Government of the People's Republic of Bangladesh
Bangladesh Water Development Board
Flood Plan Coordination Organisation

FLOOD ACTION PLAN

NORTHEAST REGIONAL WATER MANAGEMENT PROJECT (FAP 6)

FISHERIES SPECIALIST STUDY

Volume 2:

APPENDICES

December 1994

SNC ♦ LAVALIN International
Northwest Hydraulic Consultants

in association with

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Bangladesh Engineering and Technological Services
Institute For Development Education and Action
Nature Conservation Movement

Canadian International Development Agency

COVER PHOTO: A typical village in the deeply flooded area of the Northeast Region. The earthen village platform is constructed to keep the houses above water during the flood season which lasts for five to seven months of the year. The platform is threatened by erosion from wave action; bamboo fencing is used as bank protection but often proves ineffective. The single *hijal* tree in front of the village is a remnant of the past lowland forest that used to cover much of the region. The houses on the platform are squeezed together leaving no space for courtyards, gardens or livestock. Water surrounding the platform is used as a source of drinking water and for waste disposal from the hanging latrines. Life in these crowded villages can become very stressful especially for the women, because of the isolation during the flood season. The only form of transport from the village is by small country boats seen in the picture. The Northeast Regional Water Management Plan aims to improve the quality of life for these people.

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Volume 2: APPENDICES

APPENDIX A

LIST OF FISH SPECIES

APPENDIX A : LIST OF FISH SPECIES

DASYATIDAE, Stingrays
- Himantura fluviatilis SHAKUSH

SYNGNATHIDAE, Pipefishes
- Microphis deocata KUMIRER KHIL
- Doryichthys cuncalus KUMIRER KHIL
- Doryichthys chokderi KUMIRER KHIL

ANGUILLIDAE, Freshwater eels
- Anguilla bengalensis BAMOSH

SYNBRANCHIDAE, Mud eels
- Monopterus cuchia KUCHIA

TETRAODONTIDAE, Puffers
- Tetraodon cutcutia POTKA

BELONIDAE, Needlefishes
- Xenentodon cancila KAIKKA

HEMIRHAMPHIDAE, Halfbeaks
- Hyporhamphus gaimardi EK THUITA
- Dermogenys pussilus EK THUITA

CYPRINODONTIDAE, Killifishes
- Aplocheilus panchax KANPONA

CHANNIDAE, Snakeheads
- Channa striatus SHOL
- Channa marulius GAJAR
- Channa barca TILA SHOL
- Channa punctatus TAKI, LATI
- Channa orientalis GACHUA, CHENG

PSILORHYNCHIDAE, Minnows
- Psilorhynchus sucatio TITARI

CYPRINIDAE, Carps, minnows, rasboras, barbs, suckers

LEUSCISCINAE, Minnows
- Oxygaster gora GHORA CHELA
- Salmostoma argentea CHELA
- Salmostoma phulo FULCHELA
- Salmostoma bacaila KATARI, NARKALICHELA

RASBORINAE, Rasboras
- Esomus danricus DARKINA
- Chela laubuca KASH KHAIRA
- Aspidoparia jaya LAIYA
- Rasbora elanga ALONG
- Rasbora rasbora LEUZZA DARKINA
- Rasbora daniconius DARKINA
- Barilius bola BHOL
- Barilius tileo TILA, TILA KOKSA, PATHARCHATA
- Barilius bendelisis JOIA, HIRALU, TILA, CHEDRA, KOKSA
- Barilius sp indet
- Danio devario BANSPATA, CHEBLI
- Danio rerio ANJU
- Danio aequipinnatus CHEBLI

CYPRININAE, Carps and barbs
- Amblypharyngodon mola MOLA
- Amblypharyngodon microlepis MOLA
- Rohtee cotio CHELA
- Chagunius chagunio JARUA
- Osteochilus neilli
- Labeo gonius GHONIA
- Labeo nandina NANDINA, NANID
- Labeo calbasu KALIBAUS, KALBASU
- Labeo rohita RUI
- Labeo angra ANGROT
- Labeo pangusia GHORA
- Labeo bata BATA
- Labeo dero KURSHA, KATAL KUSHI
- Cirrhinus mrigala MRIGEL
- Cirrhinus reba LASU, LACHO
- Puntius sarana SARPUNTI
- Puntius chola CHALA PUNTI
- Puntius guganio MOLA PUNTI
- Puntius phutunio PHUTANI PUNTI
- Puntius conchonius KANCHAN PUNTI, TAKA PUNTI
- Puntius ticto TIT PUNTI
- Puntius gelius GILI PUNTI
- Puntius sophore JAT PUNTI
- Puntius terio TERI PUNTI
- Puntius cosuatis KOSUATI
- Tor tor MOHASOL
- Tor putitora MOHASHOL
- Catla catla CATLA, KATAL

GARRINAE, Suckers
- Crossocheilus latius KALABATA
- Garra gotyla GHAR POIA
- Garra annandalei

COBITIDAE, Loaches
- Nemachilus botia BALICHATA
- Nemachilus zonalternans
- Nemachilus corica KORICA
- Nemachilus zonatus DARI
- Nemachilus beavani
- Nemachilus sikmaiensis
- Nemachilus savona SAVON KHORKA
- Nemachilus sp indet
- Acanthophthalmus pangia PANGA
- Somileptes gongota PAHARI GUTUM
- Botia dario RANI
- Lepidocephalus guntea GUTUM
- Lepidocephalus irrorata PUIYA
- Lepidocephalus berdmorei PUIYA
- Neoeucirrhichthys maydelli

CLARIIDAE, Walking catfishes
- Clarias batrachus MAGUR

SILURIDAE, Butter catfishes, Freshwater shark
- Wallago attu BOAL
- Ompok bimaculatus KANI PABDA
- Ompok pabda MADHU PABDA

HETEROPNEUSTIDAE, Stinging catfishes
- Heteropneustes fossilis SINGI

OLYRIDAE, Catfishes
- Olyra kempi

CHACIDAE, Catfishes
- Chaca chaca CHEKA

SCHILBEIDAE, Catfishes
- Silonia silondia SHILLONG
- Pangasius pangasius PANGAS
- Ailia coila KAJULI
- Ailiichthys punctata BASPATA, ANULI
- Pseudeutropius atherinoides BATASI
- Eutropiichthys vacha BACHA
- Clupisoma murius MURI BACHA
- Clupisoma garua GHAURA, LAURA

AMBLYCIPITIDAE, Torrent catfishes
- Amblyceps mangois

BAGRIDAE, Catfishes
- Rita rita RITA
- Chandramara chandramara
- Batasio tengana TENGRA
- Aorichthys aor AIR
- Aorichthys seenghala GHAGOT
- Mystus cavasius GULSHA
- Mystus bleekeri TENGRA
- Mystus tengara BAJARI TENGRA
- Mystus vittatus TENGRA
- Mystus armatus

SISORIDAE, Catfishes
- Conta conta
- Glyptothorax telchitta TELI, TELCHITTA
- Pseudecheneis sulcatus
- Gagata viridescens GANG TENGRA
- Gagata youssoufi GANG TENGRA
- Bagarius bagarius BAGHAIR
- Erethistes pussilus KUTAKANTI
- Hara jerdoni KUTAKANTI
- Hara hara KUTAKANTI

NOTOPTERIDAE, Knifefishes
- Notopterus chitala CHITAL
- Notopterus notopterus FOLI, KANGLA

ENGRAULIDAE, Anchovies
- Setipinna phasa PHASA

CLUPEIDAE, Shads, herrings, sradines
- Gudusia chapra CHAPILA
- Hilsa ilisha HILSA, ILISH
- Corica soborna KACHKI
- Gonialosa manminna GONI CHAPILA

MASTACEMBELIDAE, Spiny eels
- Macrognathus aculeatus TARA BAIM
- Mastacembelus armatus BAIM
- Mastacembelus pancalus CHIRKA BAIM

MUGILIDAE, Mullets
- Rhinomugil corsula KHORSULA
- Mugil cascasia BATA

ANABANTIDAE, Climbing perches, gouramies
- Colisa sota BOICHA
- Colisa fasciatus KHAILSHA
- Ctenops nobilis NAFTINI
- Macropodus cupanus
- Anabas testudineus KOI

SCIAENIDAE, Croakers
- Johnius cujus POA

GOBIIDAE, Gobies
- Brachygobius nunus NUNA BAILLA
- Glossogobius giuris BAILLA, BELE

NANDIDAE, Mud perches, leaffishes
- Nandus nandus MENI, BHEDA
- Badis badis NAPIT

AMBASSIDAE, Glassfishes
- Chanda nama CHANDA
- Chanda ranga LAL CHANDA
- Chanda beculis
- Chanda sp indet

Unidentified finfish from the Luba River
- NOWRAJ
- PAKHIRANGA

PRAWNS
- Macrobrachium rosenbergi, GOLDA CHINGRI, BORO ITCHA
- Small prawns ITCHA, CHINGRI

<u>EXOTIC INTRODUCTIONS</u>
- Hypophthalmichthys molitrix SILVER CARP
- Aristichthys nobilis BIGHEAD CARP
- Cyprinus carpio COMMON CARP, CARPIO
- Ctenopharyngodon idellus GRASS CARP
- Mylopharyngodon pisceus BLACK CARP
- Oreochromis mossambicus TILAPIA
- Oreochromis niloticus TILAPIA
- Puntius gonionotus THAI BARB

APPENDIX B

LIST OF JALMOHALS UNDER NEW FISHERIES MANAGEMENT POLICY

APPENDIX B: LIST OF JALMOHALS UNDER NEW FISHERIES MANAGEMENT POLICY

Table B1: Jalmohals Under NFMP, Sunamganj

District: SUNAMGANJ					
Thana	**Jalmohal**	**Area**	**No. of Licenses**	**Total License Fee (Tk) 1991**	**% FEE Realized**
Sadar	Laiya Gazaria	24 ha	160	1,40,360	100
	Shapaardara	5 km	25	30,008	100
	84/8 Surma River	10 km	49	88,330	100
	Kalner Haor	44 ha	138	2,19,615	86
	Mohasingh River	13 km	290	83,160	40
	81/5 Surma River	-	50	45,211	36
	Mora Mohasingh River	-	191	65,591	39
	Digdair Baushi	14 km	40	1,33,233	23
	Utharia River	8 km	117	84,700	NIL
	83/7 Surma River	11 km	66	1,46,410	100
Dherai	Shaytankhali 1st	22 ha	21	12,342	100
	Shaytankhali 2nd	45 ha	38	2,904	100
	Shaytankhali 5th	67 ha	136	73,820	97
	Shoatiar River	48 ha	270	79,618	100
	Kashipur Lairadighi Group A	-	173	1,46,410	75
	Shasha River 1st, 2nd	40 ha	54	65,065	81
	Balibeel, Upper Bali Beel	20 ha	70	53,155	NIL
Sulla	Ghagtia Hoogly PotangaBeel	58 ha	69	68,849	100
	Moragang	23 ha	72	92,565	48
	Shaytankhali 6th	41 ha	104	16,940	86
	Kashipur Lairadighi Group D	54 ha	77	62,956	67
	Kashipur LairadighiGroup C	286 ha	24	2,43,210	17
Jamalganj	Chatidhara group fishery	121 ha	80	2,49,634	100
	Upper part of Jaal Baulai	37 ha	84	31,887	100
	Harinagar Putia River	-	100	36,300	100
	Noya Nadi Laximpur River	-	179	84,700	100
Tahirpur	Tarajan Beel	12 ha	40	20,570	100

District: SUNAMGANJ					
Thana	**Jalmohal**	**Area**	**No. of Licenses**	**Total License Fee (Tk) 1991**	**% FEE Realized**
Jagannathpur	KalakhaliNagdora&Suraya R	130 ha	233	34,000	100
Dharmapasa	Boalia/Mokshedpur dhighor	93 ha	97	56,676	100
	Ubdakhali Gomai River	92 ha	68	16,150	100
Chaatak	Surma River 1st	109 ha	298	1,76,660	58
	Alda River	25 ha	-	10,981	NIL
Dowara	79/2 Surma River	96 ha	526	95,565	100
	Goarai Khal	11 ha	36	5,445	100
	Bondayhori group fishery	61 ha	485	1,40,683	41
	Borochapra choto	24 ha	175	1,48,225	22
SUBTOTAL	36 jalmohals	1,583 ha 61 km	4,635	30,61,928	

Table B2: Jalmohals Under NFMP, Sylhet

District: SYLHET					
Thana	**Jalmohal**	**Area**	**No. of Licenses**	**Total License Fee (Tk) 1991**	**% Fee Realized**
Sadar	6/2 Surma River	121 ha	53	77,000	100
	7 Surma River	47 ha	158	58,300	100
Golapganj	5 Surma River	124 ha	116	38,500	100
Bishwanath.	Bashia River	11 ha	50	16,998	100
	Brahmana River	26 ha	165	14,520	100
Balaganj	Shadipur River	38 ha	37	60,700	100
Kanaighat	Dauchai River	24 ha	59	71,370	100
SUBTOTAL	7 jalmohals	391 ha	638	3,37,388	

Table B3: Jalmohals Under NFMP, Mymensingh

District: MYMENSINGH					
Thana	**Jalmohal**	**Area**	**No. of Licenses**	**Total License Fee (Tk) 1991**	**% Fee Realized**
Sadar	Brahmaputra River	40 km	522	20,937	NIL
	Sreekhalir gang.	10 ha	25	2,750	NIL
Trishal	Brahmaputra River	11 km	135	4,355	73
Gofargaon	Brahmaputra River	3 km	141	4,455	25
Bhaluka	Khiru nadi	16 ha	235	6,442	78
Fulbaria	Borabila Beel	107 ha	175	7,330	56
Fulpur	Kharia nadi	41 km	189	4,840	80
SUBTOTAL	7 jalmohals	133 ha 95 km	1,422	51,109	

Table B4: Jalmohals Under NFMP, Netrokona

District: NETROKONA					
Thana	**Jalmohal**	**Area**	**No. of Licenses**	**Total License Fee (Tk) 1991**	**% Fee Realized**
Purbadhala	Jaria nadi	34 ha	37	5,324	-
	Mora nadi	17 ha	20	3,388	-
	Rajdhala Beel	53 ha	49	51,387	-
Mohanganj	Shapmara khal	16 ha	49	26,015	-
	Cirail Beel	19 ha	62	9,680	-
Kalmakanda	1, Ubda-khaliandHooglaBeel	60 ha	191	80,611	F.S.
Madan	Boyranala nadi	28 ha	73	41,343	-
Durgapur	Kongsha nadi	202 ha	105	48,320	-
SUBTOTAL	8 jalmohals	429 ha	586	2,66,068	

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Table B5: Jalmohals Under NFMP, Kishorganj

District: KISHORGANJ					
Thana	**Jalmohal**	**Area**	**No. of Licenses**	**Total License Fee (Tk) 1991**	**% FEE REAL-IZED**
Kuliarchar	Kalinadi jalmohal	813 ha	338	25,622	F.S.
Kotiadi	Kutir Beel	12 ha	44	4,000	-
Astagram	Karatia kolkolia	247 ha	352	40,059	-
Itna	UjanshimulGouraNadirTook	195 ha	249	2,46,500	-
Tarail	Suti nadi jalmohal	9 ha	64	10,222	-
Mitamoin	Moisharkandi boranpur	127 ha	164	49,624	-
SUBTOTAL	7 jalmohals	1,403 ha	1,211	3,76,027	

Table B6: Jalmohals Under NFMP, Hobiganj

District: HOBIGANJ					
Thana	**Jalmohal**	**Area**	**No. of Licenses**	**Total License Fee (Tk) 1991**	**% Fee Realized**
Sadar	Bari Beel, Ratna nadi	41 ha	299	1,32,868	76
Baniachong	Bhandar Beel	43 ha	133	1,77,157	100
	Firani Beel	11 ha	104	81,917	100
Ajmiriganj	Kalninadi, Gashardohor	99 ha	53	3,93,250	NIL
Nobiganj	Beri Beel	30 ha	214	45,738	NIL
Lakhai	Dhaleswari River 1st part	117 ha	135	75,900	66
SUBTOTAL	6 jalmohals	341 ha	938	9,06,830	

Table B7: Jalmohals Under NFMP, Moulvibazar

District: MOULVIBAZAR					
Thana	**Jalmohal**	**Area**	**No. of Licenses**	**Total License Fee (Tk) 1991**	**% Fee Realized**
	Beri Beel	60 ha	490	1,71,366	97
	KushiyaraRiverparts 1, 2,18	42 ha	187	41,422	100
Sadar	Burburi Beel and gang	34 ha	78	56,900	84
Rajnagar	Kushiyara River part 7	7 ha	31	13,276	100
SUBTOTAL	4 jalmohals	143	786	2,82,964	

APPENDIX C

LIST AND MAPS OF DUARS IN MAJOR RIVERS AND TRIBUTARIES

APPENDIX C: LIST AND MAPS OF DUARS IN MAJOR RIVERS AND TRIBUTARIES

INDEX

C.1 SURMA RIVER AND TRIBUTARIES

C.1.1 SURMA RIVER (Amalshid to Sylhet)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)•	BORO-MAACH	CHOTO-MAACH
Sayadpurar dor	Sayadpur	6-7	LC,MC.	Ch,Ca,P,B
Atgramar dor	Atgram	6-7	As above	As above
Gouripurar dor	Gouripur	8-9	As above	As above
Konar dor	Kanaighat	8-9	As above	As above
Bagar dor	Kanaighat	8-9	As above	As above
Birdholar dor	Birdhalpara	8-9	As above	As above
Astagramar dor	Astagram	8-9	As above	As above

Notes:

• Depth during dry season
* Duars proposed for fish sanctuaries.
** Echo sounding data (all other depths from interviewing with fishermen

B Bacha
Ba Bailla
C Chital
Ca Chapila
Ch Chela
G Golda chingri
L Laso
LC Large catfish
MC Major carp
P Pangas
Pa Pabda
Pu Puti
R Rani
T Tengra

C.1.2 SURMA RIVER (Sylhet to Sunamganj)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)	BORO-MAACH	CHOTO-MAACH
Anantapur	Anantapur	8-9	LC,C,MC	Ch,Ca,P,B
Sharpurar dor	Sharpur	8-9	As above.	As above
Digholir dor*	Digholi	10-11	As above	As above
Shahibpurar dor	Shahibhagar	10-11	As above	As above
Nowar dor	Dighligaon	9-10	As above	As above
Khidirpurar dor	Khidirpur	11-12	As above	As above
Wazirpurar dor	Wazirpur	9-10	As above	As above
Rampurar dor	Rampur	9-10	As above	As above
Perkular dor	Perkul	9-10	As above	As above
Bagairar dor	Pirpur	13	As above	B,Ch,Ca,R
Muktigaor dor**	Tokergaon	16	As above	As above
Boalir dor**	Baulai	12	As above	As above
Thanar dor**	Chatak	17	As above	As above
Baushar dor **	Bausha	18	As above	As above
Baturar dor**	Batura	13	As above	As above
Dowabazarar	Dowabazar	20	As above	As above
dor**	Machimpur	13	As above	As above
Machimpurar	Chandipur	15	As above	As above
dor**	Dwarabazar	26	As above	As above
Pandarmuk**	Sharifpur	12-13	As above	As above
Dwarabazar*,**	Damband	11-12	As above	As above
Sharifpur*	Nurpur	10-11	As above	As above
Damband	Brahmangaon	12-13	As above	As above
Nurpur				
Brahmangaor dor*				

C.1.3 SURMA RIVER (Sunamganj to Jamalganj)

Lalpurarkoor	Lalpur	16-17	LC,C,MC	B,Ch,Ca,R
Ajkhalir dor	Ajkhali	14-15	As above.	As above
Puranlaxmansre	Laxmansree	14-15	As above.	Asabove
Paindar dor	Painda	10-12	As above.	As above
Baburbazar	Babur bazar	12-14	As above.	As above
Amriar dor	Amria	15-16	As above.	As above
Noagaoar duar	Noagaon	15-16	As above.	As above
Jamlabaz*	Jamlabaz	15-16	As above.	As above

C.1.4 OLD SURMA (Sunamganj to Ajmiriganj)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)	BORO-MAACH	CHOTO-MAACH
Jaykalasar dor	Jaykalas	10-11	LC,C,MC	B,Ch,Ca,T
Ghazinagar	Ghazinagar	10-11	As above.	As above
Thakurbogar duar	Thakurbogar	10-11	As above.	As above
Sujanagarar duar	Sujanagar	10-11	As above.	As above
Chandpurar duar	Chandpur	10-11	As above	As above
Chandpurar dor	Chandpur	10-11	As above.	As above
Narsinghpurar duar	Narsinghpur	9-10	As above.	As above
2	Kartikpur	9-10	As above.	As above
Kartikpurar duar	Kator	8-9	LC,MC.	As above
Katorar dor	Katore	7-8	As above	As above
Guchir duar	Ajmiriganj	7-8	LC,C,MC	Ba,B,T,Ca
Bheramonar dor				

C.1.5 BRAHMONI RIVER (Bishwanathpur area)

Motokonar dor	Motokona	4-5	LC,MC,C	Ch,Ca,P
Majorgoar dor	Majargaon	4-5	As above	As above
Khasir dor	Mojlishpur	4-5	LC,MC	As above
Naya dor	Pakhibari	4-5	As above	As above
Gazirmokam	Gazirmokam	4-5	As above	As above
Kaligangar dor	Kaliganga	4-5	As above	As above

C.1.6 LUBHA RIVER (Laxmiprashad to Bangladesh boarder)

Kukubarir dor	Laxmiprasad	12-14	LC,MC,C	Ch,Ca,P,T
Baganar dor	Forestoffice	12-14	As above	As above
Bagbarir dor	Forest	15-16	As above	As above
Barar dor	Galachipa	27-30	As above	As above
Mainrir dor	Boarder	27-30	As above	As above

C.1.7 SHARI-GOYAIN RIVER (Bangladesh boarder to Perkul via Goyainghat)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)	BORO-MAACH	CHOTO-MAACH
Telanji*	Boarder	25-26	LC,MC,C	B,Ch,Ca,R
Jalmarar dor*	Lala khal	23-24	As above	As above
Bhukta*	Lamapara	15-16	As above	As above
Nayakhal	Nayakhel	9-10	LC,C,MC	As above
Kakunkhair dor	Kakunkhai	6-7	As above	As above
Hatir dor	Berakhai	6-7	As above	As above
Budhigaon	Budhigaon	6-7	As above	As above
Boalir dor	Titkuli	6-7	As above	As above
Gatur dor	Birbirighat	9-10	As above	As above
Noanagar	Noanagar	9-10	LC,MC,C	As above
Nogrir dor*	Goyainghat	6-7	LC,C,MC	As above
Gonkir dor	Bagail beel	5-6	LC,MC	As above
Nihain dor	Nihain	6-7	As above	As above
Laxminagar	Laxminagar	6-7	As above	As above
Gatur dor	Siyala beel	6-7	As above	As above
Chaltabarir dor	Chaltabari	6-7	As above	As above
Kumarpara	Kumarpara	6-7	As above	As above
Tokargaon	Tokarpara	6-7	As above	As above
Paglar dor	Shalutikar	6-7	As above	As above
Shalutikar	Shalutikar	7-8	As above	As above
Ulur dor	Nayatila	6-7	As above	As above
Pirgaor dor	Pirgaon	6-8	As above	As above
Chamurar dor	Chamura	7-8	As above	As above
Bandhaghatar dor	Bandhaghat	6-7	As above	As above
Rajagaor dor	Rajagaon	6-7	As above	As above
Nawagaor dor	Nawagaon	8-9	LC,MC,C	As above
Dhumkhalar dor*	Zilkar haor	8-9	LC,MC	As above
Lalpurar dor	Lalpur	6-8	As above	As above

C.1.8 Maha Singh River (Dabar to Markuli)

Bue beelar dor	Bue beel	9-10	C,LC,MC	B,L,Ca,Ch.
Birgaor duar	Birgaon	9-10	LC,C,MC	As above.
Bogdobar dor	Bogadoba beel	8-9	MC,LC,C	As above.

C.1.9 ABBUA AND RAKTI RIVER (Tahirpur and Jamalganj)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)	BORO-MAACH	CHOTO-MAACH
Fatepuar dor	Fatepur	16-17	LC,C,MC.	B,R,Ca,L
Behilir dor	Behili-Alipur	9-10	C,LC,MC.	As above.
Batanar dor	Alipur	10-12	LC,C,MC.	As above.
Badarpurar	Badarpur	8-9	As above.	As above.
dorChamrarbari	Chandpur	8-9	As above.	As above.
Barakurir duar	Barakuri	8-9	As above.	As above.
Ahmakkhalirdor*,**	Morala	14-15	As above.	As above.
Sripurar dor	Sripur	7-8	As above.	As above.
Dhutoma	Dhutoma	6-7	As above.	As above.
Fazilpurardor	Fazilpur	10-11	As above.	As above.
Anwarpurardor	Anwarpur	7-8	As above.	As above.
Alipurar dor	Alipur	7-8	As above.	As above.
Lamar dor	Bahadurpur	7-8	As above.	As above.
Atlar dor	Bahadurpur	8-9	As above.	As above.

C.1.10 GHASIA AND PATNAI GANG (Tangua Haor area, Tahirpur)

Alam duar*	Tangua haor	16-17	C,LC,MC	B,L,Ca,Ch.
Joypurar duar	Tangua haor	14-15	LC,C,MC	As above.
Rupa beelar dor*	Tangua haor	12-13	MC,LC,C	As above.
Tangua beelar dor	Tangua haor	12-13	As above.	As above.
Berberia*	Berbaria	12-13	As above.	As above.
Keshabpur	Keshabpur	10-11	LC,MC,C	As above.
Mamudpur	Mamudpur	10-11	As above.	As above.
Ramsinghpur	Ramsinghpur	10-11	As above	As above.
Garwakhla	Garwakhla	10-11	As above.	As above.
Jamlabad	Jamlabad	10-11	As above.	As above.

Figure C-1

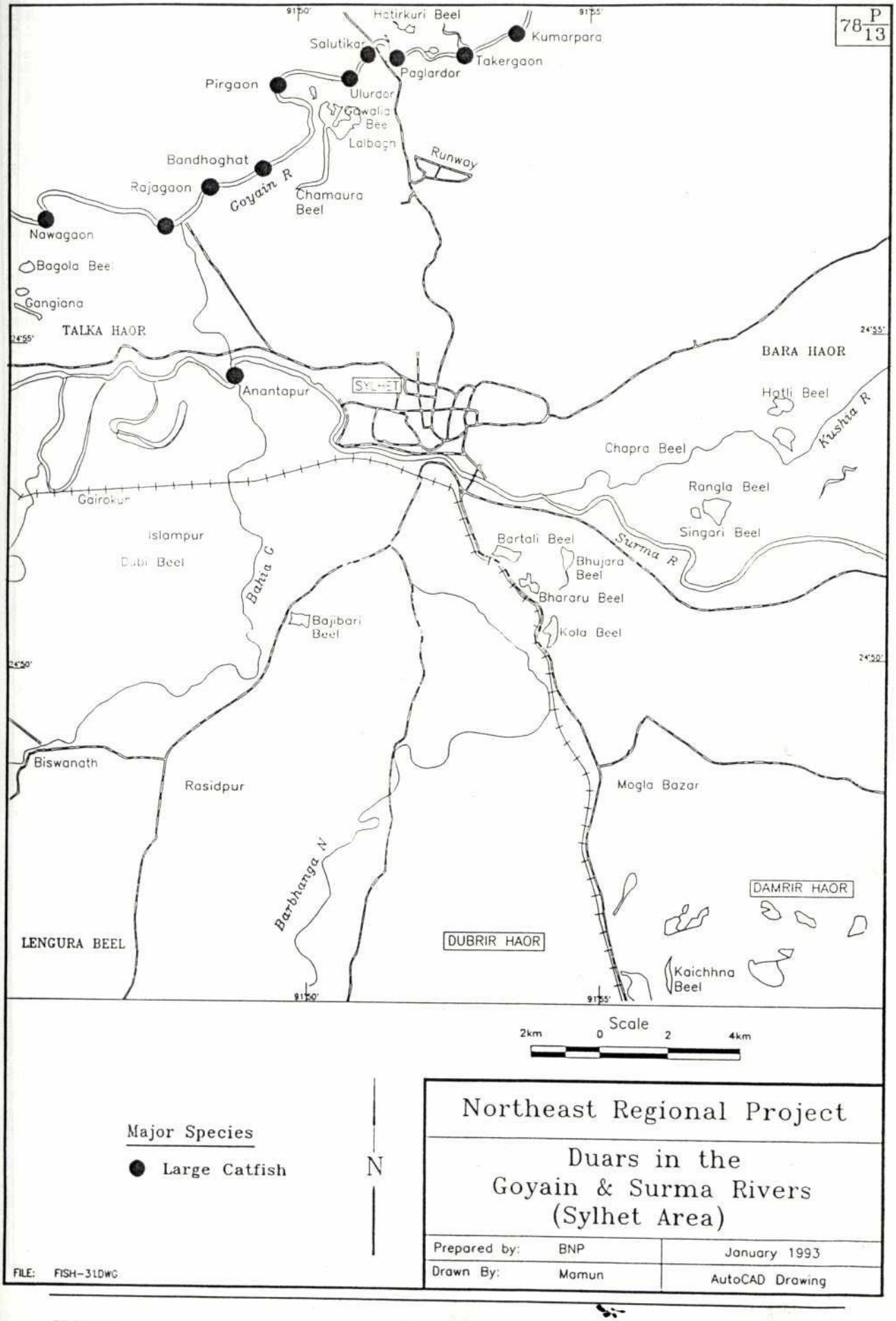

78 P/13
Hatirkuri Beel
Kumarpara
Salutikar
Takergaon
Paglardor
Pirgaon
Ulurdar
Gawalia Bee
Laibagh
Runway
Bandhoghat
Rajagaon
Goyain R
Chamaura Beel
Nawagaon
Bagola Bee
Gangiana
TALKA HAOR
BARA HAOR
Anantapur
SYLHET
Hatli Beel
Kushia R
Chapra Beel
Rangla Beel
Singari Beel
Gairokur
Islampur
Dubi Beel
Bahia C
Bartali Beel
Surma R
Bhujara Beel
Bhararu Beel
Bajibari Beel
Kola Beel
Biswanath
Rasidpur
Mogla Bazar
Barbharga N
DAMRIR HAOR
LENGURA BEEL
DUBRIR HAOR
Kaichhna Beel
91°50'
91°55'
24°55'
24°50'
Scale
2km 0 2 4km
Major Species
Large Catfish
N
Northeast Regional Project
Duars in the Goyain & Surma Rivers (Sylhet Area)
Prepared by: BNP
January 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: FISH-31.DWG

Figure C-2

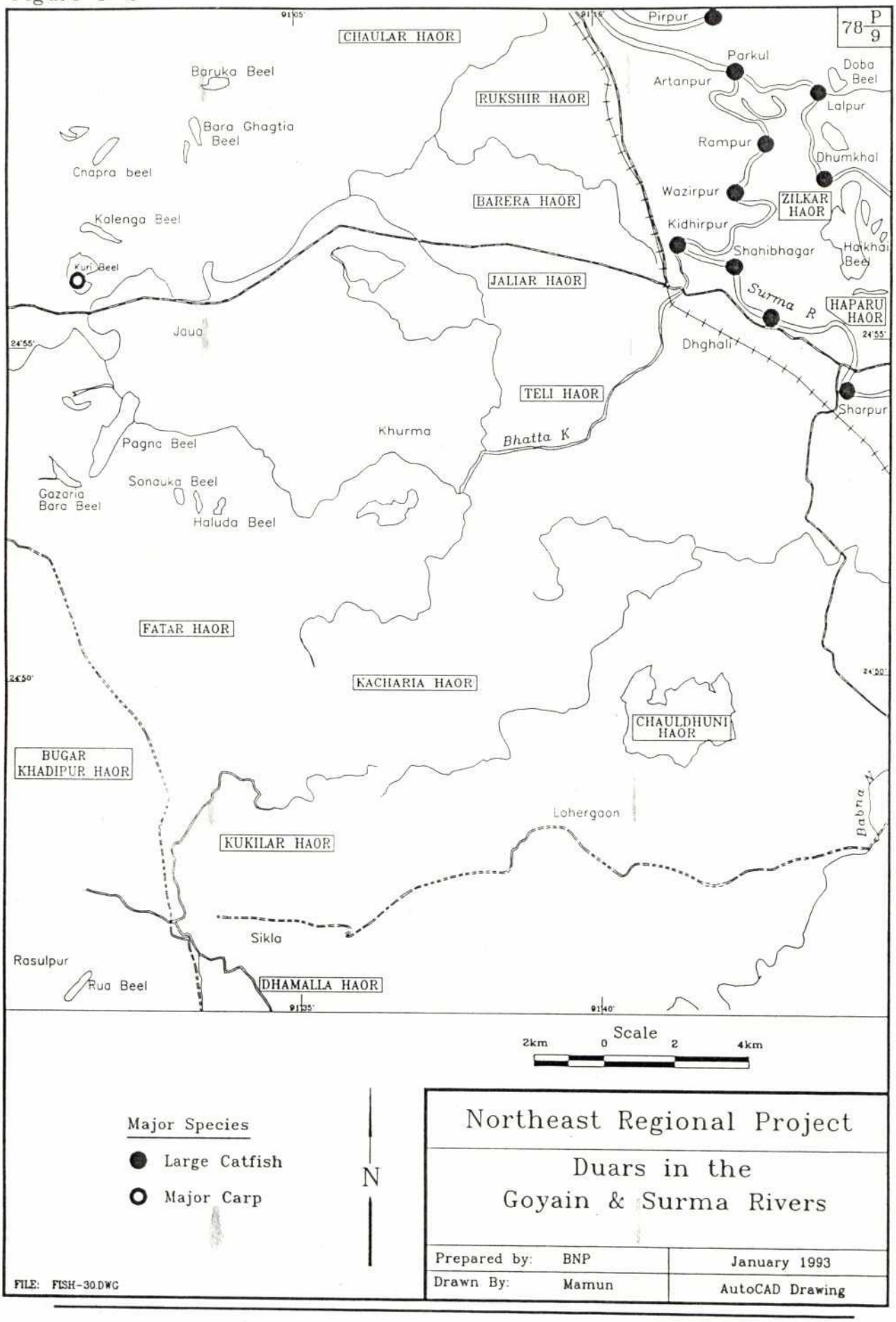

78 P/9
CHAULAR HAOR
RUKSHIR HAOR
BARERA HAOR
JALIAR HAOR
TELI HAOR
FATAR HAOR
KACHARIA HAOR
CHAULDHUNI HAOR
BUGAR KHADIPUR HAOR
KUKILAR HAOR
DHAMALLA HAOR
ZILKAR HAOR
HAPARU HAOR
Pirpur
Parkul
Artanpur
Doba Beel
Lalpur
Rampur
Dhumkhal
Wazirpur
Kidhirpur
Shahibhagar
Hakhai Beel
Surma R
Dhghali
Sharpur
Baruka Beel
Bara Ghagtia Beel
Chapra beel
Kalenga Beel
Kuri Beel
Jaua
Khurma
Bhatta K
Pagna Beel
Sonauka Beel
Gazaria Bara Beel
Haluda Beel
Lohergaon
Babna R
Sikla
Rasulpur
Rua Beel
24°55'
24°50'
91°05'
91°40'
Scale
2km 0 2 4km
Major Species
Large Catfish
Major Carp
N
Northeast Regional Project
Duars in the Goyain & Surma Rivers
Prepared by: BNP
January 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: FISH-30.DWG

Figure C-3

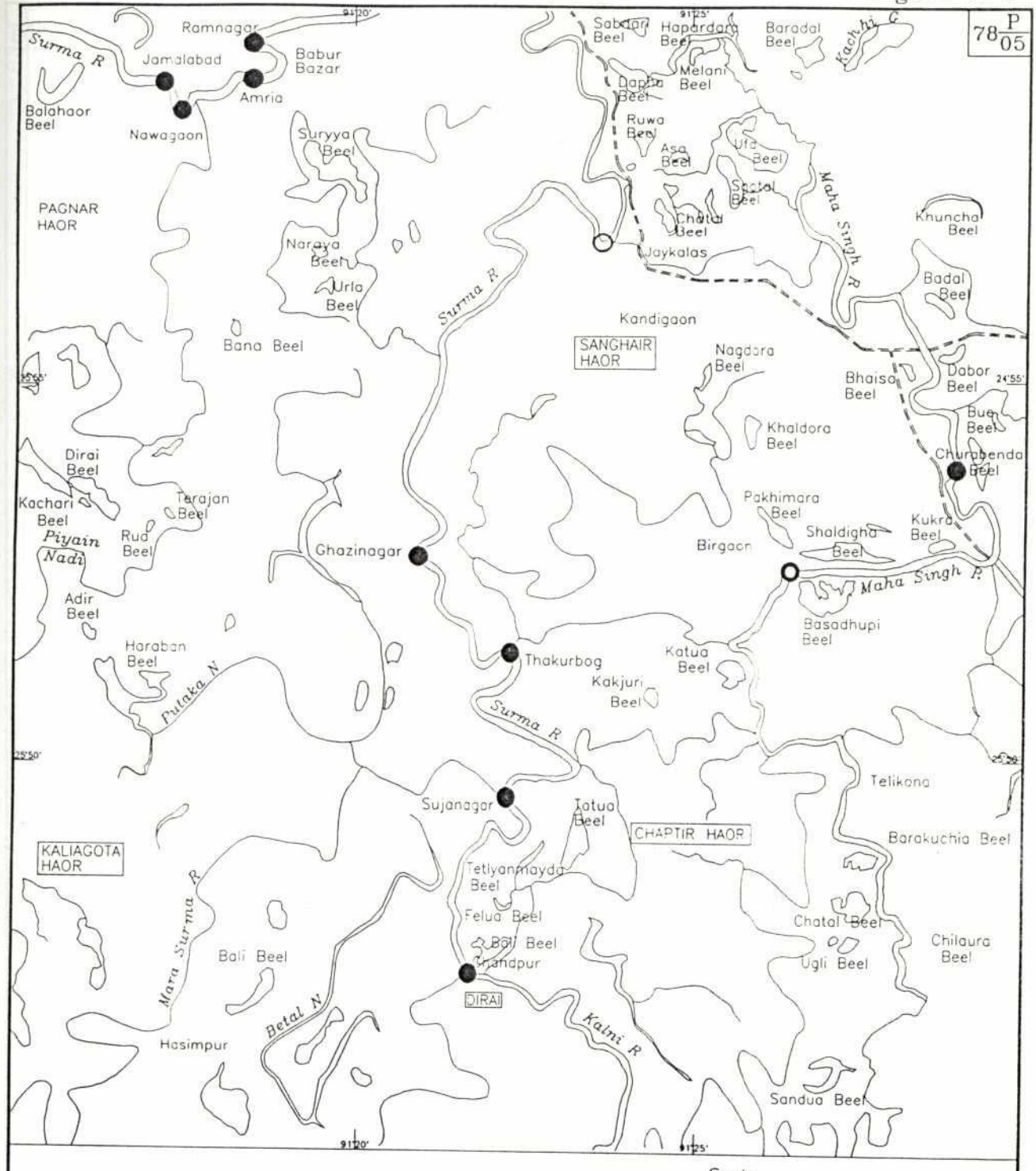
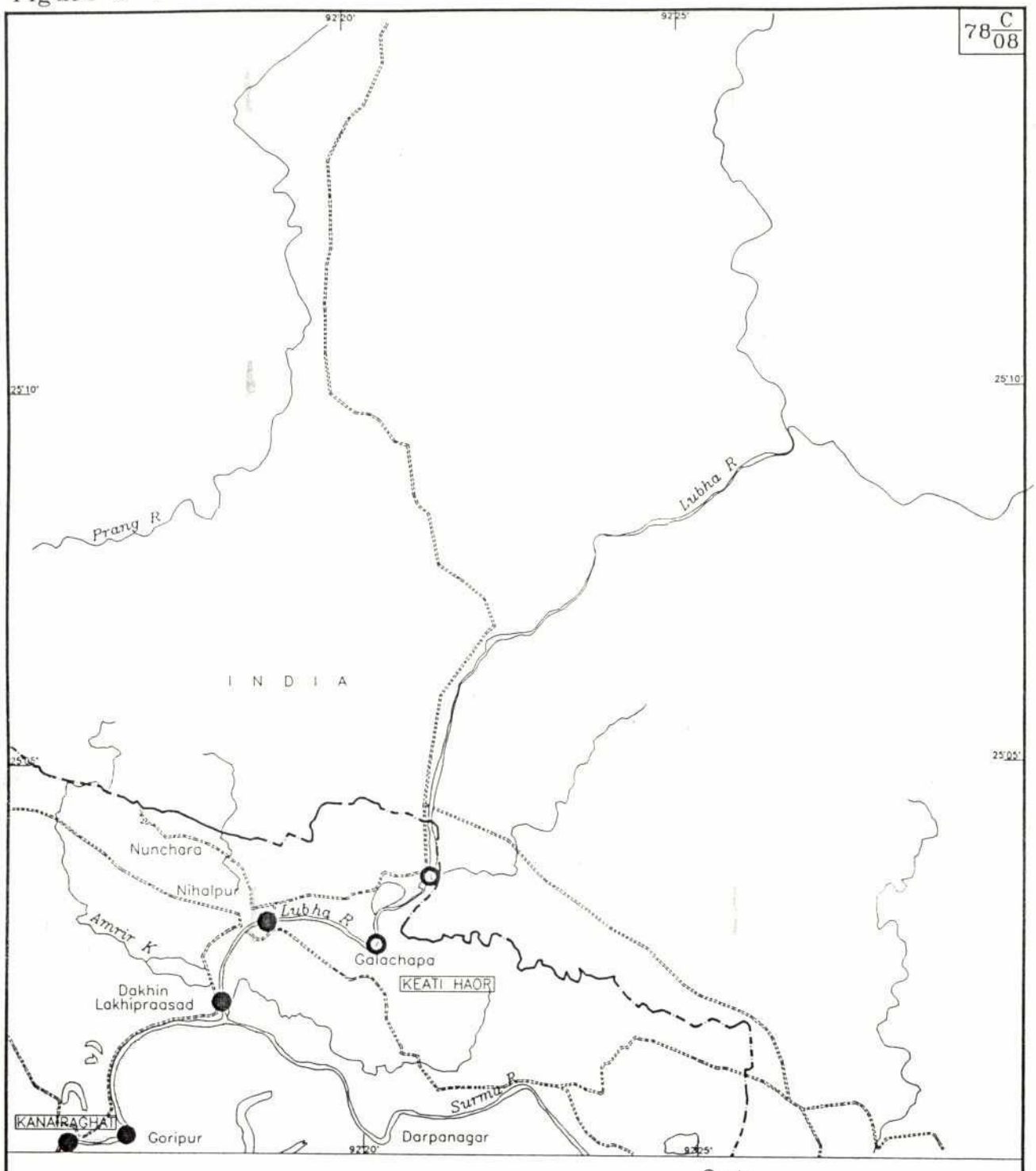

78 P/05
Ramnagar
Surma R
Jamalabad
Babur Bazar
Amria
Balahaor Beel
Nawagaon
Suryya Beel
PAGNAR HAOR
Naraya Beel
Urla Beel
Bana Beel
Surma R
Sabdar Beel
Hapardara Beel
Baradal Beel
Kachhi C
Melani Beel
Daptia Beel
Ruwa Beel
Asa Beel
Ufa Beel
Sadal Beel
Chatal Beel
Jaykalas
Maha Singh R
Khuncha Beel
Badal Beel
Kandigaon
SANGHAIR HAOR
Nagdara Beel
Bhaisa Beel
Dabor Beel
Bue Beel
Khaldora Beel
Churabenda Beel
Pakhimara Beel
Kukra Beel
Shaldigha Beel
Birgaon
Maha Singh R
Basadhupi Beel
Dirai Beel
Kachari Beel
Piyain Nadi
Rud Beel
Terajan Beel
Ghazinagar
Adir Beel
Haraban Beel
Putaka N
Thakurbog
Katua Beel
Kakjuri Beel
Surma R
Telikona
Sujanagar
Jatua Beel
CHAPTIR HAOR
Barakuchia Beel
KALIAGOTA HAOR
Tetlyanmayda Beel
Felua Beel
Bali Beel
Mandpur
Chatal Beel
Ugli Beel
Chilaura Beel
Mara Surma R
Bali Beel
DIRAI
Betal N
Kalni R
Hasimpur
Sandua Beel
Major Species
Large Catfish
Major Carp
Chital
N
Scale
2km 0 2 4km
Northeast Regional Project
Duars in the Surma and Mohasing Rivers (Jamalganj & Derai)
Prepared by: BNP
January 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: FISH-35.DWG

Figure C-4



Northeast Regional Project		
Duars in the Luba & Surma Rivers (Kanairghat)		
Prepared by:	BNP	January 1993
Drawn By:	Mamun	AutoCAD Drawing

FILE: FISH-38.DWG

Figure C-5

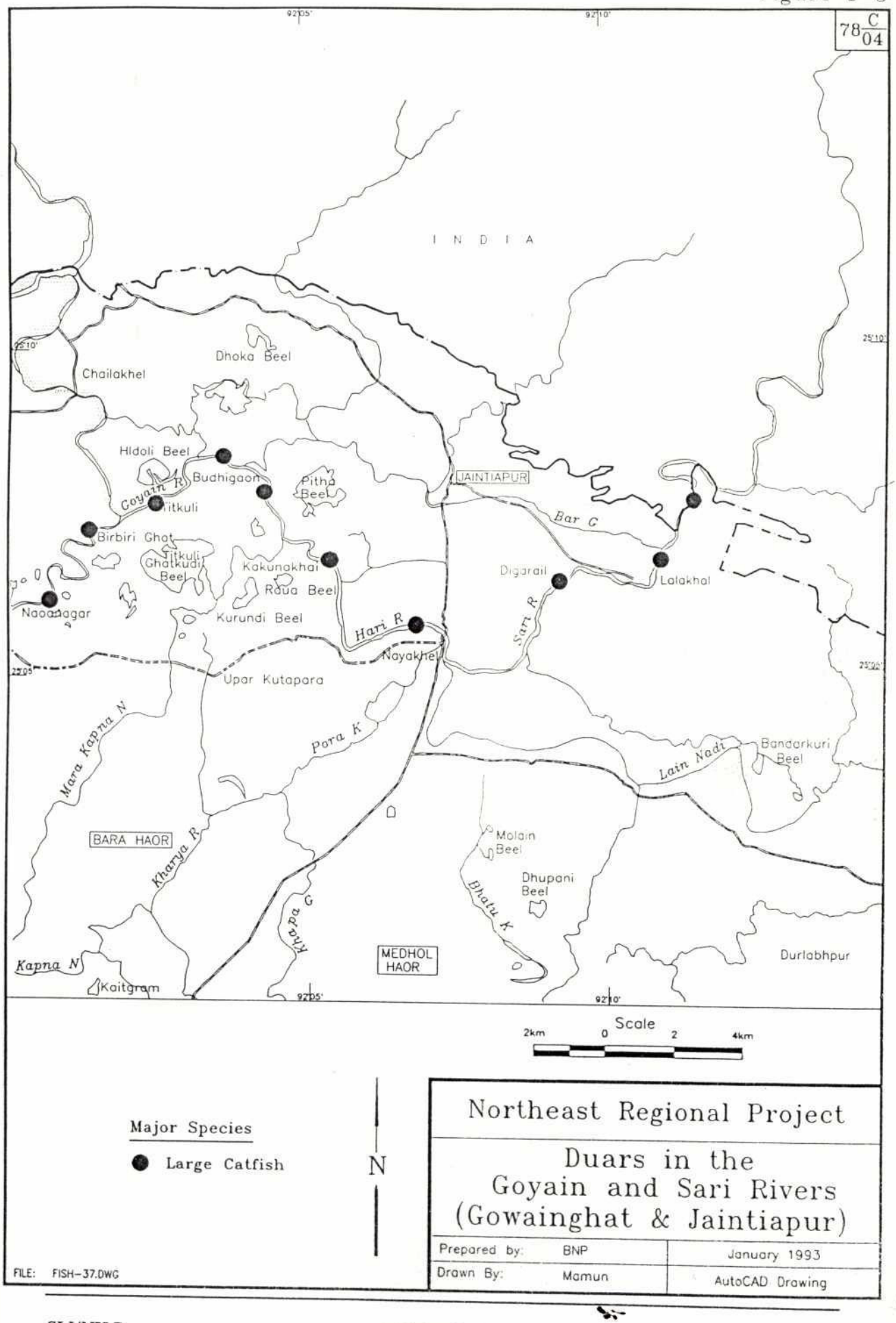
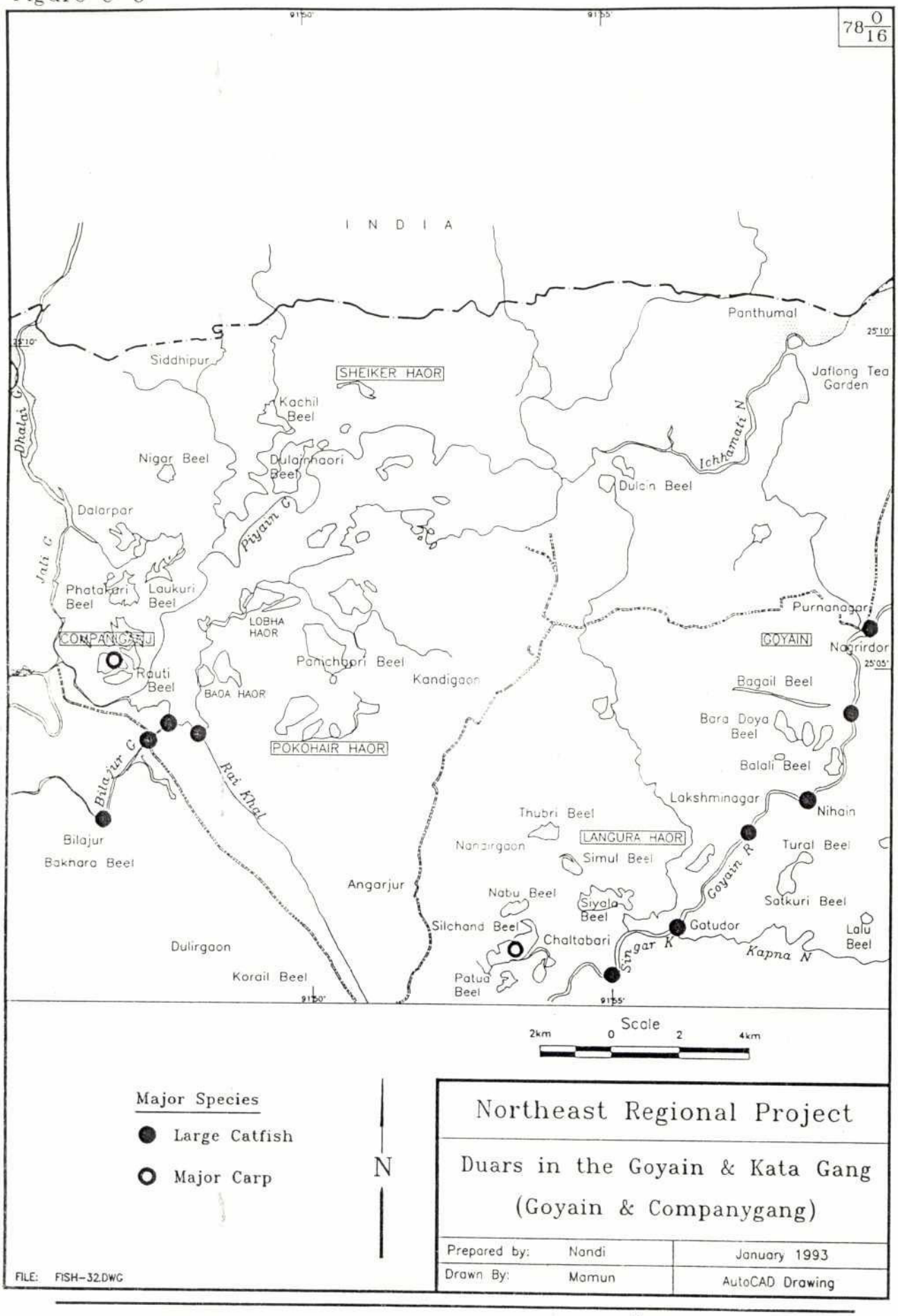

78 C/04
92°05'
92°10'
INDIA
25°10'
Dhoka Beel
Chailakhel
Hidoli Beel
Budhigaon
Goyain R.
Pitha Beel
Jitkuli
JAINTIAPUR
Bar G
Birbiri Ghat
Jitkuli Ghatkudi Beel
Kakunakhai
Raua Beel
Digarail
Lalakhal
Sari R.
Nabanagar
Kurundi Beel
Hari R.
Nayakhel
22°05'
Upar Kutapara
Mara Kapna N.
Pora K.
Lain Nadi
Bandarkuri Beel
BARA HAOR
Kharya R.
Molain Beel
Dhupani Beel
Bhatu K.
Khara G.
MEDHOL HAOR
Durlabhpur
Kapna N.
Kaitgram
Scale
2km 0 2 4km
Major Species
Large Catfish
N
Northeast Regional Project
Duars in the Goyain and Sari Rivers (Gowainghat & Jaintiapur)
Prepared by: BNP
January 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: FISH-37.DWG

Figure C–6



Northeast Regional Project

Duars in the Goyain & Kata Gang (Goyain & Companygang)

Prepared by:	Nandi	January 1993
Drawn By:	Mamun	AutoCAD Drawing

FILE: FISH–32.DWG

Figure C-7

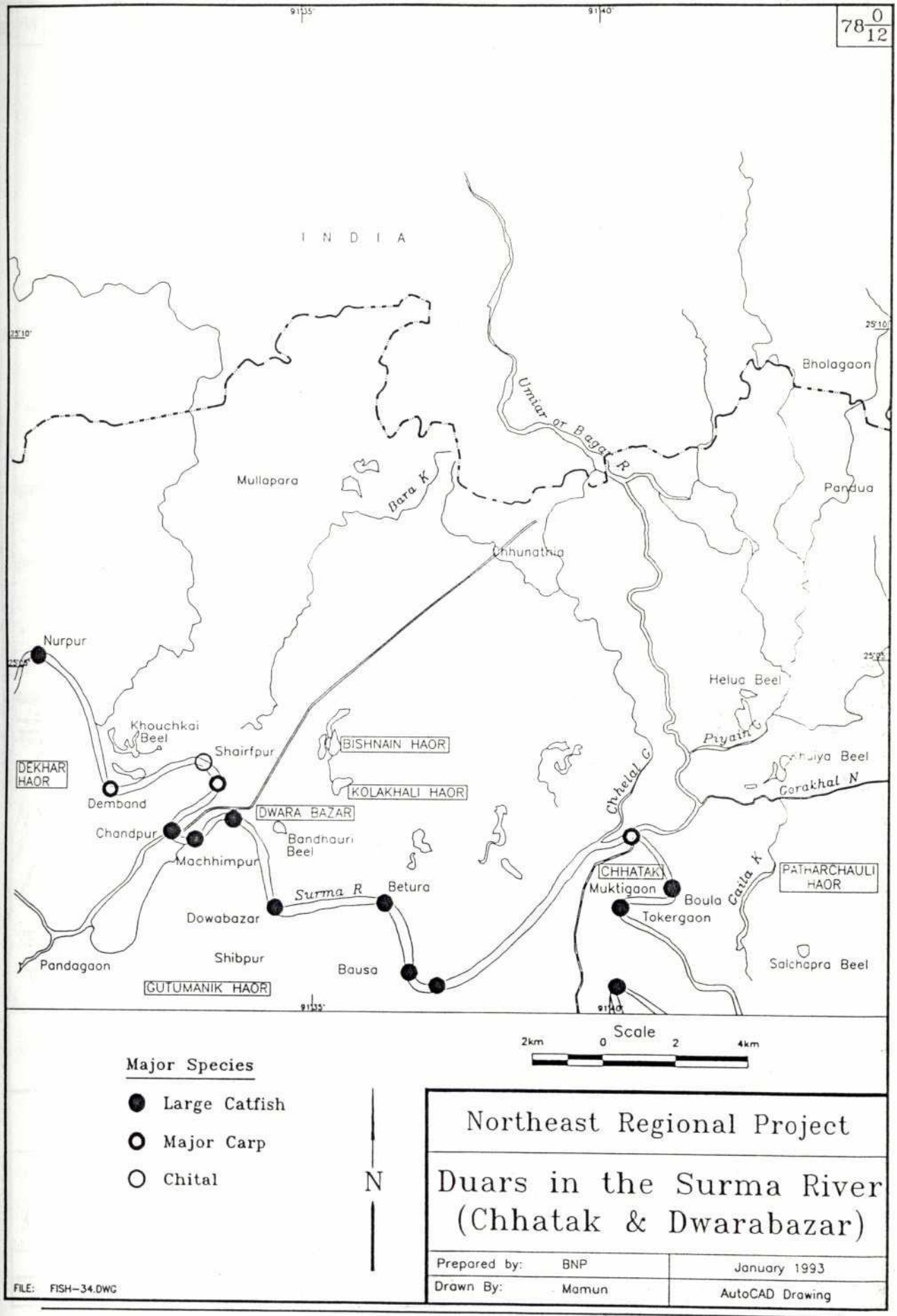

78 0/12
INDIA
Umiar or Bagar R.
Bholagaon
Mullapara
Bara K.
Pandua
Chhunathia
Nurpur
Khouchkai Beel
Shairfpur
DEKHAR HAOR
Demband
BISHNAIN HAOR
KOLAKHALI HAOR
DWARA BAZAR
Bandhauri Beel
Chandpur
Machhimpur
Surma R.
Betura
Dowabazar
Pandagaon
Shibpur
Bausa
GUTUMANIK HAOR
Helua Beel
Piyain C.
Chhela C.
Gorakhal N.
CHHATAK
Muktigaon
Boula
Tokergaon
Caila K.
PATHARCHAULI HAOR
Salchapra Beel
Scale
2km 0 2 4km
Major Species
Large Catfish
Major Carp
Chital
N
Northeast Regional Project
Duars in the Surma River (Chhatak & Dwarabazar)
Prepared by: BNP
January 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: FISH-34.DWG

Figure C-8

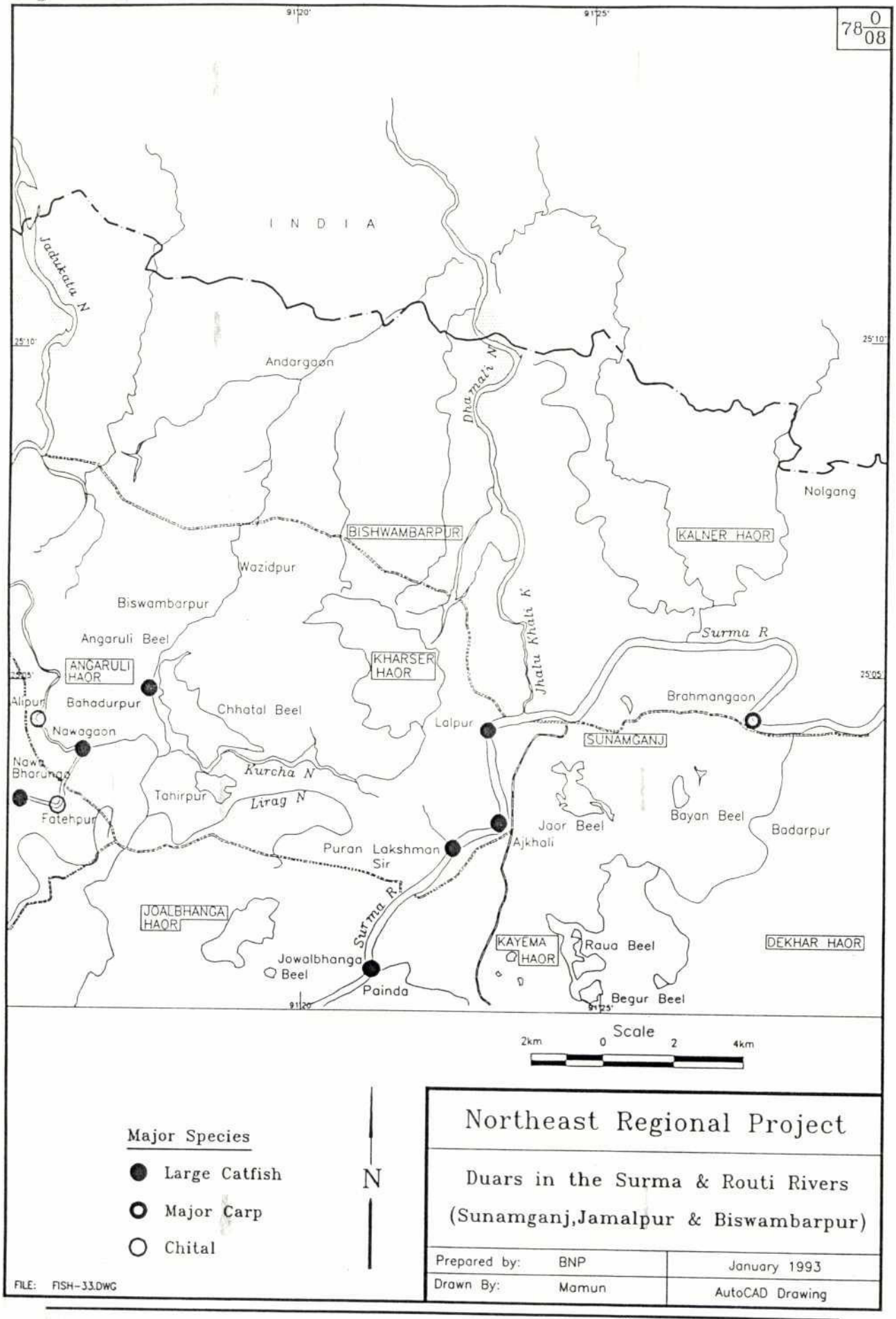

78 0/08
91°20'
91°25'
25°10'
25°05'
INDIA
Jadukata N
Andargaon
Dhamai N
Nolgang
BISHWAMBARPUR
KALNER HAOR
Wazidpur
Biswambarpur
Angaruli Beel
ANGARULI HAOR
KHARSER HAOR
Jhalu Khali K
Surma R
Alipur
Bahadurpur
Chhatal Beel
Brahmangaon
Nawagaon
Lalpur
SUNAMGANJ
Nawa Bharunga
Kurcha N
Tahirpur
Lirag N
Fatehpur
Jaor Beel
Bayan Beel
Badarpur
Ajkhali
Puran Lakshman Sir
Surma R.
JOALBHANGA HAOR
KAYEMA HAOR
Raua Beel
DEKHAR HAOR
Jowalbhanga Beel
Painda
Begur Beel
Scale
2km 0 2 4km
Major Species
Large Catfish
Major Carp
Chital
N
Northeast Regional Project
Duars in the Surma & Routi Rivers
(Sunamganj,Jamalpur & Biswambarpur)
Prepared by: BNP
January 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: FISH-33.DWG

Figure C-9

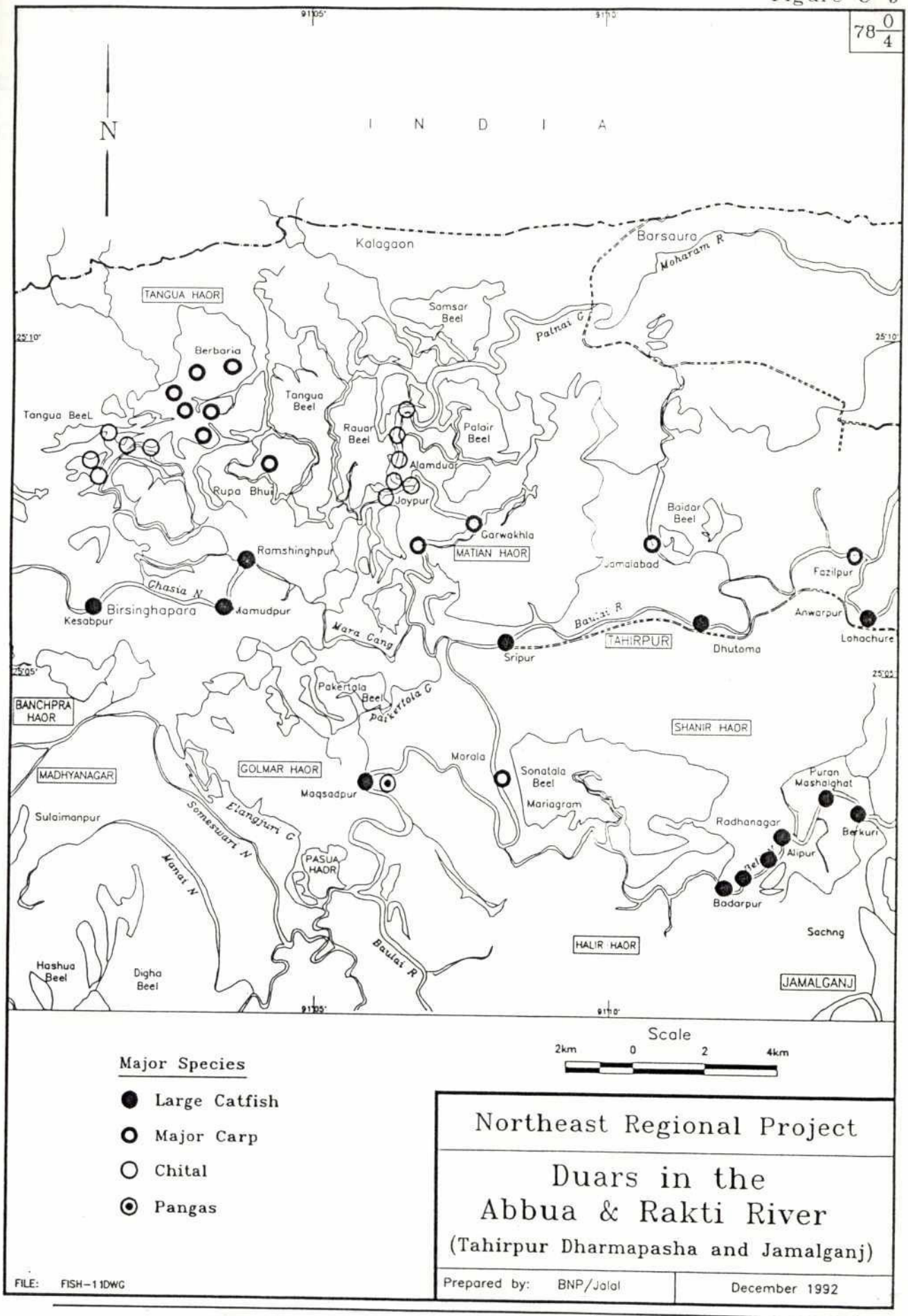
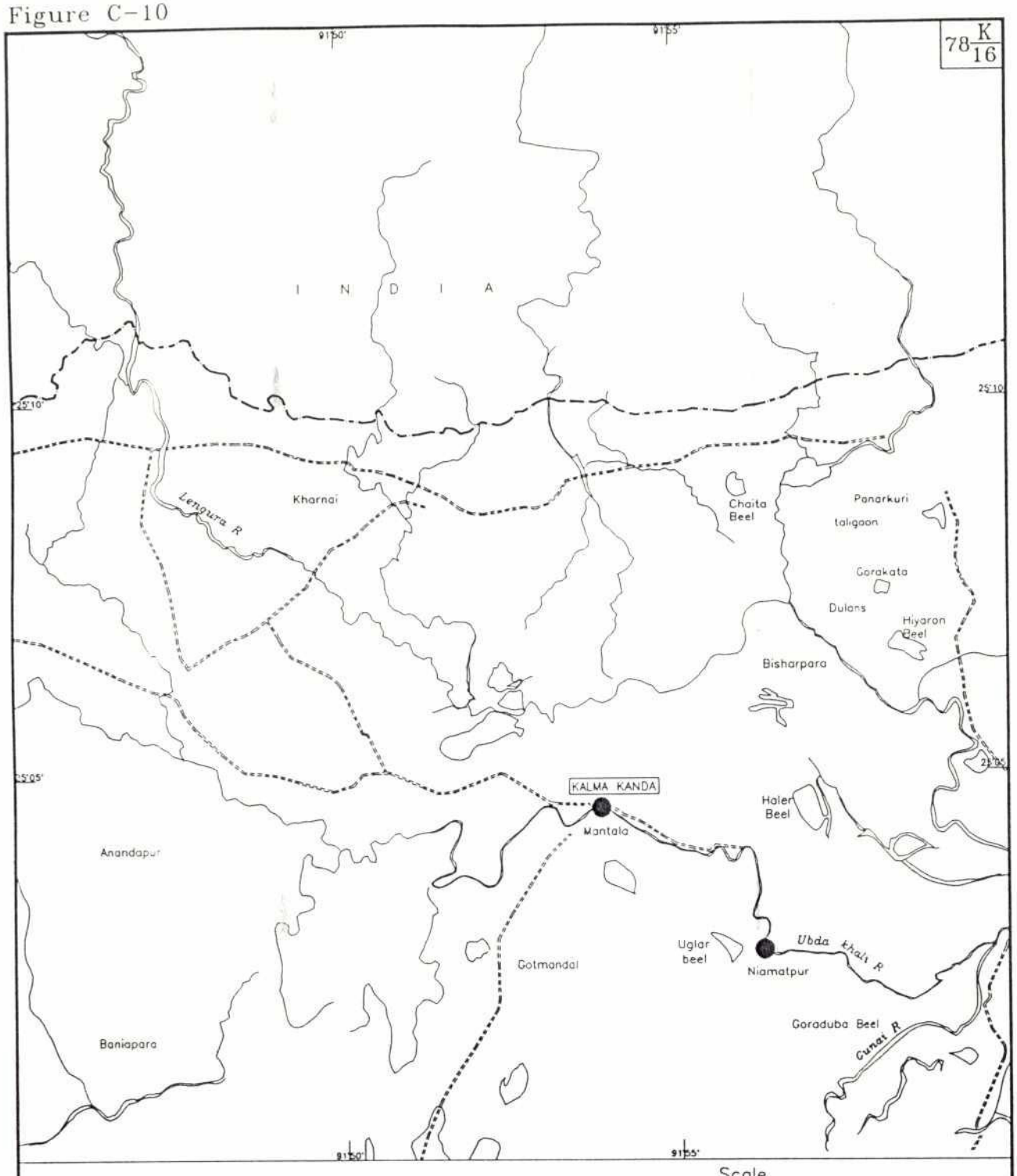

78 0/4
N
I N D I A
Kalagaon
Barsaura
Moharam R
TANGUA HAOR
Samsar Beel
Patnai C
Berbaria
Tangua Beel
Tangua BeeL
Rauar Beel
Palair Beel
Alamduar
Rupa Bhui
Jaypur
Baidar Beel
Garwakhla
MATIAN HAOR
Ramshinghpur
Jamalabad
Fazilpur
Chasia N
Birsinghapara
Kesabpur
Mamudpur
Mara Gang
Baulai R
Anwarpur
Lohachure
TAHIRPUR
Sripur
Dhutoma
Pakertola Beel
Paikertola C
BANCHPRA HAOR
SHANIR HAOR
MADHYANAGAR
GOLMAR HAOR
Marala
Sonatala Beel
Puran Mashalghat
Maqsadpur
Mariagram
Sulaimanpur
Someswari N
Elangjuri C
Radhanagar
Berkuri
Alipur
PASUA HAOR
Manai N
Badarpur
Sachng
HALIR HAOR
Hashua Beel
Digha Beel
Baulai R
JAMALGANJ
25°10'
25°05'
91°05'
91°10'
Scale
2km 0 2 4km
Major Species
Large Catfish
Major Carp
Chital
Pangas
Northeast Regional Project
Duars in the
Abbua & Rakti River
(Tahirpur Dharmapasha and Jamalganj)
FILE: FISH-11DWG
Prepared by: BNP/Jalal
December 1992

Figure C-10



Northeast Regional Project

Duars in the Ubdakhali River (kalmakanda)

Prepared by: BNP/Jalal | December 1992

FILE: FISH-13.DWG

C.2 KUSHIYARA RIVER AND TRIBUTARIES

C.2.1 KUSHIYARA RIVER (Amalshid to Balaganj via Fenchuganj)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)	BORO-MAACH	CHOTO-MAACH
Tinganga	Amalshed	9-10	LC,C.	B,Ch,Ca,L
Gangajal	Gangajal	7-8	As above.	As above.
Jokigangardor	Jakiganj	7-8	As above.	As above.
Bhuiyamura	Bhuyamura	7-8	As above.	As above.
Kalaramar dor	Mewa	10-11	As above.	As above.
Moiyakhalirdor	Moiyakhali	9-10	LC,C,MC.	As above.
Chariar dor*	Charia	16-17	MC,LC,C.	As above.
Babur dor	Sheolaghat	10-11	As above.	As above.
Dheunagar dor	Dheunagar	10-11	As above	As above
Digholbak	Digholbak	9-10	LC,MC,C	As above.
Alipurar dor	Alipur	14-15	As above	As above.
Kakairdir dor*	Kakairdi	10-11	As above.	As above.
Balingar dor	Balinga	10-11	As above.	As above.
Fenchugangar dor	Fenchuganj	10-11	As above.	As above.
Kurar dor	Akhakhazna	9-10	As above.	As above.
Portir dor	Mohammadpur	9-10	As above.	As above.
Govindsree	Govindsree	8-9	As above.	As above.
Amkonar dor	Golapganj	10-11	As above.	As above.
Korortir dor	Palakona	9-10	As above.	As above.
Rokonpurar dor	Pump house	10-11	As above.	As above.
Dekapurar dor	Dekapur	10-11	As above.	As above.
Sonapurar dor	Sonapur	13-14	As above.	As above.
Sadapurar dor	Sadapur	10-11	As above.	As above.
Azampurar dor	Azampur	10-11	As above.	As above.
Sheikpurar dor	Sheikpur	10-11	As above.	As above.
Islampurar dor	Islampur	11-12	As above.	As above.

C.2.2 KUSHIYARA RIVER (Balaganj to Ajmiriganj)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)	BORO-MAACH	CHOTO-MAACH
Berkurir dor**	Berkuri	19	LC,MC	B,Ch,Ca.
Shapurar dor**	Shapur	15	As above.	As above
Korchar dor**	Korchabaid	17	As above.	As above.
Chorkir dor**	Abdullapur	21	LC,MC,C.	As above.
Jalalpuar dor**	Jalalpur	18	LC,MC.	As above.
Jamirkonar dor**	Jamirkona	17	As above.	As above.
Poradair**	Islampur	12	As above.	As above.
Poradair**	Poilanpur	17	LC,MC.	As above.
Manumuk**	Manumuk	14	As above.	As above.
Bahadurpur**	Bahadurpur	11	LC,MC,C.L	As above.
Brahmangaon**	Brahmangaon	23	C,MC,C.	As above.
Perkular dor**	Perkul	16	LC,MC.	As above.
Kamarkheda**	Kamarkheda	15	As above.	As above.
Hossainpur**	Hossainpur	15	As above.	As above.
Mirkhalir dor**	Ahmadpur	17	LC,MC,C.	As above.
Digholbagh**,*	Digholbagh	14	LC,MC.	As above.
Digholbagh**,*	"	16	As above.	As above.
Digholbagh**,*	"	18	LC,MC,C.	As above.
Digholbagh**,*	"	32	As above.	As above.
Atghor**	Atghor	19	As above.	As above.
Bara Pechi*	Pechirbazar	16	As above.	As above.
Jalalpurar dor*	Jalalpur	14	LC,MC .	As above.
Kaittar dor*	Kaitta	14	As above.	As above.
Bagakhalir dor*	Banglabazar	25	LC,MC,C.	As above.
Alokdir dor*	Alokdi	19	As above.	As above.
Pilegaor dor*	Pilegaon	18	As above.	As above.
Ranigangar dor**,*	Raniganj	22	As above.	As above.
Alampurar dor**	Alampur	18	As above.	As above.
Balichata**	Balichata	17	As above.	As above.
Bagmaynar dor**	Bagmayna	19	As above	As above.
Roailar dor**,*	Roail	31	As above.	As above.
Mohiskonar dor	Mohiskona	15-16	As above.	As above.
Baushir dor	Baushi	15-16	As above.	As above.
Galishalar dor	Galishal	12-13	As above.	As above.
Markulir dor	Markuli	12-13	As above.	As above.
Pratappurar dor	Pratappur	11-12	As above.	As above.
Bherar dor	Bherardohor	12-13	As above.	As above.
Matidora	Matodora	11-12	As above.	As above.
Badalpurar dor	Badalpur	11-12	As above.	As above.
Pirispurar dor	Pirispur	11-13	As above.	As above.

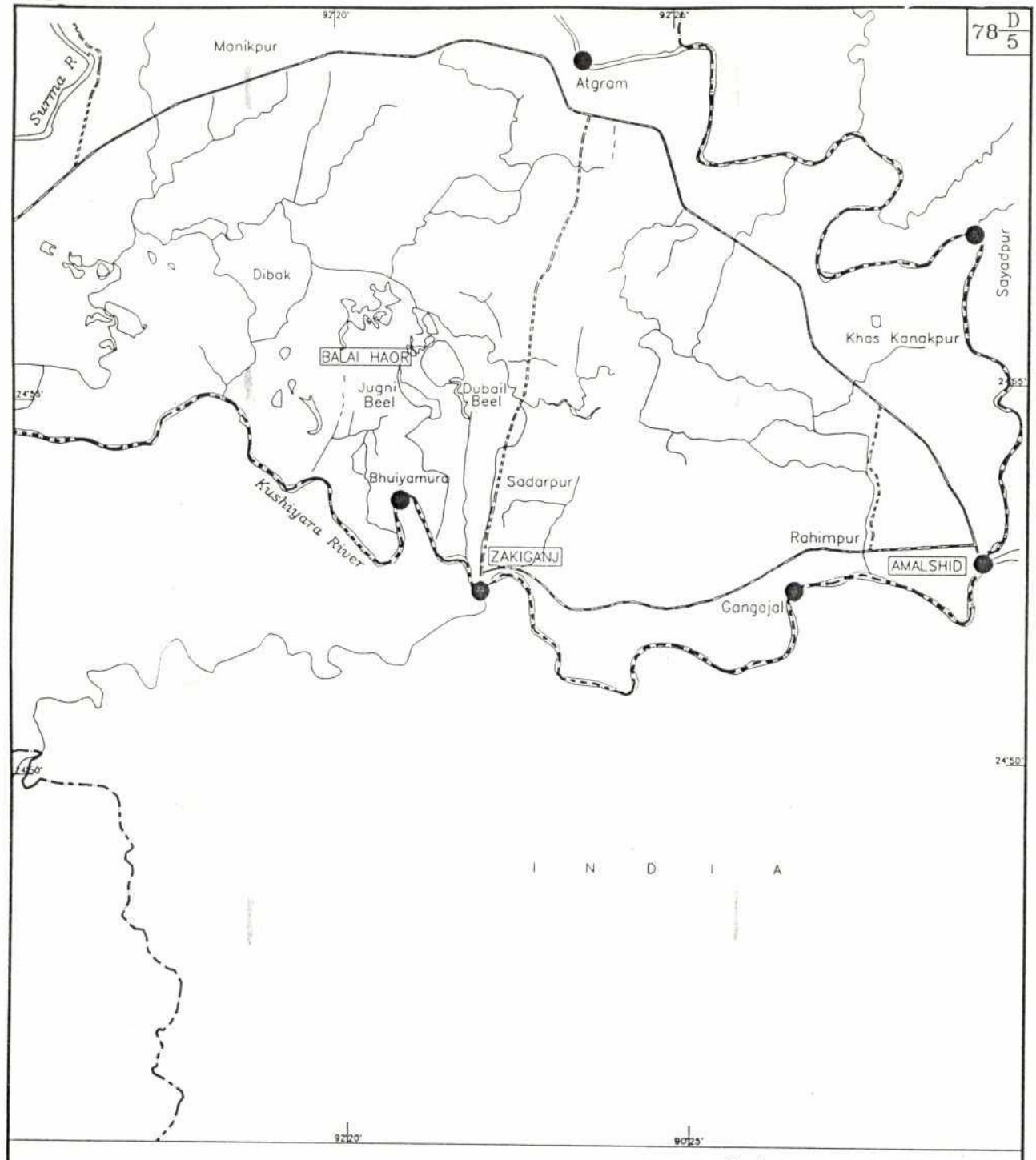
C.2.3 SONAI BARDHAL RIVER (Beanibazar area)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)	BORO-MAACH	CHOTO-MAACH
Malighor dor	Sorapur	6-7	LC,MC	B,Ch,Ca,R
Masur dor	Kalaiura	6-7	As above.	As above
Holdipurar dor	Holdipur	6-7	As above.	Asabove
Baraigram	Baraigram	6-7	As above.	As above
Bibirai dor	Bibirai	6-7	As above.	As above

C.2.4 BHERAMONA/KALNI RIVER (Ajmiriganj to Madna)

Bardair duar	Ajmiriganj	6-7	LC,MC	B,L,Ca,G
Chondir duar	Ajmiriganj	7-8	As above.	As above
Kanchganpurar dor	Kanchanpur	10-11	LC,C,MC	As above.
Kalimpurar dor	Kalimpur	9-10	As above.	As above.
Ichapurar dor	Ichapur	10-11	As above.	As above.
Adampurar dor	Adampur	10-11	As above.	As above.

Figure C-11



Northeast Regional Project	
Duars in the Kushiyara River (Zakiganj)	
Prepared by: BNP/Jalal	January 1993

FILE: FISH-18DWG

Figure C-12

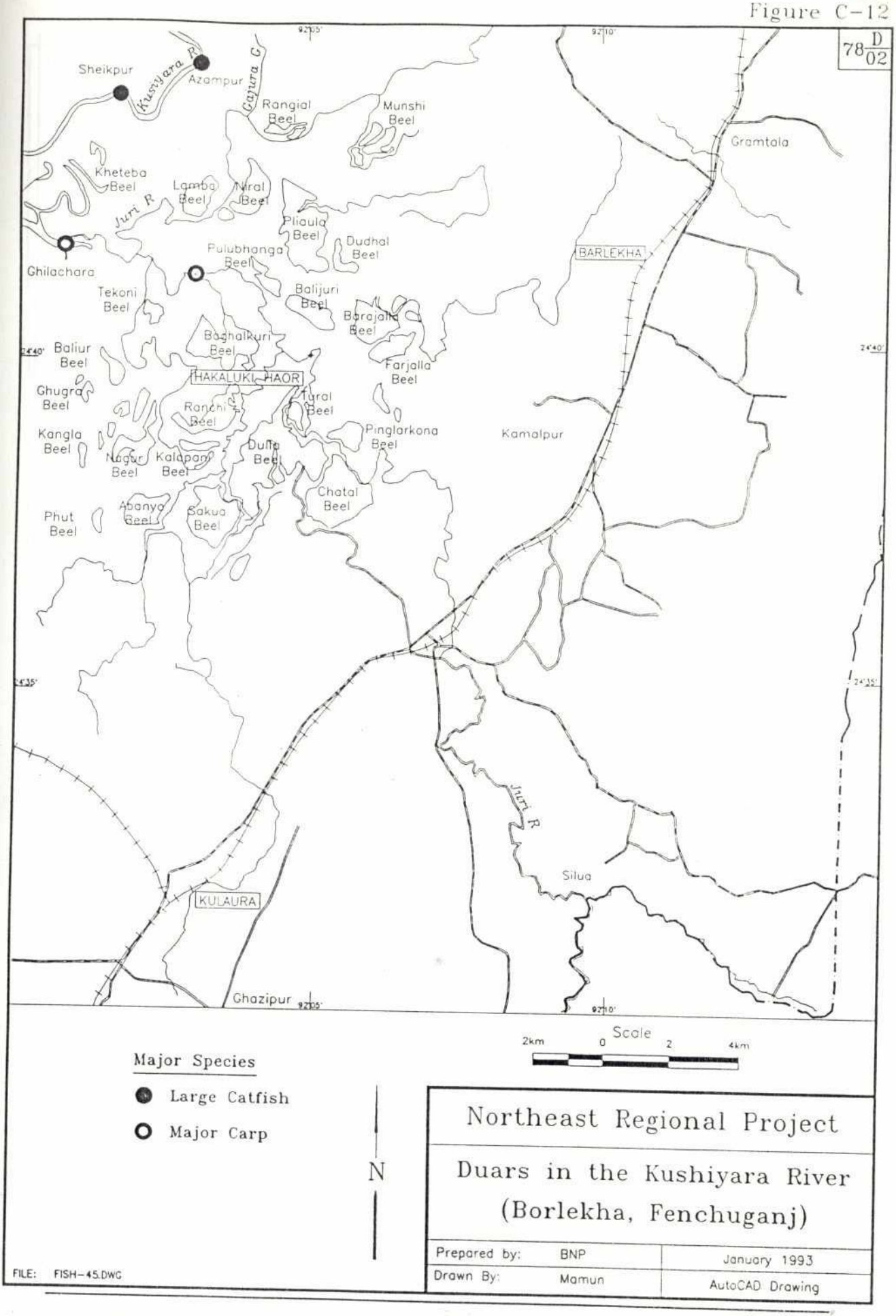

78 D/02
Sheikpur
Azampur
Kushiyara R
Gajura G
Rangial Beel
Munshi Beel
Gramtala
Kheteba Beel
Lamba Beel
Niral Beel
Juri R
Pliaula Beel
Dudhal Beel
Pulubhanga Beel
BARLEKHA
Ghilachara
Tekoni Beel
Balijuri Beel
Barajalla Beel
Baghalkuri Beel
Baliur Beel
Farjalla Beel
HAKALUKI HAOR
Ghugra Beel
Tural Beel
Ranchi Beel
Kangla Beel
Pinglarkona Beel
Kamalpur
Dulla Beel
Nagur Beel
Kalapani Beel
Chatal Beel
Abanya Beel
Sakua Beel
Phut Beel
Juri R
Silua
KULAURA
Ghazipur
24°40'
24°35'
92°05'
92°10'
Scale
2km 0 2 4km
Major Species
Large Catfish
Major Carp
N
Northeast Regional Project
Duars in the Kushiyara River
(Borlekha, Fenchuganj)
Prepared by: BNP
January 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: FISH-45.DWG

Figure C–13

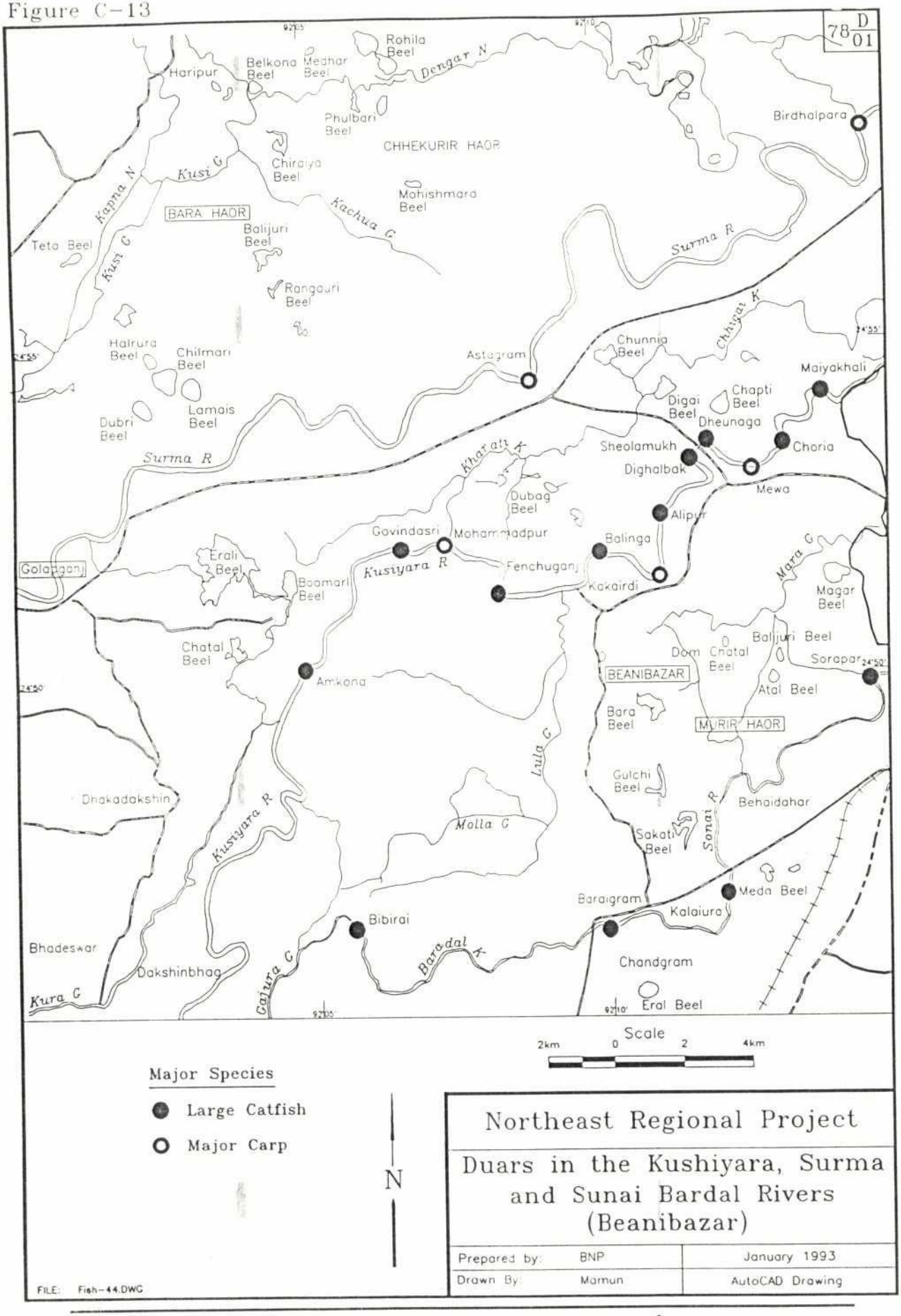

78 D/01
Rohila Beel
Dengar N
Haripur
Belkona Beel
Medhar Beel
Phulbari Beel
CHHEKURIR HAOR
Birdhalpara
Chiraiya Beel
Kapna N
Kusi G
Mohishmara Beel
BARA HAOR
Kachua G
Surma R
Baljuri Beel
Teta Beel
Rangauri Beel
Hairura Beel
Chilmari Beel
Astagram
Chunnia Beel
Chhiyar K
Maiyakhali
Digai Beel
Chapti Beel
Dhenunaga
Choria
Lamais Beel
Dubri Beel
Surma R
Kharati K
Sheolamukh
Dighalbak
Mewa
Dubag Beel
Alipur
Govindasri
Mohammadpur
Balinga
Golapganj
Erali Beel
Kusiyara R
Fenchuganj
Kakairdi
Mara G
Baomari Beel
Magar Beel
Chatal Beel
Baljuri Beel
Dom Chatal Beel
Sorapar
Amkona
BEANIBAZAR
Atal Beel
Bara Beel
MURIR HAOR
Lula G
Gulchi Beel
Dhakadakshin
Kusiyara R
Molla G
Sonai R
Behaidahar
Sakati Beel
Meda Beel
Baraigram
Kalaiura
Bibirai
Bhadeswar
Baradal K
Chandgram
Dakshinbhag
Kura G
Cainra G
Eral Beel
Scale
2km 0 2 4km
Major Species
Large Catfish
Major Carp
N
Northeast Regional Project
Duars in the Kushiyara, Surma and Sunai Bardal Rivers (Beanibazar)
Prepared by: BNP
January 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: Fish-44.DWG

Figure C-14

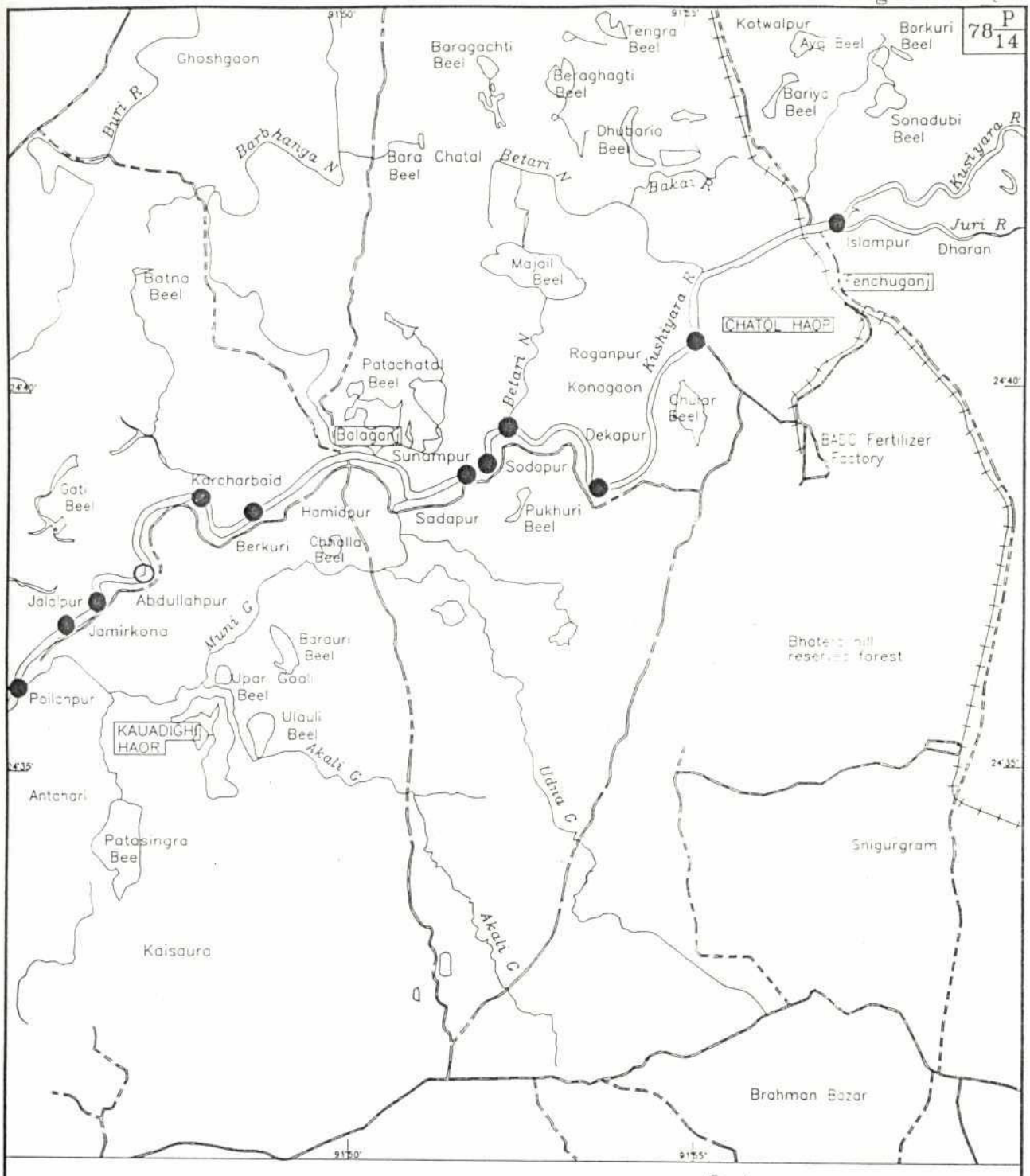

78 P/14
Ghoshgaon
Bhuti R
Barbhanga N
Baragachti Beel
Tengra Beel
Katwalpur
Ayo Beel
Borkuri Beel
Betaghagti Beel
Bariya Beel
Sonadubi Beel
Dhuttaria Beel
Bara Chatal
Betari N
Baka R
Kushiyara R
Juri R
Islampur
Dharan
Fenchuganj
Batna Beel
Majail Beel
CHATOL HAOR
Roganpur
Konagaon
Patachatal Beel
Betari N
Kushiyara R
Chutar Beel
Balaganj
Dekapur
BADC Fertilizer Factory
Sunampur
Sodapur
Gati Beel
Karcharbaid
Hamidpur
Sadapur
Pukhuri Beel
Berkuri
Chhalia Beel
Jalalpur
Abdullahpur
Jamirkona
Muni C
Barauri Beel
Bhatera hill reserved forest
Upar Gooli Beel
Pailanpur
KAUADIGHI HAOR
Ulauli Beel
Akali C
Udna C
Antahari
Patasingra Beel
Snigurgram
Kaisaura
Brahman Bazar
91°50'
91°55'
24°40'
24°35'
2km 0 2 4km
Scale
Major Species
Large Catfish
Chital
N
Northeast Regional Project
Duars in the Kushiyara River
(Fenchuganj & Balaganj)
Prepared by: BNP
January 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: FISH-43.DWG

Figure C–15

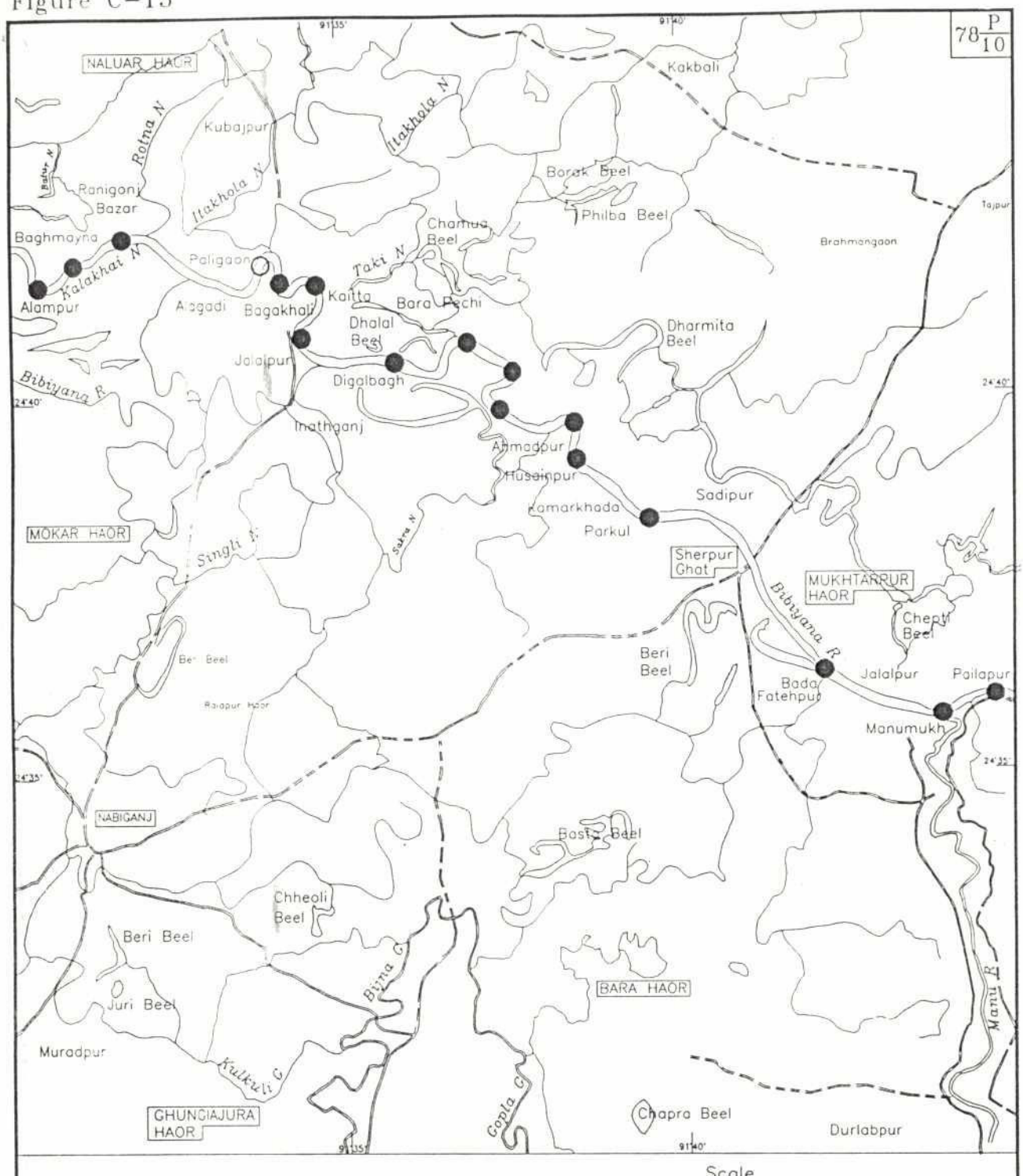
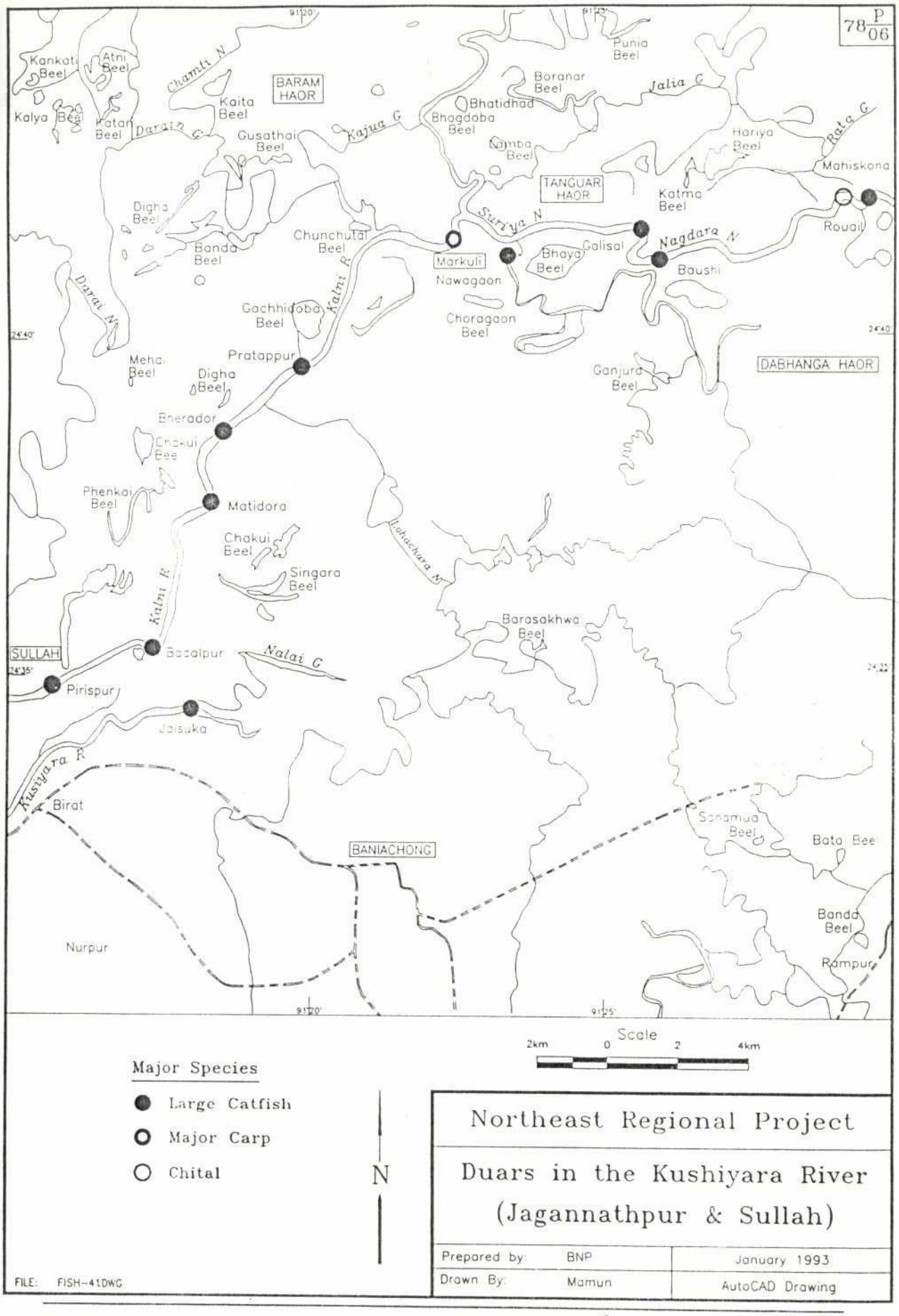

78 P/10
NALUAR HAOR
Kakbali
Kubajpur
Rotna N
Itakhola N
Ranigonj Bazar
Borak Beel
Philba Beel
Tajpur
Baghmayna
Chamua Beel
Brahmangaon
Paligaon
Taki N
Kalakhai N
Alampur
Alagadi
Bagakhali
Kaitta
Bara Pechi
Dhalal Beel
Dharmita Beel
Jalalpur
Digalbagh
Bibiyana R.
Inathganj
Ahmadpur
Husainpur
Sadipur
Kamarkhada
Parkul
MOKAR HAOR
Singli R.
Sara N
Sherpur Ghat
MUKHTARPUR HAOR
Chepti Beel
Beri Beel
Bibiyana R.
Jalalpur
Pailapur
Bada Fatehpur
Manumukh
NABIGANJ
Basti Beel
Chheoli Beel
Beri Beel
Bijna C.
BARA HAOR
Juri Beel
Muradpur
Kulkuli C.
Manu R.
GHUNGIAJURA HAOR
Gopla C.
Chapra Beel
Durlabpur
Scale
2km 0 2 4km
Major Species
Large Catfish
Chital
N
Northeast Regional Project
Duars in the Kushiyara River
(Moulavibazar & Jagannathpur)
Prepared by: BNP
January 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: FISH-42.DWG

Figure C-16


78 P/06
Kankati Beel
Atni Beel
Kalya Beel
Katar Beel
Chamti N
Darain G
BARAM HAOR
Kaita Beel
Gusathai Beel
Kajua G
Punia Beel
Boranar Beel
Jalia G
Bhatidhad
Bhagdoba Beel
Kamba Beel
Hariya Beel
Rata G
Mahiskona
TANGUAR HAOR
Katma Beel
Rouail
Digha Beel
Banda Beel
Chunchutal Beel
Surya N
Nagdara N
Galisal
Bhaya Beel
Markuli
Nawagaon
Baushi
Darai N
Katni R
Gachhidoba Beel
Choragaon Beel
Meha Beel
Digha Beel
Pratappur
Ganjura Beel
DABHANGA HAOR
Enerador
Chakui Beel
Phenkai Beel
Matidora
Chakui Beel
Singara Beel
Kushchara N
Barasakhwa Beel
SULLAH
Basalpur
Nalai G
Pirispur
Jaisuka
Kushiyara R
Birat
BANIACHONG
Sonamua Beel
Bata Beel
Banda Beel
Rampur
Nurpur
Scale
2km 0 2 4km
Major Species
Large Catfish
Major Carp
Chital
N
Northeast Regional Project
Duars in the Kushiyara River
(Jagannathpur & Sullah)
Prepared by: BNP
January 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: FISH-41.DWG

C.3 DHANU/BAULAI RIVER AND TRIBUTARIES

C.3.1 DHANU/BAULAI RIVER (Jamalganj to Karimganj via Itna)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)	BORO-MAACH	CHOTO-MAACH
Kalipurar dor	Kalipur	15-16	LC,C,MC	B,Ch,Ca,L
Gazariar duar	Gazaria	10-11	As above.	As above
Chandpurar dor	Chandpur	10-11	As above.	Asabove
Sonapurar duar	Sonapur	10-11	As above.	As above
Lalpurar duar	Lalpur	12-13	As above.	As above
Laxmipurarduar	Laxmipur	12-13	As above.	As above
Golakpurarduar	Golakpur	11-12	As above.	As above
Santipurarduar	Santipur	11-12	As above.	As above
Mara dhanu	Dalakandi	13-14	As above	As above
Alipurar duar	Alipur	12-13	As above	As above
Chandpurarduar	Chandpur	12-13	As above	As above
Gaglajurarduar	Gaglajur	15-16	As above	As above
Barantararduar	Barantar	8-9	As above	As above
Asadpur	Asadpur	9-10	As above	As above
Saldighar duar**	Laipsa	15	As above	As above
Nawtanar duar2**	Nawtana	14 & 12	As above.	As above.
Faridpurar duar**	Faridpur	12	As above.	As above.
Jagendrapur**	Jagendrapur	12	As above.	As above.
Jaganathpur loop**	Jaganathpur	10	As above.	As above.
Jaganathpurar duar2**	Jaganathpur	10 & 13	As above.	As above.
Kaliajurir goona**	Kaliajuri	12	As above.	As above.
Mara dhanu 3**	Khaliajuri	10,12,11	As above.	As above.
Putiar duar**	Putir khal	8	As above.	As above.
Karakhala**	Karakhola	13	As above.	As above.
Kalar duar**	Pashat	17	As above.	As above.
Puran duar	Dhanpur	12	As above	As above.
Batagar duar	Bataga	10-11	As above.	As above.
Itnar duar 3	Itna	11-12	As above.	B,Ca,Ba,Ch
Kulirbidar dor	Kulirbida	10-11	As above.	As above.
Elongjurir duar 2	Elongjuri	10-11	As above.	As above.
Bagadiar dor	Bagadia	10-11	As above.	As above.
Mitamainar duar 2	Mitamain	10-11	As above.	As above.
Goradighar duar	Goradighar	9-10	As above.	As above.
Boribarir dor	Boribari	9-10	As above.	As above.
Simulbaghar dor 2	Simulbagh	11-12	As above.	As above.
Beel boyar dor	Noagaon	9-10	As above.	As above.

