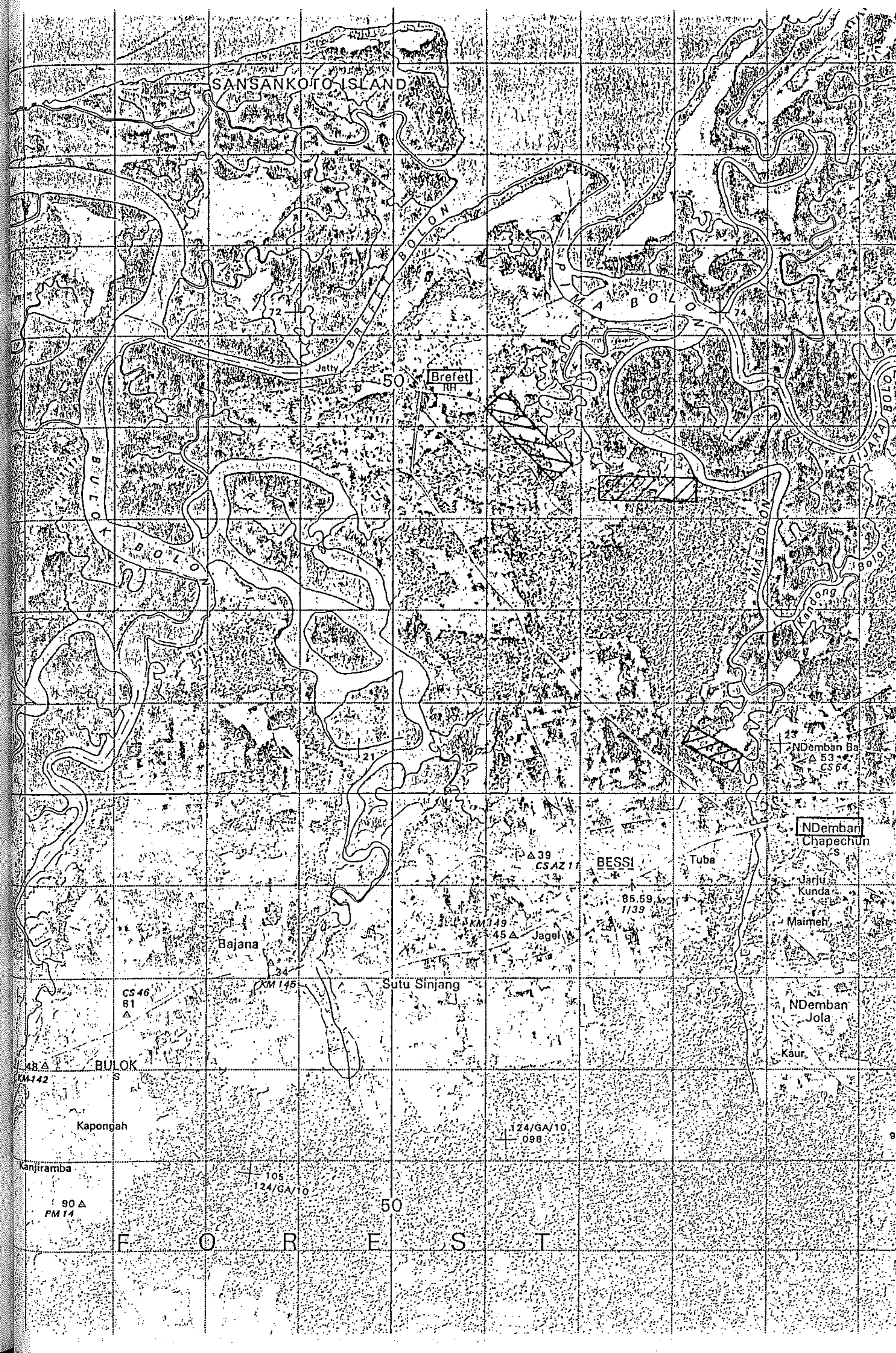
5.

Village name : Bajana/Foni Brefet District/Western Div.
=======

Approx. Population : 450
Rice growing area involved: 10 ha
Village participation : fair, women did not participate in construction

Description	Finished	Quantity	Condition
Anti Salt Dike		-	
Contour bund	June 86	830 m	good/fair
Spillways		7	good

Area situated in narrow valley 150 m south of the village. Getting wider and flatter towards the river. No salt intrusion; tidal flow blocked by main road. Heavy loss of run-off due to steep gradient of valley bottom. Contourbunds in lower part cause excellent water retention. Water level actively managed by stopboards in gate. Excellent yields with local, transplanted varieties; over 4 t/ha. Bunds in upper reaches of valley suffer from forcefull peak flows. Repeated bund ruptures. Additional spillway in upper most bund solved problem for that bund. Valley clearly too narrow for water retention structures because of concentrated, forcefull peak flows.



SANSANKOTO ISLAND
BREFET BOLON
PIMA BOLON
BULOK BOLON
KAIJARA BOLON
Kandong Bolon
72
74
Jetty
50
Brefet
RH
21
NDemban Ba
53
CS 64
60
NDemban
Chapechun
39
CS AZ 1
BESSI
Tuba
Jarju Kunda
85.59
I/39
Maimeh
KM 149
45
Jagel
Bajana
34
KM 145
Sutu Sinjang
CS 46
81
NDemban Jola
Kaur
48
KM 142
BULOK
S
Kapongah
124/GA/10
098
96
Kanjiramba
105
124/GA/10
90
PM 14
50
F O R E S T

6.