C.3.2 KAWNAI RIVER (Sonamoral Haor to Chandra Sonathal Haor, Dharmapasha)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)	BORO-MAACH	CHOTO-MAACH
Jaisree 2	Jaisree	11-12	C,LC,MC	B,Ch,Ca,LAAs
Daulatpur 3*	Daulatpur	12-13	C,P,LC,MC	above
Mahamudnagar 4	Mahamudnag.	13-14	As above.	As above
Pratapur	Pratapur	25-26	LC,C,MC	As above
Muktarpur	Muktarpur	15-16	As above.	As above
Milanpur*	Milanpur	22-23	C,P,LC,MC	As above
Sukdevpur	Sukdevpur	20-22	As above.	As above
Mukshudpur*	Mukshudpur	20-22	As above.	As above

C.3.3 PIYAIN RIVER (Laipsa Bazar to Jaganathpur, Kaliajuri)

Phada**	Rangchapur	14	MC,LC,C	B,Ca,L,S,G
Jamunar khaw**	Rangchapur	12	As above.	As above.
Baganir neem	Rangchapur	10-11	As above.	As above.
Mominar khaw	Rangchapur	10-11	As above.	As above.
Horkargara	Rangchapur	10-11	As above.	As above.
Khorkoria	Rangchapur	10-11	As above.	As above.
Hatbila	Rangchapur	10-11	As above.	As above.
Gudargota khaw	Rangchapur	10-11	As above.	As above.
Phangsiar Agrar khaw	Rangchapur	9-10	As above.	As above.
Bagar khaw	Dhalimati	10-11	As above.	As above.
Borkir took**	Dhalimati	9	As above.	As above.
Rautala bazar	Rautala	10	As above.	As above.
Boiragir khaw**	Rautala	12	As above.	As above.
Shisur duar**	Mirzapur	12	As above.	As above.
Shaintar duar**	Daudpur	19	As above.	As above.
Auti**	Chakua	12	As above.	As above.
Chorkir duar**	Chakua	11	As above.	As above.
Lamba baid**	Chakua	10	As above.	As above.
Gangar khaw	Chakua	9-10	As above.	As above.
Gobindapurar khaw	Govindapur	9-10	As above.	As above.
Katwagara	Alipur	10-11	As above.	As above.
Bagar duar	Balampur	9-10	As above.	As above.
Pirarbathan	Chunai	9-10	As above.	As above.
Elonguri	Elongjuri	6-7	As above.	As above.

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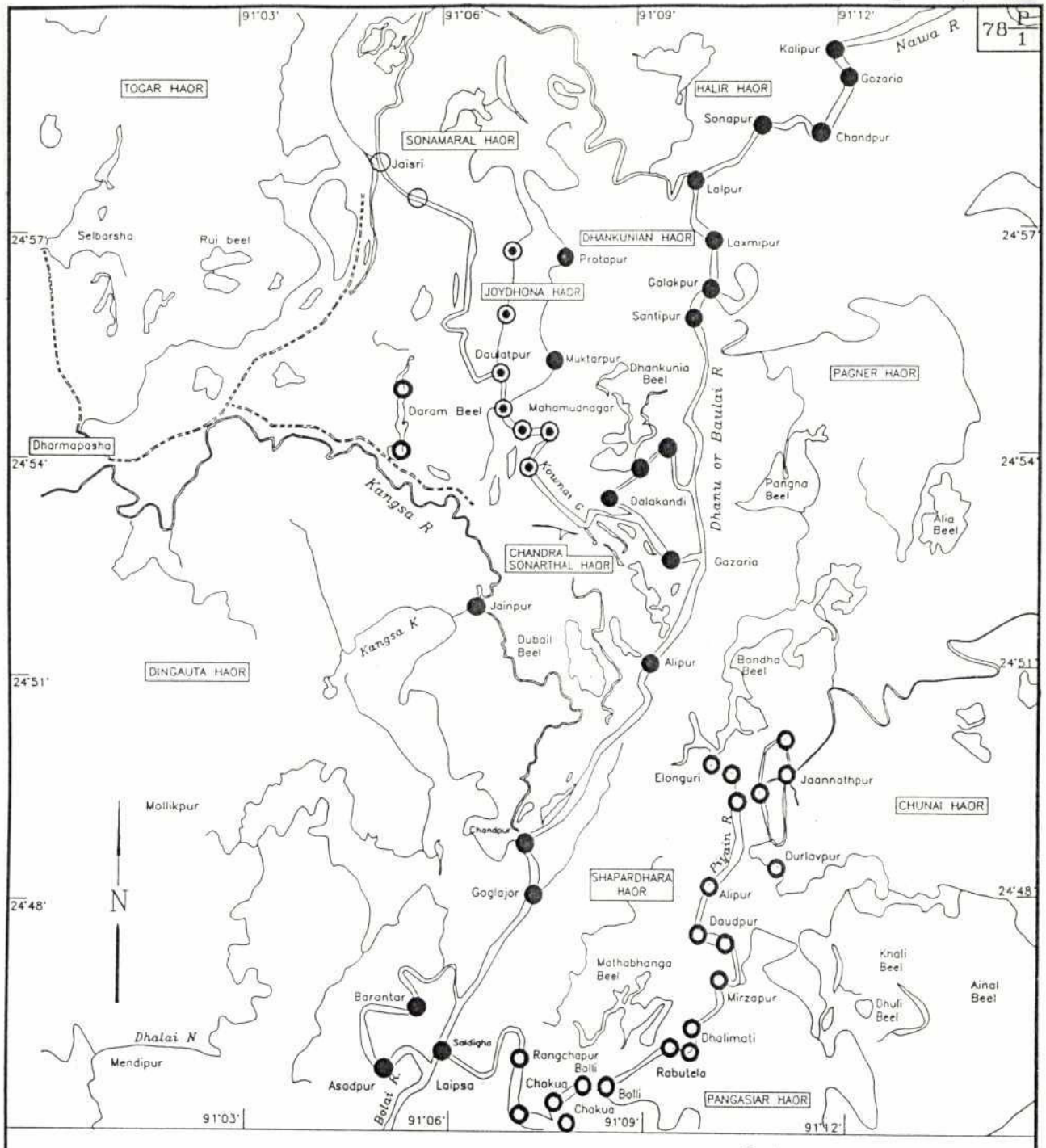
C.3.4 MARA DHANU (Kaliajuri)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)	BORO-MAACH	CHOTO-MAACH
Ballavpurar duar 2*	Ballavpur	25-26	C,LC,MC	B,L,Ch,Ca

C.3.5 GHORAUTRA RIVER (Karimganj to Bajitpur)

Sutarparar dor	Sutarpara	10-12	MC,LC,C	B,Ba,Ch,Ca
Banda Kalibari	Kalibari	10-11	C,LC,MC	As above.
Niklir duar	Nikli	10-12	LC,C,MC	As above.
ChotoDighirpar	Choto Dighirpar	9-10	As above.	As above.
Chhatir Char	Chhatirchar	10-12	As above.	As above.
Dighirpar	Dighirpar	11-12	As above.	As above.
Dilalpurar dor	Dilalpur	10-11	As above.	As above.

Figure C-17



Northeast Regional Project

Duars in the Dhanu, Kawnai and Piyain Rivers (Kaliajuri–Dharampasha and Jamalganj)

Prepared by: BNP/Jalal | December 1992

FILE: Fish-10.DWG

Figure C-18

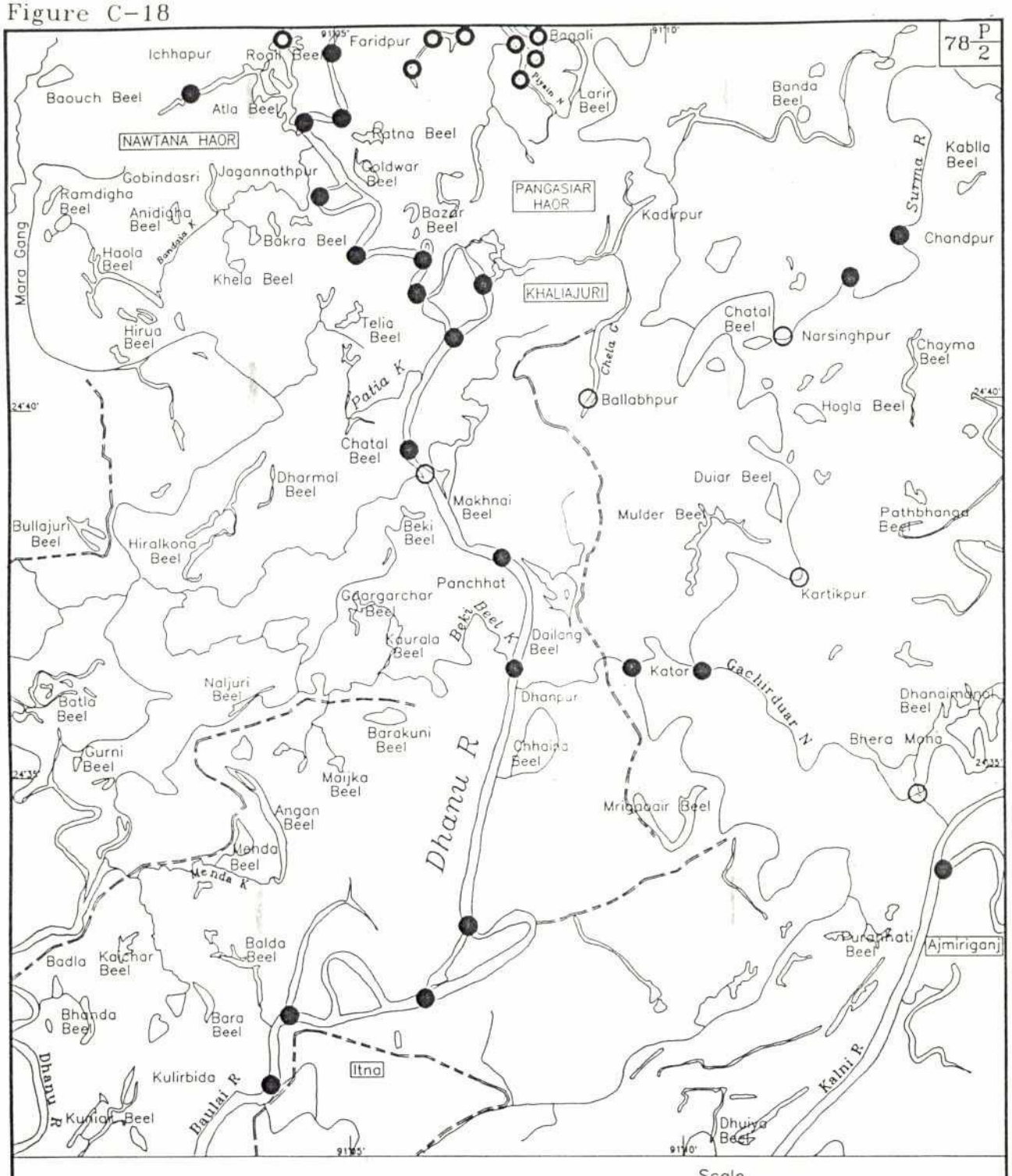

78 P/2
Faridpur
Bagali
Ichhapur
Roah Beel
Baouch Beel
Atla Beel
Piyain R
Larir Beel
Banda Beel
NAWTANA HAOR
Ratna Beel
Goldwar Beel
Kablla Beel
Surma R
Gobindasri
Jagannathpur
PANGASIAR HAOR
Ramdigha Beel
Anidigha Beel
Bandalia K
Bazar Beel
Kadirpur
Chandpur
Mara Gang
Haola Beel
Bakra Beel
Khela Beel
KHALIAJURI
Hirua Beel
Telia Beel
Chatal Beel
Narsinghpur
Chayma Beel
Chela G
Patia K
Ballabhpur
Hogla Beel
24°40'
Chatal Beel
Dharmal Beel
Duiar Beel
Makhnai Beel
Mulder Beel
Pathbhanga Beel
Bullajuri Beel
Hiralkona Beel
Beki Beel
Panchhat
Kartikpur
Gaorgarchar Beel
Kaurala Beel
Beki Beel K
Dailang Beel
Katar
Gachirduar N
Naljuri Beel
Dhanpur
Dhanaimanol Beel
Batla Beel
Barakuni Beel
Bhera Mona
Gurni Beel
Chhaira Beel
24°25'
Moijka Beel
Mrighaair Beel
Angan Beel
Dhanu R
Nanda Beel
Menda K
Balda Beel
Puranhati Beel
Ajmiriganj
Badla Kaichar Beel
Bhanda Beel
Bara Beel
Itna
Kulirbida
Baulai R
Kalni R
Dhanu R
Kumar Beel
Dhuiya Beel
91°35'
91°40'
Scale
2km 0 2 4km
Major Species
Large Catfish
Major Carp
Chital
N
Northeast Regional Project
Duars in the Dhanu/Baulai Bheramona & Piyain Rivers (Itna, Kaliajuri & Ajmiriganj)
Prepared by: BNP
January 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: FISH-40.DWG

Figure C-19

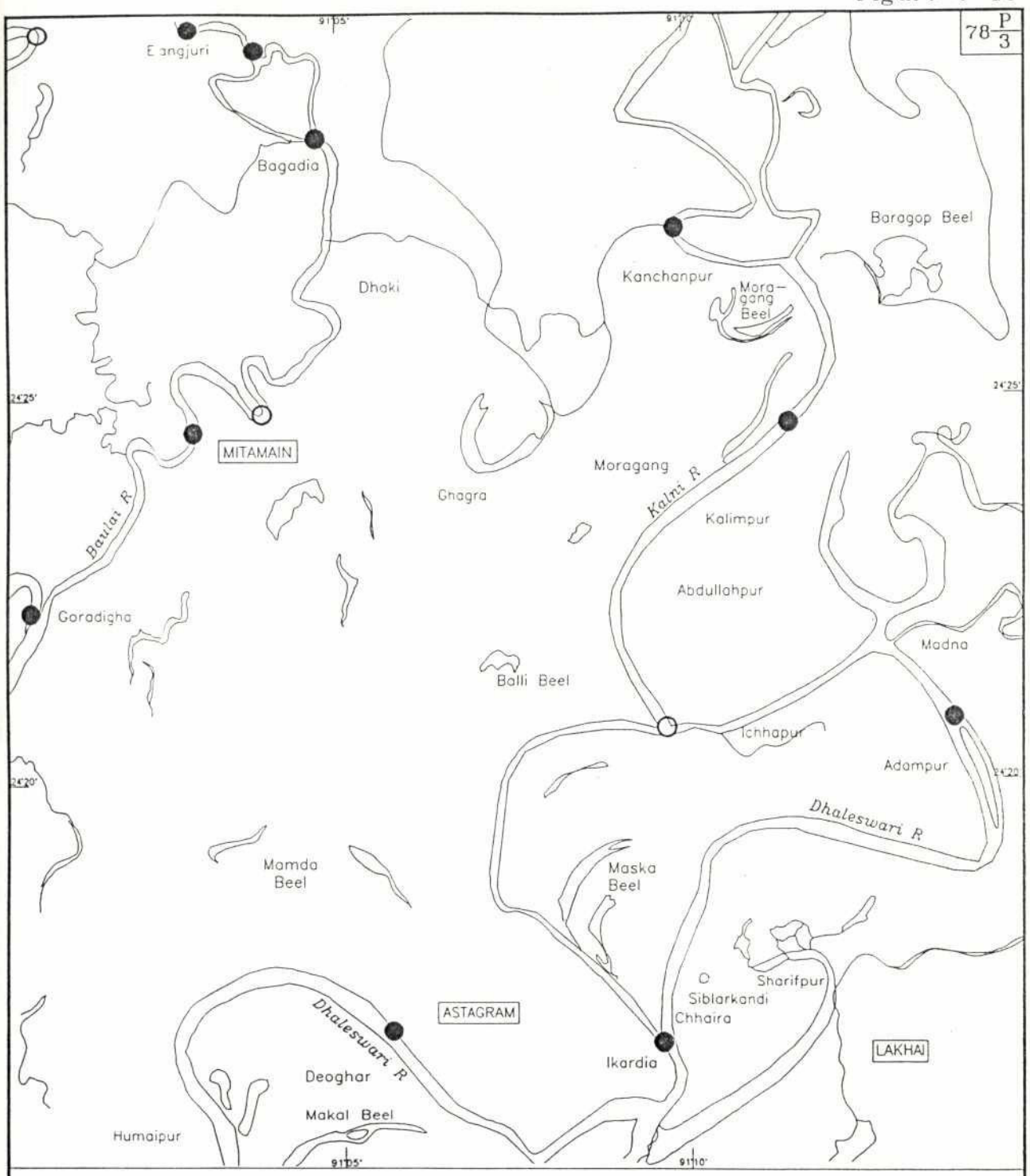
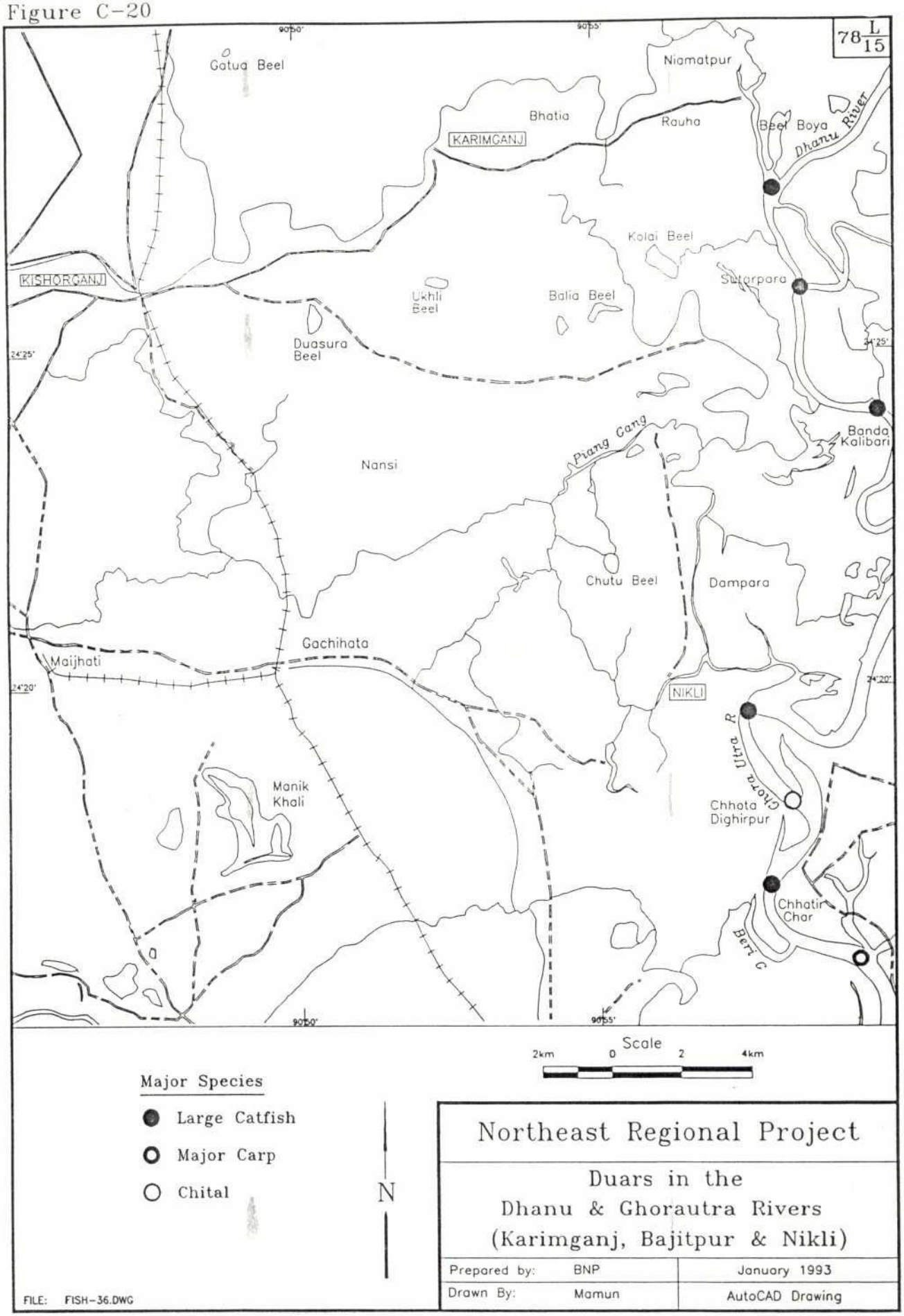

78 P/3
Bagadia
Dhaki
Kanchanpur
Mora-gang Beel
Baragop Beel
MITAMAIN
Baulai R
Ghagra
Moragang
Kalmi R
Kalimpur
Abdullahpur
Goradigha
Madna
Balli Beel
Ichhapur
Adampur
Dhaleswari R
Mamda Beel
Maska Beel
Sharifpur
Siblarkandi
Chhaira
ASTAGRAM
Ikardia
LAKHAI
Deoghar
Makal Beel
Humaipur
24°25'
24°20'
91°05'
91°10'
Scale
2km 0 2 4km
Major Species
Large Catfish
Chital
N
Northeast Regional Project
Duars in the Baulai & Dhaleswari River (Astagram-Mitamain)
Prepared by: BNP/Jalal
January 1993
FILE: FISH-20.DWG

Figure C-20


78 L/15
Gatua Beel
Niamatpur
Bhatia
Rauha
KARIMGANJ
Beel Boya
Dhanu River
Kolai Beel
KISHORGANJ
Ukhli Beel
Balia Beel
Sutarpara
Duasura Beel
24°25'
Piang Gang
Banda Kalibari
Nansi
Chutu Beel
Dampara
Gachihata
Maijhati
24°20'
NIKLI
Ghorautra Ultra R
Manik Khali
Chhota Dighirpur
Chhatir Char
Beri C
90°50'
90°55'
Scale
2km 0 2 4km
Major Species
Large Catfish
Major Carp
Chital
N
Northeast Regional Project
Duars in the
Dhanu & Ghorautra Rivers
(Karimganj, Bajitpur & Nikli)
Prepared by: BNP
January 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: FISH-36.DWG

C.4 KANGSHA RIVER AND TRIBUTARIES

C.4.1 KANGSHA RIVER (Purbadhala to Thakurkona, Netrokona)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)	BORO-MAACH	CHOTO-MAACH
Raghurampur	Raghurampur	5-6	LC,MC	B,L,R,Ch,P
Bandukhali *	Manikpur	8-9	As above	As above
Kamarkhali	Purakadulia	8-9	LC,C,MC	As above
Khataurir duba	Jaria	5-6	LC,MC,C	As above
Sharishtala	Sharistala	5-6	As above	As above
Kumarbari	Jaria	6-7	As above	As above
Kulunja	Jaria	5-6	As above	As above
Kawtahaas	Jaria	5-6	As above	As above
Moishakhali	Choruivita	5-6	As above	As above
Anammya	Koilati	5-6	As above	As above
Mucharbari	Jamdhala	6-7	As above	As above
Durgabari	Kurikuinna	5-6	As above	As above
Purbadohor	Puradohor	6-7	As above	As above
Lomboogachir	Chandragona	5-6	As above	As above
Borailarduba	Borail	5-6	As above	As above
Moinakhali	Moinakhali	5-6	As above	As above
Bautar duba	-	5-6	As above	As above
Kalomduar *	Betati	8-9	LC,C,MC	As above
Tetuliar duba	Paspai	6-7	As above	As above
Chitalia	Baghura	8-9	As above	As above

C.4.2 NAYAKHAL (Nazirgangar bazar to Baushar khal, Netrokona)

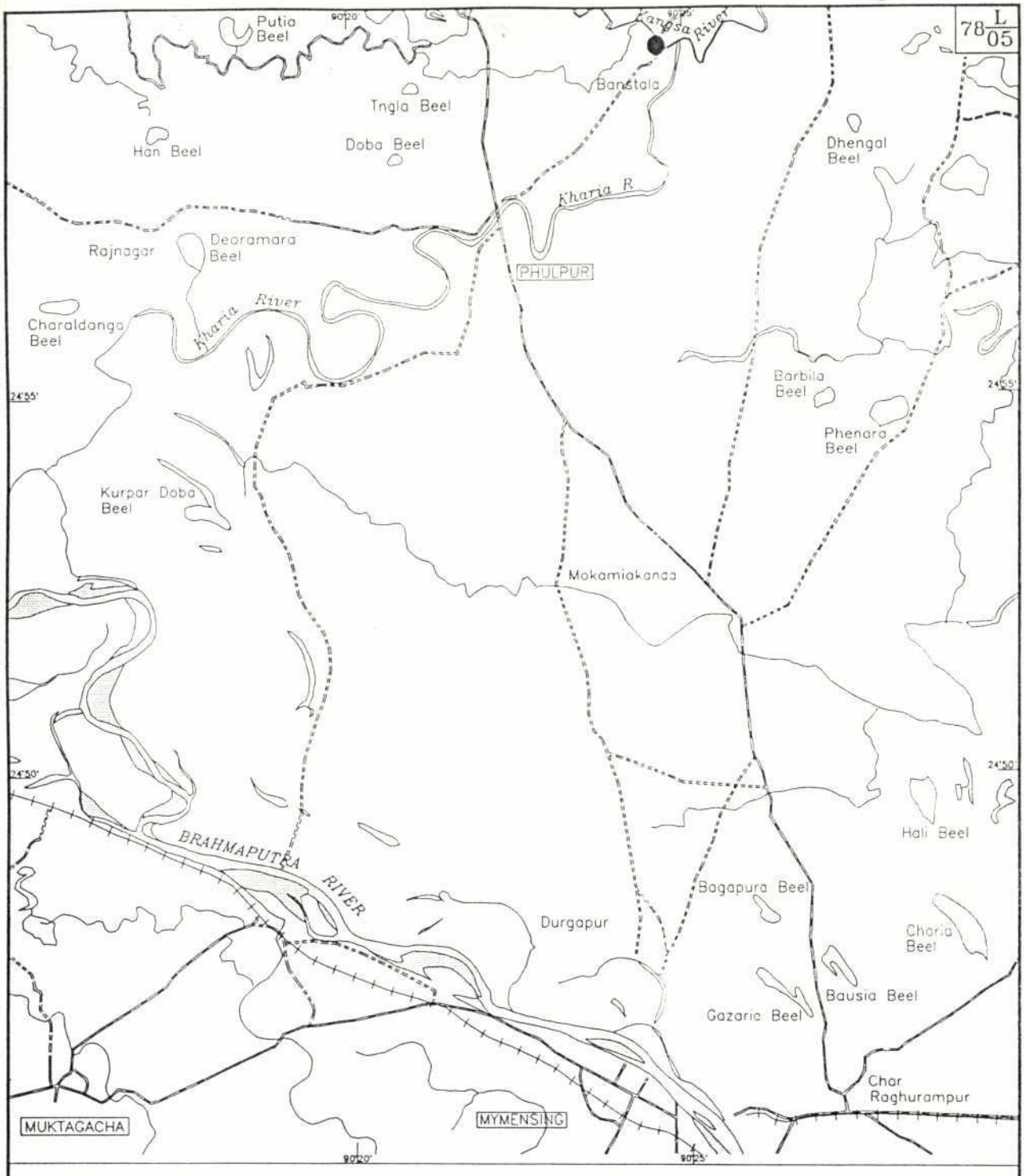
Kuriamara	Nazirganj	5-6	LC,MC,C	B,L,P,Ch,G
Kamrail	Kulasree	6-7	As above	As above
Choudhamiar koor	-	6-7	As above	As above
Karimkhali	Bausa	5-6	As above	As above

C.4.3 BISHNAI RIVER (Thakurkona to Atpara thana, Netrokona)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)	BORO-MAACH	CHOTO-MAACH
Baishdar	Baisdair	6-7	LC,C,MC	B,L,P,Ch,R
Deulir duba	Deuli	5-6	As above	As above
Shawtar duba 2	Sahata	5-6	As above	As above
Lalchandar duba	Shyampur	6-7	As above	As above
Bishnair duba	Bisnaikanda	6-7	As above	As above
Amirkhar duba*	Peajkandi	8-9	LC,C,MC	As above
Dharar duba	Isailipur	6-7	As above	As above
Gulduba *	Laxmipur	5-6	As above	As above

C.4.4 MOGRA RIVER (Atpara to Madan, Netrokona)

Bichunarkoor	Narayanpur	6-7	LC,MC,C	B,L,P,Ch,G
Kalibarir koor*	Monisha	10-11	As above	As above
Nazirgangar koor*	Nazirganj	9-10	As above	As above
Gopalasram	Gopalasram	5-6	As above	As above
Madhuakhali	Madhuakhali	5-6	As above	As above
Nilkantapur	Nilkantapur	5-6	LC,MC,C	As above
Mangalsri	Mangalsri	5-6	As above	As above
Barai bhadara	Baraibadara	5-6	As above	As above
Jahangirpur	Jahangirpur	6-7	As above	As above
Bajitpur	Bajitpur	8-9	As above	As above
Parashkhila*	Parashkhila	10-11	As above	As above
Bagajau	Bagajan	10-11	As above	As above
Boitakhali	Boitakhali	8-9	As above	As above
Paharpur	Paharpur	9-10	As above	As above
Sridharpur	Sridharpur	8-9	As above	As above
Binni	Binni	5-6	As above	As above
Fatepur	Fatepur	6-7	As above	As above



Northeast Regional Project

Duars in the Kushiyara River (Phulpur)

Prepared by:	BNP	February 1993
Drawn By:	Mamun	AutoCAD Drawing

FILE: FISH-46.DWG

Figure C-22

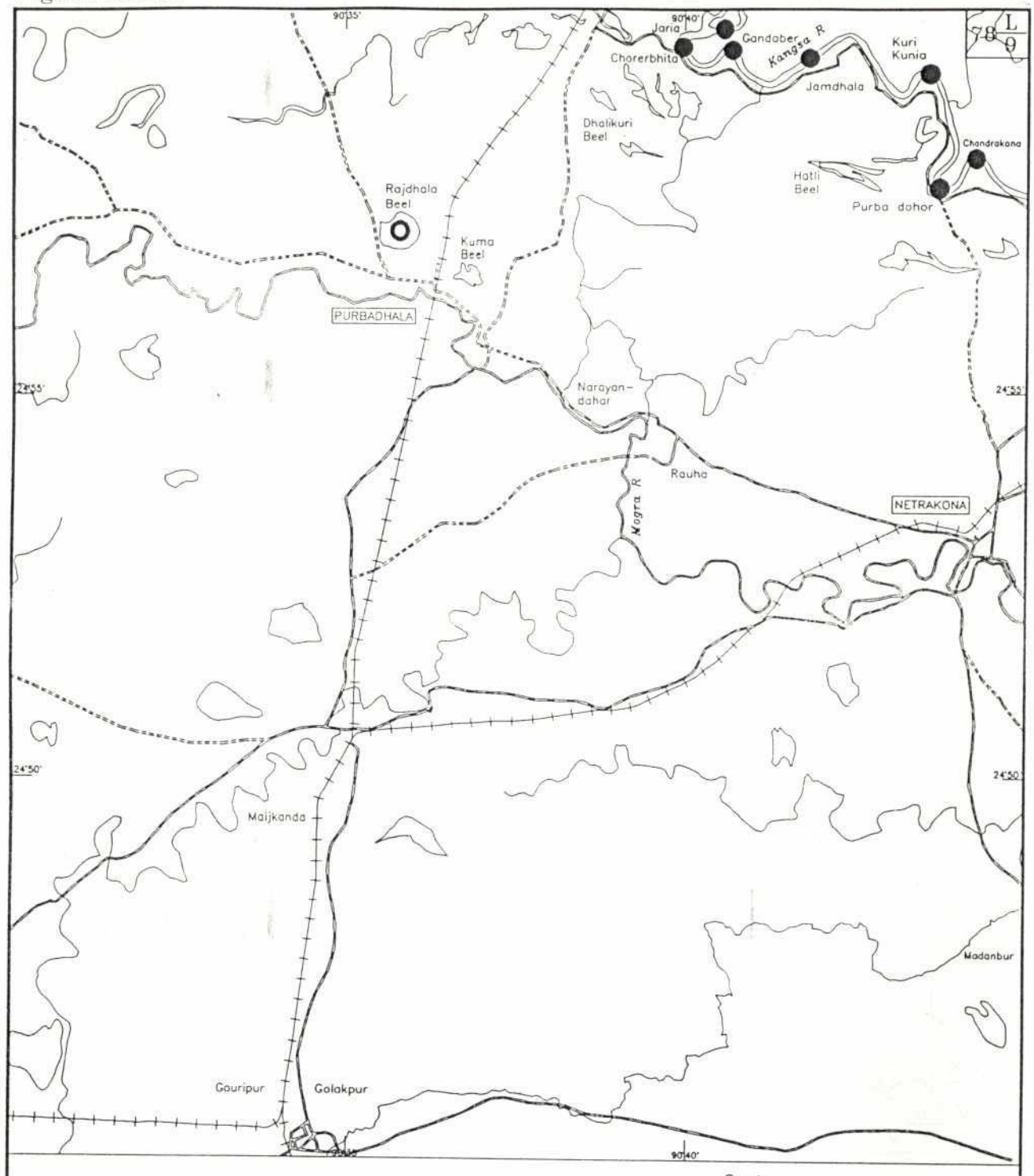
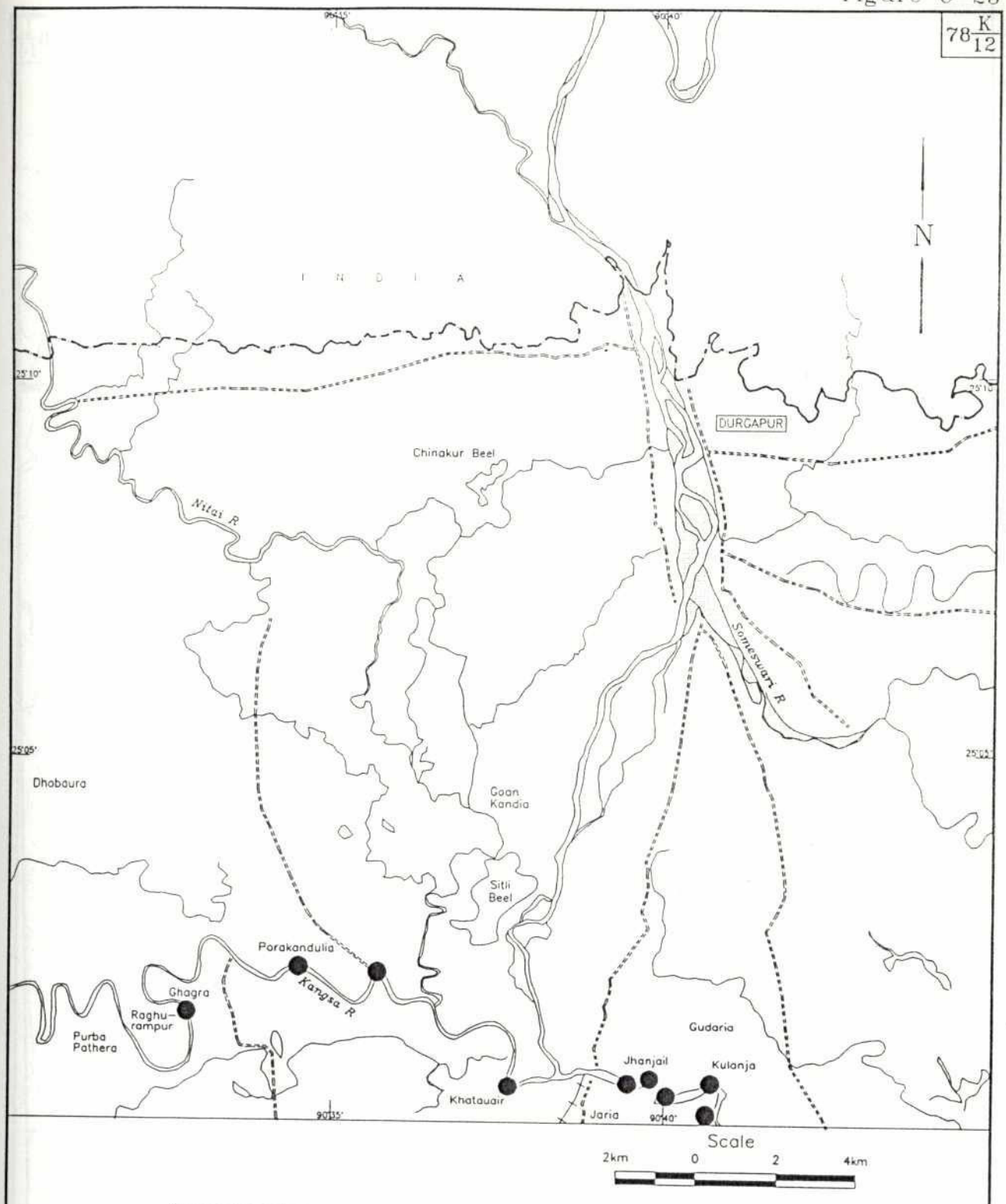

90°35'
90°40'
Joria
Gandaber
Kangsa R
Kuri Kunia
Chorerbhita
Jamdhala
Dhalikuri Beel
Chandrakona
Hatli Beel
Purba dohor
Rajdhala Beel
Kuma Beel
PURBADHALA
24°55'
Narayan-dahar
Rauha
Nogra R
NETRAKONA
24°50'
Maijkanda
Madanbur
Gauripur
Golakpur
90°40'
Scale
2km 0 2 4km
Major Species
Large Catfish
Major Carp
N
Northeast Regional Project
Duars in the Kangsha River (Netrokona & Purbadhala)
FILE: FISH-12DWG
Prepared by: BNP/Jalal
December 1992

Figure C-23



Northeast Regional Project

Duars In the Kangsa River (Purbadhala and Jaria)

FILE: FISH-9.DWG

Prepared by: BNP/Jalal

December 1992

55

Figure C-24

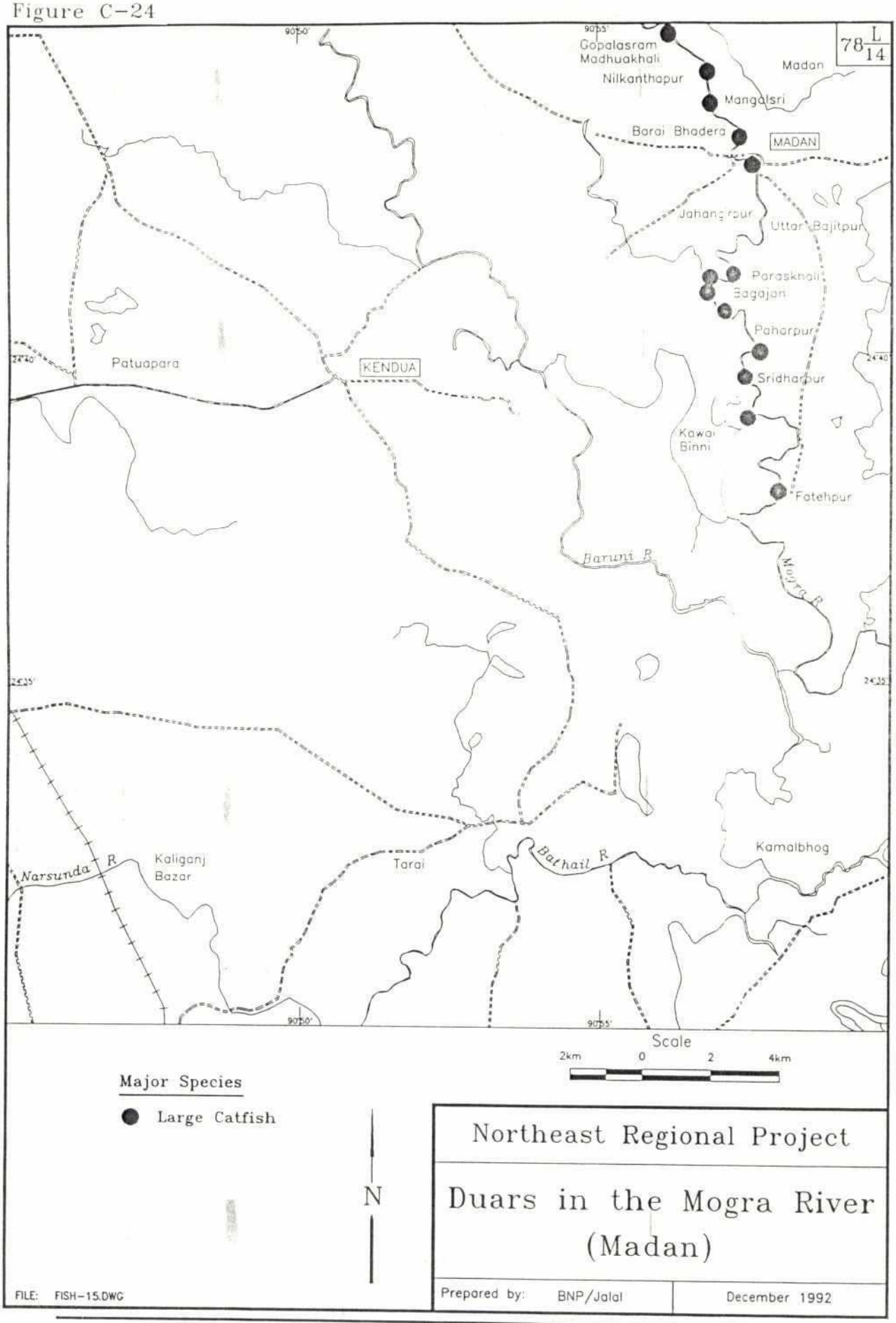
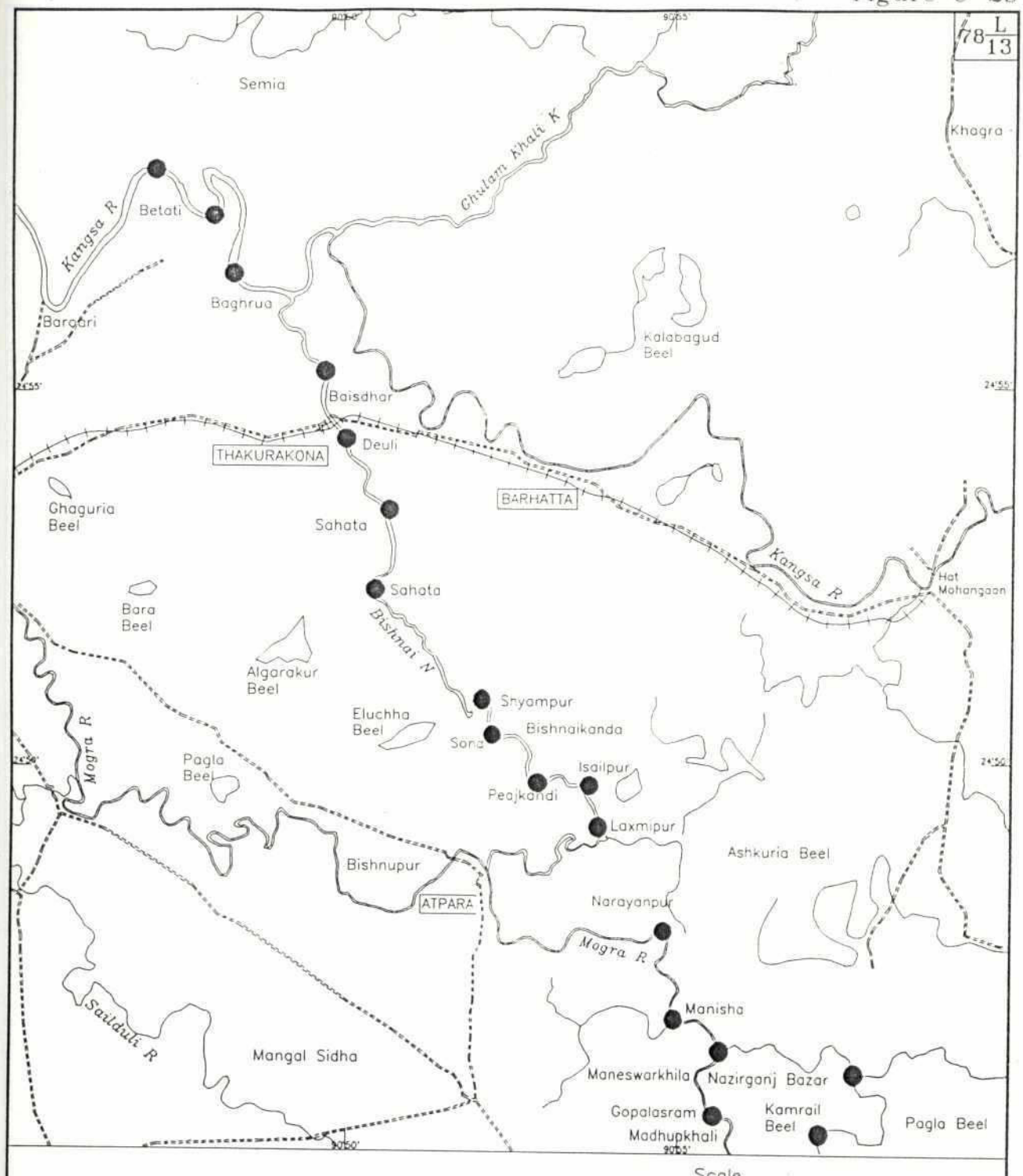


Figure C-25


78 L/13
Semia
Khagra
Ghulam Khali K
Kangsa R
Betati
Baghrua
Baradari
Kalabagud Beel
Baisdhar
Deuli
THAKURAKONA
BARHATTA
Ghaguria Beel
Sahata
Sahata
Kangsa R
Hat Mohangaon
Bara Beel
Bishnai R
Algarakur Beel
Shyampur
Eluchha Beel
Bishnaikanda
Sona
Mogra R
Pagla Beel
Isailpur
Peajkandi
Laxmipur
Ashkuria Beel
Bishnupur
ATPARA
Narayanpur
Mogra R
Manisha
Saildubi R
Mangal Sidha
Maneswarkhila
Nazirganj Bazar
Gopalasram
Madhupkhali
Kamrail Beel
Pagla Beel
Scale
2km 0 2 4km
Major Species
Large Catfish
N
Northeast Regional Project
Duars in the Kangsa, Bishnai and Mogra Rivers (Atpara)
FILE: FISH-17.DWG
Prepared by: BNP/Jalal
December 1992

C.5 UPPER MEGHNA RIVER

C.5.1 UPPER MEGHNA RIVER (Astagram to Bhairab bazar, Kishorganj)

NAME OF DUAR	ADJACENT VILLAGE	DEPTH (m)	BORO-MAACH	CHOTO-MAACH
Echordir dor**	Astagram	28	LC,C,MC	B,Ch,Ca,Ba
Bagailar dor**	Bagail	15	As above	As above
Chatalparar dor**	Chatalpar	24	As above	As above
Ainargoop**	Ainargoop	21	As above	As above
Rajapurar dor*,**	Rajapur	35	LC,C,P,MC	As above
Mendipurar dor**	Mendipur	19	As above	As above

C.5.2 KALI RIVER (Kuliarchar thana)

Kunnamuk *,**	Kuliarchar	16	LC,MC,C	Ch,Ca,B,Ba
Kadirpurar dor *,**	Kadirpur	17	As above	As above.

Figure C-26

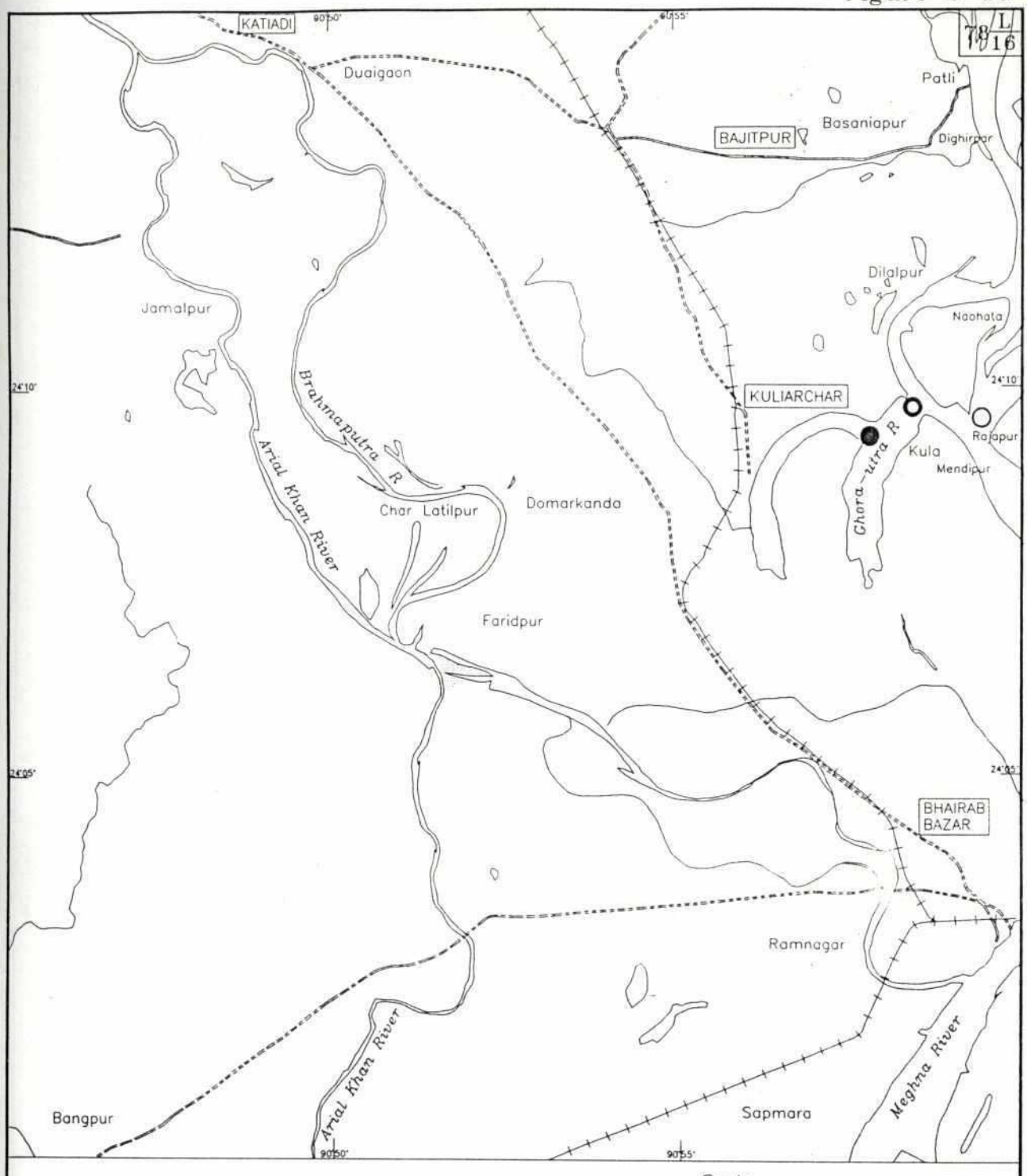
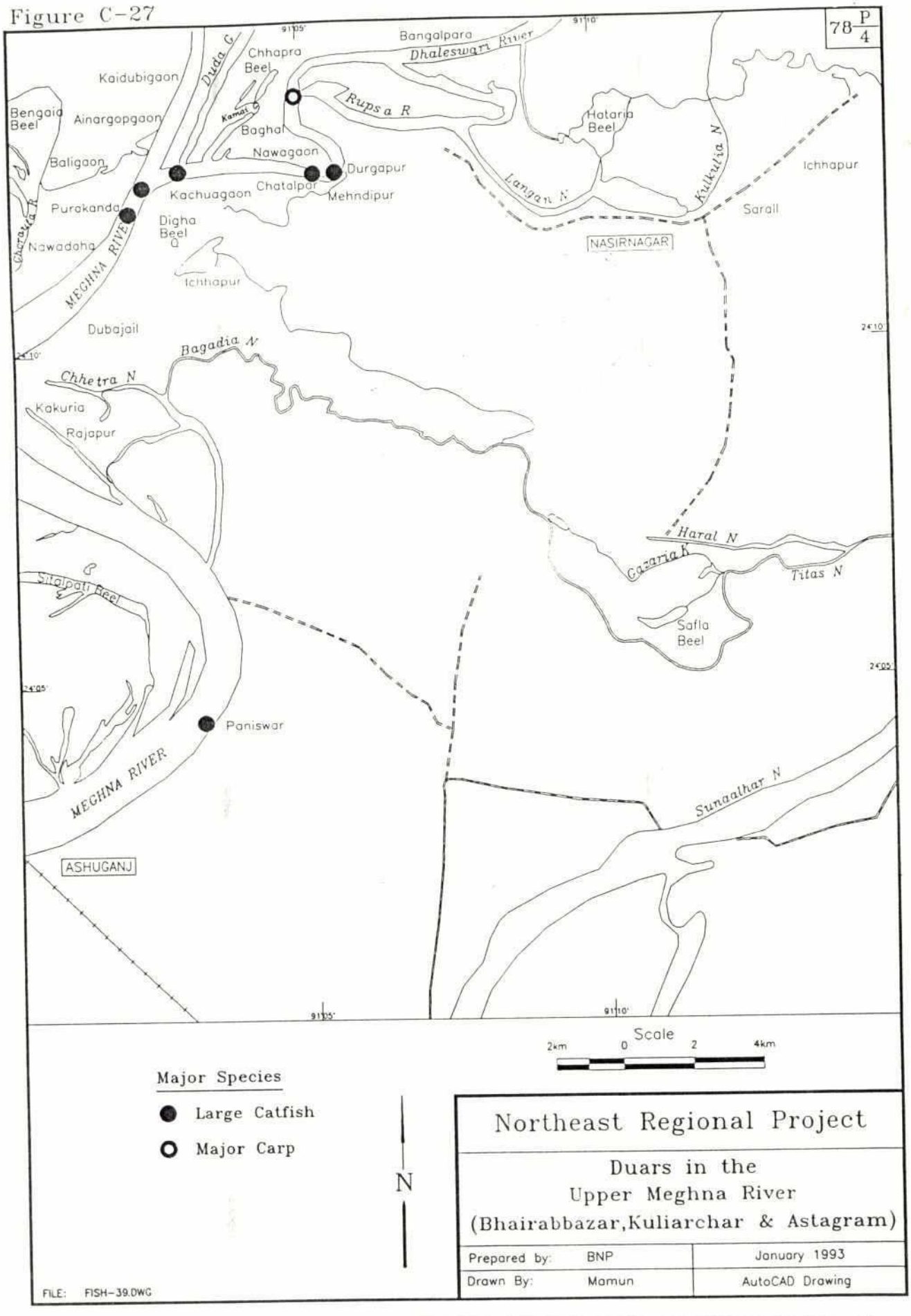

78 L/16
KATIADI
Duaigaon
Patli
Basaniapur
BAJITPUR
Dighirpar
Dilalpur
Jamalpur
Naohata
KULIARCHAR
Brahmaputra R.
Arial Khan River
Char Latilpur
Domarkanda
Chora-utra R.
Kula
Rajapur
Mendipur
Faridpur
BHAIRAB BAZAR
Ramnagar
Arial Khan River
Meghna River
Bangpur
Sapmara
90°50'
90°55'
24°10'
24°05'
Scale
2km 0 2 4km
Major Species
Large Catfish
Major Carp
Chital
N
Northeast Regional Project
Duars in the Meghna & Ghorautra Rivers (Kuliarchar)
FILE: FISH-19.DWG
Prepared by: BNP/Jalal
January 1993

Figure C-27



Northeast Regional Project	
Duars in the Upper Meghna River (Bhairabbazar, Kuliarchar & Astagram)	
Prepared by: BNP	January 1993
Drawn By: Mamun	AutoCAD Drawing

FILE: FISH-39.DWG

APPENDIX D
LIST OF HIZAL/KOROCH GARDENS

APPENDIX D : LIST OF HIZAL/KOROCH GARDENS

Name of Garden	Remarks
District: **SUNAMGANJ**	
North Shachapur	Lease value was Tk 15000 for 1992-96. Branches sold for katha.
Pereezpur	Lease value was Tk40000 for 1992-96. Branches sold for katha.
Ragisrapur	Lease value was Tk13100 for 1992-96. Branches sold for katha.
Rahimapur	Lease value was Tk60000 for 1992-96. Branches sold for katha.
Anantapur	Lease value was Tk4200 for 1992-96.
Dulvarchar	Lease value was Tk18200 for 1992-96. Branches sold for katha.
Bhatgaon	Lease value was Tk11700 for 1992-96. Branches sold for katha.
Rukshar	Lease value was Tk8700 for 1992-96
North Fatepur	Lease value was Tk22250 for 1992-96. Branches sold for katha.
Bicharkanda	Lease value was Tk1000 for 1992-96
Paana	Lease value was Tk2000 for 1992-96
Latifpur	Leased out for 1992-96.
Nichintapur	Leased out for 1992-96.
Nayanagar	Leased out for 1992-96.
Horihorpur	Leased out for 1992-96.
Shukhair	Leased out for 1992-96.
Ratansree	Leased out for 1992-95.
Shatur	Leased out for 1992-95.
Bagbari	Leased out fgor 1992-95.
Nayanpur	Leased out for 1992-95.
Binodpur	Leased out for 1992-95.
Manik khila	Leased out for 1992-95.
Islampur	About 220 trees around the Tanguar haor floodplain, Jaganathpur.
Bhatidhal	About 300 trees around the Tanguar haor floodplain, Jaganathpur.
Lalpur	About 100 trees around the Korchar haor,Bishwambarpur thana, garden managed by the villagers.
Udaypur	About 150 trees near Hatimara fishery, Sullah.

Name of Garden	Remarks
Kartikpur	About 200 trees near Hatimara fishery, managed by the fishermen.
Gopalpur	Within the Shanir haor floodplain, Tahirpur thana.
Rajendrapur	As above.
Fatepur	As above.
Rangarchar	As above.
Noagaon	As above.
Kholya	As above.
Niamatpur	As above.
Auriapur	As above.
Shahebpur	As above.
Noapara	As above.
Kirdatpur	Garden around the Jamalganj and Biswambarpur area, owned by the Government and branches used for katha.
Sujatpur	As above.
Kawa	As above.
Bahadurpur	As above.
Bhutiarpur	As above.
Duanoi	As above.
Kathalia	As above
Alipur	As above.
Gopalpur	As above.
Pasuar haor	More than 1000 trees around the Gulmar haor, planted and managed by the lessee, Dharmapasha.
Tanguar haor complex	More than 11400 trees exist within the haor complex, planted by the leesee.

Name of Garden	Remarks
District: **SYLHET**	
Gardona	About 500 trees around the Medhol haor area, planted and managed by the village people.
Patnipurar bag	About 2-300 trees around the Boro haor area, owned by Government.
Manpurar bag	As above.
Patkir bag	As above.
Luchir bag	About 200 treees around the Rouchunni floodplain, managed by the village people, Goyainghat.
Khalagramar bag	As above.
Rouchunnir bag	About 500 trees were planted by the DOF under floodplain plantation program.
Jalurmuk	Garden near the Ratargul village, Goyainghat. About 7 km long and .5 km width, managed by the DOF.
Sylhet-Fenchuganj road side	Road side plantation made by the R & H to protect road from wave.
Sylhet-Jaintiapur road side	Plantation made during the British period. Two types of plants exist along with the road side (Hizol at the bottom and Jarul at the slope of the embankment.

District: **MOULAVIBAZAR**	
Chatla beel	About 500 trees were planted by the lessee around the Hakaluki haor.

District: **HOBIGANJ**	
Dillir Akhra	More than 5000 trees planted by the Hindu prists during the Mughal period.

Name of Garden	Remarks
District: **KISHORGANJ**	
Humaipur	About 30 trees around the Humaipur haor, Bajitpur.

District: **NETRAKONA**	
Adampur Goalbari	About 250 trees around the Chela piya fishery, planted and managed by the farmers, Kaliajuri.
Adampur	As above.
Ballavpur	As above.
Jaganathpur	About 30 trees along with the Dhanu River.
Bolli	About 100 trees around the Rangchapur fishery, Kaliajuri. Trees are managed by local people.
Faridpur	About 100 trees around the Faridpurar duar, Kaliajuri. Trees are managed by the local people.
Chandail	Garden exists within the Kalmakanda thana in the Government khas land.
Bishnupur	As above.
Medirkandi	As above.
Kaliara	As above.
Ramvadrapur	As above.
Baushir	As above.
Ranigaon	As above.

APPENDIX E

BFRSS FISHERIES PRODUCTION DATABASE

APPENDIX E : BFRSS FISHERIES PRODUCTION DATABASE

Table E1: List of BFRSS Sampling Station

District	Type	Location	River/Beel	Thana
Sylhet	Riverine	Miragaon	Surma river	Sadar
		Korcharpar	Kushiyara River	Balagonj
		U.Gangapur	Kushiyara River	Balagong
	Beel	Chhotolola	Hail haor	Fenchuga
	Subsistance	Mohammadpur		Bajitpur
Sunamganj	Riverine	Ujanlalpur	Surma River	Jamalgon
		Joykolosh	Surma River	Sadar
		Khidirpur	Surma River	Chatak
	Beel	Pirannagar	Pirannagar beel	Sadar
		Kuri Beel	Kuri beel	Chatak
	Subsistance	Sadarpur	Deker haor	Sadar
Moulvibazar	Riverine	Homorkona, Monumukh	Kushiyara River	Sadar
		Premnagar		Rajnagar
	Beel	Beri beel	Beri Beel	Sadar
		Chatal Beel	Hakaluki haor	Kulaura
	Subsistance	Sherpurgaon		Sadar
Habiganj	Riverine	Azamnagar, Rania	Kalni River	Ajmiriganj
		Modna		Lakhai
	Subsistance	Sreerampur		Sadar

BFRSS has 3 large riverine fish catch data sampling stations in the region:
Bhairab; Chandiber(Upper Meghna River)
Kuliarchar; Daspur(Ghorautra River)
Bajitpur; Dighipar (Ghorautra River)

There is one station for the subsistence fishery (Sadar-Maizbag) and 2 stations for beel fishery data collection (Karimgonj Fhalia beel and Nalia Akarma beel).

Overall fish production in Northeast Region,
broken down by water body groups and greater districts.

in metric tons WATER BODY \ YEAR	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1988/89 % GRAND TOTAL
UPPER MEGHNA RIVER							
Sylhet	755	1853	3058	2292	2662	1806	
Mymensingh	1234	1677	872	632	607	1025	
Comila	3668	2639	5679	5200	3732	6347	
Dhaka	5183	4255	5169	8255	7855	4952	
Subtotal	10840	10424	14778	16379	14856	14130	12.4%
OTHER RIVERS							
Sylhet	NA	7591	8789	8659	11531	11272	
Mymensingh	NA	15916	8978	9796	12132	10681	
Subtotal	20417	23507	17767	18455	23663	21953	19.2%
TOTAL RIVER FISHERIES	31257	33931	32545	34834	38519	36083	31.6%
BEELS*							
Sylhet	14715	15519	16993	15999	17098	17999	
Mymensingh	13233	13734	12811	13152	13479	15478	
Subtotal	27948	29253	29804	29151	30577	33477	29.3%
FLOOD LANDS							
Sylhet	16976	9837	15259	15300	15596	14812	
Mymensingh	7374	6731	11030	12434	12437	11826	
Subtotal	24350	16568	26289	27734	28033	26638	23.3%
TOTAL CAPTURE FISHERIES	83555	79752	88638	91719	97129	96198	84.2%
PONDS							
Sylhet	3905	2625	5561	9603	8722	8340	
Mymensingh	8435	7450	7227	7769	9551	9735	
Subtotal	12340	10075	12788	17372	18273	18075	15.8%
GRAND TOTAL	95895	89827	101426	109091	115402	114273	100.0%

* 1989/90 beel production: Sylhet = 19,030; Mymensingh = 13,984; Subtotal = 33,014.

Species composition of overall fish production in Northeast Region, broken down by water body groups.

in metric tons

WATER BODY SPECIES \ YEAR	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89
UPPER MEGHNA RIVER						
Carp	705	451	496	48	86	630
Catfish	256	227	464	52	249	316
Livefish	92	0	0	0	0	0
Hilsa	2466	1971	3778	5611	5882	5357
Big shrimp	1240	1511	81	20	38	168
Small shrimp	0	1418	1707	1020	833	1213
Miscellaneous	6081	4846	8252	9628	7768	6446
Subtotal	10840	10424	14778	16379	14856	14130
OTHER RIVERS						
Carp	5822	6703	1971	784	804	3435
Catfish	2980	3431	1581	753	710	739
Livefish	802	923	1	26	0	8
Hilsa	618	711	1504	1940	689	1517
Big shrimp	1	1	6	15	11	0
Small shrimp	0	0	665	240	215	290
Miscellaneous	10194	11738	12039	14697	21234	15964
Subtotal	20417	23507	17767	18455	23663	21953
TOTAL ALL RIVERS						
Carp	6527	7154	2467	832	890	4065
Catfish	3236	3658	2045	805	959	1055
Livefish	894	923	1	26	0	8
Hilsa	3084	2682	5282	7551	6571	6874
Big shrimp	1241	1512	87	35	49	168
Small shrimp	0	1418	2372	1260	1048	1503
Miscellaneous	16275	16584	20291	24325	29002	22410
Subtotal	31257	33931	32545	34834	38519	36083
BEELS*						
Carp	6696	7009	7141	6985	7326	8021
Catfish	5198	5441	5544	5422	5687	6227
Livefish	196	205	209	204	214	234
Hilsa	0	0	0	0	0	0
Big shrimp	0	0	0	0	0	0
Small shrimp	833	872	888	869	911	998
Miscellaneous	15025	15726	16023	15672	16438	17997
Subtotal	27948	29253	29804	29151	30577	33477

FLOOD LANDS						
Carp	40	36	60	67	67	0
Catfish	341	271	437	479	482	1030
Livefish	4054	2996	4803	5177	5215	5846
Hilsa	0	0	0	0	0	0
Big shrimp	0	0	0	0	0	0
Small shrimp	3197	1869	2903	2920	2975	1838
Miscellaneous	16718	11396	18086	19090	19294	17924
Subtotal	24350	16568	26289	27733	28033	26638
TOTAL CAPTURE FISHERIES						
Carp	13263	14199	9668	7884	8283	12086
Catfish	8775	9370	8026	6706	7128	8312
Livefish	5144	4124	5013	5407	5429	6088
Hilsa	3084	2682	5282	7551	6571	6874
Big shrimp	1241	1512	87	35	49	168
Small shrimp	4030	4159	6163	5049	4934	4339
Miscellaneous	48018	43706	54400	59087	64734	58331
Subtotal	83555	79752	88638	91718	97129	96198
PONDS**						
Carp	8430	7056	8268	10600	11575	11538
Catfish	441	298	625	1075	978	936
Livefish	59	49	61	81	86	85
Hilsa	0	0	0	0	0	0
Big shrimp	30	20	43	74	67	64
Small shrimp	0	0	0	0	0	0
Miscellaneous	3380	2652	3792	5542	5566	5451
Subtotal	12340	10075	12788	17372	18273	18075
TOTAL FOR NORTHEAST REGION						
Carp	21693	21255	17936	18483	19858	23624
Catfish	9216	9668	8650	7781	8107	9248
Livefish	5203	4173	5073	5488	5515	6174
Hilsa	3084	2682	5282	7551	6571	6874
Big shrimp	1271	1532	130	109	116	232
Small shrimp	4030	4159	6163	5049	4934	4339
Miscellaneous	51398	46359	58191	64629	70301	63782
GRAND TOTAL	95895	89827	101426	109091	115402	114273

* Based on 4 year means, and assuming 75% of production coming from pile fishery and 25% from annual fishery.

** Based on 4 year means for greater Sylhet and Mymensingh Districts.

Annual % change in fish production in Northeast Region, by water body groups.

WATER BODY GROUP \ YEAR	1984/85	1985/86	1986/87	1987/88	1988/89	Mean
Upper Meghna River	-3.8%	41.8%	10.8%	-9.3%	-4.9%	6.9%
Other rivers	15.1%	-24.4%	3.9%	28.2%	-7.2%	3.1%
TOTAL RIVER FISHERIES	8.6%	-4.1%	7.0%	10.6%	-6.3%	3.2%
BEELS	4.7%	1.9%	-2.2%	4.9%	9.5%	3.7%
FLOOD LANDS	-32.0%	58.7%	5.5%	1.1%	-5.0%	5.7%
TOTAL CAPTURE FISHERIES	-4.6%	11.1%	3.5%	5.9%	-1.0%	3.0%
PONDS	-18.4%	26.9%	35.8%	5.2%	-1.1%	9.7%
GRAND TOTAL	-6.3%	12.9%	7.6%	5.8%	-1.0%	3.8%

Species composition of production from pile fisheries and annual fisheries of beels in the Northeast Region (based on sampled beel survey in greater Sylhet and Mymensingh Districts).

by percentage weight

	1985/86	1986/87	1987/88	1988/89	4 year mean	1989/90
P I L E F I S H E R Y						
Rui (Labeo rohita)	4.98	9.10	4.49	7.25	6.46	9.48
Catla (Catla catla)	6.80	1.57	0.88	1.60	2.71	3.46
Mrigal (Cirrhinus mrigala)	0.38	1.91	2.03	3.38	1.93	5.84
Kalbasu (Labeo calbasu)	15.10	7.21	9.10	6.70	9.53	11.90
Gonia (Labeo gonius)	9.71	6.88	13.36	4.10	8.51	10.05
Boal (Wallago attu)	5.15	18.73	8.96	10.26	10.78	14.28
Air (Mystus aor, M.seenghala)	4.50	7.96	6.69	5.64	6.20	6.94
Pabda (Ompok pabda)	2.10	1.34	3.62	4.00	2.77	2.42
Shol/Gazar (Channa spp)	1.78	7.22	3.26	2.40	3.67	3.49
Chital/Foli (Notopterus spp)	2.93	3.98	4.44	3.26	3.65	4.24
Koi (Anabas testudineus)	0.00	0.34	0.16	0.11	0.15	0.43
Singi/Magur (Heteropneustes, Clarias spp)	0.01	0.41	0.68	0.76	0.47	0.38
Sarpunti (Puntius sarana)	6.91	5.83	2.12	1.85	4.18	2.24
Small shrimp	0.51	1.13	3.14	5.49	2.57	5.95
Carpio (Cyprinus carpio)	0.14	0.00	0.00	1.07	0.30	0.00
Punti (Puntius spp)	0.00	0.00	0.00	0.00	0.00	0.00
Tengra (Mystus spp)	0.00	0.00	0.00	0.83	0.21	4.82
Baim (Mastacembelus spp)	0.00	0.00	0.00	0.15	0.04	0.00
Chapila (Gudusia chapra)	0.00	0.00	0.00	0.00	0.00	0.00
Others	39.00	26.39	37.07	41.15	35.90	14.08
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
A N N U A L F I S H E R Y						
Rui (Labeo rohita)	0.18	1.84	1.72	4.03	1.94	4.98
Catla (Catla catla)	0.00	0.98	0.40	1.75	0.78	2.55
Mrigal (Cirrhinus mrigala)	0.00	1.00	0.85	2.62	1.12	1.60
Kalbasu (Labeo calbasu)	0.32	5.94	2.91	6.89	4.02	9.29
Gonia (Labeo gonius)	0.24	0.58	0.57	0.84	0.56	3.75
Boal (Wallago attu)	12.38	7.80	4.74	9.51	8.61	13.40
Air (Mystus aor, M.seenghala)	13.54	2.73	3.87	3.03	5.79	4.37
Pabda (Ompok pabda)	0.00	0.00	1.34	1.65	0.75	0.26
Shol/Gazar (Channa spp)	0.78	0.70	0.95	1.25	0.92	1.20
Chital/Foli (Notopterus spp)	1.10	0.11	1.03	2.49	1.18	1.61
Koi (Anabas testudineus)	0.17	0.00	0.40	0.99	0.39	0.16
Singi/Magur (Heteropneustes, Clarias spp)	0.23	0.02	0.36	1.52	0.53	0.75
Sarpunti (Puntius sarana)	2.55	0.14	0.12	0.94	0.94	1.00
Small shrimp	5.85	1.93	5.21	3.79	4.20	3.02
Carpio (Cyprinus carpio)	0.00	0.00	0.00	0.85	0.21	0.80
Punti (Puntius spp)	9.64	0.00	6.28	2.15	4.52	4.01
Tengra (Mystus spp)	4.35	0.00	0.00	1.60	1.49	1.58
Baim (Mastacembelus spp)	0.23	0.00	0.00	0.45	0.17	0.00
Chapila (Gudusia chapra)	0.14	14.66	6.16	3.80	6.19	0.00
Others	48.30	61.57	63.09	49.85	55.70	45.67
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00

Statistics on subsistence fishing on flood lands in the Northeast Region by greater districts.

DISTRICT\YEAR	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89
NUMBER OF SUBSISTENCE HOUSEHOLDS						
Sylhet	637000	686000	660000	680000	636000	636000
Mymensingh	615000	699000	729000	947000	947000	810000
TOTAL	1252000	1385000	1389000	1627000	1583000	1446000
AVERAGE CATCH PER HOUSEHOLD (kg)						
Sylhet	26.65	14.34	23.12	22.50	24.52	23.29
Mymensingh	11.99	9.63	15.13	13.13	13.13	14.60
TOTAL	19.45	11.96	18.93	17.05	17.71	18.42
TOTAL CATCH ESTIMATED (t)						
Sylhet	16976	9837	15259	15300	15596	14812
Mymensingh	7374	6731	11030	12434	12437	11826
TOTAL	24350	16568	26289	27734	28033	26638

Species composition of fish production from ponds
in greater Sylhet and Mymensingh Districts.

DISTRICT SPECIES\YEARS	1985/86	1986/87	1987/88	1988/89	4 year mean
S Y L H E T					
Rui (Labeo rohita)	20.48	20.85	19.36	17.75	19.61
Catla (Catla catla)	11.23	5.06	3.61	5.14	6.26
Mrigal (Cirrhinus mrigala)	3.55	5.69	6.22	8.10	5.89
Kalbasu (Labeo calbasu)	9.38	11.19	22.01	18.61	15.30
Minor carp	0.00	0.00	0.00	0.00	0.00
Silver carp (Hypophthalmichthys)	0.00	0.00	0.00	0.00	0.00
Grass carp(Ctenopharyngodon idellus)	0.60	0.00	0.00	0.00	0.15
Mirror carp (Cyprinus carpio)	0.00	0.00	0.00	0.00	0.00
Tilapia (Oreochromis spp)	0.00	0.00	0.00	0.00	0.00
Shrimp	0.00	1.87	0.73	0.46	0.77
Air (Mystus spp)	8.96	10.61	11.42	13.19	11.05
Boal (Wallago attu)	0.14	0.20	0.00	0.00	0.09
Shol (Channa spp)	0.36	0.86	0.12	0.16	0.38
Chital,Foli (Notopterus spp)	2.40	2.41	0.10	0.28	1.30
Koi (Anabas testudineus)	0.11	0.36	0.36	0.31	0.29
Singi,Magur (Heteropneustes,Clarias)	0.15	0.08	0.24	0.12	0.15
Sarpunti (Puntius sarana)	0.00	0.00	0.00	0.00	0.00
Punti (Puntius spp)	20.43	16.63	14.92	14.62	16.65
Others	22.21	24.19	20.91	21.26	22.14
TOTAL	100.00	100.00	100.00	100.00	100.00
M Y M E N S I N G H					
Rui (Labeo rohita)	30.39	22.64	24.46	25.08	25.64
Catla (Catla catla)	28.25	33.58	32.61	23.87	29.58
Mrigal (Cirrhinus mrigala)	24.50	22.48	11.04	10.41	17.11
Kalbasu (Labeo calbasu)	3.68	1.44	0.34	0.00	1.37
Minor carp	0.00	0.00	0.00	0.00	0.00
Silver carp (Hypophthalmichthys)	5.29	3.70	0.00	0.00	2.25
Grass carp(Ctenopharyngodon idellus)	0.00	0.00	0.00	0.00	0.00
Mirror carp (Cyprinus carpio)	0.00	0.00	0.00	8.51	2.13
Tilapia (Oreochromis spp)	0.00	0.00	0.00	0.00	0.00
Shrimp	0.00	0.00	0.00	0.00	0.00
Air (Mystus spp)	0.00	0.00	0.00	0.00	0.00
Boal (Wallago attu)	0.00	0.27	0.00	0.00	0.07
Shol (Channa spp)	0.15	0.00	0.00	1.14	0.32
Chital,Foli (Notopterus spp)	0.00	0.00	0.00	2.89	0.72
Koi (Anabas testudineus)	0.18	0.29	0.00	0.00	0.12
Singi,Magur (Heteropneustes,Clarias)	1.36	0.17	0.00	0.00	0.38
Sarpunti (Puntius sarana)	0.00	0.00	0.00	0.00	0.00
Punti (Puntius spp)	0.11	0.00	0.00	0.42	0.13
Others	6.09	15.43	31.55	27.68	20.19
TOTAL	100.00	100.00	100.00	100.00	100.00

Carp spawn/fertilized eggs collected from Old Brahmaputra River.

in kg

1984	1985	1986	1987	1988	1989
781	486	323	120	14.8	61.3

APPENDIX F

DATA ON FISH IMPORTS, EXPORTS AND CONSUMPTION FOR ALL BANGLADESH

APPENDIX F: DATA ON FISH IMPORTS, EXPORTS AND CONSUMPTION FOR ALL BANGLADESH

Table F1: Exports and Imports of Marine Frozen Fish Product

FROZEN FISH					
YEAR	MARINE FISH PRODUCTION q	IMPORTS		EXPORTS	
		q	v	q	v
1980	400	20	45	396	854
1981	600	-	-	602	1244
1982	800	-	-	823	2669
1983	2300	-	-	2304	4515
1984	3500	-	-	5127	8237
1985	3700	-	-	4094	7337
1986	3800	-	-	6330	15448
1987	2514	-	-	5002	15777
1988	3768	-	-	5708	14392
1989	2136	-	-	3464	7778

q quantity in metric tons
v value in US$ 1000

Note: Differences between marine fish production and export quantities represent in large part the exports of freshwater fish

Data source: FAO (1991)

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Table F2: Export and Imports of Dried Fish

DRIED FISH					
YEAR	DRIED FRESHWATER FISH PRODUCTION q	IMPORTS		EXPORTS	
		q	v	q	v
1980	...	35	30	418	2044
1981	...	13	12	459	1857
1982	...	-	-	467	2490
1983	8600	-	-	511	2552
1984	8500	-	-	504	2850
1985	8300	-	-	557	2725
1986	8000	0	0	894	3556
1987	8800	-	-	1082	5297
1988	13683	-	-	1245	5838
1989	14920	7	9	1342	7748

Table F3: Exports and Imports of Frozen Prawn and Shrimp

FROZEN PRAWNS AND SHRIMP					
YEAR	FROZEN PRAWN & SHRIMP PRODUCTION q	IMPORTS		EXPORTS	
		q	v	q	v
1980	8564	-	-	8843	39792
1981	6757	-	-	6878	36582
1982	8037	-	-	8103	45049
1983	11450	-	-	11650	63193
1984	12550	-	-	15086	70132
1985	22400	-	-	22405	78591
1986	27000	-	-	17505	99142
1987	29950	-	-	20273	125779
1988	18665	-	-	20123	139726
1989	15386	-	-	20701	146831

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Table F4: Export and Imports of Canned Fish

CANNED FISH				
YEAR	IMPORTS		EXPORTS	
	q	v	q	v
1980	0	1	0	15
1981	-	-	7	41
1982	0	0	-	-
1983	0	0	-	-
1984	-	-	-	-
1985	-	-	-	-
1986	-	-	-	-
1987	-	-	-	-
1988	-	-	-	-
1989	-	-	-	-

Table F5: Exports and Imports of Canned Shrimp

CANNED SHRIMP				
YEAR	IMPORTS		EXPORTS	
	q	v	q	v
1980	-	-	...	...
1981	-	-	...	...
1982	-	-	...	...
1983	-	-	...	...
1984	-	-	...	...
1985	-	-	...	...
1986	-	-	4	8
1987	-	-	-	-
1988	-	-	-	-
1989	-	-	-	-

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Table F6: Export and Imports of Fish Oil

FISH OIL				
YEAR	IMPORTS		EXPORTS	
	q	v	q	v
1980	-	-	-	-
1981	-	-	-	-
1982	23	14	-	-
1983	-	-	-	-
1984	-	-	-	-
1985	-	-	-	-
1986	2	1	-	-
1987	4	6	-	-
1988	-	-	-	-
1989	-	-	-	-

BANGLADESH

- FOOD BALANCE SHEET OF FISH AND FISHERY PRODUCTS IN LIVE WEIGHT AND FISH CONTRIBUTION TO ANIMAL PROTEIN SUPPLY

YEAR	PRODUCTION	NON-FOOD USES	IMPORTS	EXPORTS	STOCKS CHANGES	FOOD SUPPLY	POPULATION	PER CAPUT SUPPLY	FISH PROTEINS	ANIMAL PROTEINS	FISH/ANIMAL PROTEINS
	(.....	METRIC TONS				.....)	(THOUSANDS)	(KG/YEAR)	(GR/PER CAPUT/DAY)		(%)
1961	777200.	0.	0.	16000.	0.	761200.	52701.	14.4	4.3	7.0	61.2
1962	789800.	0.	0.	27505.	0.	762295.	54025.	14.1	4.2	7.0	60.5
1963	790500.	0.	0.	27497.	0.	763003.	55398.	13.8	4.1	6.9	59.3
1964	822500.	0.	0.	23199.	0.	799301.	56825.	14.1	4.2	7.1	59.5
1965	810900.	0.	0.	7189.	0.	803711.	58312.	13.8	4.1	7.0	59.0
1966	829900.	0.	0.	1293.	0.	828607.	59860.	13.8	4.1	6.8	60.4
1967	857500.	0.	0.	1703.	0.	855797.	61471.	13.9	4.2	6.9	60.4
1968	860000.	0.	0.	2708.	0.	857292.	63144.	13.6	4.1	6.8	59.9
1969	877200.	0.	0.	3583.	0.	873617.	64878.	13.5	4.0	6.8	59.4
1970	690100.	0.	0.	1900.	0.	688200.	66671.	10.3	3.1	5.9	52.2
1971	740100.	0.	0.	1300.	0.	738800.	68522.	10.8	3.2	5.9	55.0
1972	818100.	0.	0.	700.	0.	817400.	70435.	11.6	3.5	5.9	58.6
1973	820200.	0.	400.	3400.	0.	817200.	72412.	11.3	3.4	5.9	57.5
1974	822082.	0.	80.	5203.	0.	816959.	74460.	11.0	3.3	5.7	57.7
1975	640070.	0.	0.	2029.	0.	638041.	76582.	8.3	2.5	4.9	51.3
1976	641605.	0.	0.	4018.	0.	637588.	78780.	8.1	2.4	4.9	49.4
1977	643769.	0.	400.	3737.	0.	640432.	81051.	7.9	2.4	4.8	49.8
1978	646895.	0.	40.	3123.	0.	643812.	83389.	7.7	2.3	5.3	43.9
1979	647128.	0.	225.	5246.	0.	642107.	85781.	7.5	2.2	5.0	44.4
1980	646970.	0.	101.	10324.	0.	636747.	88219.	7.2	2.2	4.5	47.6
1981	651256.	0.	33.	8696.	0.	642593.	90703.	7.1	2.1	4.5	46.7
1982	689498.	0.	0.	10299.	0.	679199.	93235.	7.3	2.2	4.5	48.9
1983	726587.	0.	0.	15658.	0.	710929.	95818.	7.4	2.2	4.6	48.4
1984	756013.	0.	0.	22093.	0.	733920.	98454.	7.5	2.2	4.6	48.9
1985	772631.	0.	0.	28329.	0.	744302.	101147.	7.4	2.2	4.8	45.9
1986	796910.	0.	0.	26638.	0.	770272.	103900.	7.4	2.2	4.8	46.5
1987	817003.	0.	0.	28535.	0.	788468.	106717.	7.4	2.2	4.7	46.8
1988	829929.	0.	0.	29209.	0.	800720.	109602.	7.3	2.2	4.6	47.6
1989	832791.	0.	0.	20123.	0.	812668.	112559.	7.2	2.1	4.6	46.7

from Laureti (1991)

APPENDIX G

FISH MARKET PRICES

APPENDIX G : FISH MARKET PRICES

INDEX

G.1 FRESH FINFISH

G.1.1 Moulvibazar

Fresh finfish prices at the Central Fish Market in Moulvibazar in Feb 1992 were as follows:

Table G1: Fresh Finfish Prices in Moulvibazar

Species	Origin	Trader's Purchase Price Tk/kg	Trader's Retail Price Tk/kg	% Mark up
CARPIO	Pathashing Haor,fishermen		90	
JAYA	Bisnagn River,fishermen	30	55	83%
CATLA	Hail Haor,leasehlder auction	80	100	25%
MRIGEL	"		100	
CATLA	Kawadighi Haor, leasehlder auction	60	70	17%
CARPIO	"	60	70	17%
BOAL	DhaleswariRiver,middleman	42	50	19%
MAGUR	Nobiganj, middleman		75	
SINGI	"		60	
KOI	Bogbokia Haor		100	
GAJAR	Hail Haor, fishermen	38	50	33%
RUI small	ShorailHaor pond, middleman		40	
Silvercarp	"		45	
GUIZZA AIR			75	
GONIA			38	
FOLI			25	
BASA	Manu River		200	
GHAURA	"		100	

G.1.2 Sherpur

Fresh finfish prices at the roadside fish market at Sherpur (near Kushiyara River bridge) in Feb 1992 were as follows:

Table G2: Fresh Finfish Prices at Sherpurghat

Species	Origin	Trader's Purchase Price Tk/kg	Trader's Retail Price Tk/kg	% Mark Up
BOAL	Kushiyara River, wholesaler	80	100	25%
CHITAL	"	94	100	6%
BASA		80	100	25%
RUI	Kushiyara River	117	135	15%
BOAL	wholesaler		100	

G.1.3 Sylhet

The retail price of RUI was 150 Tk/kg at Bandar Bazar in Sylhet in Feb 1992.

G.1.4 Kanairghat

Fresh finfish retail prices at the public market in Kanairghat in Feb 1992 were as follows:

Table G3: Fresh Finfish Prices in Kanairghat

Species	Origin	Price Tk/kg
CHAPILA	Surma River	15-20
CHAPATI	Surma River	20-25

G.1.5 Halir Haor

Landing prices of fresh finfish from fishermen at the Satidora Beel Group Fishery camp in Halir Haor in Feb 1992 were as follows:

Table G4: Fresh Finfish Prices in Halir Haor

Species	Price Tk/kg
PABDA	55
BOAL	25
KALIBAUS	25

G.1.6 Sunamganj

Fresh finfish retail prices at the Sunamganj Fish Market on 12 May 1992 were as follows:

Table G5: Fresh Finfish Prices at Sunamganj

Species	Origin	Price Tk	Size
CATLA	Pond	20-25 each	300 gm
HILSA	Surma River	?	300 gm
KATCHKI		5 per portion	50 gm portion
BOAL		80-90 per kg	
GONIA	Tangua haor	20 each	350 gm females with eggs
MRIGAL		70-80 per kg	

Other species on sale were: BAIM, ANULI, GHAGOT AIR, LASU, RITA, MAGUR, GONGLA (GOLSHA), SINGI, BACHA and PABDA.

G.1.7 Kuliarchar

Prices of fish at the landing centre in Kuliarchar in 1991-92 were as follows:

Winter season (main season)

Table G6: Fresh Finfish Prices in Kuliarchar

Species	Price Tk/kg	Size Range
CATLA	70-90	
RUI	100-140	<3 kg
MRIGEL	50-60	<4-5 kg
KALIBAUS	50-60	<3 kg
AIR	90-100	<4-5 kg
BOAL	50-70	<4-5 kg
PABDA	60-80	
GULSHA	30-40	
CHAPILA	12-18	

May 1992 (time of visit)

Table G7: Fresh Finfish Prices in Kuliarchar in May

Species	Price Tk/kg
PABDA	70-100
AIR	80-100
GULSHA	35-50
KACH	30-40

Rainy season (June-July)

Shrimp dominate the catch (see section G.2.1 below).

G.1.8 Srimangal

Seaonal availability of fish in the Srimangal market is as follows:

Table G8: Seasonal Variation of Fish Availability of Srimangal

Month	Source	% Conttibution
Nov-Jan	Openwater, mainly Hail haor	80% Haor 20% other
Feb-May	Pond culture, sea	75% Pond 25% Ilish
Jun-Sep	Mainly seafish (Ilish)	75% Sea 25% Openwater

According to wholesale marketers, price of fish increased by 400% over the last 10 years. This is due to:

- Higher income levels due to increased employment abroad during the last decade;
- Increased demand due to high population growth;
- Reduced fish populations due to overfishing, fish disease, reduced fish grazing area because of increased paddy cultivation lands (HYV) and siltation of river beds;
- Indiscriminate use of insecticides in paddy fields which may sometimes cause huge losses of fish and fish spawn particularly at the time of early rains (as many paddy fields are adjacent to beels and rivers).

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Prices of fresh finfish at the wholesale market in Srimongal in 1991/92 were as follows:

Table G9: Fresh finfish Prices at Srimangal

Species	Price Tk/kg	Average Size Range
RUI	78	4-5 kg
RUI	39	1-1.5 kg
CATLA	52	4-5 kg
CATLA	28	1-1.5 kg
MRIGEL	50	4-5 kg
MRIGEL	26	1-1.5 kg
BOAL	38	
KOI	78	
AIR	Very rare in the area	
PABDA	Very rare in the area	

G.1.9 Mohanganj

Two renowned fish marketing place known by all in the greater Mymensingh area are: Mohanganj and Kuliarchar. Dharmapasha and Khaliajuri are the important fish producing areas in the region and Mohanganj is one of the important fish outlet point to Dhaka and other places. Average prices of fresh finfish at the Mohanganj wholesale market (ARAT) in 1991/92 were as follows:

Price = Tk/kg

Table G10: Fresh Finfish Prices at Moulvibazar

Species	Large (>3 kg)	Medium (>1 kg)	Small (<1 kg)
Rui	100-120	60-70	30-45
Air	75-90	45-50	30-45
Boal	70-80	50-70	30-35
Pangas	75-90	60-70	35-45
Chital	60-80	40-60	35-45
Pabda			90-130 60-70
Laso			40-60 40-50
Batashi			30-35
Gulsha			50-60
Tengra			25-35
Bojori			20-30
Koi			40-50 25-30
Shingi			30-40
Magur			70-80
Shingi Magur			40-60
Shoal			20-25
Gazar		30-40	20-25
Sarputi			40-50
Bheda			30-40
Rani			120-150 110-130
Baim		40-60	30-40

G.1.10 Kishorganj

Retail prices of fresh finfish at Puranthana Fish Market in Kishorganj (Jan 1992) were as follows:

Table G11: Fresh Finfish Prices at Puranthana in Kishorganj

Species	Price Tk/kg
RUI	100
CATLA	80
BOAL	70

G.1.11 Dharmapasha

There are two ice factories in the Dharmapasha market, producing 600 - 1000 kg/day of blocked ice. Ten arats are in the market, and between 100 to 1200 kg/day of finfish are processed for transport to Dhaka (daily basis). Average market prices of finfish (and ITCHA) at the arat on 2 Sept 92 were:

Table G12: Fresh Finfish Prices in Dharmapasha

Species	Price Tk/kg
TENGRA	18 *1
ITCHA	7 *2
PABDA	55 *3
KALIBAUS	50 *4
BAIM	38 *5
BOAL	50
SHOAL	40
CHAPILA	12

*1-5 = Order of abundance

G.1.12 Chamraghat

Chamraghat is one of the renowned fish wholesale markets in Kishoreganj district for exporting fish to Dhaka and other areas of the country. Due to lack of sufficient water on the floodplain in Sept 92 (which resulted in a shorter grazing period and facilitated overfishing), overall fish production in the area is at least 30-35% lower than last year. Most of the retailers in the ghat mentioned that fish are on average 30-40% smaller compared to the same time last year. However, more fish was expected in the month of October/November instead of December-February. Market abundance and price of fish are given in the following table:

Table G13: Fresh Finfish Prices in Chamrarghat

Species	Price Tk/kg
CIRKA	35
BAILLA	35
BAIM	40
SARPUTI	60
KALIBAUS	65
TENGRA	35

Order of abundance: CIRKA & BAIM 70%; BAILLA 10%; KALIBAUS 10%; TENGRA 10%.

In comparison to Kishorganj, prices are 15-20% less, and in comparison to Dhaka, prices about 50% less.

G.1.13 BFDC Pagla, Narayanganj

Retail prices at the BFDC fish processing and marketing centre in Pagla, Narayanganj, on 18 June 93 were as follows:

Table G14: Fresh Finfish Prices in BFDC, Pagla

Species	Size	Weight (kg)	Price Tk/kg
RUI	Small Nola	< 0.75	45
	Big Nola	0.75 - <1.0	55
	Small	1.00 - <1.5	70
	Medium	1.50 - <2.0	80
	Large	2.00 - <3.0	95
	Very large	3.00 - <5.0	115
	Extra Large	5.00 +	125
CATAL	Nola	< 1.00	45
	Small	1.00 - <2.00	50
	Medium	2.00 - <3.00	60
	Large	3.00 - <5.00	75
	Very Large	5.00 +	85

Species	Size	Weight (kg)	Price Tk/kg
MRIGAL	Nola	<1.00	40
	Small	1.00 - <3.00	50
	Medium	3.00 - <5.00	65
	Large	5.00 +	75
KALIBAUSH	Small	< 1.00	55
	Large	1.00 +	75
CHITAL	Small	< 2.00	40
	Medium	2.00 - <3.00	55
	Large	3.00 - <5.00	65
	Very Large	5.00 +	75
AIR	Small	<1.00	45
	Medium	1.00 - 3.00	60
	Large	3.00 +	80
BOAL	Small	<1.00	35
	Medium	1.00 - 3.00	50
	Large	3.00 +	65
GRASS CARP	Small	<1.50	45
	Medium	1.5 - 3.00	55
	Large	3.00 +	65
SILVERCARP	Small	<1.50	26
	Medium	1.5 - 3.00	32
	Large	3.00 +	40
COMMON CARP	Small	<1.50	40
	Medium	1.50 - 3.00	50
	Large	3.00 +	60
MIRROR CARP	Small	< 1.50	40
	Medium	1.50 - 3.00	50
	Large	3.00 +	60
KOI	Average	All size	40
KACHKI	Average	"	20
KAZALI	Average	"	40

Species	Size	Weight (kg)	Price Tk/kg
GAZAR	Small	< 1.00	25
	Medium	1.00 - 3.00	35
	Large	3.00 +	40
GOLSHA	Average	"	55
GONIA	Average	"	25
KAKKYA	Average	"	25
CHELA	Average	"	40
CHAPILA	Average	"	40
TILAPIA	Small	< 200gm	30
	Medium	200 - 500 gm	35
	Large	500 gm - +	40
PUTI	Average	"	30
PAPDA	Small	< 15cm	
	Large	15cm +	80
FOLI	Average	"	40
BAIM	Small	Small variety	40
	Large	Large variety	40
BACHA	Average	All sizes	50
BATASHI	Average	"	30
BAGNA	Average	"	50
MOLA	Average	"	40
MAGUR	Average	"	50
SHOAL	Small	<1.00	30
	Large	1.0 +	40
SARPUTI	Average	All sizes	50
SINGHI	Average	"	40

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G.2 FRESH PRAWNS

G.2.1 Kuliarchar

Prices of fresh prawns at the landing centre in Kuliarchar (1991/92) were as follows:

- June-July 1991 (rainy season): Prawns dominate the fishermen's catches. An average of 50-100 Juri (1Juri=38 kg) of shrimp are landed daily and packed in a nearby cold storage. Prices of shrimp were grade 10 = Tk.350-400/kg; grade 90 = Tk.100-110/kg.
- May 1992: Tk.100-115/kg (with head)

G.2.2 Mohanganj

At the Mohanganj wholesale market (arat) average prices of prawns in 1991/92 were:

Table G15: Wholesale Prices of Golda and Icha

Species	Small Lot (1 kg)
Golda chingri	Tk 60-300/kg
Icha	Tk 10-18/kg

G.2.3 Bajitpur

Fresh water giant prawn (GOLDA CHINGRI) is the most economically important species in the Humaipur floodplain (which now is under the Humaipur FCD/I Project). More than 3000 chai are used to catch chingri from the floodplain. Chai are placed at the depth of 3-5 feet and snail meat, small shrimps are used as bait. Sometime red colored bricks are also used to attract shrimp. Collected catch records (5 Sept 92) are given below:

Table G16: Price of Different Sized Golda in Bajitpur

Number	Weight (gm) (head on)	Length (cm) (TL/HL)	Price Paid to Fishermen Tk/kg
24	1100	20/10; 17/8; 13/6	120
30	1100	17/8; 15/7; 11/5	100
50	1100	11/5; 10/5; 8/4	50
90	1100	7/4; 6/3; 5/3	30

The haor price is mainly determined by the "Bapary". The cost of each chai in Bajitpur market is about Tk.20-30. Before the season (harvesting season started from the end of June) the Beparies invest money to the operators/harvesters @ Tk.2000-3000 per person and the operators are bound to sale their products to that investors. Sometimes that Baparies are taken money from the nearby cold storage (Kuliarchar). Baparies wait near the river/haor on a boat to collect the daily catch. The chai operations are performed round the day, but prawns are collected mainly in the morning between 8:00 and 11:00 am.

G.2.4 Sherpur

Large GOLDA CHINGRI was selling retail at 150 Tk/kg at the roadside fish market, Sherpur (near Kushiyara River bridge) in Feb 1992.

G.2.5 Dharmapasha

The average market price of ITCHA at the Dharmapasha arat on 2 Sept 92 was Tk 7/kg.

G.3 DRIED FISH

G.3.1 Moulvibazar

Prices of dried fish at the Central Fish Market in Moulvibazar in Feb 1992 were as follows:

Table G17: Dried Fish Price in Moulvibazar

Species	Origin	Trader's Retail Price Tk/kg	Equivalent Wet Weight Price Tk/kg
TENGRA	Sylhet/Sunamganj areas	90	27
PABDA	"	180	54
KAIKKA	"	80	24
PUTI	"	90	27
BOAL	"	150	45

G.3.2 Halir Haor

Prices of dried fish at the Satidora Beel Group Fishery camp in Halir Haor in Feb 1992 were as follows:

Table G18: Dried Fish Price in Halir Haor Area

Species	Origin	Trader's Purchase Price Tk/kg	Equivalent Wet Weight Price Tk/kg
PUTI	Halir Haor, from fishermen	125	38
TENGRA	"	63	19
CHINGRI	"	15-18	4.5-5.4
KAIKKA	"	100	30

G.3.3 Sunamganj

Prices of dried fish at Sunamganj market on 12 May 1992 were as follows:

Table G19: Dried Fish Price in Sunamganj

Species	Origin	Price Tk/kg
BASHPATI	Chittagong	40
SIDOL PUNTI	Local	60
SHOAL	Local	60
KAIKA	Local	80
LOTIA	Chittagong	50
PABDA	Local	150
BOAL	Local	150
TENGRA	Local	80

G.3.4 Kaliajuri

Prices of dried fish in 1991 in Khaliajuri area are given below:

Table G20: Dried Fish Price in Khaliajuri

Species	Price at Khola Tk/kg
Kachki	55-57
Tengra (Bojori)	60-62
Chapila	20-22
Boal/Air	82-83

G.3.5 Srimangal

Prices of dried fish at the Srimangal wholesale market in 1991-92 were as follows:

Table G21: Dried Fish Price in Srimangal Wholesale Market

Species	Price Tk/kg
GULSHA	100
TENGRA	75-80
BOJORI	75-80
PABDA	150-200
AIR	200-250
BOAL	150-250
SHOAL	150-200
CHELA	80
MOLA	50-60
BATASHI	200
CHINGRI	50

G.4 SEMI-FERMENTED FISH

G.4.1 Kaliajuri

Retail prices of semi-fermented fish in 1991 in Khaliajuri area are given below:

Table G22: Semi-fermented Fish Price in Khaliajuri

Species	Price at Khola Tk/kg
Puti	80-90
Pabda	200
Bashpata	30
Along	80
Chanda	50-60

G.4.2 Srimangal

Prices of semi-fermented fish at the wholesale market in 1991/92 were as follows:

Table G23: Semi-Fermented Fish Price in Srimangal

Species	Price Tk/kg
Puti	80
Koiya	80

APPENDIX H

THE PROTECTION AND CONSERVATION OF FISH RULES, 1985

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THURSDAY, OCTOBER 17, 1985

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

MINISTRY OF FISHERIES AND LIVESTOCK

NOTIFICATION

Dhaka, the 16th October, 1985

No. S.R.O. 442-L/85.—In exercise of the powers conferred by Section 5 of the Protection and Conservation of Fish Act, 1950 (E. B. Act XVIII of 1950), the Government is pleased to make the following rules, the same having been previously published as required by sub-section (5) of that section, namely :—

THE PROTECTION AND CONSERVATION OF FISH RULES, 1985.

1. **Short title.**—These rules may be called The Protection and Conservation of Fish Rules, 1985.

2. **Definitions.**—(1) In these rules, unless there is anything repugnant in the subject or context,—

(a) "form' means the form annexed to these rules ; and

(b) "Schedule" means a Schedule annexed to these rules.

(2) The words or expression used in these rules but have not been defined shall have the same meaning as assigned to them in the Act under which these rules are made.

3. **Erection of fixed engines prohibited.**—(1) No person shall erect or use fixed engines in the rivers, canals, khals and beels.

(2) Any fixed engine erected or used in contravention of sub-rule (1) and any fish caught by means of such engine may be seized, removed and forfeited.

(7637)

Price : Taka ·75

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4. **Construction of bunds, etc., prohibited for certain purpose.**—No person shall construct bunds, weirs, dams and embankments or any other structure, whether temporary or permanent, in, on, across or over the rivers, canals, khals or beels for any purpose other than irrigation, flood control or drainage.

5. **Destruction of fish by explosives, etc., prohibited.**—No person shall destroy or make any attempt to destroy any fish by explosives, gun, bow and arrow in inland waters or within coastal territorial waters.

6. **Destruction of fish by poisoning prohibited.**—No person shall destroy or make any attempt to destroy any fish by poisoning of water or the depletion of fisheries by pollution, by trade effluents or otherwise in inland waters.

7. **Catching and destruction of certain fish during certain period prohibited.**—No person shall, during the period from 1st day of April to 31st day of August each year, catch or cause to be caught or destroy fry of Shol, Gazar and Taki moving in clusters or the parent fish while guarding them in the rivers, canals, khals, beels or any other sheet of water which ordinarily has direct communication with any river, canal, khal or beel :

Provided that the prohibition shall not extend to the catching or destruction of the fry and the parent fish of the species named above for the purpose of carp culture.

8. **Catching of carp fishes prohibited in certain waters.**—(1) No person shall catch or cause to be caught carp fishes, that is Rui, Catla, Mrigal, Kalbaus and Ghania of any size in the waters of the rivers, khals, etc., specified in the First Schedule during the period mentioned in the said Schedule unless he has a licence therefor issued by a competent officer in this behalf :

Provided that no licence for catching of the abovenamed carp fish shall be allowed for purpose other than pisciculture.

(2) A licence issued under sub-rule (1) shall be issued in the form shown and shall be subject to the conditions as are specified on the face of the licence.

(3) There shall be collected a licence fee of Tk. 100 for each licence issued under this rule.

9. **Sale of fish prohibited.**—No person shall catch, carry, transport, offer, expose or possess fish of the species and sizes mentioned in columns 2 and 3 of the Second Schedule at any time during the period mentioned in column 4 thereof :

Provided that the prohibition shall not apply to the catching, carrying, sale, transport or possession of any fish for the purposes of, or in connection with, pisciculture.

10. **Disposal of forfeited fish.**—Any fish forfeited for a breach of any of these rules shall be disposed of by auction and the auction money thereof shall be deposited in such Head of Account of the Government as it may direct.

11. **Prohibition on catching, carrying, transporting, offering, exposing or possessing of frogs.**—Notwithstanding anything contained in these rules, the Government may, by notification in the official Gazette, prohibit the catching, carrying, transporting, offering, exposing or possessing of any frog dead or alive during such period in such area and with such exceptions as may be specified therein.

FIRST SCHEDULE

[*see* rule 8(1)]

Sl. No.	Name of the river, canal, etc.	Period.
1	2	3
1	River Kushiara from the Fenchuganj Railway bridge up to village Lama Gangapur, Upazila Fenchuganj, District Sylhet.	From 1st April to 30th June in any year.
2	River Kushiara from its junction with Lula canal up to village Kakordi, Upazila Beanibazar, District Sylhet.	Ditto.
3	Lula canal from its junction with Kushiara river up to its junction with Hakaluki haor, Upazila Fenchuganj, District Sylhet.	Ditto.
4	Karchar Dala (flowing from the river Kalni also known as Beramohana) from village Karacha to Makalchandi haor, Upazila Baniachang, District Habigongj.	Ditto.
5	Chairer Khal (flowing from the river Kalni also known as Beramohana) from village Halalnagar up to Makalkandi haor, Upazila Baniachong, District Habigonj.	Ditto.
6	Bahushiar Dala (flowing from Bibiana) from village Bahusha up to Mokar haor, Upazila Nabiganj, District Habigonj.	Ditto.
7	Fatepur Khal (flowing from the river Shaka Kushiara) from village Fatepur up to Ghardiar Beel, Upazila Ajmirigonj, District Habigonj.	Ditto.
8	River Surma from its junction with Madhabpur Khal to its junction with Chenger Khal at the southern boundary of the village Parkal, Upazila Chhatak, District Sunamgonj.	Ditto.
9	River Surma from village Karirgaon up to the Chhatak Thanaghat, Upazila Chhatak, District Sunamgonj.	Ditto.
10	River Surma from its junction with Poinda river at the southern border of the Poinda village up to its junction with Rakiti River, Upazila Sunamgonj, District Sunamgonj.	Ditto.

1	2	3
11	River Peain from its junction with Surma river up to village Pedar, Upazila Chhatak, District Sunamgonj.	From 1st April to 30th June in any year.
12	River Garakhal from its junction with river Peain up to its junction with Kurdhara, Upazila Chhatak, District Sunamgonj.	Ditto.
13	River Kataganj from its junction with river Peain up to its junction with Dala Dhalarmukh, Upazila Chhatak, Sunamgonj.	Ditto.

SECOND SCHEDULE

[*see* rule 9]

Sl. No.	Species of fish.	Size.	Period.
1	2	3	4
1	Carps, *i.e.*, Catla, Rui, Mrigal, Kalbaush and Ghania.	Below 23 (twenty-three) centimetre in length.	Between July December each year.
2	Hilsha (popularly known as Jatka in some parts of Bangladesh).	Ditto	Between November and April each year.
3	Pungas	Ditto	Ditto.
4	Silon	Below 30 (thirty) centimetre in length.	Between February and June each year.
5	Bhola	Ditto	Ditto.
6	Aor	Ditto	Ditto.

FORM OF LICENCE

[*see* rule 8(2)]

Licence for Catching Carps in Prohibited Waters.

1. Licence No. Date:

2. Issued to :.....
(Name in full)

(a) Father's Name :

(b) Permanent address :

(c) Present address :

3. Method of catching :

4. Type and number of gear to be used :

5. Area of catching :

6. Species and size to be caught :

7. Catch to be landed at :

8. Licence fee paid : Tk....., *Vide* M.R. No. .....

Date.....

9. Validity of the licence : from.....to.....

10. Date of issue.....

(*Signature of Issuing Officer*)
with seal.

The licence is issued subject to the following conditions :

(a) The licence is non-transferable.

(b) The licence shall comply with and ensure that catch is made in conformity with the provisions of the "Protection and Conservation of Fish Act, 1950" and the rules made thereunder.

(c) The licence is liable to cancellation at any time for violation of any of the conditions stipulated therein.

(d) Any other condition, if any.

By order of the President

ZAHIRUL HOQ

Deputy Secretary.

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রেজিস্টার্ড নং ডি এ-১

বাংলাদেশ গেজেট

অতিরিক্ত সংখ্যা

কর্তৃপক্ষ কর্তৃক প্রকাশিত

সোমবার, জানুয়ারী ২৫, ১৯৮৮

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

মৎস্য ও পশুপালন মন্ত্রণালয়

মৎস্য শাখা-৩

প্রজ্ঞাপন

ঢাকা, ১০ই মাঘ,১৩৯৪/২৫শে জানুয়ারী, ১৯৮৮

নং এগ,ভার,ও ২৪-আইন/৮৮—Protection and Conservation of Fish Rules, 1985-এর Rule 12 এ প্রদত্ত ক্ষমতাবলে সরকার, মাছ ধরার ক্ষেত্রে, ৪·৫ সেন্টিমিটার বা তদপেক্ষা কম ব্যাস বা বৈর্ধ্যের ফাঁস বিশিষ্ট নিম্নলিখিত জাল বা অনুরূপ ফাঁস বিশিষ্ট অন্য যে কোন জালের ব্যবহার নিষিদ্ধ করিলেন:

মাছ ধরা জালের নাম

জালের প্রকার	প্রচলিত নাম	স্থানীয় নাম
গিল জাল (Gill net)	কারেন্ট জাল	১। কারেন্ট জাল।
		২। জাপানী কারেন্ট জাল।
		৩। ফান্দি জাল।
		৪। ফাঁস জাল।
		৫। কাঁপা জাল।
		৬। বাঁধা জাল।
		৭। কাটি জাল।

রাষ্ট্রপতির আদেশক্রমে

মহিবুল হক

উপ-সচিব।

মোঃ সিদ্দিকুর রহমান, ডেপুটি কন্ট্রোলার, বাংলাদেশ সরকারী মুদ্রণালয়, ঢাকা, কর্তৃক মুদ্রিত। খোন্দকার মাহ্‌ফুজাল করিম, ডেপুটি কন্ট্রোলার, বাংলাদেশ ফরমস ও প্রকাশনী অফিস, তেজগাঁও, ঢাকা কর্তৃক প্রকাশিত।

(২৬৭)

মূল্য: ৩০ পয়সা

রেজিস্টার্ড নং ডি এ-১

বাংলাদেশ গেজেট

অতিরিক্ত সংখ্যা

কর্তৃপক্ষ কর্তৃক প্রকাশিত

বুধবার, নভেম্বর ৪, ১৯৮৭

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

মৎস্য ও পশুপালন মন্ত্রণালয়

প্রজ্ঞাপন

ঢাকা, ১৭ই কার্তিক, ১৩৯৪/৪ঠা নভেম্বর, ১৯৮৭

নং এস, আর, ও ২৬৯-আইন/৮৭—Protection and Conservation of Fish Act, 1950 (E. B. Act XVIII of 1950) এর section 3-তে প্রদত্ত ক্ষমতাবলে, সরকার Protection and Conservation of Fish Rules, 1985 নিম্নবর্ণিত ভাবে সংশোধন করিলেন। উক্ত E. B. Act XVIII of 1950 এর section 3(5) এর বিধান মোতাবেক উক্ত সংশোধনীর প্রাক-প্রকাশনা সম্পন্ন হইয়াছে:—

উপরি-উক্ত Rules এর rule 11 এর পর নিম্নরূপ নূতন rule সংযোজিত হইবে, যথা:—

"12. Prohibition on use of fishing nets and regulation of mesh thereof, etc.—(1) Notwithstanding anything contained in these rules, the Government may, by notification in the official Gazette,—

(a) prohibit the use and methods of operation of any kind of fishing net ;

(b) regulate the size of the mesh of any fishing net.

(2) The period for which and the water in which the prohibition shall remain in force may be specified in the notification issued under sub-rule (1).

(3) Any fishing net used or operated in contravention of sub-rules (1) or (2), and any fish caught in the process of such contravention, may be seized and forfeited." ।

রাষ্ট্রপতির আদেশক্রমে

জহিরুল হক
উপ-সচিব।

মোঃ সিদ্দিকুর রহমান, ডেপুটি কন্ট্রোলার, বাংলাদেশ সরকারী মুদ্রণালয়, ঢাকা, কর্তৃক মুদ্রিত।
খোন্দকার মাহ্‌ফুজাল করিম, ডেপুটি কন্ট্রোলার, বাংলাদেশ ফরমস ও প্রকাশনী অফিস, তেজগাঁও, ঢাকা কর্তৃক প্রকাশিত।

APPENDIX I

FISHERIES SECTOR COMPONENT OF FOURTH FIVE YEAR PLAN (1990-95)

FISHERIES

I. Introduction

10.3.1 Fisheries, one of the major subsectors of agriculture, play a dominant role in nutrition, employment, foreign exchange earning and other areas of the economy. The subsector contributes about 80% to the nation's animal protein intake, nearly 6% to the GDP and more than 12% to the export earning of the country.

II. Fish Resources In Bangladesh

10.3.2 Bangladesh has extensive water resources within her boundaries and the territorial and economic zones in the Bay of Bengal. The water resources are broadly divided into inland and marine resources. The inland water resources of Bangladesh is considered to be very rich both in area and in potential for fisheries development. The total area of perennial waters is estimated at 1.45 million ha while the inundated crop fields and other low lying areas that retain monsoon water for 4-6 months are estimated at 2.83 million ha of water surface. Inland fisheries contribute more than 72 percent to the total catch of fish in Bangladesh.

10.3.3 Inland fisheries resources are generated mainly from three sources - impounded waters, inundated crop fields and open waters. Impounded water bodies in the form of ponds, dighis and tanks are scattered all over the country. There are an estimated 1.28 million ponds in the country covering an area of 0.15 million ha out of which about 55 percent of the area is under cultivation, 30 percent is cultivable and 15 percent is derelict. The inundated low-lying crop fields provide temporary feeding and breeding grounds for various species of fresh water fish and shrimp. Moreover, the baors covering an area of about 5.5 thousand ha and the Kaptai lake are also important sources of fisheries in Bangladesh. Open waters include rivers and their tributaries, beels and baors and estuaries. The total area of inland open waters is estimated to be 4.05 million ha of which about 25 percent is rivers. In case of marine fisheries, Bangladesh has a coastal belt of 480 km. Various exploratory surveys conducted in the continental shelf upto 100 meter depth charted four major fishing grounds, namely south patches, south of south patches, middle ground and swatch of no ground. Besides, the artisanal fishery extends upto a depth of 40 meters in the Bay and harvests about 95 percent of the total marine landings.

III. Review of Past Development

10.3.4 Over the last decades, fish output has increased at a slow rate with the value added from fisheries growing at a rate less than 2 percent over the period. The Third Five Year Plan envisaged a fish production target of 10 lakh tons during 1989/90 compared to 7.74 lakh tons during 1984/85. The performance of the sub-sector during the period reveals that some shortfall in the above production target is likely. While the output performance of marine fisheries has been satisfactory, the major shortfall is likely to be in inland capture fisheries. However, substantial headway has been made in culture fishery.

10.3.5 The Third Five Year Plan also envisaged additional employment of about 10 lakh people in the fisheries sector by 1989/90. The available estimates suggest that the number of such additional employment opportunities created would be about 8.80 lakh by 1989/90 which is 88 percent of the target.

10.3.6 Over the Third Plan period, export earnings from fisheries sub-sector experienced sharp increases in value terms due to favourable export prices. However, quantity targets are not achieved. The Third Five Year Plan envisaged an export earnings of Tk.532.40 crore from 38 thousand metric tons of shrimp, froglegs, fish and fish products. The estimated total earnings from fisheries sector during 1989/90 is expected to be Tk.541.00 crore from 35.2 thousand metric tons of exports. The Third Five Year Plan physical targets and expected achievements are shown in Table 10.3.1.

Table 10.3.1 Physical Target and Export Achievement during the Third Five Year Plan

Programmes	Target	1989-90 Expected achievement	1989-90 Percent of target achieved
1. Fish production (in thousand metric tons)			
A. Inland Fisheries	772.4	612.5	79
Ponds	192.0	161.0	84
Baors	2.8	1.5	57
Coastal Aquaculture	34.2	27.0	79
Rivers and estuaries	250.4	190.0	76
Beels and Haors	75.0	50.0	67
Kaptai lake	8.0	5.0	63
Floodplains	210.0	178.0	85
B. Marine Fisheries	228.0	234.5	103
Total (A+B)	1000.4	847.0	85

Items	Target Quantity	Target Value	Expected Achievement Quantity	Expected Achievement Value
2. Fish Export (quantity in thousand metric tons and value in crore taka)				
Shrimp	30.0	500.0	28.0	440.0
Fish and Fish Products	6.0	30.0	4.5	56.0
Other Aquatic Organisms	2.0	2.4	2.7	45.0
Total	38.0	532.4	35.2	541.0

10.3.7 The Third Five Year Plan earmarked a total of Tk. 350.00 crore in the public sector for the development of fisheries. However, the actual allocation through RADPs amounted to Tk. 231.36 crore over the period of which actual expenditure incurred amounted to Tk. 116.93 crore only which is 50.54 percent of total RADP allocations. In addition to sectoral problems, limited financial power of Project Directors and lack of delegation of financial authority to appropriate levels are major factors in delays in project implementation and lower utilization of allocated funds in the sub-sector.

10.3.8 With increasing demand and high price of shrimp in the international markets, shrimp farming expanded in the coastal regions after independence of Bangladesh. However, it is mostly done in the traditional way : by trapping the shrimp larvae and juveniles coming with incoming tides and rearing them for about six months in low-lying areas inside and outside the polders.

10.3.9 Favourable climatic conditions enable quite a few species of fish and fisheries organisms to thrive well in the different types of water bodies in Bangladesh. A total of about 675 species - 475 from marine and 200 from fresh water - are recorded. The distribution of different species/categories varies not only with the type of water bodies but also with the season and the method of cultivation.

IV. Constraints to Fisheries Development

10.3.10 Inspite of tremendous potential to development, fish production has failed to keep pace with its ever increasing demand due to population increase. As a consequence, per capita availability of fish has declined over the years causing serious nutritional and other problems. There are various impediments to fisheries development some of which are particular to the sources of fisheries. In case of capture fishery, inadequate knowledge and know-how,over fishing and indiscriminate killing of juveniles and destruction of spawning grounds, obstruction of migration routes due to unplanned construction of dams and embankments, degradation of water quality, lack of proper management policy and credit facilities, defective fish conservation laws and inadequacy of proper processing, marketing and other facilities are some of the major factors affecting proper development. The major constraints to the development of closed water culture fishery in Bangladesh relate to problems of property rights, competing water uses and related conflicts, lack of trained manpower and quality fish seed and lack of finance. The problems are diversified in nature and vary not only with the type of water bodies but also from place to place. In case of marine fishery, inadequate knowledge and information on fisheries resources, lack of proper management policy and modern fishing know-how, use of inefficient fishing equipments, inadequacy of harbour and related processing, marketing and other facilities as well as credit are some of the major constraints to development.

V. Objectives, Strategies and Policies for Fisheries during the Fourth Five Year Plan

10.3.11 Increased production and exports and creation of employment opportunities have been the main focus of development activities in the subsector over the years. However, a number of problems related to water body management, allocation of exploitation rights, fish biology and conservation technology development and dissemination are needed to be solved in order to permit both immediate output gains and long-term preservation of fish resources. An important constraint faced by the sub-sector relates to the lack of institutional strength in planning and implementing fisheries development programmes.

Objectives during the Fourth Five Year Plan

10.3.12 In view of the importance and long-term potential of fisheries development to meet the national development objectives, the Fourth Plan would emphasize the following :

(a) To increase fish production for domestic consumption,

(b) To improve the socio-economic conditions of the fishing community and others engaged in fisheries and create additional employment opportunities for poverty alleviation,

(c) To enhance the fisheries resource base through extension of commercially important fisheries in unexplored and under exploited areas,

(d) To enhance fish production and management technology,

(e) To train required manpower at all levels for facilitating the transfer of technology,

(f) To increase foreign exchange earnings through export of fish and fish products.

(g) To improve general environment and public health.

Major Strategies and Policies during the Fourth Plan

10.3.13 In order to achieve the objective of fisheries development, the following strategies and policies will be emphasized during the Fourth Plan :

(i) Development of skilled manpower, appropriate research and technologies, expanded institutional/ organizational capabilities to plan and implement development activities,

(ii) Biological management of Jalmahals by providing fishing rights to the genuine fishermen and gradual replacement of existing leasing system,

(iii) Large-scale stocking of inland open waters, inundating flood lands with rigid enforcement of fish and fish habitat conservation practices,

(iv) Community-based integrated development approach for artisanal fisheries with improvements in technology, processing, marketing and distribution facilities,

(v) Provision of technical inputs, credit and training,

(vi) Continuation of the marine fishery resources survey for its development and management to achieve MSY (Maximum Sustainable Yield) level, identification of new fishing grounds and preparation of extension materials on resource position, more effective fishing and resource conservation,

(vii) Policy supports for and development of complementary processing facilities for development of fishery products,

(viii) Gradual intensification of aquaculture practices to obtain increased production per unit area,

(ix) Policy support for improving quality of fish and fish products,

(x) Adequate infrastructure to support planned expansion of fish culture in the private sector,

(xi) Formulation and implementation of a well-defined land/water use policy to avoid wasteful resource conflicts, along with effective measures against dumping of industrial and other wastes into the open water system and use of agricultural biocides of long residual effects,

(xii) Adequate policies and measures to harness the export potentials of fisheries.

Programmes during the Fourth Five Year Plan

10.3.14 In order to improve the performance of the fisheries sub-sector during the Fourth Plan period, appropriate reorganisation and coordination of organizational and institutional capabilities for increased effective planning, implementation and maintenance of subsectoral development programmes would be undertaken through effective coordination among ministries/ agencies involved, manpower training, integration of fisheries into water resources planning and monitoring and relevant data generation.

10.3.15 The strategies for formulation and execution of policies for inland fisheries development would include : biological management of fisheries, prevention of overfishing, artificial stocking, enforcement of fish and fish habitat conservation practices, development of selected preserved fish sanctuaries, development of appropriate low-lying areas into permanent water bodies for fish cultivation, improvement of fresh water aquaculture in open water system, adequate system of hatchling production and nursery rearing of fingerlings of suitable species, support for pen and other culture techniques in seasonal and perennial water bodies and similar other measures. Government programmes in this area would emphasize adequate policy support, development of the required service delivery system including technical inputs and credit, extension, production, production incentives and effective protection against unauthorized and illegal wastage of fish resources. The programmes would also include designing of appropriate mechanism for scientific fish cultivation in derelict fish ponds and other water bodies.

10.3.16 In the case of shrimp farming, emphasis would be given on adequate infrastructure and policy support for planned expansion and increased productivity in shrimp culture especially brackishwater shrimp farming. Measures in this respect would emphasize on formulation and execution of a well-defined land and water use policy in the relevent zones to avoid wasteful resource use conflicts and provide adequate support for private sector initiatives. In order to minimize wasteful loss of wild seed for fresh water fish and shrimp culture, emphasis would be placed on introduction of appropriate seed handling and transportation technologies.

10.3.17 Strategies for marine fisheries would include adequate policy supports and development of omplementary processing and other facilities for its development. In this respect, emphasis will be given on echnological improvements of the artisanal sector in marine fishing technology instead of highly capital ntensive trawler fleet. Improvements in fish processing technologies, distribution and marketing channels, nfrastructure, adequate credit facilities and security of the fishermen are other areas where policies would ocus.

10.3.18 For the development of effective fisheries education, research, training and extension, neasures would be undertaken to establish effective institutional linkages among relevant organizations and levelopment of desired technical manpower. This would emphasize on development of field-oriented and ipplied research programmes with appropriate priorities and transfer of technology with adequate training hrough coordination between research objectives and institutions and extension system. Attempts would be nade for the development of demonstration fish farms at each Union under the supervision of Upazila Fisheries Officer through provision of credit and other input deliveries and incentives.

10.3.19 In order to reduce post-harvest losses and other wastages, measures would include improved provision, creation and better access to fishing grounds, farming areas, landing sites and markets by providing basic infrastructures at landing, processing and marketing sites. Better techniques for production of dried and salted fish and other fish products would also be encouraged in order to reduce such losses.

10.3.20 For the rapid growth of fisheries, coordination among water resources development agencies in planning and designing of water projects for properly managed fishery would be stressed. This would involve adequate provisions in such projects for losses in fishery sub-sector in arriving at economic viability and justification.

10.3.21 In order to initiate proper management of fisheries resources, emphasis would be given on promulgation and proper execution of adequate fish conservation laws through revision of existing laws on the basis of biological studies of commercial fish species. In addition, enforcement of laws relating to treatment of wastes would be emphasized for regulation of harmful discharge of agrochemicals and industrial effluents into the water systems.

Inland Fisheries Development :

10.3.22 Inland open water fisheries will be developed through effective management and conservation measures of riverine fisheries and floodplains. Massive artificial stocking of open waters, such as, rivers, flood lands, beels, baors, lakes etc. with fish fingerlings will be done and biological management and fish habitat conservation practices would be strictly observed. Selected species to be stocked will include Chinese and Indian carps as well as Magur, Koi, Punti, Golda shrimp etc. Short time stocking with miscellaneous species of small fish in the sluices, dykes, floodplains, reservoirs etc. will also be encouraged during the monsoon seasons. For development of floodplain fisheries the selected areas would be Rajshahi, Khulna and Dhaka Divisions including Sylhet and Mymensingh floodplains. More floodplain areas will be taken up for development during Fourth Five Plan through improved management and conservation practices. The protection and conservation measures will include :

(i) rigorous implementation of fish protection and conservation act,

(ii) establishment of fish sanctuaries,

(iii) exploitation of non-sanctuary perennial beels,

(iv) strict enforcement of the ban on Jhatka (Hilsa Fingerling) catch during February-April,

(v) heavy penalisation to the users of `Current Jal',

(vi) imposition of penalty on the industrial dumping of untreated and harmful industrial wastes into any open water system,

(vii) fisheries development and conservation in the flood control, drainage and irrigation projects etc.

10.3.23 With a view to ensure benefit to the fishing community and the licensed fishermen, two systems of management, such as, licensing system as per New Fisheries Management Policy (NFMP) and modified leasing system will function simultaneously. The existing yearly lease system will be replaced by a longer term of at least 4 year period to encourage appropriate investment, better management and higher production and to allow the fish sufficient time to grow to maturity and breed. Subject to successful implementation, the NFMP will gradually replace the leasing system.

Aquaculture Development :

10.3.24 Aquaculture will be given high priority for development as an industry with a view to create new or alternative employment opportunities for rural people, increase export earnings and facilitate the rural and urban environment and also to compensate the loss of open water fisheries due to adverse effect of flood control, drainage and irrigation projects. For development of aquaculture private sector will be further stimulated with the production responsiblities including hatchery and nursery operations. Government will provide necessary support services in the form of technical advice, adequate credit, extension, infrastructure facilities, production incentives etc.

Freshwater Aquaculture :

10.3.25 Besides 146,890 ha. of ponds and 5,488 ha. baors, planned aquaculture will be introduced into a new area of 40,000 ha consisting of irrigation canals, road-side ditches, low-lying paddy fields enclosed within flood control dykes or rural roads, and the low lying areas in and around the cities and towns.

10.3.26 Culture of fish species that feed on plankton, macro-vegetation and detritus will receive the most attention. Quick growing species that easily breed in closed waters, e.g., nilotica, punties, etc. will be given due consideration for seasonal waters. Because of high local demand and export potential, abundance of suitable culture areas and availability of culture technologies, Macrobrachium shrimp, Magur and Koi will also receive adequate attention.

10.3.27 Wherever feasible, integration of aquaculture with agriculture and animal husbandry will be practised as a general farming system. Steps will be taken to selectively utilize the municipality wastes for fish production purpose.

10.3.28 Subject to successful experimentation, pen and cage culture technologies will be employed on large scales in various types of suitable water bodies, largely through the landless or marginal farmers.

10.3.29 The Upazila Parishads with the help of the Fisheries Officers, will urgently make an inventory of all the culturable water areas, assess their present status and recommend measures to develop them. In each union, the Government/NGO will actively cooperate with a selected private fish farm and develop it into an effective demonstration fish farm for the union. Each union will produce adequate number of large size fingerlings for all the village ponds under the union. The Parishad may create mass awareness to help bring the derelict ponds for productive uses. The khas ponds in the Upazila may be managed by the Upazila Parishad with a view to create employment opportunities for the marginal and landless farmers.

10.3.30 All large low-lying areas, lakes and canals in and around cities and towns, that retain or can be easily made to retain by simple development works, at least 1 meter of monsoon water for more than 3 months, will be urgently developed for production of fish simultaneously with the improvements of the urban environment and public health and beautification of the city areas. The baors will be used primarily for fish production. The utilisation of the baor land and water for agricultural purpose must adjust with the fisheries needs.

Brackishwater Aquaculture :

10.3.31 Brackishwater aquaculture production will be increased both by expanding the culture area as well as further improving the existing culture technologies.

10.3.32 About 35,000 ha of new tidal area will be brought under culture of shrimp and brackishwater fish. Common facilities in the form of water distribution and drainage canals, will be excavated to bring as much of

the potentially suitable land under shrimp and fish farming as needed. The large unmanageable farms will be divided into manageable units with the provision of adequate supply and drainage canals. Year-round and semi-intensive shrimp culture will be stressed in areas where river salinity remains suitably high throughout the year.

10.3.33 Giving due consideration to the fall of shrimp price in the world market, improved traditional or semi-intensive culture will be emphasised carefully keeping the production cost as low as possible. Intensive culture system requiring high investment, costly feed and highly sophisticated water management, will be avoided.

SEED PRODUCTION :

Fish Seed

10.3.34 In order to support the massive open water stocking programme and the greatly expanded aquaculture plan as proposed, an extremely well-concerted system of large scale hatchling production, and nursery rearing of adequate carp fingerlings of preplanned species combinations, will be given serious attention. Besides carps, seed production of Magur, Koi, Punti, etc. will also be encouraged.

10.3.35 Urgent measures will be taken to replace the presently practised crude collecting and handling methods of the wild carp seed with modern and scientific collection and handling method to prevent undue mortality of the valuable seed resources. The extra care will be well justified since the wild seed still comprises over 85 percent of the total quantity of the carp seed used for aquaculture purpose.

10.3.36 Broodstock of high quality and improved genetic strain will be locally developed, or imported under strict quarantine. A strict quality control system for broodstock selection at the local hatcheries will be stressed. Broodstock rearing and hatchling production of catla, grasscarp, bighead carp,mirror carp, black carp, and other species which are relatively difficult to successfully handle, will be the main responsiblities of the public sector hatcheries and fish seed farms.

10.3.37 A critical assessment of the time bound need of fingerling of appropriate species combinations for each union, will be made by the local administration in collaboration with the fishery officers. Each district will produce hatchlings adequate for all the waters under its command, or a deficit district will import hatchlings from a surplus zone. Matching with the fingerling need of a union, suitable waterbodies in the form of ponds, road-side ditches, irrigation canals, etc. will be promptly identified and clearly assigned to the task of fingerling production.

10.3.38 Strictly supervised credit projects for fingerling production will be introduced.

Shrimp Seed

10.3.39 Shrimp farming in Bangladesh being entirely dependent on the wild seed, attention will be given to prevent colossal loss of the seed due to inappropriate handling and transportation and later, post-stocking loss due to inappropriate culture management. Exploration and spotting of resourceful new seed grounds, mass collection of the seed and their temporary holding at collection sites and later their transportation to the farming areas, will receive high priority. The landless rural community will be involved at various stages of fry industry development.

10.3.40 Giving cognigence to the need of gradually reducing the dependence on wild seed, importance will be laid on hatchery development. Hatchery technology will be established through the joint collaboration of the public sector with selected private entrepreneurs. The private entrepreneurship will be supported by the public sector in the form of technical advice, feed and brood shrimp supply and bank credit support.

10.3.41 Because of high salinity requirements, marine shrimp hatcheries will be established in the Cox's Bazar region and freshwater shrimp hatcheries in the coastal districts of the country. The public sector will have

to develop essential infrastructure and basic amenities to promote development of hatcheries for which suitable sites are located in isolated and remote areas.

Feed

10.3.42 Commercial formulation and production of shrimp and fish feed to support the greatly expanded culture fisheries programme, will receive high priority. Efforts will be made to make the best utilisation of the indigenous ingredients. Any shortfall in the raw materials, particularly fishmeal, will be imported.

Marine Fisheries Development :

10.3.43 Giving due consideration to the known marine resource situation and the present level of exploitation, further capitalization of marine fishing will be done very cautiously.

10.3.44 The small scale fishing sector with its present 95% contribution to total marine fish landing, much better rate of economic return, higher employment opportunities and its potential capacity for further vertical and horizontal expansion, will receive more attention than industrial fishing. Introduction of diversified and more effective fishing gears and equipping selected types of boats with appropriate engines, will receive priority so as to enable the small scale sector to more effectively exploit the fish and shrimp within the 40 m depth zone. In this respect regional experience will be taken advantage of.

10.3.45 The industrial shrimp trawler operators will be induced to save the low priced by-catch of the shrimp trawls by offering them an incentive price for the by-catch. Steps will be taken to process the `trash fish' items into nutritious and high priced human food. Measure will be taken to exploit the shark populations for vitamin rich oil and exportable fins.

10.3.46 Results of the pelagic fishery resources surveys conducted in the past on national and regional basis, in the Bay of Bengal, will be promptly interpreted in relation to Bangladesh. Test gill-netting and longlining for tuna, spanish mackerel and sharks will be expeditiously conducted through a TCP or TCDC project. Successful test results will lead to development of a fleet of mechanized boats for pelagic fishing in the distant waters.

10.3.47 Large volumes of unutilized raw data generated as a result of expensive exploratory surveys conducted in the past, will be analysed and interpreted without further delay. In order to maintain a continuity in the past surveys and to regularly monitor the fisheries resources situation, a low cost but well planned survey system will be introduced. Under this system, practical information from BFDC and private sector trawlers, sail boats, motorized boats and various types of other fishing units, will be regularly collected and analysed. Based on the survey results, practical extension materials on the dynamics of the fisheries resources, more effective fishing, necessity and means for resource conservation, etc. will be prepared and made available to the fishermen.

Fish Landing, Postharvest Technology and Marketing:

10.3.48 Reasonably good access to all the baors, beels, haors, shrimp farms and other big fish landing centres, including those along the coast, will be established or improved; this will ensure quick transportation and encourage healthy competition amongst the local monopolizers and the distant buyers, creating opportunities for the producers to get a better deal for their fish and shrimp. New fish landing and marketing facilities will be created or improved at selected points. Improvements in the traditional drying and salting methods will be introduced.

Fisherfolks Welfare and Community Development

10.3.49 Welfare and community development to uplift the socio-economic conditions of the fishing community and fish farmers will receive special attention.

10.3.50 Granting the openwater fishing right to the licensed fisherfolks, introduction of supervised credit in place of compulsory requirement of collateral, identification of the fishing community as an important target group for allotment of khas waters and lands for aquaculture, etc. will be some of the measures for supporting the fishing community development.

10.3.51 Fishing and fish farming materials and equipment will be imported and distributed through the fisherfolks societies so that the users get the necessary items at the lowest costs.

10.3.52 Measures will also be taken to provide security of marine fishing boats, equipment, gear and fish of the fisherfolks by introducing a special insurance project at a reasonable premium. Each boat will compulsorily keep the standard life saving equipment. Sea piracy will be handled sternly. Training to fishing techniques, better handling of fish, improve traditional fish drying and salting technologies, will be stressed.

Women's Role in Fisheries Development :

10.3.53 Special emphasis will be given to ensure participation of women in fishery development activities so as to raise the family income to have a better standard of living. The suitable profession for the women in fishery sector will be net making, fry collection and rearing, fish processing, drying, salting, feed preparation, pond preparation etc. The womenfolk to be involved in this profession will be trained so as to motivate them in fisheries development activities. The technical assistance projects having such components for development of womenfolks and fisher women will be implemented during the plan period.

Fisheries Credit :

10.3.54 Lack of coherent lending policy and collateral requirments for processing of applications have left the disadvantaged sections of the community in numerous problems to get access into the institutional credit programme. As a result the fish farmers and the landless community are compelled to borrow from the Mohajans and the money lenders. To give greater emphasis for development of this sector, a separate Fisheries Bank may be created or the Krishi Bank may open separate windows for disbursing fisheries credit in selected places. Soft term loans would be made available to the fish farmers and marginal farmers without collateral.

10.3.55 Credit allocation in the fisheries sector is shrinking both in number and in amount as a result of poor loan disbursement and recovery. This is a very unhealthy sign in the rural development efforts. Consistent with the approach to stimulate the small scale private sector which in Bangladesh, comprises entrepreneurs mostly of limited financial means and without mortgageable assets, the credit institutions will have to liberalize credit policy and introduce a supervised credit system not essentially requiring a collateral for loan. This system will ensure appropriate utilisation of the loan, application of the correct technology and management, ensure production and loan recovery.

10.3.56 Khas waters taken on lease for 5 years or a longer period, should be acceptable as a collateral to the Bank for sanctioning loan. Shrimp, carp, magur and koi farming will be recognized as an export oriented industry and will be entitled to bank loan on a reduced interest rate, moratorium and other concessions allowed to the export industries.

Fisheries Research :

10.3.57 The main research thrust will be given on semi-intensive fish and shrimp culture integrated with livestock farming and agriculture, development of effective fish and shrimp feed, intensive nursery rearing, fish disease control, new fish product development and open water fisheries management.

10.3.58 Fisheries Research Institute established in 1984/85 will undertake problem oriented and adaptive research. The Institute would also undertake research on other aquatic species which have economic importance in the country. For example, the freshwater mussels which produce valuable pink pearls have export potentials. Pink pearls may be produced by artificial inseminations as is commercially done in Japan. The Institute may undertake research on this to develop suitable technology for dissemination to the farmers level.

10.3.59 Frog, on the other hand, is one of the important sources of foreign exchange earnings. The frog species which have commercial importance are Rana tigrina, Rana hexadactyla and Rana limnocharies etc. It is believed that frog population is sharply declining due to large scale harvesting and lack of proper conservation and management of the resource. The decline in the frog population may cause imbalance in the crop field eco-system. Scientific conservation and management of this resources is, therefore, urgently needed. As

such appropriate technology for management and conservation and culture practices would be developed through research for replication in the field.

Survey/Studies and Establishment of Data Bank :

10.3.60 For broadening the data-base and for project identification and detailed project preparation, a number of surveys will be made. Socio-economic and pilot studies will be conducted to support welfare of the fishing communities, form sound bases for expanded development projects and adopt measures for resource conservation and management.

10.3.61 Definite actions will be taken to substantially improve and broaden the fisheries data-base and establish a well-organised Fisheries Information System for collection, publication, analysis, storage and retrieval of information.

Fisheries Training and Extension :

10.3.62 The main objectives of training and extension would be to augment fish production, exploit resources at a sustainable basis, appropriate utilisation of the fisheries resources and resource conservation.

10.3.63 The fish farmers, fishermen and others directly dependent on fisheries will be the main target groups for receiving fisheries training. Inservice training for the fishery officials and staffs would be organised to increase efficiency and capabilities of the relevant Departments. If necessary, facilities may be expanded in the existing Fisheries Training Institute. Farmers' training will also be organised in each Upazila to provide training in fish culture, rearing, fry handling and distribution etc. with the initiative of Upazila Fishery Officials and Upazila Parishads. Vocational training in shrimp and fish seed collection, transportation, nursery rearing, aquaculture, net weaving, improved fish salting and drying, etc. will also be organised. Existing hatcheries, nurseries, grow out farms, fish salting and drying yards, etc. will be used as training centres.

10.3.64 A foundation training course for the newly recruited officers of the Fisheries Cadre will be introduced. Refreshers courses will also be organised periodically. Appropriate utilisation of the persons trained within the country or abroad, in any specific disciplines, will be ensured. Emphasis will also be given on higher education and training in specialised areas during the Plan period.

10.3.65 For extension and motivaion activities, demonstration centres will be established at the Upazila and Union levels for practical demonstration to the target groups. Fish farmings activities would be widely popularised through TV, Radio and Cinema programmes.

Fisheries Education :

10.3.66 Fisheries education in Bangladesh at the University levels will be made as relevant to the present need as possible. The courses and curricula will be urgently revised to make them directly relevant to the long-term national fisheries development policies and programmes. The fisheries students will, as an essential requirement for Degree, devote at least 20% of the academic year, to practical work with public or private sector fisheries projects.

10.3.67 Education, research and extension will have to be mutually reinforced and integrated with each other by establishing effective and obligatory institutional linkages amongst the Universities, research institutes and fisheries development organisations.

Strengthening, Planning, Implementation, Monitoring and Evaluation :

10.3.68 The planning, evaluation and monitoring capacities of the Ministry of Fisheries and Livestock, Department of Fisheries, Fisheries Research Institute, Bangladesh Fisheries Development Corporation and Fisheries Wing in the Planning Commission would be strengthened by employing adequate manpower, arranging training and providing logistic supports.

10.3.69 The Department of Fisheries, the chief executing agency in the fisheries sector, will be urgently restructured and reorganised to substantially strengthen the fisheries data-base and the planning, operational

and evaluation capacities of the Department of Fisheries. A strong separate cell will be created in the Department of Fisheries to develop fisheries in the Bangladesh Water Development Board Projects.

10.3.70 The responsibility of overall development, management and control of fisheries resources and fish habitats will centrally lie with the Ministry of Fisheries and Livestock.

Impact on the Environment

10.3.71 The process of flood control and drainage development has been changing the aquatic environment of inland waterbodies affecting inland water natural fish production both in quantity as well as in species diversity. Flood control inhibits access of fish to breeding and feeding areas thereby reducing or eleminating fish reproduction. The industrial establishments, on the other hand, discharge their liquid and solid wastes into the rivers without any regard to the damages that affluent discharges can cause to the aquatic environment and living resources within the environment. Another source of inland water chemical pollution is the use of chemical insecticides and pesticides. These chemicals also destroy micro-organisms, planktons and envertibrates altering the food chains in the aquatic habitats. To protect aquatic environment and fish population, impact of flood control and irrigation projects should be carefully studied and regulatory measures taken to help redress the environmental problems. Legal measures or imposition of penalty on industrial dumping of untreated and harmful industrial wastes into the open water system should also be strictly followed.

Private Sector Investment

10.3.72 Private sector investment has been increasing in fishing industry and commercial fish culture. During the Fourth Five Year Plan, private sector is expected to invest more in hatchery construction both for carp and shrimp breeding, fish processing plants, acquisition of fishing vessels, fish and shrimp culture activities etc. Adequate policy supports would be provided to sustain the private sector intiatives in the fisheries sector.

Inter-sectoral Linkage

10.3.73 Fishery sector provides employment to a vast segment of the population in fish culture activities and ancillary industries. The development of fishery sector will not only create employment opportunities in the rural areas in fish culture, fry and fingerlings production activities but will also create jobs for development/establishment of subsidiary industries like fish processing, ice making, net making, fish canning, boat building etc. The constructions of shrimp/fish hatcheries, fish seed multiplication farms, pond complex, dykes, sluice gates etc. through implementation of various fishery projects will also contribute to the development of rural roads and electrification of remote village areas. The development/re-excavation of derelict tanks/ponds/canals for fish culture operations may lead to incremental food production as these waterbodies may be used as reservoirs for irrigation and other uses. Integrated farming practices, such as, fish-cum-poultry farming, fish-cum-duck farming, backyard poultry rearing, fish-cum-paddy farming, improvement of horticulture etc. may also be introduced in and around the fishery projects for better utilization of land and water resources and to derive optimum benefits. Implementation of fishery projects will also help improve the general environment and public health.

Role of NGOs

10.3.74 NGOs are increasingly active for development of fisheries in the rural areas. They normally involve themselves in rural development and target group formation activities in the fishery sector which focus on income generation among the poor through development of waterbodies, improved aquaculture practices and other related activities. NGOs may also be involved in socio-economic surveys, extension work, credit disbursement and recovery, group formation, training, motivation and organisational development in the rural areas. But selection and involvement of NGOs in fisheries projects should be done carefully keeping in view their expertise and experience in specific projects and areas.

Major Policy Issues during the Fourth Five Year Plan

10.3.75 For accelerating the development of fisheries sector some of the major policy issues which would be given attention are as follows :

10.3.76 Fisheries will be considered as a priority sector to generate additional employment opportunities and alleviate poverty of the rural community.

10.3.77 A well-defined land and water utilisation policy will be framed on the basis of land topography, monsoon and tidal inundations, water salinity, soil quality and other environmental and economic factors for optimum utilisation of resources. Guided by this policy the low-lying areas, riverine and coastal areas, sweet and brackishwater areas including khas lands will be optimally used for culture of shrimp and suitable fish species.

10.3.78 The yearly leasing of inland open-waters will be replaced with the licensing system under the New Fisheries Management Policy. On the other hand an investment and management oriented leasing system covering atleast 4 years or more would to be adopted to ensure higher production and resource conservation.

10.3.79 All khas ponds, suitable irrigation and drainage canals, road side ditches and similar other public waterbodies will be earmarked for aquaculture for distribution on long-term basis to local fisherfolk, landless and marginal farmers, unemployed youths and professionally trained fisheries people.

10.3.80 The credit institutions will be reorganised and strengthened and credit policy would be re-oriented and streamlined to quickly respond to the needs for fisheries development. To encourage fish farming activities in the rural areas, fishermen community would get the preference of collateral free loan for healthy growth of fishery sector.

VI. Production and Export Targets during the Fourth Five Year Plan

10.3.81 The value added in the fisheries sector has been projected to grow at the rate of 4.8 percent per annum during the Fourth Plan period. During 1994/95, the population of the country has been estimated to be about 12.52 crore. The current level of per capita per day consumption of fish is 20.5 gm. In order to raise the level of consumption to 24.55 gm. per capita per day at the end of the Plan period, the required production of fish should be 11.26 lakh tons. It is assumed that during 1994/95 the export of fish and shrimp will be about 64,000 tons and another 10,000 tons of fish will be required for industrial and other uses. In view of this demand, the fish production target during the terminal year of the Fourth Five Year Plan has been set at 12.0 lakh tons.

10.3.82 The major thrust for fisheries development will be on both culture and capture fisheries, conservation and management along with institutional and man-power development activities to further gearup the fisheries sector. The FFYP, therefore, envisages the following targets for 1994-95:

(i) To increase the level of production of fish from 8.47 lakh tons in 1989/90 to 12.0 lakh tons of which inland production will be 9.38 lakh tons (inland capture fisheries - 5.23 lakh tons and inland culture fisheries 4.15 lakh tons) and marine production 2.62 lakh tons.

(ii) To export about 45,000 tons of head on shrimp, 17,000 tons of fish and fish products and 2,000 tons of other aquatic organisms.

(iii) To generate full time and part time employment opportunities of about 10 lakh people by 1994-95.

10.3.83 In order to achieve the growth target, the terminal year production level is presented in Table 10.3.2.

Table 10.3.2 Fish Production Target during the Fourth Five Year Plan

(In '000' metric tons)

Source of Production	1989-90	1994-95
1. Inland Fisheries :	612.50	938.00
i) Ponds	161.00	308.90
ii) Baors	1.50	5.50
iii) Coastal Aquaculture	27.00	81.00
iv) Rivers and estuaries	190.00	210.00
v) Beels and Haors	50.00	67.60
vi) Kaptai Lake	5.00	7.50
vii) Floodplains	178.00	237.50
viii) Irrigation canals, road-side ditches, fresh-water polders and enclosures etc.		20.00
2. Marine Fisheries	234.50	262.00
Total :	847.00	1200.00

10.3.84 Export earnings from shrimp, fish and fish products and other aquatic organisms during 1989/90 are expected to be Tk.541.00 crore. During the Fourth Five Year Plan export earnings from fisheries have been projected to increase to Tk.971.50 crore in 1994/95. The targets set for 1994/95 are shown in Table 10.3.3.

Table 10.3.3 Projection of Export of Fishery Products, 1994/95
(Quantity in thousand metric ton and value in Crore Taka)

Items	1989-90		1994-95	
	Qty.	Value	Qty.	Value
1. Shrimp (head on)	28.00	440.00	45.0	720.0
2. Fish and Fish products	4.5	56.00	17.0	221.00
3. Frog legs	2.7	45.00	2.0	30.50
Total :	35.2	541.00	64.0	971.50

VII. Financial Outlay during the Fourth Five Year Plan

10.3.85 In order to implement the fisheries development programmes Tk.749.00 crore has been earmarked for the public sector during the Fourth Plan. This includes about Tk.229.79 crore for implementation of the on-going projects spilled over to the Fourth Plan. The detailed break-down of the programme-wise allocations is shown in Table 10.3.4.

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Table 10.3.4 Programme-wise Allocation for the Public Sector During the Fourth Five Year Plan (at 1989-90 prices)

(Taka in Crore)

	Name of programme	Total Allocation
1.	Survey, investigation, feasibility study, research etc.	56.00
2.	Fisheries education, training, extension and community development	125.00
3.	Culture and capture fisheries development (including production inputs and waterbodies development)	524.00
4.	Fish landing, storage, processing, marketing, transportation, distribution facilities etc.	30.00
5.	Block provision for new projects	14.00
	Total :	749.00

10.3.86 In addition to the public sector allocation of Tk.749.00 crore an amount of Tk.600.00 crore is expected to be invested for implementation of the programmes for fish development in the private sector. For the purpose, programmes/projects will be developed for implementation in the private sector with support and services from the public sector.

APPENDIX J

CONSTITUTION OF NATIONAL FISHERMEN ASSOCIATION

CONSTITUTION.
OF
NATIONAL FISHERMEN ASSOCIATION

REGD. OFFICE: 20, SEGUNBAGICHA, DHAKA -1000.
MAILING OFFICE: 3/2, PURANA PALATAN, DHAKA-1000.
BANGLADESH.

REGISTERED AS PER CLAUSE 46 OF THE REGISTRATION ACT, 1961:

1. Name of the Association: National Fishermen Association. (BNFA)
2. Address of the organization:
   i) Regd. office: 20, Segun Bagicha, Dhaka-1000/ Bangladesh.
   ii) Mailing Office: 3/2, Purana paltan, Dhaka-1000, Bangladesh.
3. Area of activities: Whole of Bangladesh:
4. Aims and objects:
   (a) To extend direct or indirect financial as well as personal services to the fishermen for their social, educational and cultural development.
   (b) To extend the necessary assisstance to establish the fundamental rights and interests of the fisher-men over Fisheries and reformation thereof to develope pisciculture by adopting modern and scientific methods, to train fishermen about fish-culture, fishings, to extend advices to do needful for the lease of Fisheries among the fishermen and to do all possible, to make all efforts for the distribution of dividents and share of fisheries among the Fishermen.
   c) To extend all possible financial as well as commercial advices to the illeterate fishermen, to extend all possible efforts to create good markets for their held/seized

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lishes in the domestic and international Markets, to extend financial and technical advices and assisstances to the poor fishermen.

d) To do needful to develope the pisciculture by adopting modern and scientific methods, to deve-lope trading of fish, marketing their held/ seized fishes in the domestic and international markets by adopting latest technology and trainings, if needed, by sending representatives to the overeas countries in the Semi-nars/Symposiums being held therein in every now and then.

e) To make the fishermen educated and consious about their self development, rights and duties and to attai. this goal, this organization will do all possible to publish periodicals, Journals etc and to supply those at free of cost among the fishermen communities to make them dutiful and awaked for their rights and duties.

f) For the financial and social development of the fishermen. this organozation will do all possible to extend interest free loan, to inspire them for their savings, to undertake various projects with its own resources and to implement thereof for the welfare of the fishermen.

g) This organization will do all possible to maintain liaison with Govt. Non- Govt and Social Welfare Organizations for the management of Fisheries (Jalmahal), marketing their Seized/held fish in the domestic and international markets.

h) For the Cultivation of fish and trading thereof, th. organization wll do all possible to import latest developed/modern/scientific fishing implements from abroad and to supply/distribute the same among the fishermen, to undertake projects and to implement thereof with the help of local Govt as well as Non-Govt and Social Welfare Organizations of the home and overseas countries.

5. **Classifications of Members:**

The Members of this organization will be classified into 4 (Four):

a) General Member.

b) Special Members.

c) Life Members.

d) Honourable Members.

e) Besides, there will be scope for patrons and advisery Council.

a) General Members:

Irrespective of classification and religion, those who come from fishermen communities who live on catching and selling fish only, who are fisher-men by born, who are not professional fishermen but is a man of same community and works for the welfare of the fishermen and who will agree to follow the Rules and Regulations of the associations and will pay regular subscriptions will be entitled/qualified to be the General Members of the Association.

b) Special Members:

Among the General Members those who will pay special subscription in addition to their regular/ normal subscription for the welfare of the fisher-men community, will be considered as the special members of the Association.

c) Life Members:

Among the General Members those who will pay TK. 3000 at a time as the special subscription/ donation will be considered a s the Life Memberes of the Asso-ciation.

d) Honourable Members:

At the recommendation of the General Committee of this Association, any person/persons, engaged in Govt

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services or who possesses extra ordinary qualities/ personalities belonging to the home and overseas countries, who will extend earnest and sincere co-operation for the establishment of the fundamental rights of the fishermen to the socie-ties and to develope the cultivation and catching fish will be considered as the honourable members of this associstion.

c. Patrons:

Irrespective of persons. organizations. caste and profession, at the recommendation of the central committee person/persons who will pay Tk.10,000 at a time will be considered as the patrons of this Asso-ciation.

Advisery Council:

For the greater and wider interest of the Associa-tion, an advisery council can be formed together with the persons who are serving in the Govt. semi-Govt and Non-Govt Agencies and organizations, elites and intelictuals of the societies, subject to the recom-mendation,and approval of the Central Committee.

6. Rules and regulations for the enrollment of the Members:

An Annexure 'A' giving details particulars of the enrollment of the members are available in the office which will be filled in and sign by the members themselves before enlistment.

7. Rights and responsibilites of the General Members, Special Members & Life Members:

a. To attend general meeting, to submit proposals and to support thereof, to take part in discussions, to caste vote, to become candidate for the mem-bership in the executive committee.

b. Rights and resposnsibilities of the patrons Advisery council and Honourable Members:

These sorts of members will extend their all possible

efforts and whole-hearted support and co-operation at the time of needfulness, distressed and natural calamities to overcome thereof.

8. **Suspension and cancellation of the Membership:**

The Memberships of the Association will be suspended/ cancelled, if the members:

a) Do not pay regular subscription for consecutive 6 (six) months.

b) Remain absence in 3 (Three) consecutive mee-tings.

c) Do anythings detrimental/against the interest of the Association.

d) Die or become mad and be punished by the court.

e) If any member is employed by the Association on the basis of salary then his membership will be cancelled. But if any member extend his services on honourary basis at allowances/service charges as per recommendation of the Central committee then his membership will not be cancelled.

9. **Revival of membership**

If any members/whose membership is/are suspended/ cancelled, apply to the president secretary general to re-instate his/their membership and if it is justifiable and recommended by the president/Secretary General & respective branch/ section/ working committee then it can be re-instated. But if the suspension/ cancellation is done by the Central Committee then it cannot be re-instated till the approval of the Central Com-mittee.

10. **Performances of Activities**

a) All activities of (1) Central (2) District (3) Sub-District(Upazila) Committees will be conducted as per directives of the central Committee. If needed, its activities may be expanded upto Union Committee.

b) Central Committee:

The central Committee will act as the Law produ-cing

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and chief Directive Authority.

c) District Committee:

District Committee wil be controlled as per direc-tives of the Central Committee.

d) Susb-District (Upazilla and Union) Committees will be conducted by the direetives of the district com-mittee and that of Union Committee by the Upazila Committee in accordance with the instruction/ directions of the central committee.

e) Suspension/Closing of Activities:

The Central Committee is authorised to suspend, cancel or close down the activities of the Districts Committee and District Committees are authorised to suspend, cancel and close down the activities of the Sub-District (Upazila) and Union Committees subject to the approval/recommendation of the Central Com-mittee.

11. Organizational Structure:

The Organizational Structure of the Bangladesh National Fishermen Association will be as follows.

1). Bangladesh National Fishermen Association, Sub-District (Upazila) Committee.,

2). Bangladesh National Fishermen Association,District Committee.

3). Bangladesh National Fishermen Association,Central Committee.

12. Number of Committees

a) General Committee.

b). Executive Committee.

13. Mode/Proceedure for the formation of General and Executive Committees:

a) Sub-District (Upazila) General Committee:

General Committee consisting of 51-71 Members will be

formed by the General and Life members of the respective Sub-District (Upazilla). 15 Members Executive Committee consisting 9 office bearers and 6 members will be elected by the General Committee.

b) The Titles of the Executive Committee of District and Sub-District (Upazilla) will be as follows:

1. President	1
2. Vice- President	2
3. Secretary General	1
4. Asstt. Secretary General	1
5. Organizing Secretary	1
6. Publicity Secretary	1
7. Cashier /Finance Secretary	1
8. Office-Secretary	1
9. Members	6

	Total=15

14. Proceedures/Mode of election :

a) Central Committee:

To elect the Cental Committee 5 Nos of Councilors, will be selected by the General Committee of each district in their General meetting. The Councilors will come from various Disstricts will be treated as the General Members of the Central Committee. The members of the Central General Committee, in their General meeting will elect office bearers and members of the Central Executive Committee consisting of 21 members in every 2 years, (Thereafter the body of the National Committee may be expanded on recomendation of registration authority). To assisst the Executive Committee, for smooth running of their activities there will be a standing Committee consisting

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of 5-7 members who will make all possible efforts by forming a sub-Committee for the co-ordination of the necessary works.

b) The Members of the Central Committee with their Titles:

1. President	1
2. Vice-President	2
3. Secretary General	1
4. Joint Secretary	1
5. Cahsier/Finance Secretary	1
6. Organizing Secretary	1
7. Asstt Organizing Secretary	1
8. Education, Cultural & Publicity Secretary	1
9. Office Secretary	1
10. Members	11
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c) Executive Committee

When it is felt necessary to elect Executive Com-mittee of the Central as well as Branches thereof, an election Committee will be nominated in all the branches. The Election Committee will conduct election in accordence with the proceedure/Rules to be formulated by the Central Committee of the Association.

d) Advisery Council:

As per decision of the Central Executive Com-mittee an Advisery Council consisting of 7 mem-bers will be formed by the Central Executive Committee. On same way, the Districts and Upazila Advisory Council will be formed by the Central and District.Executive Committee respectively as per recommendation of the Central Committee.

15. Proceedures for Appointment of stfafs and officers :

To perform the usual office works, to make the plans and projects and to implement thereof, president/ Secrtary General can appoint office staffs, Plans and Projects officer or any other officers/workers as per service-rule of the Association. Besides, if needed, any member/office bearers of the Association can be entrus-ted with any work in lieu of honeurary allowances/ service charges.

16. Proceedure for Meetting:

a) Meetting of the Committee and corum:

The meetting of the Executive Committee of each Sub-district (Upazilla) will be held at least 4 (Four) times in a year and that of Districts and Central Committee will be held at least thrice in a year.

b) The general meetting of the branches and Central Committees will be held at least once in a year.

c) To make corum, the presence of at least 1/3 members will be required for the meetting of the Executive Committee of Central, District and Sub-District (Upazila) and that of for General meetting will be required the presence of majority members.

d) The meeting of the Executive Committee of each branch will be held for a notice of 7 days and that of Central Committee will be held for a notice of 10 days. The General meetting of the branch Committee as well as Central Committee will be held for a notice of 15 days.

e) The emergency meeting of the Executive Com-mittees of the branches as well as Central can be held for a notice of 24 hours.

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g) REQUISITION AND CALL FOR MEETTING:

1 As per provision laid down in the constitution, the President/Secretary General will call meeting as per clauses above but if they failed to call the meeting and if there are sufficient reasons/proofs that the meeting is not called willingly then the Executive Committee/ General Committee in presence of 1/3 members of the Committee can submit demand to the President/ Secretary General in writting showing reasons thereof and giving agendas/matters to be discussed therein. On receipt of demand notice from the members of the Executive Committee/ General Committee, if the President/Secretary General failed to call the meeting of the Executive Committee within 10 days from the date of receipt of demand notice and that of General Committee within 15 days then the members signed in the demand notice, as conveners, may convene the convention/meeting of the Executive Committee/ General Committee at any suitable place and time. If the meeting/ convention is held successfully then the decision to be taken therein will be treated as the decision of the Executive/General Committee.

h) The Notice for the requisition convention/ meeting will be sent to all the members of the General Committee/ Executive Committee under registered post with A. D. or under certificate of posting and also to be published in the local dailies in due course.

17. FINANCIAL MANAGEMENT:

The funds of the Assocission will be collected through following proceedures:

a) Subscriptions, admission fees and at a time dona-tion to be received from the General members.

b) Subscription to be received from special and life members.

c) Donation to be received from the Patrons and wel-wishers.

d) Funds to be received from selling news papers, periodicals, Journals etc.

e) Donation to be received from the Govt, Non-Govt and social welfare organizations of home and overseas countries.

f) Founds to be received from the plans/projects to be undertaken by the Association for the welfare of the fishermen and also funds to be received from Govt and Non-Govt agencies as service charges by implementing the project.

18. PROCEEDURES FOR THE MAINTANANCE OF ACCO-UNTS AND EXPENDITURES :

a) All funds to be collected against receipts to be printed by the Central Committee and signed by the president/ Secretary General of the Central Committee. No Branch is allowed to print or use their own receipt without prior permission of the Central Committee.

b) Funds to be received from the General members as well as from life members as admission fees, special subscriptions, donations to be deposited at the rate of 50%, 25% and 25% to the Accounts of Upazilla, Zilla and central Committees respectively. Besides, 25% of the funds to be collected by the Zilla and Upazilla committees will be deposited/ Transferred to the accounts of the Central Com-mittee.

c) In all the Branches, Accounts to be opened in any schedule Bank and funds collected to be deposited to the respective A/c.

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d) The accounts will be operated by joint signature of the cashier and any one of the following:

President/Secretary General.

e) Cashier will be held responsible for all financial matters (Receipts and Expenditures).

f. Accounts for the receipts and expenditures should be maintained properly against Cr/Dr vouchers which should be approved by the President/ Secretary General at their own risks. Presidents/ Secretary General will be held responsible for the receipts and expenditures of the entire money. In all branches, recommendation from the Executive Committee will be required to withdraw the money from the respective Bank before the estimated/proposed expenditures and necessary approval from the General Committee in their Annual General Meeting

g) Annual Budget for the receipts and expenditures to be placed and approved by the General Committee, in The Annual General Meeting.

19. AUDIT AND ACCOUNTS :

There will be the provision for the audit of the accounts in all the branches of the organizations. The accounts of the the Central Committee will be audited by the authorised/ registered Auditors of the registra-tion authority and the accounts of the Zilla and Upazilla Committee will be audited at the recommnedation/ decision of the Central executive Committee. In addition to this, Accounts will be audited by the Auditors, authorised by the Registration, Authority or by Social Welfare Directrate.

20. AMENDMENT OF THE CONSTITUTION AND THE PROCEEDURES FOR ABOLITION:

a) The amendment of any clause of the Constitution to be proposed will be submitted/placed to the members of the Executive Committee which is part of the Central Committee and after the approval of the Executive Committee it will be placed to the Registration Authority for their final approval and the amendment will be considered Executive if it is approved by the Registration Authority.

b) ABOLITION:

Due to any specific reason or circumstances, if it is required to abolish the Association and if 3/5 members of the General Committee will caste their votes in favour of abolition, it will be placed to the Registration Authority for their final approval. If approved by the Registration Authority, the movable and impovable properties of the orga-nization will be transferrd sold off to other orga-nization. Unless otherwise, the Registration Authority will do needful to the matter as they feel necessary/ fit for.

21. This directives is made in accordence with the Govt policies currently prevailing/enforced but for the greater and wider interest of the Bangladesh National Fishermen Association it can be amended as per directives of the Govt./administrative instruments.

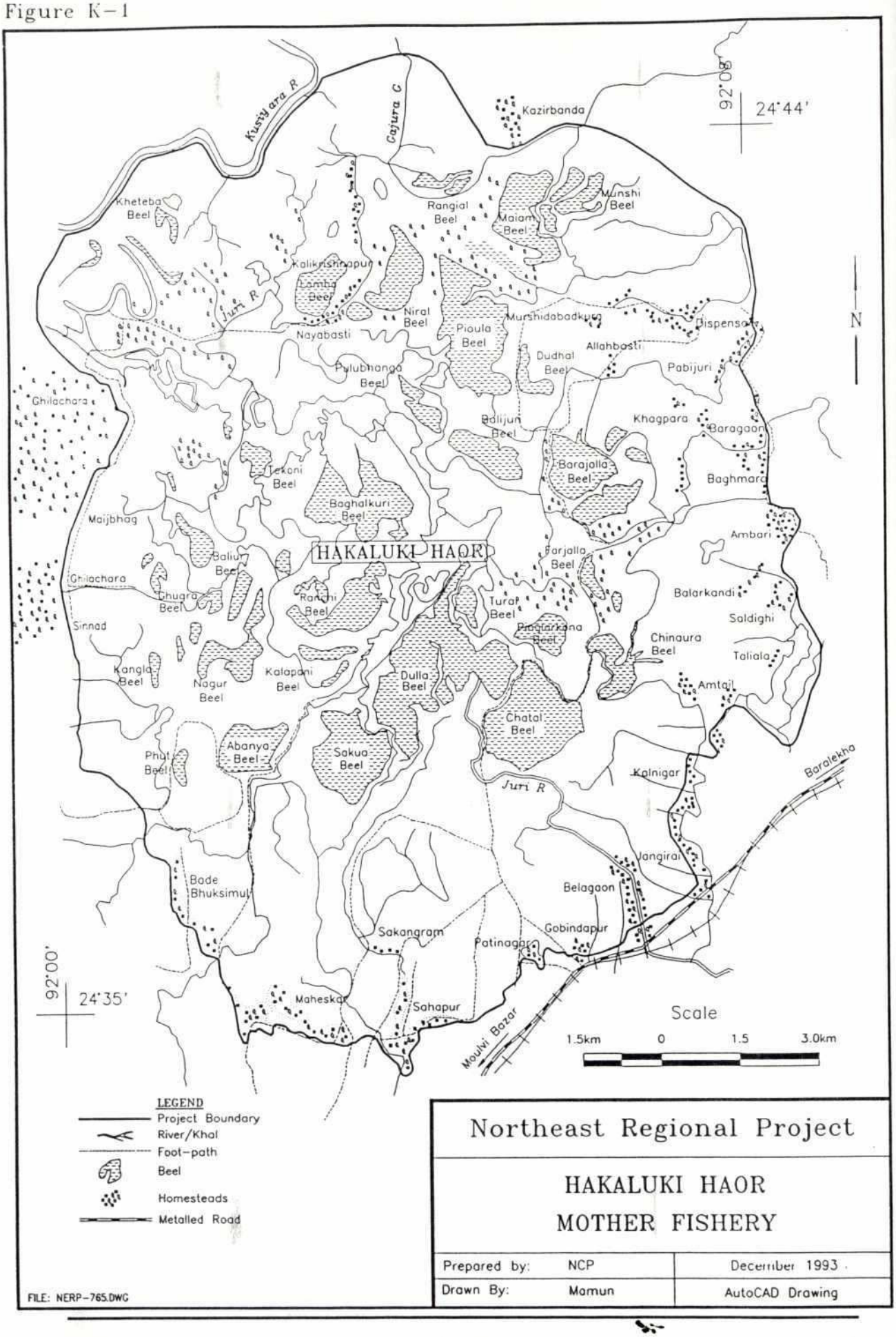
APPENDIX K

CASE STUDIES OF FISHERIES IN AREAS WITHOUT FCD/I PROJECTS

APPENDIX K: CASE STUDIES OF FISHERIES IN AREAS WITHOUT FCD/I PROJECTS

INDEX

Figure K–1


Kushiyara R
Cajura C
Kazirbanda
92°08'
24°44'
Kheteba Beel
Rangial Beel
Maiam Beel
Munshi Beel
Kalikrishnapur
Lamba Beel
Juri R
Niral Beel
Nayabasti
Pioula Beel
Murshidabadkuna
Dispensa
N
Allahbasti
Dudhal Beel
Pabijuri
Pulubhanga Beel
Ghilachara
Baljun Beel
Khagpara
Baragaon
Tekoni Beel
Barajalla Beel
Baghmara
Baghalkuri Beel
Maijbhag
HAKALUKI HAOR
Ambari
Baliu Beel
Farjalla Beel
Ghilachara
Dhugra Beel
Ranchi Beel
Turar Beel
Balarkandi
Saldighi
Sinnad
Pingarkana Beel
Chinaura Beel
Taliala
Kangla Beel
Nagur Beel
Kalapani Beel
Dulla Beel
Amtail
Chatal Beel
Phut Beel
Abanya Beel
Sakua Beel
Baralekha
Kalnigar
Juri R
Jangirai
Bade Bhuksimul
Belagaon
Sakangram
Gobindapur
Patinagar
92°00'
24°35'
Maheskar
Sahapur
Scale
1.5km 0 1.5 3.0km
Moulvi Bazar
LEGEND
Project Boundary
River/Khal
Foot-path
Beel
Homesteads
Metalled Road
Northeast Regional Project
HAKALUKI HAOR
MOTHER FISHERY
Prepared by: NCP
December 1993
Drawn By: Mamun
AutoCAD Drawing
FILE: NERP-765.DWG

K.1 HAKALUKI HAOR

Environment

Hakaluki is a Khashia tribal word meaning "hidden treasure". It is considered by fishermen to be a mother fishery. The haor covers parts of five thana: Borolekha (40%), Kulaura(30%), Fenchuganj(15%), Golapganj (10%) and Beanibazar (5%). Hakaluki is the largest haor in the region, with an area of 204 km^2. It receives water from two rivers (Juri and Panai), and all haor water drains in the Kushiyara River. Flood water enters the haor in May/June and is retained up to October/November. The Juri and Kontinala Rivers encircle Hakaluki Haor and meet at the Kushiyara.

The inflowing rivers and streams are Pabijuri, Dorir bandh, Jurigang (connected with Chatla, Pingla Tarul beel), Kuyachuri (connected with Chatla beel), Kontinala (connected with Tarul and Chatla beel), Dholchura, Borudal, Phanai, Dhamai, Newgori, Jolongachara, Shatmachara, Ratnachara, Shatu nadi, Kamarikhal, Munshir khal (Jagir khal), Sunai nadi (area with heavy silt accumulation), Darsana nadi and Shahebar khal. The main oulet is the Juri River, which discharges into the Kushiyara near Islampur and Fenchuganj. The mouth of the haor is named Sadipur bazar.

There are more than 125 beel/jalmohals within Hakaluki Haor. The larger beels are listed below:

Table K1: List of Beels under Borolekha Thana

Thana: BOROLEKHA			
Jalmohal	**Area (ha)**	**Jalmohal**	**Area (ha)**
Maila group	110	Hoogla beel	27
Pinglar dubi	17	Medha beel	30
Gotaura haor group	570	Eral haor group	31
Baiya group	59	Koyarkona	30
Chinaura Agar group	28	Kalapani Agar group	116
North and South Gazua	46	Polobhangha marasunai	160
Koya magur	15	Haram digha	20
Jolla par jolla	419	Maya juri	11
Pinglarkona chepti group	154	Balijuri	41
Chandar beel group	9	Katua and Kukurdubi	110
Moochna beel group	47	Diga beel group	35
Nirai beel group	14	Malam beel group	174
Tekoni group	33	Ronchi beel	91
Hoogla barang tas	228	Bola juri	16

Thana: BOROLEKHA			
Jalmohal	**Area (ha)**	**Jalmohal**	**Area (ha)**
Kata khala group	16	Nagua lari bai	92
Shiuri digha	11	Athbila	26
Tolar	26	Chinaura Agar group	48
THANA TOTAL: 2,860 ha			

Table K2: List of Beels Under Kulaura Thana

Thana: **KULAURA**			
Jalmohal	Area (ha)	Jalmohal	Area (ha)
Chakia beel group	383	Nagua beel	335
Tural beel	104	Hawa borni foot	121
Goura kuri beel	30	Kangli gourakuri beel	21
Bhitar gavi beel	44	Akdir beel	9
Mara chatla beel	4	Mara chatla beel	307
Moish mara beel	4	Dalia beel	8
Koyar kona beel	6	Nagua lori beel	23
Ganga juri beel	5	Sree konchi beel	34
Pata chapra beel	24	Medha beel	93
Juri nadi beel	59	Bhur kanai beel	6
Maichlar daak	26		
THANA TOTAL: 1,646 ha			

Table K3: List of Beels under Golapganj Thana

Thana: GOLAPGANJ			
Jalmohal	**Area (ha)**	**Jalmohal**	**Area (ha)**
Lamba beel	2	Khatarbag group	26
Choto hawa beel group	10	Bara dal	6
Mandimiar dohor	5	Bachakuri	14
THANA TOTAL: 63 ha			

At present, the following areas are identified as important fisheries: Gotaura haor group (mainly for carp), Jolla par jolla group (mainly for RUI), Malam beel, Pinglar dubi, Polobhanga mara sunai group, Moosna beel group (mainly for AIR, BOAL, PUTI), Chinaura group, Choudala group (mainly for BOAL and other catfish), Katua and kukurdubi, Chatla beel (mainly for PABDA), Tural beel, Ranchi beel, Baddakuri, Kuya churi (mainly for BATASHI), Medha beel, Lamba beel, Balijuri (mainly for SARPUTI) and Naad beel (mainly for CHITAL). Just downstream from the Juri bridge, there is a place named 'Kontirdor' where large fish congregate.

Aquatic vegetation occurs mainly in the shallower parts of the haor. Other than the shorelines, most of the openwater areas were found to be weed free. In the shallower parts the following aquatic weeds were seen: Shaluk, Kataula, Kachuripana, Jhinari, Gaor, Azola, Duckweed, Shapla, Karail, Katachar and deep water rice.

Water colour recorded in different parts of the haor was as follows:

Table K4: Water Colour in Different Beels in Hakaluki Haor

Area	Water Colour	Remarks
Chinaura Beel	Slightly reddish to transparent	Very few submerged weeds
Chatla Beel	Slightly greenish	No weed
Maisla Beel	Slightly greenish	No weed
Kukurdubi Beel	Slightly greenish	No weed
Koyakona Beel	Transparent	Weed present
Tekoni Beel	Transparent	No weed
Gilachara Bazar Area	Slightly greenish	No weed
Pitaitikar Area	Transparent	No weed
Kuyar Chara	Transparent	Large quantity of weeds
Kontinala Mukh	Turbid	Large quantity of silt

Chatla Beel has come under threat of sedimentation from the Juri River. To counteract this threat, an embankment was contructed around the beel to deflect river sediments away from the beel. A tree plantation was started in 1991 by Mr Rashid Mia (lessee of Chatla beel) on the beel embankment. He planted about 5000-6000 Hizal, Koroch and Cipti trees. Around the plantation zone, the water colour was found to be greenish and a school of small fish were seen.

Fishery resources

Kalibaus, Boal, Rui, Ghagot, Rui, Pabda and Chapila are the main species of the haor. From the Kushiyara there are frequent upstream movements of fish towards the beels and tributaries of Hakaluki.

The environmental conditions in and around Hakaluki Haor are favourable for carp spawning. The Kontinala, Juri and several smaller rivers, and streams, flow from the adjacent hills to the Kushiyara through Hakaluki haor. A number of small hills are present before the confluence of

the Juri-Kushiyara River near Gilachara bazar. Parts of the river beds are covered by stones, gravels and coarse sand. There are continuous currents from the inflowing rivers, and occasionally there is some backflow of water from the Kushiyara. Piles in the perennial beels and continuous current flow can be expected to attract carp. No studies have been conducted regarding carp breeding in the area, and no carp spawn was seen in the haor area. But local people suspect that carp breeding grounds might exist near Islampur village where the Juri River discharges into the Kushiyara. This year a large number of carp fry were caught in some areas of Hakaluki haor. Fishermen had observed the zigzag movement and jumping behaviour of carp broodstock during the new/full moon time in April/May when new flood waters entered the haor.

Most non-carp fish species breed in this area. Local fishermen report that they find eggs in the abdomen of Tengra and Pabda twice a year (April-May and June-July). The fishermen also state that the majority of fish species probably breed within the area as smaller size fry are always present during late April and May.

Fishing practices

Catch composition and yields for several types of fishing gear used in the haor are as follows:

Table K5: Catch Composition by Gear

Gear Type	Fish Species	Remarks
Borshi	Kangla, Air, Baim, Lati Beda, Ballya, Tengra, shingi & Magur	10000-1200 borshi operated by 3 persons on country boat. Daily income Tk 50-70/unit.
Pine jal	Chapila fry only	525/32 feet net operated by 14 persons on two country boats. Time required per operation: 30-40 minutes. Total catch per hour: 5 kg.
Kapri jal	Mola, Icha, Boisa	525 x 32 feet net operated by 10-14 persons. Time requied per operation: 60-90 minutes
Thela jal	Icha, Chela	Daily income Tk 20-30

During the flood season, Mola,Chapila, Icha abd Boal are the main species caught by net. Mainly seine net and gill net are used. At that time seine net catches average about 77-80 kg/day (14 men pulling the net) with a value of about Tk 700-1200. Fishermen in the Kanungo bazar have stated that the floodplain fishing season lasts from April to October.

Dori is a fish trap used to catch small shrimp, rui and all types of fry. It acts as a shelter and is considered to be a destructive fishing method which is a major factor preventing increase of the fish population.

The permanent and semi-permanent water bodies are generally leased by rich people. As a result genuine fishermen do not get a chance to catch fish in the beel and the internal rivers. Fish guards, acting on behalf of lesees, sometimes extort money from them.

Lessees install katha during August-September in their leased jalmohals. Hizal, Shawra, Jarul, Korach, Mulibash and Jam trees are commonly used. Each Katha costs about Tk 20,000. Chatla

beel especially has numerous katha. Moreover people have stated that large quantities of table salt, rice bran and cow dung are applied to kathas during September/October. Preparations for beel harvesting begin in October when the beel outlets are partially closed by temporary earthen dams with one opening in the middle. At the opening, a one-way bamboo fence is placed which allows fish to gain entrance into the beel from the river/canals, but cannot return back again. People usually wait until the last flood waters (goola) in October, as they believe that fish abundance is high during the time of October goola. Afterwards the opening in the dam is closed. Fish harvesting starts at the end of December and continues up to February. In the conventional sense, there is no pile fishery within the haor area as beels are harvested annually. This is one of the reasons for the decline in fish production in the haor.

Most of the fish harvested from beels during the winter are transported to cold storages in Ajmiriganj, Kuliarchar and Chittagong. As a result, only low value small fish are available in the local markets.

Production trends

Fish production of the haor has been declining over the last few years due to several reasons:

- Disease infestation.
- Effect of the Fenchuganj Fertilizer plant, which not only restricts migration, but also discharges ammonia gases that cause environmental pollution and are hazardous.
- Decomposition of paddy roots and stems, which has created deoxygenation problems during breeding time in April/May when water depth is low.
- Total dewatering of beels for annual fishing, resulting in complete elimination of all fish species.
- Deforestation within the haor (use of trees for fuel and katha).
- Use of current jal, chat jal and other destructive fishing gears.
- Siltation of the important beels (Barang beel, Tamshakuri beel, Malam beel, Shingjuri beel, Chatal beel, Tural beel, Guala beel). Silt is carried into the haor by the Juri River.
- Reduction of bird occurrence due to deforestation, as bird droppings are an important source of nutrients to produce natural fish food organisms.

Species observed in catches on 22 July 92 were as follows: Ghagot juveniles (20-25 cm size), Chapila, Puti, Tengra (with eggs), Cheng, Mola, Taki, Bheda, Chirka, Baim, Chanda, Icha, Potka, Ilish (17.5-20 cm size), Pabda (with egg), Ghonia fingerlings and Kalibaus fingerlings (14-15 cm). The daily catch was about 1-2 kg/unit, worth Tk 20-50 at Kanungo bazar.

Special aspects/problems

Local people stated that a massive fish mortality occurred in the Juri River in April 1992. This was attributed to toxic plants (Bishlat) washed downstream from India. It is interesting to note that only scaleless species were said to be affected (Air, boal, ghagot etc) and fish with scales were not affected. Further investigation should be made of the reasons for the mass fish mortality.

Hakaluki Haor is a unique natural sanctuary area for fish and birds. At present the haor is still not highly affected by human interventions. Consideration should be given to declaring Hakaluki Haor a sanctuary area. More detailed investigation is required into the spawning of carps inside

the haor. Most of the beels are encircled by high land which is not utilized for agriculture. It would be possible to undertake a massive tree plantation programme in such areas with the help of the DOFr. An initiative could also be taken for a massive plantation programme of water resistant trees (hizal, koroch, etc) on the submersible and full flood embankments in the haor.

K.2 TANGUA HAOR

Environment

Tangua Haor is recognized as an important wetland site in Bangladesh, and is considered a mother fishery by fishermen. It has a surface area of 130 km^2. It is located near the foothills of the Khasia hills. There is a renowned Bengali proverb behind the name of Tangua haor which states:

Chay kuri kanda (There are 120 uplands)
Nay kuri beel (There are 180 beels)
Aii nia Tanga (All together formed by Tangua)

Most of the area of the haor is covered with water throughout the year. The floodplain is subdivided into several parts. The water comes from the hills adjacent to the haor. A large number of interconnected tributaries makes the area a unique habitat for fish. The near-natural state of Tangua Haor is impressive as most of the area is covered with indigenous vegetation. Terrestrial areas are covered with natural bushes and there are no paddy fields within the haor. Large stands of hizal trees is present, and planted hizal grow well in the haor.

There are more than 54 permanent beels and canals within the haor. Alam duar is the most important fishery, and receives much of the haor drainage water flow-through. The following jalmohals are considered as most important for fish production:

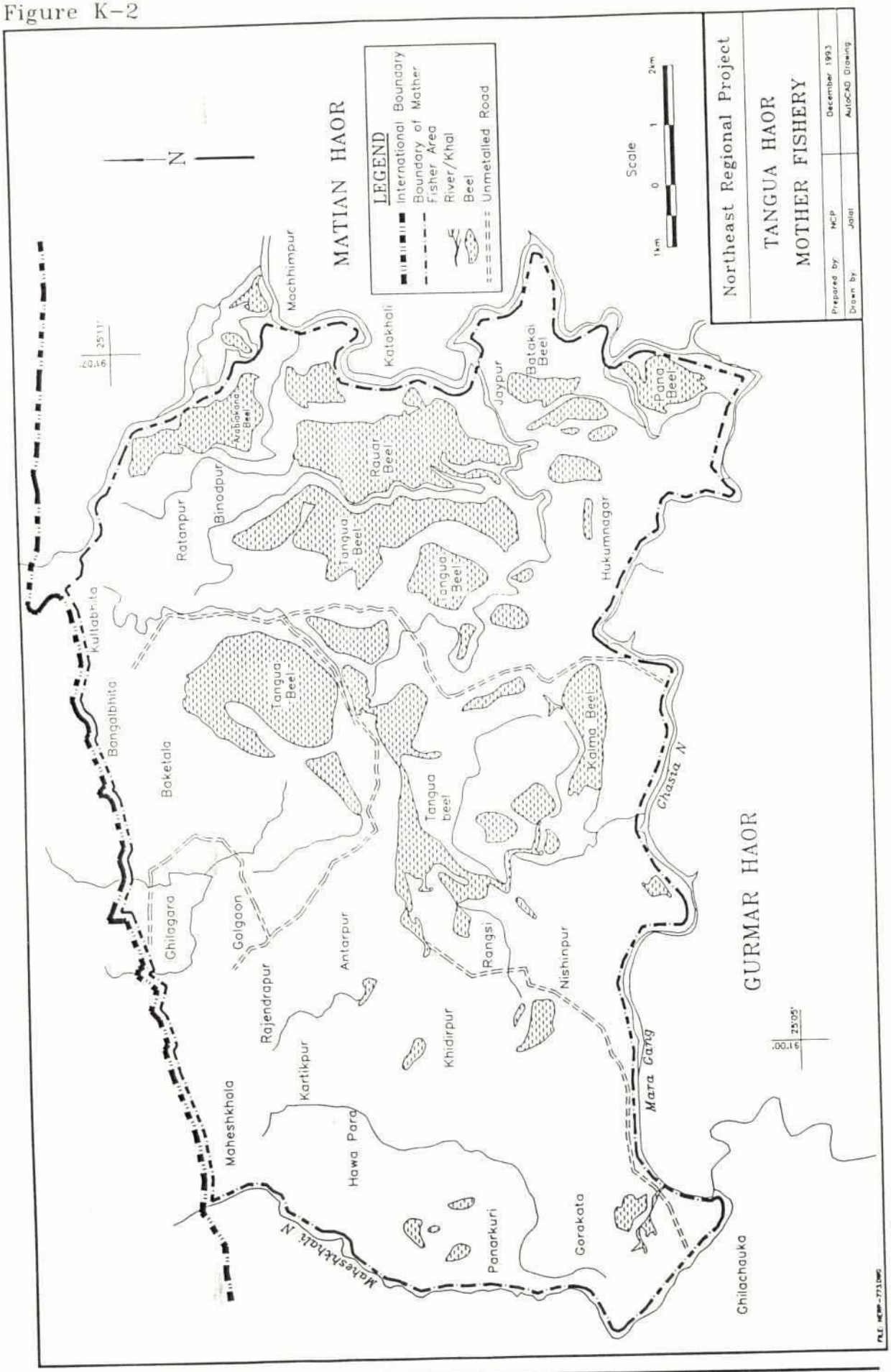
Table K6: Important Jalmohals in Tangua Haor

Jalmohal	Main Species
Alam duar	Chital, Boal, Air, Bacha.
Rupa Bhui	Catla, Rui, Mrigel, Laso.
Nazar khali	Ghonia.
Kawarkhal	Kanla
Ruhar dair	Boal, Laso.

Haor water is clear with a fate greenish colour.

The following trees and aquatic plants occur in Tangua haor: HIZOL, KOROCH, NOL, KHAGRA, CHAILLA (preferred by Boal for breeding), JHAW (preferred by Rui), BAN TULSHI (preferred by Ghonia and Boal for breeding), PHALOI, PARUA (preferred by Pabda), JHARA BON, BALLUA, BAN GOLAP, BINNA, HUGAL (preferred by Shoal, Gazar for making nests), SINGRA, KUI, SHALUK, PHALOI (preferred by Rui), GAUR (preferred by Rui, Catla, Kalibaus), KAURALI and KAASH.

Figure K-2


MATIAN HAOR
GURMAR HAOR
N
LEGEND
International Boundary
Boundary of Mather Fisher Area
River/Khal
Beel
Unmetalled Road
Scale
1km 0 1 2km
Northeast Regional Project
TANGUA HAOR
MOTHER FISHERY
Prepared by: NCP
December 1993
Drawn by: Jalal
AutoCAD Drawing
Machimpur
Kataklali
Jaypur
Batakal Beel
Pana Beel
Ratanpur
Binodpur
Rauar Beel
Tangua Beel
Hukumnagar
Kullabhita
Bangalbhita
Baketala
Ghilagara
Golgaon
Rajendrapur
Antarpur
Kalma Beel
Chasia N
Rangsi
Nishinpur
Khidirpur
Kartikpur
Hawa Para
Maheshkhola
Mara Gang
Maheshkhali N
Panarkuri
Gorakata
Chilachauka
25°17'
25°05'

Fishery resources

The area is regarded as an important breeding ground for carp, large catfish and many smaller fish species. Generally, spawning migrations start during the premonsoon flood (usually during April-May) and continue into the first part of the full monsoon flood (May-June). Most breeding takes place in shallower waters. But within the shallower water spawning behavior differs from species to species. Species are separated into two breeding behaviour categories by local fishermen:

River breeders: The following species prefer to spawn within the river: Chital, Ghagot, Kalibaus, Catla, Rui, Mrigel, Air, Rani, Pabda, Pangas, Basa, Garua, Shilon, Baaspata, Kajuli.

Floodplain/Beel breeders: The following species prefers to spawn either on the floodplain or in beels: Shingi, Magur, Koi, Bheda, Puti, Icha, Chanda, Mola, Ghonia, Boal, Sarputi, Gulsha, Tengra, Laso, Kholisha, Along.

During the premonsoon flood some species migrate a short distance laterally against the current through small canals and passages to locate bushy or reedy areas (Chailla bon, Nol Khagra, Bon tulshi, Parua, Binna bon, Hugol bon, etc.) for spawning. During that period some species form a spawning school which is locally called *Jaak dhora*. The migratory movement of a typical jaak toward a spawning place is locally called *uijja*. The following species carry out ujjia migrations: Boal, Ghonia, Kangla, Laso, Koi, Puti, Shingi, Magur, Tengra, Cirka, Batashi, Kholisha, Bheda, Pabda.

Within an area breeding behavior differs from species to species. Ghonia, Boal, Kangla, Foli, Pabda, Shoal, Gazar, Lati, Cheng, Koi and Laso prefer to breed on newly inundated areas where slow current and bush/reeds exist. They are locally called *Jangal* breeders. Air, Ghagot and Rita make holes in the shallower parts of the river for spawning. Chital prefer to breed inside an inundated boat or a katha.

Fishing practices

Katha is the principal fishing method used in the haor. Large areas of katha were observed which were encircled by bamboo stakes.

Production trends

Inspite of the high level of environmental quality and human inputs such as tree plantations, the production level is gradually declining.

Special aspects/problems

The principal threat to Tangua Haor is sedimentation. The Jadukata River is the main feeder river of the Tangua haor basin and it carries large quantities of sand and stones from the Indian hills. The river bed is gradually raising which reduces the water storage capacity of the river. The problem started after the 1988 flood. Due to the low carrying capacity of the Jadukata River, flash flood water now passes down the Maharam River. This causes the Maharam River to carry a large quantity of sand to Matian haor and the Tangua haor area. As a result, the Alam duar of Tangua haor is gradually silting up. Pachasloal beel has already been destroyed due to siltation.

Reexcavation of the old Jadukata River is recommended by the local fishermen to keep the great Tangua haor as it was.

Smuggling of fish to India is thought to be minor (1-2% of production).

K.3 KHALIAJURI AREA

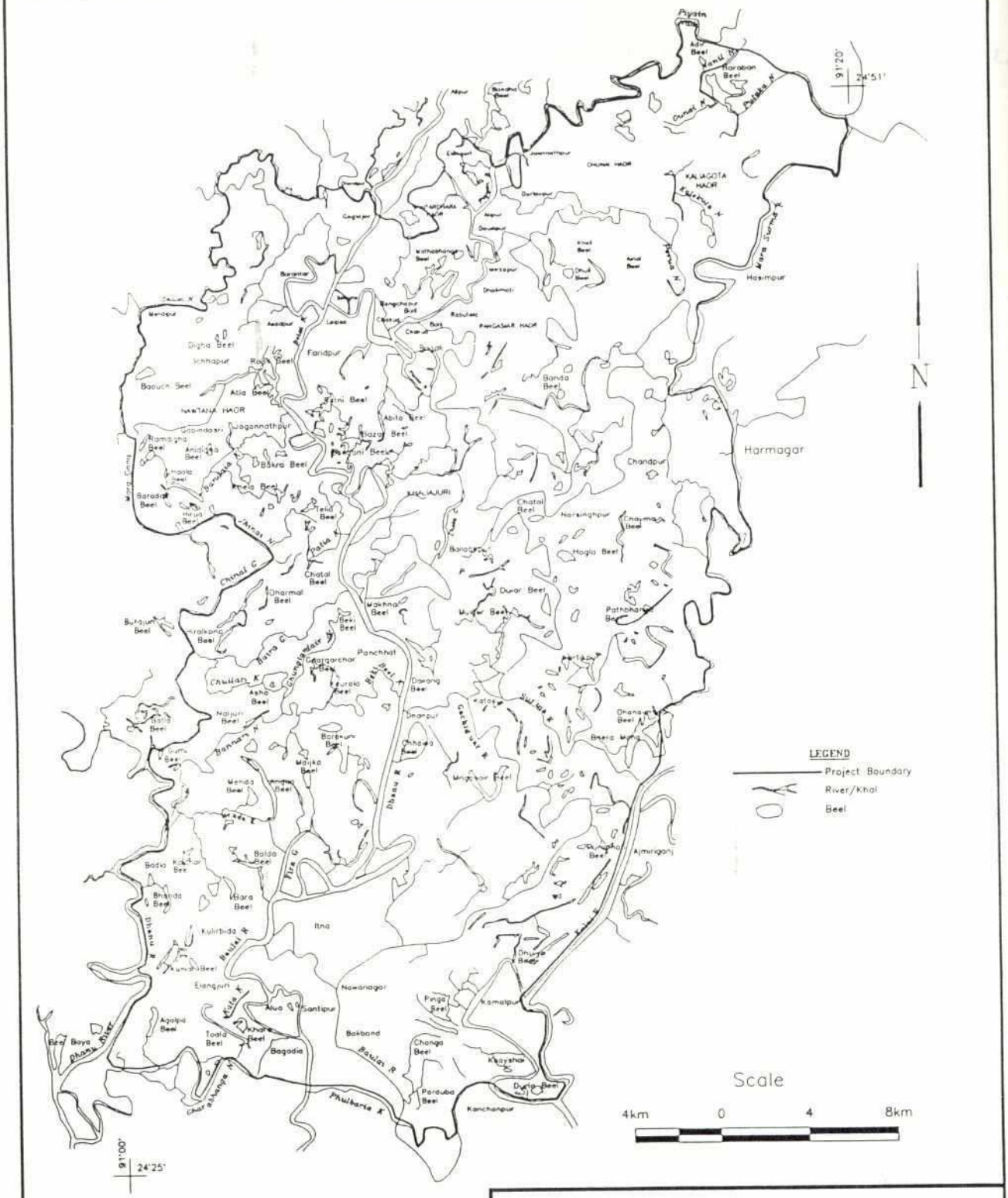
Environment

Khaliajuri means 'empty basin' in Bangla. It has a surface area of 975 km^2, and covers a large part of the southern portion of the Sylhet basin. It is the most deeply flooded portion of the basin. It is regarded as a mother fishery. Among all the fisheries of the region, Khaliajuri is one of the most important, because of its longer water retention period, topography and fish abundance. Local peoples state that the average depth of Tangua and Hakaluki Haors is less than the Khaliajuri area. Normally haors and beels of the Khaliajuri area are inundated by the end of April and flooding continues up to mid November. During full flood, high haor lands are under 3-3.5 m of water and low lands under 7-8 m of water.

The area receives discharge from the Surma and Baulai (Dhanu) Rivers, as well as numerous channels and seasonal khals. It is bounded in the south by the Kalni reach of the Kushiyara River (Beramona channel area). The Baulai has created many shallow grazing areas for fish, deep pockets for broodfish overwintering and a number of oxbow bends and loops for fish breeding. Moreover it carries a large volume of water from the Surma River to the Upper Meghna River.

A total of 124 important beels and rivers are under the Khaliajuri fishery which includes almost all important water bodies in the area. If the small fisheries (less than 12 ha) are included, the total number is about 300. The most important fisheries in Khaliajuri are listed in the following table:

Figure K-3



Northeast Regional Project		
Khaliajuri Area Mother Fishery		
Prepared by:	NCP	January 1994
Drawn By:	Mamun	AutoCAD Drawing

FILE: NERP-762.DWG

Table K7: Important Fishery in Khaliajuri Area

Fishery	Area (ha)	Location	Remarks
Bagoonbari, Thanaghat (near Kachijuli), Kewatkhali, Kalirbazar, Senbari	-	Mymensingh	Carp spawn collection centres in Brahmaputra River
Bahadhurabad ghat, Pularkandi (Dewanganj), Sharishabari, (Jaganathganj), Islampur ghat, Madharganj	-	Jamalpur	Carp spawn collection centres in Brahmaputra River
Bengla	202	Bajitpur	Receives water from Ghorautra River
Kula	-	Bajitpur	
Chorabandha	728	Bajitpur	
Nagua khal, Dilalpur	66	Bajitpur	Receives water from Ghorautra River
Humaipur	-	Bajitpur	Meghna fishery
Nawhata	105	Bajitpur	Receives water from Ghorautra River
Kalinadi	-	Kuliarchar	Oxbow bend which receives water from Upper Meghna River
Beelbaya, Chamraghat	-	Karimganj	Receives water from Nagchini River
Chela Payia group, Adampur Goalbari	30	Khaliajuri	Receives water from Dhanu River
Makhnai beel, Adampur	36	Khaliajuri	Mother fishery* (Dhanu)
Bodyarkoop group fishery	-	Khaliajuri	-
Ranichapur group fishery, Laipsa bazar	202	Khaliajuri	Mother fishery*
Dhalimati	121	Khaliajuri	Mother fishery*
Chunai	121	Khaliajuri	Mother fishery*
Chowtar group fishery	101	Khaliajuri	Mother fishery*
Pukijani	14	Khaliajuri	
Bajail	57	Khaliajuri	Mother fishery*
Rakti	28	Khaliajuri	Mother fishery*
Moradhanu	26	Khaliajuri	Mother fishery*
Hizal dair	18	Khaliajuri	Dhanu River
Chagol Dair	18	Khaliajuri	Dhanu River

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Fishery	Area (ha)	Location	Remarks
Kirtankhola	24	Khaliajuri	Dhanu River
Moraganj, near Khaliajuri town	53	Khaliajuri	Mother fishery*
Kathalgang	36	Khaliajuri	Mother fishery*
Chinamora	16	Khaliajuri	
Norshigpur	65	Khaliajuri	
Hatimara	51	Khaliajuri	
Adra	18	Khaliajuri	
Duia	18	Khaliajuri	
Chaiya	24	Khaliajuri	
Muldair	32	Khaliajuri	
Baki	20	Khaliajuri	
Boyra Nadi	16	Khaliajuri	
Feni group fishery	26	Khaliajuri	
Shalika	14	Khaliajuri	
Bordair group	12	Khaliajuri	
Boalirdair group	16	Khaliajuri	
Lori	24	Khaliajuri	
Kankati	14	Khaliajuri	
Jhigdori	12	Khaliajuri	
Roail	40	Khaliajuri	Mother fishery*
Dhanu Nadi	101	Khaliajuri	Mother fishery*
Khaliajuri goona	20	Khaliajuri	Mother fishery*
Jaganthpur goona	16	Khaliajuri	Mother fishery*
Faridpur goona	16	Khaliajuri	Mother fishery*
Sainnar beel, Dhanpur	202	Itna	Water from Dhanu
Kalarduar, Pachhat, Dhanpur	-	Itna	Water from Dhanu
Bagli, Itna	-	Itna	Water from Dhanu
Dhailong (Harmara), Dhanpur	84	Itna	Water from Dhanu
Guchir Duar	43	Itna	Receives water from Surma River
Puran Duar	56	Itna	Receives water from Dhanu

Fishery	Area (ha)	Location	Remarks
Burir line	-	Itna	Receives water from Meghna
Firagang	-	Itna	Receives water from Dhanu
Itnar Duar, near thana	98	Itna	Receives water from Dhanu
Itna Bajajalkar, near thana	183	Itna	Receives water from Dhanu
Equrdia Duar	-	Astagram	Meghna fishery
Kawnir Neer, Kanchanpur	-	Mitamoin	-
Kalmar baak	-	Hobiganj	Dhaleswari River

* Mother fishery: Traditional fish sanctuary designated by local fishing community. People are of the opinion that fish must be preserved here and that netting should be completely restricted. The normal water depth of these fisheries is great (7-11m in winter). Fish seek shelter and some species breed in mother fishery areas.

Boya Beel receives water from the Nagchini River adjacent to the Chamrarghat. Here there is a river bend with a shallow inundated area which is perhaps an ideal breeding place for many species. The main species present in the beel are BOAL and LACHA.

The Bheramona fishery in the south is located at the western side of the Bheramona River near Ajmiriganj thana, Hobiganj. It is connected by Katakhal to the Kushiyara/Kalai/Beramohana river. There are two important rivers in the area, the Baulai (Dhanu) and Kushiyara. Usually Dhanu river water is clear and Kushiyara is muddy/turbid. Due to heavy turbidity, it is not possible to install katha before September, otherwise all katha is silted up.

There are several hizal and koroch gardens in some of the villages. The tree plantations were established to meet four objectives: Serve as a wave protection dam during the flood season; shade during the dry season; fuel source during the flood season (straw and cow dung is used during the dry season); source of income through sale of branches for katha. The following privately owned tree plantations exist in the area:

Table K8: Private Plantation Area in Khaliajuri Area

Plantation Area	Adjacent Haor
Udaypur	Hatimara Fishery
Lartikpur	Hatimara Fishery
Adampur Goalbari	Chella Piya Fishery
Adampur	Chella Piya Fishery

Fishery Resources

The Khaliajuri area is famous for fish. People throughout the entire Baulai/Kushiyara floodplain believe that if Khaliajuri produces less quantity of fish, then all markets will suffer. As per the opinion of the experienced manager of AFI, the important (productive) fisheries within the Ajmiriganj area are:

Table K9: Most Important Fishery in Khaliajuri Area

Fishery	Major Species
Chandina	
Dhanu River	
Ronichapur	Rui,Kalibaus, Gonia, Chital, Boal, Air,Pabda, Basha,Catla
Dhalimati	Kalibaus, Boal, Rui, Chital, Catla
Moraganj	Gonia, Kalibaus, Chital, Air
Bheramona	
Bhanda	
Gacherdohor	
C group fishery	
Kathalgang	Gonia, Kalibaus, Chital, Air
Chunai	Kalibaus, Rui, Chital, Boal, Catla
Faridpurar duar	Kalibaus, Rui, Mrigel, Boal, Chital

The water depth of the above jalmohals during the dry season is about 13-17m.

There are several duars within the jalmohals and some duars have great depth (in some areas the deepest part is about 20-22 m during the dry season). The following are the most important duars:

Table K10: Important Duars in the Khaliajuri Area

Duar	Name of Fishery/Connected River
Ballavpurar	Noragang fishery, Khaliajuri
Kalar duar	Dhanu River, Pashat, Dhanpur
Jamunar khew	Rangchapur fishery (Dhanu River), near Laipsa bazar, Khaliajuri
Phada Auti	Rangchapur fishery (Dhanu River), near Laipsa bazar, Khaliajuri
Faridpurar duar	Rangchapur fishery (Dhanu River), near Laipsa bazar, Khaliajuri
Agrar khew	Rangchapur fishery (Dhanu River), near Laipsa bazar, Khaliajuri
Bangani khew	Rangchapur fishery (Dhanu River), near Laipsa bazar, Khaliajuri
Khorkoria khew	Rangchapur fishery (Dhanu River), near Laipsa bazar, Khaliajuri
Hatbila khew	Rangchapur fishery (Dhanu River), near Laipsa bazar, Khaliajuri
Borkir took	Dhalimati fishery (Dhanu River), near Chakua village, Khaliajuri
Bagar khew	Dhalimati fishery (Dhanu River), near Chakua village, Khaliajuri
Boiragir duar	Dhalimati fishery (Dhanu River), near Chakua village, Khaliajuri
Saintar duar	Dhalimati fishery (Dhanu River), near Chakua village, Khaliajuri
Jaganathpurar duar	Dhanu River, Khaliajuri
Bheramona duar	Bheramona River, near Ajmiriganj
Bordairar duar	Bheramona River, near Ajmiriganj

Fishermen of the area state that most of the above duars harbour larger size fish. During the last fishing season they caught fish in the following weight ranges:

Table K11: Size of Larger Fish Caught in Different Duars

Species	Weight Range (kg)
Catla	10-15
Rui	8-10
Mrigel	3-5
Boal and Air	10-12
Chital	12-16
Kalibaus	4-7

These jalmohals are important overwintering grounds for carp, catfish and knifefish broodstock. Catch composition by weight is about 50% large catfish, 30% major carp and 20% other fish. Fishermen also state that Chitol, Air, Ghagot, Boal, Ghonia, Kalibaus, Pabda, Batashi, Gharua, Laso, Baim and virtually all smaller species of fish breed in this area during March and April. The breeding behaviours of Boal, Ghonia, Pabda and Puti are more or less the same (i.e formation of schools, followed by congregation and spawning around kandha where low velocity water currents have recently inundated grassy areas). But Air, Guzi, Chitol and Kalibaus prefer to breed in and around katha. The fishermen could not confirm the breeding of other major carp in the area, but large number of carp fry are always seen and caught by the local fishermen during May and June. This area is regarded as a mother fishery by fishermen where many large fish take shelter from September/October up to the spawning migration in March/May. Because of its greater water depth, low rate of siltation and abundant fish forage, the area should be designated a fish sanctuary as soon as possible.

The currently most important fish species in Kaliajuri are Catla, Rui, Air, Boal, Pabda, Kalibaus, Chital (less), Tengra, Batashi, Sarputi (less), Chapila, Kaski.

Seasonal abundance of fish in Khaliajuri is as follows:

Table K12: Seasonal Abundance of Fish Species in Khaliajuri Area

Abundance	Period	Main Species
High	Nov to Feb	RUI, MRIGEL, CATLA, KALIBAUS, GHONIA, AIR, BOAL, CHITAL, GHAGOT, SHOAL, GAZAR, LACHA, GULSHA, TENGRA, TENGRA, CHAPILA, BATASHI, PUTI, KOI, CHANDA
Low	March to mid-June	MOLA, CHAPILA, KACHKI, BATASHI
Medium	mid-June to Oct	BAIM, PABDA, GULSHA, BOAL, FOLI, RITA, SHOAL

Sainna Beel, Puranduar, Dhailong Beel and Kalarduar are renowned fisheries in the area. Some people maintain that still now in Kalarduar (in the Dhanu River) Catla of 30-40 kg size and Boal and Air of 10-20 kg size can be caught. The average depth in winter is about 12-13 m (as reported by fishermen). This duar is located in the Baulai river near Nagar and covers an area of about 1.6 km long and 100-120 m wide.

The Chela Piya Group Fishery is another important fishery. This floodplain area is entirely covered with canals. Water enters the canals from the Baulai River. The other ends of the canals are closed. The main species captured in winter are: RUI, KALBASU, BOAL, SHOAL, GAZAR, PUTI, GULSHA TENGRA, PABDA, GHONIA and BAIM. In the rainy season (June-September) major species captured are: GOLDA CHINGRI, TENGRA, PABDA and CHELA. In April-May only CHAPILA, KECHKI, and BATASHI are caught. According to local people, in the month of May new flood waters gradually arrive as a consequence of heavy sudden rain. After lightning and thunderstorms most of the fish move against the incoming water current from the beels to the river. Small canals covered by grass are the preferred breeding sites for BOAL, GHONIA, SARPUTI, PABDA, GULSHA TENGRA, SHINGI, MAGUR and KOI. Boidarkoop

is a part of the Chela Piya Group Fishery and consists of a deep hole used by large fish for overwintering. The Makhnai beel fishery is adjacent to the Chela Piya River and receives water from the Baulai River near Kaliajuri. The main species caught are KALIBAUS, GHONIA, AIR and SARPUTI. Recently a few Silver Carp and Common Carp have been caught. These species had probably migrated from flooded ponds, or possibly the floodplain stocking program in Moulavibazar.

Makhnai Beel covers about 2000 ha of agricultural land and in most years early floods cause extensive crop damage.

The Ranichapur Group Fishery covers a water area of about 200 ha. Last year the dominant species were Kalibaus, Chital, Air, Rui Ghonia and Shilong (75% of the catch). Small fish (Pabda was the major species) constituted 25% of the catch. Ranichapur receives water mainly from the Baulai River, but some water comes via Pangasiar Haor. People of Khaliajuri maintain that out of 124 larger jalmohals, Ranichapur and Dhalimati are the best two as large fish are always present. Probably the greater depth, the stands of Hizol, Borun, Mera and Koroch trees in the area, and restrictions on the use of current net and other destructive fishing gears are the main reason for this. Near Ranichapur, on 1-3 May 1992, a large number of Rui fry (4 cm size) was caught by the people of Balichakua village.

There is some evidence that individual carp return to the same beel during the dry season year after year (ie homing behavior). The fishermen maintained that if any fish escape from the net during harvesting, most of these same fish will return back to the same beel after the breeding and feeding migration. The hypothesis was tested by the lessee of the Rangchapur fishery. He 'marked' fish by cutting off one lobe of the tail fin and then returned the fish to the water. Three years later these marked fish were recaught in the same place at the time of the pile fishing. Similar tail fin amputation marking and recapture results have been obtained by lessee and fishermen at Tangua Haor, which is also a mother fishery. If carp and perhaps some other large species (catfish, knifefish, ilish) actually do home the same way salmon do, this will have profound and far-reaching implications for fisheries management, development and conservation.

In the Bheramona fishery, the most abundant species are carp fingerlings (Catla5-9 cm, Rui 6-10 cm, Kalibaus 7.5-15 cm, Ghonia 7.5-15 cm), Batashi, Taki, Shoal, Koi, Ghagla (like Air, colour: greyish to light gold, 11 bands dorsally to ventrally with 5 spots at each band), Puti, Chanda, Golda chingri, Icha, Chirka, Baim, and Poa fry. Among the valuable species, only Golda chingri is the major catch (by chai) in the floodplain (10-20 grade size). Most people maintain that the abundance of carp fry is high this year (particularly Rui, Catla and Kalibaus).

Fishing practices

The most commonly used fishing gear in the Kaliahuri area and the species caught are given in the following table:

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Table K13: Common Gears and Area of Operation

Gear Type	Species Caught	Area of Operation
Ghora jal and Laua jal	Mainly for ilish	Confluence of river and canal/floodplain
Kona ber jal	Keski, Kajuli, Cirka Batashi, Chapila	floodplain, canals and rivers (Katha)
Ghana ber jal	Chapila, Pabda, Puti, Gulsha, Bashpata	Floodplain, canals and rivers (katha)
Ber jal	Catla, Rui, Mrigel, Air, Chitol	River, canal and floodplain
Uther jal	Ghonia, Ghagot, Air, Shoal, Gazar	River, canal and floodplain
Current jal	Pabda, Puti, Bheda	Canal and floodplain
Chai	Kalibaus, Rui, Chanda, Golda Chingri, Tengra	Canal and floodplain
Borshi	Boal, Gazar, Lati, Baim	River, canal and floodplain
Uich	Cirka	Floodplain

Fishing gear used in different types of fisheries are as follows:

Subsistence fishery: Mainly current jal, Konaberjal, Chai(bamboo trap), Borshi (long line)

River fishery: Goira jal (2 persons), Horhoriajal (2 persons), Utharjal (3 persons), Pinejal (3 persons), Berjal (11 Persons), Lorijal (5 persons), Binejal (3 persons)

To catch Boal and Air (also turtles), HAJARI BORSHI (longline) is widely used.