Village name : Brefet/Foni Brefet District/Western Div.

Approx. Population : 375
Rice growing area involved: 45 ha
Village participation : excellent, women participate in constr.(majority)

Description	Finished	Quantity	Condition
Anti Salt Dike	May 87	900 m	good
	April 88	775 m	good
Contour bund		250 m	fair
Single Sluicegate		3	good
Spillway/Sluicegate with 1 gates	March 88	2	good
Spillway	March 88	1	good

Two seperate areas situated 1 and 2 Km east from the village respectively. Areas solely used for rice cultivation; sandy clay soils on rather flat alluvial/colluvial soils. Salt intrusion and poor water retention indicated as initial problems. Anti salt dike effectively blocks tidal intrusion and retains fresh water on a approx 150 m wide fringe up to contourbund. Prolonged impoding; excellent conditions for transplanted 120 days varieties. S.C variety 'Peking' yielded over 3 t/ha. Most successfull scheme thanks to excellent village participation and full commitment.

Second area abandoned for more than 10 years due to salt intrusion. Despite doubt about timely leaching project executed. Construction of single dike and two sluice gates. Sufficient rainfall in 1988 to allow flushing the area three times before transplanting; soil salinity sufficiently decreased. Capacity of gate insufficient to allow timely draining run-off of three haevy storms (between 75 and 125 mm) within 3 successive days; single door sluice gate washed away followed by salt intrusion and loss of crop.

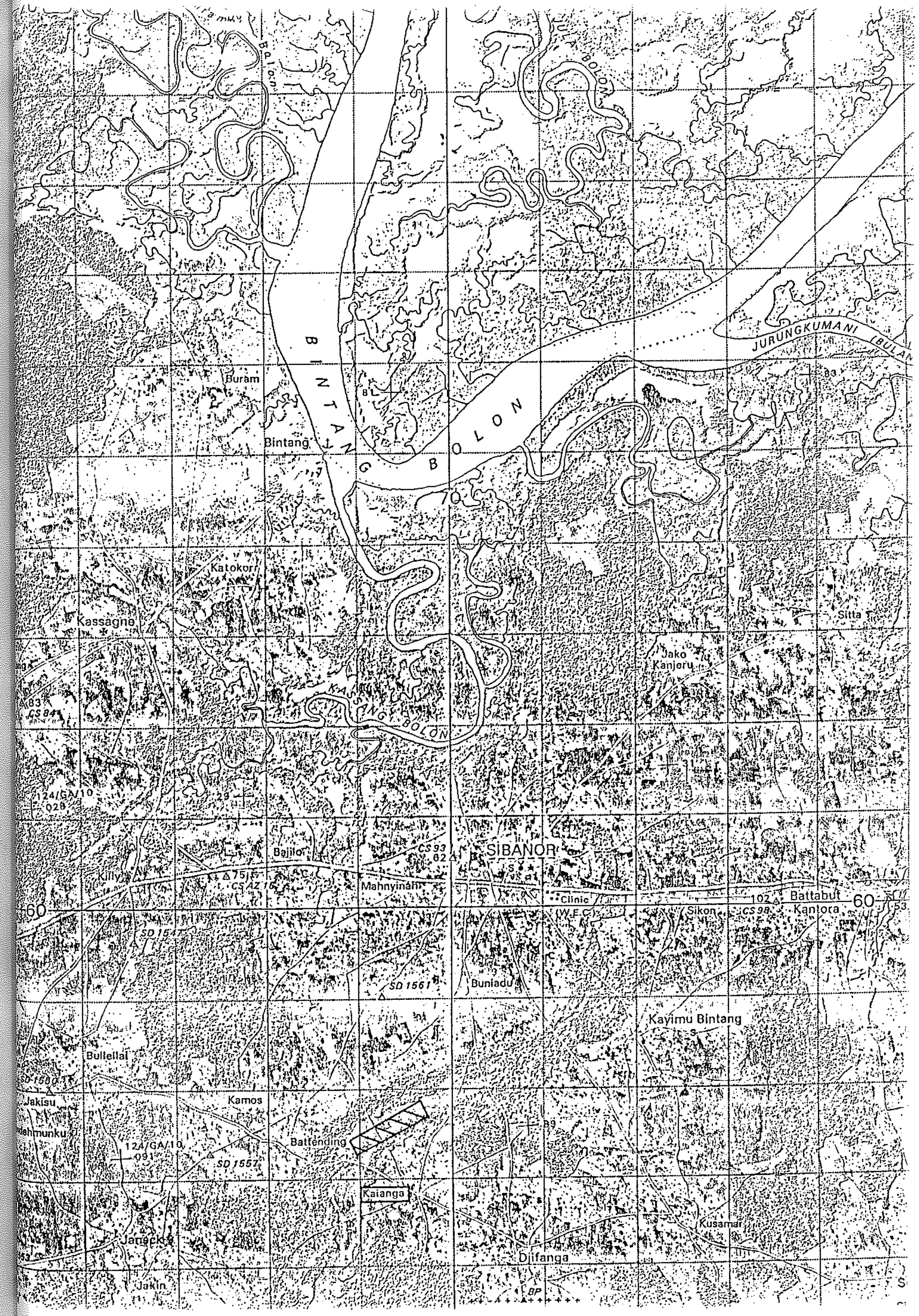
7.

Village name : Ndemban/Foni Brefet District/Western Div.

Approx. Population : 310
Rice growing area involved: 15 ha
Village participation : Fair, women participate in construction (50/50)

Description	Finished	Quantity	Condition
Anti Salt Dike	Feb 86	775 m	good
Contour bund		-	
Spillway/Sluicegate with 1 gates	April 88	1	good

Area situated 1 Km nort west of the village, bordering upland. Salt affected with poor water retention. No vegetable gardening during the dry season. Construction of single dike initially without sluice gate. Sluice gate/spillway combination constructed in '88. Participation reasonable. Area affected by heavy flooding in 1988 causing dike rupture; additional spillway(s) necessary.

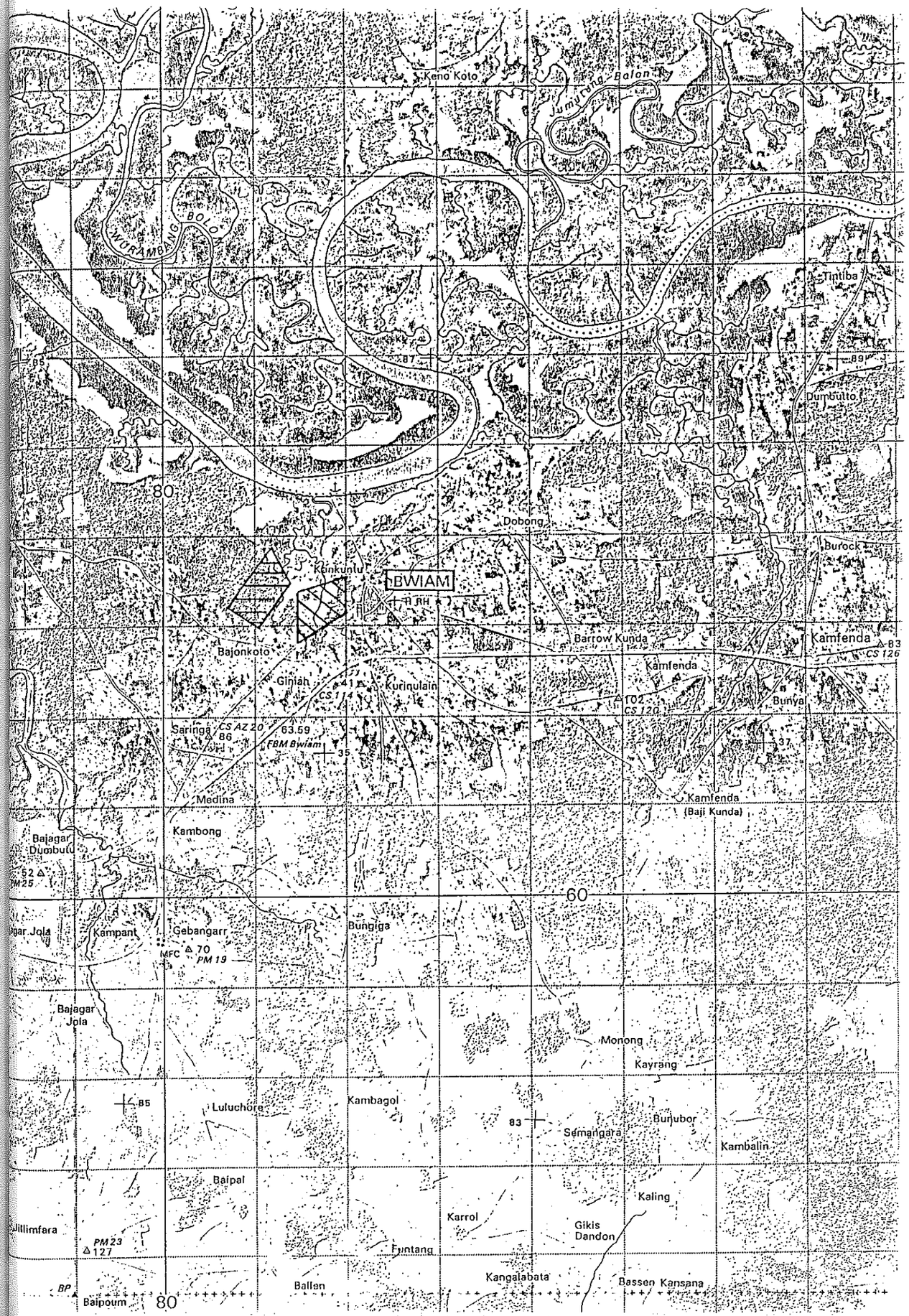


BINTANG BOLON
JURUNGKUMANI
Buram
Bintang
Katokor
Kassagne
Jako
Kanjoru
Sitta
SIBANOR
Bajilo
Killy
Clinic
Battabut
Kantora
Sikon
W.F.C
Bunladu
Kayimu Bintang
Bullellai
Jakisu
Kamos
Battending
Kaianga
Kusamar
Djifanga
Jakin

Village name : Kayenga/Foni Karanai District/Western Div.
=======
Approx. Population : 150
Rice growing area involved: 10 ha
Village participation : good, women participate in constr. (minority)

Description	Finished	Quantity	Condition
Anti Salt Dike		-	
Contour bund	May 86	680 m	good

Area situated 1 Km north of the village on the upper most reaches of a valley eventually draining into the Casamance, Senegal. Sandy loam soils with poor water retention. Area practically abandoned due to wide spread water stress and lack of adapted varieties. Contourbund construction to induce water retention and forced seepage to improve soil moisture conditions. Introduction of S.C. variety ('Peking'). Total cultivated area in 86 was approx 8 ha; a 400% increase to the estimated 1.5 ha in foregoing years. Due to local dry pocket in rainfall distribution area suffered from water stress consequently discouraging farmers to plant same area. 1987 showed good yields. In 1988 about 10 hectares was cultivated again with encouraging results. With estimated 1200 mm of rain crop performance is good. Entire area planted with short cycle variety. Yields reasonable; around 1.5 t/ha.
Contourbunds, for two seasons unaffected without spillways are in need of simple drop structures to avoid damage during extreme peak flows as experienced in 1988 with a yearly total well above 1200 mm.