Katha are widely used throughout the area for fish shelters. Branches of Hizal, Koroch, Barun, Mera, Jarul and Jam trees are used. Normally katha are installed during the time of water recession. In every important fishery there are several katha and all the katha are harvested during the time of annual/pile harvesting (Dec to March). The Moragang Fishery is a renowned pile fishery in the area. It is more or less a natural lake with no water inlet and outlet channels in winter . It is about 5 km long and 70-100 m wide. Forty jurinda of branches (80 boats) are used in the katha fishery. Last year each jurinda cost about Tk 40,000-50,000 to install. Each jurinda uses 4000-5000 small diameter rot-resistant muli bamboo, which cost about Tk 10-15 each.

The Sreelaxmi Fishery Coop is one of a number of such fishermen groups in the haor area. They engage in fishing in different beels and rivers rented by lessees. 100-150 fishermen form one group, headed by a leader (Matabbar/Morol). In winter they make a fishing contract with the lessee and they organize the fishing activity. The contract between the lessee and his group is based on a share of the catch, usually 25-30%. From that part (25-30%) fishermen get only 50%. The leader does not participate in fishing. He is responsible for managing the boats and nets and other equipments and often he is an investor. Basically the Morol is another type of exploiter of the genuine fishermen. Due to lack of capital, fishermen realize only the value of their labour. Morols originate from the fishermen class. During winter, the catch is higher. As a result fishermen earn more. In the flood season the average income per person is about Tk 30-50.

Dol jal is a specialized net which is used for enclosing katha set in the deeper parts of a river (duar). The size of the net is dependent on the area of the katha and the depth of the duar. Bigger nets are made by joining together several stock net pieces. For example, the depth of the Jamuna khew in the Rangchapur fishery is about 13-17 m during the dry season. To perform one katha harvesting operation, it is necessary to join 3-4 pieces of net vertically. At the time of the operation, the net is set and tied to bamboo poles fixed around the katha. The net is set by two or three boats from the two ends, quickly enclosing the area. The net is gradually drawn together as the tree branches are removed from the katha. The net served as an enclosure while actual harvesting is made by uther jal, small mesh ber jal and cast net. Harvesting one katha takes 5-8 hours and employs 10-14 persons.

In the Bheramona fishery, chai, current jal and konaber jal are widely used at present. It is estimated that there are more than 100 konaber jal and about 500-600 current jal in daily operation. If these operations continue without any administrative control, a sharp decrease in production can be expected in the coming years.

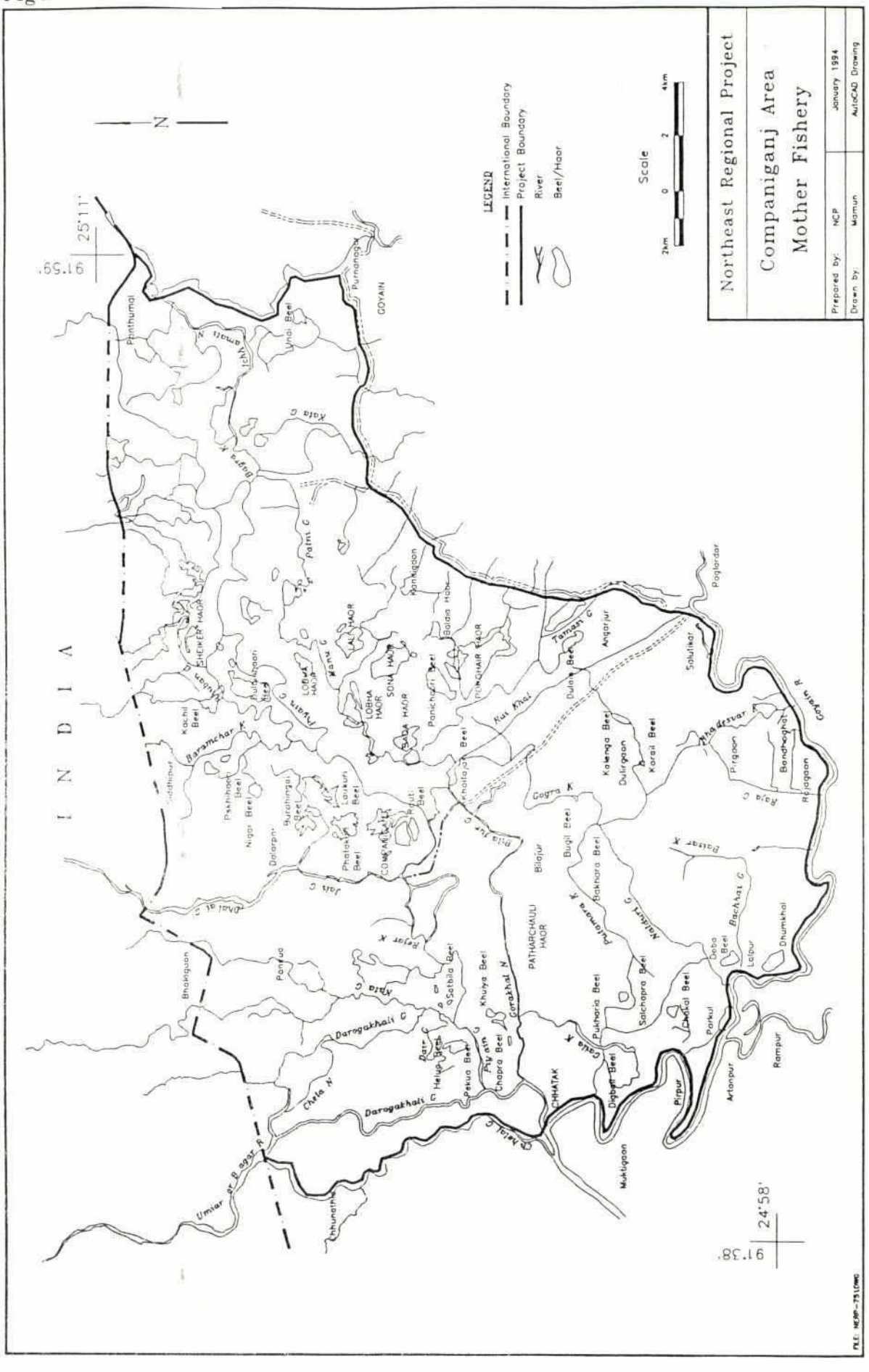
Production trends

Over the last 5 years the total catch has gradually declined by 70%. Local people identified the following problems:

- Overfishing. Due to population increase and scarcity of alternative employment opportunities after the paddy harvest in April.
- Rapid deforestation for fuel for homestead use. No massive tree plantation programs have been initiated by any agency. Recently some of the medium and large farmers have begun small-scale plantations of hizal, koroch, borun and mera trees around their houses.
- Annual beel fishing as a result of insecurity of leases as well as widespread poaching and intergroup conflict for dominancy among the rich people.
- Shortage of water resulting from siltation, use of water for irrigation, and draining of wetlands to create more land for rice cultivation.
- No supervision over the pile fisheries. There are some sanctuary piles in the area, but no one is maintaining these piles. As a result the abundance of 'mother fish' (broodstock) is decreasing rapidly.

The Bheramona fishery is suffering especially serious negative impacts from sedimentation. Once it was renowned for its larger size fish production capacity. Prior to 1972 it was one of the deepest fisheries in the area, and six important Khaws (extensive katha installations) were present (Pathamara, Pulakata, Norsingmorol khaw, Bheramonar duar, Durgar khaw and Paitlachurar khaw). At that time, the average depth of each khaw was about 13-17 m in March/April. The major fish species were Pangas (80%), Nandina, Bacha, Koral (Berkul), Catla, Rui, Chitol, Kalibaus, Ghonia, Pabda, Boal, Air, Golda chingri, Batashi and Chapila. At present Pangas, Nandina, Bacha and Koral are more or less extinct. After 1972, massive sedimentation began in the area. The major water bodies were silted up and became dead. Now, each year large quantities of sediment are deposited downstream of the Ajmiriganj river port. As a result, silt-bearing turbid water enters through the Bheramona passage into the low lying lands of the Sulla, Itna and Khaliajuri areas and remains stagnant for several months. People of the area claim that oversiltation in the area is the result of embankment construction in the upper part of Kushiyara River, sedimentation in the Upper Meghna River near Bhairab bazar and excessive use of katha and bamboo sticks in the rivers for fishing. At present, fishing activities are performed only in

Figure K-4


Northeast Regional Project
Companiganj Area
Mother Fishery
Prepared by: NCP
January 1994
Drawn by: Mamun
AutoCAD Drawing
LEGEND
International Boundary
Project Boundary
River
Beel/Haor
Scale
2km 0 2 4km
N
INDIA
25°11'
91°59'
24°58'
91°38'
Phinthumai
Amati N.
Lyndi Beel
Purnanagar
GOYAIN
Kata C.
Bogra K.
Patni C.
Kochil Beel
Baramchar K.
Siddhibari
Pashchoti Beel
Nagri Beel
Dolargari
Burathingai Beel
Lohasuri Beel
Phatakchar Beel
Jala C.
Dhalai C.
Bhalugaon
Pantua
Atia C.
Darogakhali C.
Chela N.
Umiar or Bogar R.
Chhunatha
Rotar K.
Qsatbila Beel
Khuya Beel
Pekua Beel
Helua Beel
Ayain Chapra Beel
Gonakhal N.
PATHARCHAULI HAOR
Bilajur
Bugil Beel
Bakhara Beel
Pukharia Beel
Salchapra Beel
Dighal Beel
CHHATAK
Mukligaon
Gosla K.
Dhalal Beel
Parkul
Pirpur
Lalpur
Deba Beel
Rachhat C.
Dhumkhal
Artanpur
Rampur
Natkhat C.
Patiar K.
Kulamara K.
Gogra K.
Kalanga Beel
Dulirgaon
Karail Beel
Pirgaon
Bandhaghat
Rajagaon
Rajia C.
Ghoramara R.
Phuldevar
Solulikar
Angarjur
Tamasi C.
Dulia Beel
Kut Khal
Panchkali Beel
Balda Haor
Ranmigaon
Poglardar
KONGHAIR HAOR
SONA HAOR
LOBHA HAOR
LAL HAOR
Wanu C.
Jhyam C.
Lohasuri Haor
SHEIKER HAOR
Bhutkhali Beel
Phatakchar Beel
Bhutkhali Beel
Khaitajan
Rui Khal
Pia Jan C.
Gogra K.
Patiar K.
Natkhat C.
Kulamara K.
Gosla K.
Rajia C.
Ghoramara R.
Gogra R.
Phuldevar
Bandhaghat
Rajagaon
Pirgaon
Karail Beel
Dulirgaon
Kalanga Beel
Solulikar
Angarjur
Tamasi C.
Poglardar
Ranmigaon
Balda Haor
Panchkali Beel
Rui Khal
Dulia Beel
Khaitajan
Bhutkhali Beel
Phatakchar Beel
Lohasuri Beel
Burathingai Beel
Nagri Beel
Pashchoti Beel
Siddhibari
Kochil Beel
Baramchar K.
Jhyam C.
Wanu C.
Patni C.
Bogra K.
Kata C.
Amati N.
Lyndi Beel
Phinthumai
Purnanagar
GOYAIN

K.4 COMPANIGANJ AREA

Environment

The Companiganj mother fishery is situated north of Chatak. It possesses extensive reed beds. There are a number of important jalmohals within the Companiganj thana, out of which the following are important:

Table K14: Important Fishery in Companiganj Area

Haor	Jalmohal/Beel	Fishery Type	Important Species
Khoilajuri	Khoilajuri	Pile	Carp and Cat fish
Khoilajuri	Panichapra	Pile	Mainly Carp
Telikhal	Laudi beel	Pile	Mainly Carp
Relikhal	Bawa beel	Pile	Mainly Carp

Fishery resources

Laudi and Bawa beels are two renowned fisheries in Companiganj thana. They are connected by the Khoiltajuri, Bishnakandi and Katanadi systems. The entire area is divided into several zones. There is continuous flow of water into the area from hilly rivers and streams. People in the area suspect that there may exist breeding grounds of major carps in the Laudi and Bawa beel areas. In May and June a large number of carp fry (6-9 cm) of Catla, Rui, Mrigel, Ghonia and Kalibaus are seen in the area. Major carps are the most abundant species in catches from these beels. Hilly topography, continuous water flow, sandy and stony river beds, gentle river shore gradients and nearby overwintering grounds (existence of pile fishery) create conditions conducive to carp spawning.

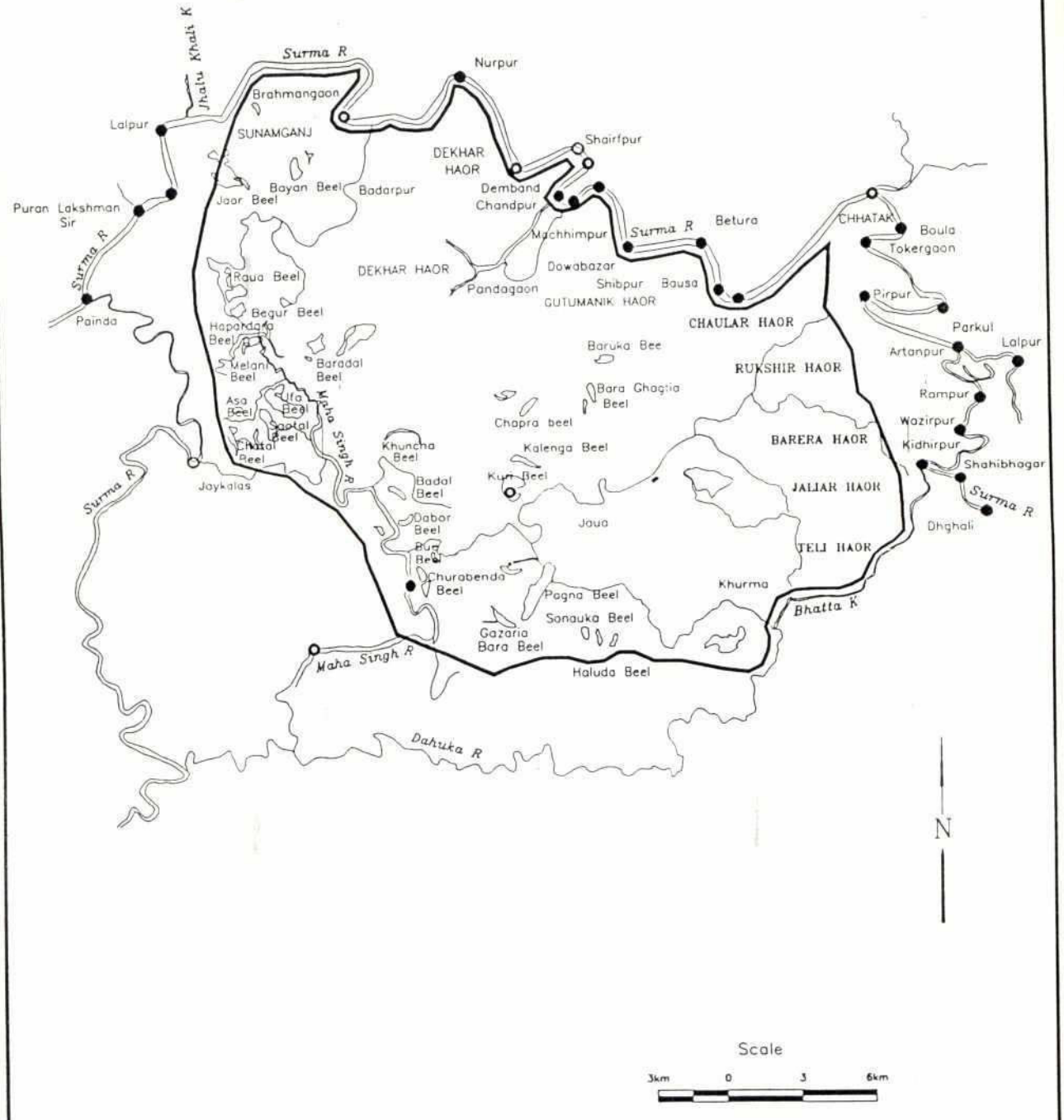
Production trends

Fishing pressure is moderate in the area, and no significant decline in production is reported.

Special aspects/problems

The rivers discharging into the Companiganj area originate in the Indian hills and there are a number of stone collecting spots in this area. Bholaganj is the most important one. Stone collection and marketing is the principal business in the area. GOB leases out the stone collection sites. Lessee in turn issue about 14,000-16,000 license to individual persons (usually boat owners) at Tk 18 per boat per day. Each boat employs 2-3 persons. The selling price of each stone-filled boat is Tk 250-275 at the Chatak market. Fishing pressure is reduced in adjacent water bodies as most labour is engaged in the highly profitable stone business. A highway is being constructed between Companiganj and Sylhet to allow transport of stone to Dhaka by road. This may result in large scale unemployment among boatmen and might increase the fishing pressure on the jalmohals in future.

Figure K-5



Northeast Regional Project	
Deker Haor	
Prepared by: BNP	December 1994
Computer Drafting by: Mamun	AutoCAD Drawing

FILE: NERP-904.DWG

K.5 DEKKER HAOR

Environment

Dekker haor is located near Sunamganj town and extends as far as Chatak thana. It is a renowned haor in the area for paddy and fish production. In the past, Dekker haor was directly connected with the silt-bearing Surma River via Pander Khal. Several years ago a cross dam was constructed at the tail of the Pandar Khal to protect Dekker haor from siltation and early flood. As a result the entire area is benefited, including the Derai thana. But it has created a new problem in the Dowarabazar area, as this area is now affected by river erosion and siltation. The Mohasingh River is the main water outlet of the haor.

There are number of beels and other water bodies within the haor area. The more important jalmohals are as follows:

Table K15: Important Fishery in Dekker Haor Area

Jalmohal	Condition	Important Fish
Bordoi-Kastaganga group	At present siltation is decreasing	Rui, Boal, Pabda, Ghonia, Air, Gulsha, Bheda, Rani
Ghoradubagroup (8-10jalmhls)	Less siltation, pile fishery	Carp, catfish
Bawani digdair	Heavy siltation	Shingi, Magur, Koi
Utharia nadi	Silted up	Smaller species
Haashmela chunni	Silted up	Smaller species
Guingerjaor group	Siltled up	Smaller species
Rouha beel	Siltled up	Smaller species
Magura hatkapani	Silted up	Smaller species

Water colour at Dabar point on the Mohasingh River is clear to slightly reddish. Water colour in the haor area is clear (visibility down to 1.8 m).

Most parts of Dekker haor are covered by submerged, floating and emergent aquatic vegetation, except the deepest beels and the canals. A list of plants is given in the following table:

Table K16: Plant in Dekker Haor with Type

Plant Type	Name	Remarks
Floating	Khudipana (Duck weed)	Occur near shore
	Kachuripana (Waterhyacinth)	"
	Kutipana (Water velvet	"
	Topapana (Water lettuce)	"
Submerged	Kataphala (Bushy weed)	Floodplain
	Karoil (Curly leaf)	"
	Katachar	"
	Futki bon	Indication of fish
	Jhagi (Hornwort)	Floodplain
	Water Milfoil	"
	Gaor (Musk grass)	Indication of fish
Emergent	Jhener (Americal Lotus)	Floodplain
	Parua (Smart weed)	"
	Arail	"

Fishermen of the area believe that the presence of FUTKI BON and GAOR results in high fish abundance (particularly major carp) in the beels. Large quantities of gaor (algae) are present in the haor and about 25-30% of the Bordoi-Kastaganga jalmohal and Ghoraduba jalmohal area are covered by gaor and futki bon. It was stated that these two jalmohals produce large quantities of carp and catfish every year.

Fishery resources

Dekker Haor probably has breeding grounds of catfish, ghonia and kalibaus as large number of small fry are seen in early May every year. Fishermen and the lessee have stated that Pandar bandh has no negative impacts on the jalmohals and major carp breeding. But it is suspected that some of the perennial water bodies within the haor that are grazing and overwintering grounds of the carps are affected by the bundh which prevents fish from migrating to their breeding grounds during the spawning season (late March to late May).

Fishing practices

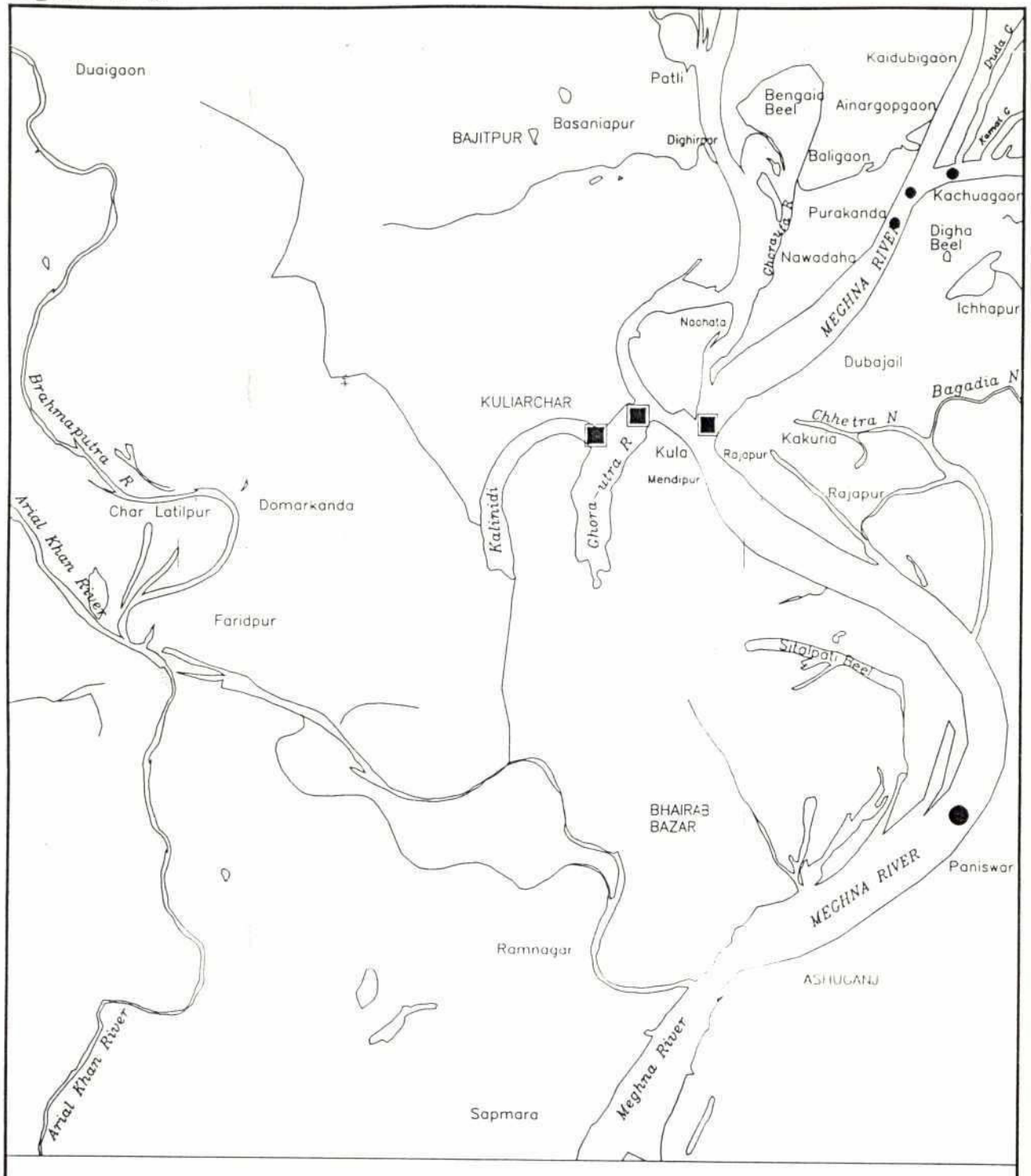
Most of the jalmohals are fished using katha installed during the late monsoon. Harvesting is annual or every third year.

Special aspects/problems

There exists an exceptional case of the Bordoi-Kastaganga jalmohal management, where the lessee (Mr. Easin Mirdha of Pagla bazar) has constructed a submersible dike around the Rangamati fishery to retain more water during the dry season so as to ensure a larger supply of irrigation water. The perfomance of this dike should be monitored in order to evaluate the utility of beel embanking as a fisheries enhancement method.

In 1991 a massive carp fry stocking programme was undertaken by the second ADB project using a nursery at Ahsanmara.

Figure K–6


Duaigaon
Patli
Kaidubigaon
Duda C
Bengaid Beel
Ainargopgaon
Kamari C
BAJITPUR
Basaniapur
Dighirpar
Baligaon
Kachuagaon
Purakanda
Chorakia R
MEGHNA RIVER
Digha Beel
Nawadaha
Ichhapur
Nachata
Dubajail
Brahmaputra R
KULIARCHAR
Bagadia N
Chhetra N
Kakuria
Kula
Rajapur
Mendipur
Rajapur
Char Latilpur
Domarkanda
Kalinidi
Chora-utra R
Arial Khan River
Faridpur
Silalpati Beel
BHAIRAB BAZAR
MEGHNA RIVER
Paniswar
Ramnagar
ASHUGANJ
Arial Khan River
Meghna River
Sapmara
2km
0
2
4km
Scale
Proposed Duar Sanctuary
Otrer Duars
Large Catfish
N
Northeast Regional Project
Kalinadi Nadi
Prepared by: BNP
December 1994
Drawn By: Mamun
AutoCAD Drawing
FILE: NERP–918.DWG

K.6 KALINADI AREA

Environment

The Kalinadi jalmohal is an ox-bow lake water body. Course sands are present at the bottom of the jalmohal. During the winter there is no flow and bypass canals are inactive. During the full flood season there is an inflow of water from the Meghna River.

Fishery resources

Fish production peaks from December to February. During this period the main species caught are AIR, BOAL, PABDA, GULSHA TENGRA, KALIBAUS, CHAPILA and other small species. Fish production is lowest in April-May when mainly PABDA, KACHKI and prawns are caught. During the rainy season, the main species are BALIA and BAIM.

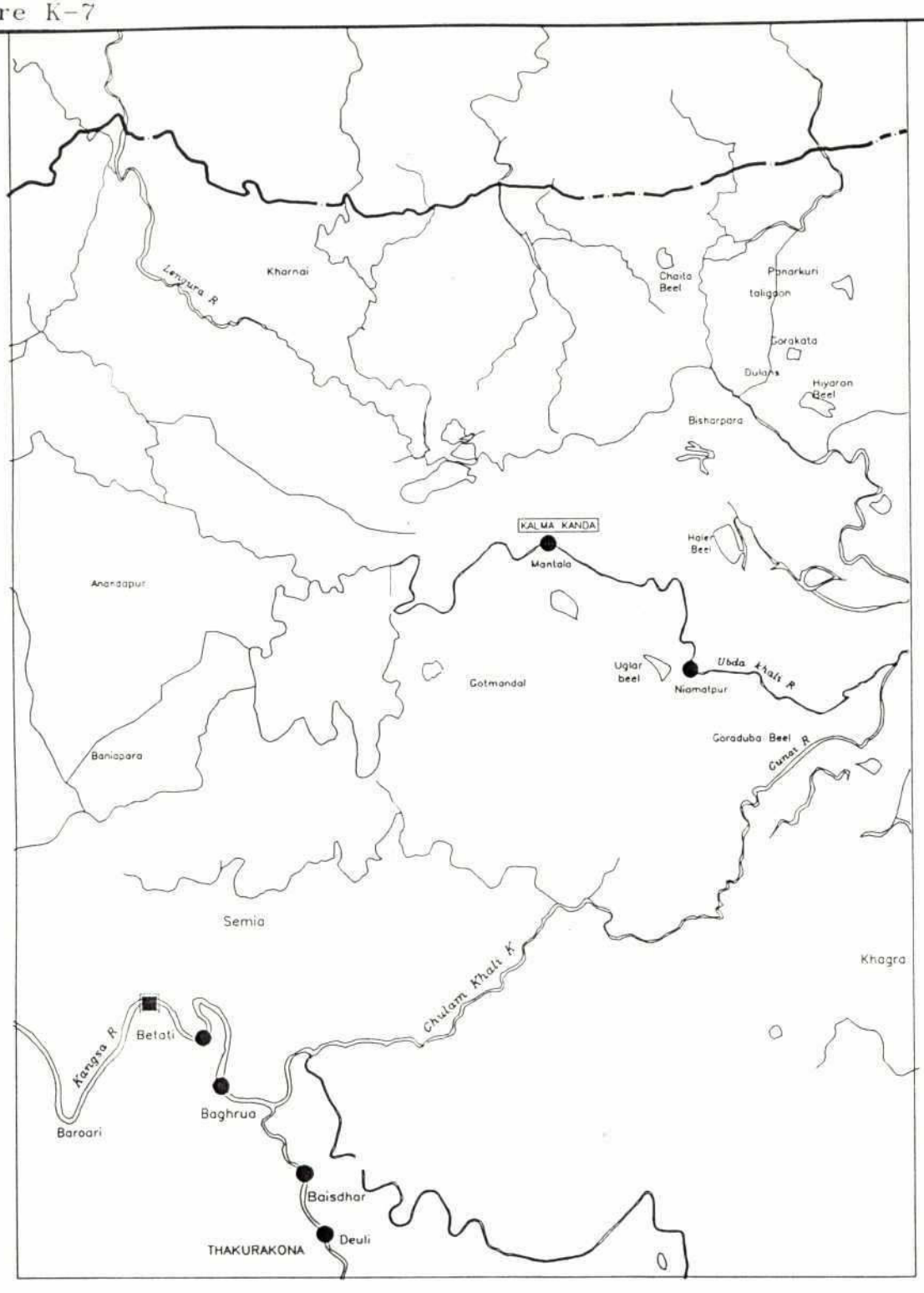
Fishermen observe large quantities of eggs and milt in the abdomens of carps caught in April-May. Carp broodstock probably enter the jalmohal from the Upper Meghna looking for suitable breeding sites.

Special aspects/problems

Nearby Kuliarchar is one of the most important fish landing centres for the floodplain area. It is claimed that about 60-70% of the production of Itna, Mitamoyin, Nikli, Astagram and Kaliajuri area fisheries passes through Kuliarchar.

With some renovation work this fishery may serve as a good spawning ground for carp.

Figure K-7



■ Proposed Duar Sanctuary

Other Duars

● Large Catfish

○ Major Carp

N

Scale

2km 0 2 4km

FILE: NERP-907.DWG

Northeast Regional Project	
Kalmakanda Area	
Prepared by: BNP	December 1994
Computer Drafting by: Mamun	AutoCAD Drawing

K.7 KALMAKANDA AREA

Environment

There are 29 important jalmohals and 7 Hizol gardens in the Kalmakanda thana.

Fishery resources

Occurence of fish by habitat type in the Kalmakanda area is as follows:

Table K17: Abundance of Fish by Habitat

Beel and Openwater	River
Gazar, Taki, Shaol, Bheda, Puti, Tengra, Bojori, Rui, Catla, Koi, Shingi, Magur, Kholisha, Foli, Chanda, Icha (small blackish), Pabda (small blackish), Boicha, Mola, Kaikka, Guzi, Chikra baim, Tara baim, Ghonia, Sarputi, Laso	Batashi, Kachki, Gulsha, Rani, Air, Boal, Chitol, Kalibaus, Big Prawns, Chapila, Gang magur, Rita, Mohashol, Nandin, Kajuli, Pabda (whitish), Bashpata, Bacha, Gaura, Poa, Ilish.

The following information about fish breeding was collected from interviews with fishermen:

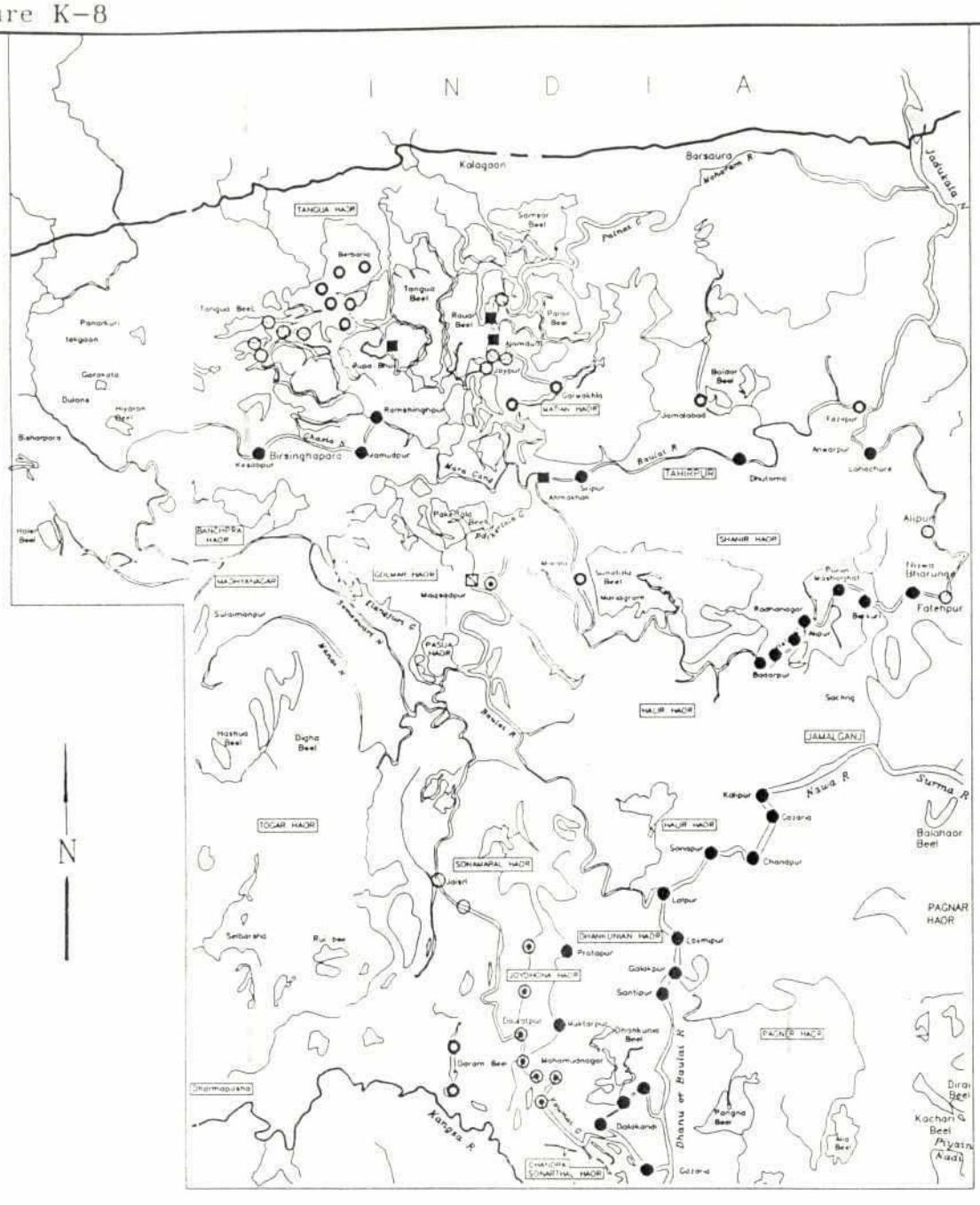
Table K18: Fish Breeding Area by Species

Species	Breeding Place
Air	Prefers to breed in the shallower parts of the river (2.5-3.0 m depth)
Chitol	Prefers to breed in katha
Chapila	Prefers to breed in the river, fry also occur in the river
Kalibaus	Prefers to breed in katha and beels
Batashi	Occurs in the deeper part of the river and prefers to breed on submerged weeds, also prefer clay bottom
Bheda	Prefers beels with dense aquatic weed
Baim	Prefers to breed in the river banks after making holes in the clay bottom
Gulsha	Prefers to breed in clear water of rivers and adjacent beels

Production trends

In the past, the area was famous for Mohashol, Koi, Boal, Air, Rui, Nandina and other species. Due to several reasons, fish production has declined about 70-80% over the last five years. The reasons for this decline according to one NITIMALA fishermen group are excessive siltation, rapid deforestation, annual harvesting of the fishery by complete dewatering and overfishing and use of current jal and chat ber jal.

Figure K-8



Major Species

- Large Catfish
- Major Carp
- Chital
- Pangas
- Proposed Duar Sanctuary

Northeast Regional Project		
Dharmapasha Area		
Prepared by:	BNP	December 1994
Drawn By:	Mamun	AutoCAD Drawing

FILE: NERP-908.DWG

K.8 DHARMAPASHA AREA

Environment

Dharmapasha is located near Mohanganj in Sunamganj district. There are a number of fish producing areas in the Dharmapasha thana. In Dharmapasha, Madhyanagar area is the most important. The renowned fish producing areas are as follows:

Table K19: Renowned Fish Producing Area in Dharmapasha

Area	Fishery	Present Condition	Main Fish Species
Togar Haor	Atla Beel		
	Sunai River (part)	Perennial	Catfish
	Kalni River (part, Kalijura group)		
	Shaiduli Beel		
	Kanglakuri Beel		
	Chatla Beel	Seasonal	Miscellaneous species
	Kalijala Beel		
Kaliani Haor	Monai River group fishery		
	Kaliani Beel	Seasonal	Miscellaneous species
	Rui Beel	Seasonal	Catfish and miscellaneous species
	Sreefully group fishery		
	Shaldigha		
Ghora-duba Haor	Boro Ghoraduba	Perennial	Carp, catfish
	Choto Ghoraduba		
Boala Haor	Bady Modhyanagar dighuli		
	Sunadubi		
	Rupeshwar		

Area	Fishery	Present Condition	Main Fish Species
Gurmar Haor	Alonjuri River		
	Pashua Beel	Perennial	Carp, catfish
	Gurma Beel		
	Darakpur River		
	Medha Beel		
	Phana Beel		
Dulij-hara Haor	Noya Beel	Seasonal	Miscellaneous species
	Bain Chapra Beel	Perennial	Catfish
	Mukshedpur Dighor	Perennial	Catfish
	Chatak Shanbari	Perennial	Catfish
Milanpur	Kawnai	Perennial	Catfish,Pangas, Laso, Ghonia
Kala-pani	Kawnai-Chunai	High siltation rate	Catfish,Pangas, Laso, Ghonia
	Chandra group	High siltation rate	Major carp
	Dhankunnya	High siltation rate	Major carp
	Dharam Beel	High siltation rate	Carp, catfish
	Tangua Beel	Perennial	Carp, catfish
Mora-gang	Chotogang	High siltation rate	Catfish

Fishery resources

Fish species present in the open water are: catla, rui, mrigel (very rare), kalibaus, ghonia, chital, foli, boal, air, guzi, rita, pangas (very rare), shilon, shoal, gazar, taki, baim, cirka, shingi, magur, sarputi, pabda, laso, bacha, tengra, gulsha, bajori, garua, chapila, koi, batashi, puti, chella, mola, keski, bheda, kaikka, rani, icha, golda chingri, common carp and silver carp.

It is suspected that a number of carp spawning grounds exist in the area, particularly in the border rivers (perhaps within the Tangua haor area). These are:

- Daulatpur area of the Boroiya River
- Milanpur area of the Kawnai River
- Shanbarir bazarar ghat of the Baulai River
- Mukshedpurar of the Baulai River
- Alamduarar in the Tangua haor

Production trends

About 90% of the fish production from the Dharmapasha area is exported to Dhaka and Chittagonj via Mohanganj, Kulirchar and Bairab bazar. As a result most of the commercially important fish are not available in the local markets. The seasonal abundance of fish in Dharmapasha fish market is as follows:

Table K20

Abundance	Months	Remarks
High	Dec - Feb	All species and large size fish are available; Harvested from the beels and the rivers
Low	Mar - Apr	Particularly smaller species like keski are available; Harvested from the rivers and canals
Medium	May - Nov	Most species are available, of which Chapila, Tengra and other smaller catfish are dominant (smaller in size); Harvested mainly from the floodplain

There are two ice factories in the Dharmapasha market which produce 600-1000 kg/day of block ice. There are 10 arats in the wholesale market where daily 100-1200 kg of fish are processed for export to Dhaka. Average market price at the arat on 2 Sept 92 were as follows:

Table K21: Species Abundance in Different Fishery

Order of Abundance	Species	Price (Tk/kg)
1	Tengra	18
2	Icha	7
3	Pabda	55
4	Kalibaus	50
5	Baim	38
	Boal	50
	Shoal	40
	Chapila	12

Fishermen and other local people maintain that the overall production of the area has decreased by 30-35% over the last five years due to the following causes:

- Siltation of perennial water bodies

- Excessive fishing pressure on the jalmohals
- Short term leasing and annual fishing by complete dewatering of the jalmohals
- Deforestation within the haor area
- Use of current jal and kona ber jal on the floodplain
- Fish disease
- Lack of reserve/pile fishery in the area

Special aspects/problems

Species which have become extinct in the area are NANDINA, MOHASHOL and KORAL (BERKUL). An investigation into the occurence of carp spawn should be made in the suspected spawning areas during April- May using Savar jal.

The following suggestions were proposed by the fishermen and the Thana Fishery Officer to solve the problems of the fisheries:

- Dredging of the important duar/koor/dor and straightening of the river bends where heavy siltation is occurring.
- Complete restriction on current jal production, importation and marketing, and delegation of real power to the DOF authority to control the importation of nets by the businessmen.
- More comprehensive support to DOF staff to implement the fishing regulations (i.e. administrative and financial support).
- Creation of employment during the flooding season for the poor to reduce the fishing pressure on the floodplain.
- Creation of new forests on the Government khas lands, river sides and the BWDB embankments.
- Maintenance of piles and declaration of the following areas as fish sanctuaries

Table K22: Species Abundance in Different Fishery

Jalmohal	Depth (March)	Main Species Present
Pasua beel	10-12 m	Rui, Catla, Kalbaus, Air Chital, Boal, Guzi, Pabda, Golda, Chingri
Ghoraduba	9-10 m	Rui, Catla, Kalbaus, Air Chital, Boal, Guzi, Pabda, Golda, Chingri
Bain chapra	9-10 m	Rui, Catla, Kalbaus, Air Chital, Boal, Guzi, Pabda, Golda, Chingri
Sunai nadi	10-11 m	Chital, Boal, Pabda, Air, Bacha, Shilon, kalibaus, Batashi (Aluni), Golda Chingri, Chapila
Jukshedpur	9-10 m	Chital, Boal, Pabda, Air, Bacha, Shilon, kalibaus, Batashi (Aluni), Golda Chingri, Chapila
Dighor		Chital, Boal, Pabda, Air, Bacha, Shilon, kalibaus, Batashi (Aluni), Golda Chingri, Chapila
Kawnai nadi	9-10 m	Pangas, Chital, Boal, Air, Kalibaus, Bacha, Shilon, laso, Chapila

K.9 ASTAGRAM AREA

Environment

Astagram is one of the more important fish producing areas in Kishorganj district. It is located on the floodplain of the Upper Meghna and Ghorautra Rivers. There are a number of significant fisheries within the area, out of which the following are the most important: Echordia Meghna (90 ha), Beel maska, Karatia Golgolia, Char daughor 1, Char daughor 2, Charia Sharifpur, Kalna Shaymarchor, Beel bolli, Beel Manda, and Berry beel.

Fishing practices

There are two khaw (Muichura and Morapora) and 8-10 Jaak in the fishery. A *khaw* is a large field of katha encircled by a row of bamboo stakes. Each individual katha within the *khaw* is called a *jaak*. Some jaaks are situated outside the khaw, in the shallower parts of the river. Branches of Hizol, Mango, Jam and Shawra are used for the jaaks. During the period of harvesting, jaaks are harvested first. The main species caught are Boal, Air, Pabda, Batashi, Carp and Golda chingri.

Information on fishing costs was obtained for the Echordia Meghna fishery:

- Lease cost (1992): Tk 163,000 *
- Operational costs:

Katha	Tk 70,000
Guards	Tk 45,000 (9 persons for 5 months);
Food	Tk 25,000 (9 persons for 5 months);
Others	Tk 4,000 (torch, batteries, etc).
Subtotal:	Tk 144,000
Total costs	Tk 307,000

* actual pre-harvesting costs may include a further 30% baksheesh

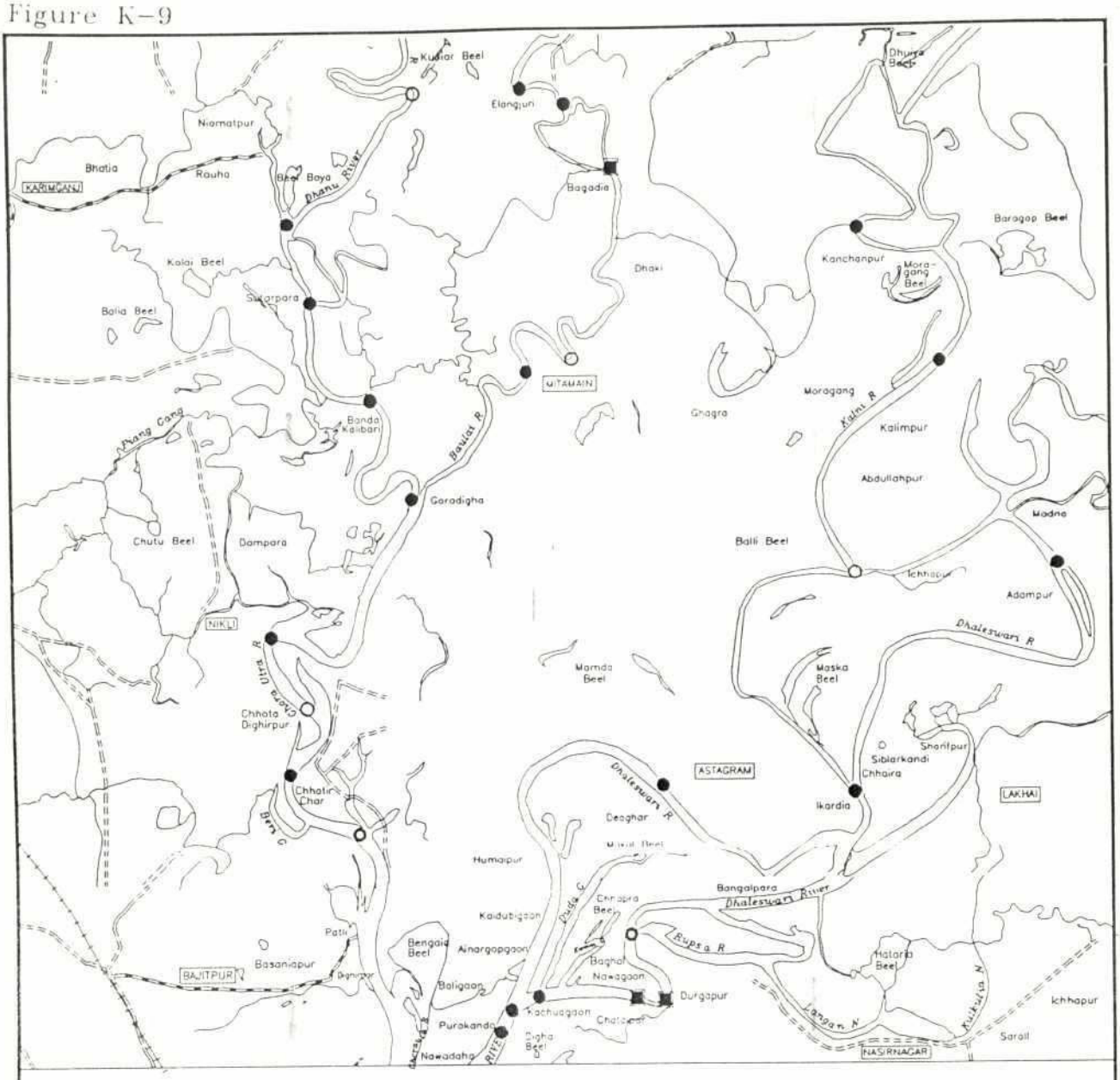
Shares for harvesting individual jaaks are 40% to fishermen and 60% to lesees of sales revenue. Shares for total khaw harvesting are 25% to fishermen and 75% to lessee.

Vim jal is a new type of net introduced in the area two years ago. The net is used mainly for catching prawns in the river during the period of high current velocity (May-June and September-October). It is a fixed gear facing against the current at the bottom of the river and resembles a Savar jal.

Production trends

Vim jal is able to catch almost all types of fish including brood and fry. Local people consider it to be a major cause of declining fish population in the area.

Figure K-9



■ Proposed Duar Sanctuary

Other Duars

● Large Catfish

○ Major Carp

○ Chital

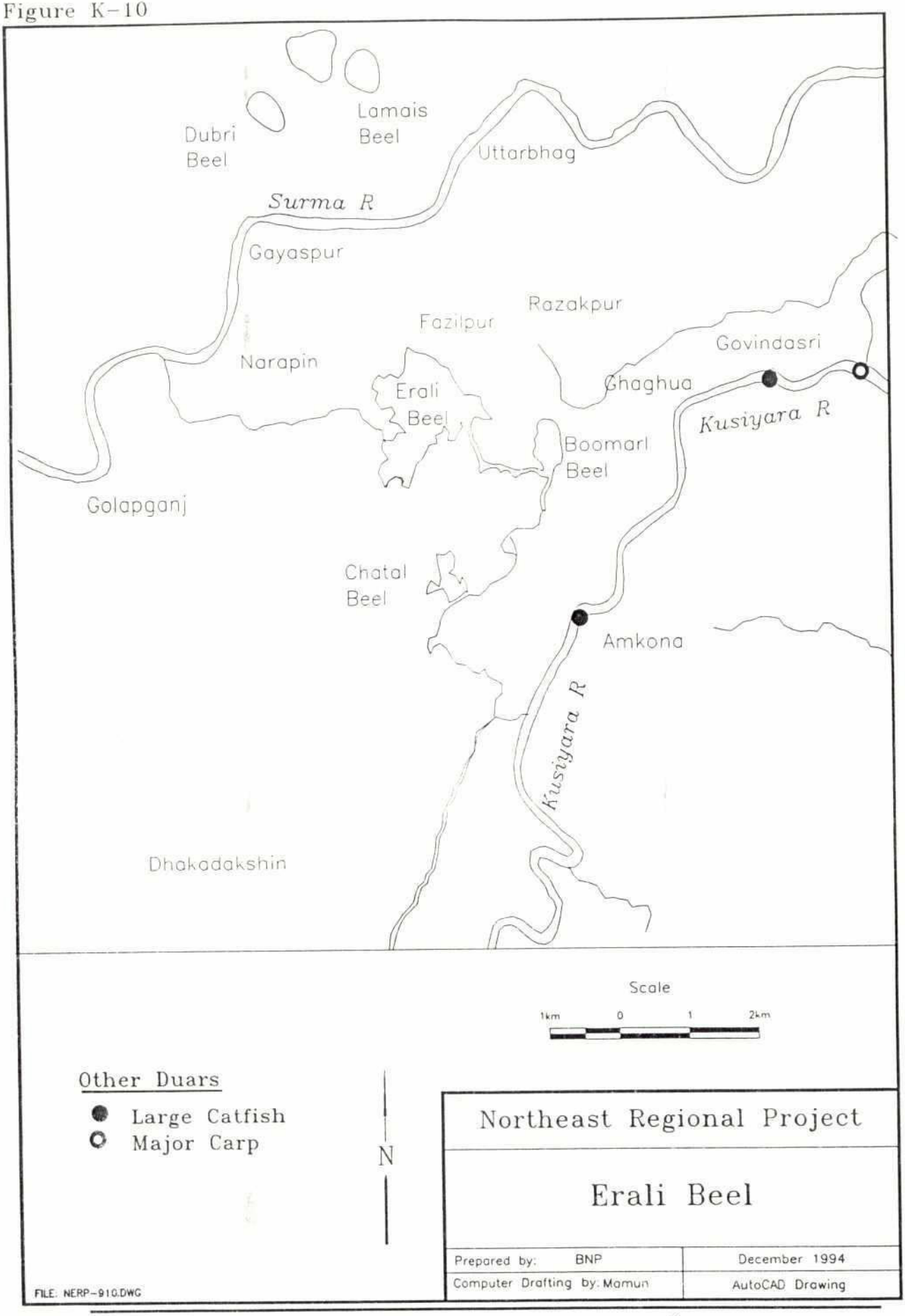
Northeast Regional Project		
Austagram Area		
Prepared by:	BNP	December 1994
Drawn By:	Mamun	AutoCAD Drawing

FILE: NERP-909.DWG

Special aspects/problems

The main problem in the Astagram area is siltation of the Upper Meghna River. People of Astagram and Bangaalpara claim that rapid siltation is the result of excess use of katha and jaak. In the river stretch from Bhairab bazar to Ajmiriganj about 0.5 million bamboo sticks are placed in the river. These are thought to reduce the current velocity and induce siltation.

Figure K-10


Dubri Beel
Lamais Beel
Uttarbhag
Surma R
Gayaspur
Razakpur
Fazilpur
Govindasri
Narapin
Ghaghua
Erali Beel
Kusiyara R
Boomarl Beel
Golapganj
Chatal Beel
Amkona
Kusiyara R
Dhakadakshin
Scale
1km 0 1 2km
Other Duars
Large Catfish
Major Carp
N
Northeast Regional Project
Erali Beel
Prepared by: BNP
December 1994
Computer Drafting by: Mamun
AutoCAD Drawing
FILE: NERP-910.DWG

K.10 ERALI BEEL

Environment

This is one of the most resourceful areas for fish in Golapganj thana. The net area is about 200 ha. The Kushiyara River is the only inflow-out flow channel of water. Previously there was another outlet to the Surma River which was closed by a cross dam constructed by the local people. Erali beel has an elongate river-like shape.

Fishery resources

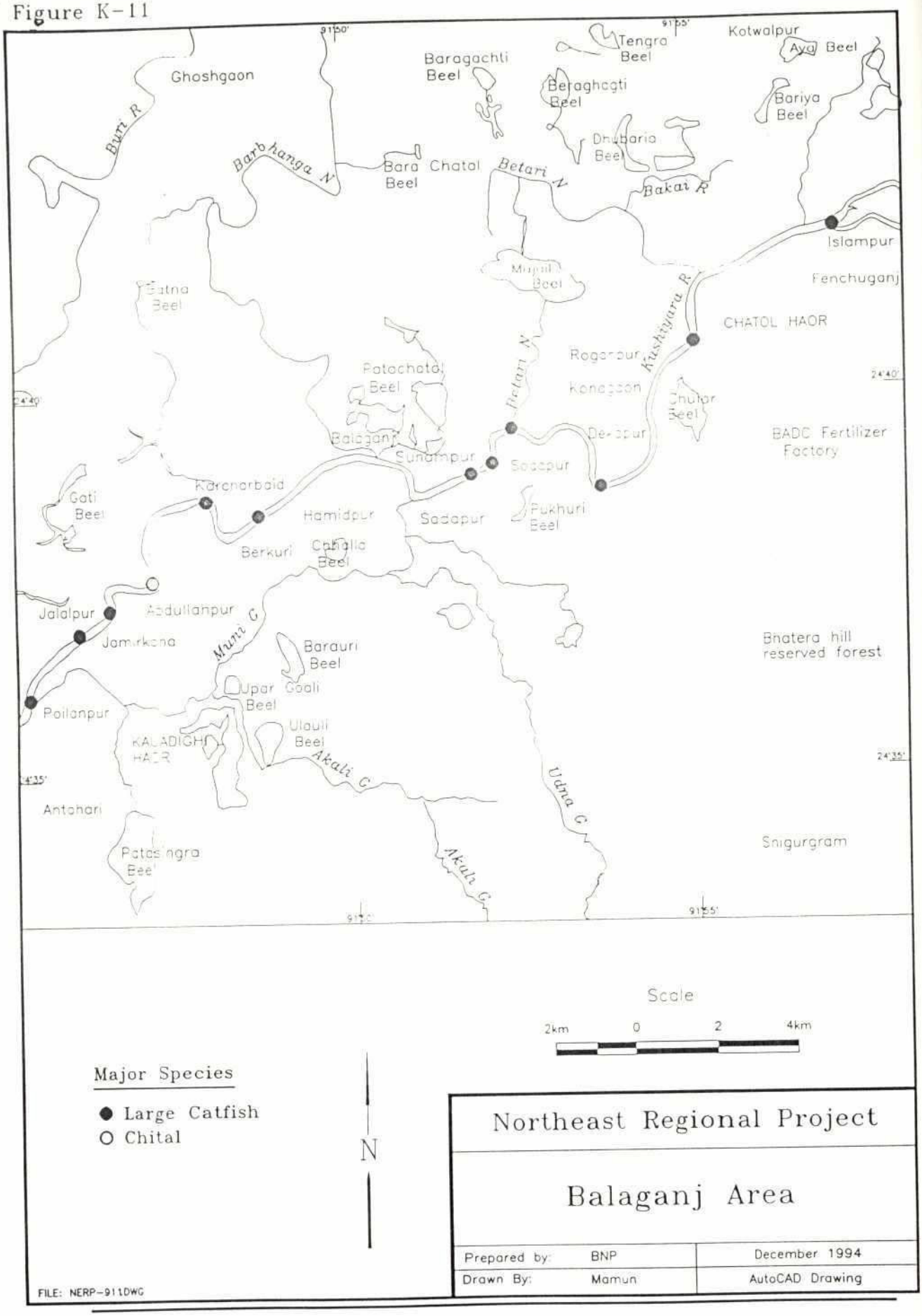
The main fish species occuring in the beel are Ghagot, Rui, Catla, Kalibaus, Baim, Chapila, Ghonia, Laso, Puti, Chanda, Ilish, Rani, Pangas (very few), Bheda, Boal and rare Nandina (last year 4 individuals were caught).

People in the area suspect that a carp breeding ground may exist in the beel. Large numbers of carp fry were seen during May this year. Course sand and rocks are present at the bottom of some areas. Special topographical features (elongate sinuous shape, gradual slope, presence of shallow and deeper areas and creation of temporary current during the period of heavy rain fall and river flooding) suggest that Erali beel may be a good carp breeding site.

Production trends

Three to five years ago, the floodplain areas of Erali beel were renowned for producing larger size Singi, Magur and koi. However, at present these species are more or less extinct due to the introduction of current jal. Current jal is the main factor for the decline in fish production in the area. It is reported that the overall production has declined by 75% over the last 5 years.

Figure K-11


Ghoshgaon
Buri R
Barbhanga N
Baragachli Beel
Tengra Beel
Kotwalpur
Ayg Beel
Bariya Beel
Bara Chatal
Betari N
Dhubaria Beel
Bakai R
Islampur
Fenchuganj
Mirpur Beel
Patna Beel
CHATOL HAOR
Rogarpur
Kushtiyara R.
Patachatal Beel
Betari N
Konapara
Chutor Beel
Balaganj
Sundarpur
Sadapur
Deopur
BADC Fertilizer Factory
Karcharbaid
Gati Beel
Hamidpur
Sadapur
Pukhuri Beel
Berkuri
Chhalia Beel
Jalalpur
Abdullahpur
Jamirkona
Muni G
Barauri Beel
Bhatera hill reserved forest
Upar Goali Beel
Poilanpur
Ulauli Beel
KALADIGHI HAOR
Akali G
Udna G
Antahari
Patasingra Beel
Akuli G
Sniguragram
91°50'
91°55'
24°40'
24°35'
Scale
2km 0 2 4km
Major Species
Large Catfish
Chital
N
Northeast Regional Project
Balaganj Area
Prepared by: BNP
December 1994
Drawn By: Mamun
AutoCAD Drawing
FILE: NERP-911DWG

K.11 BALAGANJ AREA

Environment

Balaganj thana is located on the floodplain of the Kushiyara River. At present most of the Balaganj area jalmohals are seasonal and this is the result of the siltation. Important jalmohals are: Chatol patachatol group fishery, Maijal group, Baragati beel, Dubria, Korcha group fishery, Rouha beel, Kalasara haor, Muktarpur haor, Niraia beel, Masma jarjuri, Harin patna group fishery, Khagdor group fishery, Loom beel group, Dayalong paloiya, Bordolai group, Sadipur nadi, Kushiara 15, 15-1/2, Auria nadi, Shingjura nadi and Jhapa khal.

Fishery resources

The most common fish species in the area are Rui, Boal, Air, Chitol, Bacha, Shilong, Rita, Rani, Ilish, Bheda, Shoal, Taki, Gazar, Batashi, Golda chingri, Icha, Chanda, Pabda, Tengra, Gulsha, Catla (very rare), Mrigel (very rare), Carpio, Baim, Cirka, Ghonia, Kalibaus, Mola and Chela.

Production trends

The Thana Fishery Officer, fishermen and the lessee identified the following factors as responsible for the decline in fish production in the area:

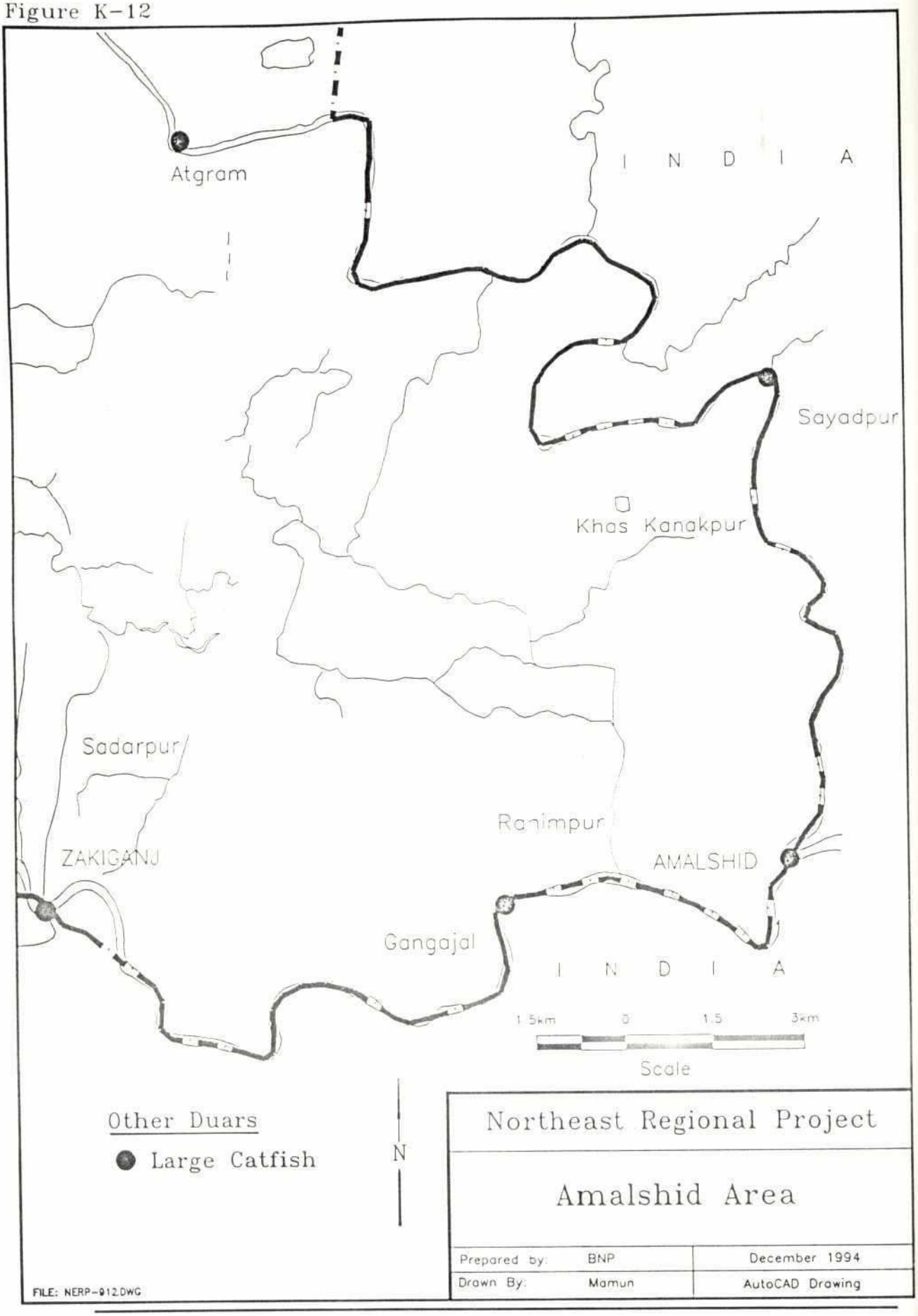
- Siltation caused by the Kushiyara River water
- Use of current jal and kapri jal in the open water
- Leasing of partially silted lands for agriculture
- Industrial effluent of Fenchuganj fertilizer plant

Special aspects/problems

Due to a high sedimentation rate, most of the jalmohals are now becoming silted up. People of the area maintain that the high rate of sedimentation started after the construction of the Manu River Irrigation FCD/I project on the opposite back.

Fresh water dolphin are quite common in the Kushiyara River particularly at the point of haor/beel inlets.

Figure K-12


Atgram
I N D I A
Sayadpur
Khas Kanakpur
Sadarpur
Ranimpur
ZAKIGANJ
AMALSHID
Gangajal
I N D I A
1.5km 0 1.5 3km
Scale
Other Duars
Large Catfish
N
Northeast Regional Project
Amalshid Area
Prepared by: BNP
December 1994
Drawn By: Mamun
AutoCAD Drawing
FILE: NERP-912.DWG

K.12 AMALSHID AREA

Environment

The Barak River originates in India, and bifurcates into the Surma and Kushiyara Rivers where it enters Bangladesh near Amalshid. At the bifurcation point, a 100 m long duar is present which is locally called GOVIR DIGHIR DUAR or TIN GANGA. The maximum depth of the duar is 18 m in the Surma portion.

Fishery resources

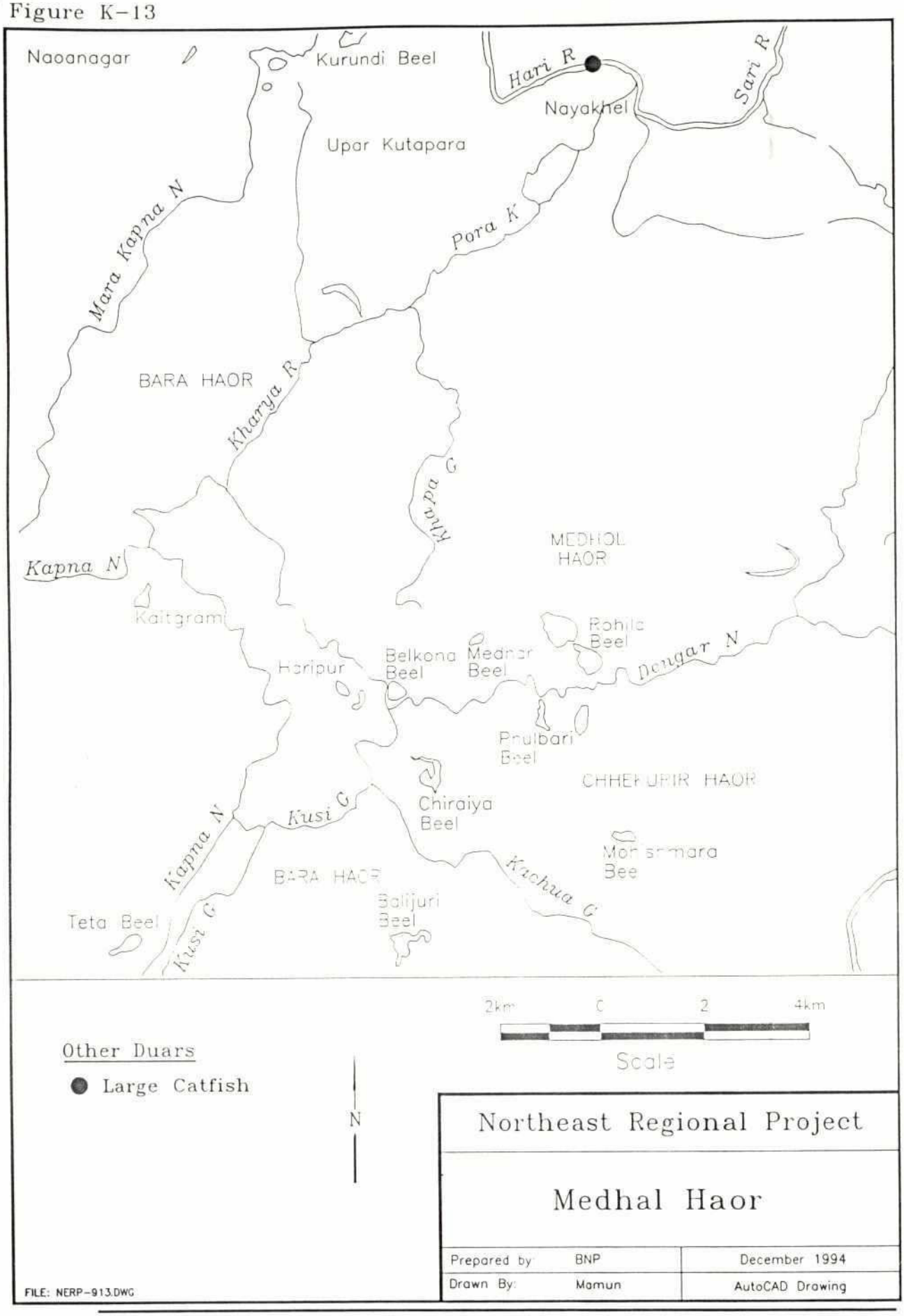
Both boromaach and chotomaach are present in the Amalshid duar. Among the boromaach Kalibaus and Boal are the most common. Other then these Rui, Mrigel, Catla, Air, Bagair, Chital and Pangas are also found. Among the chotomaach Tengra, Pabda, Baashpata, Rita, Puti, Chapila, Laso, Baim, Cirka, Rani, Jatka, Bailla, Chanda, Poa and Kaikka are abundant. Shoal, Gazar, Taki, Singi, Magur, Koi, Mola, Gutum, Bheda, Fali, and Shilon do not occur in the area.

Fishermen of the area maintain that boromaach, particularly carp, migrate up the Barak River during April and May and are caught by the Indian fishermen. It is also claimed that in the upper reach of the Barak River (near the proposed Tipaymukh dam) there is a spawning ground of carp. Bangladesh waters are used as overwintering grounds by carp.

Special aspects/problems

Fishermen of the area say that the broodstocks of carp should be managed as common property of Bangladesh and India. Bilateral discussion and programmes are required to maintain and manage those stocks.

Figure K-13


Naoanagar
Kurundi Beel
Hari R
Sari R
Nayakhel
Upar Kutapara
Mara Kapna N
Pora K
BARA HAOR
Kharya R
Khapa G
MEDHOL HAOR
Kapna N
Kaltgram
Rohila Beel
Haripur
Belkona Beel
Mednar Beel
Dangar N
Phulbari Beel
CHHEPUPIR HAOR
Chiraiya Beel
Kusi G
Kapna N
Kachua G
BARA HAOR
Salijuri Beel
Teta Beel
Kusi G
2km
0
2
4km
Scale
Other Duars
Large Catfish
N
Northeast Regional Project
Medhal Haor
Prepared by: BNP
December 1994
Drawn By: Mamun
AutoCAD Drawing
FILE: NERP-913.DWG

K.13 MEDHOL HAOR

Environment

Medhol haor is located near Jaintiapur, and is adjacent to Boro haor. The Sari-Goyain River is the main source of water of Medhol haor. The Sari River water enters into the haor through the Line River (Pabijuri River) near Chatal bazar at the eastern side. It subsequently branches into the Kushi, the Khorish and the Khapa Rivers. All these rivers again enter into the same Sari-Goyain River near Goyain ghat thana.

A number of beels exist within the boundary of Medhol Haor, of which Ruila beel is the most important. The entire beel is embanked by a 1.0-1.7 m high submersible dike. The dike was constructed by the Late K.S.Abdul Karim, Haripur in 1945 after the construction of Sylhet-Tamabeel road in 1934.

There are a number of interconnecting canals between the beels. Some canals were manually constructed by the lessee. Two types of canal exist within the system. Shallower canals were designed to facilitate overflow water during the pre-monsoon flood period. The deeper canals act as fish catching pockets and drainage channels during the harvesting period.

At the eastern side of the Medhol beel, hizal trees were planted by the local people. Trees are managed by the village people as the hizal not only save the village from wave damage during the flood period, but also generate income from sale of tree branches which are used to finance some community projects such as repair of the school and mosque.

Fishing practices

Medhol haor is under the three year pile fisheries management system. The main species caught are rui, kalibaus, ghonia, catla and mrigel, followed by boal, air, rita, chital and pabda. Experience has shown that larger size fish are only caught during the third year, and that a triennial harvesting schedule is much more profitable than annual harvesting. Typically the relative yields of large and small species from a katha over three years are as follows:

Table K23: Yield of Large and Small Fish in Different Fishing System

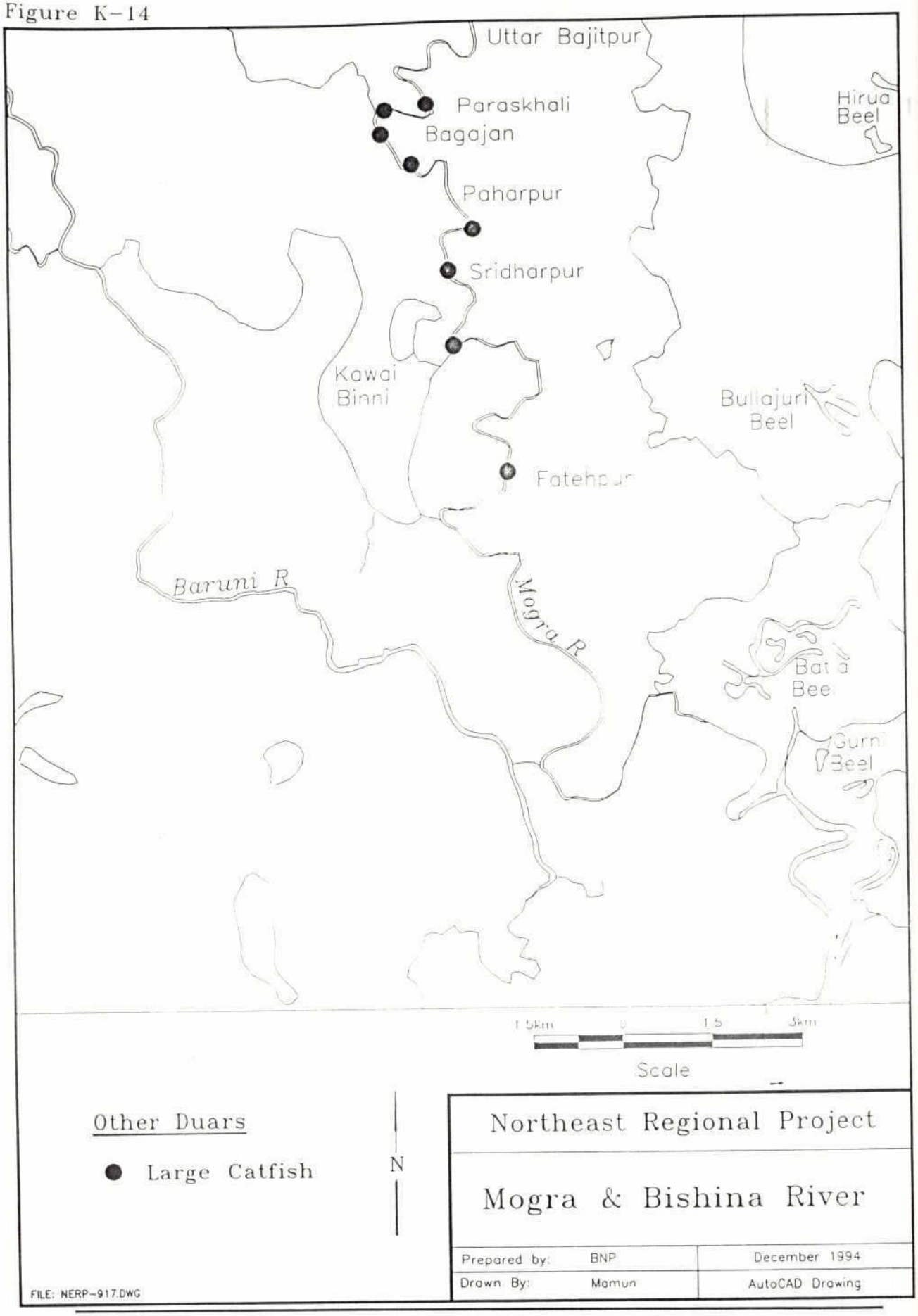
Year of Fishing	Boromaach	Chotomaach
First year fishing	10%	90%
Second year fishing	40%	60%
Third year fishing (Pile fishery)	70%	30%

It is believed that older fish always return back to their original first year grazing and overwintering grounds.

Special aspects/problems

Before construction of the dike, Ruila Beel was leased from the Kingdom of Jaintapur (Queen Laxmi Rani via Kamala Rani) for a 16 year period for an annual lease payment of Tk 1,600. The present lease value is Tk 514,000.

Figure K-14


Uttar Bajitpur
Paraskhali
Bagajan
Paharpur
Sridharpur
Fatehpur
Kawai Binni
Hirua Beel
Bullajuri Beel
Baruni R
Mogra R
Bata Bee
Gurni Beel
1.5km
0
1.5
3km
Scale
Other Duars
Large Catfish
N
Northeast Regional Project
Mogra & Bishina River
Prepared by: BNP
December 1994
Drawn By: Mamun
AutoCAD Drawing
FILE: NERP-917.DWG

K.14 MOGRA AND BISHNAI RIVERS

Environment

Atpara thana is situated at the confluence of the Bishnai tributary with the Mogra River. River duars are locally called DUBA. The duars act as refuges for larger catfish, Chital and smaller species. It is stated that most of the duars have remained stable over the last 20 years. Duars are located either near bends or about 100-200 m upstream of bends.

Besides the rivers a number of beels exist in the area. Most of the beels are seasonal or semi-seasonal. Ashkuria beel, Paglar beel, Ghagra pagla beel and Alucha beel are important fisheries. Ashkuria and Pagla beels retain water year round (1.3-2.0 m depth) and act as refuges for Shingi, Magur, Koi, Puti, Kholisha, Mola, Laso, Tengra, Bojori, Gulsha, Lati, Cheng, Shoal, Gazar, Bheda, Batashi, Air, Boal, Rui and Icha.

Fishery resources

The main species present in the area are Air, Boal, Ghagot, Kalibaus, Singi, Magur, Chapila, Chela, Mola, Koi, Pabda, Puti, Kholisha, Tengra, Gulsha, Baim, Cirka, Bojori, Lati, Shoal, Gazar, Icha. Less abundant species present in the area are Rui, Chital, Bacha, Laso, Ghonia, Garua, Sarputi, Golda chingri and Ilish.

Special aspects/problems

Kalibarir duba near Manisha village has been maintained for a long time as a fish sanctuary by the local fishermen. It is connected with the floodplain of the Sirail beel and Chapri beel. The duba is a refuge for Air, Ghagot, Boal, Chital, Rui, Catla (rare), Mrigel (rare), Garua, Pabda, Bacha, Laso, Chapila and Chela. The depth and area of the duar estimated by the fishermen during the dry season is about 10-11 m and 0.8 ha, respectively. Fishermen of the nearby village maintain this duar as a sanctuary as there is a traditional belief that they have been obliged by the Goddess Kali to conserve larger size fish in order to sustain themselves as fishermen. They have the strong belief that if they maintain this mother fishery, then fish will be an unlimited open water resource for them and they will never be unemployed in the fishery profession. To protect the duar, they sometimes fight against miscreants. The management and protection system in place at the Kalibarir duba fish sanctuary should be studied further as an indigenous example of community-based fisheries management.

No sanctuaries exist in the region for chotomaach although small species are important for the mass of the population. For various reasons chotomaach stocks have also been declining, and some species are at the point of regional extinction (Bheda, Koi, Sarputi). Chotomaach sanctuaries could be a viable mitigative measure to restore chotomaach in the area. It is suggested that in every region there should be one shallower beel designated as a chotomaach sanctuary to serve as a secure overwintering ground. Ashkuria beel of Atpara might be a good sanctuary for chotomaach. The Ashkuri beel is connected with the Bishnai River through Hatibhanga canal near Laxmipur village.

Figure K-15

Proposed Duar Sanctuary
Other Duars
Large Catfish
Chital
N
Scale
1.5km 0 1.5 3km
Northeast Regional Project
Chamrarghat & Mitamian Area
Prepared by: BNP
December 1994
Computer Drafting by: Mamun
AutoCAD Drawing
Kumar Beel
Elangjuri
Bagadia
Dhaki
Ghagra
MITAMAIN
Bandal R.
Goradigha
Banda Kalibari
Sakarpara
Chamrarghat
Boya Dhanu River Beel
Niamatpur
Rauha
Kolai Beel
Bhatia
Balia Beel
Gang Piang

K.15 CHAMRAGHAT AND MITAMOIN AREA

Environment

Chamraghat is located in Kishorganj district. The rivers, canals and floodplain of Karimganj, Mitamoin and Itna are the main fishery environments supplying Chamraghat market. Khunkunir beel, Daudori beel, Phenakona beel and the Ghagra river are important fish producing jalmohals in Mitamoin area. Most of the beels are seasonal.

Fishery resources

Khunkunir beel, Daudori beel, Phenakona beel and the Ghagra river produce mainly large catfish and miscellaneous small species.

Fishing practices

Kona ber jal, Khara jal, Thela jal, Uther jal, Current jal, Chai and Borshi are the most commonly used fishing gears in the area. Bandoira jal is less common and mainly used to catch Catla, Rui, Mrigel, Laso and Kalibaus. It is a fixed gear (25 m x 25 m net fixed with 20 bamboo) and four persons are required to operate the net. It is operated near the shore of inundated rivers.

There are three subsistence level fishermen villages near the Karimganj thana (Nayakanda, Kacharipara and Jangalbari). They are one of the most deprived classes in society. They own nets, but do not have access to jalmohals and traditionally they are not empowered by any practical political commitments. Most of the potential water bodies are leased to the richer people. Fishermen of the area regard the NFMP was a 'lighthouse' for them, but not a single jalmohal was allocated to them under the policy. Due to lack of jalmohals they are restricted to catching fish in the seasonal rivers and part of open water near their village.

Production trends

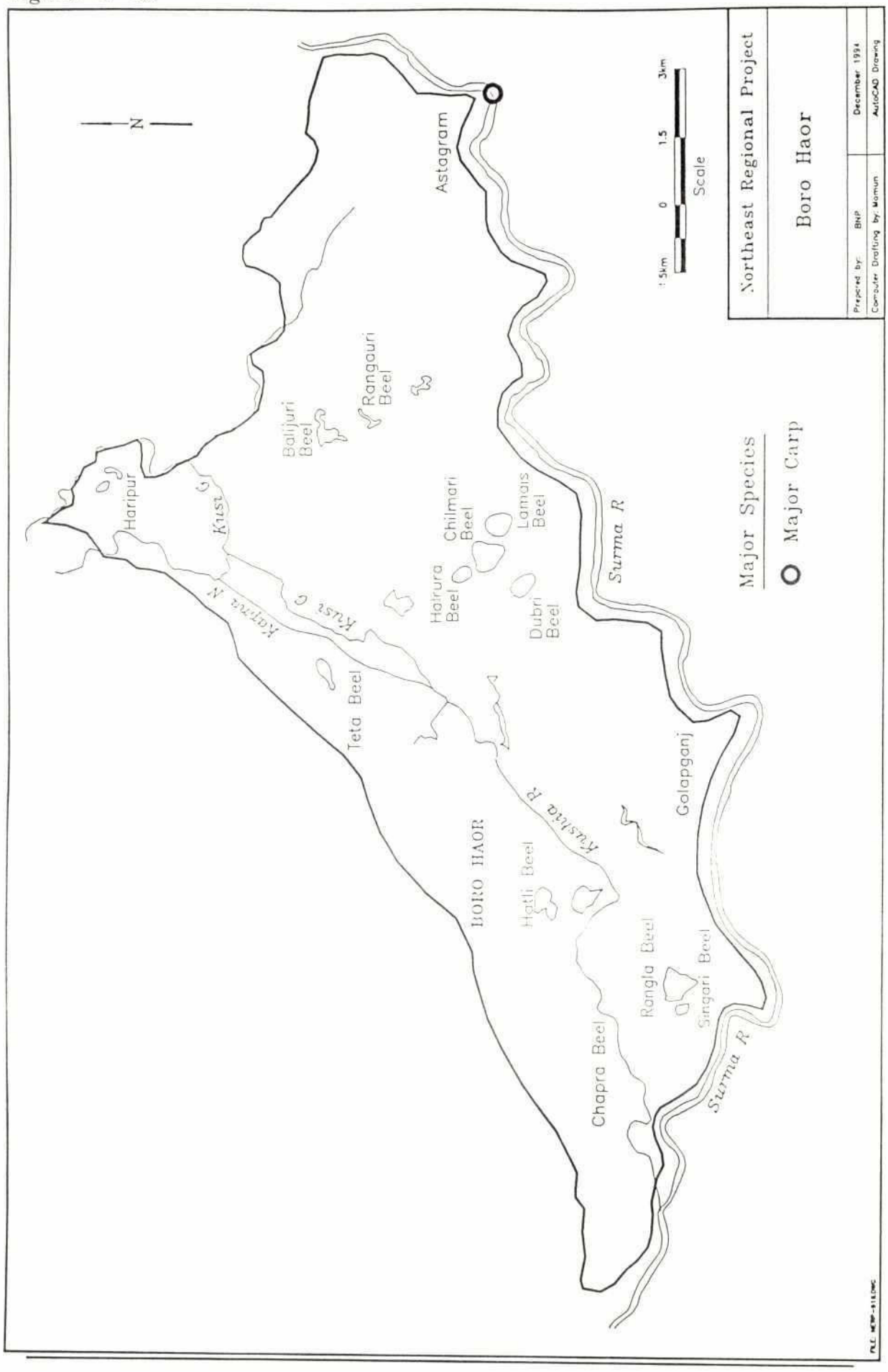
Chamraghat is one of the most important fish wholesale markets in Kishoreganj district exporting fish to Dhaka and other areas of the country.

Due to a lack of sufficient water on the floodplain in Sept 92 (which resulted in a shorter grazing period and facilitated overfishing), overall fish production in the area was at least 30-35% lower than the previous year. Most of the retail fish traders in the ghat mentioned that fish are on average 30-40% smaller in size compared to the same time last year.

Special aspects/problems

Fresh water dolphins are common in the area, particularly at the confluence of the Narasunda and the Baulai River (near Noagaon village) where large numbers of dolphins are seen. Dolphin abundance is an indicator of fish abundance, migratory routes and greater water depth.

Figure K-16


N
Astagram
Rangauri Beel
Balijuri Beel
Haripur
Kusi
Chilmari Beel
Lamais Beel
Hairura Beel
Dubri Beel
Surma R
Kusi
Kajma N
Teta Beel
BORO HAOR
Kushia R.
Golapganj
Hatli Beel
Rangla Beel
Singari Beel
Chapra Beel
Surma R
Major Species
Major Carp
1.5km 0 1.5 3km
Scale
Northeast Regional Project
Boro Haor
Prepared by: BNP
December 1994
Computer Drafting by: Mamun
AutoCAD Drawing

K.16 BORO HAOR

Environment

Boro Haor is located near Sylhet. The Sari and Rangpan rivers are the important sources of water (as well as fish) for some perennial beels in Jaintapur. Kendra beel (121 ha), Bori beel (101 ha), Chatta beel (101 ha) and Gagrajan (61 ha) are the important fish production areas, with catfish species predominating. An embankment has been constructed at Boro beel.

Fishery resources

The dominant species in Boro haor are Puti, Tengra, Shoal, Gazar, Rui, Kalibaus, Singhi, Koi, Magur, Small shrimp, Boal and Bacha. The Sari River near Jaintapur is probably the most important source of larger size fish and fingerlings. In the river the dominant large species are Kalibaus, Boal, Air and Mohoshoal. One fishermen stated that he had seen Mohashoal of 40-50 kg in the river.

Special aspects/problems

On 11-12 March, 1992, mass mortality of fish occurred in the river. It was suspected that some poisonous plants were thrown into the water in the upstream Indian area. People also observed that at the time of mortality the water color turned blackish, temperature suddenly dropped, the silt concentration rapidly increased and the taste of the water was slightly saline.

K.17 VARIOUS OTHER FISHERIES

UPPER MEGHNA RIVER

On 1 May 1992, a visit was made to Bahubal market and Bhairab Bazar. There were very few fish in the market, mainly small species. In the Upper Meghna River, there were very few fishing boats. Jatka (small Hilsa) was dominant in catches, but other small fishers were also being caught. Larger carp were very scarce.

BENGRA AREA

The Bengra Fishery receives water from the Ghorautra river and there is no outlet. The main species are Rui, Kalibaus, Air and Boal. Among small species, Chanda, Kaski, Poa, Bacha, Chapila, Puti and Rita are the most abundant.

KUSHIYARA RIVER at SHERPUR

Sherpur market is remarkable in always having large adult BOROMAACH on sale, especially rui, catla, boal, air and chital. Most are caught nearby in the Kushiyara River. This indicates that there is a good population of broodstock resident year round in this part of the river. The degradation of the river bed, which resulted after river channelization (loop cutting) downstream has created a deeper river channel, and this attracts BOROMAACH broodstock, who find it a suitable habitat. Apart from boromaach, most chotomaach can also be found in the market, including BANGRA, GUNGRI, LAYA, ITCHA, LACHU, TENGRA, BAILLA, PABDA, GONIA, ILISH, CHELA, RITA and GHAGOT.

BANIACHONG HAOR

On 21 Sept 92 the shallower part of the haor was full of aquatic vegetation and the water colour was clear (transparent). Phytoplankton and suspended organic debris was observed in the water. In the deeper zone some filamentous algae (locally called GAUR) was observed, and around the gaur a large number of rotifers and cladocerans were present. It is likely that gaur serves as a good substrate for zooplankton. Fishermen in the area observe that carp (Rui, Catla, Kalibaus) are more abundant around the gaur areas. These species feed on zooplankton. The Baniachong area is notable for producing catfish, live fish and miscellaneous species. There are no important jalmohals in the area.

BEANIBAZAR AREA

Beanibazar area is flashed over by the Kushiyara and the Sunai-Bardal Rivers. No permanent beels exist in the area but there are important duars in the rivers. Muria haor (including five beels), Shakhaeti beel and Tesree beel are the principal seasonal jalmohals where mainly chotomaach are produced. River duars act as refuges for boromaach, mainly Boal, Air, Ghagot, Rui and Mrigel. Freshwater dolphin are present in the Babur duar near the Sheola ferry ghat of the Kushiyara River.

GONESWAR HAOR

The beels of Goneswar Haor are shallow and mainly habitats of chotomaach. During the flood season some boromaach also enter into the haor. The haor is renowned for Koi, Shingi, Magur, Sarputi and Pabda. Local fishermen have proposed to keep one or two beels (possibly Ganesbanda beel) as a chotomaach sanctuary. The beel is connected with the Mogra River by a small canal (Ukhra khal). The BWDB has proposed constructing a submersible embankment around the haor.

KUIRA BEEL

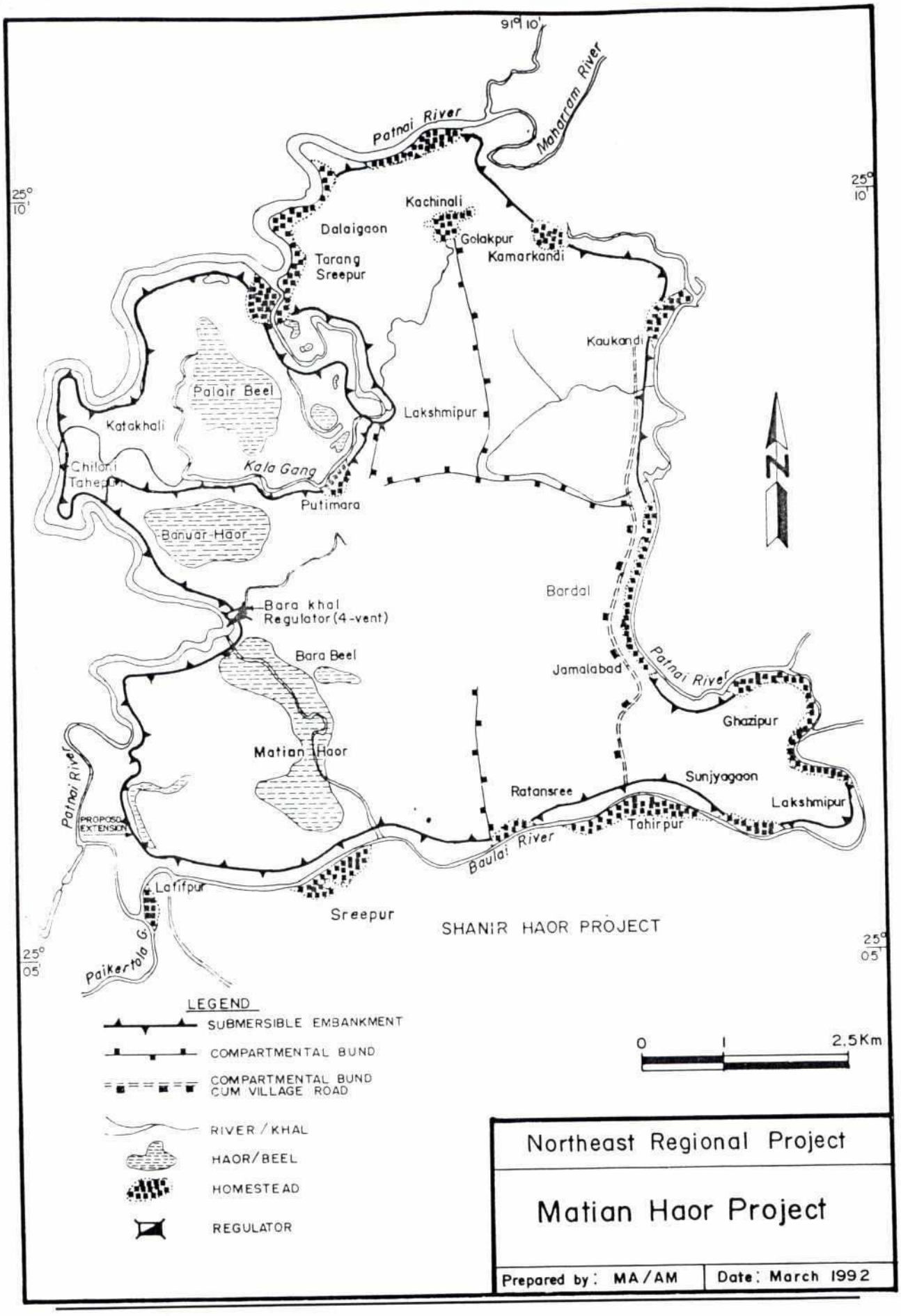
This beel is situated near Daukhali. It is a permanent water body and a good fish producing area.

APPENDIX L

CASE STUDIES OF FISHERIES IMPACTS OF FCD/I PROJECTS

APPENDIX L: CASE STUDIES OF FISHERIES IMPACTS OF FCD/I PROJECTS

INDEX


91° 10'
Patnai River
Mahgram River
25° 10'
Kachinali
Dalaigaon
Golakpur
Kamarkandi
Tarang
Sreepur
Kaukandi
Palair Beel
Lakshmipur
Katakhali
Chilori
Tahepur
Kala Gang
Putimara
Banuar Haor
N
Bardal
Bara khal
Regulator (4-vent)
Bara Beel
Jamalabad
Patnai River
Ghazipur
Matian Haor
Sunjyogaon
Ratansree
Lakshmipur
Patnai River
PROPOSD EXTENSION
Tahirpur
Baulai River
Latifpur
Sreepur
SHANIR HAOR PROJECT
25° 05'
Paikertola G.
LEGEND
SUBMERSIBLE EMBANKMENT
COMPARTMENTAL BUND
COMPARTMENTAL BUND CUM VILLAGE ROAD
RIVER / KHAL
HAOR/BEEL
HOMESTEAD
REGULATOR
0
1
2.5Km
Northeast Regional Project
Matian Haor Project
Prepared by: MA/AM
Date: March 1992

L.1 PARTIAL FLOOD PROTECTION PROJECTS

L.1.1 MATIAN HAOR PROJECT

Project location and general data

District: Sunamganj
Thana: Tahirpur
Project Type: Partial Flood Protection
Status: Completed
Gross Area: 6,380 ha
Net Area: 6,310 ha
Population: 25,700

Environment and engineering works

Hydrology: The Project is bordered by the Patnai river in the north and west and a small tributary of the Patnai river to the east. The Baulai river borders the southern side. The Patnai river is a branch of the Jadukhata river which also receives flows from numerous small streams originating in the Meghalaya hills. The Patnai river flows into the Baulai river which in turn flows into the Surma below Jamalganj. The Project area generally slopes south and west and most drainage is affected through a regulator across the Boro khal into the Patnai River. Sediment deposition in the lower reaches of the Jadhukata river has contributed to increased flows in the Maharram river which discharges into the Patnai river. The higher water levels in the Patnai river are hampering drainage. To counteract this problem, local people throughout the project are requesting that the project's peripheral rivers be dredged.

Water bodies: There are several permanent water bodies within the project including Bara *Beel*, Banuar *Beel* and Palair *Beel*. The soil of the haor seems to be clay loamy with a pale pink colour.

Project concept and history: The project purpose was to provide protection for the *boro* crop through May 15th. This crop is frequently inundated by pre-monsoon flash floods after mid-March. During the monsoon season, Matian Haor floods to depths ranging from of 1.5 to 6.0 meters. As a result, much of the Haor is flooded to deeply to produce a monsoon season crop and is therefore only cropped with local boro during the winter months. The protective works consist of 46 kilometers of submersible embankments around the project area combined with a regulator to facilitate drainage and flushing. The project was originally constructed by the local administrative authorities through a FFW program. It was then handed over to the BWDB in 1976 as a part of Haor Development Program in Sunamganj District. BWDB started upgrading the embankment in 1977 and the work was completed in 1979. The regulator was completed in 1985 with IDA financing. Since project completion, the embankments have been maintained by BWDB with FFW wheat allocations. The project has been included in the Systems Rehabilitation Project. Rehabilitation of the project through BWDB with IDA and EEC financing is expected to start shortly.

Submersible embankments: The embankments were constructed to a crest level of 6.1 meres (PWD) and with a crest width of 2.4 meres. They were designed for a return period of 10 years. The southern embankment from Tahirpur to Latifpur village is generally in good condition and requires only routine maintenance work. Reportedly, the embankment section from Tahirpur to Ratansree village does not overtop before the *boro* is harvested under normal circumstances. It was observed on 22 January, 1992 that water was draining from the project area through a public cut in front of Sreepur village. Reportedly, the cut was made to drain the *haor* area and local farmers have requested that a drainage structure be provided at this location. Additional drainage structures will likely be included in the Systems Rehabilitation Project. There is one breach near Latifpur village that reportedly occurred during the last week of May, 1991. This breach apparently recurs each year at the same location. Local farmers believe that this breach occurs as a direct result of a breach on the projects northeastern side. Flood water enters the project area through this breach — caused by the Maharram river — and moves southwest across the project and erodes the embankment at Latifpur. The Thana Nirbahi Officer at Tahirpur has stated that flood flows in the Maharram River have increased which is causing breaches in adjacent embankments and as a direct result increased crop damage. Maharram River is closed by the local administrative authority every year in late January, ostensibly so farmers can plant their *boro* crops earlier. Reportedly, construction of the closure costs Tk 150,000.

Compartmental bunds: The compartmental bund from Tahirpur to Kaukandi village was originally constructed by BWDB and now local authority are upgrading the bund to a village road. Another compartmental bund near Bardal village is under construction. This work has been suspended because funds are unavailable. Farmers have requested that BWDB carry out the work as the bund will be used to retain water, transport paddy and provide communication between Bardal and Tarang-Sreepur village. Retansree villagers have also requested that their compartmental bund on the western side of their village be completed. Farmers have also requested completion of the compartmental bund from Kala Gang loop to Bara Khal Regulator. This was originally started by BWDB.

Regulator: The project includes one regulator which is located at Bara Khal. It has four vents and is in good structural condition. On 22 January 1992, the regulator gates were open but water was not draining from the project *haor* area as the river water level was high.

Fishery resources

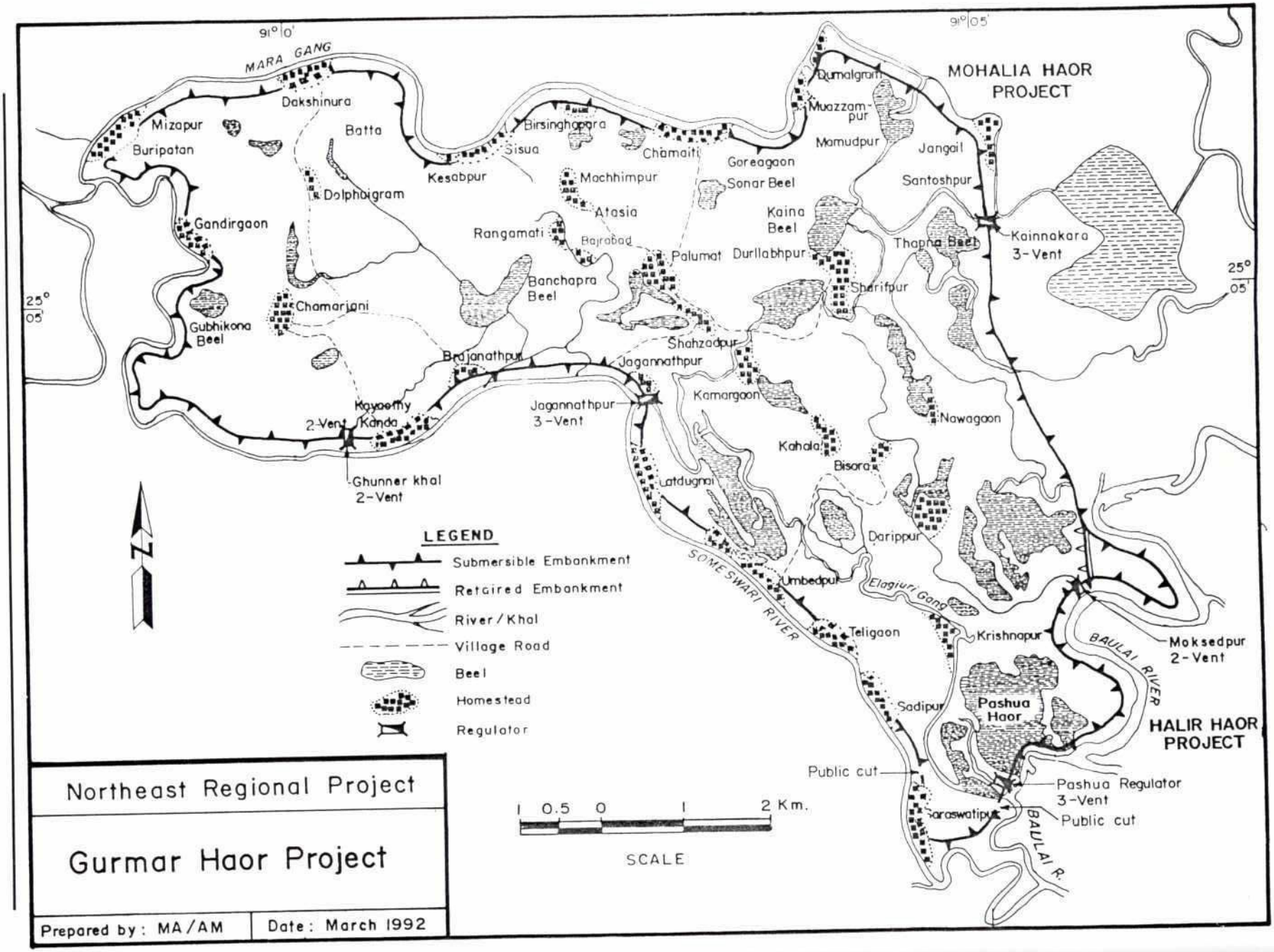
Matian has good stocks of large fish (boal, gonia, rui, kalibaus). About 85-90% of the catch consists of boromaach. Important fisheries in the haor are Borobeel, Kosma, Lambadair, Poinda, Khadarkuna and Khalganj. Boal, Gonia, Gazar, Pabda, Shoal and other small species breed within the haor.

Fishing practices

Permanent water bodies within the project (including Bara *Beel*, Banuar *Beel* and Palair *Beel)* are now leased under open auction for a period of three years, and the general public are forbidden to fish in them. At the junction of Matian, Bainya patai and Tangua Haor, a large Khola (Boalmarakhola) houses fishermen living with their families. These fishermen were hired from other areas only for fishing purposes. Annual fishing is the present harvesting system.

Production trends and project impacts on fisheries

Many people of the Boalmara khola were happy with the good fish harvest, and production was increasing. A representative of the Bara Beel lease-holders has stated that the fishery resources have increased substantially since construction of the Matian Haor FCD Project since it helps to maintain the required depth of water for pile fisheries. The controlled water management system allows maintenance of good dry season water levels (2.0-2.5 m) within the haor, so that, fish can grow well. Large quantities of carp are reportedly produced in the *beels*. However the khola manager said that some dredging is needed for the pile fishery system.


91°10'
91°05'
MARA GANG
Dakshinura
Mizapur
Buripatan
Batta
Kesabpur
Birsinghpara
Sisua
Chamaiti
Machhimpur
Dolphoigram
Gandirgaon
Atasia
Rangamati
Bajrabad
Goreagaon
Sonar Beel
Dumalgram
Muazzam-pur
Mamudpur
Jangail
Santoshpur
MOHALIA HAOR PROJECT
Kaina Beel
Thapna Beel
Kainnakara 3-Vent
Palumat
Durllabhpur
Sharifpur
Banchapra Beel
Chamarjani
Gubhikona Beel
25° 05'
Shahzadpur
Brajanathpur
Jagannathpur
Jagannathpur 3-Vent
Kamargaon
Nawagaon
Kayoothy Kanda 2-Vent
Ghunner khal 2-Vent
Kahala
Bisora
Latdugnai
Darippur
SOMESWARI RIVER
Umbedpur
Elagiuri Gang
Teligaon
Krishnapur
BAULAI RIVER
Moksedpur 2-Vent
Sadipur
Pashua Haor
HALIR HAOR PROJECT
Public cut
Pashua Regulator 3-Vent
Saraswatipur
Public cut
BAULAI R.
LEGEND
Submersible Embankment
Retgired Embankment
River / Khal
Village Road
Beel
Homestead
Regulator
1 0.5 0 1 2 Km.
SCALE
Northeast Regional Project
Gurmar Haor Project
Prepared by : MA / AM
Date : March 1992

L.1.2 GURMAR HAOR PROJECT

Project location and general data

District: Sunamganj
Thana: Dharmapasha and Tahirpur
Project Type: Partial flood protection and drainage
Status: Completed 1991
Gross area: 5,360 ha
Net area: 5,000 ha
Population: 17,900

Environment and engineering works

Hydrology: The project is bordered to the east by submersible embankment, to the southeast by the Baulai River, to the south and west by the Someswari, and to the north by Mara Gang. The area is deeply flooded during the monsoon season to 1.5-6.0 m. Flash floods occur during April and May when heavy rain falls in the area and in Meghalaya State. Reportedly, the Baulai transports large quantities of sediment and siltation at the Baulai offtake has substantially decreased its flow. The Baulai also receives flow from many small streams originating Meghalaya, however. Siltation is also occurring at the Baulai outfall on the Surma below Jamalganj. Local people state that Baulai water levels are rising as the bed level rises from sedimentation. Two project regulators (two vent at Moksedpur and three-vent at Pashua) drain into the Baulai; the three-vent Kainnakara regulator drains through low areas and in turn into the Baulai. The Baulai is not navigable during the dry season. In the 1991-2 *boro* season - the first and only since the completion of the project regulators - Baulai water levels remained high through January, such that on 22 Jan 92, only 10% of the cultivable area had been planted, as compared to 80% in normal years. The two regulators on the Baulai were observed to be open, but water levels in the river were too high for drainage. The Someswari originates in Meghalaya State in India and flows through Mymensingh to the Surma-Baulai River. Reportedly, the Someswari also transports large quantities of sediment and is silting up such that its outfall is almost dry in winter. Two project regulators (three-vent at Jagannathpur and two-vent at Ghunner Khal) drain into the Someswari.

Water bodies: Important water bodies include Pashua beel, Banchapra beel, Sonar beel, Kaina beel and Thapna beel. There are extensive natural stands of koroch trees around Pashua beel.

Project concept and history: The project objective is to exclude pre-monsoon floods until 15 May when the *boro* harvest is complete, and to improve the drainage network. Project works consist of 45 kilometres of submersible embankments, more than 30 kilometres of re-excavated drainage channels, and five regulators used to fill the basin after the *boro* harvest and for post-monsoon drainage. BWDB identified the project. In 1981, studies were prepared under ADB and EEC financing. In 1989, the embankment and canal re-excavation was completed; in 1990 the embankment was retired; in 1991 the regulators were completed.

Submersible embankments: In May 1990 after the *boro* harvest, flash flooding breached the retired Baulai embankment in two places near the Moksedpur regulator. The submersible embankment along the Someswari River is in good condition and requires only routine maintenance work, except for a public cut between the Pashua regulator and Jagannathpur village.

The cut was made in 1992 to relieve localized post-monsoon drainage congestion. Severe erosion inside and outside the project has occurred on long stretches of the eastern embankment on both sides of the Kainnakara regulator. Local people state that this is due to wave action. They request repair so that future *boro* crops will be protected.

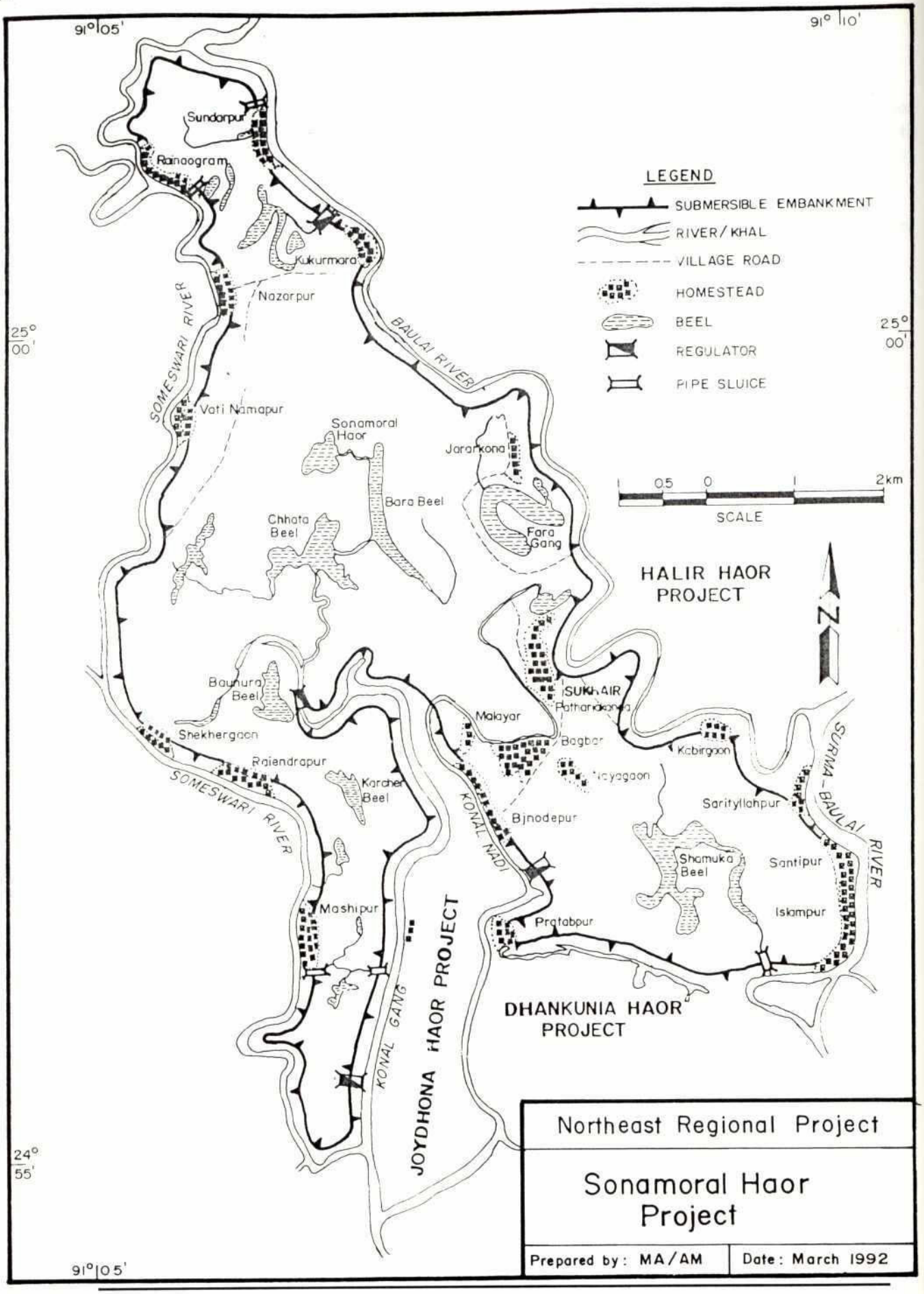
Structures: The project's five regulators are each fitted with vertical-lift steel gates. All structures are in good operational condition.

Fishing practices

The project has several permanent *beels* and most are now leased under open auction for a period of three years. The general public are forbidden to fish in them. A representative of the Pashua Haor leaseholder stated that they have a nine-year lease through 1992 with the Pearl and Fishery Resources Development Program, ending in 1992. After 1992, the a three-year lease will be given out by open auction.

Production trends and project impacts on fisheries

Local people including the leaseholder report that fish resources have increased since the completion of the submersible embankment in 1989, which has increased the water retained in the permanent *beels* to the depths required by pile fisheries. Some of the *beel* drainage channels were blocked by the embankment.


91°05'
91° 10'
25° 00'
24° 55'
Sundorpur
Ranaogram
Kukurmara
Nazarpur
SOMESWARI RIVER
BAULAI RIVER
Vati Namapur
Sonamoral Haor
Jararkona
Bara Beel
Chhata Beel
Fara Gang
HALIR HAOR PROJECT
Baunura Beel
SUKHAIR
Pathardanga
Makayar
Bagbar
Kabirgaon
Shekhergaon
Rajendrapur
Karcher Beel
SOMESWARI RIVER
KONAL NADI
Bjnodepur
Sarityllahpur
SURMA-BAULAI RIVER
Shamuka Beel
Santipur
Iskampur
Mashipur
Pratabpur
JOYDHONA HAOR PROJECT
KONAL GANG
DHANKUNIA HAOR PROJECT
LEGEND
SUBMERSIBLE EMBANKMENT
RIVER/KHAL
VILLAGE ROAD
HOMESTEAD
BEEL
REGULATOR
PIPE SLUICE
0.5 0 1 2km
SCALE
N
Northeast Regional Project
Sonamoral Haor Project
Prepared by: MA/AM
Date: March 1992

L.1.3 SONAMORAL HAOR PROJECT

Project location and general data

District: Sunamganj
Thana: Dharmapasa
Type: Partial flood protection
Status: Completed - 1991
Gross Area: 3,725 ha
Net Area: 3,160 ha
Population: 11,900

Environment and engineering works

Hydrology: The Project is bordered by the Baulai River to the north, the Surma-Baulai River to the east, the Konal Nadi to the south, and the Someswari to the west. The Baulai River is a branch of the Jadhukata River and flows into the Surma-Baulai River below Jamalganj. The Jadhukata originates in the Megalaya plateau. The Baulai River is gradually filling with sediment which is delaying post-monsoon drainage.

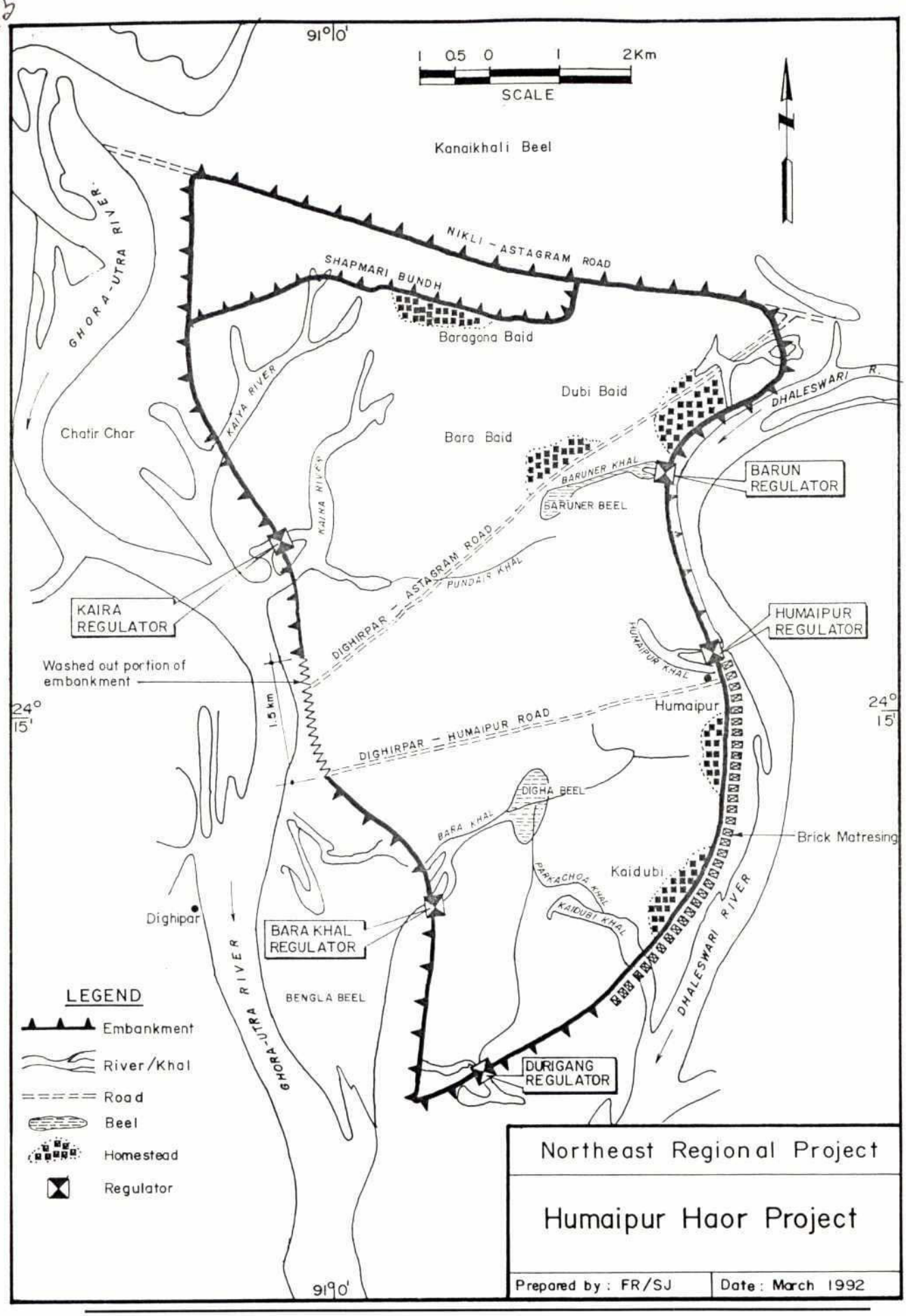
Project concept and history: The project is to protect *boro* crops from pre-monsoon flash floods by the use of submersible embankments, four regulators, four pipe sluices and irrigation inlets. During the monsoon, Sonamoral Haor is flooded to depths ranging from 1.5 to 6.0 meters. The dominant crop within this flood regime is *boro* paddy which is subject to inundation and damage by flash floods. The infrastructure is designed to provide protection through mid-May, to provide drainage and flushing, and to facilitate irrigation. The project was identified by BWDB in 1981. Feasibility studies were subsequently carried out and the project was recommended for inclusion in the SSISP program. Construction works started in 1986-87 and the project was completed in 1990-91.

Submersible embankments: The embankment is generally in good condition although annual routine maintenance work is required. BWDB have reported that suitable material for embankment construction is not available locally and that imported material is used. There are breaches and public cuts. Local farmers report that generally the breaches in the embankment occur in May as the embankment is being overtopped. The public cuts are made to drain the *haor*. Additional drainage structures are requested. Local people have stated that sediment deposition is occurring along Baulai River and that this impedes drainage.

Structures: The regulators and pipe sluices are fitted with steel vertical lift gates and are in good operational condition. The majority of the irrigation inlets along Baulai River are also in good condition and the farmers appear to be using them efficiently.

Production trends and project impacts on fisheries

The fishery groups at Sonamoral and Kuraijan have stated that the project has increased fishery resources as it helps to maintain the required water level for pile fishing during the dry season.


91°0'
1 0.5 0 1 2Km
SCALE
Kanaikhali Beel
NIKLI - ASTAGRAM ROAD
SHAPMARI BUNDH
Baragona Baid
GHORA-UTRA RIVER
KAIYA RIVER
Chatir Char
Dubi Baid
Bara Baid
DHALESWARI R.
BARUNER KHAL
BARUN REGULATOR
SARUNER BEEL
KAINA RIVER
DIGHIRPAR - ASTAGRAM ROAD
PUNDARI KHAL
KAIRA REGULATOR
HUMAIPUR REGULATOR
HUMAIPUR KHAL
Washed out portion of embankment
1.5 km
24° 15'
Humaipur
DIGHIRPAR - HUMAIPUR ROAD
DIGHA BEEL
BARA KHAL
Brick Matresing
PARKACHOA KHAL
Kaidubi
KAIDUBI KHAL
Dighipar
BARA KHAL REGULATOR
BENGLA BEEL
GHORA-UTRA RIVER
DHALESWARI RIVER
DURIGANG REGULATOR
LEGEND
Embankment
River/Khal
Road
Beel
Homestead
Regulator
Northeast Regional Project
Humaipur Haor Project
Prepared by : FR/SJ
Date : March 1992

L.1.4 HUMAIPUR HAOR PROJECT

Project location and general data

District: Kishoreganj
Thana: Bajitpur
Project Type: Partial flood control
Status: Begun 1976, completed 1983
Gross area: 5,260 ha
Net area: 4,730 ha
Population: 49,630

Environment and engineering works

Hydrology: The project is bounded in the west by the Ghora-Utra River and in the east by the Dhaleswari River. Both are perennial rivers that are very slightly influenced by tides. According to BWDB officials, there is some tidal irrigation potential: in the lean season, river water enters the area through the regulators at high tide. Sedimentation and development of new projects nearby is affecting water levels in the external rivers, possibly rendering the original embankment design height insufficient for pre-monsoon flood control. Water levels need to be monitored to confirm this. Drainage of the area to the north of the project seems not to be affected by the project. It drains to the east and west into the Ghora-Utra and Dhaleswari.

Water bodies: The project is located in a deep haor area. Jalmohals within the haor are Koiya nadi, Kaira nadi, Digha beel, Barunar beel, Humaipur khal and Koidubi khal. In most of the places water color of the haor was slightly greenish to transparent. On the floodplain the following submersed vegetation occurs: chailla, gang karati, patua bon, kuyar pata, phutki ban, ghurar langur. Fishermen of the area mentioned that Kuyar pata, Phutki ban, Ghurar langur and Gaur promote high fish abundance in the area.

Project concept and history: The project concept was to protect the *boro* crop from pre-monsoon flash flooding by providing 32 kilometres of submersible embankments with five regulators for flushing and drainage. The project is located in a low *haor* area which floods to depths of 2.5-5.0 meters during the monsoon season. In 1950's, the Ministry of Irrigation identified *boro* cultivation as the area's only viable agricultural development option. In 1957, MOI formulated the project. In 1976-8, the embankment was constructed under FFW. In 1982-3, the regulators were constructed. In 1984, 1.5 kilometres of embankment along the Ghora-Utra was eroded and has not been repaired. Since project inception, BWDB has been responsible for operation and maintenance.

Submersible embankments: All information in this section concerning embankment condition comes from BWDB or local people, as the embankment was under 1 meters of water during the field visit. In 1984, a 1.5 kilometres embankment reach along the Ghora-Utra in the west was eroded by the river; it has not been repaired. This reach plus an adjacent 2.5 kilometres are not set back far enough, rendering it vulnerable to river erosion. After this embankment failure, people living within the project cut the embankment near the structures, to enable boat passage and to allow drainage while the structures are closed (the responsibility for structure operation rests with BWDB officials, but they rarely go to the structure sites). In the east, strong

south-easterly winds give rise to heavy wave action. Brick-mattressing protects about 5.0 kilometres of the eastern embankment; an additional 10 kilometres or so of this embankment is also vulnerable to wave erosion. The remaining 12 kilometres of the embankment is good condition but requires routine maintenance work. As the project is not accessible by motorized vehicles (it is surrounded by rivers), the 4.3 meters crest width of the embankment is excessive; 2.4 meters is adequate for pedestrians, carts, etc. BWDB officials report that the internal channels of the project are silted up, limiting the water storage volume for tidal irrigation. The channels were flowing full during the field visit so the condition of the channels could not be examined.

Structures: There are 5 sluice gates around the project:

Table L1: Location of Sluice Gate Around Humaipur Haor

Sluice Location	Vents
Baruna	2 vents, steel gates
Humaipur	2 vents, fallboards
Duriganj	1 vent, fallboards
Barokhal	2 vents, fallboards
Kaira	3 vents, steel gates

The sluice gates were inundated on the 1st day of July,1992. BWDB officials report that the five regulators are all in good operational condition. Their location and size appear adequate for both flushing and drainage. No provision is included for country boat passage.

Fishery resources

In July 1992 the main fish species being caught were Golda chingri, Balia, Chapila and Carp fingerling. Among these, Golda prawn was dominant. Fish abundance by area is as follows:

- River: Golda chingri, Icha, Gulsha, Bacha, Gaura, Air, Chitol, Boal, Baim, Kalibaus.
- Beel and open water: Tengra, Shingi, Magur, Puti, Koi, Mola, Shoal, Taki, Gazar.

Bengla is a pile fishery where major carp and catfish are the dominant species. Fishermen of the area have confirmed it as a breeding ground of catfish. Large numbers of carp fry have been seen in June and July. Species that have become extinct in the area are Nandin, Taka, Gagla, Mohashol and Pangas.

Fishing practices

Fishing gear in use in the area are:

Table L2: Fishing Gearwise Information of Humaipur Haor

Gear	Operation Area	Species Caught	Value of Catch/Day
Uthar jal (2 cm mesh)	Main river	Rita, laso	Tk 100-300
Goyra jal (1.5 cm mesh)	Canals, floodplain	Bacha, nagri, garua	Tk 70-100
Ghurti jal (1 cm mesh)	Floodplain	Kaikka, chela, puti, kalibaus, laso (bhagna)	Tk 100-150
Borshi	Floodplain	Bailla, baim	Tk 30-50
Chai (100 chai per unit)	Floodplain	Golda chingri	Tk 200-400
Current jal (3 cm mesh)	Floodplain	Laso, puti, lati	Tk 50-60

Fresh water giant prawn (Golda chingri) is the most economically important species on the Humaipur floodplain. Golda are caught by specially made bamboo baskets (*chai)* placed on the bottom on the floodplain. The cost of each chai in Bajitpur market is about Tk 20-30. More than 3,000 chai are used to catch chingri from the floodplain. Chai are placed at the depth of 1.1.7 m and snail meat or small prawns are used as bait. Sometime red colored bricks are also used to attract Golda. The prawn fishery is mainly controlled by the 'Bapary'. There are a number of private investor within the area. Before the season (harvesting season started from the end of June) the Baparies lend money to the operators/harvesters (around Tk 1,000-3,000 per person), and the operators in turn are obliged to sell their catches to the investors. Sometimes the Baparies take money from the nearby cold storage in Kuliarchar. Baparies wait near the river/haor in boats to collect the daily catch. During the time of harvesting, the investors pay Tk 80-90/kg (head on). The chai operations are performed 24 hours per day, but the prawns are collected mainly in the morning between 8-11 am. After the collection of prawns, investors sell the collected produce to a local arat (Bajitpur) at Tk 100-110/kg. The aratdars deheaded the shrimps and sell the products to Kuliarchar freezing plant. Prawn prices in Kuliarchar last year are as follows:

Table L3: Gradewise General Price for Prawn

Grade	Price (Tk/kg)
10	350-375
20	260-270
30	200-230
50	150-160
90	100-120

Five fishermen villages were identified in the area. These are Ahsanpur (about 300 fishermen), Dighirpar (about 300), Boali-Shibpur (about 150), Kachuakhali (about 200) and Kamarbali (about 100). For fishing, the fishermen depend on the open water and the rivers of the area. They are organized, but the leadership is very weak or sometimes also exploitative (and have no political commitments to uplift the society). Basically the leaders are the 'pocket' people of richer class, and the genuine fishermen are always fearful to say anything against their leaders. Often fish are extorted from them by rich people.

Production trends and project impacts on fisheries

There are four arat and five ice factories in the Bajitpur market. Fish abundance in the arat varies from season to season. Arat managers gave the following production records:

Table L4: Seasonal Variation of Daily Supply of a Aarat in Bajitpur

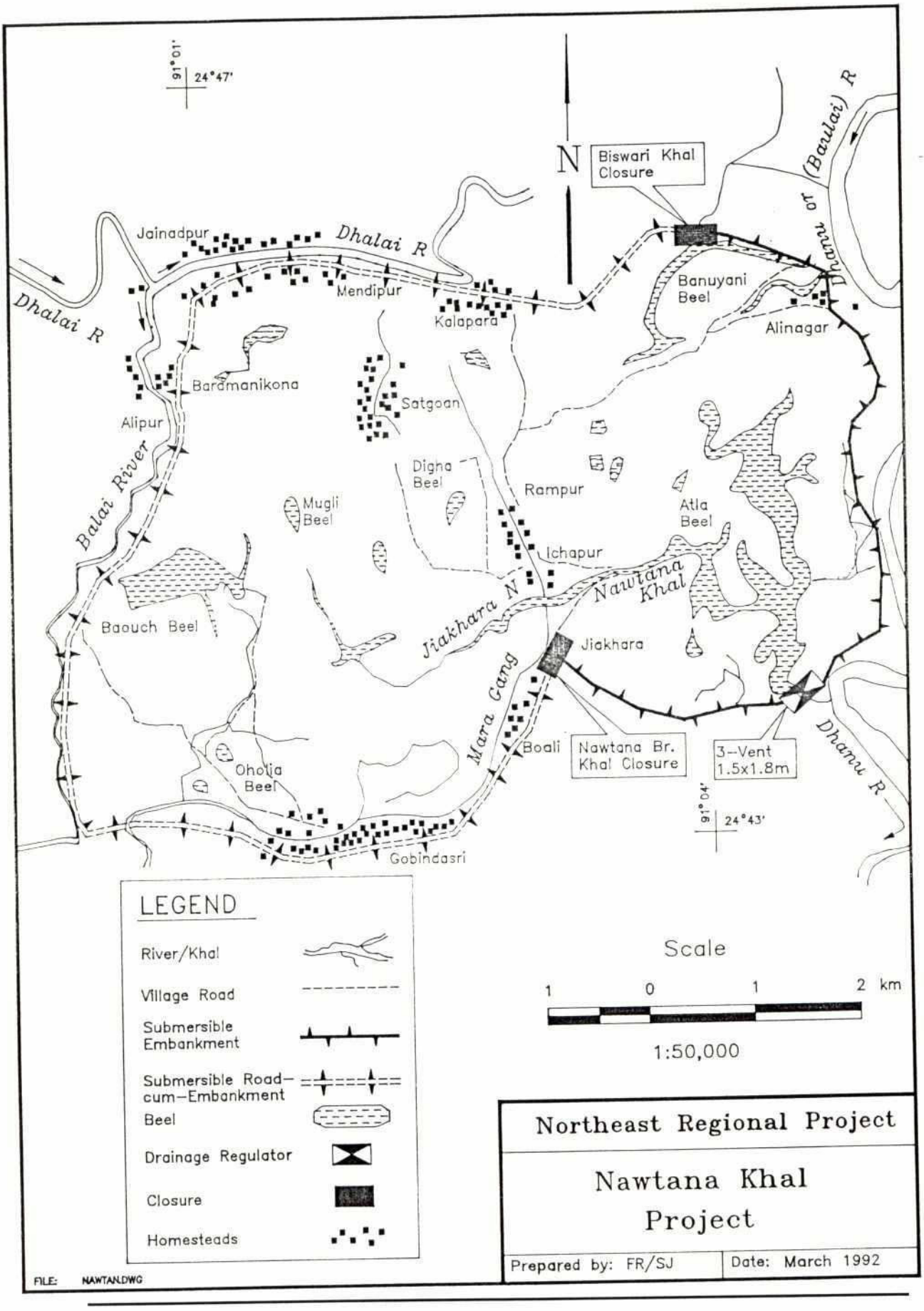
Period	Species Caught	Quantity per Day
Nov-Feb	Shingi, magur, koi, puti, lati, air, boal, gazar, rui, batashi	1,200-1,700 kg
Mar-May	Mainly pond fish (carp and miscellaneous)	300-400 kg
Jun-Aug	Bailla, golda chingri	400-500 kg
Sep-Oct	Cirka, baim, keski, chapila, air, tengra, gulsha, boal, ilish, icha	600-700 kg

People fishing in the project area report that there was no change in fishery activities due to project implementation. No direct negative impacts on fisheries were mentioned by the fishermen. After the construction of the submersible embankment, sedimentation had been reduced and water retention capacity has been slightly increased.

Bengla is one of the most renowned fishery in the area, and is closely linked to the Humaipur haor project. Near the Baro khal regulator (Boali-Shibpur village) and Chatir char area heavy scouring and siltation has been going on over the last two years. In August, '92 a large demonstration was organized by the local people in front of the Kishoreganj DC office. People of the local area suspect that if this continues, it will affect the Bengla fishery. People do no know whether this is the result of the Humaipur haor project or not.

An investigation is required of the sedimentation problem at the Bengla fishery. Local people have proposed the excavation of a new canal (about 70-100 m) near the Kaira regulator to make the river flow straight.

The Bengla and Kula fisheries are the main source of fish in the area and these should be declared as reserve fisheries to ensure sustainable production of fish. Most of the fishermen in the area recommended Gorumarar khal and Boro khalar mu of Bengla fishery as reserve fisheries.


91°01'
24°47'
N
Biswari Khal Closure
Dhalai R
Jainadpur
Mendipur
Kalapara
Dhalai R
Dhanu or (Baulai) R
Banuyani Beel
Alinagar
Bardmanikona
Satgoan
Alipur
Balai River
Digha Beel
Rampur
Mugli Beel
Atla Beel
Ichapur
Nawtana Khal
Jiakhara N
Baouch Beel
Jiakhara
Mara Gang
Boali
Nawtana Br. Khal Closure
3-Vent 1.5x1.8m
Dhanu R
Ohotia Beel
91°04'
24°43'
Gobindasri
LEGEND
River/Khal
Village Road
Submersible Embankment
Submersible Road-cum-Embankment
Beel
Drainage Regulator
Closure
Homesteads
Scale
1 0 1 2 km
1:50,000
Northeast Regional Project
Nawtana Khal Project
Prepared by: FR/SJ
Date: March 1992
FILE: NAWTAN.DWG

L.1.5 NAWTANA KHAL PROJECT

Project location and general data

District: Netrokona
Thana: Kaliajuri
Project Type: Partial flood protection
Status: Begun 1987, completed 1989
Gross area: 3,120 ha
Net area: 2,145 ha
Population: 7,330

Environment and engineering works

Hydrology: The area is bordered in the north and west by the Dhalai River, a distributary of the Kangsha (not shown on map), and in the east by the Baulai River. Backflow from the Baulai causes most of the area's pre-monsoon and monsoon flooding. Water is available in both rivers during the irrigation season, based on field observations (Jan 92) and local people's reports. Drainage is generally to the south and southwest. Drainage of the adjacent area to the north of the project is reportedly not impeded by the closure of Biswari Khal at the project embankment: a link canal north of the closure maintains the connection of Biswari Khal to the Baulai.

Water bodies: Important beels in the Nawtana Haor are Roail, Atla, Borobeel, Noyabeel, Agradulikoor and Bollajan.

Project concept and history: The project objective is to reduce pre-monsoon flood damage to the *boro* crop and encourage farmers to shift from local to high-yielding varieties, through the provision of 5.5 kilometres of submersible embankments with closures at Nawtana Branch Khal and Biswari Khal, augmenting 16.7 kilometres of existing road embankments, and a three-vent flushing/drainage regulator at Nawtana Khal. Nawtana Khal Project is a deeply flooded *haor* area that contains more than ten *beels*. *Boro* is the only crop in the area. Before the project, it was damaged by pre-monsoon floods in most years. The project was identified by BWDB and was constructed under EIP. In 1987, construction began and in 1989 implementation was complete.

Submersible embankments: The western and southern road-cum-embankments are in generally good condition. Routine maintenance work is required for the newly constructed BWDB submersible embankment. The embankment was reportedly cut in 1990 by individual farmers at two locations. One cut was made by an influential farmer to drain his land. The other cut was made for low lift pump irrigation. Both were repaired before any flood damage to crops.

Structures: The three-vent Nawtana Regulator has not properly worked since construction. There is continuous water/leakage into the haor. Therefore local people in the haor constructed another small dyke after the sluice.

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Fishery resources

April and May are the breeding season of most of the commercially important fishes. During one field visit a KONAJAL was observed being operated at the mouth of the regulator. In a single netting about 5-6 kg fish were caught. The species caught were Pabda (no eggs or milt), Tengra (with eggs and milt), Golda Chingri (no eggs), Chapila (no eggs or milt) and Kachki (very small fry). Probably the fishes were gathered there to migrate into the haor for breeding and were easily caught by the fishermen with the fine meshed net.

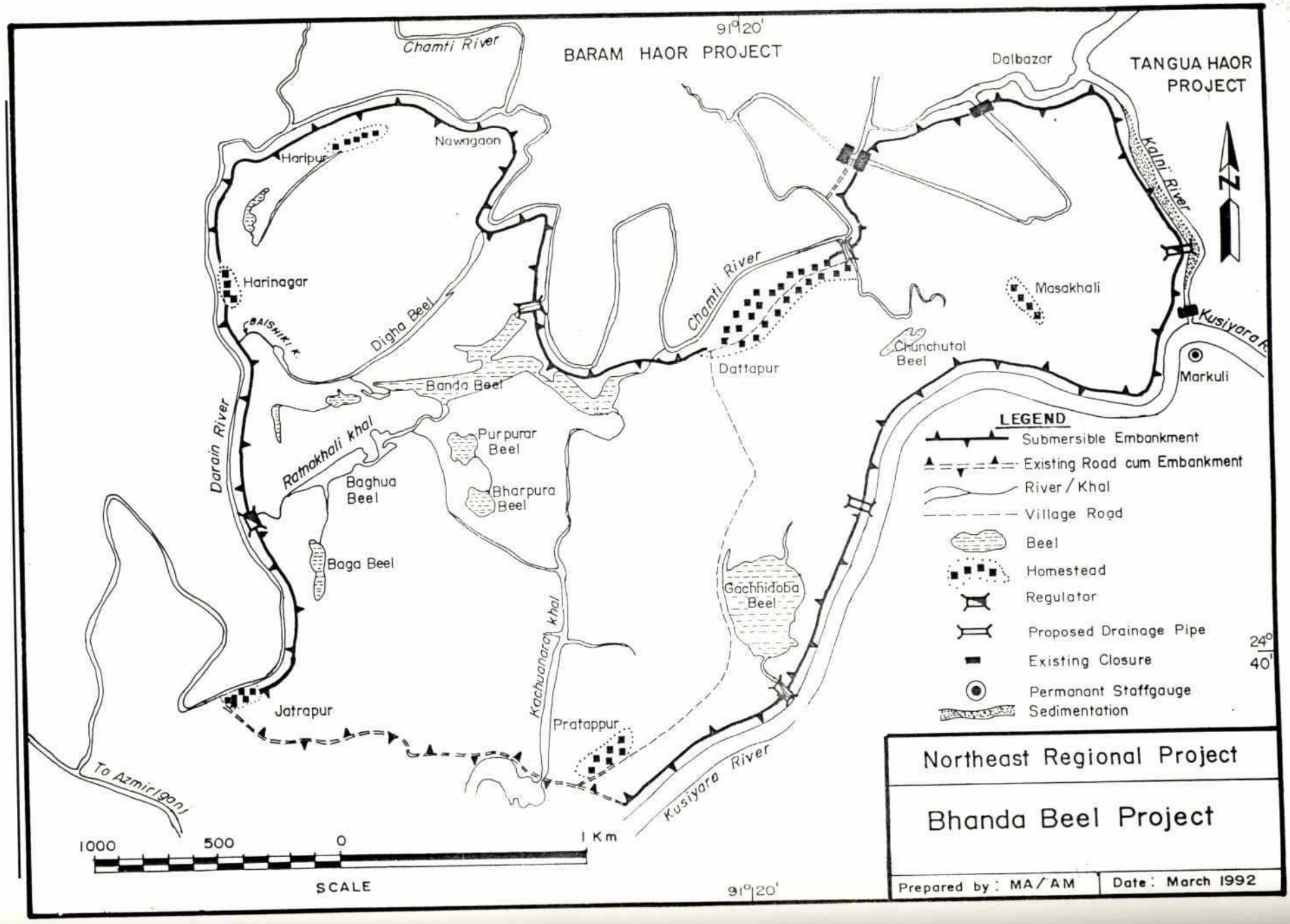
Fishing practices

There is a large fishery organization in the area named Roail Beel Fishery which is managed by *Monika Matshajibi Samabaya Samity* (Monika Fishermen's Co-operative Society). The society's objectives are to establish a commercially viable organization and to increase fish production, through investment and better management.

Production trends and project impacts on fisheries

Due to water restriction, fish populations within the haor have been severely reduced. Fish abundance seems to be less in 1991/2 than in previous years, and local people believe that this is due to fish disease.

There are several FCDI projects in the Derai and Sulla areas, including the Nawtana fishery. Fishermen and the lessee maintain that FCD/I projects have negative impacts on fisheries as they have restricted the breeding migration during the early monsoon and the overwintering migration during the flood recession period. But a positive impact of submersible embankments on fisheries is that they protect against the inflow of silt into beels during the early flood period.


91°20'
BARAM HAOR PROJECT
TANGUA HAOR PROJECT
Chamti River
Dalbazar
Haripur
Nawagaon
Harinagar
BAISNIKI K.
Digha Beel
Chamti River
Kalni River
Masakhali
Kusiyara R.
Chunchutal Beel
Dattapur
Markuli
Banda Beel
Darain River
Ratnakhali khal
Purpurar Beel
Baghua Beel
Bharpura Beel
Baga Beel
Gachhidoba Beel
Kachuanara khal
Jatrapur
Pratappur
To Azmiriganj
Kusiyara River
LEGEND
Submersible Embankment
Existing Road cum Embankment
River / Khal
Village Road
Beel
Homestead
Regulator
Proposed Drainage Pipe
Existing Closure
Permanant Staffgauge
Sedimentation
24° 40'
1000 500 0 1 Km
SCALE
91°20'
Northeast Regional Project
Bhanda Beel Project
Prepared by : MA/AM
Date : March 1992

L.1.6 BHANDA BEEL PROJECT

Project location and general data

District: Sunamganj
Thana: Sullah
Project Type: Partial flood control, drainage, and irrigation
Status: Began 1987, completion scheduled for 1993
Gross area: 4,000 ha
Net area: 3,600 ha
Population: 17,200

Environment and engineering works

Hydrology: The project area is bordered by the Kalni River to the east, Chamti River to the north, Darain River to the west, and Kushiyara River to the south. The Kalni branches off from the Old Surma River (not shown - off map to the northeast). The Kalni drains southwest into the Chamti River; previously (before the Kalni was closed near Markuli), the Kalni drained south-east into the Kushiyara River. The Chamti is the main drainage channel for the project area. It flows into the Darain which, in turn, flows into the Kushiyara below Azmiriganj. Chamti flow is seasonal but it has navigable depth due to backwater from the Kushiyara River. According to the SDE Hydrology, Sylhet, the main sources of Chamti flow are Bhatta Khal (not shown on map) and the Old Surma River. Flow in these channels, which are silted up, is seasonal, but backwater from the Kushiyara fills most sections. In the Kushiyara adjacent to the project, most of the flow comes from the Suriya River (off map to the east). Upstream of the project (and a few kilometres downstream from Sherpur gauging station [175]), the Kushiyara bifurcates into the Bibiyana and Suriya Rivers. These rejoin just upstream of Markuli closure. BWDB officials and local people say that most of the flow is currently passes through the Suriya since the Bibiyana is silted up. People involved in breach repair (see below) say that in recent years Kushiyara water levels have increased substantially. In 1990, the submersible embankment (completed 1990-1) was overtopped before the *boro* harvest. The design crest level is 6.93 m PWD at Dal Bazar, 6.70m PWD at Nawagaon and 6.57m PWD at Jatrapur. After the 1990 event, EIP reviewed the levels and has revised them to 7.40 m PWD for the entire embankment.

Water bodies: The haor is in a deeply flooded area. It has several permanent and semi-permanent beel/jalmohals of which the following are the most significant: Bhanda beel, Gasherdohor, Boga beel, Purpurar beel and Bharpura beel. The Kushiyara River bears more silt than the other rivers. As a result more sediments are deposited where Kushiyara water directly enters into the haor and beels. The Bhanda beel is far from the Kushiyara River (but adjacent to the Chamti River) and the water colour is transparent to reddish green.

Project concept and history: The project objective is to provide rapid post-monsoon drainage to allow early planting of *boro* crops and to protect *boro* crops from pre-monsoon flash floods. Pre-monsoon flash floods occur in April and May whenever heavy rains fall in the area and in Meghalaya State in India. The area is deeply flooded to 1.5-6 meters in the monsoon season. Most of the area is single-cropped: *boro* in the lower areas and *aman* on the higher land along the project boundary. Project infrastructure consist of: 32 kilometres of submersible embankment; compartmental bunds; one regulator; five pipe sluices; and 20 low lift pump irrigation inlets.

The regulator will be provided with a boat transfer facility. The project was identified by the BWDB (Sylhet O & M Division) in 1987 and, after an EIP appraisal mission, included in the 1987-8 EIP program. Project completion is scheduled for 1992-93. The submersible embankment is complete (constructed during the 1987-8 through 1990-91 construction seasons). All 20 irrigation inlets have been installed. Construction of the regulator and two pipe sluices has begun; completion is scheduled for 1991-92.

Submersible embankments: Generally the embankment is in good condition and requires only routine maintenance work. One public cut was observed near Harinagar village. Local people say the cut was made to drain the area. They request provision of a drainage structure at this location. In the 1991 monsoon season, a breach occurred near Kachuanara Khal in the Jatrapur-Protappur road embankment, which forms the southernmost part of the project embankment. The breach was enlarged by floodwater from the Kushiyara after intense rainfall beginning on 25 Dec 1991. Local people tried to close the breach to save *boro* seed beds and recently planted crops. They state that the embankment was not constructed to proper section and request an immediate repair. They also indicate that breaches are a regular occurrence. Another breach was observed during the field visit just downstream of the Markuli closure. Silt from the Kushiyara entering the project area caused severe sediment deposition 1.0-1.5 m thick, particularly in the drainage basin of the pipe sluice near the Markuli closure. The pipe sluice itself is completely blocked by silt. BWDB officials state that the embankment on the Kushiyara right bank near Markuli should be raised because of increased Kushiyara water levels. They say that the increased flow caused a new channel to develop (location unknown), which they had to close. And they say that water levels have increased due to siltation of the Kushiyara below Ajmiriganj, and by the construction of a low embankment along the Kushiyara left bank.

Regulators and pipe sluices: The project plan calls for one regulator and five pipe sluices. During the field visit to Ratnakhali Regulator the contractor's representative said that more than 50% of the work has been completed and that the remainder should be completed in 1991-92. BWDB officials say that EIP has approved only four of the five planned pipe sluices, and that two will be completed in 1991-92.

Irrigation inlets: About 20 irrigation inlets have already been installed. During field enquiries local people said these inlets are mostly installed at locations where low lift pumps are to be used. Some of the inlets are in use.

Fishery resources

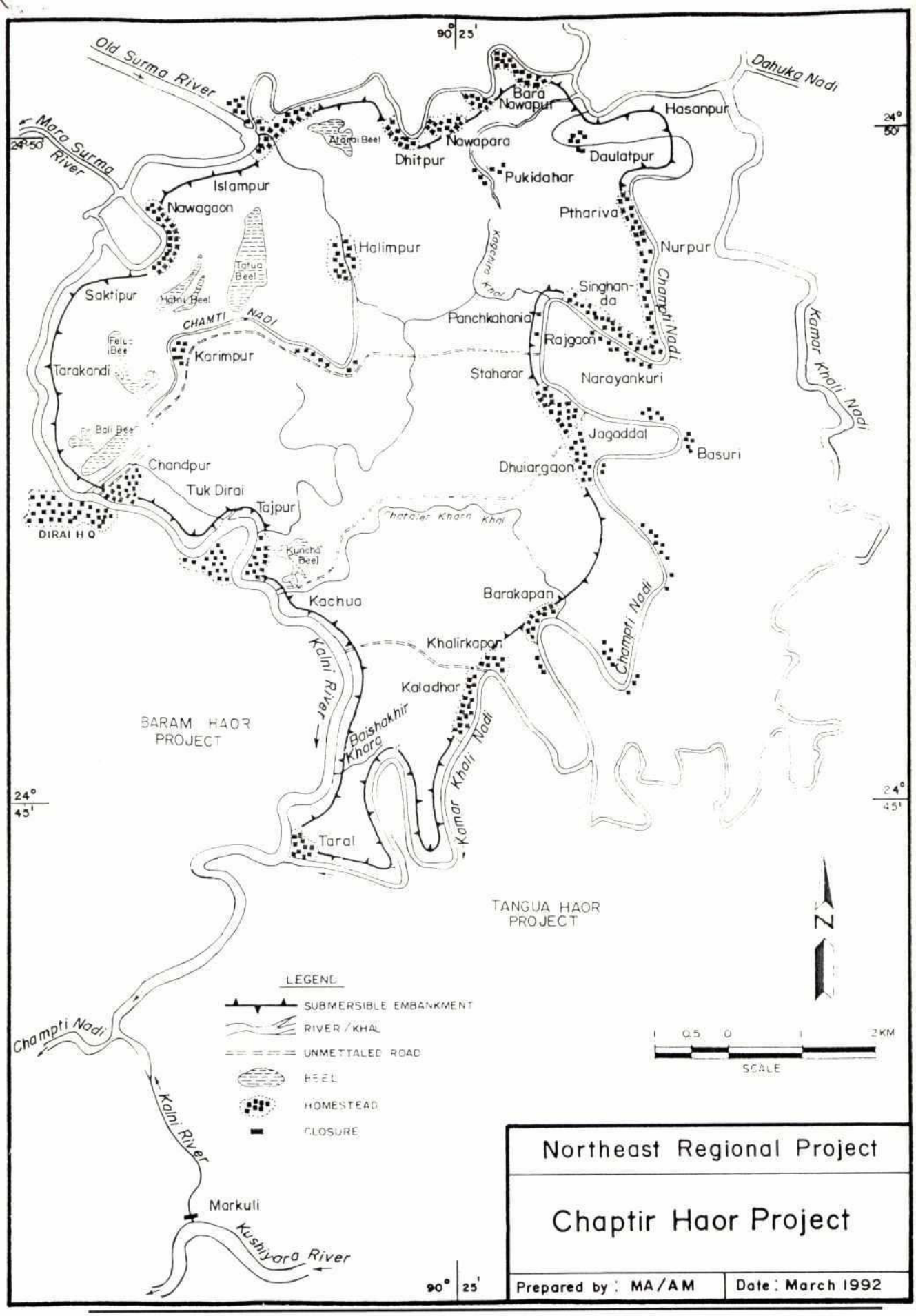
Mainly smaller species occur in Bhanda beel. The most important are Bacha, Tatkini, Chanda, Icha, Puti, Mola, Pabda, Batashi, Chapila and Taki.

Fishing practices

Only Bhanda beel has a pile fishery. Within Bhanda beel there are eight khaws. The present lessee harvests the khaws in December. The *beels* are now leased under open auction and the public are generally forbidden to fish in them. Subsistence fishermen around Protappur village say that lease-holders sometimes permit them to catch fish in the *beels* but that 50% of their catch must be given to the lease-holder.

Production trends and project impacts on fisheries

Construction of submersible embankment was completed in 1991, but the regulators have not been fully completed. Lessee of the Bhanda beel mentioned that until now there is no significant impact on fisheries due to the construction of the embankment. But the proposed drainage structures may create a problem for fish migration in the future.


90° 25'
Old Surma River
Mara Surma River
24°50'
Dahuka Nadi
Bara Nawapur
Hasanpur
24° 50'
Atarai Beel
Nawapara
Dhitpur
Daulatpur
Pukidahar
Islampur
Nawagaon
Pthariya
Halimpur
Kaoshia Khal
Nurpur
Tatua Beel
Singhan-da
Champti Nadi
Saktipur
Kalni Beel
CHAMTI NADI
Panchkahania
Kamar Khali Nadi
Felu Beel
Rajgaon
Karimpur
Tarakandi
Staharar
Narayankuri
Bali Beel
Jagaddal
Basuri
Chandpur
Dhuiargaon
Tuk Dirai
Tajpur
DIRAI H O
Kunicha Beel
Barakapan
Kachua
Champti Nadi
Khalirkapan
Kalini River
Kaladhar
BARAM HAOR PROJECT
Baishakhir Khara
Kamar Khali Nadi
24° 45'
Taral
TANGUA HAOR PROJECT
N
LEGEND
SUBMERSIBLE EMBANKMENT
RIVER / KHAL
UNMETTALED ROAD
BEEL
HOMESTEAD
CLOSURE
1 0.5 0 1 2KM
SCALE
Champti Nadi
Kalini River
Markuli
Kushiyara River
90° 25'
Northeast Regional Project
Chaptir Haor Project
Prepared by : MA/AM
Date : March 1992

L.1.7 CHAPTIR HAOR PROJECT

Project location and general data

District: Sylhet
Thana: Dirai
Project Type: Partial flood control
Status: Under construction
Gross Area: 4,453 ha
Net Are: 3,642 ha
Population: 22,700

Environment and engineering works

Hydrology: The Dahuka Nadi, which is called Bhatka Khal at its upstream end bifurcates into the Kamar Khali Nadi and the Champti Nadi. The Dahuka Nadi is a distributary of the Surma River and sediment deposition has taken place at its off-take. The Kamar Khali Nadi, which formerly drained to the Kushiyara River in the south, silted up near its outfall and is currently flowing into the Kalni River. The Kalni River was closed near Markuli in 1978. The closure induced sediment deposition in the river channel. The flow direction of the Kalni River subsequently reversed and currently the flow is through the Champti Nadi which has a smaller cross-section than the Kalni River. The Sub-Divisional Engineer, BWDB, Sylhet has stated that sediment deposition has occurred at the off-take of the Bhatta Khal and old Surma River. The rivers now do not have perennial flow though water remains in most sections due to backwater from the Kushiyara River.

Water bodies: Fishermen around Chataler Khara have stated that most of the project area becomes dry during the winter, and there are no large permanent water bodies.

Project concept and history: The Project concept was to protect the *boro* crop from early flash floods through the construction of embankments and to provide adequate drainage facilities by constructing regulators. About 35 kilometres of submersible embankment have been constructed but no hydraulic structures have been built to date. Chaptir Haor floods during the monsoon to depths ranging from 1.5 metres to 4.5 metres. The main crop grown is local *boro*. Originally a low embankment was constructed by the Thana council under the Food For Work program. In 1976, the project was handed over to BWDB to be included as a part of the Haor Development Program in Sunamganj District. Embankment re-sectioning started in 1977 with GOB financing but work was suspended in 1978 after completion of 35 kilometres of embankment due to financial constraints. However, the project was declared complete. To date, no hydraulic structures have been constructed. The project is to be rehabilitated and upgraded under the System Rehabilitation Project, Cycle-B (Credit No 2099/BD), with IDA and EEC financing. Since 1980, maintenance of the embankment is being carried out under the Food For Work program.

Submersible embankments: BWDB reported that the embankment of Chaptir Haor mostly follows the original alignment set by local authorities with the result that the set-back distance from the peripheral rivers is inadequate. The original alignment was maintained to minimize land acquisition costs. The embankments will likely need to be retired at some locations.

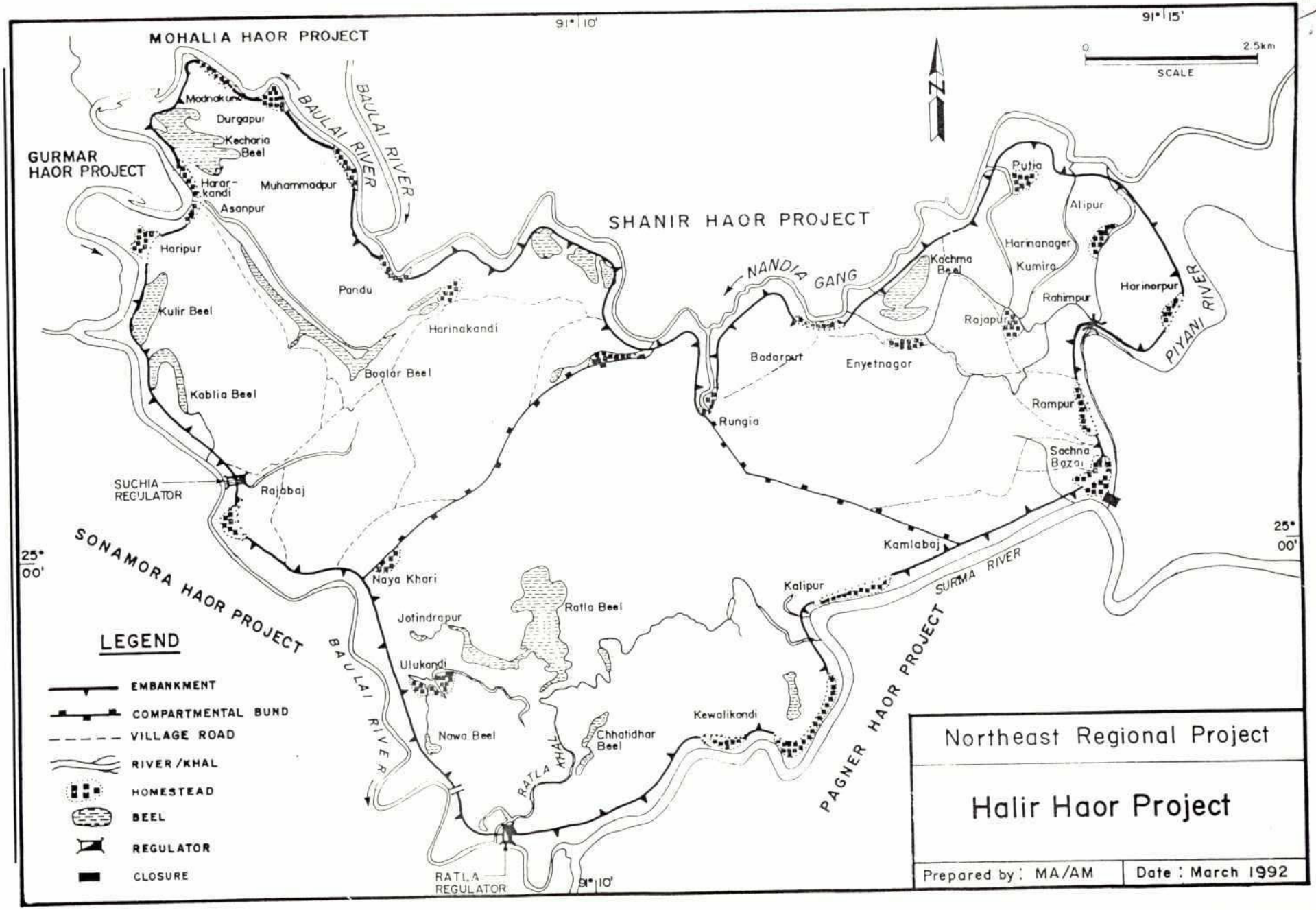
BWDB also indicated that the design crest elevation of 7.30 metres PWD requires re-evaluation as it was overtopped in April 1990. However, it was decided to continue with the present embankment design until the results of the North East Regional Project studies are available. From Tuk Dirai to Taral, local people and BWDB official have reported that the embankment along this section is subjected to severe wave action. Several breaches or public cuts were observed along this section. Reportedly the project has about 18 cuts mostly made to drain out standing water. Farmers throughout the project have requested the construction of drainage structures.

Fishery resources

Mainly small fish species occur in the area.

Production trends and project impacts on fisheries

Local fishermen state that the project does not have any adverse impact on the existing fish resources.


MOHALIA HAOR PROJECT
GURMAR HAOR PROJECT
SHANIR HAOR PROJECT
SONAMORA HAOR PROJECT
PAGNER HAOR PROJECT
91° 10'
91° 15'
25° 00'
N
0 2.5km
SCALE
Modnakuna
Durgapur
Kecharia Beel
Harar-kandi
Muhammadpur
Asanpur
Haripur
Kulir Beel
Kablia Beel
Pandu
Harinakandi
Boalar Beel
BAULAI RIVER
SUCHIA REGULATOR
Rajabaj
NANDIA GANG
Kachma Beel
Putia
Alipur
Harinanager
Kumira
Rahimpur
Harinerpur
Rajapur
PIYANI RIVER
Badarpur
Enyetnagar
Rungia
Rampur
Sachna Bazar
Kamlabaj
Kalipur
SURMA RIVER
Naya Khari
Jotindrapur
Ulukandi
Ratla Beel
Nawa Beel
RATLA KHAL
Chhatidhar Beel
Kewalikandi
RATLA REGULATOR
LEGEND
EMBANKMENT
COMPARTMENTAL BUND
VILLAGE ROAD
RIVER /KHAL
HOMESTEAD
BEEL
REGULATOR
CLOSURE
Northeast Regional Project
Halir Haor Project
Prepared by : MA/AM
Date : March 1992

L.1.8 HALIR HAOR

Project location and general data

District: Sunamganj
Thana: Jamalganj and Tahirpur
Project Type: Partial flood protection
Status: Completed
Gross Area: 7,325 ha
Net Area: 6,680 ha
Population: 26,600

Environment and engineering works

Hydrology: The Project area is bordered to the north by the Nandia Gang and Baulai Rivers, to the west by the Baulai River, to the east by the Piyani River, and to the south by the Surma River. The Nandia and Piyani Rivers originate from the Ratki River to the northeast of the project. The Piyani Rivers outfall into the Surma River has been closed so water now flows from the Rakti River via the Nandia Gang River into the Baulai River and finally into the Surma River below Jamalganj. This may be resulting in increased water levels in these rivers and may account for premature overtopping of the embankments. Both the Baulai and Rakti Rivers originate from the Jadhukata River. Sediment deposition at their off-takes has resulted in the channels drying up during the winter months.

Water bodies: The project has several permanent water bodies including Ratla Beel, Boala Beel, Kuraijan Beel, Chatidhara beel, Hawarma group fishery, Netuar dubi, Ramarkuri and Bodhair kuri. Hizol/koroch gardens exists around the following villages: Rahimapur, Kirddatpur, Sujatpur, Kawa, Pirizpur, Bahadurpur, Bhutiarpur, Sukhair, Duanoi, Kathalia, Alipur, Gopalpur.

Project concept and history: The Project aims to protect *boro* crops from pre-monsoon flooding. Halir Haor floods to depths ranging up to 6 meters during the monsoon season. The area is mostly single cropped with local *boro*. Before project implementation, the *boro* crop was damaged almost every year by pre-monsoon flash floods. To protect the *boro* crop, 53 kilometers of submersible embankments were constructed. Two regulators were placed in the embankment to facilitate post-monsoon drainage and flush water into the *haor* basin following *boro* harvest. Low embankments were initially constructed by the local authorities. BWDB started embankment construction in 1977 using GOB resources and the embankments were completed in 1984. Construction of the two regulators was started in 1984 and was financed under IDA credit 955-BD. They were completed in 1987. Since completion, embankment maintenance is being carried out under the Food For Work program.

Submersible embankments: The northern submersible embankment is generally in good condition except for a few breaches. Local people have stated that the embankment from Enayetpur to Putia village is most critical as it breaches every year. Reportedly, the embankment is overtopped before the *boro* harvest and the breaches occur in the process of the embankments being overtopped. There is a public cut in the embankment at Alipur village which was made to improve drainage at that point. The submersible embankments on the other sides of the project are also in good condition, and require only routine maintenance work. It was also reported here that the embankment overtopped at several locations before the *boro* harvest and farmers

throughout the project have requested that the embankments be raised. The section of embankment from Sachna Bazar to Alipur village has been upgraded by the upazila authority and is now also used as a road.

Compartmental bunds: There are a number of compartmental bunds in the project area, initially constructed by local farmers. One such bund (Kamlabaj to Badarpur) is being rehabilitated by the BWDB. The Contractor reported that construction of the bund will be completed by March 1992. Local farmers have stated that there are other bunds which require rehabilitation. The bunds are designed to retain water for land preparation and to facilitate irrigation.

Structures: There are two regulators included in the project and both are in good structural condition. However, the regulators are fitted with fall-boards. People report that the boards leak profusely and are very difficult to operate under pre-monsoon flood conditions. It was observed on 22 January 1992, that the structures were open, but were not draining due to high water levels in Baulai River. Local people reported that the Baulai river water levels are higher because its bed level has increased.

Fishery resources

Species abundance greater area is as follows:

Table L5: Abundance of Different Groups of Fish

Chotomaach	Boromaach
Percent of the total :70%	Percent of the total:30%
Baim,Kaikka-15% Shoal,Gazar-10% Tengra-5% Kechki-5% Rani-5% Bheda-5% Pabda-5% Icha-5% Other misc.-45%	Carp-40% Catfish-50% Chital-10%.

Table L6: Degree of Abundance of Different Fish Species

High	Medium	Low
Rui, Ghonia, Kalibaus, Boal, Ghagot, Pabda, Kanla, Garua, Laso, Kaikka, Circa, Baim, Kechki, Chapila, Chanda, Shoal, Gazar, Bheda, Koi, Shingi, Magur, Puti	Mrigel, Air, Guzi, Gang magur, Chital, Batashi, Bacha, Mola, Rani, Shilon	Bagair, Catla, Ilish, Poa, Pangas, Baashpata, Bailla, Golda chingri

Chatidhara beel is famous for carp and large catfish.

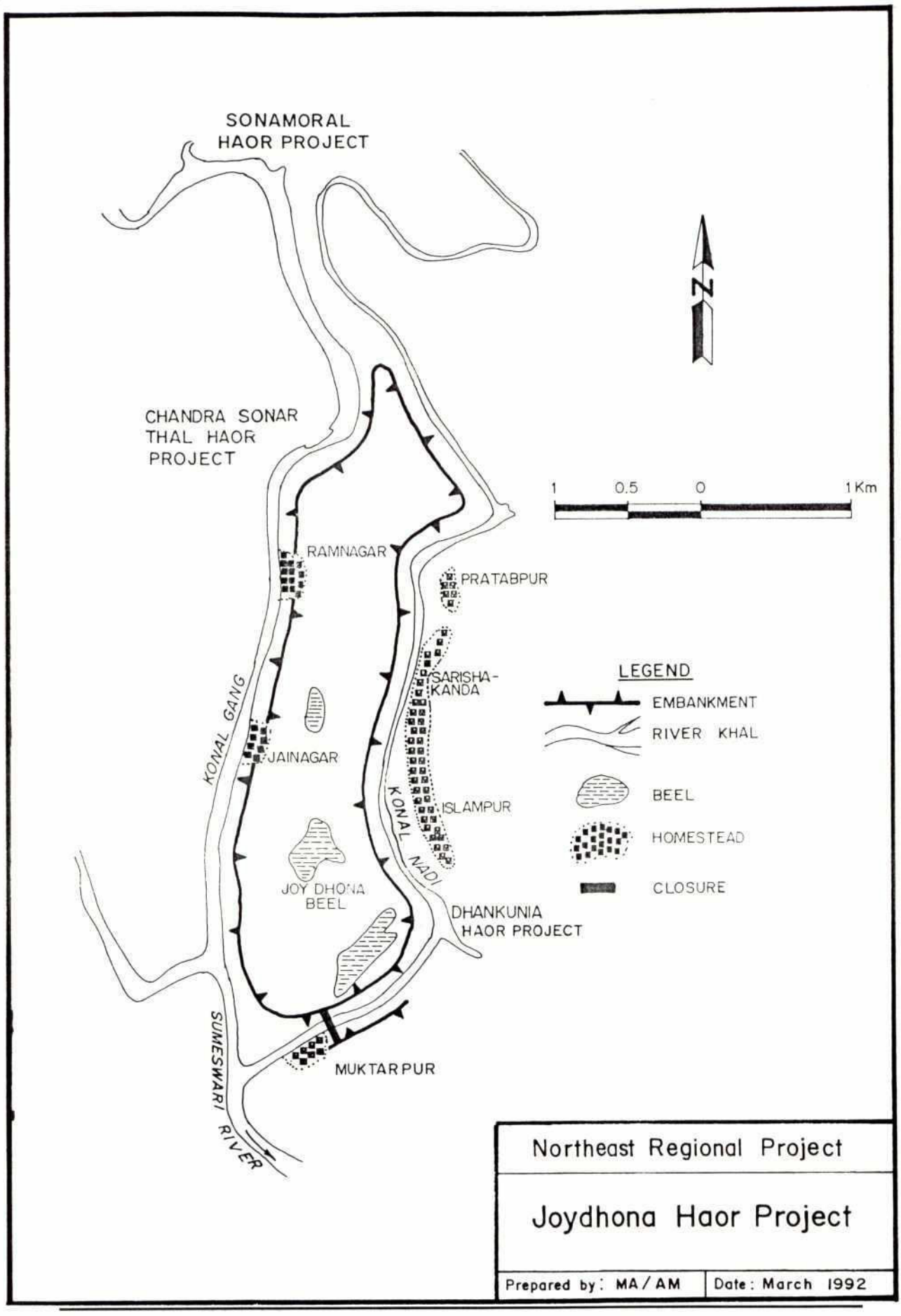
Fishing practices

The *beels* are now leased under open auction for a period of three years and the general public is forbidden to fish in them.

Production trends and project impacts on fisheries

The Chatidhara Fishery Group which leases Ratla Beel and the adjacent small *beels* have reported that the project has no negative impact on the fishery resources. However, other fishermen, a lessee and the TFO maintain that the overall fish production in the area has declined by 40-50% over the last ten years due to the following causes:

- Overfishing and annual fishing
- Rapid deforestation within the haor area due to expansion of agricultural land and fuel crises
- Siltation which reduces water retention capacity of the jalmohals (Bolhor beel has been silted up by this process). It is anticipated that sediment deposition in the beels will further affect fisheries.


SONAMORAL
HAOR PROJECT
CHANDRA SONAR
THAL HAOR
PROJECT
N
1 0.5 0 1Km
RAMNAGAR
PRATABPUR
SARISHA-
KANDA
JAINAGAR
KONAL GANG
KONAL NADI
ISLAMPUR
JOY DHONA
BEEL
DHANKUNIA
HAOR PROJECT
MUKTARPUR
SUMESWARI RIVER
LEGEND
EMBANKMENT
RIVER KHAL
BEEL
HOMESTEAD
CLOSURE
Northeast Regional Project
Joydhona Haor Project
Prepared by: MA / AM
Date: March 1992

L.1.9 JOYDHONA HAOR PROJECT

Project location and general data

District: Sunamganj
Thana: Damapasha
Project type: Partial flood control and drainage
Status: Declared complete, 1980
Gross Area: 1,330 ha
Net Area: 1,214 ha
Population: 4,000

K.1.9.2 Environment and engineering works

Hydrology: Joydhona Haor is bounded by rivers on all four of its sides. The Konal Gang forms the west project boundary. The river drains three beels inside Sonamoral Haor Project: Chhata Beel, Bara Beel and Sonamoral Haor. The beels are interconnected and together drain to the Konal Gang River through a regulator in the Sonamoral Project embankment. Once outside the Sonamoral Project the Konal Gang flows in a southerly direction and joins Someswari River at the south-west corner of Joydhona Haor Project. The Konal Nadi River forms the northern,eastern,and southern project boundaries. It originates from Sukhair Beel which is also inside Sonamoral Haor. The Konal Nada drains from the beel through a regulator in the Sonamoral embankment then alongside the project and joins the Someswari River at the southern most point of the Joydhona Haor Project. Farmers have complained that there are no well defined internal drainage channels. Both BWDB officials and local farmers have reported that water levels in the peripheral rivers have increased in recent years. This may be due to sediment deposition at the outfall of the Someswari River.

Water bodies: The project area contains a few small beels which generally become dry during winter. The Konal Gang on the western side of the project is relatively deep.

Project concept and history: The project concept was to protect the boro crop from pre-monsoon flash floods with 12.5 kilometres of submersible embankments around the area. The initial plan included the building of regulators for flushing and drainage, but due to budget constraints no hydraulic structures have been built to date. During the monsoon season, Joydhona Haor floods to depths ranging from 2.0 m to 6.0 m. Project infrastructure was not designed to have any impact on these maximum flood depths. Low embankments were initially constructed by the local authorities under a FFW program and were then handed over to BWDB as a part of the Haor Development Program for Sunamganj District. BWDB completed construction of the submersible embankments but due to lack of funds, construction was suspended (without building hydraulic structures) and the project was declared complete. BWDB are maintaining the embankments through FFW programs. A proposal has been submitted for completion of the project under the System Rehabilitation Project (Credit No 2099/BD) with financing by IDA and EEC.

Submersible embankments: Current embankment maintenance began in late Jan 92 and is scheduled for completion in mid-Mar 92. A design crest elevation of 6.10 meters PWD is reportedly being used for maintenance work. The embankment was overtopped in 1990 and 1991

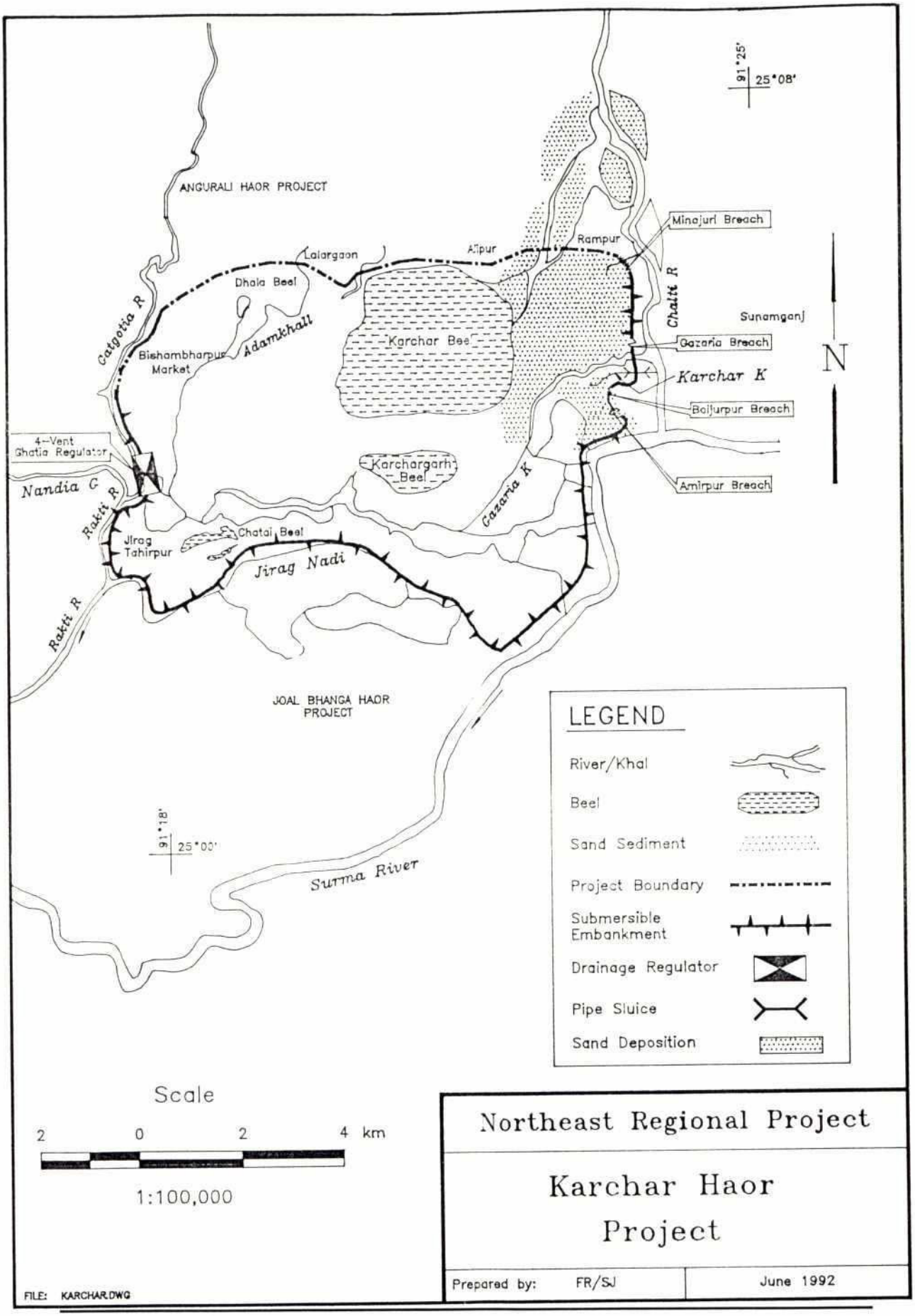
before harvesting. Local farmers have requested that the embankment be raised. Farmers have made one public cut on the western side of the project to drain the *haor*. There are a few breaches in the eastern embankment reportedly caused by wave action and overtopping. There are no water control structures.

Fishery resources

The relatively deep Konal Gang reportedly contains many carp.

Production trends and project impacts on fisheries

Local people consider that the project to date has had no impact on fisheries.


91°25'
25°08'
ANGURALI HAOR PROJECT
Minajuri Breach
Rampur
Alipur
Lalargaon
Dhala Beel
Catgotia R
Chalti R
Sunamganj
Karchar Beel
Gazaria Breach
Bishambharpur Market
Adamkhali
Karchar K
N
Baijurpur Breach
4-Vent Ghatia Regulator
Karchargarh Beel
Amirpur Breach
Nandia C
Rakti R
Gazaria K
Chatai Beel
Jirag Tahirpur
Jirag Nadi
Rakti R
JOAL BHANGA HAOR PROJECT
91°18'
25°00'
Surma River
LEGEND
River/Khal
Beel
Sand Sediment
Project Boundary
Submersible Embankment
Drainage Regulator
Pipe Sluice
Sand Deposition
Scale
2 0 2 4 km
1:100,000
FILE: KARCHAR.DWG
Northeast Regional Project
Karchar Haor Project
Prepared by: FR/SJ
June 1992

L.1.10 KARCHAR HAOR PROJECT

Project location and general data

District: Sunamganj
Thana: Bishambharpur Sunamganj
Project type: Partial flood protection
Status: Completed 1968
Gross area: 7,770 ha
Net area: 6,600 ha
Population: 37,000

Environment and engineering works

Hydrology: The project is bounded in the east by the Surma and Chatli Rivers, in the south by the Jirag Nadi, and in the west by the Gatgotia and Rakti Rivers. The Chalti originates in Meghalaya State and flows into the Surma near Amirpur. In the recent past, the Chalti silted up both near the international boundary and at its outfall. The Jirag Nadi branches off the Rakti. It is a seasonal river that has silted up badly in the recent past. The Rakti branches off from the Jadukata River in the north and flows into the Surma in the south. Both offtake and outfall have silted up recently. The Gatgotia branches off the Dhamalia River a few kilometres upstream of the project's western corner. The Gatgotia flows into the Rakti near Jirag Tahirpur village. The Gatgotia is perennial; its dry season discharge used to flow through the Rakti, but now it flows through Nandia Gang, due to the siltation at the Rakti outfall.

Water bodies: The haor is fed by the Karach River, where holds water year round. There is only one outlet/inlet (the sluice gate). Near Laopur village the original passage of the Karoch river was blocked by the BWDB embankment. Important jalmohals within the area are:

Table L7: Status of Important Jalmohals in Karchar Haor

Jalmohal	Condition	Main Species
Boishardair	Seasonal	Smaller species
Chonna bonna	Seasonal	Smaller species
Laiya gazaria	Annual	Kalibaus, ghonia
Karcha nadi	Annual, Pile	Rui, kalibaus, boal, chapila, pabda, ghonia
Shingirdair	Seasonal	Smaller species
Chatol beel	Seasonal	Smaller species
Pathardair	Seasonal	Smaller species

Water colour varies from area to area. Near the Chalti River, water was highly turbid, whereas in the Rakti River area water was transparent to slightly greenish. There exists an approximate correlation between water color and fishing gear deployment:

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Table L8: Existing Correlation between Water Colour and Fishing Gear

Water Color	Conditions	Gear Used
Transparent	No current, submerged and emergent plabts	Current jal, ber jal
Greenish	No current, no aquatic vegetation	Borshi, chai
Muddy	With current, without weeds	No fishing

On the banks of the Rakti River and the Ghagotia River, about 100 hizal and 10-15 koroch trees are present. The hizol-koroch gardens are owned by the local mosque and maintained properly by the management.

Project concept and history: The project objectives were: (i) to protect *boro* crops from pre-monsoon flash floods up to 15 May by providing 39 kilometres of submersible embankments around the east, south, and west of the area, and in the north to link broken higher land there, and a four-vent flushing/drainage regulator in the southwest; and (ii) to allow entry of irrigation water through a pipe sluice in the eastern embankment. The Karchar Haor area is deeply flooded during the monsoon season to 1.0 - 6.0 meters. The area's northern boundary is about 7 kilometres from the Meghalaya hills. The area is mainly single cropped to local *boro*. Before the project, the *boro* crop was damaged by pre-monsoon flash floods almost annually. This is one of the older projects in the Sunamganj area, implemented by the East Pakistan Irrigation Ministry in 1967-68. BWDB now maintains and manages the project through its Sunamganj Division Office.

Submersible embankments: The project is bounded in the east, south, and west by embankments, and in the north by broken higher ground with numerous villages, joined by a low embankment used as a footpath. In the eastern embankment, four major breaches were observed:

- Bajurpur breach: formed in 1991, about 100 m long, 1.5 kilometres north of Bajurpur village. Large scour hole, but no sand deposition.
- Amirpur breach: formed in 1991, 160 m long, close to Amirpur village. Sand deposition on about 10 ha.
- Gazaria breach: formed in 1991, 200 m long, at the offtake of the Gazaria River from the Chalti. Sand deposition on about 600 ha (2 kilometres X 3 kilometres), 2 meters deep. The Gazaria is a seasonal distributary of the Chalti. Farmers claim that breaching began after the far (east) side of the Chalti was embanked (not a BWDB embankment).
- Minajuri breach: recurs and is repaired annually, 520 m long, northeastern corner of project. Coarse sand deposition on about 100 ha.

The embankment is repaired using locally-available but easily erodible sandy material. BWDB report that often fill must be placed in wet conditions, due to insufficient funds for de-watering, and cannot be properly compacted. The eastern embankment has also been cut in several places by people living in villages outside the embankment. A flushing sluice in the eastern embankment on Karchar Khal was provided to supply irrigation water from the Chalti to the eastern part of the project. Sedimentation is a recurring problem however: in 1988, the inlet and

outlet channels had to be re-excavated, and then in 1989 they silted up again. The sluice is currently inoperable. The southern and western embankments are in better condition. A few minor breaches were observed. Along some river levees, farmers report that low (0.6 m) embankments have been constructed by BWDB under FFW. Some of these embankments have been completely eroded by overtopping. Public cuts are not a problem on these embankments (no adjacent settlements). There are no irrigation inlets in the project but there are a number of low lift pumps along the Rakti River on the southwestern side of the project (near Jirag Tahirpur village).

Regulator: A four-vent wooden regulator in the western embankment on the Ghatia near Jirag Tahirpur village was constructed in 1968 to allow the polder to be filled after the *boro* harvest and to be drained after the monsoon. The regulator is operational, but in poor structural condition. Bridge deck, aprons, and wingwalls are all badly damaged. Farmers state that the structure is too small to drain the project properly.

Fishery resources

The TFO and fishermen of the area provided the following information on fish abundance in the area:

Table L9: Abundance of Different Groups of Fish in Karchar Haor

Chotomaach	Boromaach
Percent : 70	Percent : 30
Puti-30% Koi-15% Chapila-15% Pabda-15% Tengra-15%Other-10%	Kalibaus, Ghonia-60%;Rui, Mrigel-30%;Boal, Chital-10%

Fishing practices

Table L10: Gear Based Species with Size in Karchar Haor

Gear	Habitat	Main Species Caught
Bel jal	Floodplain with submerged weed	Kalibaus (19 cm), Bheda (9 cm), Rani (6.5 cm), Puti (8 cm), Cirka (15 cm), Kaikka (23 cm), Lati (22 cm), Chela (8.5 cm), Potka (6.5 cm), Tengra (11 cm), Chanda (9 cm), Pabda (7.5 cm), Catch: 2 kg/haul. Catch value: Tk 60-65
Borshi	Floodplain without weeds	Cheng (25-32 cm), Baim (56 cm), Bheda (11-13 cm)Bait: earthworms, icha. Daily catch value: Tk 30-150
Chai	Floodplain without weeds	Tengra (11-13 cm), Bait: snail meat. Daily catch value: Tk 30-50
Thela jal	Floodplain with weeds	Icha, Puti, Mola. Daily catch: Tk 10-25
Current jal	Floodplain with weeds	Puti (9 cm), Kalibaus (16 cm), Ghonia (12 cm), Bheda (11 cm). About 70-100 nets are in operation

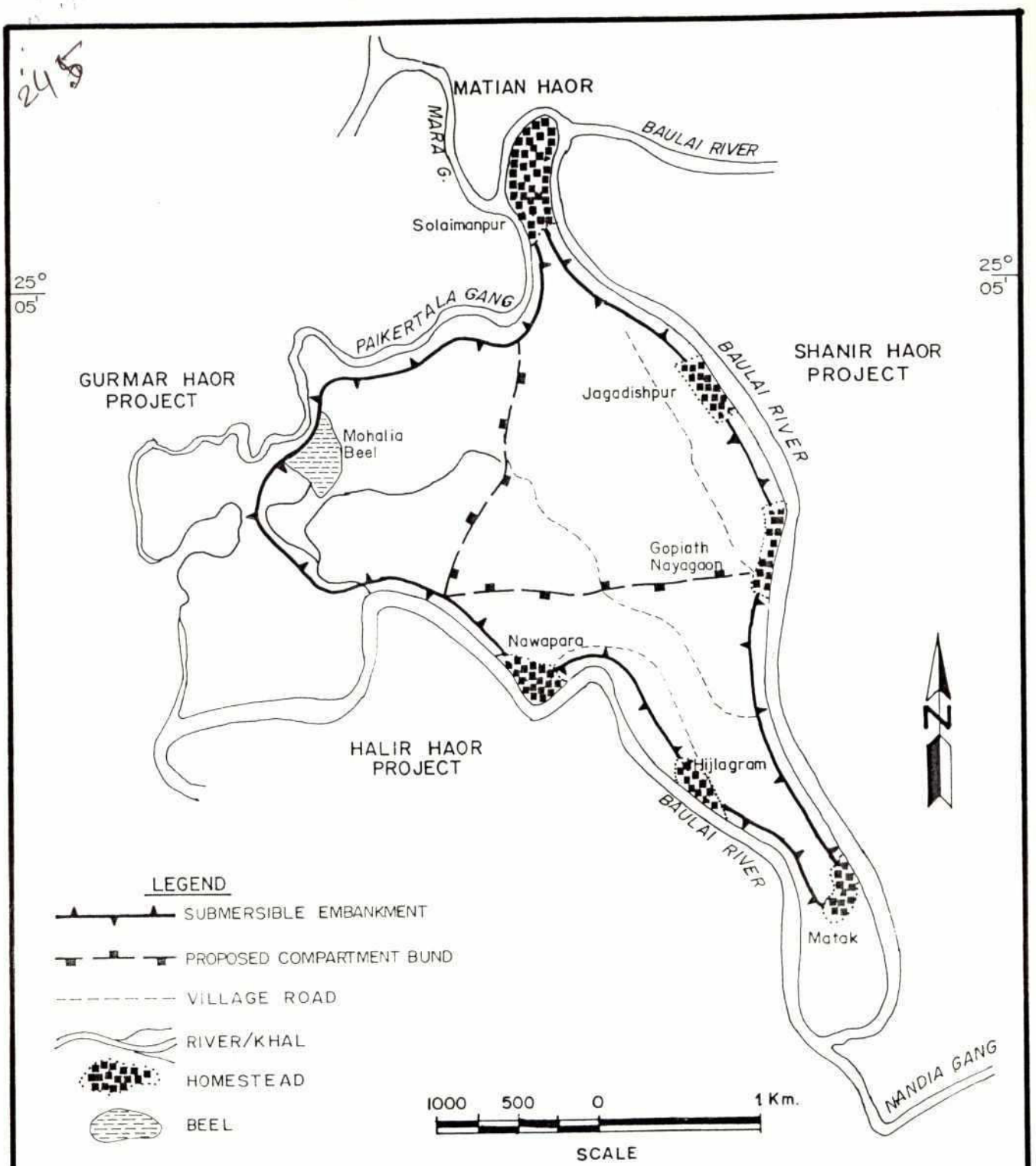
Karchar Beel is leased out by open auction for three year periods and the public is not permitted to fish in this *beel*.

Production trends and project impacts on fisheries

The Chalti River carries massive quantities of sand from the Indian hills which are deposited over large areas of Karchar haor. Local fishermen report that fish production has been severely reduced by sediment deposition in Harnur Beel and Karchar Beel. Laiya Gazaria and other jalmohals are rapidly silting up. Fisheries have not declined in Karchar beel or the western *beels* that are not affected by sand deposits from the embankment breaches.

Illegal fishing and overfishing are going on without any major control. Large numbers of current jal and bel jal are used in the open water.

Annual fishing by complete dewatering is another reason for the rapid decline of fish population in the area.



Northeast Regional Project	
Mohalia Haor Project	
Prepared by: MA / AM	Date: March 1992

L.1.11 MOHALIA HAPOR PROJECT

Project location and general data

District: Sunamganj
Thana: Tahirpur and Jamalganj
Project type: Partial flood protection
Status: Completed
Gross Area: 1,356 ha
Net Area: 1,200 ha
Population: 5,000

Environment and engineering works

Hydrology: The Project area is bordered by the Baulai river to the north, east and south, and the Paikertala river to the west (see Hydrology Area Map page XX). The Baulai river is slowly infilling with sediment in the vicinity of the project. As a result, the channel does not sufficient water for irrigating HYV *boro* crops so farmers are compelled to produce lower yielding local varieties. The Project topography is gently sloping from the northeast to the southwest. Drainage is effected through cuts in the embankment to the lower Paikertala and lower Baulai rivers.

Water bodies: Local people have reported that for the most part *beels* dry out in the winter season.

Project concept and history: The Project was constructed to protect *boro* within the haor from pre-monsoon flash floods. Mohalia Haor is deeply flooded during the monsoon season with water depths ranging from 3.0 to 6.0 meters. The area is mostly single cropped with local *boro*. The infrastructure to be constructed consisted of 15 kilometers of submersible embankments and regulators. A low embankment was initially constructed around the project by local authorities under a FFW program and the project was handed over to BWDB in 1976, as a part of Haor Development Program in Sunamganj District. BWDB started upgrading the embankments in 1977 with GOB financing and the work was completed in 1978. However, because funds were unavailable, related project components such as regulators were not constructed and the project was declared complete. Embankment maintenance is being carried out under the FFW program. There is some indication that the Project will be included in the portfolio of the Systems Rehabilitation Project (Cycle-B; Credit No 2099/BD) which is being implemented by BWDB with IDA and EEC assistance.

Submersible embankments: The project embankments are generally in good condition although there are a number of public cuts - three in the western embankment and one in the southern embankment. The public cuts are made to provide post-monsoon drainage as there are no hydraulic structures. Local farmers have requested that drainage regulators be constructed. There was reportedly one structure built in 1989 by the local authorities but it was under designed and consequently failed immediately after construction. It was never again made operational. Along some sections, the river bank is high (eg around Solaimmpur village) and no embankments are required at these locations. Reportedly, the southern embankment is breached each year by wave action at a number of locations. The southern embankment was overtopped in 1990 and

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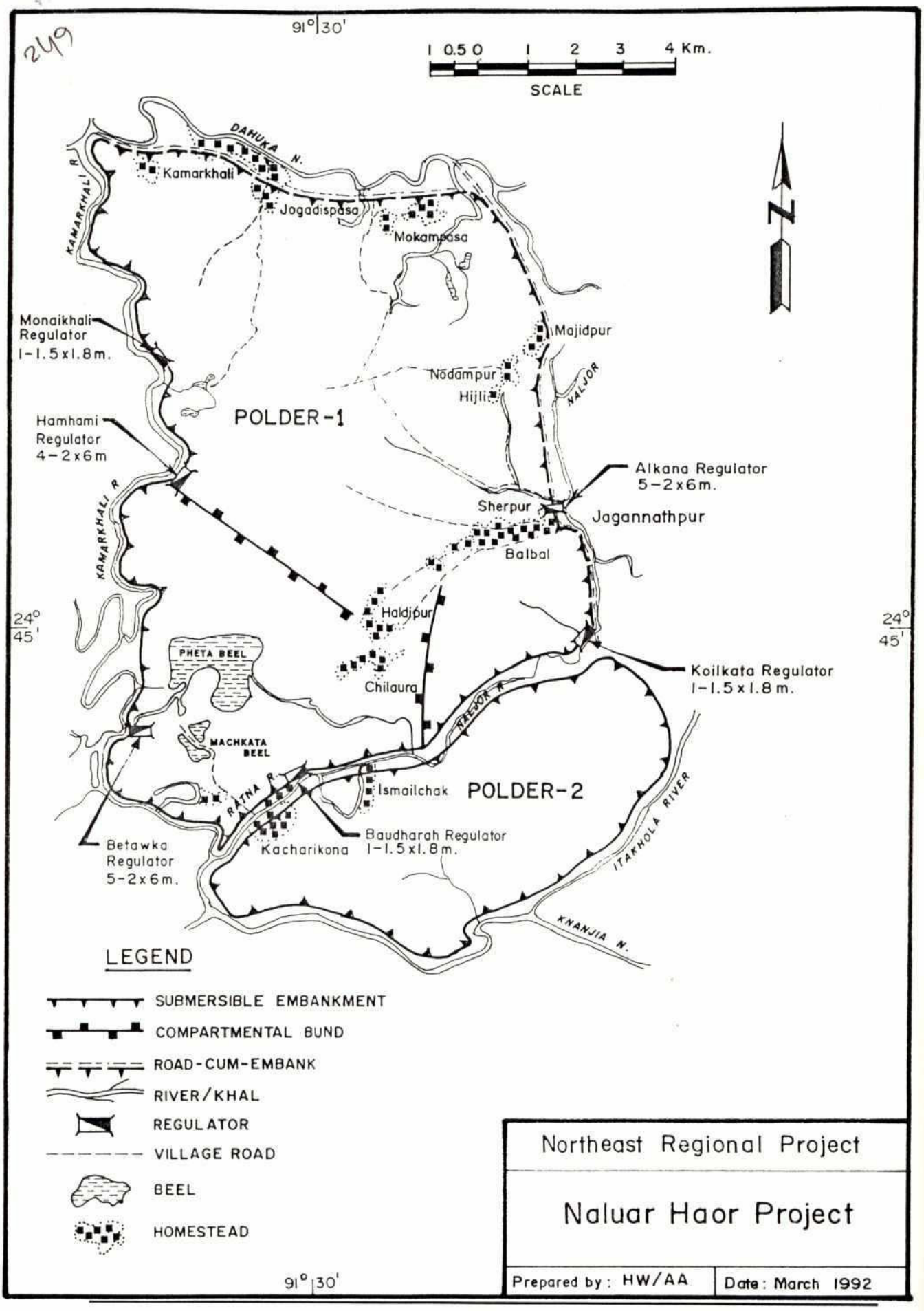
1991 before the *boro* crop was harvested. The design crest level of the embankment is 6.1 meters PWD.

Production trends and project impacts on fisheries

Due to the seasonal nature of the beels, local people do not consider the project embankments to have affected the fishery in any way.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SCALE
N
DAHUKA N.
KAMARKHALI R.
Kamarkhali
Jogadispasa
Mokampasa
Monaikhali Regulator 1-1.5x1.8m.
Majidpur
Nodampur
Hijli
NALJOR
POLDER-1
Hamhami Regulator 4-2x6m
Alkana Regulator 5-2x6m.
Sherpur
Jagannathpur
Balbal
KANARKHALI R.
24° 45'
Haldipur
PHETA BEEL
Chilaura
Koilkata Regulator 1-1.5x1.8m.
MACHKATA BEEL
RATNA R.
Ismailchak
POLDER-2
Baudharah Regulator 1-1.5x1.8m.
Kacharikona
Betawka Regulator 5-2x6m.
ITAKHOLA RIVER
KNANJIA N.
LEGEND
SUBMERSIBLE EMBANKMENT
COMPARTMENTAL BUND
ROAD-CUM-EMBANK
RIVER/KHAL
REGULATOR
VILLAGE ROAD
BEEL
HOMESTEAD
Northeast Regional Project
Naluar Haor Project
Prepared by: HW/AA
Date: March 1992

L.1.12 NALUAR HAOR PROJECT

Project location and general data

District: Sunamganj
Thana: Jagannathpur
Project type: Partial flood control and drainage
Status: Begun 1983, completion expected 1993
Gross area: 12,141 ha
Net area: 10,724 ha
Population: 57,600

Environment and engineering works

Hydrology: The area lies in the Surma-Kushiyara floodplain. It is surrounded by Surma spill channels that flow from northeast to southwest, draining into the Kushiyara; in winter, inflow from the Surma drops to zero and water levels are controlled by the Kushiyara. The spill channels are: the Kamarkhali to the west of Polder 1, the Dahuka to the north, the Naljor to the east, and the Naljor and Ratna to the south; the Itakhola lies south of Polder 2. During the pre-monsoon and monsoon seasons, Surma water levels are about 2 meters above Kushiyara levels. The Surma distributaries carry high velocity flash floods that erode the channels and their flood embankments. Towards the end of the monsoon, Surma levels fall and the flow is confined to the channel.

Water bodies: Most of the project's many *beels* become dry in winter.

Project concept and history: The project objectives are (i) to reduce pre-monsoon damage to nearly mature *boro* and young *aman* crops; and (ii) to encourage HYV *boro* cultivation on lower lands by improving post-monsoon drainage and providing protection from pre-monsoon floods. Currently, the project consists of two polders. Polder 1 is the larger of the two, with a gross area of 9,840 hectares. Its planning and implementation began in 1983-4. Works in this polder will consist of 52 kilometres of submersible flood/road embankment, 8 kilometres of compartmental bund dividing the polder into three drainage basins, and six regulators (one five-vent flushing regulator and one five-vent, one four-vent, and three one-vent flushing/drainage regulators). Polder2 has a gross area of about 2300 hectare. Works are limited to 26 kilometres of submersible embankment built in 1990-1 and 1991-2; no structures are planned as yet. The area includes Naluar Haor and other low lying *beels*. The area is deeply flooded during the monsoon season. Before 1983, the northern part of the area where elevations are relatively high was partially protected from flooding by road embankments in the east and north-east. The rest of the area was flooded for most of the year and was not used for agricultural production. Flood protection was requested by the local population. In 1983, BWDB proposed, and IDA and FFW agreed to finance, construction of a single polder with six structures in the Naluar Haor basin. In 1984, FFW completed the submersible embankments but structure construction under IDA Credit 955-BD was deferred due to fund shortages. In 1987, a proposal under IDA Credit 1870-BD to complete the project was submitted and accepted. In 1989-90, an updated feasibility study report was prepared. In 1990-1 and 1991-2, the Polder 2 embankments (not included in the feasibility study) were constructed under FFW. In 1991-2, re-sectioning of 60% of damaged Polder 1 embankments and construction of the three multiple-vent regulators was begun and compartmental bunds (not included in the feasibility study) were constructed.

In 1992-3, the re-sectioning of the remaining 40% of damaged Polder 1 embankments and construction of the three one-vent regulators is scheduled, with which the project should be complete. Since 1984, earthwork maintenance has been carried out under FFW.

Polder 1: The earthworks currently required in Polder 1 include twelve breach closures, six *khal* closures, and re-sectioning of 27 kilometres of flood embankment and 3 kilometres of road embankment that were damaged mainly by wave action. The remaining 16 kilometres of peripheral roads and 6 kilometres of embankments are in good condition and are above design crest elevation. Construction of compartmental bunds is also underway. The bunds will not be provided with cross-drainage facilities (culverts) and will divide the polder into three separate drainage basins; the implications for drainage requirements and regulator design should be investigated. The embankment's crest elevation is higher than and the cross-section different from those specified in the feasibility report. The design crest level corresponded to 0.3 meters freeboard above the 1:10 year flood level expected before 15 May. Crest elevations varied from 7.5 meters PWD in the north to 7.1 meters PWD in the south. The design crest elevation of embankments currently under construction is 7.9 meters PWD.

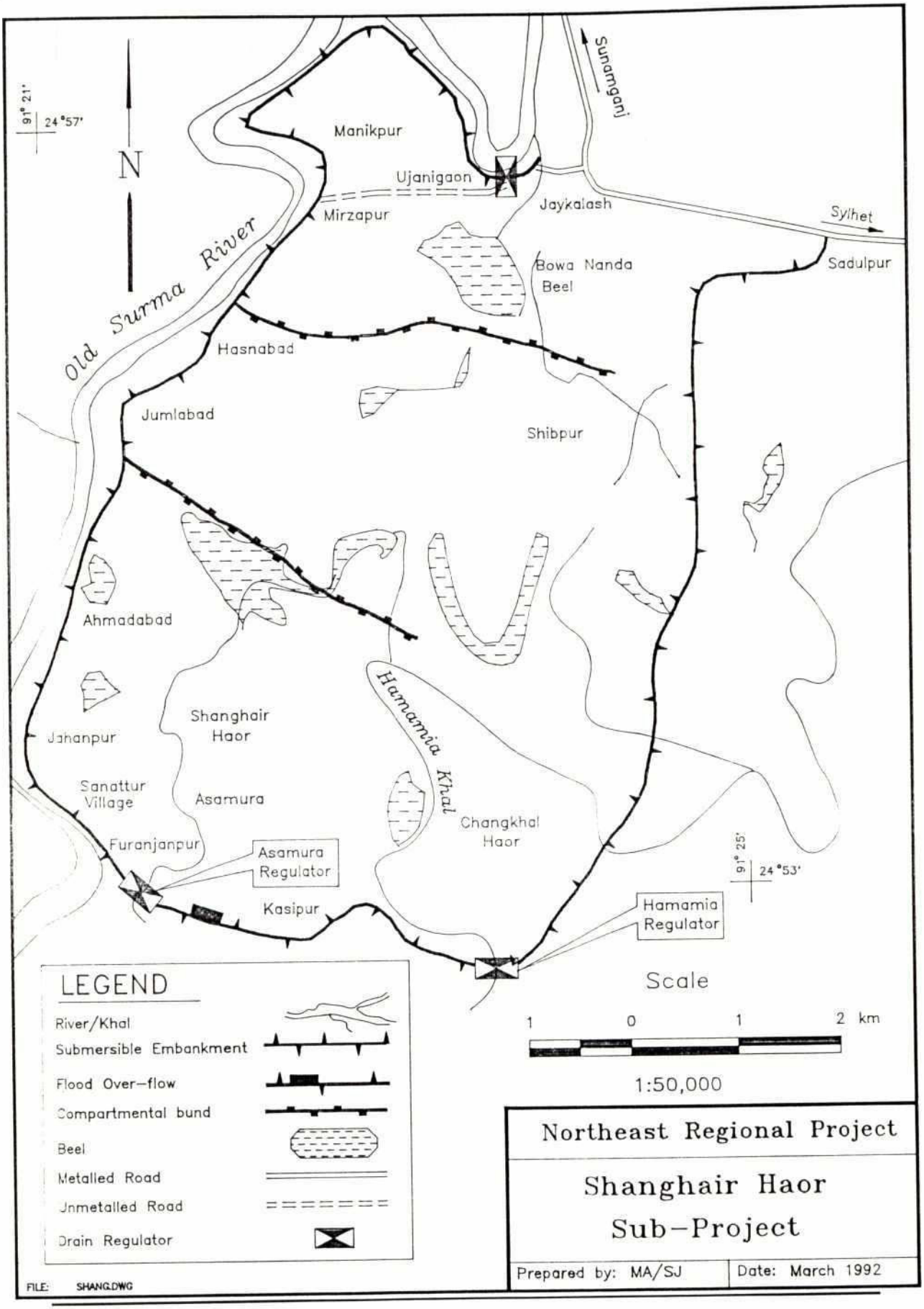
Polder 2: FFW constructed 26 kilometres of submersible embankment in 1990-1. The design crest level is 7.9 meters PWD and the formation level is 8.9 meters PWD, including 1 meter for settlement. About 1.2 kilometres of embankment was eroded during the 1991 flood season and is scheduled for re-sectioning in 1991-2. Six *khals* drain through openings in the embankment. No hydraulic structures have been constructed and none are planned.

Fishing practices

Beels are leased under open auction for a three year period. Fishing in them is prohibited to the general public.

Production trends and project impacts on fisheries

The *khals* have not yet been closed and as yet the fishery is unaffected by the project. Once the regulators are installed, fish migration will be blocked from around 1 April to 15 May. The *khals* will still be open during the monsoon. Improved drainage and some increase in the winter irrigation for HYV *boro* will reduce the dry season water area, which will have a negative effect on the overwintering fish brood stock.


91° 21'
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N
Manikpur
Ujanigaon
Mirzapur
Old Surma River
Sunamganj
Jaykalash
Sylhet
Sadulpur
Bowa Nanda Beel
Hasnabad
Jumlabad
Shibpur
Ahmadabad
Jahanpur
Shanghair Haor
Hamamia Khal
Sanattur Village
Asamura
Changkhal Haor
Furanjanpur
Asamura Regulator
Kasipur
Hamamia Regulator
91° 25'
24°53'
LEGEND
River/Khal
Submersible Embankment
Flood Over-flow
Compartmental bund
Beel
Metalled Road
Unmetalled Road
Drain Regulator
Scale
1 0 1 2 km
1:50,000
Northeast Regional Project
Shanghair Haor
Sub-Project
Prepared by: MA/SJ
Date: March 1992
FILE: SHANG.DWG

L.1.13 SHANGHAIR HAOR PROJECT

Project location and general data

District: Sunamganj
Thana: Sunamganj
Project type: Partial flood control
Status: Completed
Gross Area: 5,000 ha
Net Area: 4,200 ha
Population: 22,900

Environment and engineering works

Hydrology: The river to the north and west of the project is an old channel of the Surma River. Local people have reported that the river dries up in the winter season near Joykalash bazar. Reportedly, sediment deposition takes place at its off-take and there is no winter flow though the lower reaches of the channel remain navigable due to back flow from the Kushiyara River.

Project concept and project history: The project was constructed to protect the *boro* crop from pre-monsoon flash floods. Since, during the monsoon period, the project area is flooded to depths ranging from 1.0 to 6.0 meters, the main crop produced is local *boro* during the winter months. Prior to project implementation, this crop was frequently damaged by early pre-monsoon flash floods. To provide protection to the crops within the haor, 25.4 kilometers of submersible embankments were constructed around the haors periphery. To provide drainage, three regulators were constructed and to facilitate irrigation, about 30 inlet structures were placed through the embankment. The submersible embankments are linked into the Sylhet-Sunamganj Highway, which acts as a full flood embankment. The project was initially proposed by BWDB (Sylhet WD Division) in 1980. An EIP appraisal mission approved the scheme the same year and recommended that it be included in their 1981 program. Construction started in 1981 and the project was completed in 1985.

Submersible embankments: Submersible embankments along the Old Surma River from Ujanigaon to Mirzapur are generally in good condition and well grassed though there are places which have deteriorated as a result of river erosion. The southern embankment from Mirzapur to Kasipur village is subjected to wave action and in this reach a section of about 600 meters has been severely damaged. The Shanghair Haor Project has two public cuts. One was made to improve drainage near Jahanpur village and the second was made to gain access to water for irrigation downstream of Sanattur village. Installation of inlet structures at these two locations has been scheduled by BWDB for 1992. Some sections of the embankment, particularly near to Ujanigaon Regulator, will likely require retirement in the near future. Local farmers have reported that since its construction the western and eastern submersible embankments have not overtopped prior to 15 May, and in some sections the embankments are so high that they do not submerge during the monsoon. They have requested that the embankment height be raised so that it can be used as a roadway during the monsoon season.

Compartmental bunds: The are two compartmental bunds (6.10 kilometers in length) which are in reasonable condition. Farmers have reported that the bunds are useful in retaining post-monsoon water for land preparation and *boro* irrigation.

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Regulators: There are three regulators which are used for flushing and drainage. Two of these, Ujanigaon and Hamaia Khal Regulators, are provided with boat transfer facilities. The regulators are structurally in good condition, but they include fall-boards which are difficult to operate.

Flood Overflow: To reduce damage to the submersible embankments when the haor filled with water, it was considered appropriate on a pilot basis to construct a hardened spillway with a length of about 150 meters. The spillway was to be constructed at an elevation 0.5 meters lower than the adjacent embankment and was located near the Asamura Regulator. Because of poor construction practices used in constructing the adjacent embankment, the embankment settled shortly after construction and its crest is now well below that of the spillway. Consequently, the spillway has never function as designed though it remains in structurally good condition.

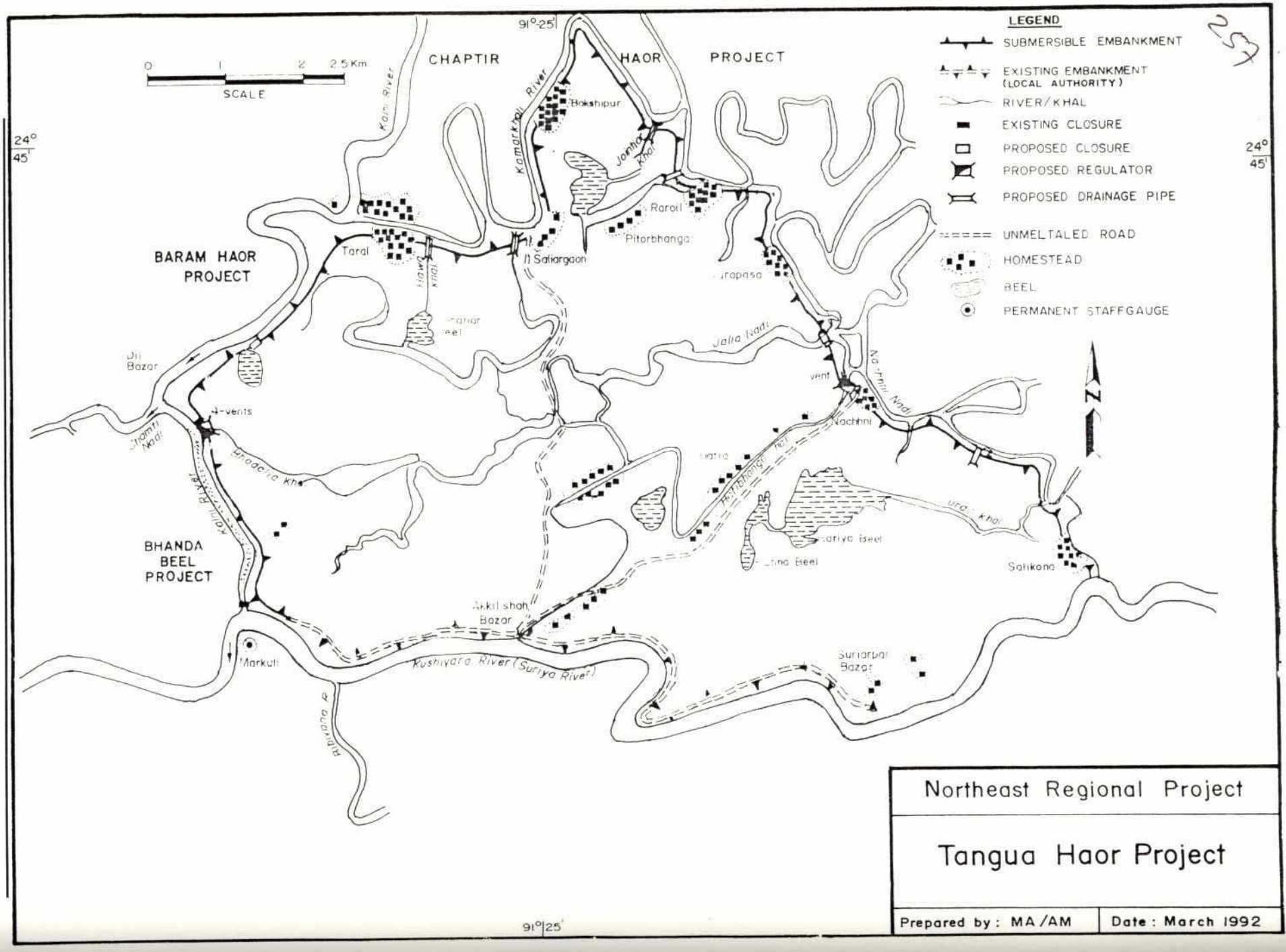
Pipe Structures: There are about 30 pipe inlets constructed through the submersible embankments and compartmental bunds. Local people have reported that six of the inlet structures are used for irrigation purposes along the Surma River, and the remaining inlets are used to provide localized drainage from homestead areas. While the majority of the inlet structures are in good condition, some of the inlets do require minor maintenance works.