Keno Koto
Jumurena Balon
WURAMBANG BOLON
Tintiba
Dumbutto
80
Dobong
Burock
Kinkunlu
BWIAM
Barrow Kunda
Kamfenda
Bajonkoto
Ginjah
Kurinjulain
Bunyal
Saringa
Medina
Kambong
Kamfenda
(Baji Kunda)
Bajagar Dumbutu
60
Kampant
Gebangarr
Bungiga
Bajagar Jola
Monong
Kayrang
Luluchore
Kambagol
Burjubor
Semangara
Kambalin
Baipal
Kaling
Karrol
Gikis Dandon
Funtang
Kangalabata
Bassen Kansana
Ballen
Baipoum
80

9.

Village name : Bwiam Santamba/Foni Kansala District/W.Div.
==========

Approx. Population : 180
Rice growing area involved: 15 ha
Village participation : good, women participate in constr. (minority)

Description	Finished	Quantity	Condition
Anti Salt Dike rebuilt	March 85 March 87	450 m	good
Contour bund	May 87	420 m	fair
Double Sluicegate		1	good
Spillway		4	good

Area cultivated by farmers from minor settlements west of Bwiam, referred to as Bwiam Santamba, situated 1.5 Km west of Bwiam. Rice fields initially affected by salt intrusion and suffering from poor water retention. Construction of one anti salt dike with good participation of the farmers. Dike was heavily damaged in August 86 when the heaviest storm in living memeory hit the area. Dike only rebuilt in 87 together with 4 additional contourbunds. Provision of double sluice gate and 4 spillways. Water retention by dike and bunds excellent. Satisfactory production in 1987 and 1988. Increase in Production by using 120 days varieties in permanent flooded zones. Reasonable commitment from farmers concerning maintenance. Good prospects for successfull project.

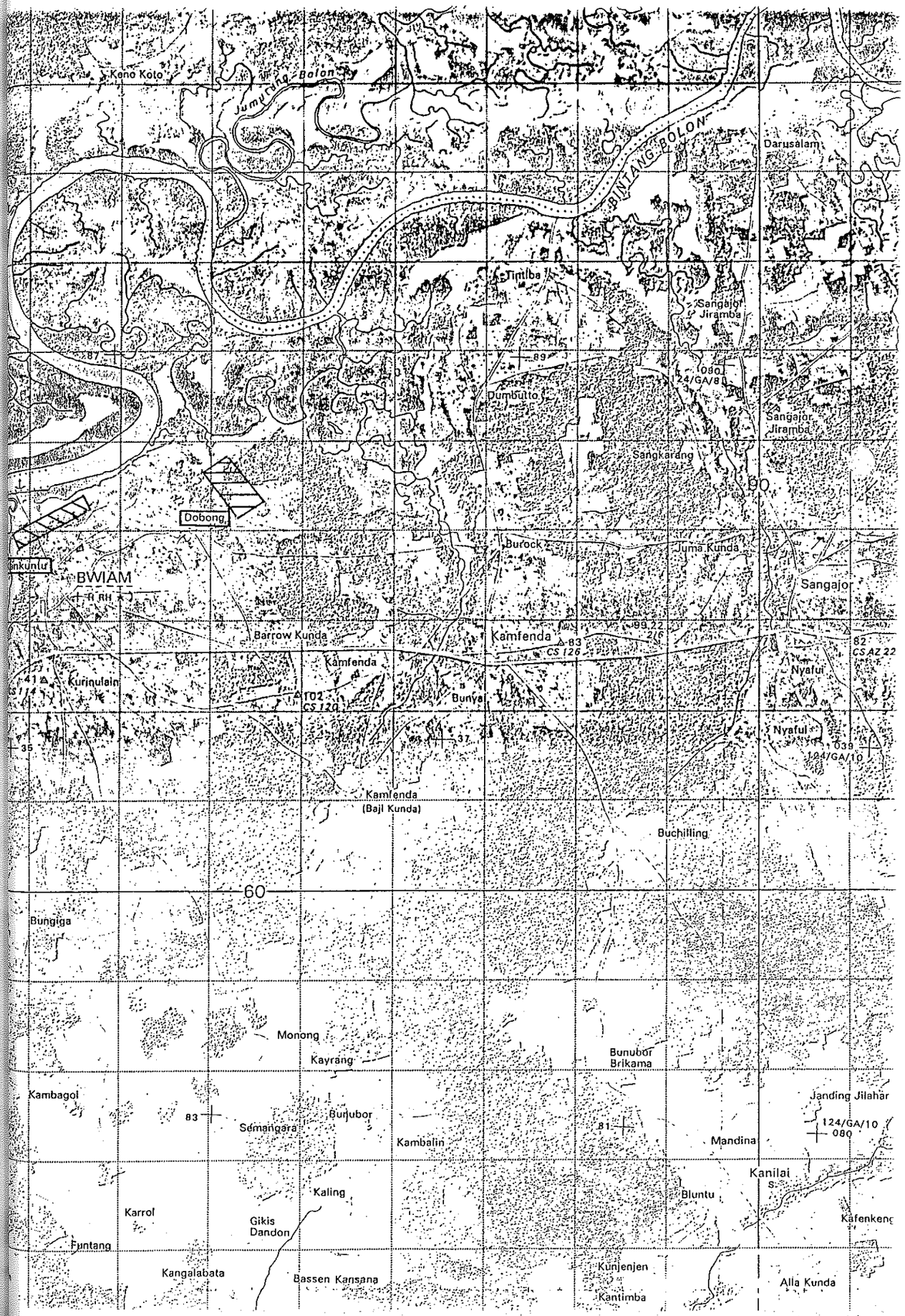
10.