Fishing practices

One representative of the fishing lease-holder at Asamura Regulator has reported that the same lease-holder has held the rights to the Shanghair jalmohal for the last 22 years, and that the present lease is for the next three years. All the *beels* are fished out each year, even if it means manually bailing out the water from the *beel*.

Production trends and project impacts on fisheries

Subsistence fishermen at Hasnabad compartmental bund have stated that there has been no change in fisheries as a result of the development of the project.



Northeast Regional Project

Tangua Haor Project

Prepared by : MA /AM | Date : March 1992

L.1.14 TANGUAR HAOR PROJECT

Project location and general data

District: Sylhet
Thana: Dirai
Project type: Partial flood control
Status: Under construction
Gross Area: 5,000 ha
Net Area: 4,500 ha
Population: 20,800

Environment and engineering works

Hydrology: The project area is bordered by the Kalni River in the west, Kamar Khali Nadi in the north, and Kushiyara River in the south. There are significant recent changes to the flow patterns:

- The Kalni River, which is a branch channel of the Old Surma River, historically emptied into the Kushyiara at Markuli. A closure was constructed at Markuli in 1978 and the Kalni River now flows westward into the Champti Nadi, then into the Darain River before finally flowing into the Kushiyara River below Asmiriganj.

- The Kamar Khali Nadi is a distributary of the Dahuka Nadi. The off-take of the Kamar Khali Nadi has filled with sediment and as a consequence has become seasonal. Historically, the Kamar Khali Nadi drained south to the Kushiyara River but sediment deposition near its outfall has forced it to flow into the Kalni River.

The Kushiyara River, a few kilometres downstream of the Sherpur gauging station (175), bifurcates into the Bibiyana and Suriya Rivers which join each other again near Markuli just upstream of the Kalni closure dam. BWDB officials and local people have stated that the Bibiyana River has been silted and that most of the flow is currently passing through the Suriya River. This may be resulting in increased water levels in the Kushiyara River.

Water bodies: The project has several *beels* of which Hariya *beel* and Boranor Beel are the largest and are permanent water bodies. Other important beels are Tangua, Shasha, Bhadalia, Bonua, Kunijuri and Jugduba. Water colour of the haor is transparent to reddish green in Bhadalia and Tangua beel areas. In the Kalni River, water is transparent green, which seems to be naturally productive. Productive water colour is the results of decomposed plant materials within the haor area (after paddy harvesting) and the rain flashed inflowing nutrients from the adjacent island villages. Moreover large stands of submerged aquatic plants were seen in the inundated areas. Around the haor a number of Koroch and Hizol tree plantations are present. Near Islampur and Bhatidal village about 1,000 Koroch and 300-400 Hizol trees are present adjacent to the Tangua and Bhadalia beel. Seagull and heron use the trees for nesting.

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Project concept and history: The project objective is to protect *boro* crops from the pre-monsoon flash floods. This will be accomplished by constructing 20 kilometres of submersible embankment; two regulators for post-monsoon drainage and pre-monsoon flushing; six pipe sluices for post-monsoon drainage; and about 30 irrigation inlets. Tanguar Haor is deeply flooded between June and October with depths ranging from 1.5 to 6.0 metres. Flash floods occur in April and May as a result of heavy rainfall in the catchment. Because of the hydrology, the area is mostly single cropped to local *boro*. Some broadcast *aus* is grown on the southern fringe of the haor. The project was identified and proposed for implementation by BWDBs Sylhet O & M Circle in 1987. An EIP appraisal mission recommended the project for inclusion in their 1987-88 program. Construction of the submersible embankment started in 1988-89 and is expected to be completed during 1991-92. Construction of three drainage pipe sluices has started and recently work orders were issued for the construction of two regulators. Twenty irrigation inlets have been installed and the remaining 10 are expected to be completed during 1991-92

Submersible embankment: The Tanguar Haor embankment does not include the embankment along Kushiyara River which was constructed earlier by local officials under a FFW program. During the field visit around Taral village, people stated that in 1990 the embankment overtopped causing severe damage to *boro* crops and that in 1991 it almost overtopped. There is a public cut near Salirgaon village and the embankment crest has eroded around Bakshipur village. Local people around Bhadalia Khal have stated that the embankment in their area is most vulnerable to wave action, particularly the section about one kilometre upstream of the *khal*, and that it breaches almost every year. About 1,000 metres of the Kushiyara embankment, upstream of Akkil Shah Bazar, has been eroded extensively by waves generated within the project area. Local people have reported that in 1990 the section was repaired by local authorities but not to the design section. They have asked for this critical reach to be repaired by BWDB and that special protective works be installed. A breach in the Kushiyara embankment was observed at Suriarpar, further upstream of Akkil Shah Bazar. The breach occurred in May 1991 while the embankments were being overtopped. The breach has been further enlarged by a flood from the Kushiyara River which occurred as a result of heavy rainfall which started on 25 December 1991. Local people who tried to close the breach in order to save their *boro* crops stated that this was the first time the embankment had overtopped since its construction. They also observed that the Kushiyara River bank had not overtopped prior to the harvest of *boro* crops until recently. They mentioned that there is another breach at Tentulia Bhanga, downstream of Akkil Shah Bazar, which occurred about the same time as that at Suriarpar. People of the area reported that overtopping and breaching are the results of silt accumulation process on the river bed. BWDB officials have report that projects located on the right bank of the Kushiyara River around Markuli require higher embankments, ostensibly due to increased flows in the Kushiyara River.

Regulators: The project plan includes the construction of two regulators. Work orders have been issued but their construction has not started. Local people have stated that the regulator could be used to drain out all the water from Hatibhanga Khal which is presently used for *boro* irrigation around Hatibhanga village. They think that the regulator would better be placed at Kurar Khal where it would operate more efficiently. During the field visit around Hatibhanga Regulator site it was observed that the Hatibhanga canal had filled with sediment for a distance of about 2 kilometres.

Irrigation Inlets: About 20 irrigation inlets have been installed and another 10 are planned for completion during 1991-92. People report that the inlets were mostly installed at those locations where low-lift pumps are to be used. Some inlets were observed to be in use.

Fishery resources

Bonua beel is renowned for Rui, and Bhadalia beel for Catla, Rui and Golda chingri production. The fishermen group of Bhatidal village has reported that fish abundance is always high around the semi-inundated Hizal and Koroch trees.

Fishing practices

Fishing gear used in the Bhadalia fishery is as follows:

Table L11: Gear Based Catch in Bhadalia Fishery

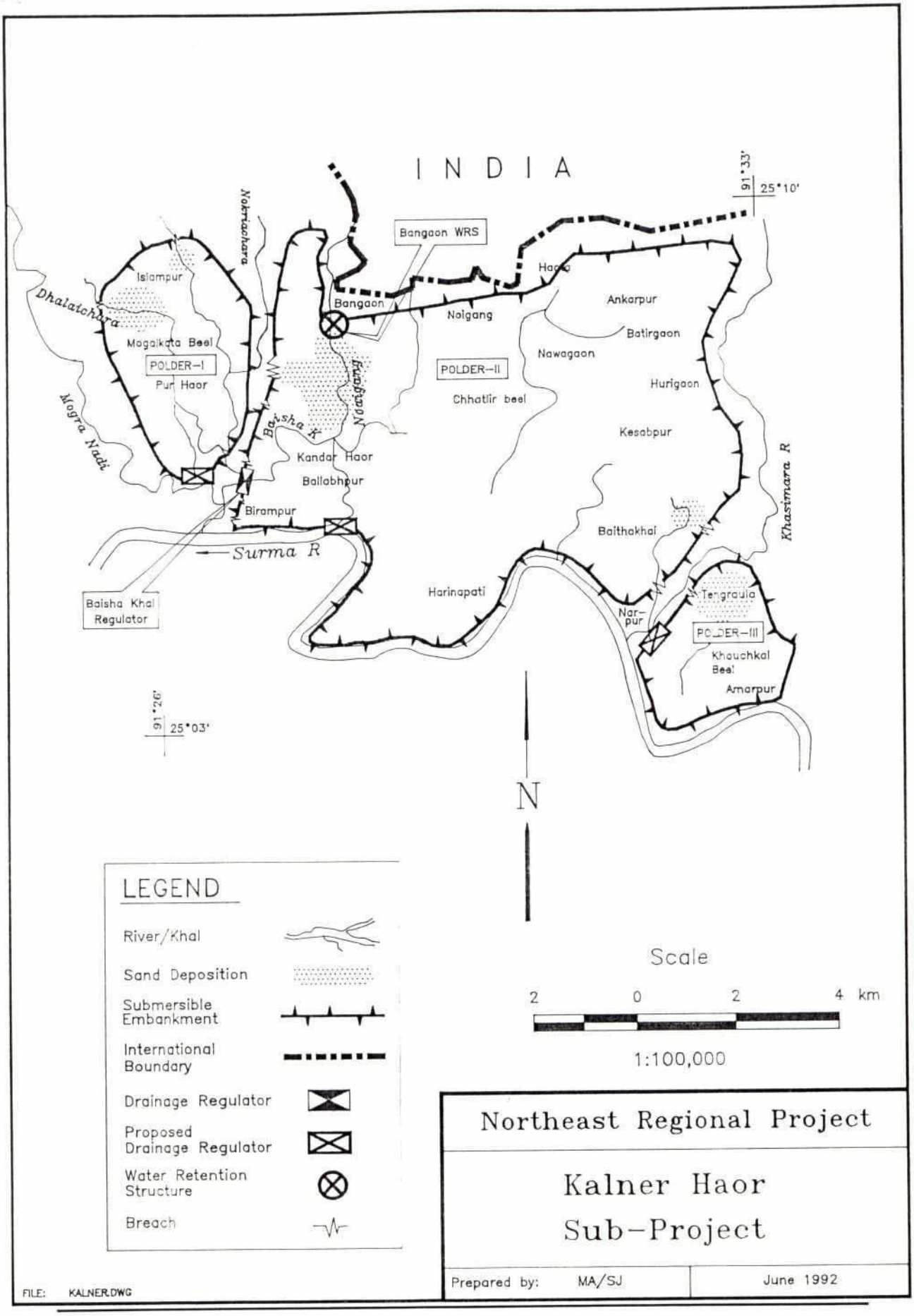
Gear	Species Caught
Vor jal	Fingerlings of Catla, Rui, Ghonia and Boal
Kona jal	Puti, Chanda, Chela, Mola, Batashi, fry of carp
Golpa jal	Pabda, Puti, fry of various species
Borshi	Cheng, Guzi, Rita, Boal, Baim
Chai	Tengra, Chingri

The Hariya Beel has been leased for a period of three years under direct auction. Subsistence fishermen around Bhadalia Beel have complained that although the lease is given for a particular limited area the lease-holders prevent them from fishing any of the *beels*.

Production trends and project impacts on fisheries

Fish species being caught at the time of the field visit (25 July 92) were Rui (7.5 cm), Catla (11.25 cm), Ghonia (8.75 cm), Kalibaus (13 cm), Laso (11.25 cm), Taki (10-17.5 cm), Puti (5-6.25 cm), Bheda (12.5 cm), Tatkini (7.5-16.25 cm), Chela, Mola, Chapila (6.25-8.75 cm) and Ghagot (17.5-22.5 cm). Fishermen in the area reported that, in the third week of May, 1992, they caught massive numbers of 2.5- 4.0 cm carp fry (Rui, Catla, Ghonia and Kalibaus) in the Kalni River (near Tukchandpur), Bhadalia Khal and in the Kushiyara River. Mrigel fry or fingerling were not caught at all.

A representative of the Hariya Beel lease-holder association stated that the project has affected the migration of fish during the spawning period. Subsistence fishermen around Bhadalia Beel state that the project has not had any apparent impact on the existing fish resources.


INDIA
91°33'
25°10'
Nakriachara
Bangaon WRS
Islampur
Dhalatchhra
Bangaon
Haoo
Ankarpur
Nolgang
Batirgaon
Nawagaon
Magalkata Beel
POLDER–I
Pur Haor
POLDER–II
Hurigaon
Chhatlir beel
Mogra Nadi
Baisha R
Kandar Haor
Kesabpur
Ballabhpur
Khasimara R
Birampur
Baithakhai
Surma R
Harinapati
Tengraula
Nar-
pur
POLDER–III
Khauchkal
Beal
Amarpur
Baisha Khal
Regulator
91°26'
25°03'
N
LEGEND
River/Khal
Sand Deposition
Submersible Embankment
International Boundary
Drainage Regulator
Proposed Drainage Regulator
Water Retention Structure
Breach
Scale
2 0 2 4 km
1:100,000
Northeast Regional Project
Kalner Haor
Sub–Project
Prepared by: MA/SJ
June 1992
FILE: KALNER.DWG

L.1.15 KALNER HAOR PROJECT

Project location and general data

District: Sunamganj
Thana: Sunamganj
Project type: Partial flood protection
Status: Begun under local initiative (date unknown), completed 1987
Gross area: 7,120 ha
Net area: 6,070 ha
Population: 48,100

Environment and engineering works

Hydrology: The project area is bounded in the north by high ground (Indian border), in the east by Khasimara River, in the south by the Surma, and in the west by the Mogra River. The Khasimara and Mogra, and hill streams associated with the Mogra, originate in Meghalaya State in India and flow southward into the Surma. The hill streams carry a substantial amount of sediment load during the pre- and post-monsoon seasons. Reportedly, sediment loads and flood peaks have been increasing, and flood peaks have been occurring much earlier, due to large-scale deforestation in the upper catchments. The Surma has silted up and consequently its water levels have been increasing.

Water bodies: There is one *haor* in Polder 1 (Pur Haor), about 40 *beels* within Polder 2, and a few *beels* in Polder 3 (including Khouchakai *beel*, the most productive *beel* in the Kalner Haor area). Three canals enter into the Kalner haor from the Indian hills and through Potang River reach the Surma River near Birampur village. Except for these canals, there are very few perennial fisheries present in the haor. The important canals are Noigang, Bongaochara and Khairmara.

Project concept and history: The project consists of three polders — Polder 2, the largest, and Polders 1 and 3, which are each considerably smaller. The three polders are surrounded by a total of 52 kilometres of submersible embankment. Polder 2 is equipped with one flushing cum drainage regulator, a water retention structure, and numerous irrigation inlets. Polder 1 is equipped with numerous irrigation inlets. Polder 3 has no structures. Kalner Haor is deeply flooded during the monsoon season to depths of 1.0-6.0 m. The area is mostly single cropped to local *boro*. Before the project pre-monsoon floods damaged the *boro* crop nearly every year. Initially (date unknown), local authorities constructed submersible embankments. In the 1980's, these were handed over to BWDB Haor Development Program. Subsequently (date unknown), BWDB rehabilitated the embankment to its present level using GOB resources. In 1986-7, the Polder 2 regulator was constructed under an IDA credit. Currently, BWDB maintains the embankment under FFW. Rehabilitation of the project is planned under Systems Rehabilitation Project, Cycle C (IDA Credit No. 2099/BD and EEC).

Polder 1: Embankments are in good condition except for the Dhalai Chara breach and the Islampur breach. These breaches recur annually, causing sediment deposition in the polder. Farmers request construction of a regulator at the south end of the polder. There are numerous irrigation inlets in the eastern embankment; irrigation water is supplied by Nakriachara. Most are in use; some are silted up or broken.

Polder 2: The western and eastern embankments breach every year in many places. Six major breaches were observed on the western boundary. The largest, near Birampur village, was reportedly caused by high velocity overtopping flow from the Nakria Chara. The eastern embankment is breached in a few locations by overtopping flow from the Khasimara River. Sand has been deposited on the east and west side of the polder. The northern and southern embankments are in good condition. The polder is served by a five-vent flushing/drainage regulator on Baisha Khal. The structure is in poor condition and farmers say that it is too small. They also complain that the fall-boards are difficult to remove under pre-monsoon flood conditions, and are often stolen. They request replacement of the boards with vertical steel lift gates. Local people claimed that the existing vents of the sluice gate are not sufficiently spaced to pass the flood water rapidly into the haor. Breaching/erosion and cutting of embankments may sometimes caused naturally and some times caused by the human being(for multi sectoral attitudes fishing,rapid plantation of paddy, future earth work profit etc.). The water retention structure (WRS) in the north-west corner of the polder, near Bangaon village, was reportedly partially damaged in the 1988 flood and was not repaired. In the 1991 flood, the abutment walls and stilling basin failed. Currently the structure is not usable. Farmers say that the WRS was effectively retaining water for irrigation but that it was too small. They request construction of a larger WRS with a pedestrian walkway. BWDB plans repairs and upgrading. There are numerous irrigation inlets in the western embankment, some constructed by BWDB and others by farmers; irrigation water is supplied by Nakriachara River. Most are in use; some are silted up or broken.

Polder 3: The embankments are in poor condition. They are reportedly overtopped before the *boro* harvest and are breached annually in numerous places. Two large breaches recur annually in the western embankment, caused by Khasimara River overtopping flow in the pre-monsoon season to the north and south of Narpur village. A larger breach near Tengraula village in the north-east corner of the polder recurs annually. Sand deposits from these breaches affect areas in the west and north-east of the polder. Farmers request construction of a regulator in the western embankment, near Narpur village.

Fishery resources

Pur Haor of Polder 1 is reported not to be very productive. The circa 40 beels within Polder 2 are reportedly very productive. Khouchakai beel of Polder 3 is the most productive beel in the entire Kalner Haor area. At the western side of the sluice gate (outside near Balikandi village) the entire canal system is divided into a number of branches which might be an important breeding place for a number of fish species. During the time of early flooding, local people catch large numbers of broodfish (Boal, Pabda, Batashi, Ghonia, Chanda, Kechki and others) at the mouth of the sluice gate and the adjacent area.

Fishing practices

Fishing gear presently used is as follows:

Table L12: Gear Based Catch per Hour in Kalner Haor

Gear	Species Caught	Catch/hr	Location
Long line	Cheng, Taki	200-300 gm	Haor area
Thela jal	Chingri	200-250 gm	Newly flooded areas
Bel jal	Chapila, chanda, puti, chela	100-150 gm	River and canals

At least 10 Bel jal, 5 Thela jal and about 1000 Long line hooks are operating around the haor area.

Costs of materials for a bel jal are as follows:

Table L13: Material Cost for a Bel Jal

Material	No of Pieces	Cost (Tk)
Large bamboo poles	2	250
Medium bamboo poles	10	500
Net	1	1,100
TOTAL =		1,850

The main fishing period is from mid-November to the end of March.

Beels are leased by open auction for three years and the public is prohibited from fishing in them. Local people report that none of the lease-holders are fishermen.

Production trends and project impacts on fisheries

The river fisheries are under the NFMP management system since 1986. Production statistics are given below:

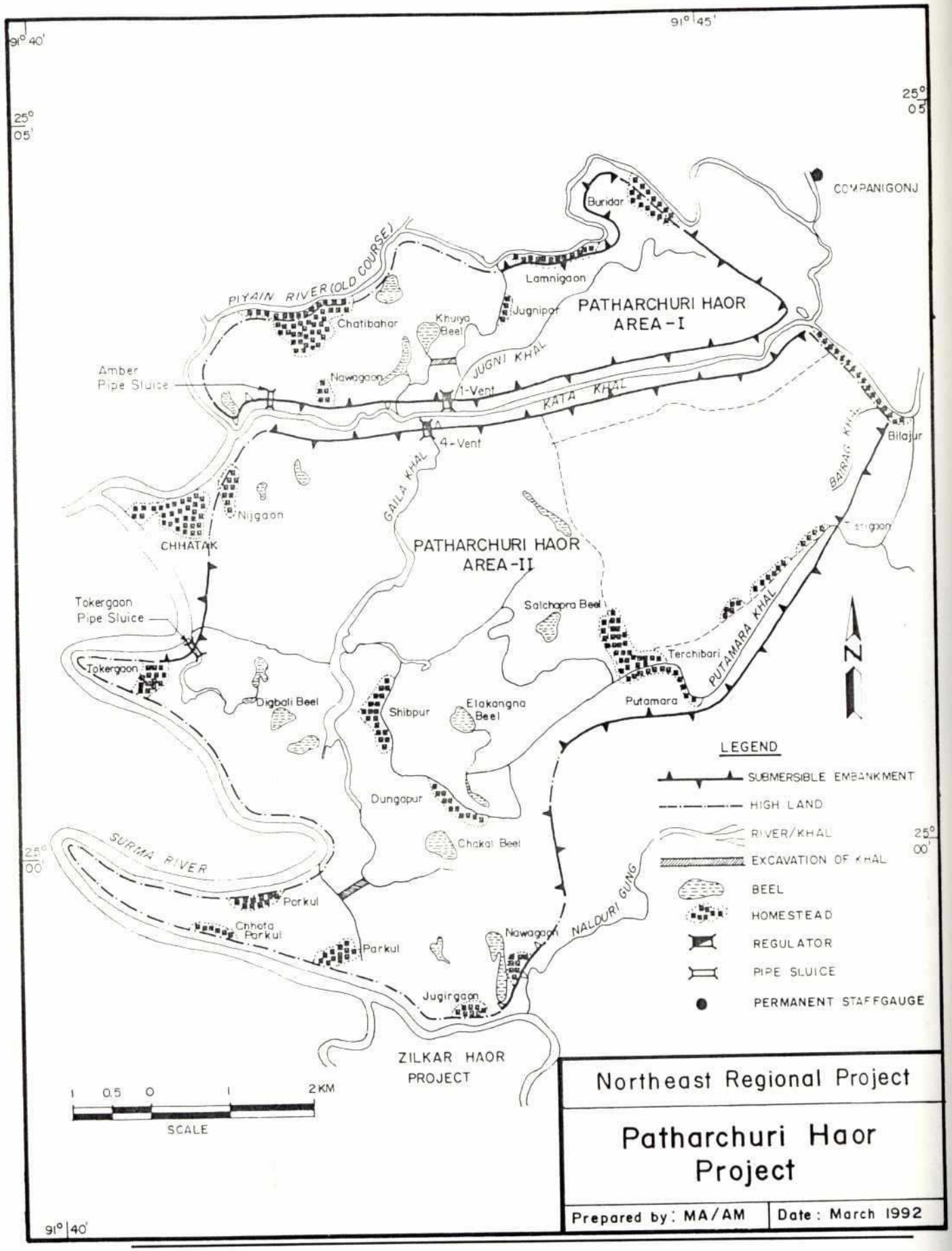
Table L14: Production Statistics of Kalner Haor

Year	Total Catch (kg)	Total Value (Tk)
1986	42,496	581,650
1987	31,955	454,517
1988	32,500	650,000
1989	34,000	850,000
1990	40,000	1,000,000

285

The main species caught are rui, catla, mrigel, boal, air, pabda, shoal, gazar, puti, tengra, kakila, mola, chela and chapila. The species catch composition is about 75% small species, 10% Boal and 15% Carp.

Kalner haor has historically been a good fish producing area but is declining. Production has declined by 70-75% over the last 10-15 years. Fishermen believe that the decline in recent years is due to fish disease and not project works. However, after the construction of the embankment rapid siltation occurred in the internal canals of the haor. Important water bodies are now facing the problem of insufficient water during the winter season.


91° 40'
91° 45'
25° 05'
25° 00'
COMPANIGONJ
Buridar
Lamnigaon
PIYAIN RIVER (OLD COURSE)
Chatibahar
Khuiya Beel
Jugnipar
PATHARCHURI HAOR AREA-I
JUGNI KHAL
Amber Pipe Sluice
Nawagaon
1-Vent
KATA KHAL
4-Vent
Bilajur
BARAG KHAL
GAILA KHAL
Nijgaon
CHHATAK
PATHARCHURI HAOR AREA-II
Tokergaon Pipe Sluice
Satchapra Beel
Terchibari
PUTAMARA KHAL
Tokergaon
Digbali Beel
Shibpur
Elakangna Beel
Putamara
N
Dungapur
Chakal Beel
SURMA RIVER
Parkul
Chhota Parkul
Parkul
Nawagaon
NALOURI GUNG
Jugirgaon
ZILKAR HAOR PROJECT
LEGEND
SUBMERSIBLE EMBANKMENT
HIGH LAND
RIVER/KHAL
EXCAVATION OF KHAL
BEEL
HOMESTEAD
REGULATOR
PIPE SLUICE
PERMANENT STAFFGAUGE
1 0.5 0 1 2 KM
SCALE
Northeast Regional Project
Patharchuri Haor Project
Prepared by: MA/AM
Date: March 1992

L.1.16 PATHERCHURI HAOR PROJECT

Project location and general data

District: Sylhet
Thana: Sylhet and Companiganj
Project type: Partial flood control, drainage, and irrigation
Status: Begun 1984, completed 1987
Gross area: 6,060 ha
Net area: 5,466 ha
Population: 13,500

Environment and engineering works

Hydrology: Polder I and II lie north and south of their common drainage channel, Kata Khal. Polder I is bounded to the north and west by the old Piyain River channel and to the west by an embankment along Teli Khal (see Piyain River Flood Plain map). Polder II is bounded to the northeast by a *khal*, to the southeast by an embankment and high land; and to the south and west by the Surma River. Kata Khal flow has been increasing, as both Piyain River and Dhalai River flows have shifted into it. The Piyain flow has shifted from the Old Piyain channel to the Piyain new course. The Dhalai River flow has shifted from the Old Piyain to Kata Khal, via the Dhalai new course and Teli Khal (see Piyain River Flood Plain). Local boatmen report significant sediment deposition in the Piyain and Dhalai old courses. The sedimentation has seriously affected an important navigation route linking Bholaganj stone quarry on the Dhalai upstream of Companiganj to Chhatak on the western side of Polder II. Some 20,000 people are engaged in river transportation of stones between these two places, which previously took one day along the old Dhalai and Piyain courses, but now takes two or three days along the Dhalai new course, Teli Khal, and Kata Khal. They request re-excavation of the old route. Farmers believe that the Kata Khal embankment is breaching more frequently as a result of the increased flood flow. They request diversion of the Piyain to its original course. Local boatman report that siltation of the project's internal channels and of Kata Khal has been minimal.

Water bodies: There are reportedly four permanent water bodies each in Polders I and II. Polder II jalmohals are:

Table L15: Permanent Water Bodies in Polder II

Jalmohal	Condition	Main Species
Laukar jaor	Seasonal	Shingi, Magur
Shilkuri beel	Pile	Rui, catfish
Patharchauli	Seasonal	Koi, Shingi, Puti, Magur, Bheda
Katanga	Pile	Carp, catfish

Kata nadi water is clear, whereas Surma river water is highly turbid due to the presence of sand particles.

Project concept and history: The project consists of Polders I and II, separated by a common drainage channel. The project objective is to protect the *boro* crop from pre-monsoon floods, to improve drainage, and to facilitate surfacewater irrigation. Project infrastructure consists of 33 kilometres of submersible embankment, one four-vent and one one-vent flushing cum drainage regulator, two pipe sluices, drainage channel re-excavation, and twenty irrigation inlets. The project area is part of the Piyain River floodplain located at the foot of the Meghalaya Plateau. Heavy rain on the Plateau causes pre-monsoon flash floods and monsoon flooding to depths of 1.5-6.0 meters. *Boro* is the main crop. Before the project, it was damaged almost every year by pre-monsoon flash floods. In 1983, the project was first proposed by BWDB (Sylhet O & M Division), and an EIP appraisal mission recommended inclusion of the project in the 1983-84 EIP program. In 1984, construction began. In 1987, the project was completed. In 1990, an operation and maintenance program was proposed in an operation and maintenance study.

Kata Khal: Embankments on both sides along Kata Khal upstream of Jugni Khal regulator are particularly vulnerable to breaches caused by flash floods entering the *khal*. Reportedly flash flood discharges have increased significantly in recent years, following sediment deposition in the Piyain and Dhalai Rivers. The flash floods cause numerous breaches every year, usually when they overtop the embankments before the polders have been filled through the flushing structures at the completion of the *boro* harvest. In 1991-2, fewer breaches than usual occurred because the flash floods came later, after the harvest. BWDB officials state that repairing of breaches is more difficult in recent years as locally available material contains peat, and is not suitable for construction.

Polder I: In late 1991, the submersible embankments of Polder I were in unsatisfactory condition, as they had settled or eroded 0.5-1.0 m due to peat in the embankment material. Farmers report that the lease-holder of a Kata Khal *jalmohal* made a public cut about 70 m upstream of the Jugni Khal regulator. There are also two breaches upstream of the regulator. Most of Polder I drains into Kata Khal through the one-vent Jugni Khal regulator. The regulator is in good condition, but, Jugni Khal has silted up, creating localized drainage congestion. To relieve this, farmers request construction of additional drainage structures on Kata Khal, upstream of the single existing regulator on Jugni Khal. BWDB officials feel that a better solution to this problem would be re-excavation and extension of Jugni Khal and smaller *khals* feeding into it. Most of the rest of Polder I drains into Kata Khal through the Amber Khal pipe sluice. The sluice is in good structural condition, but the gate hoist was slightly damaged by a mechanized boat during the last monsoon season.

Polder II: In late 1991, the submersible embankments of Polder II were in unsatisfactory condition, as they had settled or eroded 1 meter or more, again due to peat in the embankment material. There are five breaches in the embankments facing Kata Khal upstream of Galia Khal Regulator; some breaches were caused by the flash floods of April 1991. There is one breach in the western embankment, adjacent to the Tokergoan pipe sluice, that recurs every year; farmers enlarge the breach further to drain out the area, as the Tokergoan sluice has not operated since its construction. Most of Polder II is drained by the regulator constructed on Galia Khal. The regulator is in good condition. Most of the rest of Polder II drains into the Surma River through the breach/cut near Tokergaon village; the Tokergaon sluice is completely silted up; the structure is slightly damaged. BWDB officials and farmers advocate provision of another drainage structure at the southwestern end of the polder, but review of drainage requirements is difficult as topographic survey information is inadequate.

Fishery resources

Major species in the larger *beels* of Polder I include boal (the most common), rui, catla and kalibash. Local fishermen report that only small fishes occur in the *beels* leased to the mosque (Polder I near the Amber pipe sluice).

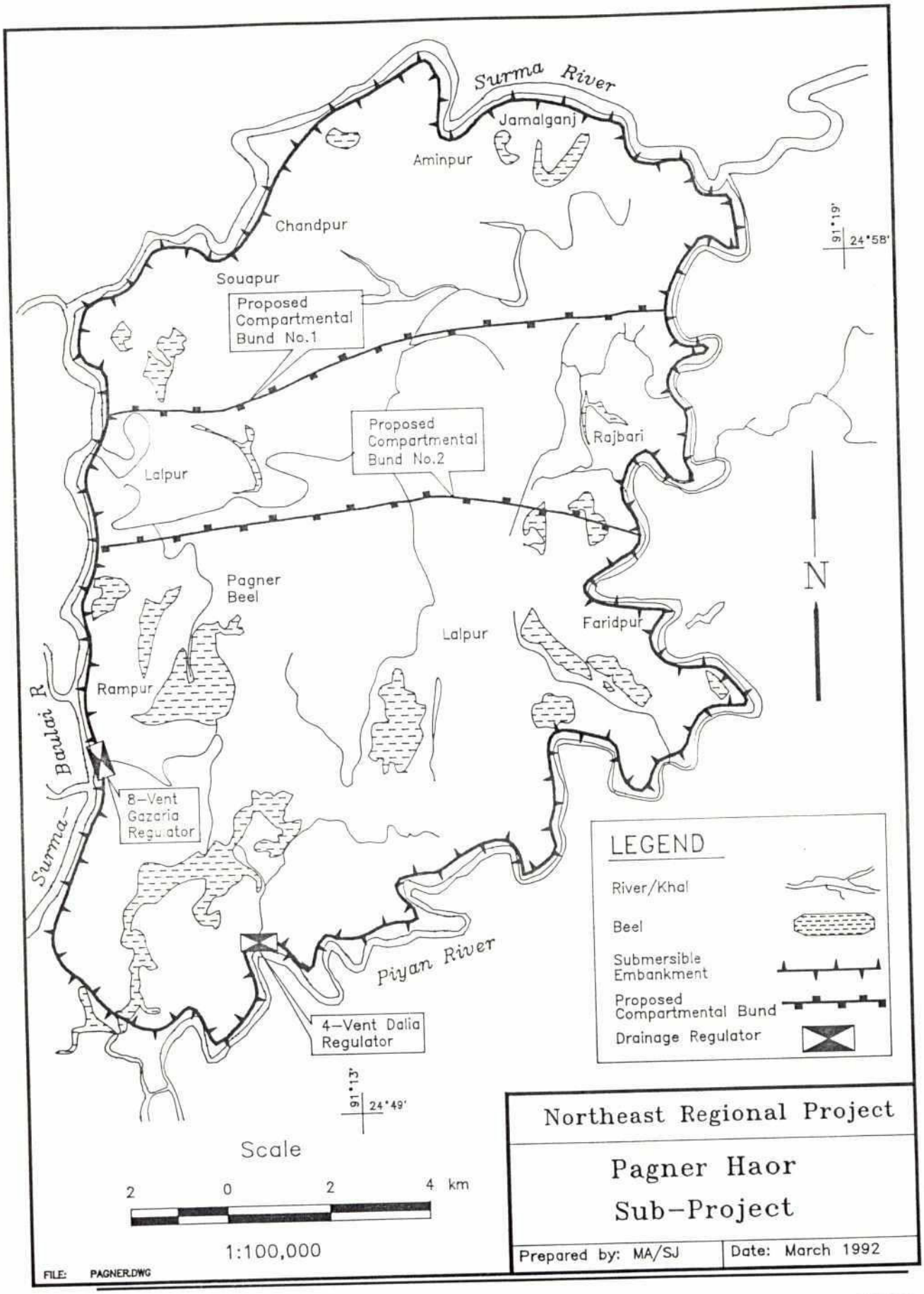
Fishing practices

Representatives of the Polder I leaseholder report that the three-year lease was given by direct auction. The leaseholder is a fish merchant in Kazirbazar, Sylhet. Beel leases held by the mosque committee are also for a period of three years. Proceeds from the sale of the fish are used for mosque maintenance.

Production trends and project impacts on fisheries

The Patherchuri project has had a positive impact on the jalmohals. After the construction of the submersible embankment, there is less sedimentation within the project area. As a result an average depth suitable for the pile fisheries is usually maintained. But fish production has declined due to other reasons: deforestation, overfishing, annual fishing and fish disease.

Farmers report conflicts with *jalmohal* lease holders over the operation of the hydraulic structures. The leaseholder drains the *haor* to catch fish, making land preparation difficult and causing drought damage to crops. The farmers would prefer to retain water for *boro* cultivation. Fishermen also cut the embankment to harvest fish.


Surma River
Jamalganj
Aminpur
Chandpur
Souapur
Proposed Compartmental Bund No.1
Proposed Compartmental Bund No.2
Rajbari
Lalpur
Pagner Beel
Faridpur
Rampur
Surma-Baulai R
8-Vent Gazaria Regulator
Piyan River
4-Vent Dalia Regulator
91°19'
24°58'
91°13'
24°49'
N
LEGEND
River/Khal
Beel
Submersible Embankment
Proposed Compartmental Bund
Drainage Regulator
Scale
2 0 2 4 km
1:100,000
FILE: PAGNER.DWG
Northeast Regional Project
Pagner Haor Sub-Project
Prepared by: MA/SJ
Date: March 1992

L.1.17 PAGNAR HAOR PROJECT

Project location and general data

District: Sunamganj
Thana: Jamalganj
Project type: Partial flood protection
Status: Under construction
Gross Area: 19,075 ha
Net Area: 17,165 ha
Population: 68,900

Environment and engineering works

Hydrology: The Project is border by the Surma River in the north, the Surma-Baulai River in the west and the Piyan River to the south and east. The Piyan River, which is a branch channel of the Surma River, drains northwest to the Surma-Baulai River. The Project area is flooded by pre-monsoon flash floods from the Surma-Baulai and the Piyan Rivers. Reportedly, the Surma River is gradually filling with sediment. The sediment deposition rate is high particularly below the Gazaria regulator. At this point the Surma banks are relatively low and are overtopped frequently during pre-monsoon flash floods.

Water bodies: The main jalmohals are Nolchondi beel, Noyakhal-Nainda beel, Dhalapakhal beel, Bashkar beel, Boisher chatol lamba beel, Dattanja beel, Bhutiarpur nadi and Kosma.

Project concept and history: The project aims to secure the *boro* crop from pre-monsoon flooding. This was to be accomplished by constructing 65 kilometers of submersible embankments around the Pagner haor. Pagner Haor is deeply flooded during the monsoon season with depths ranging from 3.0 to 6.0 meters. Local boro, produced during the winter months is the dominant crop. There is a small amount of broadcast *aman* grown on the higher lands along the project boundary. Prior to project implementation, the *boro* crop was damaged most years. Construction of two regulators is planned. These would serve to fill the *haor* basin after the *boro* is harvested and would provide post-monsoon drainage. Water would be retained after the monsoon for irrigation throughout the *haor* by constructing compartmental bunds. In addition some inlet structures are planned. Low embankments were originally constructed by the local authorities through a Food For Work program and the project was handed over to BWDB as a part of the *haor* Development Program in Sunamganj District. BWDB continued construction of the embankments using GOB resources and the embankments were essentially completed in 1980. Since 1981, maintenance of the embankments has been carried out by BWDB through Food For Work programs. Recently the project was identified by BWDB for rehabilitation through the System Rehabilitation Project with financial assistance from EEC and IDA. Regulator construction started in 1991 under this program and are scheduled for completion in 1994.

Submersible embankments: Routine maintenance work on the submersible embankments along the Surma-Baulai River started at the beginning of February 1992 and is expected to be completed by mid-March 1992. Local farmers have stated that there are many breaches in the Surma-Baulai embankment, some recurring every year at the same location. In 1990 and 1991, the embankment was overtopped and breached before harvesting, and local farmers have requested

that the embankment crest be raised. Systems Rehabilitation Project engineers have reviewed flood levels in Pagner Haor and the surrounding area and have agreed to raise the embankment crest level from a reported 6.10 meters PWD elevation to a revised level of 7.50 meters PWD. The Systems Rehabilitation Project will finance this work after the regulators are complete in 1994.

Regulators: One each is planned at Gazaria and Dalia. Construction of the eight vent Gazaria Regulator started in 1991, while construction of the four vent Dalia Regulator is scheduled to start in 1992.

Fishery resources

The main species in individual water bodies is as follows:

Table L16: Species Abundance in Different Beels

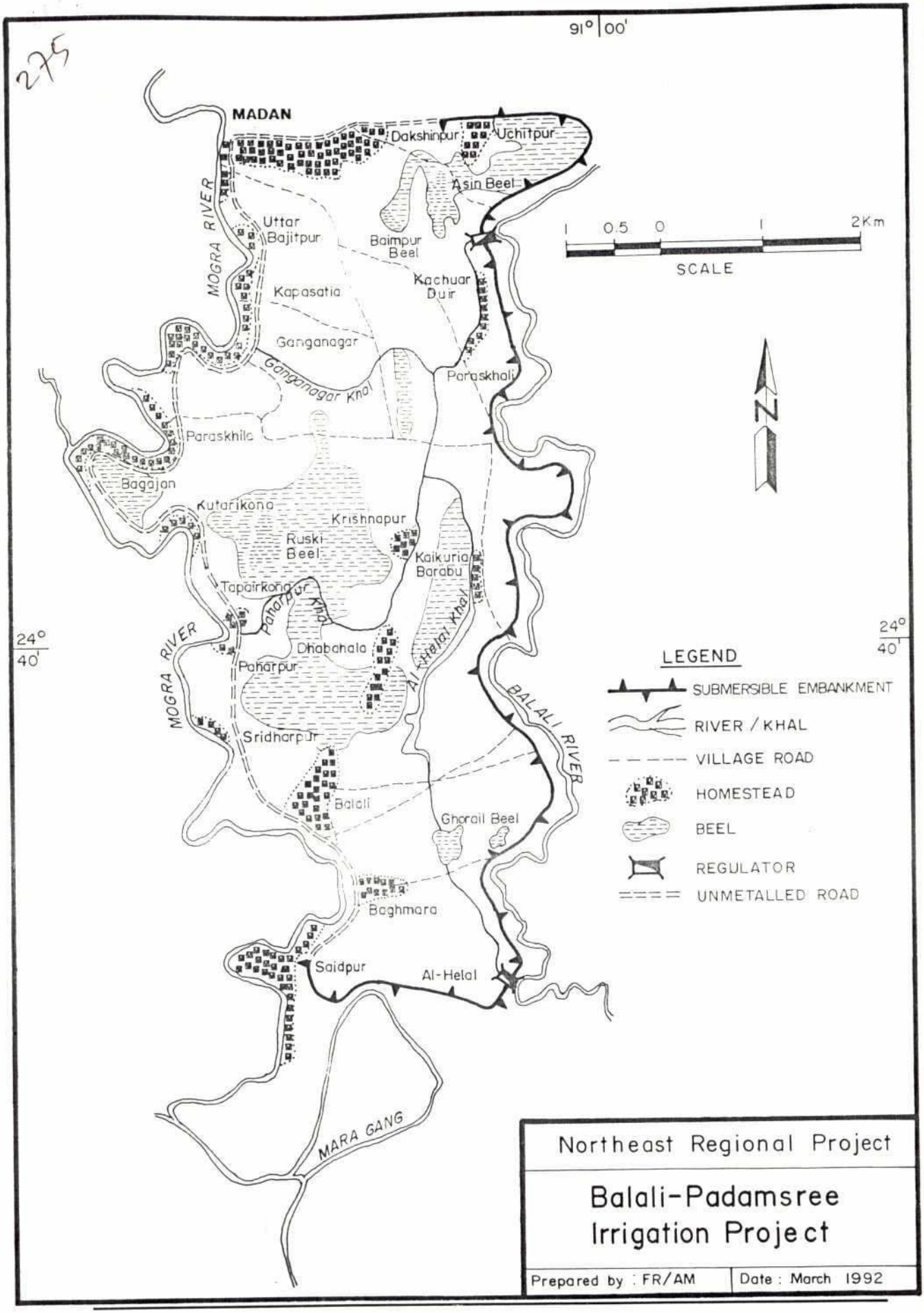
JALMOHAL	MAIN SPECIES PRESENT
Nolchondi beel	Pabda, Rui, Ghagot, Boal, Kalibaus, Golda chingri
Bashkar beel	Pabda, Rui, Kalibaus, Ghagot, Boal
Bhutiarpur nadi	Rui, Ghonia, Chital
Kosma	Carp, Pabda

Fishing practices

Dattanja beel has a pile fishery.

Production trends and project impacts on fisheries

Local people have reported that fisheries have decreased. It is generally believed that this is the result of sediment deposition in the *beels* causing most of the *beels* to become dry during the winter. Farmers reported that silty-sand has been deposited to a depth of about one meter in the lower *beel* areas. Reportedly, the Surma River transports large quantities of silt and sand and these are carried into the Pagner Haor area when the river breaches its bank. Some of the smaller *beels* have been filled with sediment in recent years. It appears that only silt (as suspended material) is transported by the floodwater into the protected area. Any sand or gravel (bed load material) appears to be retained within the river banks and does not normally enter the protected area.


275
91° 00'
MADAN
Dakshinpur
Uchitpur
Asin Beel
MOGRA RIVER
Uttar Bajitpur
Baimpur Beel
Kachuar Duir
Kapasatia
Ganganagar
Ganganagar Khal
Paraskhali
Paraskhila
Bagajan
Kutarikona
Krishnapur
Ruski Beel
Kaikuria Barabu
Tapairkona
Paharpur Khal
Al-Helal Khal
Dhabahala
Paharpur
BALALI RIVER
Sridharpur
Balali
Ghorail Beel
Baghmara
Saidpur
Al-Helal
MARA GANG
24° 40'
1 0.5 0 1 2Km
SCALE
N
LEGEND
SUBMERSIBLE EMBANKMENT
RIVER / KHAL
VILLAGE ROAD
HOMESTEAD
BEEL
REGULATOR
UNMETALLED ROAD
Northeast Regional Project
Balali-Padamsree Irrigation Project
Prepared by : FR/AM
Date : March 1992

L.1.18 BALALI-PADAMSREE IRRIGATION PROJECT

Project location and general data

District: Netrokona
Thana: Madan
Project type: Partial flood protection, irrigation and drainage
Status: Begun 1986, completion scheduled 1991-2
Gross area: 2,390 ha
Net area: 2,020 ha
Population: 11,080

Environment and engineering works

Hydrology: The project area is bounded in the west by the Mogra River and in the east by the Balai. The Mogra is part of the Mogra-Kangsha system; the Balai River is one of the distributaries of the Dhanu-Baulai system. These rivers eventually fall into the Upper Meghna. Neither the Mogra nor Balai discharges have been measured. Both these rivers seem to have ample water in the dry season, based on observations of the Balai in Jan 92 and on field enquiries. This water is likely partly due to Meghna backwater. The Balai and regulator outfalls were seen to be clear of siltation.

Water bodies: Madan thana is located at the bank of the Mogra River and the eastern part is closely linked with the large Khaliajuri depression. There are a number of beels and canals in the area, of which most are perennial. Talar haor, Ganeswar haor and Jaliar haor are the three renowned haors in Madan. Beels and adjoining canals in Talar haor are Chatal beel, Ain beel, Baimpur, Balam dor, Ruski, Mosna, Ubli, Khaya beel and Chandkau beel. Beels in Ganeswar haor are Ganesbanda beel, Bailjala beel, Chikni beel, Kailang beel and Marameshwar beel. The environment and topography of the beels create a unique habitat for chotomaach. Also within the Balali-Padamsree project there are some permanent water bodies which produce Rui, Kalibaus, Boal, Air and Ghagot. The Mogra has 14 important duars within Madan tana.

Project concept and history: The project objective is to provide dry-season irrigation and pre-monsoon flood protection up to 31May for *boro* crops. Flood control facilities will consist of 16 kilometres of submersible embankment with two regulators in the eastern embankment at Kachuar Duir and Al-helal. Irrigation facilities will consist of re-excavation of 25 kilometres of *khal*. BADC will supply 25 two-cusec and 60 one-cusec low lift pumps to cooperatives to be organized by BRDB. At present, about 70% of the net cultivable area is under *boro* cultivation; the other 30% is unirrigated higher land. During the monsoon, the entire area is deeply flooded and no crops are grown. In 1981, a feasibility study was prepared with ADB and EEC financing. In 1985, a project appraisal report was prepared. In 1986-7, implementation began by BWDB under the ADB Small Scale Irrigation Sector Project. Completion is scheduled for the end of the 1991-2 construction season.

Submersible embankments: Embankment construction is complete. They are in good condition and are well grassed.

Regulators: Both regulators are under construction, with completion scheduled for the end of 91/92 construction season. No *khal* re-excavation has yet been undertaken.

Fishery resources

Most of the floodplain and beels are the habitat of chotomaach. Boromaach are produced within the river system, and large catfish species are dominant. Some carp, Chital, Ilish and Golda chingri are also present in the area.

Fish abundance by habitat is as follows:

Table L17: Species Abundance by Group and Habitat

BOROMAACH		CHOTOMAACH	
River	Beel	River	Beel
Chital(R), Boal, Ghagot, Air, Gang magur, Kalibaus, Rui(R), Mrigel(R), Catla(R), Baghair(R)	Rui (R), Catla (R), Mrigel (R), Air, Boal	Pabda, Batashi, Chela, Bacha, Garua, Shilon, Ghonia, Chapila, Kechki, Baim, Bailla, Rani, Golda Chingri	Koi, Shingi, Magur, Lati, Cheng, Shoal, Gazar, Bheda, Kholisha, Puti, Bojori, Tengra, Gulsha, Baim, Cirka, Chapila, Bacha, Fali, Icha, Golda Chingri

(R) = Rare

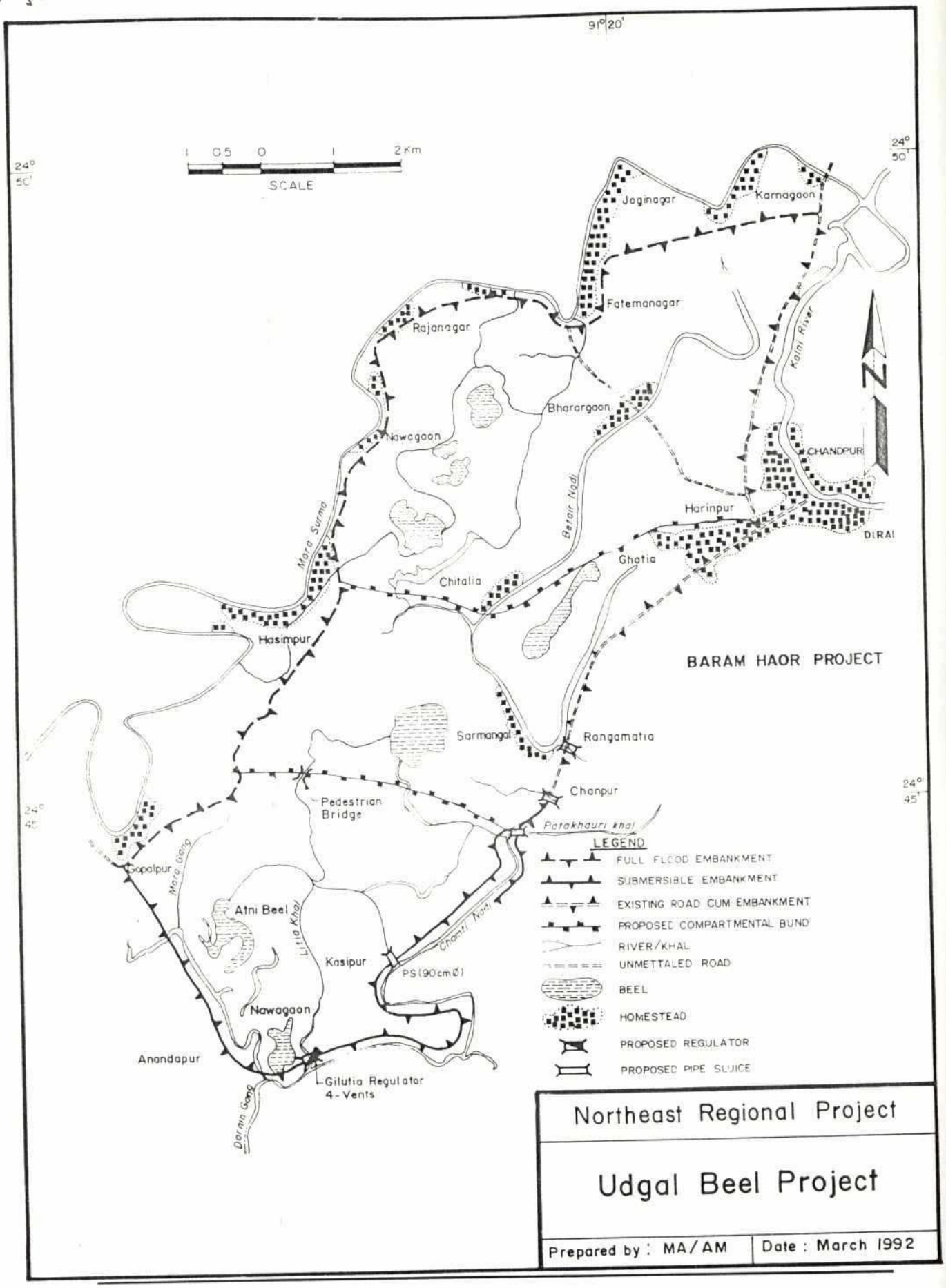
Fishermen of the area stated that Koi, Shingi, Magur, Air, Puti, Lati, Shoal, Gazar, Cheng, Mola, Chapila, Chanda, Batashi, Icha and Cirka require slow water currents for breeding, and rain flow water can serve that purpose. Continuous rain and thunder are the important triggers for breeding. The fish also require aquatic vegetation and reeds/bushes for breeding.

Production trends and project impacts on fisheries

For several reasons, production of long distance migratory fish species has declined sharply. Also, the once famous larger size KOI and PABDA are now no longer found. Area fishermen do not expect the project to have any impact on fisheries. They stated that construction of submersible embankments does not have much negative impact on breeding of the following species: Koi, Shingi, Magur, Air, Puti, Lati, Shoal, Gazar, Cheng, Mola, Chapila, Chanda, Batashi, Icha and Cirka. Three duars in the Mogra River were proposed as fish sanctuaries by the fishermen. These duars are linked with adjacent beels/haor. The proposed sanctuary duars are as follows:

Table L18: Dry Season Depth of Three Important Duars

Duar	Dry Season Depth	Main Species
Bagajau	15-16 m	Air, Boal, Chital, Kalibaus, Rui, Bacha, Chela, Chapila, Golda chingri, Fali, Laso
Paharpur	15-16 m	As above
Kalibarir dor	15-16 m	As above


91°20'
24° 50'
24° 45'
1 0.5 0 1 2 Km
SCALE
Joginagar
Karnagaon
Fatemanagar
Rajanagar
Kalni River
Bharargaon
Nawagaon
CHANDPUR
Mora Surma
Betar Nadi
Harinpur
DIRAI
Ghatia
Chitalia
Hasimpur
BARAM HAOR PROJECT
Sarmangal
Rangamatia
Chanpur
Pedestrian Bridge
Patakhauri khal
Gopalpur
Mora Gang
Atni Beel
Little Khal
Kasipur
Chamti Nadi
PS(90cmØ)
Nawagaon
Anandapur
Gilutia Regulator 4-Vents
Dorma Gang
LEGEND
FULL FLOOD EMBANKMENT
SUBMERSIBLE EMBANKMENT
EXISTING ROAD CUM EMBANKMENT
PROPOSED COMPARTMENTAL BUND
RIVER/KHAL
UNMETTALED ROAD
BEEL
HOMESTEAD
PROPOSED REGULATOR
PROPOSED PIPE SLUICE
Northeast Regional Project
Udgal Beel Project
Prepared by : MA/AM
Date : March 1992

L.1.19 UDGAL BEEL PROJECT

Project location and general data

District: Sunamganj
Thana: Dirai and Sylhet
Project type: Partial flood protection
Status:Under construction
Gross Area: 5,900 ha
Net Area: 4,700 ha
Population:21,800

Environment and engineering works

Hydrology: The project is bordered by the Kalni River and Chamti River in the east, Mara (old) Surma in the north and west and Darain River in the south. The Kalni River was closed near Markuli in 1978 and since then the Chamti River has become the main drainage channel for the project area. The Chamti River flows into the Darain River which, in turn, flows into the Kushiyara River below Ajmirganj. It has a navigable depth because of backwater from the Kushiyara River. The main sources of flow for Chamti River are the Old Surma River and the Bhatta Khal. The latter has recently silted.

Water bodies: Most of the *beels* in the project dry out during the winter season.

Project concept: The project was conceived to protect *boro* crops in the area from pre-monsoon flash floods. This is to be accomplished by constructing 16 kilometers of submersible embankments; 18 kilometers of full flood embankment cum road; one regulator to provide post-monsoon drainage and pre-monsoon flushing; three pipe sluices to provide post monsoon drainage; irrigation inlets; and, ancillary structures. The project area is deeply flooded during the monsoon season to depths ranging from 1.0 to 6.0 meters. The area is mostly single cropped with local *boro* being the main crop while some broadcast *boro* is grown on the higher lands along the project boundary. The *boro* crop is damaged by pre-monsoon flash floods in most years.

The project was proposed by BWDB (Sunamganj Water Development Division) in March 1990 and an EIP appraisal mission recommended the project be included in their 1990-91 program. Construction of the embankment commenced in 1991 and the embankment work is scheduled for completion in 1992-93. Work on the regulator is scheduled to start in 1992-93 and the project is scheduled to be completed in 1993-94.

Full Flood Embankments: The proposed full flood embankment extends from Karangaon to Gopalpur village and follows the present village road alignment. The embankment is primarily intended to improve communications as the existing village road is under water during the rainy season.

Submersible Embankment: The proposed submersible embankment is from Gopalpur village to Patakhauri pipe sluice. The embankment from Patakhauri pipe sluice to Dirai upazila center shares a common boundary with Baram Haor embankment and mainly follows the existing village road.

A low embankment has been constructed along the southern project boundary by the local authorities using Food for Work. Some sections of this embankment are along the river and are well constructed but the embankment is not continuous. Local farmers request that the embankment crest level be raised to ensure that their *boro* crop is secure. They maintain that water levels in the peripheral rivers are higher than in the past.

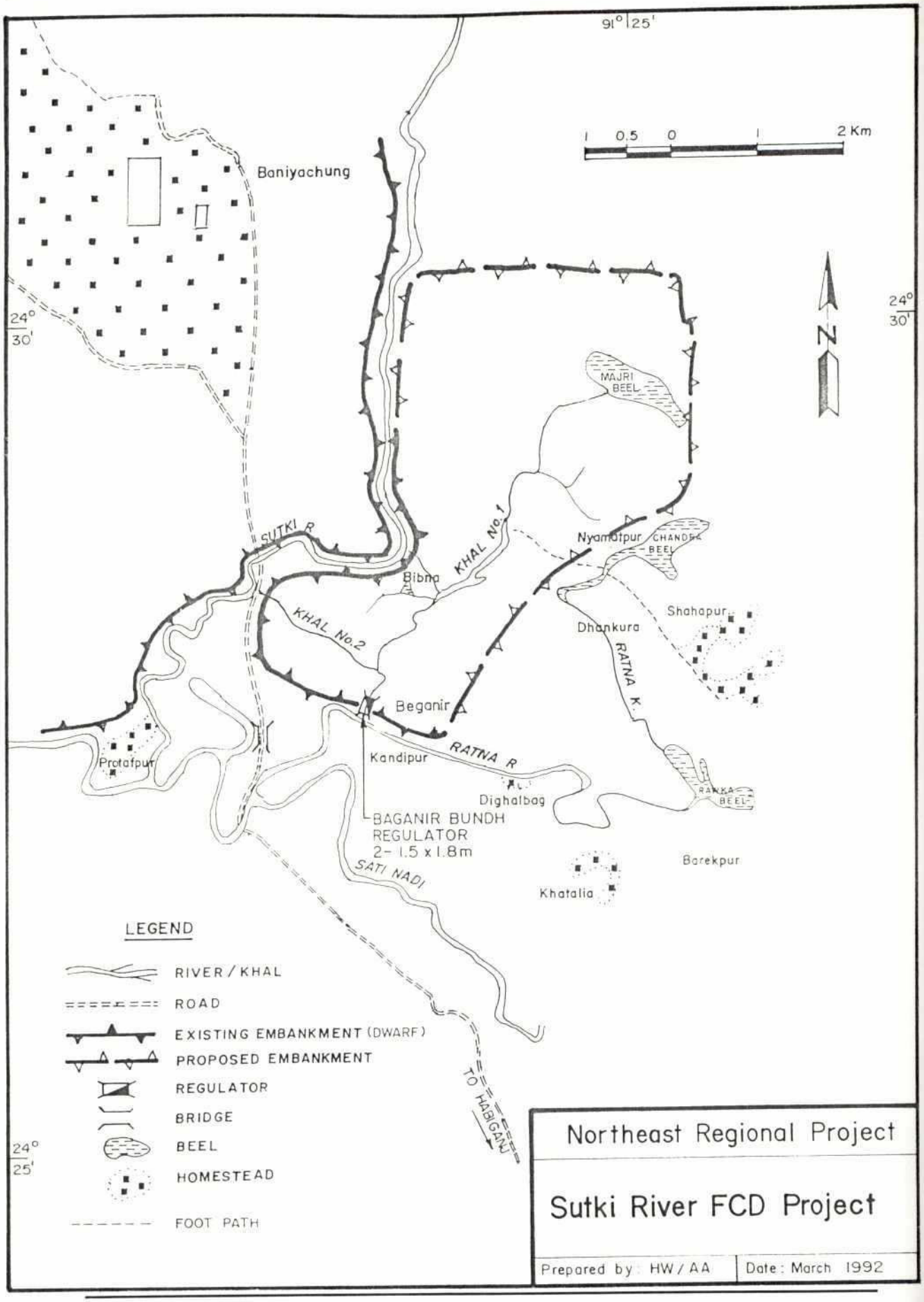
Structures: The project plan includes one regulator, three pipe sluices, two culverts, one pedestrian bridge, 20 irrigation inlets and compartmental bunds. Construction of Gilutia Regulator is scheduled to start in late 1992.

Fishery resources

The *beels* mainly produce small fish.

Fishing practices

The *beels* are now leased by open auction and local people are generally not permitted to fish in them. Subsistence fishermen at Darain River have stated that the lease-holder sometimes permits them to catch fish in the *beels* but more than 50 percent of the catch must be given to the lease-holder.


91° 25'
1 0.5 0 1 2 Km
N
24° 30'
24° 25'
Baniyachung
MAJRI BEEL
SUTKI R.
KHAL No.1
Nyamatpur
CHANDPA BEEL
Bibna
KHAL No.2
Shahapur
Dhankura
RATNA K.
Beganir
RATNA R.
Kandipur
Protapur
Dighalbag
RANKA BEEL
BAGANIR BUNDH
REGULATOR
2- 1.5 x 1.8m
SATI NADI
Barekpur
Khatalia
TO HABIGANJ
LEGEND
RIVER / KHAL
ROAD
EXISTING EMBANKMENT (DWARF)
PROPOSED EMBANKMENT
REGULATOR
BRIDGE
BEEL
HOMESTEAD
FOOT PATH
Northeast Regional Project
Sutki River FCD Project
Prepared by: HW / AA
Date: March 1992

L.1.20 SUTKI RIVER FCD PROJECT

Project location and general data

District: Habiganj
Thana: Baniachung
Project type: Partial flood control, drainage, water retention
Status: Begun 1985, halted 1987; ongoing
Gross Area: 1,417 ha
Net Area: 810 ha
Population:4,740

Environment and engineering works

Hydrology: The project is bounded by the Sutki River to the west and the Ratna to the south. The area is composed mainly of low-lying *beels*. The poorly-defined north and east boundaries follow slightly higher land. The area is deeply flooded throughout the monsoon. The main drainage channel, Khal #1, originates in Majri Beel, drains through other *beels*, and finally discharges into the Ratna at Baganir. Before the project, pre-monsoon flood water entered the area through Khal #1, damaging mature *boro* crops; to prevent this, farmers constructed an earth dam every year at the *khal* outfall. Local farmers state that pre-monsoon floods also enter the area overland from the north and east.

Project concept: The project objectives are to protect the area from flooding from the Ratna and Sutki Rivers to the south and west, and to provide irrigation water for the *boro* crop by retaining water in the *khals* and *beels*. BWDB works consist of a two-vent flood control/water retention regulator, and re-excavation of 58 kilometres of channels to improve drainage. Locally constructed works consist of 9 kilometres of 0.5 meter-high submersible embankments and field irrigation channels. Farmers state that pre-monsoon floods also enter the area overland from the north and east, and as such, the project concept for flood control is incomplete. Before 1983 (date unknown), local farmers constructed 9 kilometres of submersible embankments. In 1983, a feasibility report was prepared and detailed engineering designs. During Nov 85 to Jun 86, the regulator was constructed under an IDA- financed Small Schemes Project. In 1985, re-excavation of drainage channels began, but in 1987, with work half complete, a dispute over earthwork measurement halted the program. Currently, BWDB, Habiganj Division, proposes additional works: upgrading the existing submersible embankment; construction of submersible embankment around the rest of the project boundary; *khal* re-excavation; improving the existing regulator with installation of country-side slide gates. Earthworks would be undertaken in phases under FFW, and regulator modification would be financed from the Project O&M fund.

Submersible embankments: The low submersible embankments constructed by local farmers need to be upgraded. Supposedly Khals No. 1 and 2 were re-excavated in 1985-7 under FFW, but there is little evidence of spoil material from a sizable earthworks program. At the time of inspection (15 Jan 92) water levels were high and the condition of drainage channels could not be assessed.

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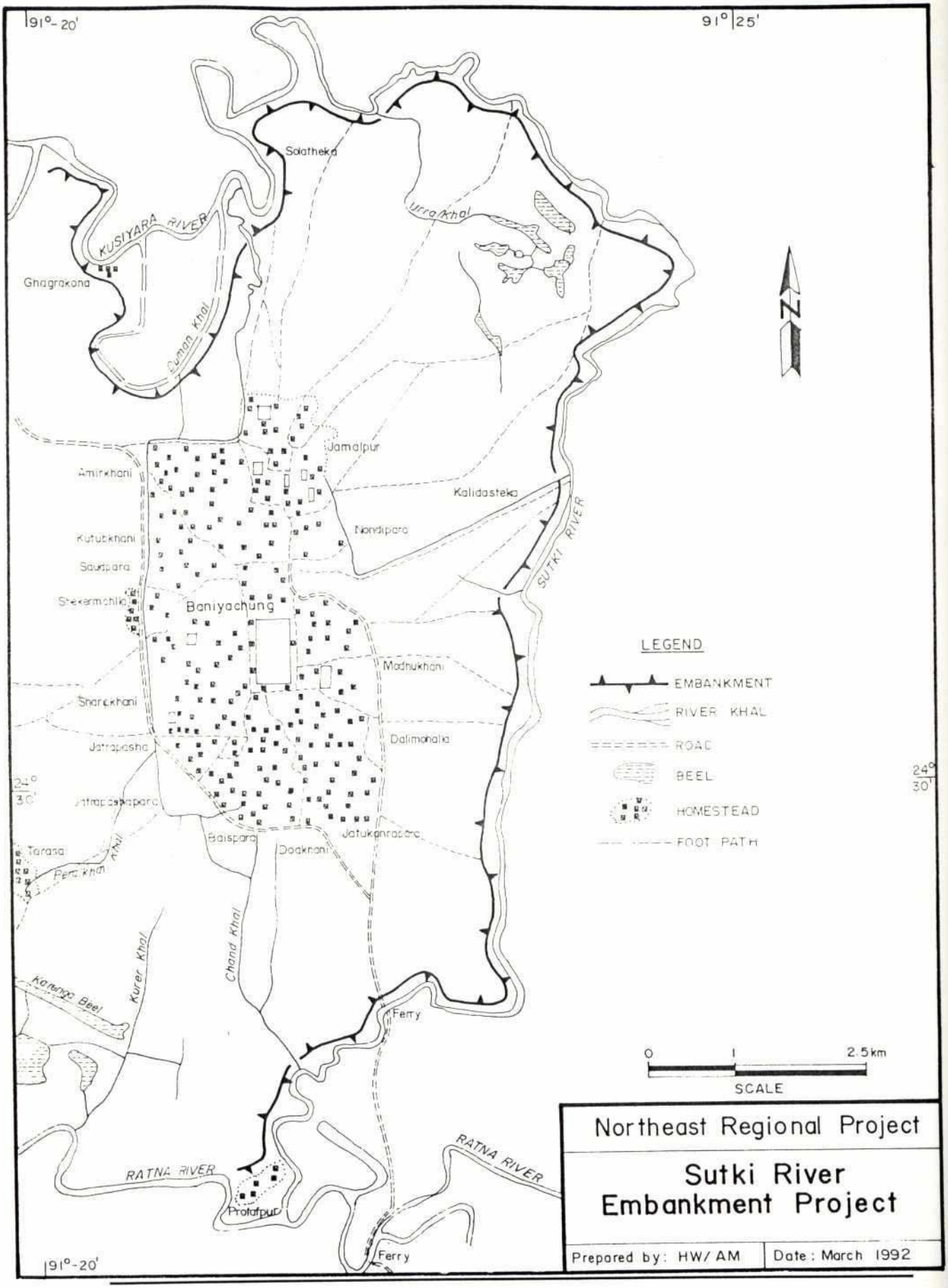
Regulator: The flushing/drainage regulator (vent size 1.5 meters x 1.8 meters) is in good condition and the hydraulic design appears adequate. Two slide gates on the river-side prevent inflow from the river. Wooden stop logs on the country-side are supposed to retain water during the post-monsoon season, but they leak profusely and farmers fill the regulator with earth on the countryside instead.

Fishing practices

Local people fish in all *beels* in the area; these are not leased out.


91°-20'
91°25'
Solatheka
Urra Khal
KUSIYARA RIVER
Ghagrakona
Duman Khal
N
Jamalpur
Amirkhani
Kalidasteka
Nandipara
SUTKI RIVER
Kutubkhani
Saudpara
Shekermohila
Baniyachung
Madhukhani
Sharakhani
Dalimonalia
Jatrapasha
24° 30'
Jatrapashapara
Baispara
Dookhani
Jatukanrapara
Tarasa
Pera Khal
Chand Khal
Kurer Khal
Karenga Beel
Ferry
RATNA RIVER
Protapur
Ferry
LEGEND
EMBANKMENT
RIVER KHAL
ROAD
BEEL
HOMESTEAD
FOOT PATH
0 1 2.5km
SCALE
Northeast Regional Project
Sutki River Embankment Project
Prepared by: HW/ AM
Date : March 1992

L.1.21 SUTKI RIVER EMBANKMENT PROJECT

Project location and general data

District: Habiganj
Thana: Baniachung and Ajmiriganj
Project type: Submersible flood protection
Status: Begun 1957, completed 1959
Gross area: 12,146 ha
Population: 54,940

Environment and engineering works

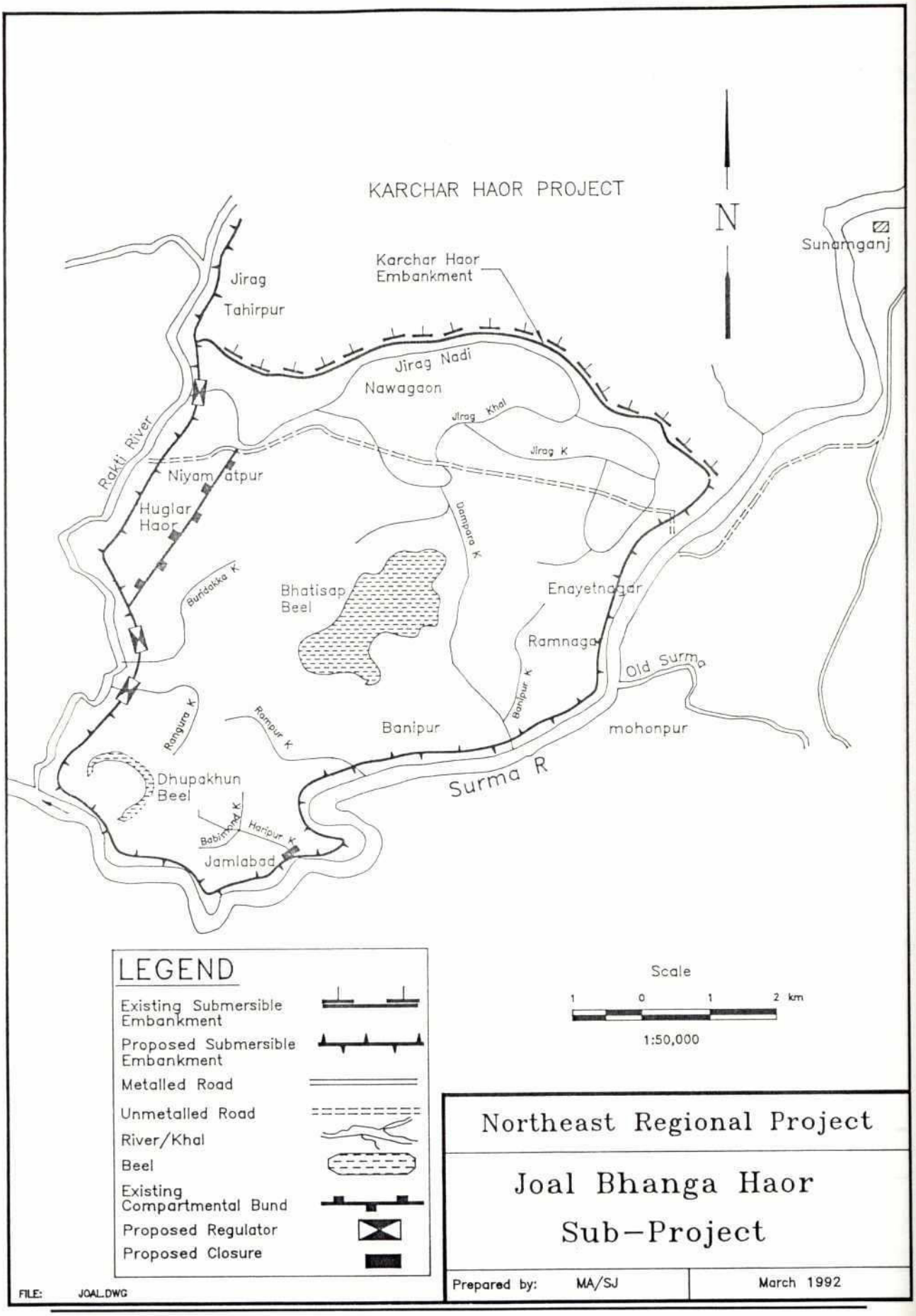
Hydrology: The project area is bounded in the north, east and south by the Sutki River, a tributary of the Kushiyara River, in the northwest by Duman Khal, and in the west by high land in the Baniachung town area. During the pre-monsoon period, Kushiyara flood water backs up into the Sutki. The embankment delays the inflow of early Sutki/Duman Khal overbank spill, but floodwaters still enter the project area through the open *khals* that drain into the Sutki. Throughout the monsoon season, the project area is mostly deeply flooded, partly due to backwater effects from the Meghna.

Project concept: The project concept is to protect the *boro* crop from pre-monsoon flooding by constructing an embankment along the Sutki River and Duman Khal right banks. Project works consist of 33.8 kilometres of submersible embankment with a design crest elevation of 9.15 meters PWD. During 1957-59, the Sutki River right embankment was constructed. Additional planned flood control and drainage works were never constructed. Over the years, various embankment reaches have been re-sectioned under FFW from time to time.

Submersible embankment: The average embankment height is about 4 m. Embankment reaches along Duman Khal and the Sutki on the northern project boundary are in poor condition. The embankment along the Sutki on the eastern project boundary is in good condition. The embankment design crest level (9.15 PWD) seems high for pre-monsoon protection.

Fishing practices

Local people are permitted to fish in the few shallow *beels* within the project, as these are not leased out under government auction even though they are government-owned (*khas*).


KARCHAR HAOR PROJECT
N
Sunamganj
Karchar Haor Embankment
Jirag
Tahirpur
Jirag Nadi
Nawagaon
Jirag Khal
Jirag K
Rakti River
Niyam atpur
Huglar Haor
Uampara K
Buridakka K
Bhatisap Beel
Enayetnagar
Ramnaga
Old Surma
Banipur K
Rangura K
Rampur K
Banipur
mohonpur
Surma R
Dhupakhun Beel
Babirchad K
Haripur K
Jamlabad
LEGEND
Existing Submersible Embankment
Proposed Submersible Embankment
Metalled Road
Unmetalled Road
River/Khal
Beel
Existing Compartmental Bund
Proposed Regulator
Proposed Closure
Scale
1 0 1 2 km
1:50,000
Northeast Regional Project
Joal Bhanga Haor Sub-Project
Prepared by: MA/SJ
March 1992
FILE: JOAL.DWG

L.1.22 JOAL BHANGA HAOR PROJECT

Project location and general data

District:Sunamganj
Thana:Sunamganj & Jamalganj
Project Type:Partial flood protection
Status:Construction begun 1992; completion expected 1994
Gross area: 4,370 ha
Net area: 3,660 ha
Population:20,000

Environment and engineering works

Hydrology: The project is bordered to the east and south by the Surma River, to the west by the Rakti River, and to the north by the Karchar Haor embankment on the far side of the Jirag Nadi. Flood water from both the Rakti and Surma starts entering the project in April through Haripur Khal, Rangual Khal, Buridakka Khal, and the Jirag Nadi. Overbank spill from the Rakti begins soon after. The area is deeply flooded during the monsoon season to depths varying from 1.0 meters to 6.0 meters. The Rakti, a distributary of the Jadukata River which originates in the Meghalaya Hills to the north, falls into the Surma at the southwestern corner of the project. Rakti water levels are thus influenced by conditions in and above the Jadukata, and by backwater from the Surma. Recent sedimentation in the Jadukata, in and around its confluence with the Dhamalia River, has diverted more than 50% of its flow into the Maharram River. In turn, Rakti flows have decreased and the Rakti outfall into the Surma is silting up. Farmers report that Rakti River now becomes dry during winter. The storage capacity of the Jirag Nadi has decreased substantially due to sediment deposition. Local people request re-excavation of the Rakti and Jirag Nadi.

Water bodies: Most *beels* dry up in winter.

Project concept: The project objectives are:

- to protect the *boro* crop from pre-monsoon flash floods, with provision for rapid post-monsoon drainage. A 16 kilometre-long submersible embankment around the project would be provided by upgrading (i) existing embankments built by farmers along the Surma and Rakti Rivers and (ii) the Karchar Haor Embankment built by BWDB. Three regulators for flushing and drainage would be provided at *khal* outfalls on the Rakti River.

- to increase irrigation surface water availability. The *khals* left open at the regulators would be re-excavated, and two pipe sluices and 22 irrigation inlets provided (location not yet decided).

The area is deeply flooded during the monsoon season to depths varying from 1.0 meters to 6.0 meters. In the 1970s, low embankments were built by farmers along the Surma and Rakti Rivers. In the late 1960's, Karchar Haor embankment was built by BWDB. In Mar 90, BWDB Sunamganj Water Development Division proposed further development of the area. In 1990, an EIP appraisal mission recommended inclusion of the project in the 1991-92 EIP program.

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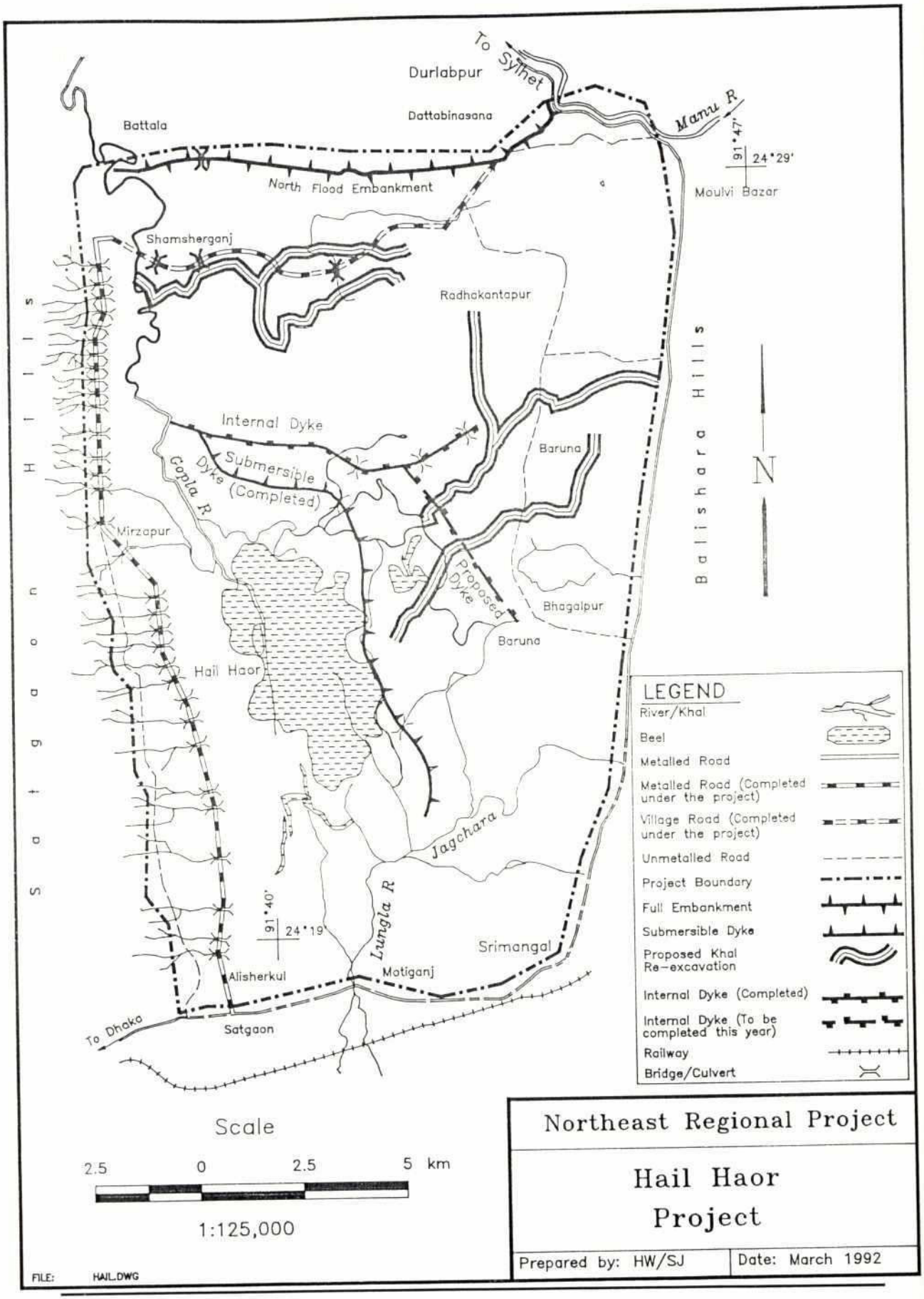
In 1992, embankment upgrading and construction of the regulators, pipe sluices, and irrigation inlets will begin under EIP. The expected date of completion is 1994.

Embankment: The locally-built dwarf embankment along the Surma and Rakti is not continuous. In 1991, before the *boro* harvest, it was overtopped in many places, local people report. The Rakti embankment has three public cuts, reportedly made for drainage. Water also enters the project through the *khals*, in particular through the Jirag Nadi. Farmers request upgrading of the embankment and construction of a regulator on the Jirag Nadi; this is planned as part of the current implementation program. The other two proposed regulator sites are not yet finalized; EIP was advised to examine the public cut locations.

Production trends and project impacts on fisheries

Local people predict that the project will have little impact on fisheries.

293



Northeast Regional Project

Hail Haor Project

Prepared by: HW/SJ	Date: March 1992

L.1.23 HAIL HAOR PROJECT

Project location and general data

District: Moulvi Bazar
Thana: Srimangal and Moulvi Bazar
Project type: Flood control and drainage
Status: Under construction since 1985
Gross area: 24,370 ha
Benefitted area: Flood control Not available
Population: 139,770

Environment and engineering works

Hydrology: The demarcated project boundary (24,370 hectares) is a small part of a much larger catchment of about 160,000 hectares. The Lungla River is the main collector that discharges into the *haor*. The Gopla River is the main drainage channel. The main source of flooding for the area is evidently the Lungla; Kushiyara flood flow apparently does not reach the project northern boundary. The *khals* that originate in hills east and west of the project (the Borshijura/Balishara Hills and the Satgaon Hills respectively) are relatively small flood sources. The Gopla River is the only drainage outlet from the basin. Reportedly, the Gopla's drainage capacity downstream of the project has been reduced by siltation. If this is the case, re-excavation of internal channels will not improve post-monsoon drainage substantially. The Gopla also drains Gangajuri Haor and other low areas to the north of Hail Haor. It appears that the Gopla downstream to its discharge into the upper Meghna has not been studied. Perhaps improvements along this reach would ameliorate drainage in Hail Haor and the other *haor* areas along the Gopla. Many FCD and FCDI alternative schemes have been studied for Hail Haor, including pumped drainage and pumped irrigation schemes.

Water bodies: The area under water varies from 2,800 hectares during the dry season to about 9,400 hectares during the monsoon period. Maximum flooded depth is 7.5 m, and maximum dry season depth is 5.5 m. There are 352 small canals (locally called CHARA) entering into the Hail haor which originate mainly from the Indian hills. Most of the canals are becoming dry during the dry season. Now only 25-30 canals retain water year round. The important canals which are the main source of water for the haor are Joinka Boishakhali chara, Haun chara, Hial chara (Narayan chara), Kaikka chara, Dachara, Khai chara, Joinka chara, Shahamura, Burburia, Kaikkagang, Fool chara, Bilash(Motiganj), Kudalia and Bara chara(Raghunandan hill).

There are 48 jalmohals in the haor, of which the following 20 are the most important:

Table L19: Area and Lease Value of Important Jalmohals in Hail Haor

Jalmohal	Area (ha)	Lease Value (Tk)	Remarks
Dubaar beel	49	400 (1986)	
Chiruar khal	9	250 (1986)	
Dighuli beel, river	34	2,000 (1985)	
Bollar beel	62	2,000 (1985)	
Chiruar duba	103	9,000 (1986)	
Ghopla 1st part	23	500 (1986)	
Ghopla 2nd part	21	8,100 (1985)	Mother fishery
Ghopla 3rd part	23	1,550 (1985)	Mother fishery
Ghopla 4th part	21	4,400 (1987)	Mother fishery
Daalpach	12	15,100 (1986)	
Jaduria	49	750 (1985)	
Medhi beel	10	825 (1987)	
Baroshuchina	17	300 (1985)	
Beel duba	336	5,000 (1986)	Mother fishery
Chapramguria	30	-	
Awi beel	156	-	
Boyra beel	37	8,000 (1985)	
Aluniberri	96	1,000 (1987)	
Pohania duba	96	7,800 (1985)	
Bashatte beel	285	40,000 (1986)	
TOTAL	1,469	105,975	

Due to less water in 1992 most of the haor area (about 80%) was covered with dense aquatic vegetation. The main species present were Shapla, Gaur, Futki, Kachuripana, Ful gas, Kanikata, Kataphala, Keroil, Katachar, Erail, Parua, Jhinari, Vat, Shaluk, Shaula, Panikola and Singra.

In most of the haor area water colour is transparent to slightly greenish (Mirzapur, Baulashir and Baruna area). Transparency was 1.0-1.5 m, which indicates little suspended plankton in the water. The stems of some aquatic plants were covered by periphyton and in some parts are covered by gaur, which is good carp feed. But at the inlets of every canal (Chara) the water was found to be highly turbid due to silt. The high rate of sedimentation is the result of the silt-bearing water entering into the haor.

Project concept: Project objectives have evolved over the last decade. The objectives of the present plan, which combines recommendations from three feasibility studies, includes control of water hyacinth and separation of *boro* and *aman* crop areas. Compartmental bunds are intended to protect crops and channel re-excavation is intended to improve drainage. Project infrastructure completed to date include two roads, one along the northern project boundary and the other on the western boundary, and a submersible embankment inside the project area. The western road includes 32 bridges and culverts with caisson foundations. Neither road ("North Flood Embankment" and the "Alisherkul-Battala" metalled road) has any hydrological or flood control function, though they do improve local transport. The current implementation program consists of construction of compartmental bunds with culverts to be linked to the submersible embankment, and of re-excavation of internal channels. No hydraulic structures exist and none are proposed for the area. Between 1964-7, the first feasibility study was carried out for EPWAPDA. During 1973-6, the second study ("*Feasibility and Definite Project Report*", two volumes) was completed. This study updated the first study and included detailed designs. In Dec 1980, a third study ("*Draft Feasibility Report for Hail Haor Irrigation Project*", five volumes) was completed for BWDB Directorate of Planning (Schemes). During 1985-7, an updated set of engineering designs were prepared by BWDB. These documents are presently being used to implement the project. In 1985, construction work began. Construction of bridges and culverts was carried out under the IDA-financed FCD-II Project. Earthwork is being carried out by BWDB under FFW. The completed construction activities consist of:

- Upgrading of 12.8 kilometres of village road embankment along the northern boundary ('North Flood Embankment') and construction of one bridge/culvert;
- Construction of 9 kilometres of submersible embankment in the middle of the area, along the northeastern periphery of Hail Haor;
- Upgrading, including bituminous surfacing, of 32.2 kilometres of village road running north-south from Alisherkul (southwestern corner of project) to Battala (northwestern corner), and construction of 32 bridges/culverts (all founded on caissons) to allow cross-drainage for the small *khals* from the western hills;
- Construction of 10 kilometres of village road south of and roughly parallel to the North Flood Embankment; and
- Re-excavation of 2 kilometres of *khal*.

For the 1991-2 construction season, construction of about 17 kilometres of compartmental bunds and re-excavation of about 47 kilometres of drainage *khals* is proposed.

Embankments: The Alisherkul-Battala metalled road and the 'North Flood Embankment' road surfaces have deteriorated badly, and no funds are currently available for re-surfacing. Otherwise, nearly all the project earthworks are in good condition. The exception is about 5 kilometres of the submersible embankment northeast of Hail Haor which was damaged during the 1991 flood season. No siltation of internal channels was observed. Local residents report that every year since 1984 the Lungla has overtopped, at Motiganj, the village road just south of the project boundary.

Fishery resources

Based on interview with fishermen, lessees and fish market surveys, the general abundance levels of fish in Hail haor are as follows:

Table L20: Degree of Abundance of Different Fish Species in Hail Haor

HIGH	MEDIUM	LOW
Ghonia, Bajori, Tengra, Gulsha, Singhi, Baim, Mola, Chela, Boisa, Kaikka, Fali	Boal, Ghagot, Gazar, Taki, Shoal, Koi, Bheda, Chanda, Kholisha, Napit, Puti, Bailla, Kechki, Icha	Catla, Rui, Mrigel, Kalibaus, Chital, Sarputi, Pabda, Chapila, Ghagla, Magur, Laso, Bashpata, Garua, Batashi, Air

Lati and Kangla also occur in the haor. Major carps are not abundant, and at present smaller species form the bulk of the ichthyomass. Pangas, Bacha, Nandina and Golda chingri are more or less extinct species in the haor.

Fishing practices

Gear type, area of operation and species captured are given below:

Table L21: Daily Catch of Different Gear with Area & Species Caught

GEAR	AREA OF OPERATION	SPECIES CAUGHT
Current jal	Near shore with less aquatic vegetation	Puti, Bheda, Kholisha, Chanda Daily catch: 1-2 kg/unit
Thela jal	Shoreline area	Icha, Mola, Cirka, Chanda Daily catch: 1-2 kg/unit
Kapri jal	Shoreline and other floodplain areas	Chapila, Mola, Chanda, Icha, Bheda, Lati, etc
Koiya jal	Floodplain with submerged weeds	Koi, Bheda, Kholisha
Borshi	Shoreline area	Cheng, Lati, Baim, Shingi
Chai	Floodplain with less aquatic weed	Tengra

Ber jal, Khapla jal, Bel jal, Faash jal, Dhormajal, Koach and Teta are also used.

The entire haor is divided into jalmohals which are leased out for a 1-3 year periods through open auction from the Moulavibazar D.C office and TNO office. Soon after the auction, the lessees issue informal licenses to individual net operators to catch fish within the open areas.

Lesees also install katha at the greatest depths of the jalmohals which are protected by their fish guards. The katha fishing system is called Dol fishing. A mat of floating water hyacinth (Kachuripana) is positioned over the katha by using bamboo sticks. For katha, the following tree branches are used in the area: Mango, Jam, Bot, Shobri, Shawra. Fishing by light is a popular method in the area. Probably water hyacinth protects fish from light attraction. Katha are harvested during December and January.

Due to less water in 1992, the entire haor area was covered by aquatic weed. Most fishing activities took place within the internal canals where slightly open places remained.

There are 22 fisherman villages around the haor area: Mirzapur, Dubarhat, Satrabot, Jatrapasha, South Pachau, Boulashir, Gondhavpur, Bhimshi, Bhunobir, Shason, Rostampur, Shaharsree, Jollarpur, Isabpur, Noagaon, West Baraura, Sreemongol bosti, Kalapur, Monargaon, Shahidpur, Hazipur and Baraura. A total of 11,500 fishermen are estimated to be present in the haor. Fish are landed at 10 centres: Kalapur, Mirzapur, Baruna, Shamsherganj, Hazipur, Rostampur, Boulashir, Bhunobir, Sreemongal bazar and G.T Road market.

There is year-round fishing in Hail Haor, but fishing is most active during the dry season from December to February. Availability of fish in the market has the following seasonal pattern:

Table L22: Second Pattern of Fish Market

SUPPLY	PERIOD	SPECIES
Large	Dec/Jan-Feb	All species
Small	Mar-July	Mainly small species
Medium	Aug-Nov	All species, but smaller sizes

Baruna and Baruna Haziganj bazar are the two most important market outlets of the Hail haor fish. Usually fishermen come to the market at about 3-4 pm and 'paikers' wait to purchase the fish. There is a 5-10% sales tax which is paid by the fishermen to the market lessees (so-called fishermen leader). Fishermen at the market stated that they receive about Tk 60-65/kg. Paikers can realize a 15-20% profit at the Sreemongal Arat, while aratders charge a 5-10% commission from the auction in the market.

Production trends and project impacts on fisheries

Total fish catch from the haor has declined 75% over the past 5 years. People of the area note that carp species became more or less extinct in the haor 15-20 years ago. Other than carps, cat fish and smaller species of fish have declined by 50-60% over the last 5-7 years. The decline in production is attributed to the following factors:

- Over-exploitation, uncontrolled use of current jal, chat jal (kapri jal) and annual harvesting of fish by complete dewatering of the basins.

- Heavy siltation of the water bodies and reduction of dry season water hectare months. The Gopla river is gradually silting up and is suffering a loss in channel volume and discharge capacity. This results in regular occurence of high flooding.

- Deforestation within the haor area.

- Expansion of agricultural land and excessive use of insecticides in the paddy fields.

- Growth of excess aquatic vegetation in the beels during the rainy season. This is due to impeded water discharge at the downstream end of the haor, which induces water logging and poor drainage.

- Fish disease (Epizootic Ulcerative Syndrome).

Local people state that the project to date has had little fisheries impact. Cutting of submersible embankment sometimes creates an opportunity for catfish and barbs to carry out upstream spawning migrations during the rainy season. But usually spawning is prevented because the broodstock is trapped by the local people.

Because of the decline in the major carp population, an artificial stocking programme was initiated by the Second ADB project. Spawn, fry and fingerlings were released in 1991 and 1992 from two nurseries sited around the haor area. Catch assessments and market surveys are being conducted to evaluate the impact of fry releases. More fingerlings purchased from the open market will be released in the haor this year.

Concerned fisheries people in the area believe that overall production can be increased by the implementation of the fish laws. But successful implementation of laws requires strong administrative support, commitment and sufficient finance. Implementing the Fish Act will entail some costs, but these might be less than the present cost of the artificial stocking programme. An economic evaluation of management versus stocking should be carried out.

Overfishing and poaching are two major reason for rapid fish decline in the area. Both the Thana Fisheries Officer and the lessees of Sreemongal have emphasized the need for biological fisheries management instead of the present financial management system. The following are the key points of biological fisheries management in a haor:

- Control of fishing gear.

- Maintenance and management of pile fishery within a haor (at least 10% of the jalmohals should be kept as pile).

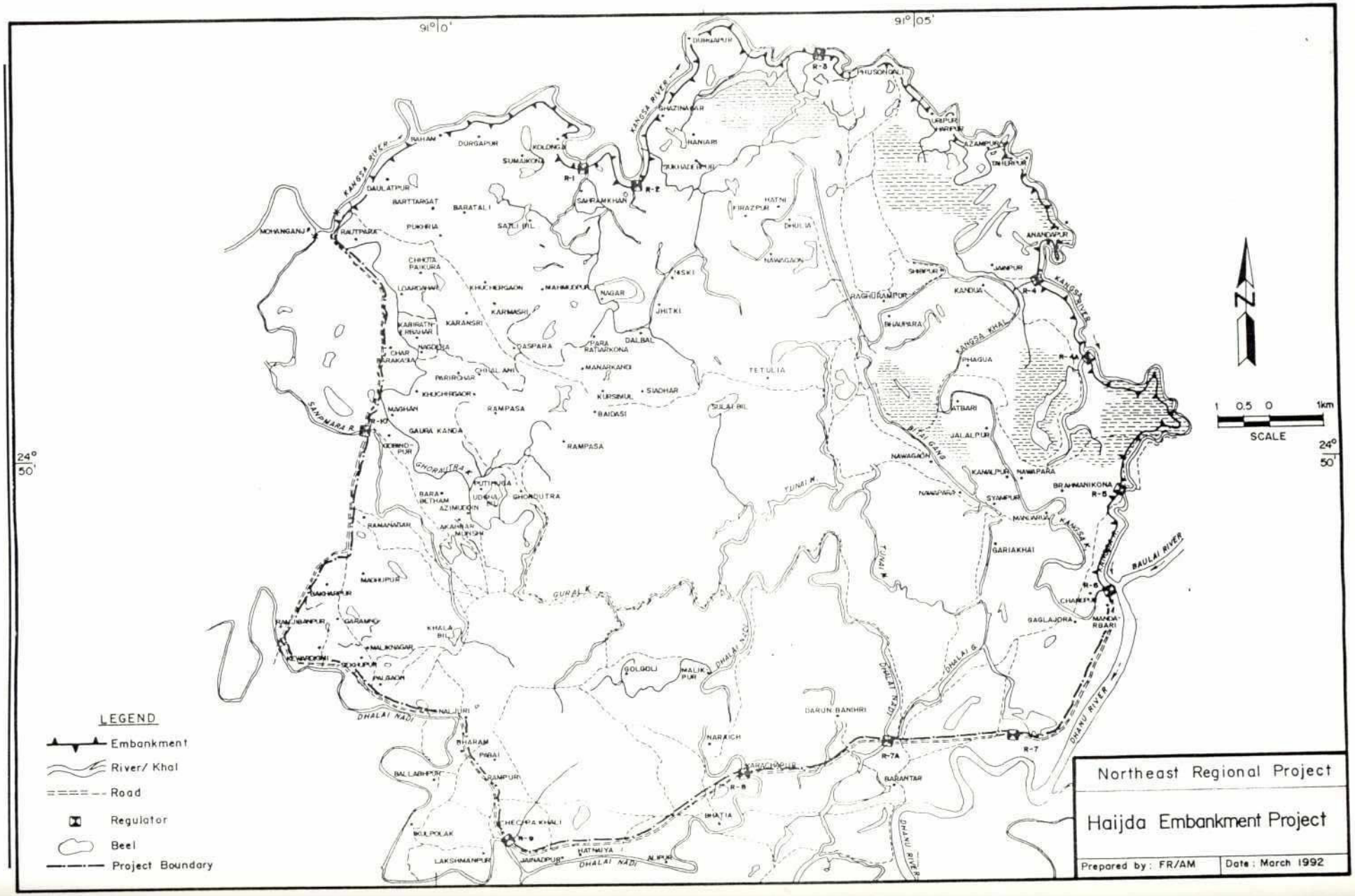
- Complete restriction on dewatering and poisoning of jalmohals.

- Maintenance and management of wetland forests within a haor (at least 1-2% of the haor area should be keep as forest land).

- Maintenance of the deepest duars and other deeper beels as reserve fishery.

Hail Haor has been identified as a wetland of some conservation significance. The Department of Forests has proposed it for protected area status, and it is one of the most important of the wetland sites in northeast Bangladesh.

The Gopla river is gradually silting up and is suffering a loss in channel volume and discharge capacity. This results in regular occurence of high flooding. It, and several other channels, need to be re-excavated.


91°0'
91°05'
24°50'
KANGSA RIVER
SANJHARA R.
GHORAUTRA R.
DHALAI NADI
GUNAI K.
TUNAI K.
BAULAI RIVER
DHANU RIVER
KANGSA KHAL
DHALAI 5
DHALAI 6
DURGAPUR
HUSONGALI
GHAZINAGAR
HANIARI
SUMAIKONA
KOLONGA
NAHAN
DAULATPUR
BARTTARSAT
BARATALI
SAHRAMKHAN
SAZLI BIL
PUKHRIA
MOHANGANJ
RAUTPARA
CHHOTA PAIKURA
KHUCHRIGAON
MAHMUDPUR
NAGAR
JHITKI
KARMASHI
KARIRATH PASWAR
KARANSRI
NAGDHA
CHAR PURAKAYA
DASPARA
PARA RATARKONA
DALBAL
MANARKANDI
GHULANI
PARIROWAR
KHUCHRIGAON
KURSIMUL
SIADHAR
TETULIA
BAIDASI
SULAI BIL
MASHAN
GAURA KANDA
RAMPASA
UDHNO-PUR
BARA BETHAM
AZIMUDDIN
UTTIPUGA
UDHNA BIL
GHORAUTRA
AKANNAR MUNSHI
RAMANAZAR
MADHUPUR
RAMJIBANPUR
GARAMPO
KHALA BIL
NALJONGAR
KEWADKONI
SEKUNDA
PALGAON
NALJURI
BHARAM PARA
BALLABHPUR
RAMPUR
CHEGORA KHALI
KULPOLAK
LAKSHMANPUR
JUNAIDPUR
HATNIYA
ALIPUR
GOLGOLI
MALIK PUR
DARUN BANDHRI
NARAICH
BARANTAR
BHATIA
HATNI
FIRAZPUR
DHULIA
NAWAGAON
AZAMPUR
TINURIYA
ANANDPUR
JANPUR
SHIMPUR
KANDUA
RAGHURAMPUR
BHALUPURA
PHAGUA
ATBARI
JALALPUR
NAWAGAON
KANAIPUR
NAWAPARA
SYAMPUR
MANGARI
BRAHMANIKONA
GARIAKHAI
CHANDI
MANDARBARI
GAGLAJORA
R-1
R-2
R-3
R-4
R-4A
R-5
R-6
R-7
R-7A
R-8
R-9
R-10
N
1 0.5 0 1km
SCALE
LEGEND
Embankment
River/ Khal
Road
Regulator
Beel
Project Boundary
Northeast Regional Project
Haijda Embankment Project
Prepared by: FR/AM
Date : March 1992

L.1.24 HAIJDA EMBANKMENT PROJECT

Project location and general data

District: Netrokona
Thana: Mohanganj
Project type: Partial flood control
Status: Under construction
Gross Area: 9,716 ha
Benefitted Area: 8,097 ha
Population: 46,600

Environment and engineering works

Hydrology: The Project is bounded by the Kangsha Rivers right bank in the north and east and the Dhalai and Sanpmara Rivers, which are distributaries of the Kangsha River, in the west and south. The Kangsha River merges with the Baulai River in the project's southeastern corner. The water levels in the Kangsha dominate the areas flood patterns — particularly in the pre-monsoon period. Historically, water entered the project area from the Kangsha River via numerous small creeks, and as flood levels in the river increased, water entered via over bank spill. The Kangsha River is reportedly silting in the reaches near its outfall into the Baulai River. This may be related to increased water levels in the Baulai as the Baulai River is reportedly carrying increased volumes of Surma River flow. The Kangsha River flow is gradually being diverted into its distributaries on the projects western side. The Project area slopes generally towards the south and east with drainage being effected into the Kangsha and Dhalai Rivers. Higher bed levels resulting from sediment deposition will affect drainage.

Project concept: The Project was conceived to protect *boro* crops planted in the low lying areas of the beels from pre-monsoon flooding. The *boro* crop was to be protected by constructing 30 kilometers of submersible embankments around the Project and using another 30 kilometers of existing road. To provide flushing and drainage 12 regulators were to be constructed. The flushing is required to equalize water levels inside and outside the Project embankments prior to their being overtopped. The project area is deeply flooded in the monsoon season and is composed mainly of low-lying *beels*, some of which are permanently flooded. This results in the area being mostly single cropped, with local *boro* as the main crop. The Project was identified by BWDB and studies at a feasibility level in 1984. The studies were financed by the Asian Development Bank and European Economic Community. Haijda Embankment was one of 12 projects recommended for implementation by the *Small Scale Irrigation Sector Project* (SSISP) and the project is currently under construction. BWDB is the implementing agency and the Asian Development Bank is providing financial assistance.

Submersible embankment: The project's submersible embankment is complete. There are a few public cuts in the embankment. The cuts are made for two reasons: to facilitate irrigation using low-lift pumps and to relieve local drainage congestion. Reportedly, the water-users re-group from year to year, each year selecting a different location for their low-lift pump operations. Hence, the location of any future irrigation inlets should be carefully reviewed with the farmers, to minimize the number of public cuts.

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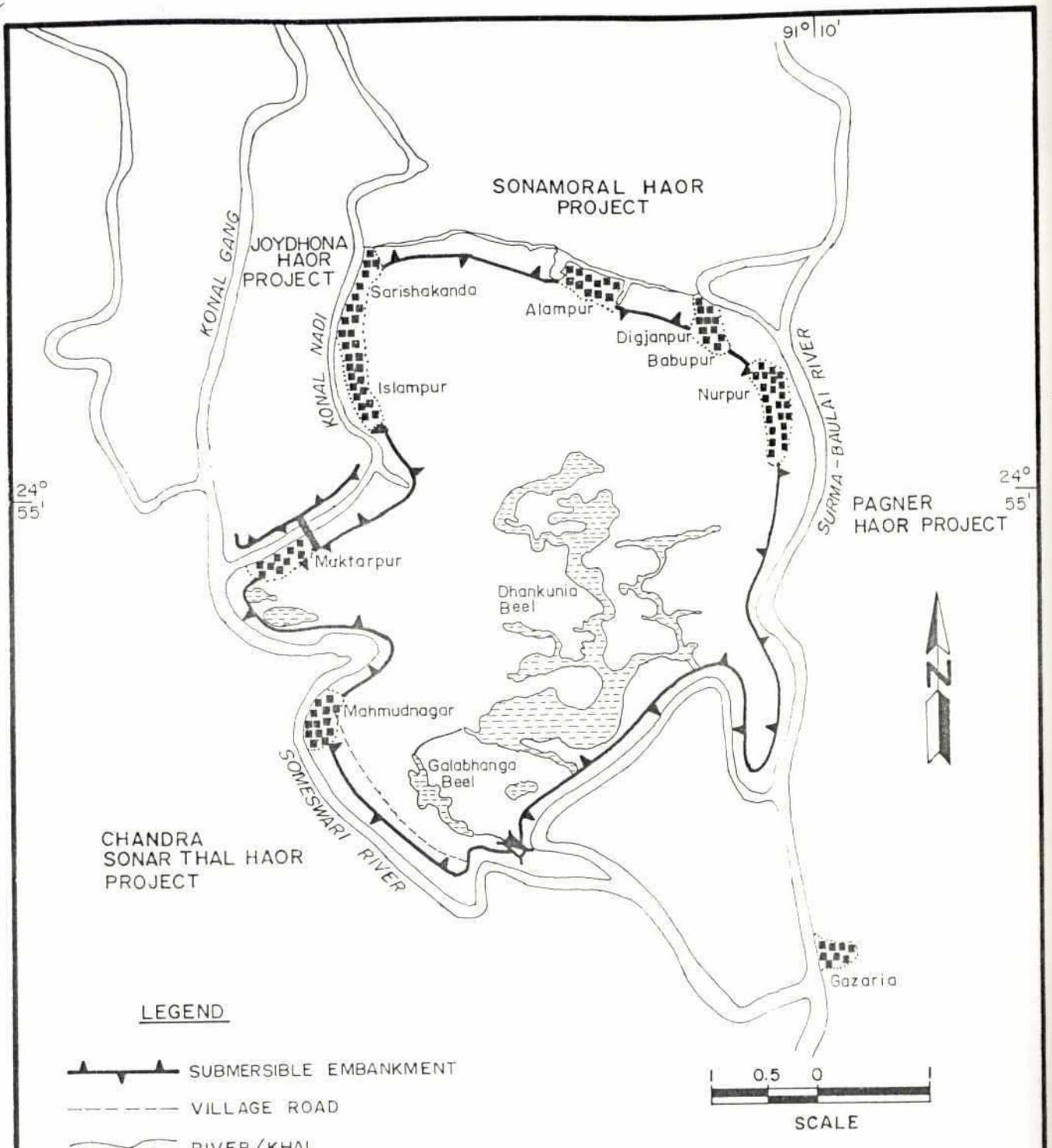
Regulators: There are 12 regulators in the project of which seven have been built. The remaining five structures are under construction. Three of the structures are on pile foundations. All the regulators are fitted with steel, vertical lift gates and two regulators have additional flap gates. All structures constructed to date are in good condition.

Production trends and project impacts on fisheries

Fishermen in the area believe that the project will have no impact on fisheries.



Northeast Regional Project	
Dhankunia Haor Project	
Prepared by: MA / AM	Date: March 1992

L.1.25 DHANKUNIA HAOR PROJECT

Project location and general data

District: Sunamganj
Thana: Darkunia
Project type: Partial flood control
Status: Completed 1966
Gross area: 1,780 ha
Net area: 1,619 ha
Population: 5,900

Environment and engineering works

Hydrology: The project is bordered to the west by Konal Nadi and the Someswari River, and to the east and south by the Surma-Baulai River. The Konal Nadi branches off the Baulai a few kilometres north of the project and falls into the Someswari on the west side of the area. It is closed at Muktarpur village. The Someswari originates in Meghalaya State in India, and falls into the Surma-Baulai River. The Someswari is seasonal; its offtake has silted up, leading to decreased flows and to siltation at its outfall. These changes may be restricting project area drainage. The Someswari is classified by BIWTA as a Class III navigation route, but due to the outfall siltation, navigation is suspended for about two to three months in the dry season. The Surma-Baulai River outfall near Gazaria *upazila* is reportedly silting up.

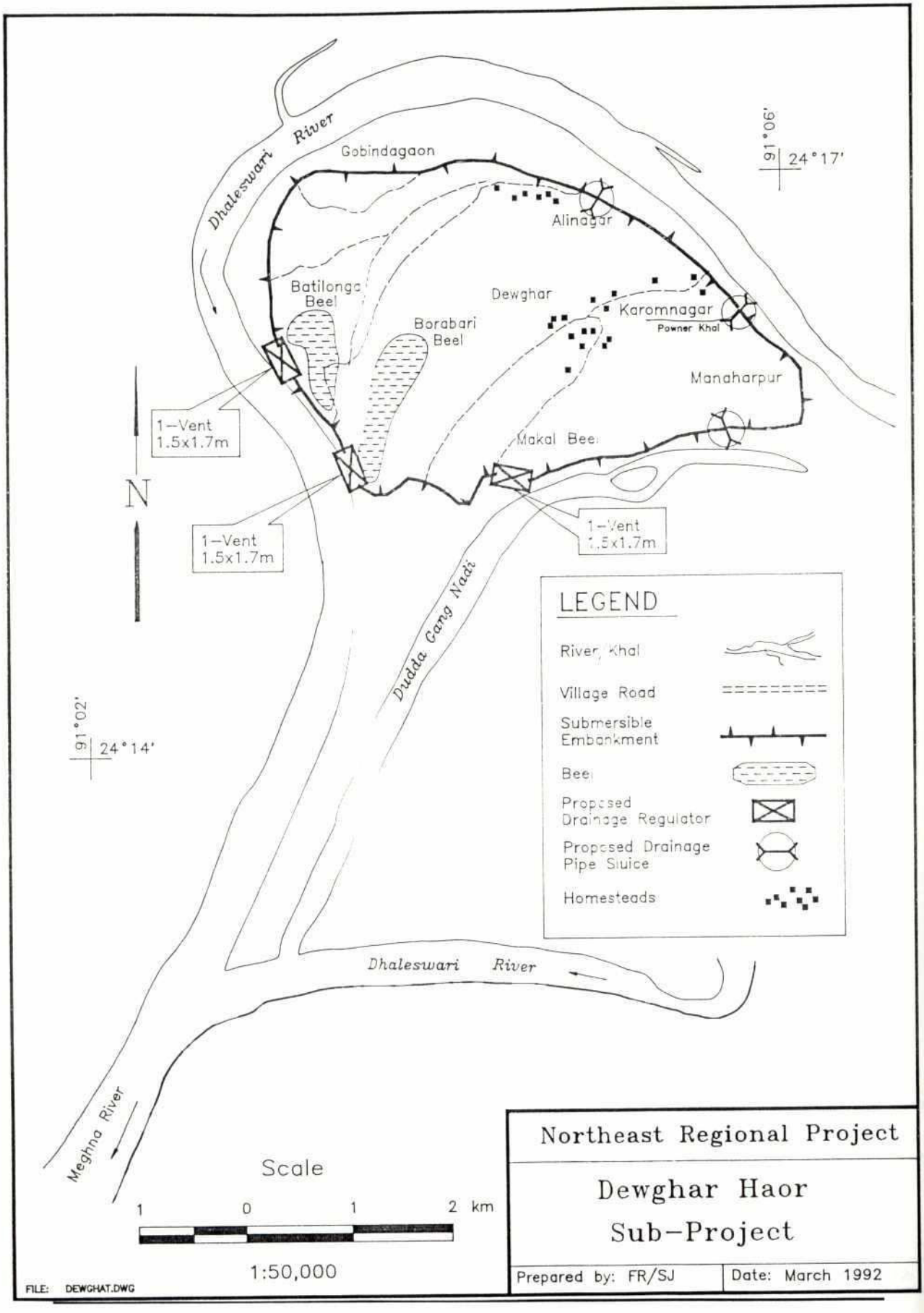
Water bodies: The project has several *beels* most of which become dry during the winter.

Project concept: The project objective was to exclude pre-monsoon flash flooding until after 15 May when the *boro* harvest is complete. The area is mostly single cropped, mainly with local *boro*. Pre-monsoon floods damaged the *boro* crop almost every year before the project was built. During the monsoon season most of the area is deeply flooded to 3.0-6.0 meters. The project consists of 25 kilometres of submersible embankments and one four-vent regulator. The regulator is used to fill the basin after the *boro* harvest and for post-monsoon drainage. The project was constructed in 1962-6 with GOB resources. Embankments are maintained under FFW.

Embankment: In mid-February 1992, embankment maintenance was underway; completion was scheduled for mid-Mar 92. The design crest level is 6.10 meters PWD. In 1990 and in 1991, however, the embankment was overtopped before the *boro* harvest. Farmers request that the height be increased. BWDB has elected to wait for the results of the regional studies before establishing new crest levels. The regulator is equipped with fall-boards. Farmers report that the fall-boards leak and are difficult to remove during pre-monsoon flood conditions. Upstream and downstream aprons are broken. The inlet and outlet channels are silted up.

Fishing practices

The *beels* are now leased out under open auction and the public are forbidden to fish them.


Dhaleswari River
Gobindagaon
91°06'
24°17'
Alinagar
Batilonga Beel
Dewghar
Karomnagar
Powner Khal
Borabari Beel
Manaharpur
Makal Beel
1-Vent 1.5x1.7m
N
1-Vent 1.5x1.7m
1-Vent 1.5x1.7m
Dudda Gang Nadi
LEGEND
River, Khal
Village Road
Submersible Embankment
Beel
Proposed Drainage Regulator
Proposed Drainage Pipe Sluice
Homesteads
91°02'
24°14'
Dhaleswari River
Meghna River
Scale
1 0 1 2 km
1:50,000
FILE: DEWGHAT.DWG
Northeast Regional Project
Dewghar Haor Sub-Project
Prepared by: FR/SJ
Date: March 1992

L.1.26 DEWGHAR HAOR SUB-PROJECT

Project location and general data.

District: Kishorganj
Thana: Astagram
Project type: Partial flood protection
Status: Under rehabilitation
Gross Area: 1,221 ha
Net Area: 980 ha
Population: 4,830

Environment and engineering works

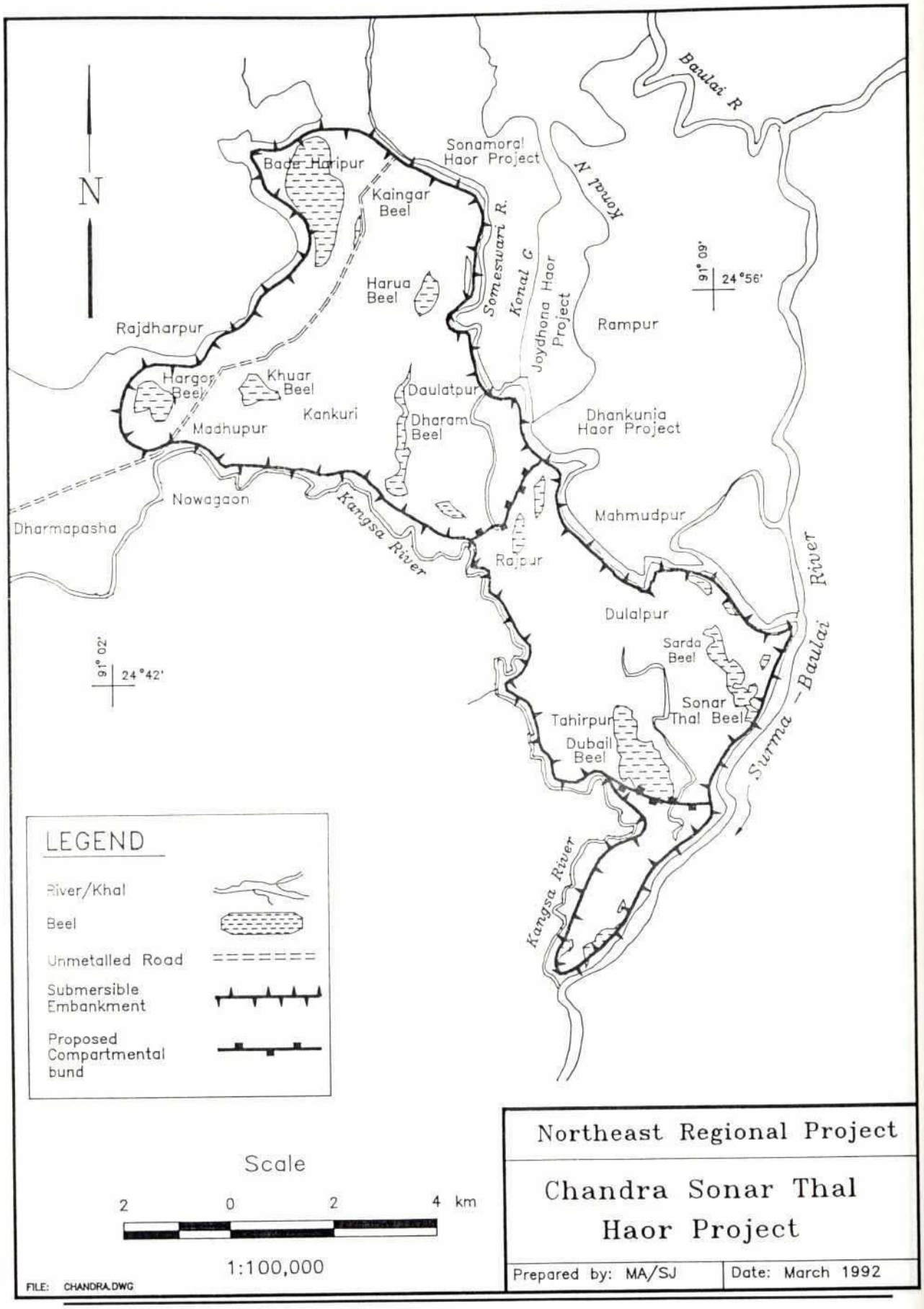
Hydrology: Branches of the Dhaleswari surround the Project on three sides (north, west and east). The river is perennial and is mildly influenced by tidal action. The Dudda Gang Nadi, a tributary to the Dhaleswari, drains the Projects southern side. In general, the area drains southward. Embankments are to be reconstructed to a design level of 3.75 meters PWD. This contrasts sharply to embankment crest levels of 6.70 meters PWD on an adjacent project — Humaipur Haor.

Project concept: The project is to provide pre-monsoon flood protection to the *boro* crop through May 15. This is to be accomplished through the construction of 16 kilometers of submersible embankments, three regulators (single-vent), and three single vent 600 mm diameter pipe sluices. The sub-project area includes mainly deeply flooded land intersected by small narrow strips of high land occupied by villages. The Project area is surrounded on three sides by branches of the Dhaleswari River (Upper Meghna). The only crop which can be grown on this flood regime is *boro* and it is frequently damaged by early monsoon floods. In 1980, a number of regulators, pipe sluices and submersible embankments were constructed by the local administration with financial assistance from CARE and Food For Work. This infrastructure was not maintained. BWDB is now rehabilitating the project under the IDA financed Second Small Scale Flood Control, Irrigation and Drainage Project (Credit 1870-BD).

Engineering Works: The existing infrastructure is dysfunctional. Structures are beyond repair and the embankments are breached at numerous locations. Construction of three regulators is expected to start during the 1991/92 construction season. Re-sectioning of the existing embankments and the construction of three minor drainage structures are scheduled for 1992-93. In preparing the project for rehabilitation, a pre-project meeting was held at the Alinagar Primary School at which the attendance exceeded 100 local people "beneficiaries". Assurances of local support to and participation in the operation and maintenance of the rehabilitated project were obtained. The absence of this participation in the past, however, make these assurances seem somewhat less than assuring.

Production trends and project impacts on fisheries

Fishermen do not anticipate any major change in the fisheries of the area due to implementation of the project.


N
Baulai R
Sonamora Haor Project
Bade Haripur
Kaingar Beel
Somesuari R.
Konal C
Konal N
Joydhona Haor Project
Harua Beel
Rajdharpur
Rampur
91° 09'
24°56'
Hargor Beel
Khuar Beel
Daulatpur
Kankuri
Dharam Beel
Madhupur
Dhankunja Haor Project
Nowagaon
Kangsa River
Dharmapasha
Mahmudpur
Rajpur
Dulalpur
Surma - Baulai River
91° 02'
24°42'
Sarda Beel
Sonar Thal Beel
Tahirpur
Dubail Beel
Kangsa River
LEGEND
River/Khal
Beel
Unmetalled Road
Submersible Embankment
Proposed Compartmental bund
Scale
2 0 2 4 km
1:100,000
FILE: CHANDRA.DWG
Northeast Regional Project
Chandra Sonar Thal Haor Project
Prepared by: MA/SJ
Date: March 1992

L.1.27 CHANDRA SONARTHAL HAOR PROJECT

Project location and general data

District: Sunamganj
Thana: Darmapashaong
Project type: Partial flood control
Status: Completed 1978
Gross area: 4,450 ha
Net area: 4,046 ha
Population: 14,900

Environment and engineering works

Hydrology: The area is bordered to the northeast by the Someswari River, to the southeast by the Surma-Baulai River, and to the west by the Kangsha River. The Someswari and Kangsha originate in Meghalaya State in India. Both rivers fall into the Surma-Baulai River; both are perennial; and both their offtakes have silted up, leading to decreased flows and siltation at their outfalls. Both are classified by BIWTA as Class III navigation routes, but due to the siltation at their outfalls, navigation is suspended for about two to three months in the dry season. The Konal Gang and Konal Nadi branch off the Baulai a few kilometres northeast of the project and fall into the Someswari on the east side of the area. Konal Gang has been provided with a drainage regulator. Konal Nadi is closed at the Dhankunia Haor project embankment. The area has no well-defined internal drainage channels. The already slow post-monsoon drainage is deteriorating due to the siltation of the Someswari and Kangsha river outfalls. The area experiences early flash floods and deep monsoon flooding of 3.0-6.0 meters.

Water bodies: There are numerous beels in the area, most of which dry out in the winter.

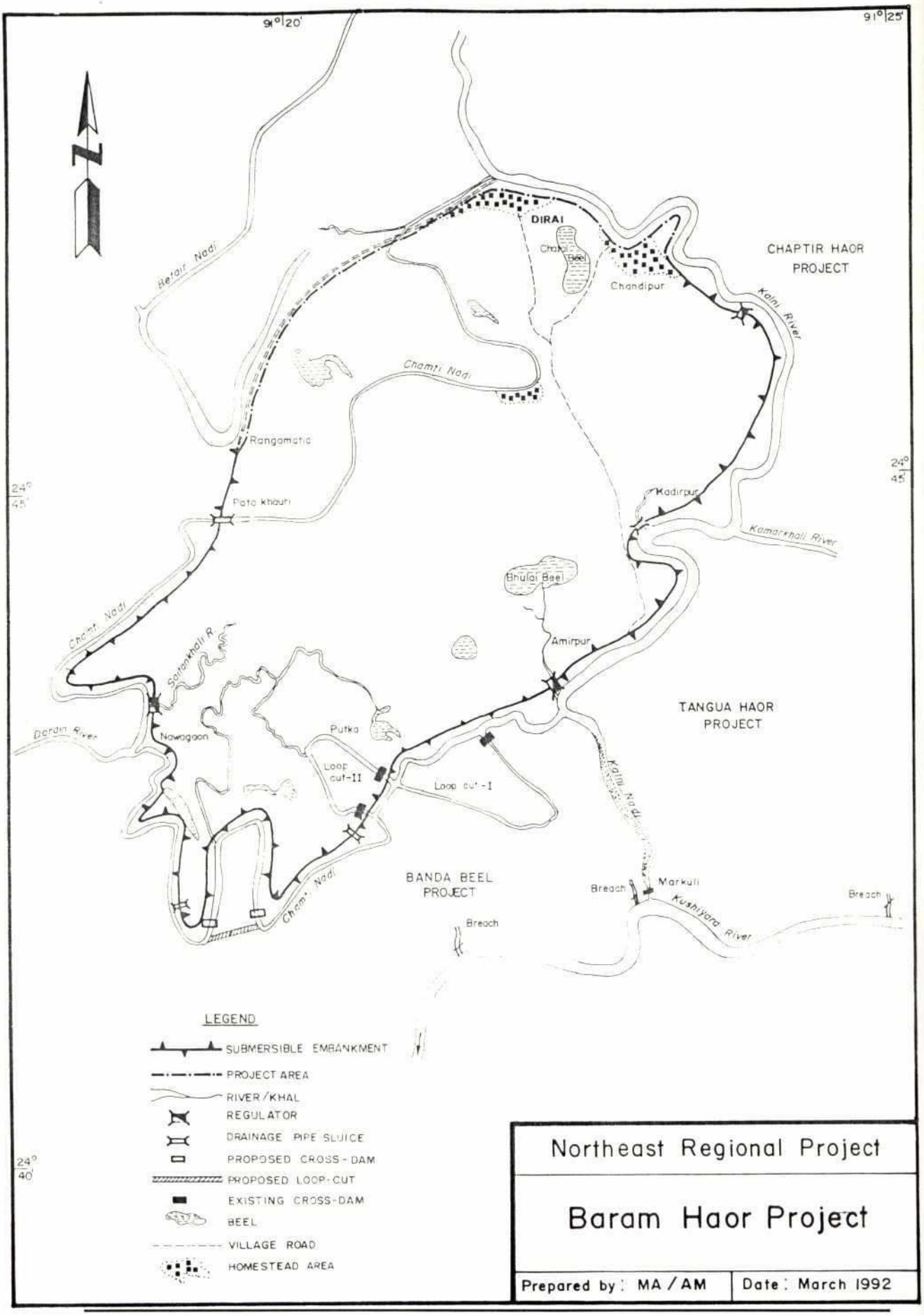
Project concept: The project objective was to reduce pre-monsoon flash flood damage to the *boro* crop with provision for drainage. The project consisted of construction of 42 kilometres of submersible embankments around the area along the peripheral rivers, without ancillary water control structures. The area is mostly single cropped with local *boro*. Before the project, the *boro* crop was damaged by pre-monsoon flash floods nearly every year. Deep flooding of 3.0-8.0 m precludes *kharif* cropping. The area has no well-defined internal drainage channels, post-monsoon drainage is slow, and farmers often plant *boro* late. Embankment construction was begun by local authorities under FFW. This embankment was subsequently handed over to the BWDB as part of the Haor Development Program. The embankment was upgraded 1974-8 with GOB funds, then work was suspended due to funding constraints and the project declared complete. Since completion, the embankment has been maintained under FFW. Rehabilitation under the BWDB IDA/EEC-financed Systems Rehabilitation Project, Cycle-C (Credit No. 2099/BD) is planned. In 1991-2, BWDB plans to upgrade two locally-constructed compartmental bunds used for post-monsoon water retention.

311

Submersible embankment: The embankment crest level is 6.1 meters PWD, top width is 3.44 meters, and side slopes are 1:2. Current embankment maintenance began late Jan 92 and should be complete by mid-Mar 92. In 1990 and 1991, the embankment was overtopped before harvest. Farmers have cut the embankment in several places to drain the *haor*. The Someswari and Surma-Baulai have breached the embankment in a few places, reportedly during pre-monsoon flash floods that overtopped the embankment before harvest. There are no regulators.

Fishing practices

Leases to the *beel* fisheries are auctioned off and fishing by local people is forbidden.


91°20'
91°25'
24°45'
24°40'
DIRAI
Chaka Beel
Chandipur
CHAPTIR HAOR PROJECT
Kalni River
Betai Nadi
Chamti Nadi
Rangamatia
Pata khauri
Kadirpur
Kamarkhali River
Bhulai Beel
Amirpur
Chamti Nadi
Sataikhali R.
Nawagaon
Putka
Loop cut-II
Loop cut-I
TANGUA HAOR PROJECT
Kalni Nadi
Chamti Nadi
BANDA BEEL PROJECT
Breach
Markuli
Kushiyara River
Breach
Breach
LEGEND
SUBMERSIBLE EMBANKMENT
PROJECT AREA
RIVER/KHAL
REGULATOR
DRAINAGE PIPE SLUICE
PROPOSED CROSS-DAM
PROPOSED LOOP-CUT
EXISTING CROSS-DAM
BEEL
VILLAGE ROAD
HOMESTEAD AREA
Northeast Regional Project
Baram Haor Project
Prepared by : MA / AM
Date : March 1992

L.1.28 BARAM HAOR PROJECT

Project location and general data

District: Sunamganj
Thana: Dirai
Project type: Partial flood protection, drainage and irrigation
Status: Under construction
Gross Area: 5,500 ha
Net Area: 4,800 ha
Population: 25,800

Environment and engineering works

Hydrology: The Kalni River, which branches from the Old Surma River about 4 kilometres upstream of Dirai, drained south-east towards the Kushiyara River in the early and mid-1970's. The Kalni River was subsequently closed near Markuli (1978) and since then it drains into the Chamti Nadi which in turn flows into the Darain River and finally into the Kushiyara River below Ajmirganj. The Chamti River, which branches from the Kalni River near Dal Bazar, has been the main drainage channel in the project area since the Kalni was closed at Markuli. Reportedly, the main sources of Chamti flows are the Old Surma River and the Bhatta Khal. However, sediment deposition has taken place in these rivers in recent years which presumably is affecting flows. All these river are seasonal but they maintain navigable depths probably due to backwater from the Kushiyara River. The Kushiyara River, a few kilometres downstream of the Sherpur gauging station (175), bifurcates into the Bibiyana and Suriya Rivers. These two rivers again merge near Markuli just upstream of the closure across the Kalni River. BWDB officials and local people believe that substantial sediment deposition has occurred in the Bibiyana River. As a result, most of the flow is currently passing through the Suriya River. It is also believed that sediment deposition has taken place recently in the Kushiyara River below Ajmiriganj. This sedimentation may be causing an increase in Kushiyara River water levels.

Water bodies: Ten *beels* exist within the boundaries of the haor of which three are permanent water bodies.

Project concept: The Project was intended to protect *boro* crops in the area from early monsoon flash flooding resulting from massive early rainfall in the Meghalya Plateau. The identified infrastructure consisted of submersible embankments, compartmental bunds, three regulators, three pipe sluices, and irrigation inlets. The regulators were needed for post-monsoon drainage and to introduce water into the protected area — thereby reducing flows over the embankment. In addition, two major loops in the Kalni River were cut to improve river conveyance capacity and to reduce overall embankment lengths. During the summer months, *Baram Haor* floods to depths ranging from 1.5 metres to 6 metres. This permits production of broadcast *aman* in the more shallowly flooded areas around the Project's periphery but the more deeply flooded areas within the haor remain fallow. Project infrastructure was not designed to alter the summer flood regime. The project was identified by the BWDB, Sylhet O & M Division, in March 1986. An Early Implementation Project (EIP) appraisal mission recommended that the project be included in their 1987 EIP Program. Submersible embankment construction was subsequently initiated in 1987 and was completed in 1989-90. Construction of one box regulator and three drainage

pipe sluices were also completed during this time period with the remaining two regulators and other miscellaneous works scheduled for completion in 1991-92 construction season.

Submersible embankment: Much of the Baram Haor embankment is in good condition and only requires routine maintenance work. However, a breach was observed near the second loop-cut (see location map). It was generally reported that the breach occurred during a flash flood in May 1991. People living near the Saitankhali Regulator reported increased water levels in the peripheral rivers in recent years. They further reported sediment deposition during the past five years at Bera Mona Beel, the outfall of the Chamti-Darain River system. This, it is believed, delays drainage and may also be resulting in increased water levels. They requested that an additional loop of the Champti Nodi be cut. Chandipur villagers indicated that the embankment at their location - the Project's northern most side - is susceptible to damage by wave action and substantial erosion occurs most years. Area farmers are generally in agreement that the embankments are regularly overtopping prior to the *boro* harvest. They request that the embankments be raised. There is also another problem. The embankments along this reach are breaching regularly. BWDB officials indicate that a combination of increased flows in the Kushiyara River and sediment deposition in the River downstream of Ajmiriganj are responsible for these problems.

Regulators and pipe sluices: The project plan calls for three regulators and three pipe sluices. Of these, one regulator and three pipe sluices have been constructed and the remaining two regulators are expected to be completed during 1991-92. The single vent Naya Khal regulator is in good condition but the stop logs need replacing. The pipe sluices are generally in good condition but water is leaking into the project area through the Patakhauri pipe sluice.

Irrigation Inlets. About 34 irrigation inlets have already been installed. Local people have reported that many of the irrigation inlets are not used since they have not been installed at the right location.

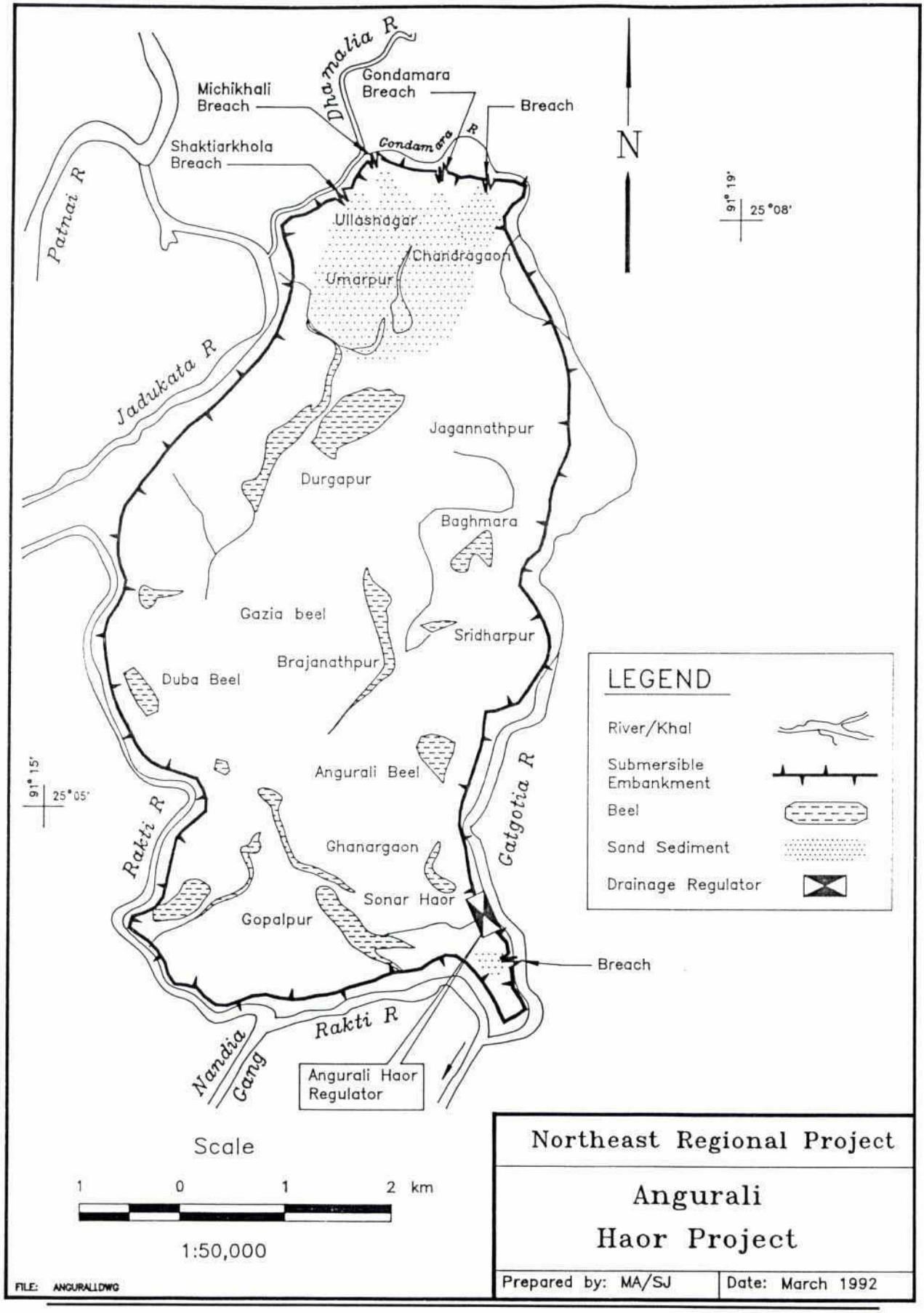
Fishery resources

The *beels* mainly produce small fish.

Production trends and project impacts on fisheries

Reportedly, the project has negligible impact on the existing fishery resources. However, there is a perception that the resource is diminishing because of sediment deposition within the *haor* area. Sediment deposition is taking place in the Chamti-Darain River, especially around Nawagaon and Harinagar villages. Reportedly, the silt load of the Kushiyara River is very high and over-bank spilling leaves behind heavy silt deposits every year. This has resulted in reduced conveyance capacity of all the minor drainage channels in the south. This, combined with the closure dam at Markuli, has shifted the main drainage system westwards towards the Darain River through the Chamti River. Local people also say that recently sediment deposition has occurred at the outfall of Darain River.

317


Dhamalia R
Gondamara Breach
Michikhali Breach
Breach
Shaktiarkhola Breach
Gondamara R
Patnai R
N
91° 19'
25°08'
Ullashagar
Chandragaon
Umarpur
Jadukata R
Jagannathpur
Durgapur
Baghmara
Gazia beel
Sridharpur
Brajanathpur
Duba Beel
Angurali Beel
91° 15'
25°05'
Rakti R
Ghanargaon
Catgotia R
Sonar Haor
Gopalpur
Breach
Rakti R
Nandia Gang
Angurali Haor Regulator
LEGEND
River/Khal
Submersible Embankment
Beel
Sand Sediment
Drainage Regulator
Scale
1 0 1 2 km
1:50,000
FILE: ANGURALI.DWG
Northeast Regional Project
Angurali Haor Project
Prepared by: MA/SJ
Date: March 1992

L.1.29 ANGURALI HAOR PROJECT

Project location and general data

District: Sunamganj
Thana: Bishambharpur
Project type: Partial flood control and drainage
Status: Completed (1987)
Gross Area: 2,592 ha
Net Area: 2,430 ha
Population: 16,900

Environment and engineering works

Hydrology: Angurali Haor project is bounded by rivers on three of its sides. The Gatgotia River is a branch of Dhamalia River and forms the east project boundary. Dhamalia River originates in the Meghalayan hills and joins Jadukata River at the northwest corner of the project. The Jadukata River also originates in the Meghalayan hills and bifurcates into Baulai and Rakti Rivers on the eastern side of the project area. The following has been reported:

- Sediment deposition has occurred at the distributaries of Jadukata River below the bifurcation point. Due to the sedimentation, peak flood flows are restricted to the Jadukata channel and flows are directed towards the northwestern embankment of Angurali Haor. The embankments are breached and floodwater enters Angurali and flow towards the southern side of the embankment. In the upper reaches of Jadukata River a new channel, the Maharram River has formed and, reportedly, 50 percent of the Jadukata flow is now directed along the Maharram River.

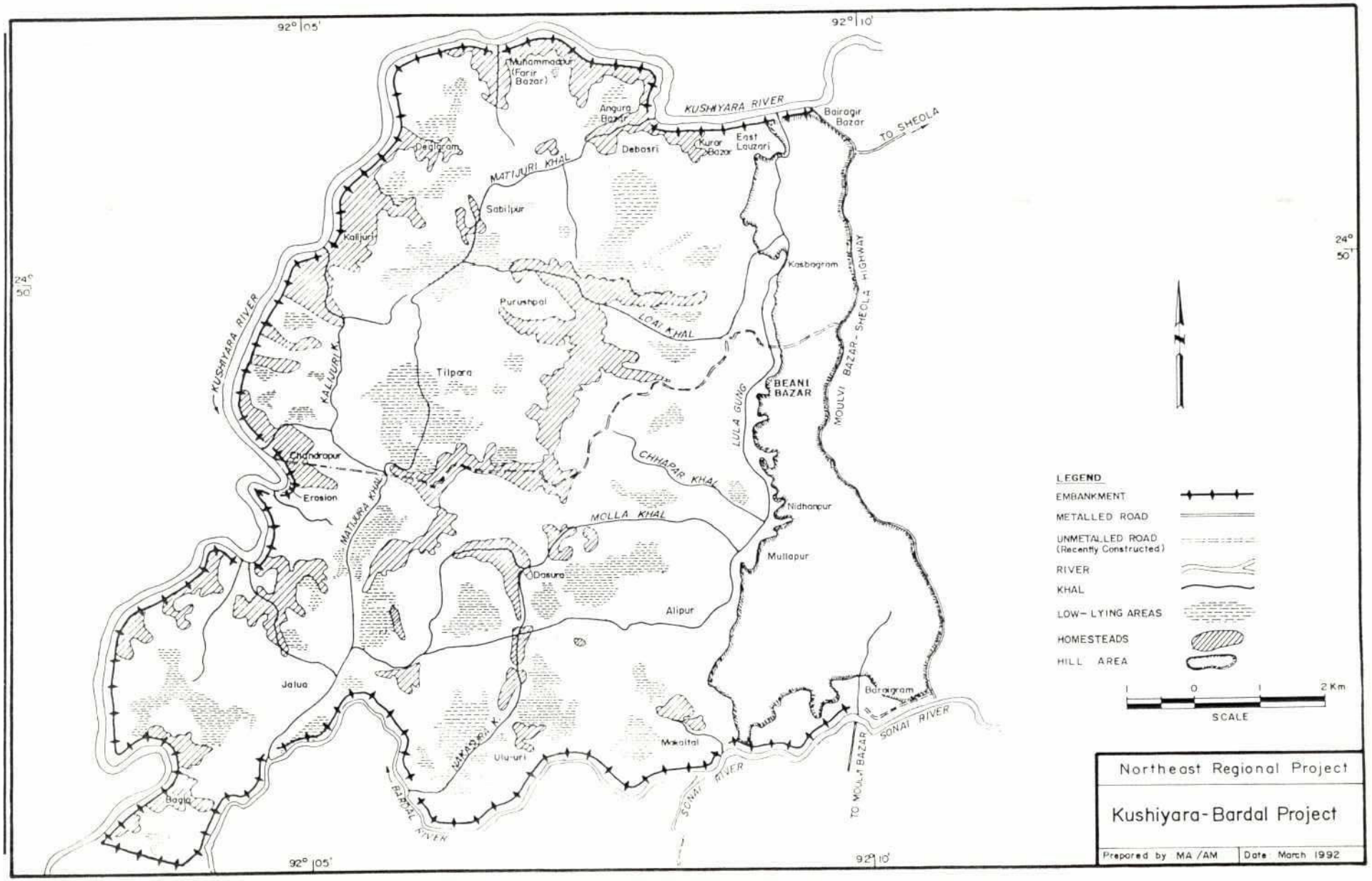
- Sediment deposition has reportedly taken place in Rakti River, a few kilometres from its off take. Flood flows along Rakti River have decreased and more of Dhamalia River's flow through Gatgotia River is now directed along Nandia Gang rather than Rakti River.

Project concept: The project concept was to protect the *boro* crop from pre-monsoon flash floods with 19 kilometres of submersible embankments around the area. To enhance project effectiveness, one two-vent regulator was added. The regulator serves to introduce water into the protected area immediately after the *boro* is harvested — thereby reducing flows over the embankment — and improves post-monsoon drainage of the *haor*. During the monsoon season, *Angurali Haor* floods to depths ranging from 2.0 m to 6.0 m. Project infrastructure was not designed to limit these maximum flood depths. The project was identified by BWDB (Sylhet O & M Division) in 1980 and an Early Implementation Project (EIP) Appraisal Mission recommended that it be included in their 1981 program. Construction started in 1982 and was completed in 1987. The project was evaluated by EIP in 1988 and reported on in the "Fourth Evaluation of EIP Projects, Engineering Study: Phase 2, Netherlands Technical Assistance Program".

Submersible embankments: Two of the rivers which bound the Project, the Dhamalia and Jadukata Rivers, originate in the Meghalayan hills. These are steep rivers with slopes ranging up to an estimated 7 per cent. The water rushing down the channels attacks embankments and transports large volumes of sediment. Consequently, while many sections of the Project embankment are in good condition, there are five major breaches. There was a breach immediately west of Shaktiarkhola market, a breach about 200 m south of the Narakara Regulator, a breach at Michikhali, and two breaches at Gondamara (refer to location map). In general, the breaches are caused by a combination of river erosion, the use of sandy embankment materials and embankment alignments without adequate set back from river channels. A serious consequence of breaches under these conditions is the large volumes of sand deposited on agricultural land. The Michikhali breach is located on the north side of the project and is about 120 m in length. Reportedly, the embankment has breached at this location each year since the project was completed. A deep channel has resulted and a large amount of sand have been deposited on about 150 ha within the project. The sand varies in depth from 0.5 m to 1.5 m making cultivation impossible. The breach is repaired annually by BWDB with World Food Program assistance. Since the embankment fill material contains a high proportion of sand and it is placed into water logged conditions, the repair work tends not to be highly effective. The Gondamara breach is located on the northern project boundary where Gondamara River flow encroaches on the embankment, eroding the embankment and causing embankment failure. Farmers in the area report that about 500 ha is covered with silty sand to depth ranging from 0.15 m to 0.25 m. Farmers are still able to grow crops in the sandy area though with reduced yields. The embankment is repaired annually by BWDB with assistance from World Food Program. Repairs are carried out using the most readily available material which has a high sand content. The breach east of Gondamara was caused by the adjacent river bank collapsing in November 1991. The collapsed section of bank is about 300 m long. BWDB are aware of the damage and intend to retire the embankment during the 1992 construction season. On the Project's western side, farmers have reported that BWDB constructed a 0.6 m high embankment on top of the river levee. The embankment has been completely eroded and little remains of the work. There is some drainage congestion in the southern part of the project when the adjacent river levels are high. However, farmers in the area report that generally drainage is not a major problem. There is one two-vent regulator, the Nayakara Regulator, which serves the area and is located on the south-eastern side of the project. The regulator is in good operating condition and farmers close to the regulator report that the regulator can adequately drain up to a 4-day continuous rainfall. However, for longer rainfall periods, its drainage capacity is inadequate and crops can be damaged. A local sluice committee operates the Nayakara Regulator.

Production trends and project impacts on fisheries

Local people report that *beels* in the project area produce large amounts of fish. There is no evidence that Project infrastructure has affected fish production.


92° 05'
92° 10'
24° 50'
Muhammadpur (Farir Bazar)
Angura Bazar
KUSHIYARA RIVER
Bairagir Bazar
TO SHEOLA
Deglgram
Debasri
Kurar Bazar
East Lauzari
MATIJURI KHAL
Sabilpur
Kaljuri
Kasbagram
MOULVI BAZAR - SHEOLA HIGHWAY
Purushpal
LOAI KHAL
KUSHIYARA RIVER
KALJURI K.
Tilpara
BEANI BAZAR
LULA GUNG
Chandrapur
Erosion
CHHAPAR KHAL
MATIKURA KHAL
MOLLA KHAL
Nidhanpur
Mullapur
Dasura
Alipur
Jalua
Baragram
SONAI RIVER
NAKASHI K.
Mokaital
Uluguri
Bagla
BARDAL RIVER
TO MOULVI BAZAR
SONAI RIVER
LEGEND
EMBANKMENT
METALLED ROAD
UNMETALLED ROAD (Recently Constructed)
RIVER
KHAL
LOW-LYING AREAS
HOMESTEADS
HILL AREA
1 0 1 2 Km
SCALE
Northeast Regional Project
Kushiyara-Bardal Project
Prepared by MA /AM
Date March 1992

L.1.30 KUSHIYARA-BARDAL PROJECT

Project location and general data

District: Sylhet
Thana: Beanibazar
Project type: Partial flood control and drainage
Status: Begun 1976, declared complete 1978
Gross Area: 7,000 ha
Net Area: 4,200 ha
Population: 54,540

Environment and engineering works

Hydrology: The project area is located in the Kushiyara floodplain. It is bounded to the west and to the north by the Kushiyara, to the east by the Moulvi Bazar-Sheola Highway, and to the south by the Sonai-Bardal. Mr. Aftab Ali, retired government officer of Angura village on the north boundary, reports that the Kushiyara has changed from a narrow deep channel to a wider, more shallow channel over the last 35 years, He believes that the Kushiyara bed may have risen some three metres over this period. The project area generally slopes in a southwesterly direction. During the monsoon season the area floods to 1.0 - 3.0 m. Flooding due to local rainfall alone reaches 1.0-2.0 m depth. Currently, pre-monsoon and monsoon river flooding enters the area through the Lula Gang, Matijura Khal, and Kalijuri Khal, mainly from the Kushiyara but also as backwater from the Sonai-Bardal. Floodwaters drain to the southwest into the Sonai-Bardal but drainage is impeded by backwater. Farmers request construction of regulators at both ends of these channels to control flooding; a few large landowners in the northwest favour continued flooding as the siltation is gradually filling in their lower fields. The difference between the pre-monsoon and monsoon flood peaks is about 1 m. Since its construction in 1978, the embankment has never been overtopped in the pre-monsoon period (before the *boro* harvest), and only once in the monsoon season (in 1991, by 10-60 cm along the Kushiyara and at five locations along the Sonai-Bardal). In other words, it appears that crest level is a little high for a submersible embankment (the crest level corresponds to the 1:20 year flood level). As a consequence, local people now expect full flood protection from the embankment. Local farmers state that most of area's drainage channels are silted up and request re-excavation. Also, the Beanibazar-Chandrapur District Council road (constructed about 1988) does not have adequate openings for drainage, and drainage congestion just north of road is reported. There is no ground water irrigation in the project area.

Water bodies: All perennial water bodies are quite small.

Project concept: The project objectives are to protect the area from pre-monsoon flooding and to improve drainage. Project works consist of 25 kilometres of submersible flood embankments along the Kushiyara and Sonai-Bardal Rivers, and excavation of two drainage channels. Re-excavation of another two major drainage channels and construction of two drainage and two flushing regulators were also planned, but the project was declared complete without these due to lack of funds for implementation. In 1967-8, the Irrigation Department issued a report describing the project entitled "Improvement of low-lying areas between Kushiyara and Bardal Rivers and west of Beanibazar." In 1976, BWDB began implementation using GOB resources. In 1978, construction of the embankment and re-excavation of two drainage channels (Matijuri

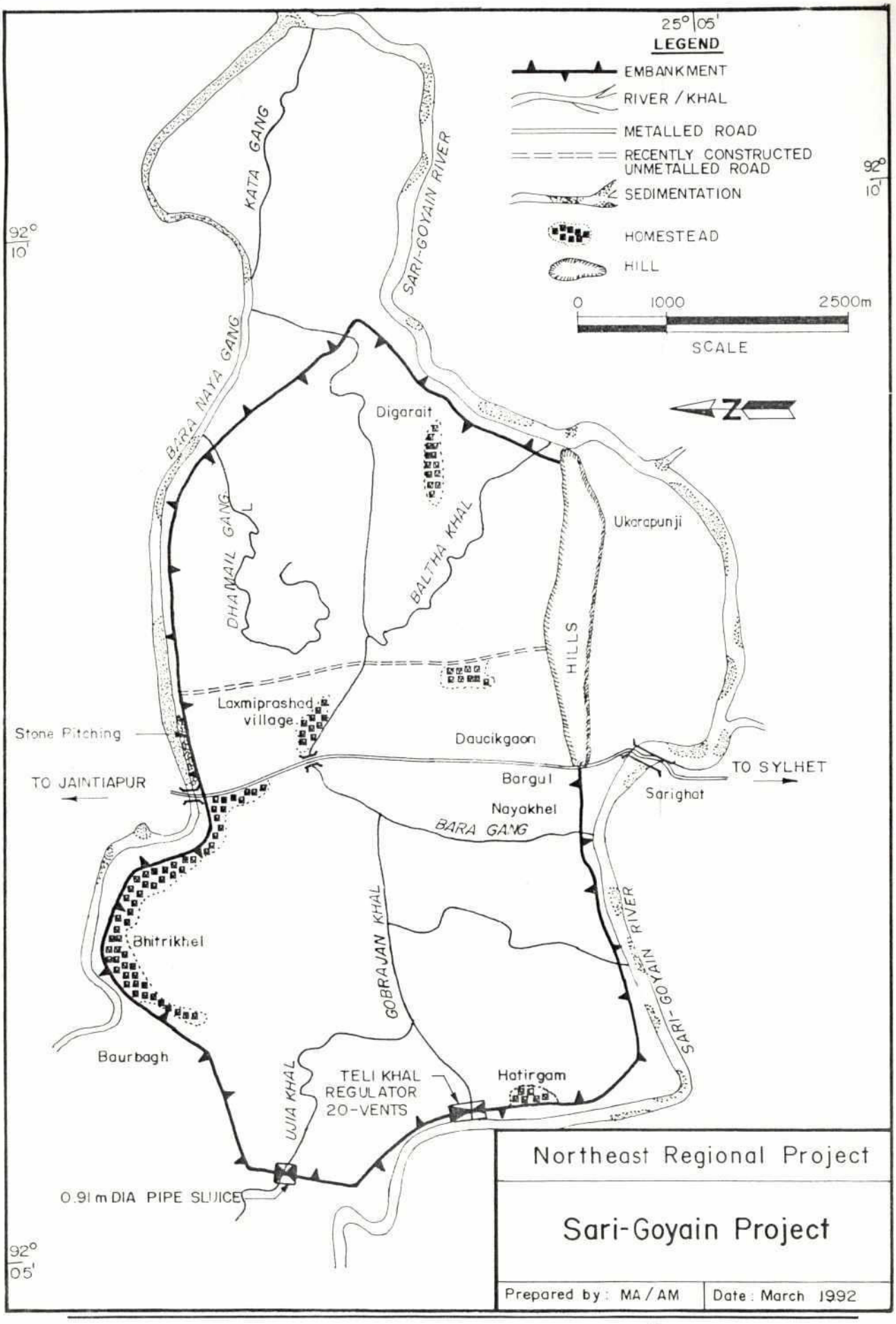
3223

and Kalijuri) were completed. Since then, embankment and drainage channel maintenance has been carried out under FFW.

Embankments: The Kushiyara embankment is in very poor condition from river and wave erosion and requires maintenance, repair of breaches, and in some locations retirement. The north and northwestern reach from Bairagir Bazar to Chandrapur, and the East Lauzari-Kurarbazar reach are in particularly bad condition. There are five large breaches that are reported to date from the 1991 pre-monsoon and monsoon floods. The sharp bend in the Kushiyara next to Chandrapur village reportedly dates from about 35 years ago when the river changed its course. The river bank is eroding and three homesteads have been destroyed. The embankment should be retired in this section. Local people request river bank protection measures (possibly using bamboo "porcupines") to secure their village. Land acquisition for retirement may prove difficult since it may involve homestead land, although the local authorities consider that the land can be made available. The Sonai-Bardal embankment is generally in good condition, particularly from Baraigram to the Sonai-Bardal bifurcation. The embankment slope is eroded at the southwest corner of the project.

Production trends and project impacts on fisheries

It appears that the project has had little impact on fishery resources.


25° 05'
LEGEND
EMBANKMENT
RIVER / KHAL
METALLED ROAD
RECENTLY CONSTRUCTED UNMETALLED ROAD
SEDIMENTATION
HOMESTEAD
HILL
0 1000 2500m
SCALE
92° 10'
92° 05'
KATA GANG
SARI-GOYAIN RIVER
BARA NAYA GANG
DHAMAIL GANG
BALTHA KHAL
Digarait
Ukarapunji
HILLS
Laxmiprashad village
Stone Pitching
TO JAINTIAPUR
Daucikgaon
Bargul
Nayakhel
BARA GANG
TO SYLHET
Sarighat
Bhitrikhel
GOBRAJAN KHAL
SARI-GOYAIN RIVER
Baurbagh
UJIA KHAL
TELI KHAL REGULATOR 20-VENTS
Hatirgam
0.91 m DIA PIPE SLUICE
Northeast Regional Project
Sari-Goyain Project
Prepared by : MA / AM
Date : March 1992

L.2 FULL FLOOD PROTECTION PROJECTS (WITHOUT PUMPED DRAINAGE OR IRRIGATION)

L.2.1 SARI-GOYAIN PROJECT

Project location and general data

District: Sylhet
Thana: Jaintiapur
Project type: Full flood control and drainage
Status: Completed
Gross Area: 5,385 ha
Net Area: 4,210 ha
Population: 17,470

Environment and engineering works

Hydrology: The Sari-Goyain River originates in the Shillong hills and flows westward upon entering the Bangladesh plains. After several kilometers, the Bara Naya Gang river branches off from the Sari-Goyain but then flows back into the Sari-Goyain about 15 kilometers further downstream. Both rivers flow generally westward about 3 kilometers apart and parallel to the Shillong foothills. The Bara Naya Gang River intercepts the run-off from the Shillong Hills and carries it into the Sari-Goyain river. Historically, this run-off would spill into the inter-riverain area between the two rivers causing sudden flash floods in this area but these floods would also drain rapidly. The Sari-Goyain Project was constructed to protect the eastern end of this inter-riverain area; the topography of which generally slopes westward. Historically, drainage was effected via the Gobrajan and Ujia khals as well as via overland flow through low lying areas in the projects northwestern edge. Project embankments, while excluding external flash floods, have reduced drainage and increased flooding outside the projects northern boundary. The Sari-Goyain River is perennial but sediment deposition has gradually taken place in the river channel. Sediment deposition has also occurred in the Bara Naya Gang river. The consequence has been reduced drainage. There are currently no plans for re-excavation of the channels.

Water bodies: There are no substantial water bodies within the project.

Project concept: The project was conceived to protect crops in the area from flooding from the Sari-Goyain and Bara Naya Gang rivers and to provide pre-monsoon and post-monsoons drainage facilities. The project is located on the floodplain of Sari-Goyain River which drains an area of 830 square kilometers along the southern face of the Shillong Hills. About 90 percent of the catchment is in India with elevations extending to 1400 meters. Most of the catchment consists of wooded slopes with rivers flowing through deeply incised canyons. To provide flood protection, full flood embankments have been constructed around the project (15.5 kilometers in length). These embankments are tied into the high hills near Bargul village. A 20 vent regulator and a 90 cm diameter pipe sluice have been constructed to provide drainage and to prevent back flow from Sari-Goyain River.

The feasibility study of Sari-Goyain project was undertaken in 1963-64 as part of a training program for the planning engineers in the East Pakistan Water and Power Development Authority (EPWAPDA). This was prepared under the direction of the Authority's general consultant, IECO. The final report was submitted in 1966 and recommended that full flood control and drainage facilities with pumped diversion and a gravity canal system be installed (see attachment for main project features). Project construction started in 1973-74 using GOB resources and flood control and drainage components were completed in 1979. Due to financial constraints, the remaining project components (pump stations etc.) were not constructed but the project was declared complete. The project has been identified for rehabilitation and is now included in the Systems Rehabilitation Project program being funded by EEC and implemented through BWDB.

Submersible embankments: The embankment on the western side of the Sarighat-Jointiapur road is in good condition except in a few locations where the movement of bullock carts and vehicles has caused damage to the crest surface. On the northern boundary along the Bara Naya Gang river, more than 600 meters of boulder pitching protective works have been installed to protect the embankment from wave action. This protective work has been well constructed and is in good condition. Immediately upstream of the protective work there is one breach resulting after an intense rainfall. The remaining embankment is in good condition and requires only some routine maintenance work.

Regulator: The 20 vent Teli Khal Regulator is located on the downstream section of Gobrajan Khal, which is the main drainage channel of the project area. The regulator itself is in good structural condition but the fall-boards are in poor condition and are leaking.

Fishery resources

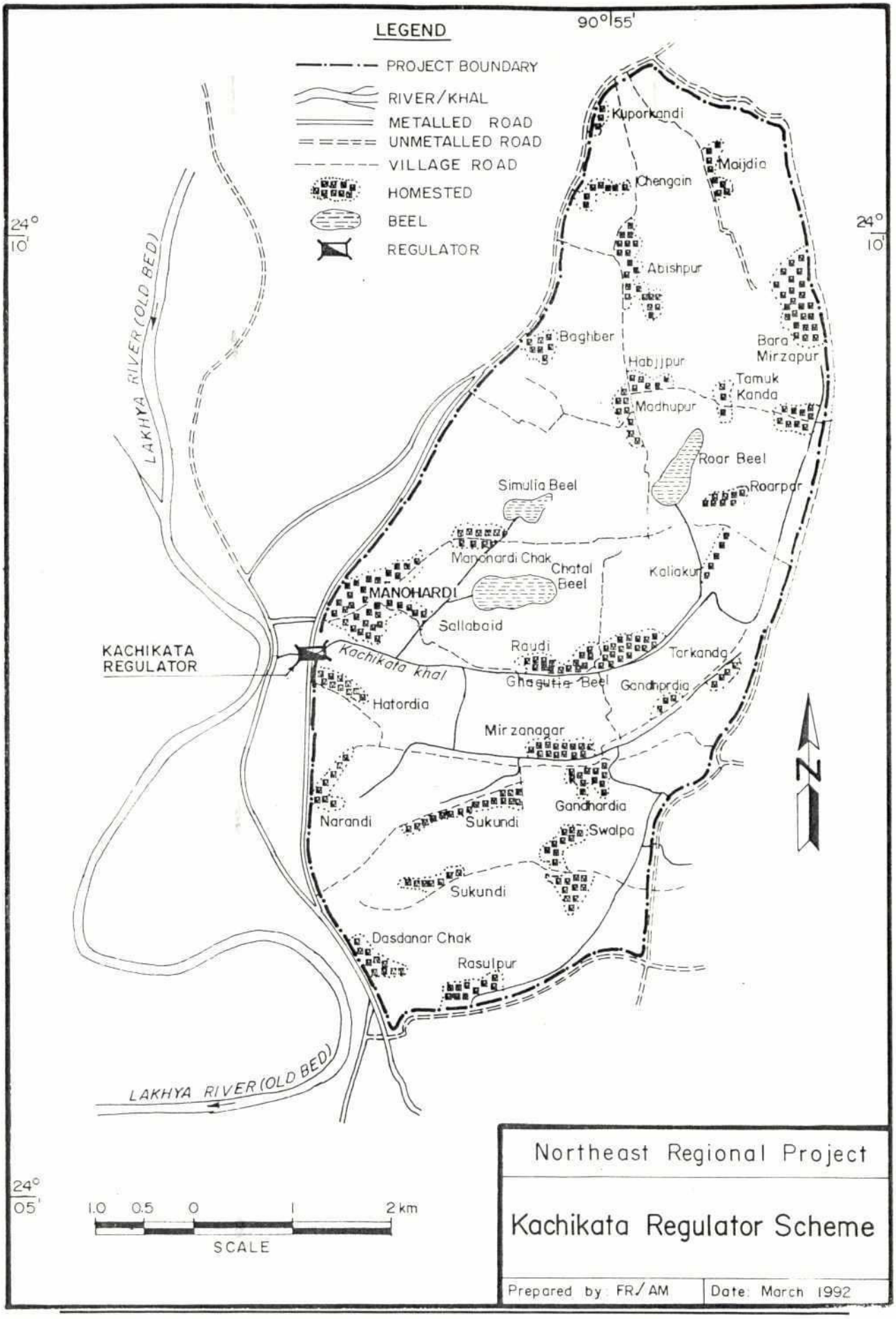
Because of the absence of substantial water bodies within the project, no major fish resource exists. Most of the resource consists of small species such as Tengra, Mola, Chingri, Lati, Foli and others.

Fishing practices

Very little fishing activity takes place in the Teli khal and other low lying areas during the rainy season and there is no substantial fishery in the project.

Production trends and project impacts on fisheries

Before the construction of the structures, the low lying areas were flooded during the rainy season and local people harvested small species (Tengra, Mola, Chingri, Lati, Foli etc). At present these species are still present, but the total catch has been reduced by 75%. People living near the Teli Khal Regulator consider that fishery resources have increased since water in the Teli Khal and Gobrajan Khal is retained by the regulator.


LEGEND
PROJECT BOUNDARY
RIVER/KHAL
METALLED ROAD
UNMETALLED ROAD
VILLAGE ROAD
HOMESTED
BEEL
REGULATOR
90°55'
24° 10'
24° 05'
LAKHYA RIVER (OLD BED)
Kuporkandi
Maijdia
Chengain
Abishpur
Baghiber
Bara Mirzapur
Habjjpur
Tamuk Kanda
Madhupur
Roar Beel
Roarpar
Simulia Beel
Manohardi Chak
Chatal Beel
Kaliakur
MANOHARDI
Sallabaid
KACHIKATA REGULATOR
Kachikata khal
Raudi
Tarkanda
Ghagutia Beel
Gandhprdia
Hatordia
Mirzanagar
Gandhardia
Narandi
Sukundi
Swalpa
Sukundi
Dasdanar Chak
Rasulpur
LAKHYA RIVER (OLD BED)
N
1.0 0.5 0 1 2 km
SCALE
Northeast Regional Project
Kachikata Regulator Scheme
Prepared by: FR/AM
Date: March 1992

L.2.2 KACHIKATA REGULATOR SCHEME

Project location and general data

District: Narsingdi
Thana: Monohardi
Project type: Flood control and drainage
Status: Completed 1991
Gross area: 6,000 ha
Net area: 3,750 ha
Population: 94,530

Environment and engineering works

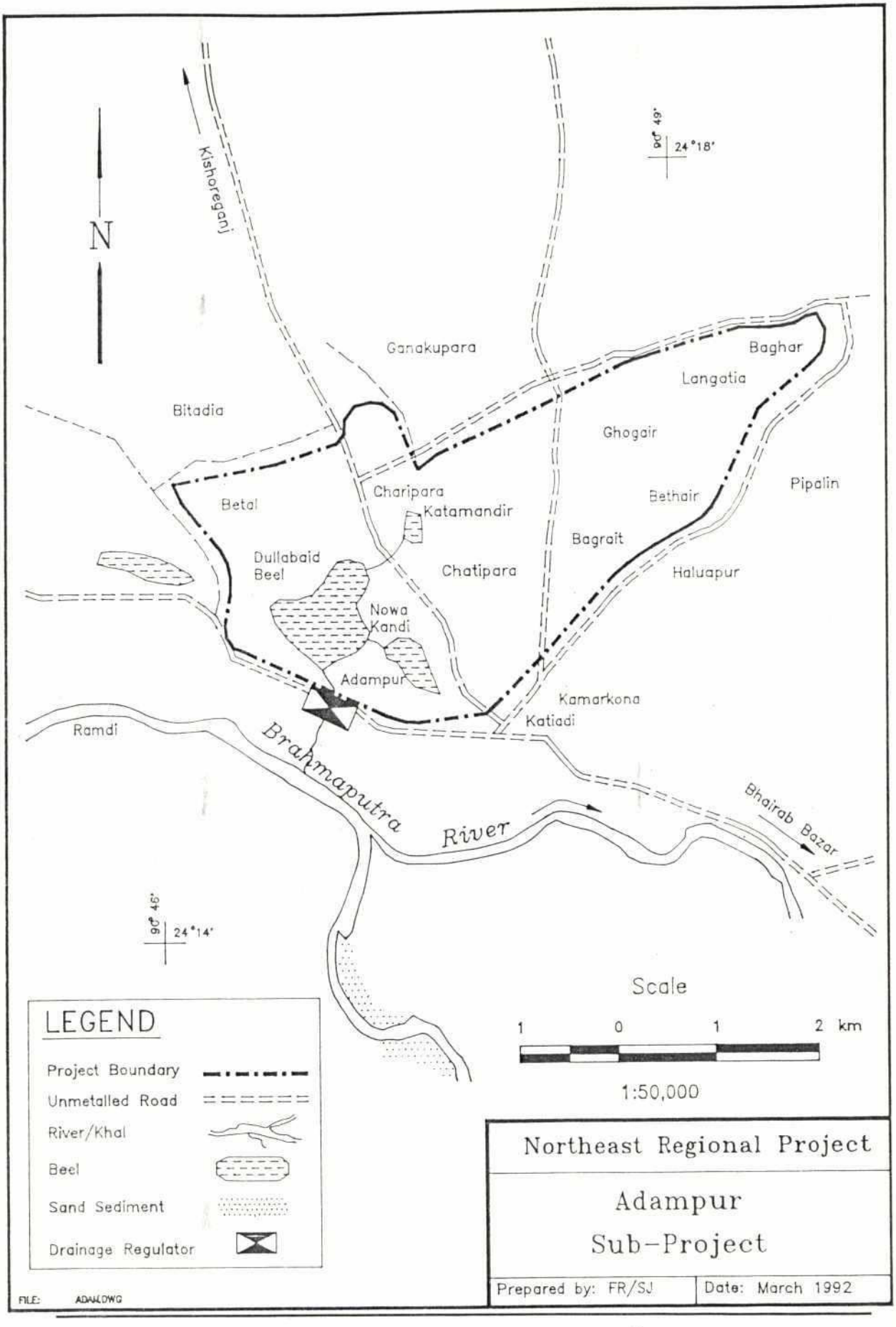
Hydrology: Lakhya River (old bed), a distributary of the Old Brahmaputra, receives all the area's drainage. The Lakhya's offtake is heavily silted, which restricts pre-monsoon spill from the Old Brahmaputra, but in the monsoon, significant spill does occur. This then backs up into the project area.

Project concept: The project objective is to relieve drainage congestion in Kachikata Khal basin by replacing an existing one-vent drainage sluice at its outfall with a four-vent structure. Kachikata Khal, which falls into the Lakhya River (old bed), is the only major drainage channel for the 6,000 hectare area. Before the one-vent regulator was installed in 1955, monsoon back flow from the Lakhya entered the area and damaged low-land crops. Once installed, the one-vent structure proved to be too small for post-monsoon drainage requirements, and drainage congestion resulted.

Regulator: In 1991, the new regulator was completed, including protective works and the fitting and fixing of vertical lift gates.

Production trends and project impacts on fisheries

Local people believe there has been no major change in fisheries since the closing of the khal with the structure in 1955.


N
Kishoreganj
90° 49'
24°18'
Ganakupara
Baghar
Langatia
Bitadia
Ghogair
Pipalin
Charipara
Bethair
Betal
Katamandir
Bagrait
Dullabaid
Beel
Chatipara
Haluapur
Nowa
Kandi
Adampur
Kamarkona
Katiadi
Ramdi
Brahmaputra River
Bhairab Bazar
90° 46'
24°14'
Scale
1 0 1 2 km
1:50,000
LEGEND
Project Boundary
Unmetalled Road
River/Khal
Beel
Sand Sediment
Drainage Regulator
Northeast Regional Project
Adampur
Sub-Project
Prepared by: FR/SJ
Date: March 1992
FILE: ADAALDWG

L.2.3 ADAMPUR SUBPROJECT

Project location and general data
District: Kishoreganj
Thana: Katiadi
Project type: Full flood control and drainage
Status: Completed
Gross Area: 1,340 ha
Net Area: 1,200 ha
Population: 14,830

Environment and engineering works

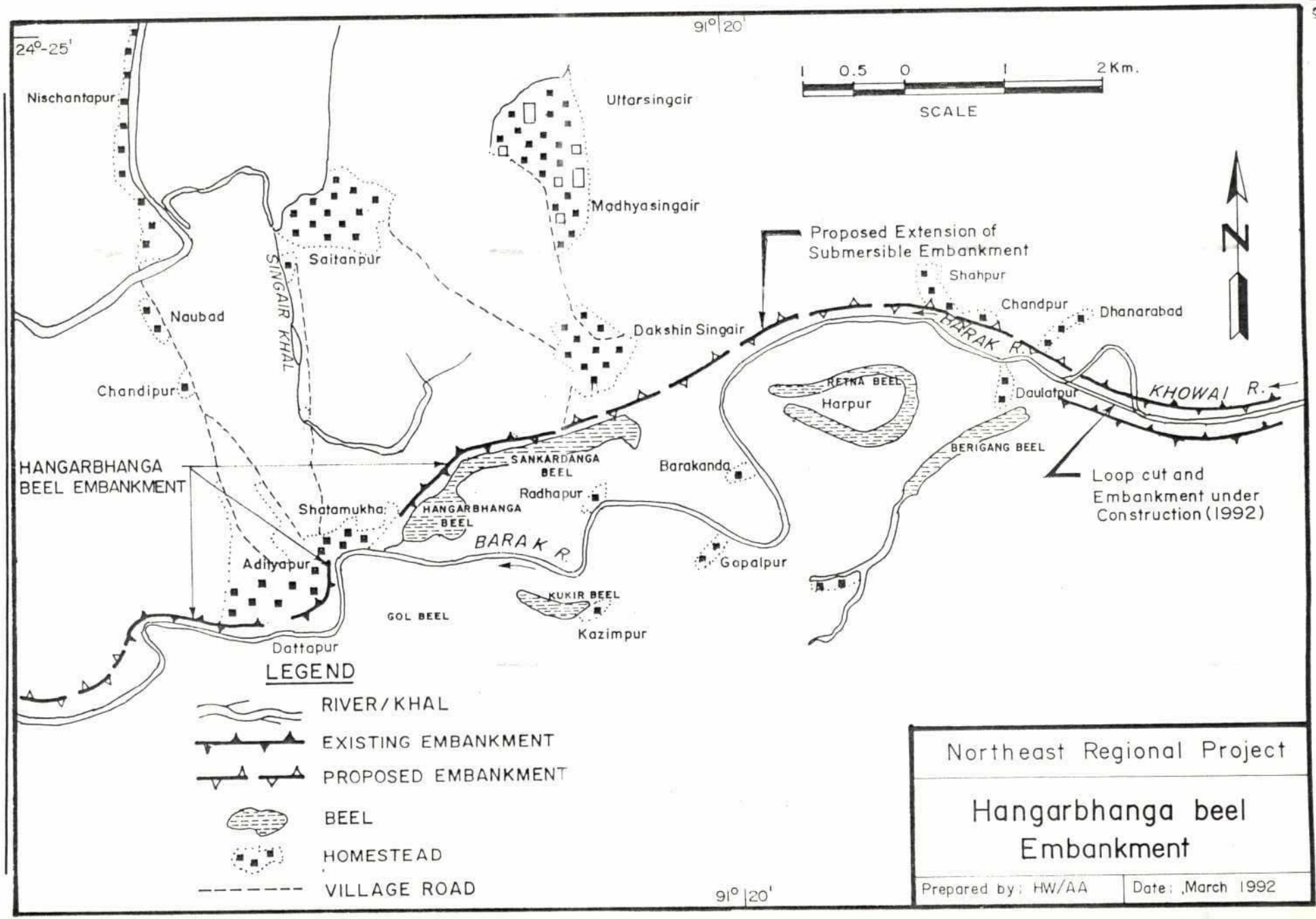
Hydrology: The Old Brahmaputra flows along the projects southern boundary and is the source of flooding within the project. The left bank of the Old Brahmaputra forms a levy which does not normally overtop. The Dullabaid Khal links the beels within the Project to the River. Water levels in the Old Brahmaputra are governed by rainfall elsewhere in its catchment — outside of Bangladesh. Water levels start to rise in April and, if left unchecked, flow via the Dullabaid Khal into Dullabaid Beel inundating crops. With the onset of the rains within the Project area, gravity drainage is possible only on an intermittent basis since Old Brahmaputra River water levels are frequently to high.

Project concept: The Project was conceived because pre-monsoon flood waters from the Old Brahmaputra River would enter Dullabaid Beel via Dullabaid khal and damage standing *boro* crops within the beel. During the Kharif seasons, monsoon floodwater would also damage standing *aus* and *aman* crops in the lower part of the project area. The project was designed to control pre-monsoon floods and to reduce the depth of flooding during the monsoon season by inhibiting the entry of flood waters from the Old Brahmaputra River into the protected area. This was to be accomplished by converting existing roads into flood embankments and constructing a regulator at the Dullabaid khal's outfall to facilitate drainage. In 1973 the Thana Council constructed a regulator at the outfall of Dullabaid Khal. For unknown reasons, the structure failed the same year it was constructed. In 1982 the regulator was re-constructed but in the following year the reconstructed regulator also failed. This time the failure was due to excessive downstream scouring which eventually undermined the structure. The present regulator was constructed in 1989 under an IDA financed SSFCDI project.

Embankments: The roadways which serve as the project's flood embankments are maintained by local bodies. When inspected in late 1991 minor repairs to the embankment were required. It was locally confirmed that prior to project implementation, water from the Old Brahmaputra River would enter the project area through Dullabaid Khal during the pre-monsoon and monsoon periods. Project infrastructure has effectively delayed pre-monsoon flooding but has had little, if any, impact on monsoon flood depths.

Regulator: The regulator is in good operational condition except for the downstream protective works which require repair. When the river level falls below the project water level, drainage is possible and the regulator gates are opened.

Production trends and project impacts on fisheries
Local people report that project implementation has had no impact on fisheries.



Northeast Regional Project

Hangarbhanga beel Embankment

Prepared by: HW/AA | Date: March 1992

L.2.4 HANGARBHANGA BEEL PROJECT

Project location and general data

District: Habiganj
Thana: Baniachung
Type: Flood control
Status: Completed
Gross Area: 1,620 ha
Net Area: 1,300 ha
Population: 7,110

Environment and engineering works

Hydrology: The Project area is located on the right bank of the Barak River which is the local name for the lower reach of the Khowai River. The Khowai River originates in the Tripura hills and is the main source of flooding in the area. The River has a steep catchment with sudden intense rainstorms giving rise to abrupt, short duration increases in Khowai water levels. The Khowai River has been fully confined from the Indian border to within 3.5 kilometers of the project area. During the monsoon season, the Project area is deeply flooded as a result of backwater from the Meghna River.

Project Concept: The purpose of the project is to protect the *boro* crops from the Khowai River pre-monsoon flash floods.

The Barak River is an extension of the lower Khowai River. The project area is located on the right bank of the Barak River. A single crop of *boro* rice is grown in the area. The Hangarbhanga Beel Embankment was constructed in three sections connecting a series of homesteads. It was constructed between 1953-55. This embankment was originally a submersible embankment but was later upgraded to serve as a local road for pedestrian and rickshaw traffic. It is maintained by the local administration.

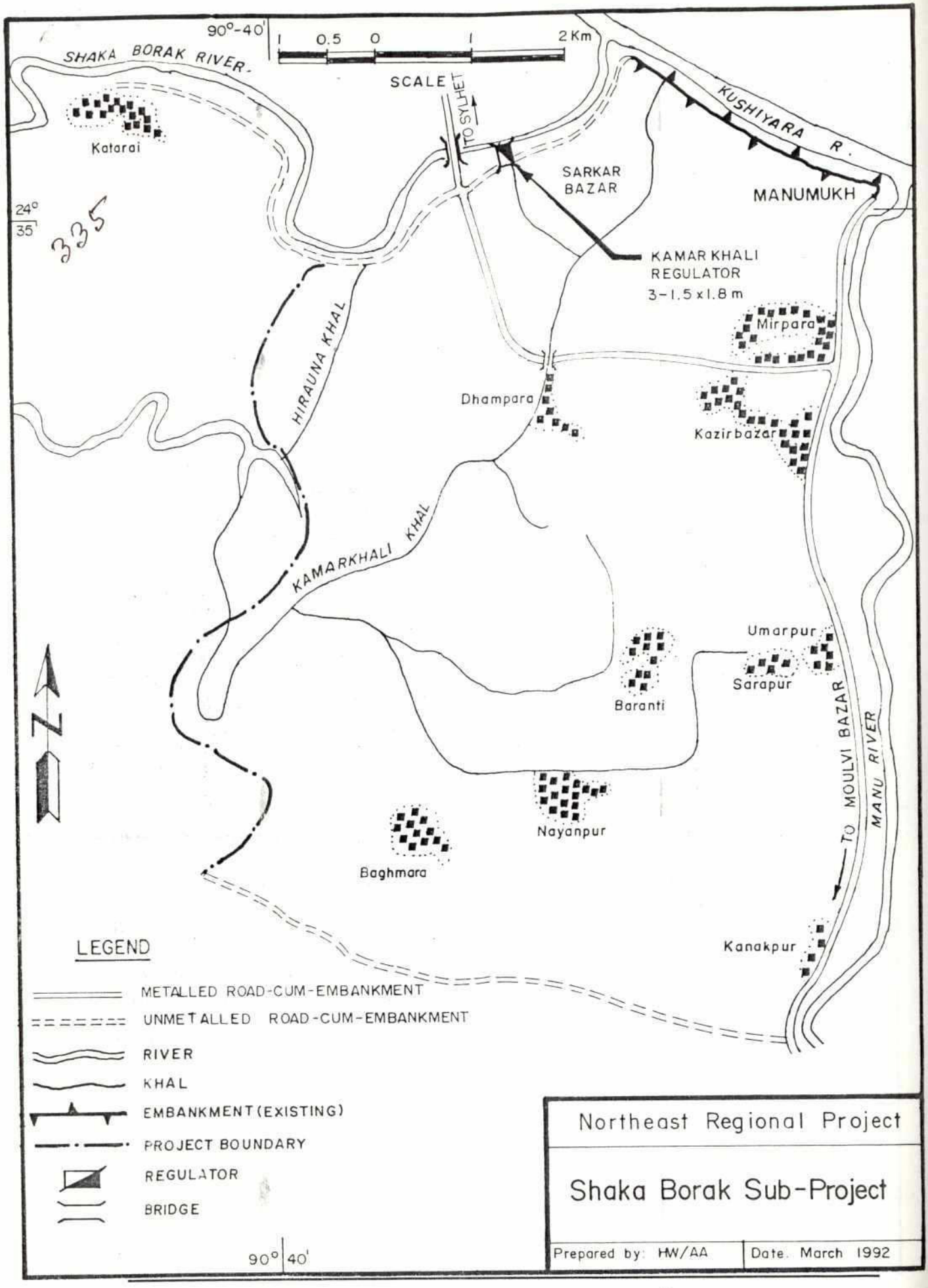
Submersible embankment: The 6.4 kilometre Hangarbhanga Embankment extends from the Hangarbhanga Beel to Dattapur village. The embankments crest elevation varies from 7.3 m PWD in its upper reach to 6.1 m PWD in the lower reach. There is one opening in the embankment at the outfall of Singair Khal into the Hangarbhanga Beel. The embankment cum road is in poor condition. To make it passable for rickshaws its surface has to be repaired after every flood season. BWDB proposed to extend the embankment a further 2.8 kilometres in the downstream direction and 3.6 kilometres in the upstream direction using Food For Work. The upstream extension would then be connected with the Khowai River right bank embankment. At present (1992) a 1 kilometre long loop cut, with embankments on both banks, is under construction on the Khowai River. The eastern side of the Project is exposed to river flooding since there are no embankments on this side — though there is a low foot path.

Fishing practices

There are no commercial fisheries in the project area. Local people fish in the small *beels* and *khals*.

Production trends and project impacts on fisheries

No negative impacts on fisheries were reported.


90°-40'
1 0.5 0 1 2Km
SCALE
SHAKA BORAK RIVER
TO SYLHET
KUSHIYARA R.
Katarai
SARKAR BAZAR
MANUMUKH
24° 35
335
KAMAR KHALI REGULATOR 3-1.5 x 1.8 m
Mirpara
HIRAUNA KHAL
Dhampara
Kazirbazar
KAMARKHALI KHAL
Umarpur
Sarapur
Baranti
TO MOULVI BAZAR
MANU RIVER
Nayanpur
Baghmara
Kanakpur
LEGEND
METALLED ROAD-CUM-EMBANKMENT
UNMETALLED ROAD-CUM-EMBANKMENT
RIVER
KHAL
EMBANKMENT (EXISTING)
PROJECT BOUNDARY
REGULATOR
BRIDGE
90° 40'
Northeast Regional Project
Shaka Borak Sub-Project
Prepared by: HW/AA
Date. March 1992

L.2.5 SHAKA BORAK SUBPROJECT

Project location and general data

District: Moulvibazar
Thana: Moulvibazar
Project type: Flood control
Status: Related construction began 1970's; project construction began 1992
Gross area: 4,520 ha
Benefitted area: Flood control 3,800 ha
Population: 31,010

Environment and engineering works

Hydrology: The area is located at the confluence of the Kushiyara and Manu Rivers. Before any of the embankments were built, water from these rivers would spill over the riverbanks and flood the area several times each year in the pre-monsoon and monsoon seasons. With the construction of the Manu and Kushiyara embankments, the main flood source for the area flooded shifted to the Shaka Borak. The Shaka Borak road embankment now prevents this, except at Kamarkhali Khal, which was left open. Drainage is southwest into the Gopla River, not towards the north, i. e. Kamarkhali Khal branch channel has no drainage function. The Shaka Borak dries up in January when inflow from the Kushiyara ceases.

Project concept: The project objective is to reduce monsoon flooding in the lower Kamarkhali Khal basin while making provision for drainage and entry of irrigation surfacewater, by providing a regulator on Kamarkhali Khal branch channel at its outfall into the Shaka Borak River. The sub-project area lies within a larger area that is effectively protected from flooding by embankments along the Kushiyara left bank, the Manu River, and the Shaka Borak River. (The Hail Haor embankment along the southern boundary does not have any flood control function.) The physical works affecting the Shaka Barak area are as follows:

- During the mid-seventies, the Manu River embankment was constructed along what is now the eastern boundary of the Shaka Borak Project.
- In 1986, the flood embankment near the southern boundary of the project was completed as part of Hail Haor Project.
- In 1987, BWDB proposed that a regulator be constructed on the Kamarkhali Khal branch channel.
- In 1988, the IDA-financed SSFCDI Project carried out limited feasibility studies.
- In 1989-90, Kamarkhali Khal main channel was blocked by the Kushiyara left embankment.
- In 1990-1, Hirauna Khal (but not Kamarkhali Khal branch channel) was closed during upgrading of a road embankment along the Shaka Borak River; this blocked entry of flood water from the Shaka Borak.
- In late 1991, construction of the regulator on the Kamarkhali Khal branch channel began.
- In Jan 92, re-excavation of 9 kilometres of the Shaka Borak — the reach downstream (west) of Kamarkhali Khal branch channel — was scheduled to start under the "Mass Participation Program of Canal Digging".

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Embankments: The area was inspected on 16 Jan 92. The embankments constructed along the Kushiyara left bank (1990) and along the Shaka Borak (1991) are in good condition and there has been no direct spill of flood waters into the area in the past two years.

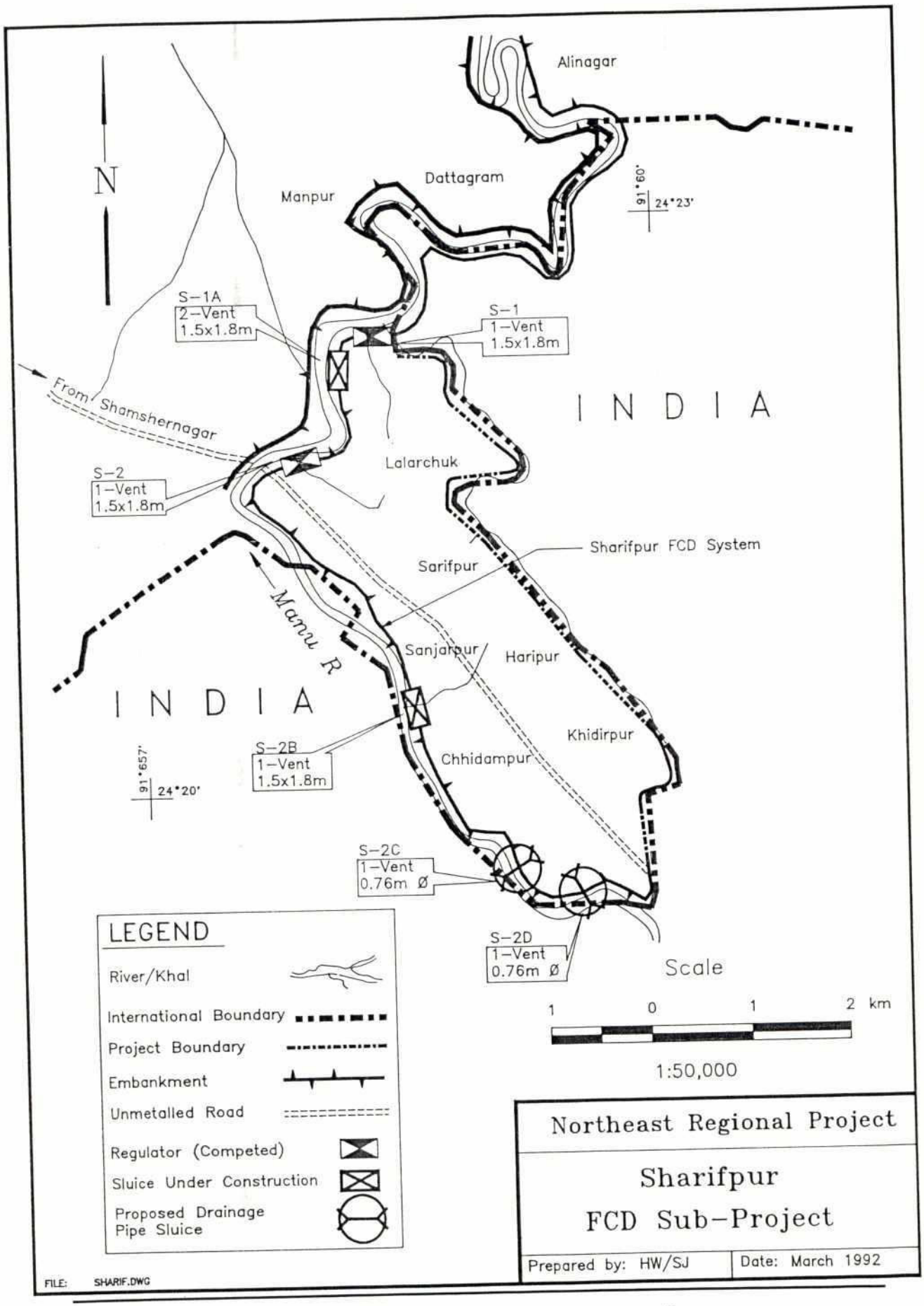
Regulator: The three-vent regulator (vent size 1.5 m x 1.8 m) at the offtake of Kamarkhali Khal branch channel from Shaka Borak River was under construction. The earth closure and diversion channel were complete. Only the slide gates on the river side remained to be installed. Re-excavation of 9 km of a silted-up section of the Shaka Borak - downstream (west) of Kamarkhali Khal branch channel - was scheduled for Jan 92. People living near the Kamarkhali Khal branch channel regulator (i.e. in the upper part of the sub-project area) state that the re-excavation will improve drainage, but they also report that there is no drainage problem. Water availability to LLPs along the Shaka Borak will improve, but only until January when the Shaka Borak dries up.

Fishery resources

There are no major fishery resources in the project area.

Production trends and project impacts on fisheries

Local fishing in the *khals* has reportedly not changed. The embankments along parts of the Kushiyara River have no impact on fisheries according to one fisherman. Another says it is very bad for fisheries. It prevents big fish from coming into the river from the beels. A breach in the embankment is considered good for the fishery in the beel behind the breach.


Alinagar
N
Manpur
Dattagram
91°60'
24°23'
S-1A
2-Vent
1.5x1.8m
S-1
1-Vent
1.5x1.8m
From Shamshernagar
INDIA
Lalarchuk
S-2
1-Vent
1.5x1.8m
Sharifpur FCD System
Sarifpur
Manu R
Sanjarpur
Haripur
INDIA
Khidirpur
S-2B
1-Vent
1.5x1.8m
Chhidampur
91°65'7"
24°20'
S-2C
1-Vent
0.76m Ø
S-2D
1-Vent
0.76m Ø
LEGEND
River/Khal
International Boundary
Project Boundary
Embankment
Unmetalled Road
Regulator (Competed)
Sluice Under Construction
Proposed Drainage Pipe Sluice
Scale
1 0 1 2 km
1:50,000
Northeast Regional Project
Sharifpur
FCD Sub-Project
Prepared by: HW/SJ
Date: March 1992
FILE: SHARIF.DWG

L.2.6 SHARIFPUR FCD SUBPROJECT

Project location and general data

District: Moulvi Bazar
Thana: Rajanagar
Project type: Flood control and drainage
Status: Completed
Gross Area: 1,460 ha
Net Area: 1,170 ha
Benefitted Area (FCD): 660 ha
Population: 7,210

Environment and engineering works

Hydrology: The Project is located within the Manu River floodplain with steep hills along its perimeter. Flash flood from the river combined with locally generated floods inundate the area in both pre-monsoon and monsoon seasons. The locally generated floods, when combined with high river stages, cause serious drainage congestion.

Project concept: The purpose was to prevent the Manu River spilling over its banks and inundating the *aus* crop. This necessitated constructing embankments along the Manu River with drainage regulators at some of the *khals*. The project area is located between the Manu River right bank and the Indian border. Construction of the flood embankment with a length of 10.2 kilometer along the right bank of Manu River was started under a FFW program in 1981 and was completed in 1989. Two single vent pipe sluices were constructed between 1984-87 under an IDA program (Credit 955-BD). In 1989 the sub-project was approved for rehabilitation under IDA Credit 1870-BD. The rehabilitation work, which involves the construction of two additional regulators, is on-going.

Embankments: The Manu River right embankment is in good condition. However, the river channel has shifted next to the embankment and bank erosion is taking place near Lalarchak village. In some reaches, the bank has been protected with boulders; more bank protection work will be required in the future.

Pipe sluices: The two existing pipe sluices (with flap gates on the river side) are in good condition. The inlet and outlet channels are small but there is no channel erosion. Silt deposited at the apron of one sluice indicates that the structure is over-sized and that there is little hydraulic head during drainage. An additional two vent regulator is to be constructed about 100 meters upstream of this sluice. In accordance with the Sub-project Rehabilitation Report (NHC 1989), the S-1A Sluice was to be constructed at the outfall of the northeastern *khal*. At present the *khal* is inactive as it is silted near the outfall and its flow has been diverted by India. Meetings were held between the Moulvi Bazar division of BWDB and their Indian counterparts and it was agreed that the BWDB will construct an embankment over the Pabni Chara. The embankment will connect the Manu right embankment with the Indian embankment and thus the existing opening will be embanked. BWDB claims that the drainage capacity of the existing S-1 Sluice is inadequate and that the additional sluice will improve drainage sufficiently to reduce the crop damage of *aus* paddy. Local farmers have confirmed that drainage is slow, but they also say that the river water level is also high at that time.

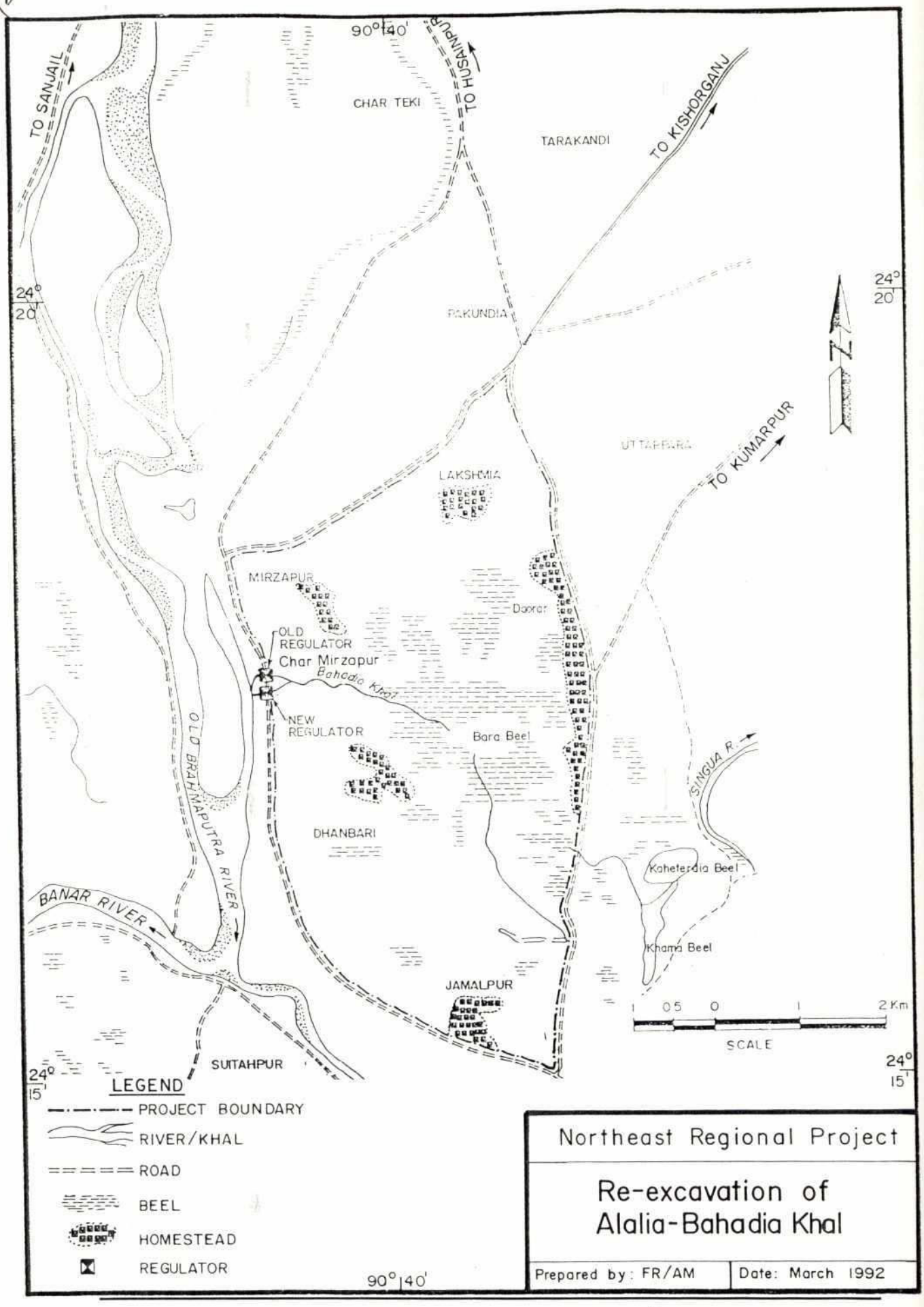
Unfortunately there are no water level records for the sluice site. Further study is required, but it appears that an additional sluice may not improve drainage significantly.

Fishery resources

There are no fisheries outside of the Manu Rivers main channel.

Production trends and project impacts on fisheries

Local people who fish in the Manu River state that the embankment has not affected their fish catch.



Northeast Regional Project

Re-excavation of Alalia-Bahadia Khal

Prepared by: FR/AM | Date: March 1992

L.2.7 ALALIA BAHADIA KHAL RE-EXCAVATION

Project location and general data

District: Kishoreganj
Thana: Pakundia
Project type: Full flood control, drainage
Status: Constructed 1946, rehabilitated 1976
Gross area: 1,820 ha
Net area: 1,420 ha
Population: 20,000

Environment and engineering works

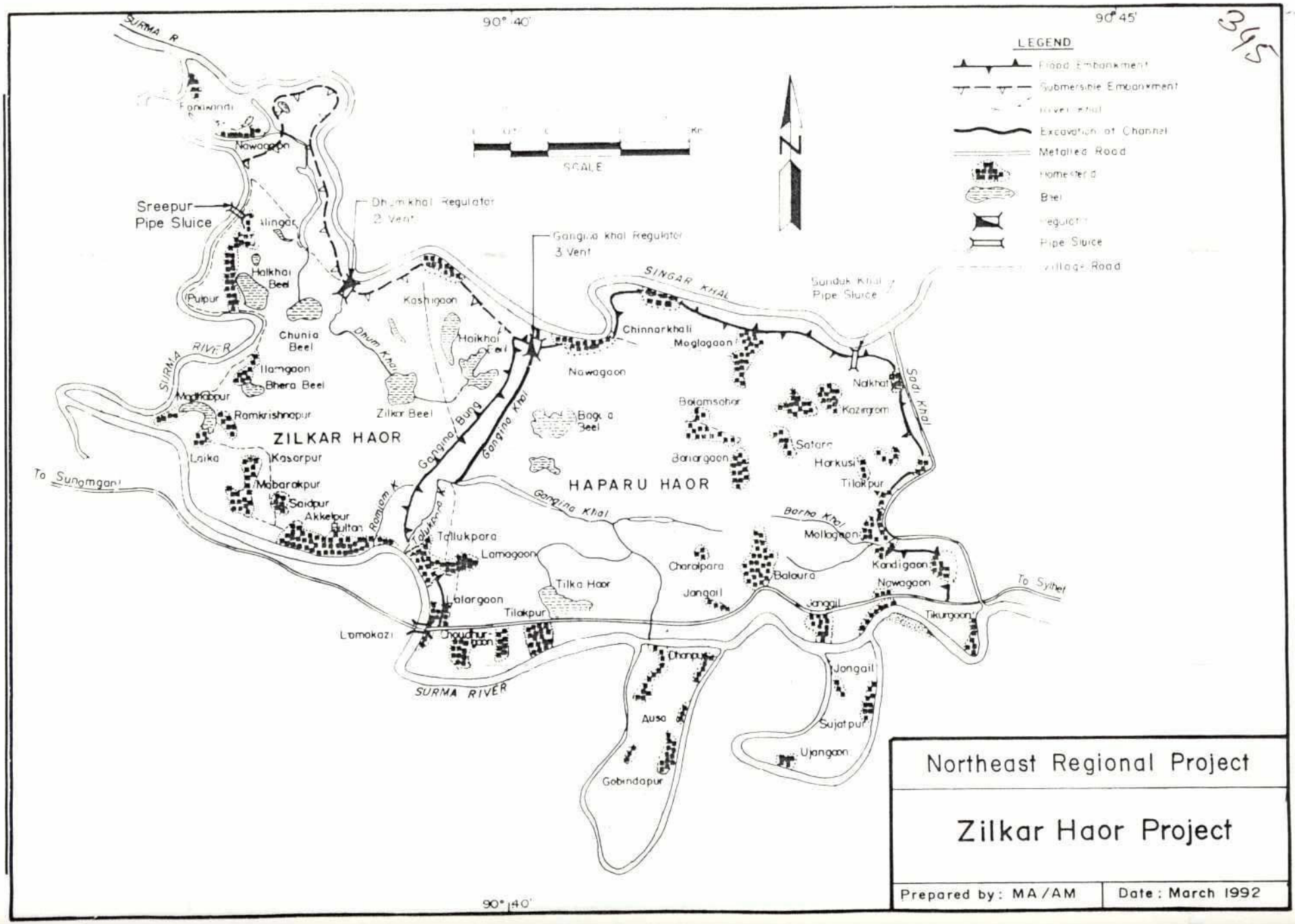
Hydrology: The Old Brahmaputra, on the western boundary of the project, is the source of the area's flooding and receives its drainage. Both flooding and drainage are effected mainly through Bahadia Khal. Project area pre-monsoon rainfall can usually drain to the river, since rainfall and pre-monsoon flood peaks rarely coincide.

Project concept: The project concept is to protect the *boro* crop from pre-monsoon flooding from the Old Brahmaputra River; and to relieve drainage congestion. Project works consist of a two-vent regulator (replacing a single-vent structure constructed in 1946) in the road/full flood control embankments around the area and re-excavation of Bahadia Khal. Originally (pre-1946), rice grown in *beels* in the area was damaged almost every year by pre-monsoon flooding from the Old Brahmaputra River. To prevent entry of this floodwater, in 1946 a regulator was provided in the road embankment surrounding the project area. In 1946, a single-vent regulator was constructed at Char Mirzapur to prevent inflow from the river. This regulator proved to be too small to drain rainfall runoff. Also its invert level is too high - about 1 meter above the *beel* level. Drainage congestion and delayed *boro* planting in the lower areas resulted; farmers cut the road embankment every year after the monsoon to alleviate the congestion, closing it again when the river began rising. In some years, farmers could not close the cut before the onset of pre-monsoon flooding, resulting in severe crop damage. To correct these problems, in 1976 a second regulator (two vent) was constructed at a lower invert level and Bahadia Khal re-excavated.

Embankments: The road embankments around the project are maintained in good condition by local authorities. The two-vent regulator is in good operational condition, including the steel vertical lift gates (1.52 x 1.83 meters). Routine maintenance requirements include clearing the regulator of water hyacinth, keeping regulator protective works in position, greasing the regulator gates, and clearing the *khal* of silt every 5-6 years.

Production trends and project impacts on fisheries

Local people report little fishing activity in the *khal*, both before and after project implementation.


90° 40'
90° 45'
SURMA R
Nowagaon
Sreepur
Pipe Sluice
Dhumkhal Regulator
2 Vent
Gangina khal Regulator
3 Vent
SCALE
N
LEGEND
Flood Embankment
Submersible Embankment
Excavation of Channel
Metalled Road
Homestead
Beel
Regulator
Pipe Sluice
Village Road
Halkhal Beel
Putpur
Chunia Beel
SURMA RIVER
Ilamgaon
Bhera Beel
Majhkapur
Ramkrishnapur
Zilkar Beel
Kashigaon
Dhum Khal
Gangina/Burg
Gangina Khal
SINGAR KHAL
Sunduk Khal
Pipe Sluice
Chinnarkhali
Moglagaon
Nowagaon
Bagda Beel
Balamsahar
Baniargaon
Nalkhal
Kazirgaon
Satara
Harkusi
Tilakpur
Sadi Khal
ZILKAR HAOR
HAPARU HAOR
To Sunamganj
Laika
Kasorpur
Mobarakpur
Saidpur
Akkelpur
Sultan
Ramkrishnapur
Tallukpara
Lamagaon
Lalargaon
Tilakpur
Chowdhurgaon
Lamakazi
Gangina Khal
Borha Khal
Mollagaon
Kandigaon
Nowagaon
Tikurgaon
To Sylhet
Charalpara
Balaura
Jangail
Tilka Haor
Chanpur
Ausa
Gobindapur
Sujatpur
Ujangaon
SURMA RIVER
Northeast Regional Project
Zilkar Haor Project
Prepared by: MA/AM
Date: March 1992

L.2.8 ZILKAR HAOR PROJECT

Project location and general data

District: Sylhet
Thana: Sylhet
Project type: Full (Haparu) and partial (Zilkar) flood control
Status: Begun 1983, completed 1987
Gross area: 5,260 ha
Net area: 4,250 ha
Population: 53,500

Environment and engineering works

Hydrology: Drainage is south to north throughout. Zilkar haor receives water mainly from Chenguar khal (Surma River) via Dhum khal. Water also enters into the haor via Ramjanar khal from the Surma near Miragaon fishing village during the high flood time. Each haor is described separately below:

- Haparu Haor: The 16 kilometres of full flood embankments constructed around Haparu Haor follow Sadi Khal in the east, Singar Khal in the north, and Gangina Khal in the west. The Sylhet-Sunamganj highway embankment, along the Surma River is high enough to function as a full flood embankment, but water can enter through four ungated openings (five others are gated). The lowest part of Haparu Haor is Gangina Khal. The embankment on the left side of the *khal*, which is called Gangina Bund, helps to retain water in Gangina Khal for dry-season irrigation. In the pre-monsoon and monsoon seasons, water drains from Haparu Haor into Zilkar Haor through eight irrigation inlets in Gangina Bund. Before the project, the area experienced pre-monsoon and monsoon flooding, but reportedly flood waters drained away rapidly. Now, with many of the natural drainage channels closed at the embankment and most of the area draining through Gangina Regulator, drainage is congested. In the pre-monsoon and monsoon seasons, rainfall and river water entering through the highway embankment collects in the northern part of the project. To effect drainage there, farmers cut the Singar Khal embankment. Clearly, the drainage system needs to be improved. Farmers also indicate that there is a need to flush out water hyacinth; this would require higher decks on structures or vents without decks, so that plants can pass underneath even when water levels are at their highest.

- Zilkar Haor: On the north boundary of the area, submersible embankment runs for 8 kilometres along Singar Khal between Gangina Bund and the high bank of the Surma. Gangina Bund bounds the area in the east. High land along the Surma bounds the area in the south and west. Before the project, there was pre-monsoon flooding and serious *boro* crop damage almost annually. Since project completion, pre-monsoon flood damage to crops has been eliminated. Farmers on the west side of the area, at Alinagar and Madhabpur villages, state that in the last few years the Surma has been overtopping its bank.

Water bodies: Zilkar haor has two permanent water bodies, Chunia Beel to the west, and Zilkar Beel to the south of Dhum Khal Regulator. Other jalmohals within Zilkar haor are Duba beel, Dhum khal, Halkhai beel and Bhara beel. The name and conditions of the jalmohals in Zilkar and Haparu haors are given below:

Table L23: Status of Different Fishery in Zilkar and Hapara Haor with Main Species

Haor	Jalmohal	Condition	Main Species
Zilkar	Zilkar beel	Seasonal, heavy siltation	Smaller species
	Dhum khal	Seasonal, little siltation	Smaller species, some boal and air
	Beel duba	Seasonal, heavy siltation	Smaller species
	Tinmoori	Seasonal, heavy siltation	Smaller species
	Koshumoora	Seasonal, heavy siltation	Smaller species
	Kookkya	Seasonal, heavy siltation	Smaller species
	Konarduba	Seasonal, heavy siltation	Smaller species
	Bhera beel	Seasonal, heavy siltation	Smaller species
Haparu	Gangina	Perennial, heavy water hyacinth infestation, little siltation	Smaller species, stocked fish
	Kattiya	Perennial, little siltation	Smaller species
	Chotohaparu	Seasonal, little siltation	Smaller species
	Barahaparu	Seasonal, little siltation	Smaller species
	Moiyarkoona	Seasonal, little siltation	Smaller species
	Jordubi	Seasonal, little siltation	Smaller species
	Dhaladubi	Seasonal, little siltation	Smaller species
	Terakoori	Seasonal, little siltation	Smaller species
	Kangladubi	Seasonal, little siltation	Smaller species
	Magurai	Seasonal, little siltation	Smaller species
	Singura	Seasonal, little siltation	Smaller species

Water colour was transparent to greenish within the haor area. In the adjacent river water colour was clayey.

Dhumkhalar duar is located in front of the Dhumkhal regulator (out side the project) in the main stream (Chenguar khal). Its total area is about 32-40 ha and it retains water year round. In March\April water depth is about 20-25 m. Before reaching the project area, Dhumkhal branches into several canals.

Project concept: Zilkar Haor project area consists of Zilkar Haor and Haparu Haor, which are separated by a full flood/road embankment on the left bank of Gangina Khal.

- Haparu Haor: Objectives are to protect *aus* and *aman* crops from monsoon flooding and protect *boro* crops from pre-monsoon flooding (i.e. provide full flood protection), and improve drainage, while allowing access to irrigation water. Project works consists of 16 kilometres of full flood embankments (including raising of Gangina Bund, originally a low road embankment), one three-vent regulator at the Gangina Khal outfall and one pipe sluice, re-excavation of 2.4 kilometres of internal channels.

- Zilkar Haor: The project objectives are to protect *boro* crops from pre-monsoon flooding (i.e. partial flood protection), while allowing for drainage and access to irrigation water. Project works consist of 8 kilometres of submersible embankments, one two-vent regulator, and one pipe sluice.