Village name : Bwiam/Foni Kansalla District/Western Div.
=====

Approx. Population : 1700
Rice growing area involved: 20 ha
Village participation : poor

Description	Finished	Quantity	Condition
Anti Salt Dike rebuilt	March 85 May 87	200 m	good
Contour bund		-	
Spillway/Sluicegate Combination with 3 gates		1	good

Situated 200 m west of the village; flat productive rice growing area, sparsely used for vegetables. Seriously affected by salt intrusion. Anti salt dike with sluice gate with three doors not able to withstand peak flow after heaviest rainfall in living memory in August 86. Discouraging experience. Farmers afterwards difficult to motivate for repair and maintenance work. Misty village leadership and internal division among villagers caused problematic continuation of project. Because of dissapointing cooperation project refrained from rebuilding destroyed contourbunds. Dike still not satisfactory repaired; repeated ruptures despite increased spill-over capacity. Nonetheless, area with high potential with skilled farmers. High yielding plots, even with local varieties.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Jumurang Bolan
BINTANG BOLON
Darusalam
Tintiba
Sangajor Jiramba
Odo 24/GA/8
Dumbutto
Sangajor Jiramba
Sangkarang
Dobong
Burock
Juma Kunda
Sangajo
BWIAM
Barrow Kunda
Kamfenda
Kamfenda CS 126
Nyafui
Kurinulain
Kamfenda CS 120
Bunya
Nyafui 124/GA/10
Kamfenda (Baji Kunda)
Buchilling
Bungiga
Monong
Kayrang
Bunubor Brikama
Janding Jilahar
Kambagol
Semangara
Burubor
Kambalin
Mandina
Kanilai
Bluntu
Karrol
Gikis Dandon
Kaling
Funtang
Kangalabata
Bassen Kansana
Kunjenjen
Kantimba
Alla Kunda

11.

Village name : Kankuntu/Foni Kansala District/Western Div.
=========

Approx. Population : 400
Rice growing area involved: 30 ha
Village participation : poor

Description	Finished	Quantity	Condition
Anti Salt dike	85,86 and 88	725 m	fair
Contour bund		-	

Area situated 300 m north of the village. Promising rice growing area unfortunately seriously affected by salt intrusion. Dike construction started encouraging but was soon left to a few individuals without any cooperation from the villagers. Construction of dike was stopped after completion of 400 m due to discouraging participation. Despite the construction of an additional 325 metres in '86 and '88 but only after considerable efforts from project staff to convince village leadership to improve the rate of participation, project management decided to refrain from any additional interventions in Kankuntu.

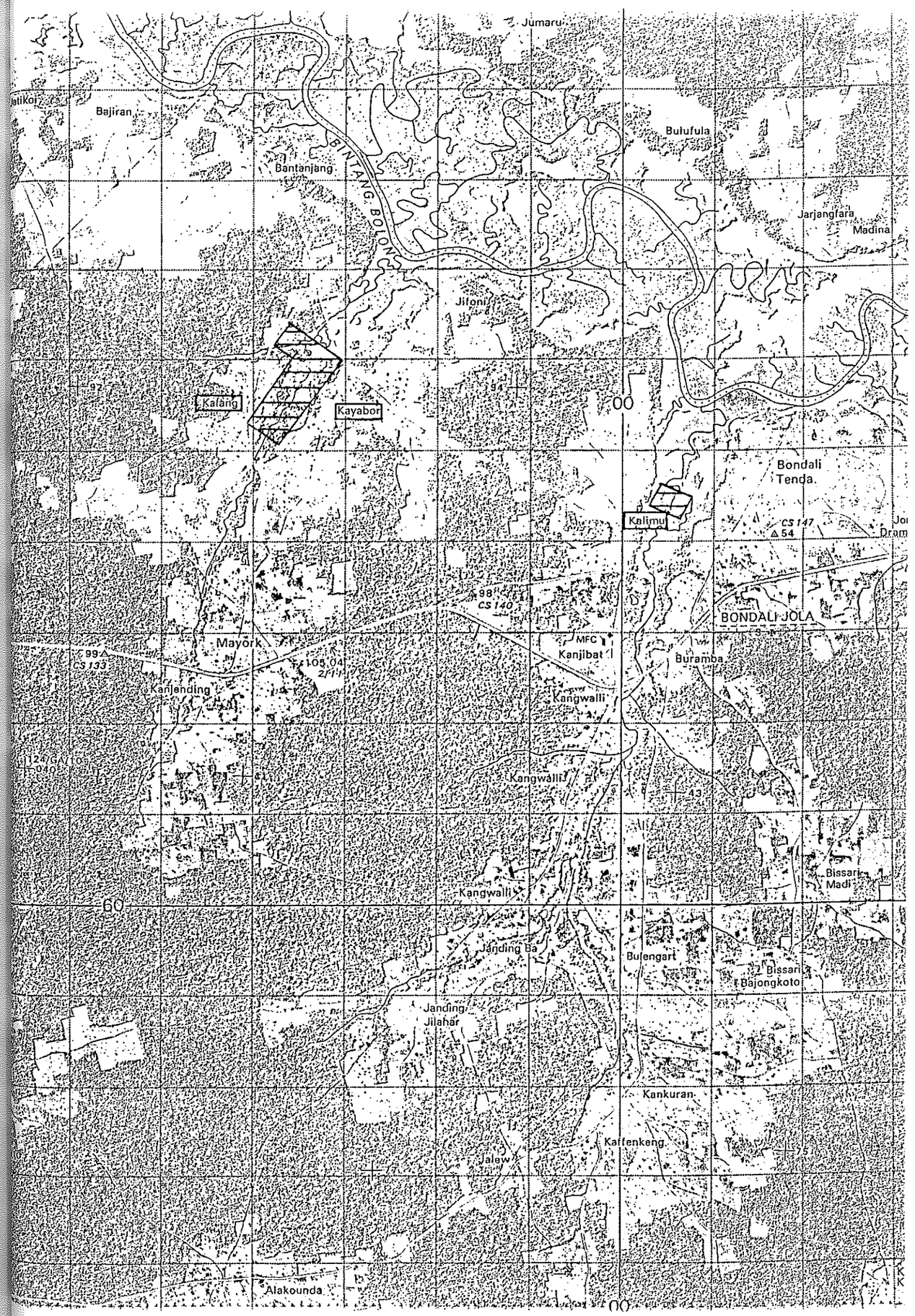
12.

Village name : Dobong/Foni Kansala District/Western Div.
======

Approx. Population : 300
Rice growing area involved: 15 ha
Village participation : good, women participate during construction

Description	Finished	Quantity	Condition
Anti Salt Dike	April 88	250 m	good
Contour bund		-	
Spillway/Sluicegate Combination with 1 gates		1	good

Rice growing area situated 200 m nort east of the village on rather wide and flat valley bottom. Not used for vegetable production. Lower fringe affected by salt intrusion; upper reaches with poor water retention. Dike construction completed with satisfactory participation. Provision of sluice gate/spillway combination. No major problems during 1988 rainy season. Area with high potential with high yields. Sufficient imponding to allow 120 days transplanted varieties.


Jumaru
Bajiran
Bantanjang
BINTANG BOLONG
Bulufula
Jarjangfara
Madina
Jifoni
Kalang
Kayabor
Bondali
Tenda.
Kalimu
CS 147
△54
98
CS 140
BONDALI JOLA
Mayork
99△
CS 133
Log 04
MFC
Kanjibat
Buramba
Kanjending
Kangwalli
Kangwalli
Kangwalli
Bissari
Madi
Janding Ba
Bulengart
Bissari
Bajongkoto
Janding
Jilahar
Kankuran
Kaffenkeng
Jalew
Alakounda

13.

Village name : Kayaborr/Foni Bondali District/Western Div.
========

Approx. Population : 200
Rice growing area involved: 40 ha
Village participation : fair/poor, women participate in constr.(minority)

Description	Finished	Quantity	Condition
Anti Salt Dike	May 86	350 m	fair
Contour bund	June 86	540 m	good
Double Sluicegate		1	good
Spillway		8	good

Rice growing area situated in narrow valley 400 m west of the village and shared with the village Kalang further east. Project referred to as Kayaborr. Lower reaches protected by a dike constructed in 1983 under auspice of the Aereal Council. However, this structure imponds extremely saline and acid and unproduvtive soils. To make better use of imponded surface run-off a dike was constructed at the fringe of the non-affected area, provided with a double sluice gate. 3 contourbunds constructed in 86, initially without spillways were damaged by peak flows and therefore provided with drop spillways in 1987 together with 5 additional bunds and spillways in the upper reaches. Village participation was good in the beginning but faded away. Complicated village leadership parting the village and social commitments resulted in poor maintenace and reluctancy in participation.

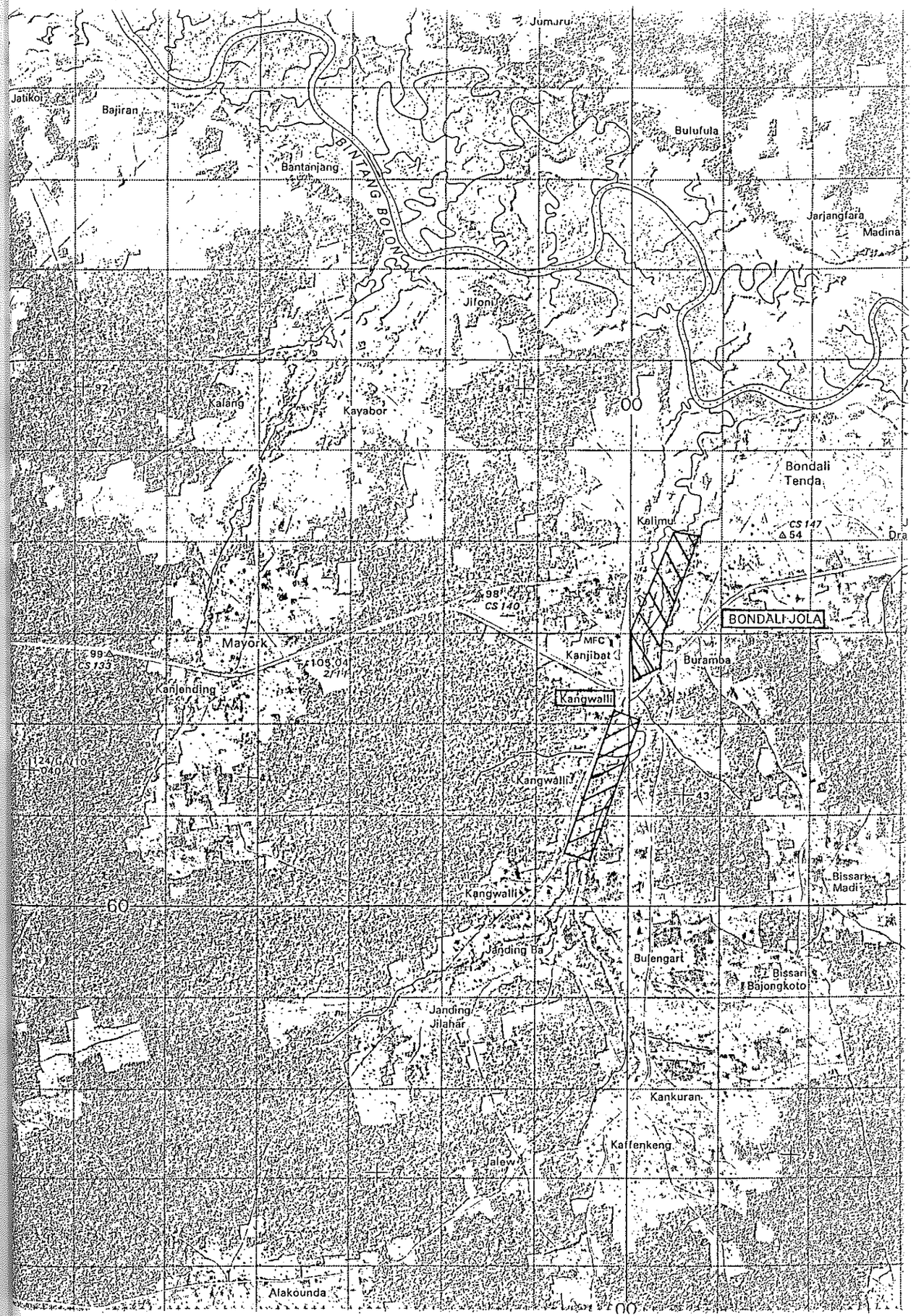
14.

Village name : Kalimu/Foni Bondali District/Western Div.
======

Approx. Population : 150
Rice growing area involved: 8 ha
Village participation : fair, women did not participate

Description	Finished	Quantity	Condition
Anti Salt Dike	Jan 85	575 m	good
Contour bund		-	
Single Sluicegate		1	poor

Small area bordering the upland 200 m north east of the village. Not used for vegetable production. Area initially affected by salt intrusion and suffering rapid depletion of imponded surface run-off. Protection by single dike provided with one sluice gate. Effectively imponding the lower part of the area for a prolonged period. Siutable for high yielding transplanted varieties. Highly skilled rice farmers. Widely use of animal drawn seeder and only project village using the sickle for harvesting. No contourbunds constructed. Sluice gate needs major overhaul. Village commitment has slightly faded away over the years but still sufficient to count on.


Jumuru
Jatikoi
Bajiran
Bantanjang
BINTANG BOLONG
Bulufula
Jarjangfara
Madina
Jifoni
Kalang
Kayabor
Bondali
Tenda
Kalimul
CS 147
Dra
98
CS 140
BONDALI-JOLA
Mayork
MFC
Kanjibat
Buramba
99
CS 133
Kanjending
105.04
Kangwalli
Kangwalli
Kangwalli
Bissari
Madi
60
Janding Ba
Bulengart
Bissari
Bajongkoto
Janding
Jilahar
Kankuran
Kaffenkeng
Jalew
Alakounda

15.

Village name : Kanwally/Foni Bondali District/Western Div.

Approx. Population : 300
Rice growing area involved: 20 ha
Village participation : good, women participate in constr. (50/50)

Description	Finished	Quantity	Condition
Anti Salt Dike		-	
Contour bund	June 88	830 m	good
Spillway		6	under constr.

Productive area situated south east of the village in the middle reach of an extended narrow valley. Contourbund construction with satisfactory participation from villagers. Spillway construction suspended due to sudden leave of construction supervisor. Experience gained during 1988 season not yet available

16.

Village name : Bondali Jola/Foni Bondali District/W. Div.

Approx. Population : 650
Rice growing area involved: 25 ha
Village participation : from good to poor, women participate (majority)

Description	Finished	Quantity	Condition
Anti Salt Dike	Dec 84	350 m	good/poor
Contour bund	April 85	680 m	poor
Single Sluicegate		3	fair
Double Sluicegate		1	fair

Area situated 600 m west of the village, shared with farmers from Kanjibat and Santamba to the east. Productive area with a high potential when improvements. First project initiated. Lack of experience resulted in poor lay-out of anti salt dikes; this has been adjusted before the cropping seasons of 1987 and 1988. Dikes suffered from insufficient maintenance and were overtopped regulary. Capacity of sluice gate, draining the main area should be increased with a drop spillway. Contourbunds were never provided with spillways; instead farmers made simple outlets with mud. Main drainage way (gully) should be provided with solid structures to prevent regular damages to the bunds. Disappointing village participation despite contineous pressure from project staff and involvement of district chief.

ANNEX 6. PROJECT COSTS

GTZ/DWR Rainfed Rice Improvement, Water-Controlled Rice Production

Project Development Costs

Table 6.2 of the main report summarizes the project cost items (given on a per hectare basis) which were used in the economic analysis of GTZ/DWR. This summary is reproduced below and is followed by an explanation of each cost item. The total hectarage developed during the period was 98 ha.

Project Costs
GTZ/DWR

Item No.	Description	Total Cost (D)	Cost per ha (D)
1.	Technical assistance	312,000	3,184
2.	Office costs (supplies)	6,262	64
3.	Staff costs	45,099	460
4.	Vehicles	68,019	694
5.	Tractor	12,448	127
6.	Truck	9,600	98
7.	Fuel	15,164	155
8.	Equipment	21,202	216
9.	Construction material	28,804	253
10.	Village labor	26,950	275
	TOTAL PROJECT COST	541,548	5,526

Explanation of Project Development Cost Items

1. Technical Assistance:

The GTZ technical assistant spent 80% of his time on activities related to water-controlled rice production.

DM 130,000 x 80% = DM 104,000 x D 3.00 = D 312,000

2. Office costs: D 6,262 is a GTZ estimate.

3. Staff costs:

Salaries	=	D 38,379
Allowances	=	11,731
		D 50,110

90% of staff costs attributed to rice-related activities:
D 50,110 x 90% = D 45,099

4. Vehicle Costs:

Two vehicles were used full time on rice-related activities.

Assumptions:-- Cost of one vehicle = D81,000.
-- Life of vehicle is 100,000 km.
-- Depreciation per vehicle = D 0.81/km.
-- Maintenance/spare parts = D 0.50/km.
-- Cost/km without fuel = D 1.31.
-- Mileage/vehicle/year = 25,000 km.
-- Total 4-wheel vehicle cost/year for rice-related activities = D 65,500 (i.e. D 1.31/km x 25,000 km x 2 vehicles)
-- One motorcycle is used full time for rice-related activities: cost/motorcycle = D 7,557.
Life of motorcycle = 3 years.
Total motorcycle cost/year - D D 2,519
-- Summary of total vehicle costs:

4-wheel vehicles	=	D 65,500
Motorcycles	=	2,519
		D 68,019

5. Tractor/trailor:

1 tractor at D 104.000 / 7 years	=	D 14,857/year
1 trailor at D 19,000 / 20 years	=	950/year
		D 15,807
5% maintenance	=	790
	=	D 16,597
75% use per year	=	D 12,448

6. Truck: Borrowed for 24 days/year for 200 km/day
Depreciation -- D 2/km
Total truck cost -- 2 x 200 x 24 = D 9,600

7. Fuel:

For 2 vehicles -- 9.09 km/litre
-- 25,000 km /vehicle/year = 50,000 km
-- 5,500 litres x D 1.47/litre = D 8,085

For motorcycle -- 20 km/litre
-- 10,000 km/year
-- 500 litres x D 1.47/litre = D 735

For tractor and truck -- total estimate = D 6,344

Total fuel cost -- 2 vehicles	=	D 8,085
motorcycle	=	735
tractor/truck	=	6,344
		D15,164

8. Equipment/tools: GTZ estimate = D21,202

9. Construction material: GTZ estimate = D 32,148

10. Village labor:

GTZ did not keep records of total man-days required to develop one hectare. However, D 20,965 were paid out as incentives to laborers to complete the 98 hectares. GTZ estimates that each laborer received approximately D 2/day.

D 20,965 / D 2 = 10,483 man-days / 98 ha = 107 or 110 MD/ha

The opportunity cost of this labor is assumed to be D 2.50/day.
(i.e. 110 MD/ha x D 2.50 x 98 ha = D 26,950)

Alternative Project Cost Structures for GTZ

1.0 -- Total project costs with village labor used in construction valued at its opportunity cost: D 5,526/ha

2.0 -- Total project costs with village labor used in construction costed according to the financial incentives or daily wage actually paid. GTZ paid a total of D 32,148 in incentives:

Cost items 1-9	=	D 5,251/ha
D 32,148 / 98 ha	=	328/ha
		D 5,579/ha

3.0 -- Total project costs less technical assistance costs:
D 5,526 less D 3,184 = D 2,342/ha.

4.0 -- Total project costs less 50% of overhead costs incurred in both development and maintenance:
Assumption: 33% staff costs were direct costs; 66% were indirect.

Project cost items 1,2,3(66%),4,5, and 6 at 50%	=	D 2,237.50/ha
Project cost items 3(33%),7,8,9, and 10 at 100%	=	1,051.50/ha
		D 3,289.00/ha

5.0 -- Total project costs less technical assistance and 50% of overhead costs incurred in development and maintenance:

Total project cost with decreasing overhead	=	D 3,289/ha
Less remaining 50% of technical assistance		1,592/ha
		D 1,697/ha

Maintenance Costs/ha

Project cost items 3,4,5,6, and 7 = D 1534/ha
Year 2 -- D 1534 x 10% = D 153
Year 3 onwards -- D 1534 x 5% = D 77

Maintenance Costs/ha with Decreasing Overhead Costs

Project cost items 3(66%),4,5, and 6 at 50%	=	D 613.50
Project cost items 3(33%) and 7 at 100%	=	307.50
		D 921.00

Year 2 -- D 921 at 10% = D 92
Year 3 and onwards = D 921 at 5% = D 46