A total of 25 irrigation inlets were installed, of which 17 are on the peripheral rivers and eight are in Gangina Bund. In 1983, BWDB proposed the project and an EIP appraisal mission approved and recommended it for inclusion in the 1983-84 EIP program. In 1984, construction started. In 1987, the project was completed. In 1990, O & M studies were carried out for EIP. The report stated that the project had been successful in protecting *boro* crops but that the full flood protection during the monsoon season is not effective. This study (and local residents) also suggest that the long narrow strip of land between the project southern boundary (the Sylhet-Sunamganj highway) and the Surma should be protected from flooding by constructing an embankment along the Surma; but costs would be high and agricultural benefits small (the area is already *aus-aman* double-cropped). It also seems likely that the embankment would cause drainage congestion, as happened in Haparu Haor.

Embankments:

Haparu Haor: The Haparu full flood embankment has not been overtopped in the five monsoon seasons since completion; the crest level appears to be adequate. Sadi Khal embankment is not set back adequately, and the embankment slope has been eroded in many places; a few locations should be retired, and much of the length requires normal maintenance work. Singar Khal embankment has settled in some reaches, particularly between the regulator and Moglagaon village; one public cut near Chinnerkhali village is reported. Gangina Bund is in generally good condition, except at a few locations where the side slope has been eroded. The Sylhet-Sunamganj highway embankment has nine openings. Five are culverts/small bridges with vertical lift gates; the other four are ungated. In addition to the ungated openings, sometimes gates are opened when external water levels are high: in May 1991, farmers report, flood water entered the project when a gate near Jangail village was opened by people living outside the project. Gangina Regulator is leaking. Sunduk Khal pipe sluice and the gated structures in the highway are in good operational condition.

Zilkar Haor: The submersible embankment from Gangina Regulator to Dhum Khal Regulator was repaired and turfed in 1990-1, and then damaged in 1991 by overtopping and wave action from southwesterly winds, with the most serious damage near Kashigaon village. Damaged sections need maintenance, and the section near Kashigaon needs bank protection works. Dhum Khal Regulator appears adequate for post-monsoon drainage and generally the area is well drained.

Dhum Khal Regulator is also used for flushing after the harvest of *boro* crops. Dhum Khal regulator and Sreepur pipe sluice are in good operational condition. The 2 vent wooden regulator was opened during the field visit time (13-14 Aug 92). Through that regulator water was coming to the Zilkar haor from the Chenguar khal via Dhum khal. Chenguar khal is the main source of water to the Zilkar haor. Water current velocity was very strong at the mouth of the sluice.

Irrigation inlets: There are eight irrigation inlets along Gangina Khal and 17 along the channels around the *haors*. Singar Khal has eleven of these, of which one is broken; local people report that five were used during the last irrigation season. Sadi Khal has six inlets, of which all are in good condition; it is report that these are not used, however. Gangina Khal has eight inlets, of which all are in good condition; they are used for drainage from Haparu Haor to Zilkar Haor, however, not for irrigation.

Fishery resources

Mainly small species are present in Zilkar haor. The main species are chingri, tengra, pabda, mola, bojori, chanda, fali, baim, lati, shoal, gazar, boal and air. In sharp contrast, the main species of the Dhum khal duar (neem) are rui, mrigel, catla, kalibaus, bacha, air, chitol, boal, garua, chapila, laso, pabda, batashi and kajuli. People of the area state that the duar is used by the fish as overwintering ground and that before implementation of the project Haparu and Zilkar haors were used as breeding ground. Previously there was a flow of water from the Surma River via Haparu and Zilkar haor to the Chenguar khal, and local people used to catch large fish during the early flood period (late March-late May).

Within Haparu haor, the Haparu group fishery and the Kattiya group fishery are the most significant. At present the following species are present in the haor area: rui, kalibaus, mrigel, boal, kanla, pabda, shoal, gazar, ghonia, shingi, magur, bheda, puti, tengra, moka(mola), chapila, icha and koi.

Fishing practices

The most commonly used fishing gear in the area are:

Table L24: Species Caught by Gear

Gear	Fishing Area	Target Species
Bel jal	River, canal	Chapila, mola, chela, laso, icha, puti, carp fry/fingerling
Vor jal	River, canal	Boal, air, ghonia, pabda, kalibaus
Laua jal	River	Ilish, kalibaus
Piya jal	River, floodplain	Kalibaus, bacha, garua, chapila, kajuli, ilish
Thela jal	Floodplain	Icha, puti
Current jal	Floodplain	Puti, bheda, chanda, kholisha, koi, carp fry
Chai	Floodplain	Tengra, gulsha, psabda, shingi, magur, cheng (earthworms and snails used as bait)
Borshi	Floodplain	Cheng, Shingi, Magur, Baim, Gulsha, Tengra, Lati (earthworms and puti used as bait)

Catch data for Aug 92 are given below for two gears:

Table L25: Sizewise Species Caught by Bel Jal and Gill Net

Gear	Species Caught	Length (cm)
Bel jal	Rui	8-25
	Bata	9
	Kalibaus	10-30
	Rani	4.5-6
	Laso	8-10
	Puti	2-5
	Chapila	2-5.5
	Chanda	3-6.5
	Chela	3-4.5
	Gang gutum	8-15
Gill net	Garua	17-30
	Kalibaus	38

Daily catch was about 1-2 kg/unit and the daily income varies from Tk 35-50/unit.

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Chunnia Beel and Zilkar Beel were previously under the *talukdari* (jamindari) system. Now they are leased out for three-year periods. A representative of the Zilkar Beel lease-holder states that the fishing rights were purchased at an open auction by five people, none of whom are fishermen.

Three fisherman village identified near the Surma River: Miragaon, Fatepur and Piragaon. In Zilkar and Haparu Haor, there exists a quazi-caste of Muslim fishermen calling themselves "Fisheri". Another caste title which they do not like to use themselves but is used by others is Maimol. Muslim fishermen constitute a caste to the extent that they only marry among themselves and are associated with a traditional occupation - fishing - which is passed on from father to son. A few of the Fishari are wealthy but the majority are poor. In their community obvious malnutrition among women and children was observed. The wealthy Fishari have benefitted with the lease system, sharing profits with other auctioneers from outside the community. Their being "fishermen' has been used as a front to fulfill one of the conditions of the lease system. In Zilkar Haor, one of the richest men is a Fishari. His wealth and his investments in various sectors is evident from the occupations of his four sons. The eldest works abroad and sends remittance. The second organizes the policing of the beels and employs fishermen to catch the fish. The third manages some 75 ker of land. The fourth is completing college education. No one catches fish as such anymore but they remain Fishari. The majority of Fishari are poor and work as kamla on a fixed contract basis. Monthly wages are about Tk 800-900, and may exceptionally reach Tk 1,000. One man who had gone to work in Sunamganj was said to be paid only Tk 450 per month. The poor Fishari are little inclined to voice protest at the exploitation they are submitted to. They have little freedom to do so because members of their own cast are closely allied with the political elite of the area. If they do not catch fish, Fishari who have some capital trade in fish. The Hindu fishermen met in Joykolosh are Namasudra by caste. Traditionally, in this area, Namashudra have been doing humbler jobs and have been considered lower than the Hindu fishermen, Jele. Their fishing equipment is less expensive and less efficient. Namasudra do not own land generally.

Production trends and project impacts on fisheries

The lessee fisherman group of Zilkar haor have reported that after the construction of the embankment and the sluice gate, fish production has been reduced by 60-70% within the haor area. The decline in catch was attributed by fisherman to the following factors:

- partial restriction of fish migration due to sluice gate.
- over-fishing.
- annual fishing.
- fish disease.
- siltation within the haor areas.

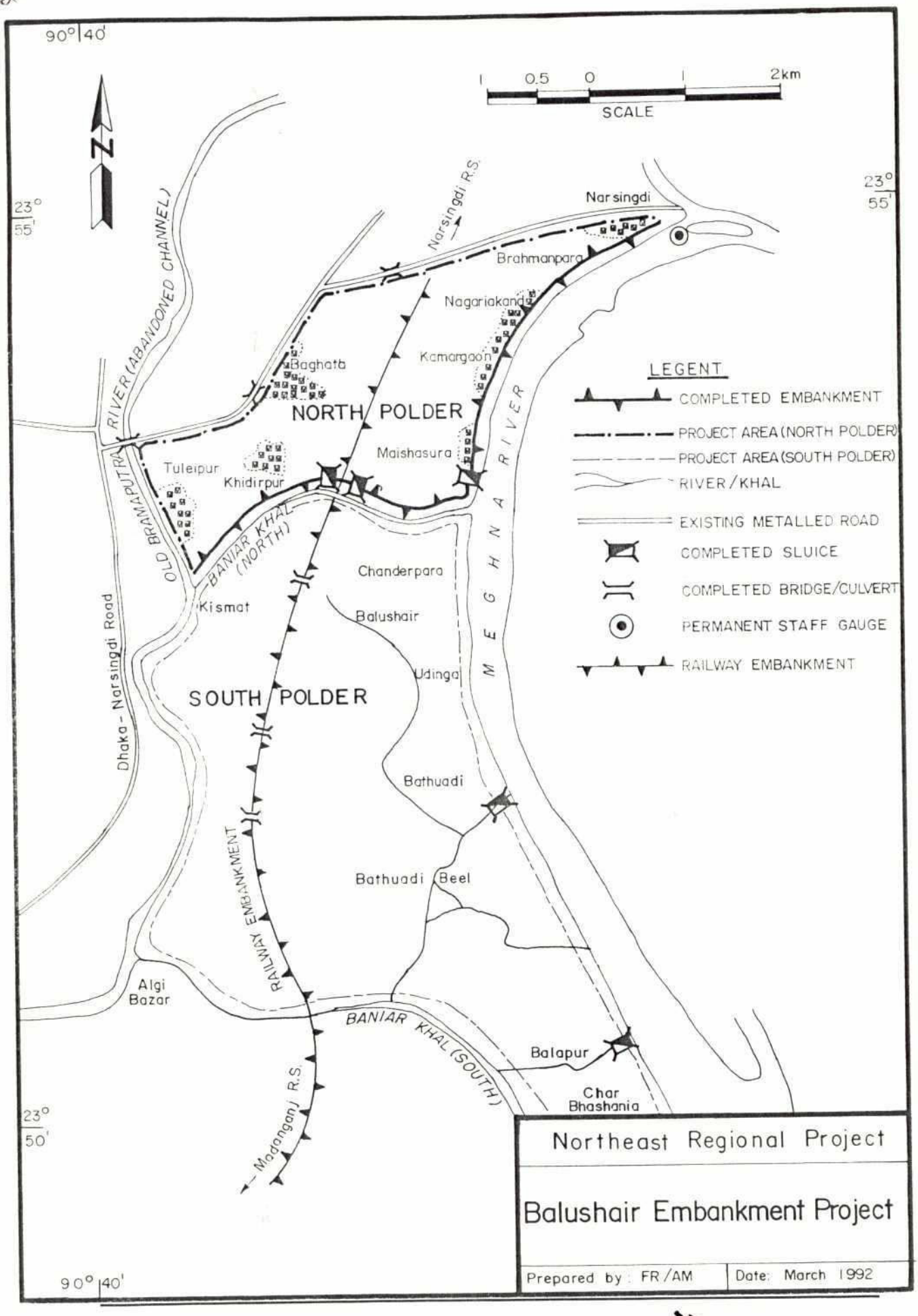
Subsistence fishermen from the Dhum Khal area report that the project's engineering works have had little impact on fisheries. They also stated that over-fishing of the *beels* (all the water bodies are harvested annually) has had a large negative impact on fisheries, and that many fishermen have become labourers.

There are conflicts between the farmers and the lease-holders of the *jalmohal*. The lease-holders are the stronger group, and they drain out the *haor* completely in late November or early December. Farmers indicate that their preference would be to close the regulators at the end of December.

The sluice gates were not designed appropriately to facilitate fish migration into the haor. As a result, natural fish stock has declined rapidly. Lessee fishermen group of Haparu fishery had stocked about 0.1 million Carp fry (2.5 cm) in 1992 (Rui, Mrigel, Kalibaus, Ghonia).

In Haparu haor, there are two sluice gates called Shonduk khal sluice and Nawgaon or Gangina khal sluice. Shonduk khal sluice is a single vent one way system regulator by which water can only pass out from the project area to the Chenguar khal. Gangina sluice is a three vent vertical lifting system regulator by which water can pass both ways. Fishermen in the area stated that a wooden regulator is better than the steel vertical type regulator as there are better opportunities for fish to migrate into their grazing ground during the late flood period. A vertical regulator is considered better than a one-way steel regulator as fish cannot migrate at all to their grazing and breeding grounds through the latter type.

About 1 km from the Gangina sluice, the embankment was breached or cut during the second week of June 1992. Local people reported that before the breaching, large quantities of water hyacinth had accumulated on the Gangina fishery and due to heavy rain, the water level was raised. As a result there was strong water pressure against the sluice and breaching occurred. People requested the sluice operator (Mr. Torab Ali member) to open the doors. He demanded money against the opening of the sluice, but people would not agreed to that proposal. Moreover there are two bel jal at the mouth of the sluice. Local people also claimed that there is a secret contract between the bel jal operator and the sluice gate operator not to open the doors. The open door would allow fish to migrate into the haor, while the closed door allows fish to be easily caught in front of the sluice.


90° 40'
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0.5 0 1 2km
SCALE
23° 55'
23° 50'
90° 40'
Narsingdi
Narsingdi R.S.
Brahmanpara
Nagariakandi
Kamargaon
Baghata
NORTH POLDER
Maishasura
Tuleipur
Khidirpur
RIVER (ABANDONED CHANNEL)
OLD BRAMAPUTRA
BANIAR KHAL (NORTH)
Kismat
Chanderpara
Balushair
Udinga
SOUTH POLDER
MEGHNA RIVER
Dhaka - Narsingdi Road
Bathuadi
Bathuadi Beel
RAILWAY EMBANKMENT
Algi Bazar
BANIAR KHAL (SOUTH)
Balapur
Char Bhashania
Madanganj R.S.
LEGENT
COMPLETED EMBANKMENT
PROJECT AREA (NORTH POLDER)
PROJECT AREA (SOUTH POLDER)
RIVER / KHAL
EXISTING METALLED ROAD
COMPLETED SLUICE
COMPLETED BRIDGE/CULVERT
PERMANENT STAFF GAUGE
RAILWAY EMBANKMENT
Northeast Regional Project
Balushair Embankment Project
Prepared by : FR / AM
Date: March 1992

L.2.9 BALUSHAIR EMBANKMENT PROJECT

Project location and general data

District: Narsingdi
Thana: Narsingdi
Project type: Full flood control and drainage
Status: Completed (North Polder)
Gross Area: 900 ha
Net Area: 560 ha
Population: 16,350

Environment and engineering works

Hydrology: The Project is located in the lower end of the Upper Meghna River system. By the time run-off reaches this point in the system, the flood peaks have been considerably damped. The early monsoon flood peaks are low and rarely result in *boro* damage.

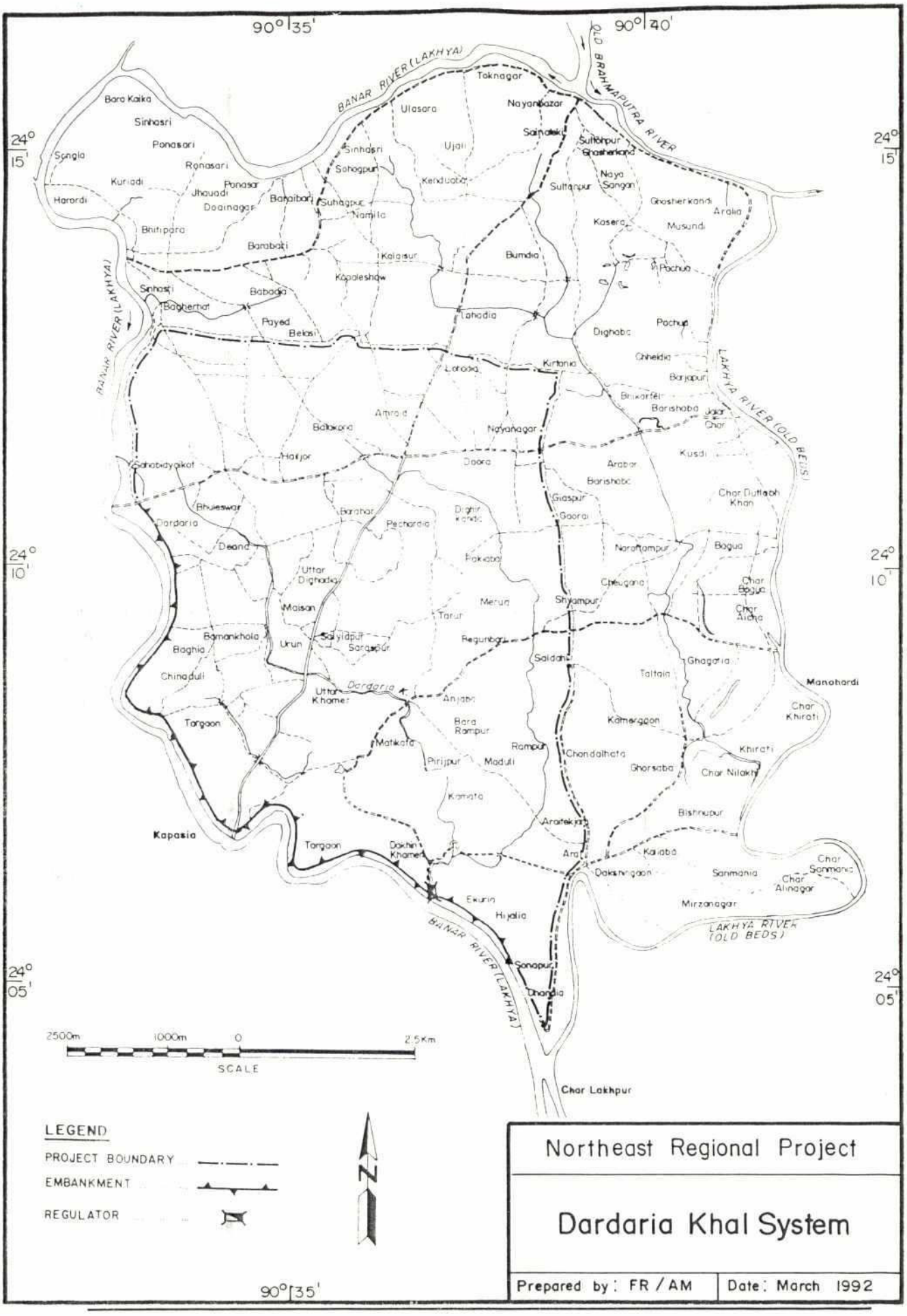
Project concept: The project was prepared by BWDB to protect *boro* and broadcast *aman* crops from Meghna River flooding. The crops were also ostensibly damaged by water hyacinth which was brought in by flood water. To improve the agriculture regime, it was considered necessary to construct full flood embankments (5.4 kilometres) along the Meghna River, dwarf embankments along the Baniar Khal, and three drainage sluices. Project construction started in 1973 and continued intermittently through 1986 with GOB financing. During this period, the North Polder was completed but only two structures were constructed in the South Polder. The South Polder was then identified by the Netherlands financed Early Implementation Project as suitable for inclusion in their programme. However, work did not proceed. It is expected that any further development will now be carried out under the Narayanganj-Narsingdi project.

Embankment: About 2.70 kilometres of the embankment's river side has been provided with 15 cm thick brick mattressing to protect the embankment from Meghna River wave action.

Regulators: There are three regulators, each fitted with vertical lift steel gates. The structures are in good operational condition.

Production trends and project impacts on fisheries

Local people have stated that there has been a reduction in floodplain fish abundance after construction of the embankment.


90°35'
90°40'
24°15'
24°10'
24°05'
BANAR RIVER (LAKHYA)
OLD BRAHMAPUTRA RIVER
LAKHYA RIVER (OLD BED)
Teknagar
Nayanbazar
Saintek
Sultanpur
Ghosherkandi
Araka
Ulasara
Ujan
Sinhasri
Sahagpur
Kendua bar
Naya Sangan
Kasera
Musundi
Bara Kaika
Sinhasri
Ponasari
Sangla
Ronasari
Kuriadi
Ponasar
Jhauadi
Harordi
Doainagar
Bahaibari
Suhagpur
Namila
Britipara
Barabati
Kalaisur
Bumdia
Pachua
Kapaleshow
Babadia
Baghierhat
Payed
Belasi
Lahadia
Digholia
Chheldia
Barjapur
Kurtania
Laradia
Brikarfeli
Barishabo
Jalar Char
Attroli
Balakpra
Nayanagar
Kusdi
Sahabdyakot
Harijor
Daora
Arabar
Barishabo
Char Dutlabh Khan
Bhuieswar
Barahar
Pechardia
Dighir kandi
Gaora
Dardaria
Deand
Narottampur
Bagua
Pakaba
Uttar Dighalia
Chhegana
Char Bagua
Char Aicha
Meiun
Shyampur
Maisan
Tarur
Bamankhola
Salyidpur
Urun
Sarasapur
Regunbari
Baghia
Saldana
Ghagaria
Chinadali
Taltala
Manohardi
Uttar Khamer
Dardaria
Anjabi
Char Khirati
Bara Rampur
Kamargaon
Targaon
Matikata
Rampur
Chandalhata
Khirati
Pirijpur
Maduli
Ghorsaba
Char Nilakhi
Kamata
Bishnupur
Kapasia
Aratekjat
Targaon
Dakhin Khamer
Ara
Kalaba
Char Sanmania
Dakshingaon
Sanmania
Char Alinagar
Ekuria
Mirzanagar
Hijalia
Sonapur
Dhangia
Char Lakhpur
2500m
1000m
0
2.5Km
SCALE
N
LEGEND
PROJECT BOUNDARY
EMBANKMENT
REGULATOR
Northeast Regional Project
Dardaria Khal System
Prepared by : FR / AM
Date : March 1992

L.2.10 DARDARIA KHAL SYSTEM

Project location and general data

District: Gazipur
Thana: Kapasia
Project Type: Full flood control and drainage
Status: Completed
Gross Area: 6,200 ha
Net Area: 3,700 ha
Population: 59,080

Environment and engineering works

Hydrology: The project is surrounded by the Banar River and an old channel of the Lakhya River. Both are distributaries of the Old Brahmaputra River. The old Lakhya channel is nearly filled with sediment and as a result the Banar River now conveys most of the flow. Sediment deposition has also affected the conveyance capacity of channels inside the Project area with the result that drainage is inadequate.

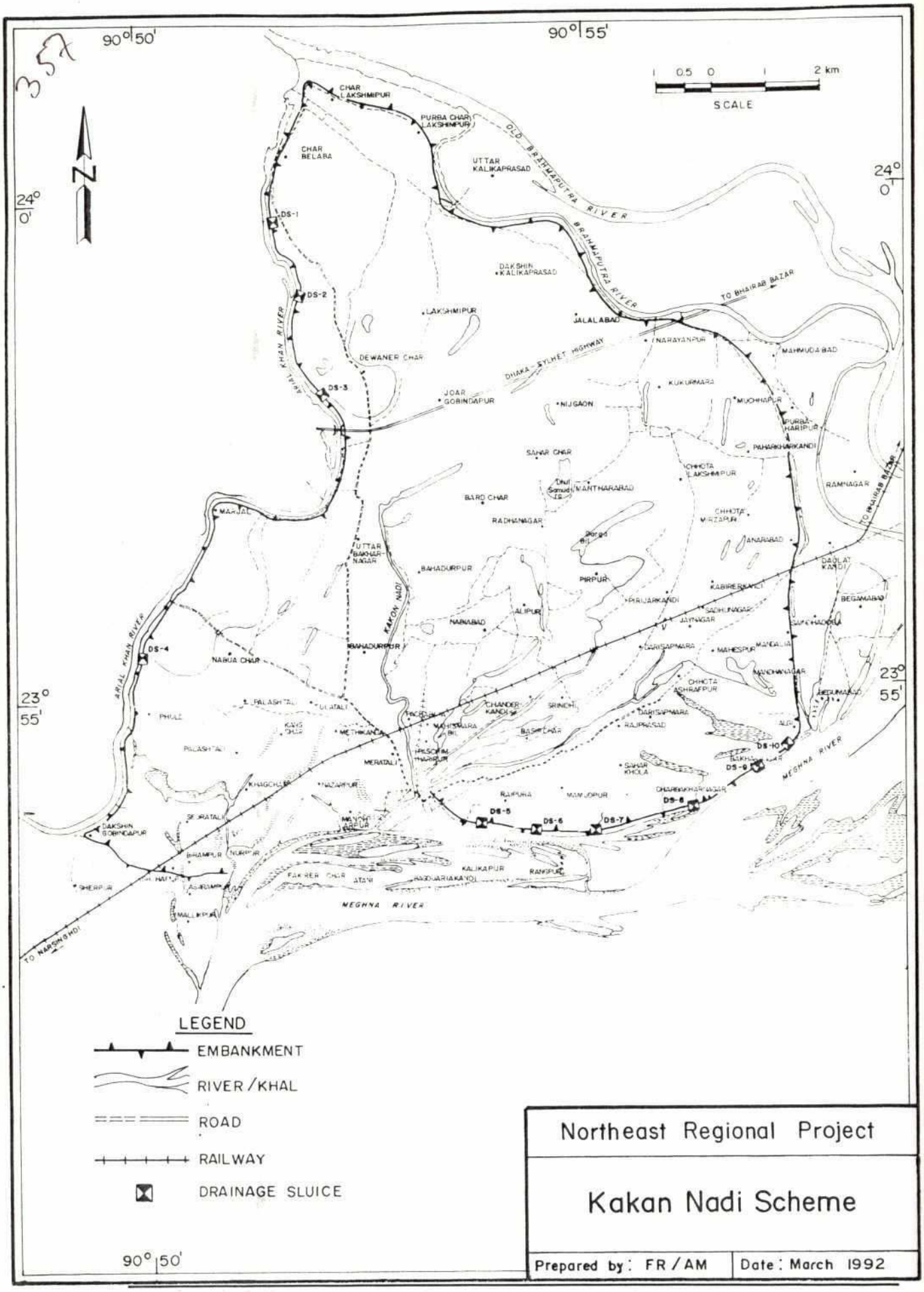
Project concept: The project objective was to provide full flood protection to the Project area through the construction of an embankment along the left bank of the Banar (Lakhya) River from Sonapur to Dardaria. Drainage was to be provided by a regulator at Ecuria and the re-excavation of Dardaria Khal. The project brief prepared by BWDB, stated that floodwater from the Banar (Lakhya) River entered the scheme area through Dardaria Khal in early June. This caused extensive damage to crops. Also, prior to project implementation, problems resulted from inadequate drainage. Post-monsoon drainage congestion delayed transplanting *boro* crops while the pre-monsoon drainage congestion damaged standing *boro* crops.

Embankments: These are in good condition.

Regulator: There is one three vent regulator (1.5 meter x 1.8 meter) with vertical lift gates on the upstream side and flap gates on the downstream side. The regulator is in good operational condition. Bank protection along the outlet channel is also in good condition. BWDB plans to construct an additional one vent regulator in 1992 adjacent to the existing regulator. The purpose of the second regulator is to flush water into the Project area for *boro* irrigation. It will be constructed with a lower invert level than the first structure. Reportedly, the invert of the existing structure is above the low flow water level.

Production trends and project impacts on fisheries

Fishermen believe that the project has reduced the abundance of fish in the area. Though the project regulator remains open for a significant period of the monsoon smaller fish are reportedly unable to migrate from the river to the floodplain through the regulator due to high water velocity. This may be one factor which is causing the decline of fish in the area.



Northeast Regional Project

Kakan Nadi Scheme

Prepared by: FR / AM | Date: March 1992

L.2.11 KAKON NADI SCHEME

Project location and general data

District: Narsingdi
Thana: Raipura and Belabo
Project type: Flood control and drainage
Status: Declared complete
Gross Area: 7,700 ha
Net Area: 4,600 ha
Population: 129,500

Environment and engineering works

Hydrology: The Kakon Nadi Project area is bounded by the Old Brahmaputra River on the north, Meghna River on the south and east and Arial Khan River on the west. During the monsoon season these rivers overflow their banks and flood the low lying areas within the project to depths exceeding 2 meters.

Project concept: The project purpose is to protect the broadcast *aman* crops; to reduce the monsoon season flood depth thereby facilitating a shift to higher yielding transplanted *aman*; to improve drainage for the *aman* crop; and, to provide pumped irrigation for a winter season crop. The project development plan included 44 kilometers of full flood embankments; 11 drainage regulators, re-excavation of internal *khals*; and, construction of a pumping station on Kakon Nadi Khal. The project was identified by BWDB and a feasibility report was prepared in 1977. Construction of flood embankments started in 1977/78 under FFW. Three regulators were constructed during 1979-81 using BWDB funds, and four regulators, two pipe sluices and three drainage/flushing inlets with provision for low lift pump irrigation were constructed between 1984 and 1988 under IDA Credit 955-BD. The pumping station was not constructed.

Embankments: Project embankments have not yet been completed. Embankments are required along the Meghna River for a 5 kilometer reach in Raipura Thana. The embankment along the southern side of the project next to the Meghna River (for a length of about 11 kilometers) is virtually non-existent. It was severely eroded by wave action at a numerous locations.

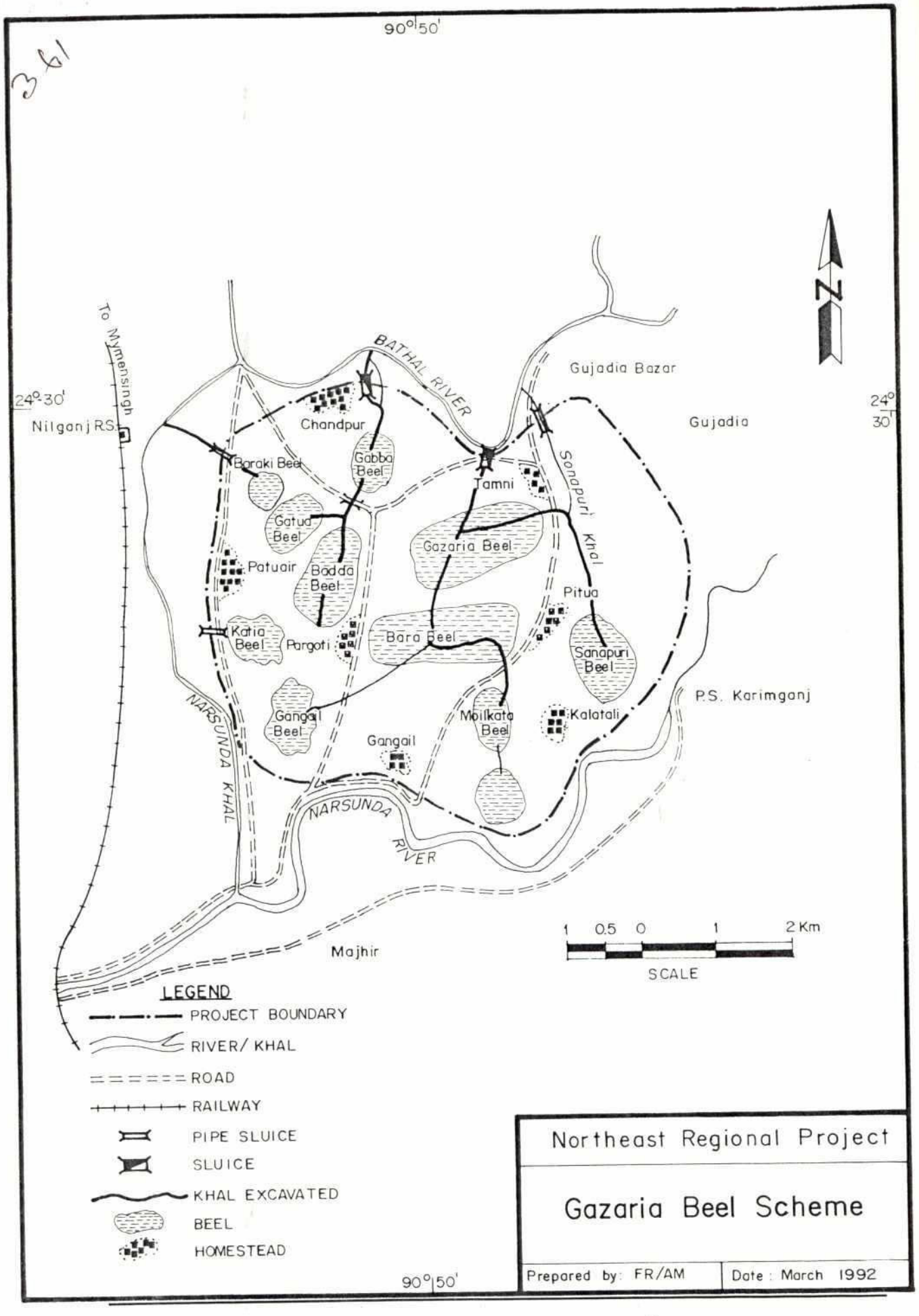
Regulators: There are eight regulators fitted with steel, vertical lift gates and two pipe sluices with flap gates. All structures are in good operational condition. However, the drainage regulator (DS3) is undersized and cannot adequately drain the local run-off from rainfall within its area. Some other structures also appear undersized. BWDB proposed that seven additional structures be constructed.

Fishery resources

Fishermen catch catfish, rui, katla and mrigel and other species in Kakon Nadi and its floodplain.

Fishing practices

Fishermen on the bank of Kakon Nadi, which is still open to the Meghna River, stated that they fish in the Kakon Nadi and its floodplain during the monsoon, but not in the Upper Meghna River. In winter, when the Kakon Nadi dries up, they fish in the Upper Meghna River. The fishermen are apprehensive that a regulator on Kakon Nadi at Raipura will reduce the fish in the Kakon Nadi floodplain. Fishermen in other parts of the project complain that there are presently less fish due to regulators on the beel outlets.


90°50'
To Mymensingh
24°30'
Nilganj RS
BATHAL RIVER
Gujadia Bazar
Gujadia
24°30'
Chandpur
Baraki Beel
Gabba Beel
Tamni
Sonapuri Khal
Gatua Beel
Gazaria Beel
Patuair
Bodda Beel
Pitua
Katia Beel
Pargoti
Bara Beel
Sanapuri Beel
P.S. Karimganj
Gangail Beel
Moilkata Beel
Kalatali
Gangail
NARSUNDA KHAL
NARSUNDA RIVER
Majhir
1 0.5 0 1 2 Km
SCALE
LEGEND
PROJECT BOUNDARY
RIVER/ KHAL
ROAD
RAILWAY
PIPE SLUICE
SLUICE
KHAL EXCAVATED
BEEL
HOMESTEAD
90°50'
Northeast Regional Project
Gazaria Beel Scheme
Prepared by: FR/AM
Date : March 1992

L.2.12 GAZARIA BEEL SCHEME

Project location and general data

District: Kishoreganj
Thana: Karimganj
Project type: Flood control and drainage
Status: Completed 1986
Gross Area: 2,720 ha
Net Area: 1,640 ha
Population: 32,380

The Gazaria beel project is located in a place where two historically renowned persons were born. Famous king Isha Kha was born in Jangalbari who fought against the Mughol emperor for the freedom of Bengal and established a new capital in Sonargaon. The first Bengali woman poet Chandrabati was also born in Patuail village near to the project. She was great for love.

Environment and engineering works

Hydrology: The project is surrounded on three sides (west, east and south) by the Narsunda River and its branches. The northern boundary is the Bathail River. The Narsunda River is a spill channel of the Old Brahmaputra. Its off-take has been silted so the river is moribund. This river is not the cause of any flooding. The Bathail River, however, floods beels within the project area during the early monsoon season. The Project drains mainly to the Bathail River in the north through several channels.

Water bodies: The important jalmohals within the project area are Gazaria beel, Bara beel, Sonapuri beel, Shandulla beel, Gattua beel, Luneshwar beel, Gobba beel, Gangail beel, Baraki beel, Badda beel, Katia beel and Moilkata beel. All the beels are now seasonal. But 15-20 years ago, most of the beels retained water year round. Gatua beel was named for its great depth. The beels are now isolated basins covered with a lot of aquatic vegetation. The main aquatic plants are Shapla, Phutki, Shaluk, Arail, Parua, Patoi ban, Jhaw, Shawla, Jarmoni, Topa pana and Khudi pana.

Local people have begun excavating small ditches called 'pagar' within the beels to trap fish. The average size of each pagar is about 15 x 10 m, with a mean depth of about 1.5 m. The pagar is surrounded by a dike 0.3-1 m high, which has a 1-1.3 m wide opening on one side.

Project concept: The Project was constructed to protect *boro* crops growing in low-lying *beel* areas from pre-monsoon flood damage and to improve post-monsoon drainage. There are 13 *beels* enclosed within the Project boundary. These *beels* are inter-connected by drainage channels. Pre-monsoon floods from the Bathail River historically spilled through Gazaria Gabba and Sonapuri Khals inundating these beels and caused damage to standing *boro* crops. Project infrastructure consists of a regulator at the outfall of Gazaria khal and a regulator at the outfall of Gabba khal. Pipe sluices were constructed at Baraki, Sonapuri and Kalia khals, and the internal channels were re-excavated. The Project was identified by the Mymensingh O&M Division in 1981 to be included in the EIP program of work. The Project was taken up the following year and completed in 1986.

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Regulators: There are 5 sluice gate within the project area. The two-vent Tamni regulator at the outfall of Gazaria khal, has steel vertical lift gates, and is in good operational condition. It remains open from May to October and is closed from November to April. The pipe sluice at the offtake of Sonapuri khal is in good structural condition, but not operational because fall-boards were never provided. It is reported (by BWDB gate operator Mr. Abdul Kashem) that the Sonapuri khal regulator does not serve any drainage function since the Sonapuri khal acts only as a distributary of the Bathail River. Except for the sluice, there is no other way for fish to migrate into the beels.

Fishery resources

Before project implementation, the following species occured in the beels: boal, ghonia, sarputi, shingi, magur, koi, catla, rui, chitol, puti, chela, kaikka, kalibaus, mola, chanda, tengra, bojori, gazar, taki, bheda and icha.

After the construction, boal, ghonia, sarputi, shingi, magur, koi, catla, rui, chital, kalibaus bojori gazar and bedha are no longer caught in the beels and the interconnected canals.

Fishing practices

Fishing gear used during the rainy season are Koi jal, Khara jal, Tak jal, Chakni jal. During the winter season Thela jal, Polo and Jhaki jal are used. Catches are about 1-2 kg/Khara jal/day during the rainy season.

The following fishing gears were seen in operation during the field visit period (4-6 Sept 92): Khara jal, Koiya jal, Kona ber jal, Tak jal, Borshi, Unnya (Bamboo basket). Detailed catch records are given below:

Table L26: One Day Catch by Different Gear with Average Length

AREA OF OPERATION	GEAR TYPE	SPECIES CAUGHT (average length, cm)	VALUE (Tk) *
Tamni sluice within project	Khara jal	Kaikka (19) Laso (11)Koi (11)Boal (26)ChelaPuti (7)Chanda (7)Lati (13)Mola (4)Bailla (13)IchaKalibaus (21)Tengra (9)Chapila (10)	20-25
Outside project area	Khara jal	Sarputi (12)Boal (26)Mola (4)Kaikka (16)Puti (6)Chapila (7)Cirka (16)Keski (3.5)Chela (7)Chanda (8)Ghonia (16)Pabda (20)Catla (31)Rui (28)	30-40
Baroki sluice pipe	Borshi	Lati (15)Cheng (13)Koi (12)Shingi (13)	15-20
Gaubba sluice	Kona jal	IchaChapila (8.5)Mola (3.5)Chela (8.5)Ghonia (17)	50-80

* Value of catch per gear unit per day

Pagars are used to trap fish and to retain water for seasonal irrigation. During August/September, owners of pagars install katha using mainly Shawra, Gub, Amli (Tetul) and

Mango tree branches. Katha installation cost per pagar is Tk 200-500. Normally a pagar is harvested three times in a year. Harvesting schedules are given below:

Table L27: Pagar Harvesting Schedule

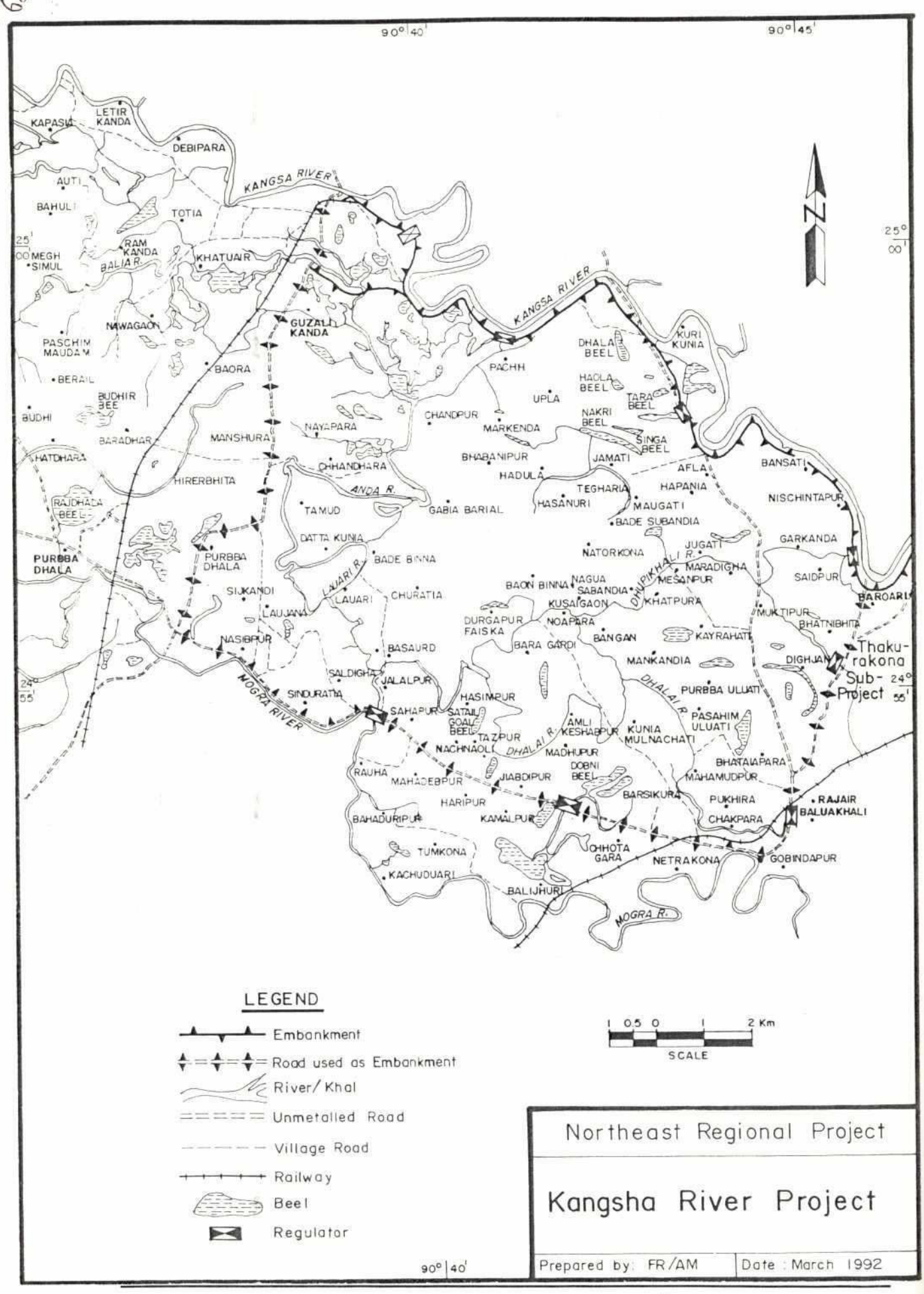
Harvest Interval	Main Species	Income (Tk per pagar)
End of Dec (first)	Singi, magur, koi, shoal, lati, cheng	500-1200
End of Jan (second)	Singi, magur	200-600
End of Feb (third)	Singi, magur	100-300

Production trends and project impacts on fisheries

Local fishermen state that before the construction of the sluice, large numbers of fish were present within the area. Major carps, Boal, Ghonia, Air, Guzi and many smaller species were abundant. After the construction of the project, fish production decreased by 50-60%. The species composition shifted to smaller species (especially livefish), and most of the boromaaach have been lost. The main reasons for the decline in fish production are exploitation of fish by chat jal and current jal and restriction of fish migration by the sluice gates.

After the construction of this project, the Boro crop is no longer damaged by floods, but the fisheries resource and the fishermen community have been seriously affected. At present they have the right to fish in the area, but there are very few fish in the beels and the average catch is Tk 10-20/day during the rainy season. As a result, now they are seeking alternate employment in other sectors.

Farmers require drainage early in the dry season to facilitate *boro* cultivation and also use most remaining standing water to irrigate their crop. The low water levels facilitate total fish harvest which depletes or destroys broodstocks in the beels. The regulators, which prevent the entry of flood water, also prevent fish stocks in the *beels* from being replenished from river fish stocks. In January the regulator was open, and water was flowing out of the beels, down the khal, past the regulator and out into the adjacent Bathal River. Once all the boro crops is planted and growing on the maximum possible land, the regulator across the khal is kept closed (and the river's water level builds up in front of the regulator). This prevents river water from entering to replenish beel water levels, and also prevents movements of fish in either direction across the regulator. So there is little chance of the fish stocks of the beels being replenished from river stocks. The overall result has been that while in the past RUI, CATLA, AIR, BOAL, KOI, MRIGEL and many other fish species used to be harvested, now there are very few fish caught at all. Local people would like to have more fish and have proposed to establish one mini hatchery around the project area for artificial stocking of fry during the monsoon period.


90° 40'
90° 45'
25° 00'
24° 55'
N
KAPASIA
LETIR KANDA
DEBIPARA
AUTI
BAHULI
TOTIA
KANGSA RIVER
MEGH SIMUL
RAM KANDA
BALIAR
KHATUAIR
NAWAGAON
PASCHIM MAUDAM
BERAIL
BAORA
GUZALI KANDA
BUDHIR BEE
BUDHI
BARADHAR
HATDHARA
MANSHURA
HIRERBHITA
RAJDHALA BEEL
PURBBA DHALA
NAYAPARA
CHHANDHARA
ANDA R.
TAMUD
GABIA BARIAL
DATTA KUNIA
BADE BINNA
LAJARI R.
SIJKANDI
LAUARI
CHURATIA
LAUJANA
NASIBPUR
BASAURD
SALDIGHA
JALALPUR
SINDURATIA
MOGRA RIVER
SAHAPUR
HASIMPUR
SATAUL GOAL BEEL
TAZPUR
NACHNAOLI
DHALAI R.
MADHUPUR
RAUHA
MAHADEBPUR
JIABDIPUR
HARIPUR
BAHADURIPUR
KAMALPUR
TUMKONA
KACHUDUARI
BALIJHURI
MOGRA R.
DHALA BEEL
KURI KUNIA
PACHH
HAOLA BEEL
UPLA
TARA BEEL
NAKRI BEEL
SINGA BEEL
CHANDPUR
MARKENDA
BHABANIPUR
JAMATI
HADULA
AFLA
BANSATI
TEGHARIA
HAPANIA
NISCHINTAPUR
HASANURI
MAUGATI
BADE SUBANDIA
GARKANDA
NATORKONA
JUGATI
MARADIGHA
SAIDPUR
BAROARI
BAON BINNA
NAGUA SABANDIA
MESANPUR
DHUPIKHALI R.
KUSAIGAON
KHATPURA
MUKTIPUR
BHATNIBHITA
DURGAPUR FAISKA
NOAPARA
BARA GARDI
BANGAN
KAYRAHATI
MANKANDIA
DIGHJAN
Thakurakona Sub-Project
PURBBA ULUATI
AMLI KESHABPUR
KUNIA MULNACHATI
PASAHIM ULUATI
BHATAIAPARA
DOBNI BEEL
MAHAMUDPUR
BARSIKURA
PUKHIRA
RAJAIR
BALUAKHALI
CHAKPARA
OHHOTA GARA
NETRAKONA
GOBINDAPUR
LEGEND
Embankment
Road used as Embankment
River/ Khal
Unmetalled Road
Village Road
Railway
Beel
Regulator
1 0.5 0 1 2 Km
SCALE
Northeast Regional Project
Kangsha River Project
Prepared by: FR/AM
Date : March 1992

L.2.13 KANGSHA RIVER IMPROVEMENT

Project location and general data

District: Netrokona
Thana: Netrokona
Project type: Flood control and drainage
Status: Completed
Gross Area: 11,600 ha
Area benefitted: flood control=11,140 ha; drainage=7,000 ha
Population: 78,180

Environment and engineering works

Hydrology: There is a significant area to the west of the project whose natural drainage route passes across the project area. Before project implementation, the western area would drain through three openings in the western road. Now arrangements have been made to divert the western drainage flows to Kangsha River. Accordingly, a ten vent regulator and an embankment (2.25 kilometers) have been constructed as part of a future plan for the western area to reduce pre-monsoon flooding from localized rainfall. However, the drainage diversion may not be successful as often there is heavy rainfall in the Kangsha basin (including the western area) and concurrent flash flooding in the Kangsha River. Hence with flooding and higher water levels in the Kangsha River, the adjacent areas cannot drain. Also, with any confining of the Kangsha, river water levels will rise, further restricting drainage.

Water bodies: The important jalmohals within the project area are Hoila beel, Kumar beel, Dhalipuri beel, Jaira ganj, Baashhata, Bonhoogli, Mogra beel, Eron beel, Charia beel, Shaldigha, Moha beel, Puta beel, Maugra beel, Maragang, Boalla beel, Koiya beel, Monglamara beel and Saldigha beel. Important koor/duars in the Kangsha River in the Jaria-Janjail area are Khotoarir duba, Sharishtalar duba, Kawttahaash, Kurunja, Moishakhali, Anaimmaya, Durgabari and Mucharbarir duba. Within the Kangsha River FCDI project, only the Jaria gang retains water year round. It has four duars: Maittara, Bangrul, Malapuri and Jaria.

Project concept: The project concept was to protect *boro* and transplanted *aman* crops in the area from flash floods. By protecting the area it was expected that farmers would invest in low lift pump and shallow tube well irrigation during the dry season and would change to HYV crops. The protection was to be provided by constructing 19.0 kilometers of full flood embankments along the Kangsha River from Jaria-Jhanjail to Baroari village; and by constructing seven drainage regulators. The existing roadway was assumed to prevent any external flooding entering the project on the other three boundaries. In 1983, on the basis of their feasibility studies, the consultants identified the project for implementation under the Small Water Sector Schemes Project funded by IDA. Detailed design was carried out by the consultant. Construction was initiated in 1986. The project was declared complete in 1990.

Embankments: In general the embankments and roadways in the project are in fair to good condition. In 1991, however, a 30 meter section of the Purba Dhala-Jariajhanjail road at Guzali Kanda was washed away when it was overtopped by floods. A short section of the north-eastern embankment has been eroded by wave action on the country side which results from the project area being flooded.

Regulators: There are seven one way drainage regulators each fitted with vertical lift gates on the structures upstream side and flap gates on the structures downstream side. The drainage sluice are constructed at the mouth of the each entry canal to the project area. Except for the Tehmohini sluice (which receives water from the Mogra River), all other canals are connected with the Kangsha River. With the exception of two regulators, the structures are in good operational condition. At one regulator the flap gate hinge broke and the gate dropped into the stilling basin. On the other regulator, the downstream protective works have been displaced and a large scour hole has formed.

Fishery resources

The following species occur in the Kangsha and its floodplain (around the Jaria-Janjail area):

Table L28: Habitat Based Species Abundance in the Kangsha Area

RIVER and CHANNEL	BEEL and FLOODPLAIN
Rani, Poa, Ilish, Kajuli, Chinlai, Batashi (rare), Gharua, Chela, Keski, Chital (rare), Rita, Chapila, Baim, Air, Catla (rare), Rui (rare), Mrigel (rare), Bayush, Golda chingri, Shilone, Bacha, Kalibaus, Gilachaki, Gulsha, Bailla	Shingi, Magur, Koi, Tengra, Lati, Gazar, Shoal, Boal (rare), Puti, Kholisha, Bheda, Chanda, Mola, Chapila, Icha, Dhela, Chata, Tara baim, Gutum, Foli, Guzi, Golda chingri, Pabda (rare), Laso, Bata (Tatkini), Cheng, Kalibaus, Cirka, Gulsha, Bojori

Four species of air catfish occur in the area:

Table L29: Maximum Size of Four Fish Species in Kangsha River

Common Name	Scientific Name	Maximum Weight (kg)
Air	Aorichthys aor	10
Bayush		6
Rita	Rita rita	2
Guzi	Aorichthys seengala	1.5

Locally extinct species are Nandin, Pangas and Mohashol.

Local fishermen give the following information about the breeding habits of certain fish species:

- Carnivorous species fish (Boal, Shoal, Gazar) breed earlier (usually in April) than the planktophagous species.
- Chital prefers to breed in the shallower parts of rivers, particularly on stones, katha or inundated boats. They carry out parental care of their spawn and fry.

- Rani prefers to breed in the rivers particularly in any quiet undisturbed shallower place where water current is weak and the riverbed consists of course sand. They often take shelter in the cavities of bamboo (chong) during their breeding period.

- Most of the beel or floodplain residing fish species prefer to breed within beels and on the floodplain during April-May when fresh goola (silty first premonsoon flood water) enters into the beels. During the goola the broodstock move against the current in dense groups, searching for heavily weeded areas in which to spawn.

Fishing practices

Mainly khora jal, chat jal, shib jal and kona jal are used in the canals and the rivers. Catch data is as follows:

Table L30: Daily Catch Value of Different Gear with Species

Gear	Species Caught	Average Daily Catch (per gear unit)	Value of Daily Catch (per gear unit)
Khora jal	Puti, Kaikka, Batashi, Chanda, Mola	2-3 kg	Tk 30-50
Chat jal	Chanda, Icha, Bashpata	3-5 kg	Tk 50-100
Shib jal	Chela, Boicha, Mola	1-2 kg	Tk 15-30
Kona jal	Chanda, Icha, Lati, Boicha	3-5 kg	Tk 50-100

Inside the Shalakhali sluice one ber jal was found in operation. The total catch was 5-6 kg during 4 hours of operation, with a market value of Tk 200-225. Species caught were lati (16 cm), tengra (7.5 cm), Guzi (23 cm), chapila (11 cm), puti (8.5 cm), Icha (5.5 cm), Baim (43 cm), koi (12 cm) and chanda (6.5 cm).

Kathas are mainly used in the duars of the Kangsha River. Although fishermen believe that Hizol is the best tree for katha it is rare in the area. Branches of Shawra, Mango and Jam tree are used instead.

People are permitted to catch fish in the *beels* during the monsoon season but in the post-monsoon period when floodwaters start to recede fishermen must purchase a license to fish in the *beel*. They must also purchase a license to fish in the Mogra River.

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Seasonal abundance of fish in the Jaria market is as follows:

Table L31: Seasonal Ability of Fish in Jaria Market

Season	Main Species	Quantity (kg per day)
December to February	Catfish, livefish	3,000
March to May	Miscellaneous species	200
June to August	Catfish, carp, miscellaneous species	700
September to November	Catfish, livefish and miscellaneous species	1000

Production trends and project impacts on fisheries

One way vertical sluices have a negative impact on fish migration, particularly from the river into the beel. Due to that, fish abundance within the project area has declined by 75-80%. As a result the majority of the fishermen in the area have either shifted their traditional profession into small trading, have become agricultural laborers, or have migrated. Fishermen and other local people attribute the destruction of fish habitat to disruption of the natural flooding system. Most of the larger fish species have already been eliminated from the area. Due to overfishing, smaller species are gradually decreasing.

Observations on the impacts of three of the sluice gates are as follows:

Tehmohini Sluice(near Shaldigha village): This four vent one-way sluice discharges water from the project to the Dhalai River (Mogra River). The main purpose of the sluice is to retain water within the project area for irrigation. After construction of the sluice, fish production within the project area declined by 50-60%. This is due to interference with fish migration by the sluice and the total harvesting of fish by complete dewatering of the water bodies. Moreover local people claim that due to insufficient water passing capacity of the sluice, water congestion sometimes occurs on the project side which creates strong current in the downstream part of the river. As a result fish do not move into the beels and erosion of the embankment occurs.

Moishakhali sluice (near Koiya beel): This structure has 10 vents. The sluice can only discharge internal water of the project into the Kangsha River (one-way system). Due to complete restriction of river water into the beels, fish production has been reduced tremendously (about 60-70% over the last three years. Moreover, it has created an opportunity at the mouth of the sluice to catch large broodfish during the periods of spawning and overwintering migration. This will ultimately reducing the overall production of the area. A number of Khara jal operate at the mouth of the sluice gate. Catch data are as follows:

Table L32: Daily Catch Variation in Different Season with Abundant Species

Season	Species Caught	Average Catch (per unit per day)
August to October	Rui, boal, chapila	5-6 kg
April and May	Rui, boal, ghonia, puti, batashi, mola, chapila	6-7 kg
June and July	Chapila	1-1.5 kg

Since construction of the sluice gate very few fish are present within the beels. Before the construction of the sluice gate, Koiya beel was famous for producing Koi. This species is now more or less extinct there. A number of Mandar trees were seen in the project area. This is a water resistant species mainly planted for gum extract, and also has homestead uses.

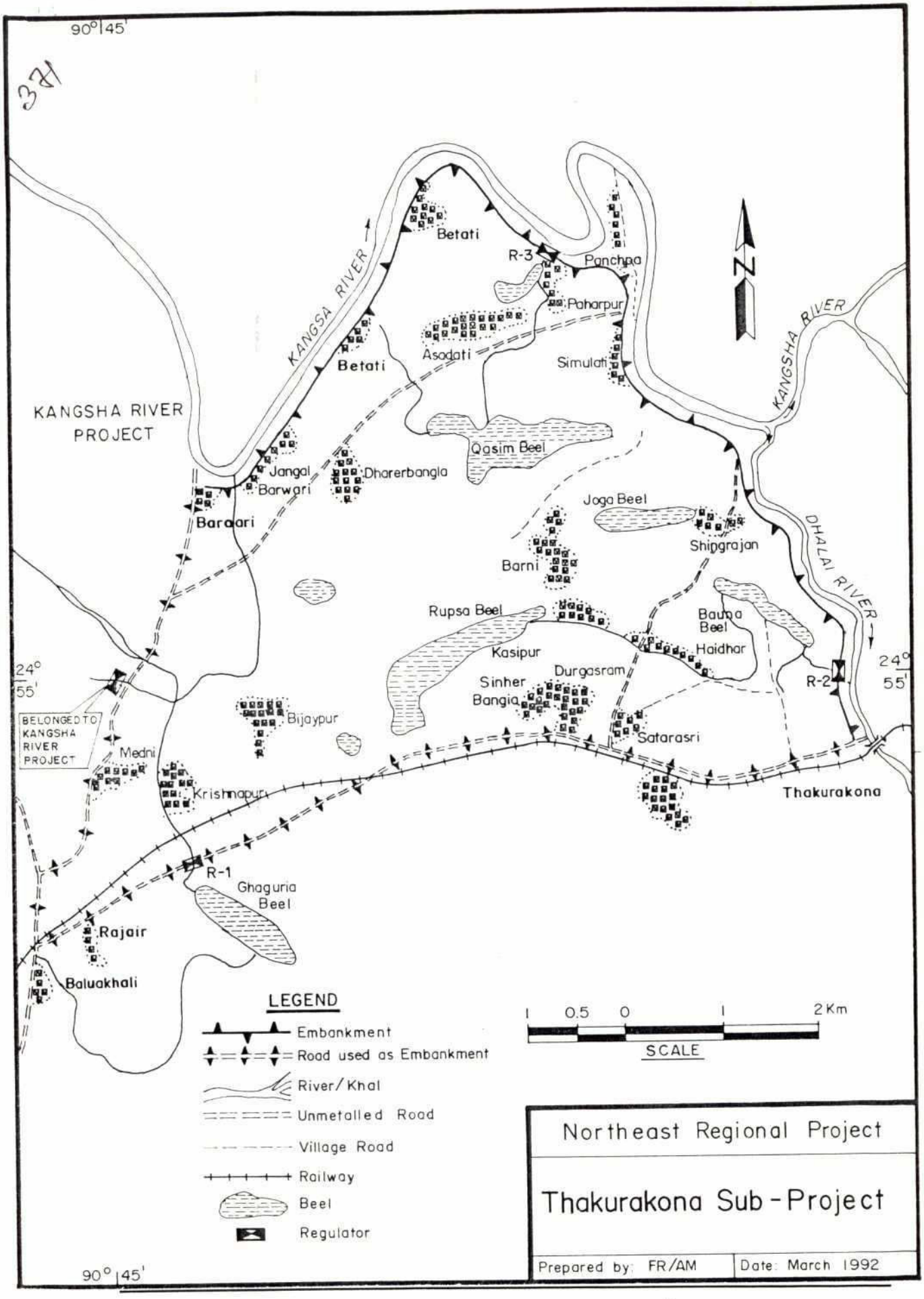
Shingrajan sluice gate (near Thakurkona): This three vent sluice gate was designed to protect against Kangsha water discharge into the project. Since its construction, fish abundance has been reduced within the project area. Local fishermen and farmers claimed that after the construction of the project, paddy cultivation has been increased at the cost of decreased fish production. This is due to interference with fish migration to their breeding grounds and grazing areas.

Fish abundance in the Jaria, Durgapur and Purbadhala area has been reduced by 75-80% over the last 10 years due to:

- High siltation rate of the major beels and duars.
- Use of LLP for irrigation during the Boro crop season. As a result beels have dried up.
- Overfishing.
- Deforestation within the beel area
- Conversion of more land for agriculture, which has resulted in shorter hectare-months of inundation.

In general, the quantity of fish in the local market is decreasing, prices have risen, and there has been a reduction in the number of species. Local people state that fish reduction in the market is mainly due to fish disease and increased export to urban areas like Dhaka and Netrokona.

Rehabilitation of the sluice gate or an artificial stocking program within the project area is expected by the fishermen groups where full flood embankments were constructed. Moreover re-excavation of the internal canal and beel will create a good fish habitat year round, as the incidence of siltation decreased markedly after project construction.


90°45'
37
KANGSA RIVER
Betati
R-3
Panchpa
Paharpur
Asodati
Simulati
KANGSHA RIVER
KANGSHA RIVER PROJECT
Qasim Beel
Jangal Barwari
Dharerbangla
Baraari
Joga Beel
Shipgrajan
DHALAI RIVER
Barni
Rupsa Beel
Bauna Beel
Kasipur
Haidhar
24° 55'
Durgasram
Sinher Bangia
R-2
BELONGED TO KANGSHA RIVER PROJECT
Bijaypur
Satarasri
Medni
Krishnapur
Thakurakona
R-1
Ghaguria Beel
Rajair
Baluakhali
LEGEND
Embankment
Road used as Embankment
River/Khal
Unmetalled Road
Village Road
Railway
Beel
Regulator
1 0.5 0 1 2Km
SCALE
Northeast Regional Project
Thakurakona Sub-Project
Prepared by: FR/AM
Date: March 1992

L.2.14 THAKURAKONA SUB-PROJECT

Project location and general data

District: Netrokona
Thana: Netrokona
Project type: Full flood control and drainage
Status: Begun 1989, completion scheduled 1992
Gross area: 3,158 ha
Net area: 2,050 ha
Population: 21,715

Environment and engineering works

Hydrology: The area is bordered in the north by the Kangsha River and in the east by the Dhalai, a distributary of the Kangsha. Flood waters from the Kangsha and Dhalai spill over their banks annually. There are four major *beels* in the project area which are separated by higher elevated ground surrounding the beels. Three major natural channels drain the *beels*. A part of the area, along with part of the Kangsha Project drains through R-1 to the *beel* areas south of the project. But most of the area now drains through R-2 into the Kangsha or through R-3 into the Dhalai. The Thakurakona Sub-project is one of a number of projects which are embanking and confining the Kangsha River. The sub-project provides protection on the Kangsha right bank area, but likely worsens flooding on the unprotected, left bank area. (Due to time constraints, impacts on the left bank were not reviewed).

Project concept: The project objective is to protect *boro* and transplanted *aman* crops from pre-monsoon and monsoon flooding. Project works consist of a road/full flood control embankment along the right banks of the Kangsha and Dhalai Rivers, from Baroari to Thakurakona and three drainage regulators. The existing rural road from Baroari to Rajair is a common boundary shared by this project and Kangsha Project. A feasibility report for the project was prepared in 1986 for BWDB under IFAD Credit No. 137 BA. Construction began in 1989 and the project is scheduled for completion in 1992.

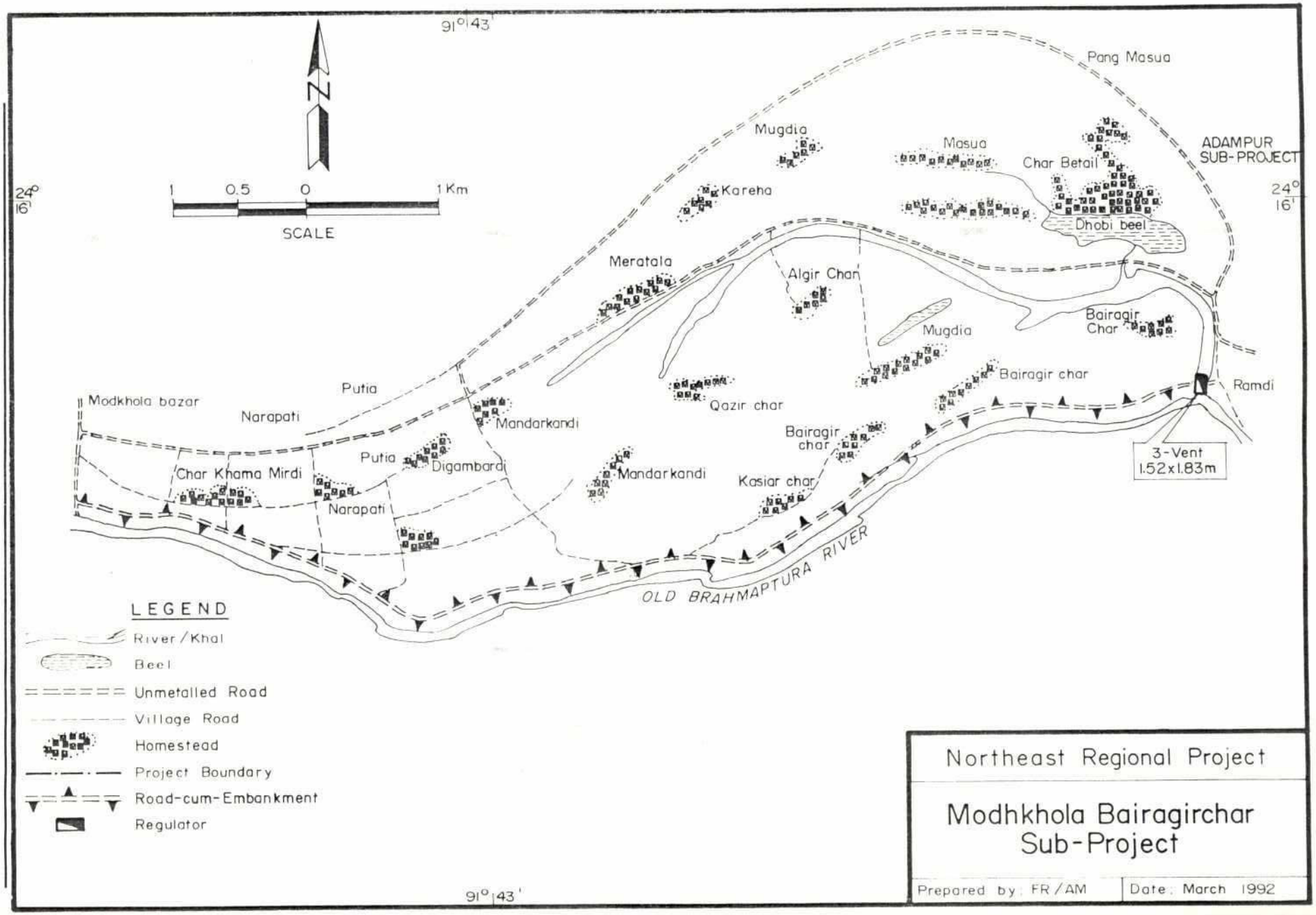
Embankments: Flood embankments have been constructed from Baroari to Thakurkona via Betati (about 13 kilometres). Some 5 kilometres of the embankment have not been constructed to the final design section and the outstanding work is scheduled for 1992. The completed section of embankment is grassed over and is in good condition. The three drainage regulators are sited on the three main drainage channels and as such drainage provisions would appear to be adequate, though smaller drainage structures may be required for localised drainage. Construction of the regulators is complete. Each regulator is fitted with vertical lift gates on the upstream side and flap gates on the downstream side. All structures have been well constructed and are in good condition. Excavation of a diversion channel at regulator R-2 is scheduled to be completed in 1992. Farmers express concern about the operation procedures for the regulators. An effective O & M organization should be established as soon as possible.

Fishing practices

Local people reported that fishermen are permitted to catch fish in the *beel* areas in the monsoon season but in the post-monsoon period they must purchase a license to fish in the beels.

Production trends and project impacts on fisheries

The embankments and regulators, by restricting the movement of fish to the floodplain, will likely have a negative impact on fisheries.


91°43'
N
1 0.5 0 1 Km
SCALE
24° 16'
Pang Masua
Mugdia
Masua
Char Betail
ADAMPUR SUB-PROJECT
Kareha
Dhobi beel
Meratala
Algir Char
Bairagir Char
Mugdia
Bairagir char
Ramdi
Modkhola bazar
Narapati
Putia
Mandarkandi
Qazir char
Bairagir char
3-Vent 1.52x1.83m
Char Khama Mirdi
Putia
Digambardi
Mandarkandi
Kasiar char
Narapati
OLD BRAHMAPTURA RIVER
LEGEND
River / Khal
Beel
Unmetalled Road
Village Road
Homestead
Project Boundary
Road-cum-Embankment
Regulator
Northeast Regional Project
Modhkhola Bairagirchar Sub-Project
Prepared by: FR / AM
Date: March 1992

L.2.15 MODHKHOLA-BAIRAGHIRCHAR PROJECT

Project location and general data

District: Kishorganj
Thana: Pakundia
Project type: Full flood control
Status: Under construction since 1990-1
Gross area: 2,063 ha
Net area: 1,855 ha
Population: 22,098

Environment and engineering works

Hydrology: The area is bounded on all sides by roads. Floodwaters from the Old Brahmaputra enter the area through the only opening, at Bairaghirchar, damaging crops. Surface water for irrigation is in short supply, and *boro* cultivation in the area mainly depends on ground water.

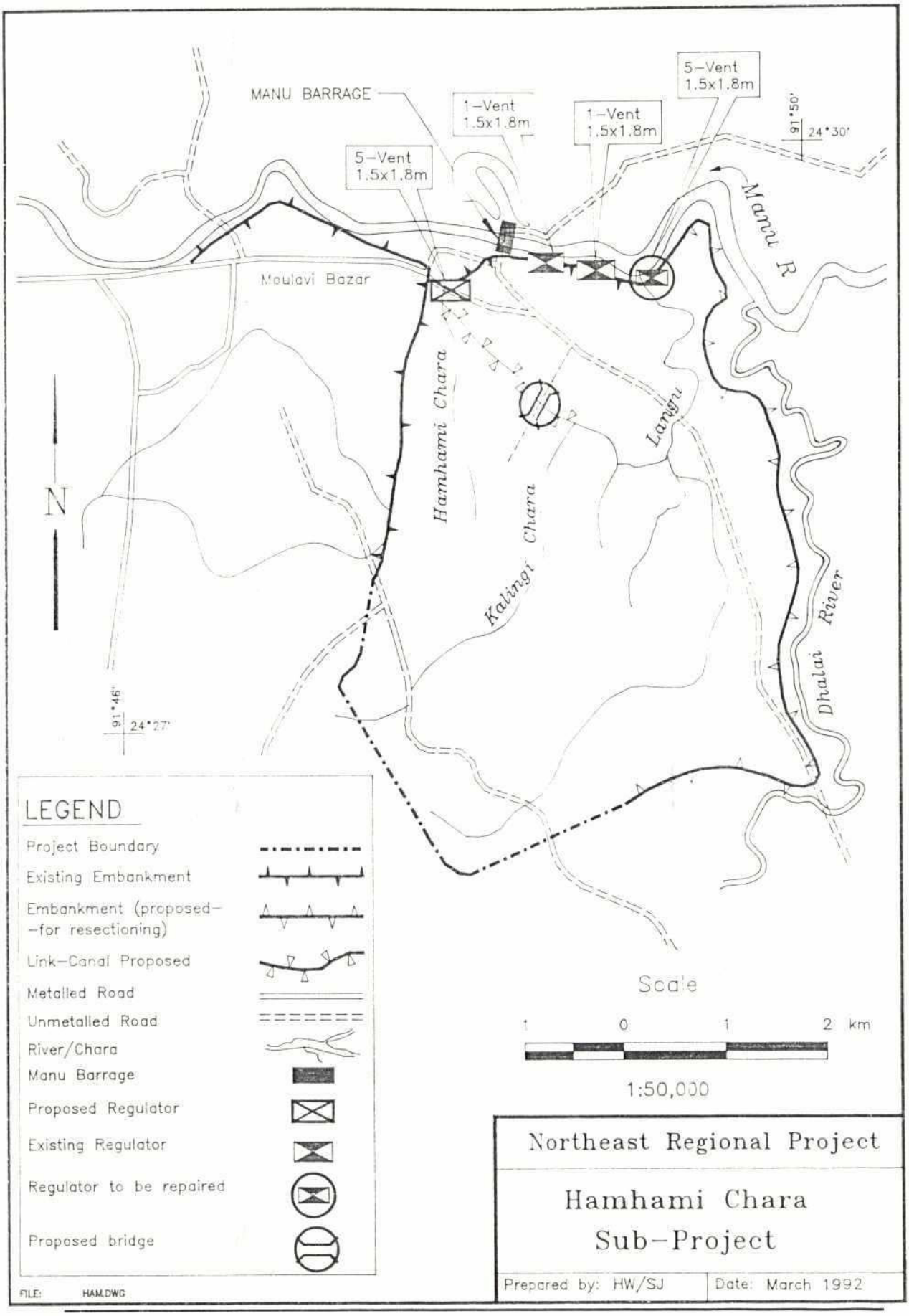
Water bodies: The area dries up completely in winter.

Project concept: The objective of the project is to protect crops from pre-monsoon and monsoon flooding by re-sectioning 9 kilometres of existing road embankment from Bairaghirchar to Modhkhola Bazar, and constructing a three-vent regulator at Bairaghirchar. The regulator replaces an existing derelict two-vent structure. In 1990-1, re-sectioning of the road embankment was completed by BWDB. Starting in 1991-2, the regulator will be constructed under the IDA-financed SSFCDI project.

Engineering works: The existing two-vent regulator at Bairaghirchar is not operational and cannot be repaired as the wingwalls have been washed away. The embankment adjacent to it is also washed away.

Production trends and project impacts on fisheries

Fish production from the area is low.


MANU BARRAGE
1-Vent 1.5x1.8m
1-Vent 1.5x1.8m
5-Vent 1.5x1.8m
5-Vent 1.5x1.8m
91°50'
24°30'
Manu R
Moulavi Bazar
Hamhami Chara
Kalingi Chara
Langu
Dhalai River
N
91°46'
24°27'
LEGEND
Project Boundary
Existing Embankment
Embankment (proposed--for resectioning)
Link-Canal Proposed
Metalled Road
Unmetalled Road
River/Chara
Manu Barrage
Proposed Regulator
Existing Regulator
Regulator to be repaired
Proposed bridge
Scale
1 0 1 2 km
1:50,000
Northeast Regional Project
Hamhami Chara Sub-Project
Prepared by: HW/SJ
Date: March 1992
FILE: HAM.DWG

L.2.16 HAMHAMI CHARA SUB-PROJECT

Project location and general data

District: Moulvi Bazar
Thana: Moulvi Bazar
Project type: Flood control and drainage
Status: Under construction since 1989
Gross area: 2,544 ha
Net area: 1,294 ha
Benefitted area: Flood control, 457 ha
Population: 16,700

Environment and engineering works

Hydrology: The project is located upstream from the Manu Barrage in the flood plains of the Manu and its left bank branch the Dholai. Both rivers are flashy during the pre-monsoon and monsoon periods. When the barrage gates are closed in winter, impounded water floods the lower parts of the project area.

Project concept: The project objectives are to protect the project area from pre-monsoon and monsoon river floods and from flooding of lower lands when the Manu Barrage gates are closed in the dry season; with provision for drainage. Project works consist of re-sectioning 6 kilometres of embankment along the Dhalai left bank and 4 kilometres along the Manu left bank; and construction of a five-vent regulator on Hamhami Chara. Excavation of an 1.8 kilometre-long link canal between Kalingi Chara and Hamhami Chara, and a 6 meter span bridge over it, were planned but were subsequently dropped. Existing related infrastructure consists of three regulators in the Manu embankment, all constructed in 1983-4: a five-vent structure at Langu Chara and two one-vent structures at two small *khals*. In 1982-3, local authorities constructed the embankments along the Dhalai River left bank and along the Manu. In 1983-4, BWDB constructed the three regulators (see above) in the Manu embankment with financing from the Kuwait Fund for Arab Economic Development. In 1986, the area was reviewed in the *Dhalai River Project feasibility study*. In 1988, BWDB prepared a proposal for Hamhami Chara Project. The project is being implemented by an IDA-financed SSFCDI project. In 1989, they prepared a limited feasibility study. In 1989-90, project implementation began. In 1991, embankment rehabilitation and the five-vent regulator on Hamhami Chara were completed, and the link canal excavation was dropped from the project (see below). Currently (1992), the SSFCDI team is reviewing the project.

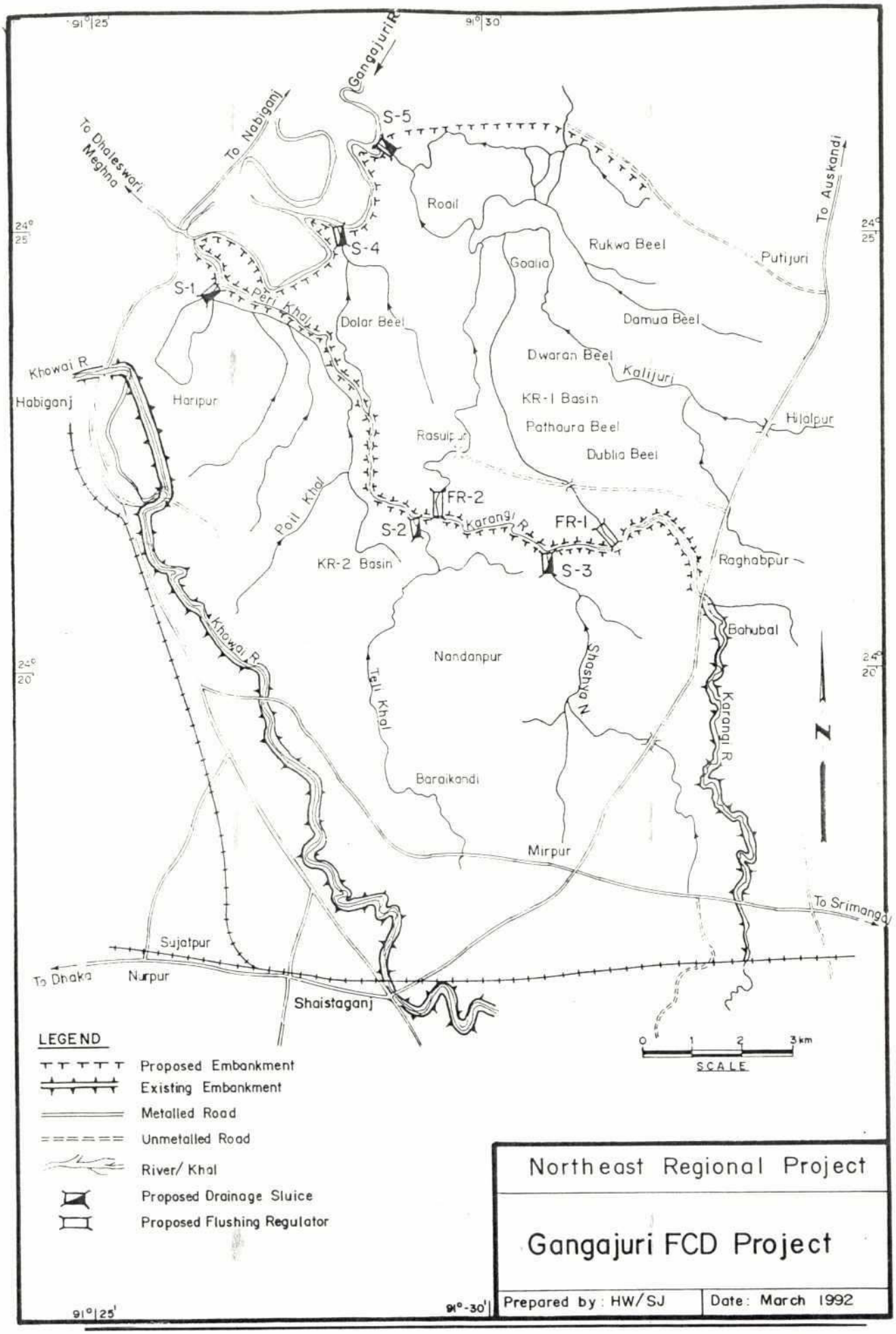
Embankments: Re-sectioning of flood embankments along the left bank of Manu River (4 kilometres) and along Dhalai River (6 kilometres) is complete. The embankments are in good condition.

Regulators: The three regulators constructed in 1983-4 are in fair condition. The five-vent Hamhami Regulator (which also functions as a bridge) appears to be well constructed and is in good condition. It has flap gates on the river side and slide gates on the country side. It is over-sized without the link canal, however. The link canal was dropped from the project due to opposition from farmers. The proposed alignment would have cut through cultivable high land

and land adjacent to the canal would have suffered from over-drainage. Detailed topographic survey maps were not available to the project planners.

Fishing practices

There is no commercial fishing in the sub-project area.



Northeast Regional Project

Gangajuri FCD Project

Prepared by: HW/SJ	Date: March 1992

L.2.17 GANGAJURI FCD PROJECT

Project location and general data

District: Habiganj
Thana: Bahubal and Habiganj
Project type: Full and partial flood control and drainage
Status: Under construction since 1991
Gross area: 15,850 ha
Net area: 13,240 ha
Population: 109,815

Environment and engineering works

Hydrology: Karangi River/Peri Khal cuts across Gangajuri Project from southeast to northwest. The area is bounded to the southwest by the Khowai River right embankment; to the northwest by a road and Gangajuri River; to the north by the Pulijuri-Sonanghat road; and to the east by the Shaistaganj-Auskandi road. The area is flooded throughout the monsoon season. Area drainage is controlled by water levels in the Gangajuri River, which drains through the Khowai (also called Barak) River into the Kalni (also called Dhaleswari) River (a branch of the Upper Meghna). Reportedly high water levels in the Barak, due to siltation at its outfall, delay drainage from the area. Hence, re-excavation of the internal drainage channels may not be fully effective. The Karangi/Peri Khal is seasonal. Unless provision is made to divert and impound irrigation water in the Karangi, irrigation water may not be available at the planned flushing regulators.

Project concept: The project will provide full flood protection to the higher (southern) part of the project and partial protection to the lower (northern) part of the project. Specific objectives include: improving post-monsoon drainage to allow earlier planting of *boro*; providing surface water for *boro* irrigation; excluding pre-monsoon flooding until 31 May when the *boro* is harvested; and controlling early monsoon flooding to protect broadcast *aman* seedlings.
Project works consist of:

- re-sectioning/construction of 45 kilometres of full and about 15 kilometres of submersible embankments along both banks of the Karangi River/Peri Khal.
- construction of 15 kilometres of submersible embankments along the left bank of the Gangajuri River.
- re-sectioning of 8 kilometres of the Putijuri-Sonanghat road/flood embankment.
- re-excavation of 124 kilometres of drainage channels.
- construction of five drainage regulators: three (S-1, S-2, and S-3) in the Karangi/Peri Khal left embankment and two (S-4 and S-5) in the Gangajuri left embankment.
- Construction of two flushing regulators (FR-1 and FR-2) to allow irrigation water into the Karangi/Peri Khal right bank area.

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Originally, in 1964 the EPWAPDA Master Plan identified Gangajuri Project, as part of the Shaistaganj Project, which also included the Khowai River Project, the area on both sides of the Khowai, and the area bounded by the Sutang, Dhaleswari, Titas and Sonai Rivers. Only the Khowai River and Gangajuri Projects were implemented. In 1987, a feasibility report for Gangajuri Project was prepared by Engineering and Planning Consultants Ltd. Also in 1987, construction began under the Small Schemes Project (IDA credit 1467-BD). In 1991, the Gangajuri River submersible embankment and three drainage regulators (S-1, S-2, and S-4) were completed. Currently underway is the re-excavation of the Karangi River/Peri Khal, and the construction of its embankments and of drainage regulator S-5. Re-excavation of internal drainage channels has not started, nor has construction of the two flushing regulators FR-1 and FR-2, and of drainage regulator S-3, which is under review. In 1992, the project is scheduled for completion.

Embankments: The completed earthworks are currently in good condition. In 1991, the embankment was cut at the S-1 regulator to reopen a pre-existing navigation route. In Jan 92 the cut was reconstructed. Likely it will be cut again as the conflict with navigation remains (see Navigation Section below).

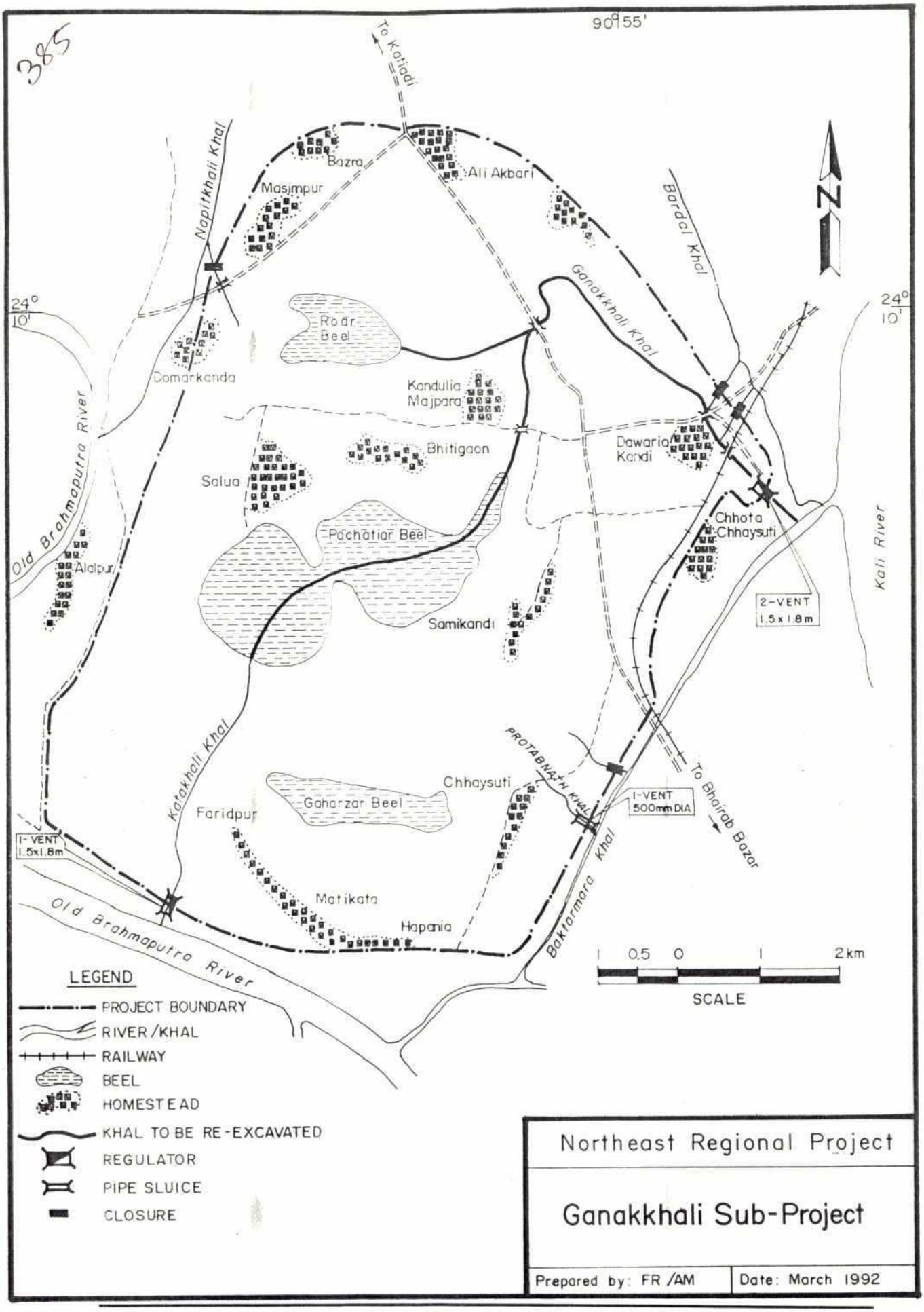
Regulators: The completed drainage regulators are equipped with river-side slide gates to prevent entry of river water, but there are no country-side gates to retain water for lift irrigation. Also, local people express concern that the completed drainage regulators are too small, and that the embankments will further aggravate the area's drainage problems.

Fishing practices

All of the *beel* areas are privately owned. The main fishing activities take place during the post-monsoon season and fishing rights are arranged directly between fishermen and land owners.

Production trends and project impacts on fisheries

The water resources infrastructure is expected to reduce open water fish production.


385
90°55'
To Katiadi
Napitkhali Khal
Bazra
Ali Akbari
Masjmpur
Bardal Khal
Ganakkhali Khal
24° 10'
Roar Beel
Domarkanda
Kandulia Majpara
Bhitigaon
Dawaria Kandi
Salua
Old Brahmaputra River
Pachatiar Beel
Chhota Chhaysuti
Alaipur
Kali River
2-VENT 1.5x1.8m
Samikandi
PROTABNATH KHAL
Katakhali Khal
Chhaysuti
To Bhairab Bazar
Gaharzar Beel
1-VENT 500mm DIA
Faridpur
1-VENT 1.5x1.8m
Baktormara Khal
Matikata
Hapania
Old Brahmaputra River
1 0.5 0 1 2km
SCALE
LEGEND
PROJECT BOUNDARY
RIVER /KHAL
RAILWAY
BEEL
HOMESTEAD
KHAL TO BE RE-EXCAVATED
REGULATOR
PIPE SLUICE
CLOSURE
Northeast Regional Project
Ganakkhali Sub-Project
Prepared by: FR /AM
Date: March 1992

L.2.18 GANAKKHALI SUB-PROJECT

Project location and general data

District: Kishorganj
Thana: Kuliarchar
Project type: Flood control and drainage
Status: Planning
Gross Area: 2,665 ha
Net Area: 1,750 ha
Population: 22,360

Environment and engineering works

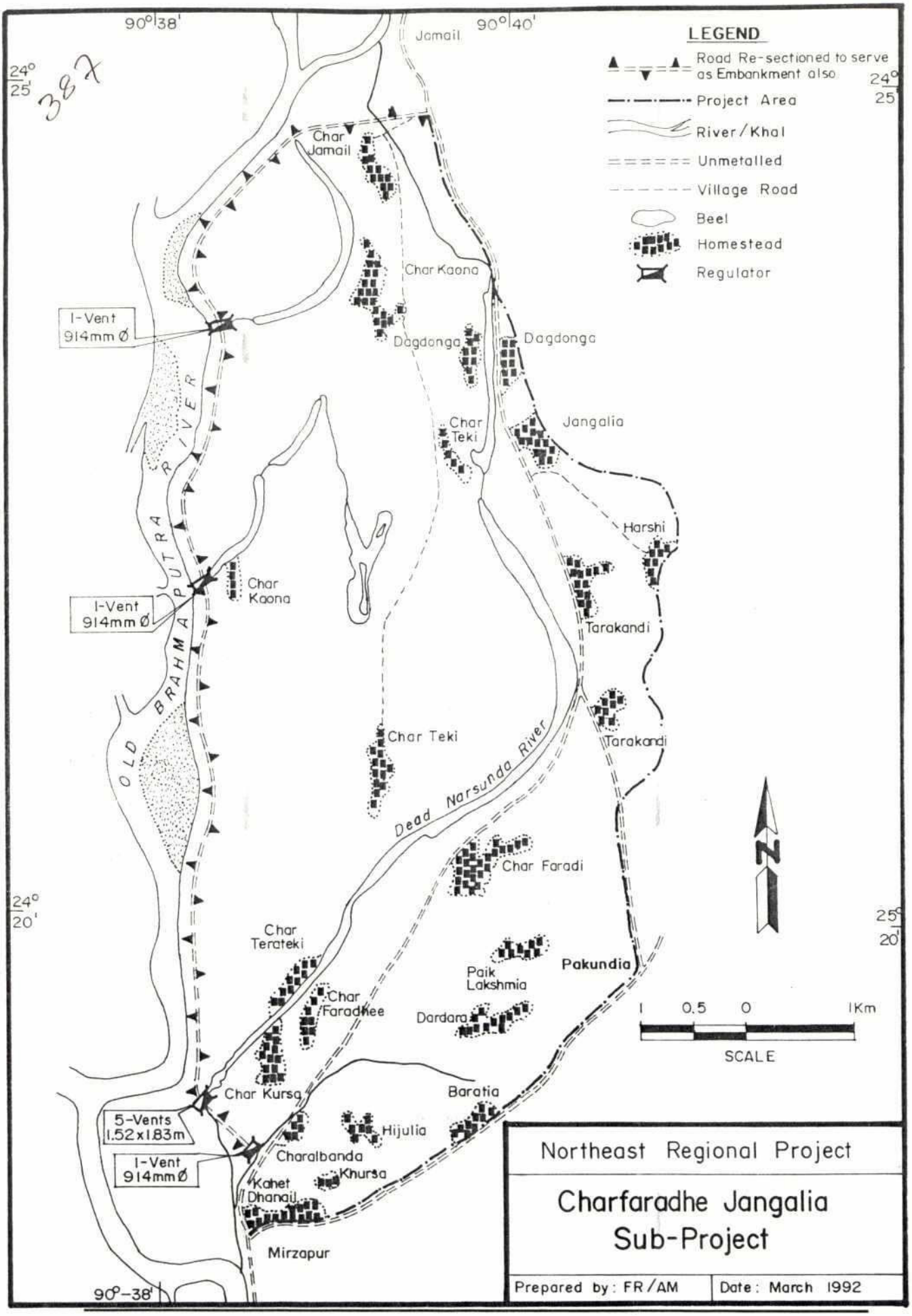
Hydrology: The Project is bounded in the south and west by the left bank of the Old Brahmaputra River and on the east by the right bank of the Baktarmara khal. The north boundary of the Project is generally higher land, though not flood free. Water levels are governed by Meghna River levels (ie downstream control). The Project area generally slopes to the southeast but as with the external rivers, water inside the project beels is affected by the Meghna River. Specifically, the beels have an elevation of 3.2 metres PWD while the average May 15 water level at Bhairab Bazar is 3.0 metres PWD. The area is also mildly affected by tides.

Project concept: The project proposes to eliminate the entry of pre-monsoon floods into the Project area and to reduce monsoon flood levels. The former is expected to reduce damage to *boro* while the latter would facilitate production of broadcast *aman* and possibly allow a shift to HYV *aman* on the higher lands which now produce *t. aman*. Water enters the area through various channels which are linked to the Old Brahmaputra River and the Baktarmara Khal. To eliminate the need to construct embankments, existing elevated roads and railways would form the Projects perimeter. It will be necessary to Construct two regulators: one at the Ganakhali Khal outfall and and one at the Katakhali Khal outfall. In addition, a pipe sluice is required Protabnath Khal. Drainage will be improved by re-excavating Ganakkhali and Jutir Khals. Four earth dam closures on Napiter Khal, Imambari Khal, Silomkhali Khal and Bardal Khal are planned to prevent flood waters entering the project. The Project was identified in early 1989 by the Mymensingh O&M Division to included under IDA's Second Small Scale Flood Control, Drainage, and Irrigation Project. A feasibility report was prepared in 1989 and implementation was approved to start during the 1989-90 construction season.

Engineering works: Construction has not yet started. The structures have been approved for construction under the IDA financed *Second Small Scale Flood Control Drainage and Irrigation Project* (Credit 1870-BD). Work is scheduled for 1991/92. Earthwork is scheduled for 1992/93 under the FFW program.

Production trends and project impacts on fisheries

Fishermen fear that fishery production will be reduced in the beel areas after project implementation.


90°38'
90°40'
Jamail
24° 25'
387
LEGEND
Road Re-sectioned to serve as Embankment also
Project Area
River / Khal
Unmetalled
Village Road
Beel
Homestead
Regulator
Char Jamail
Char Kaona
Dagdonga
Dagdonga
Char Teki
Jangalia
Harshi
1-Vent 914mm Ø
OLD BRAHMAPUTRA RIVER
Char Kaona
1-Vent 914mm Ø
Tarakandi
Char Teki
Tarakandi
Dead Narsunda River
Char Faradi
24° 20'
25° 20'
Char Terateki
Pakundia
Paik Lakshmia
Char Faradhee
Dardara
1 0.5 0 1Km
SCALE
Char Kursa
Baratia
5-Vents 1.52x1.83m
Hijulia
1-Vent 914mm Ø
Charalbanda
Khursa
Kahet Dhanail
Mirzapur
90°-38'
Northeast Regional Project
Charfaradhe Jangalia Sub-Project
Prepared by: FR/AM
Date: March 1992

L.2.19 CHARFARADHEE-JANGALIA SUB-PROJECT

Project location and general data

District: Kishorganj
Thana: Pakundia
Project type: Full flood control
Status: Under construction since 1990
Gross area: 3,485 ha
Net area: 3,015 ha
Population: 38,170

Environment and engineering works

Hydrology: The area is bounded on all sides by roads. The drainage system consists of four channels, all draining westward, two directly into the Old Brahmaputra and two indirectly through intervening *khals*. Flood waters from the Old Brahmaputra enter the project area through all four channels. Existing internal village roadways separate the area into four catchments draining into each of the four drainage channels. Despite this, the five-vent regulator on the Dead Narsunda was designed (according to the feasibility report and project design notes) for drainage of the entire area and thus is likely over-sized. The pipe sluices, on the other hand, were designed only for local drainage of low pockets and are likely under-sized. The Old Brahmaputra is almost dry during the winter period.

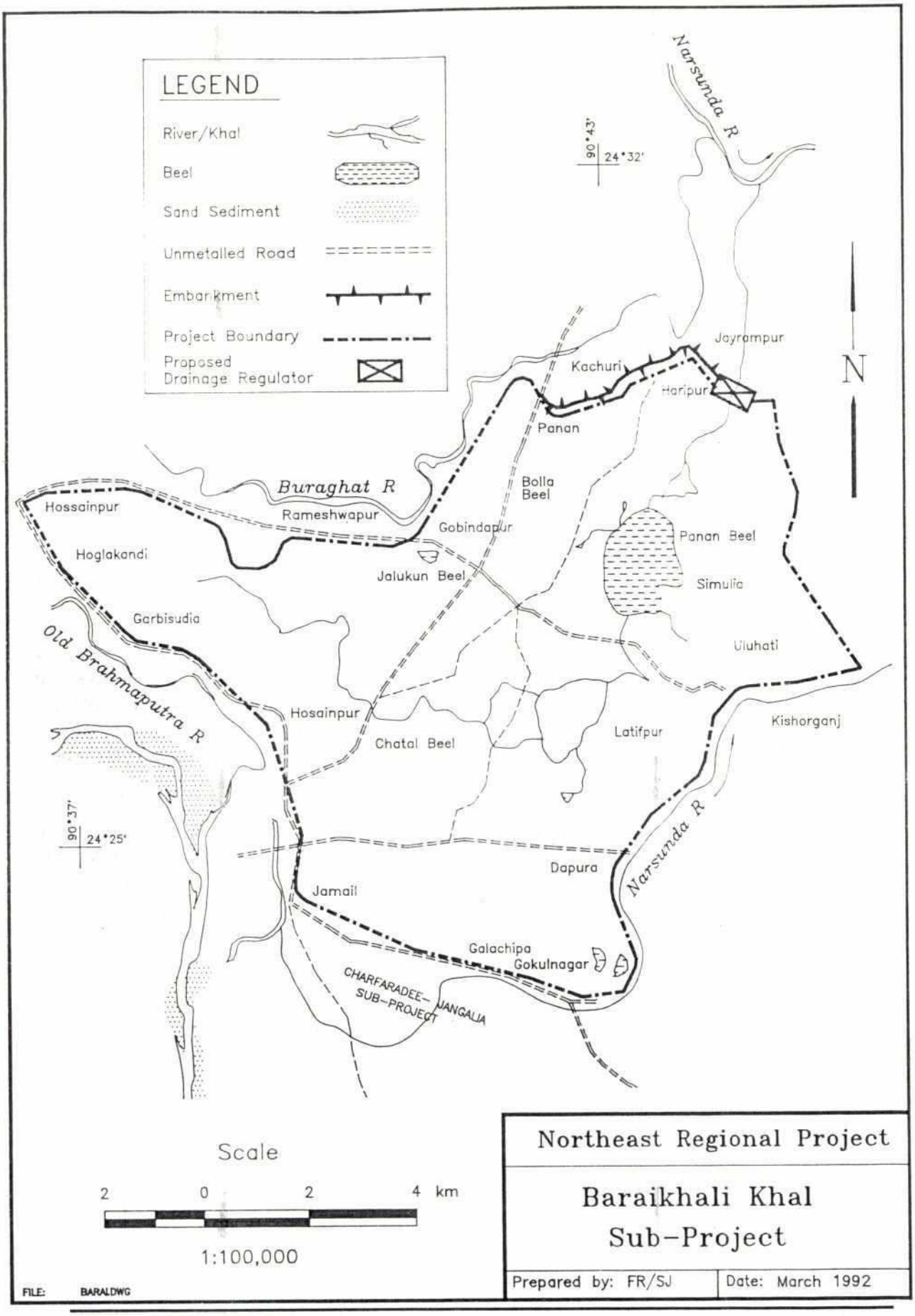
Project concept: The project concept is to provide full flood protection with provision for drainage. The project objective is to control monsoon flooding to reduce damage to transplanted *aman*, and to foster cropping shifts from broadcast *aman* to transplanted *aman*; and to reduce pre-monsoon flood damage to *boro*. Flooding is from the Old Brahmaputra River. The project consists of re-sectioning 10 kilometres of road embankment, and construction of four water control structures, a five-vent regulator at the Dead Narsunda outfall, and three one-vent pipe sluices at the other outfalls. In 1990, embankment re-sectioning was completed under FFW in 1990. In 1991, the three pipe sluices were completed. Currently (1991-2 construction season), the five-vent regulator at the Dead Narsunda outfall is under construction. The project structures are being implemented under the IDA-financed SSFCDI Project.

Embankment: The embankment - originally a village road that was re-sectioned in 1990 by BWDB - is in moderately good condition. Village roads divide the area into four nearly-equal-sized compartments.

Structures: Evidently the pipe sluice on Charalbanda *khal* is undersized and causing drainage congestion. Local people have already cut the closure over the sluice to drain water threatening to damage crops. In 1990-1, the substructure of the five-vent regulator was completed. The reinforcing steel projecting above the substructure has rusted after spending a monsoon season under water.

Production trends and project impacts on fisheries

Local people state that fish production is low in the area.


LEGEND
River/Khal
Beel
Sand Sediment
Unmetalled Road
Embankment
Project Boundary
Proposed Drainage Regulator
Narsunda R
90°43'
24°32'
N
Jayrampur
Kachuri
Haripur
Panan
Bolla Beel
Buraghat R
Hossainpur
Rameshwapur
Gobindapur
Panan Beel
Hoglakandi
Jalukun Beel
Simulia
Garbisudia
Uluhati
Old Brahmaputra R
Hosainpur
Chatal Beel
Latifpur
Kishorganj
90°37'
24°25'
Dapura
Narsunda R
Jamail
Galachipa
Gokulnagar
CHARFARADEE-SUB-PROJECT
JANGALIA
Scale
2 0 2 4 km
1:100,000
FILE: BARALDWG
Northeast Regional Project
Baraikhali Khal Sub-Project
Prepared by: FR/SJ
Date: March 1992

L.2.20 BARAIKHALI KHAL SUB-PROJECT

Project location and general data

District: Kishorganj
Thana: Nandail, Kishoreganj and Hossainpur
Project type: Full flood control and drainage
Status: Begun 1981, completion scheduled 1992
Gross area: 9,385 ha
Net area: 7,500 ha
Population: 117,180

Environment and engineering works

Hydrology: The area is bounded in the south by the Old Brahmaputra and in the north by the Narsunda River. The road embankment was constructed on the natural levee of the Old Brahmaputra. Currently the Old Brahmaputra neither spills water into the project area, nor receives drainage flows from it. The Narsunda is now the flood source for the area.

Project concept: The project area drains south to north through the Baraikhali Khal into the Narsunda River. In the monsoon season, flooding from the Narsunda damages *aman* crops that are grown on the higher land to the south. Before re-excavation of Baraikhali Khal, local pre-monsoon rainfall runoff collected in the *khal* (its outfall was silted up), damaging the *boro* grown on the low land around it. Project objectives are full flood control to secure both *boro* and *aman* crops, and drainage improvement to reduce damage to *boro* grown on low lands. Project works consist of re-sectioning of 5.1 kilometres of road embankment, construction of an eight-vent regulator at the lower end of the *khal*, and re-excavation of 5.6 kilometres of the *khal*. In 1981, *khal* re-excavation was completed by BWDB under FFW. Construction of the regulator is scheduled for 1991-2 under the IDA financed SSFCDI Project. Embankment re-sectioning is scheduled for 1992 under FFW.

Engineering works: Baraikhali Khal appears to be in good section. In the dry season, local people construct one or more earthen cross dams on the *khal* to retain water for *boro* irrigation. Once the pre-monsoon rains begin, water backs up behind the dam(s), causing flood damage to *boro* cropped areas further up the system. Farmers suggest replacing the dam(s) with a water retention structure.

Fishery resources

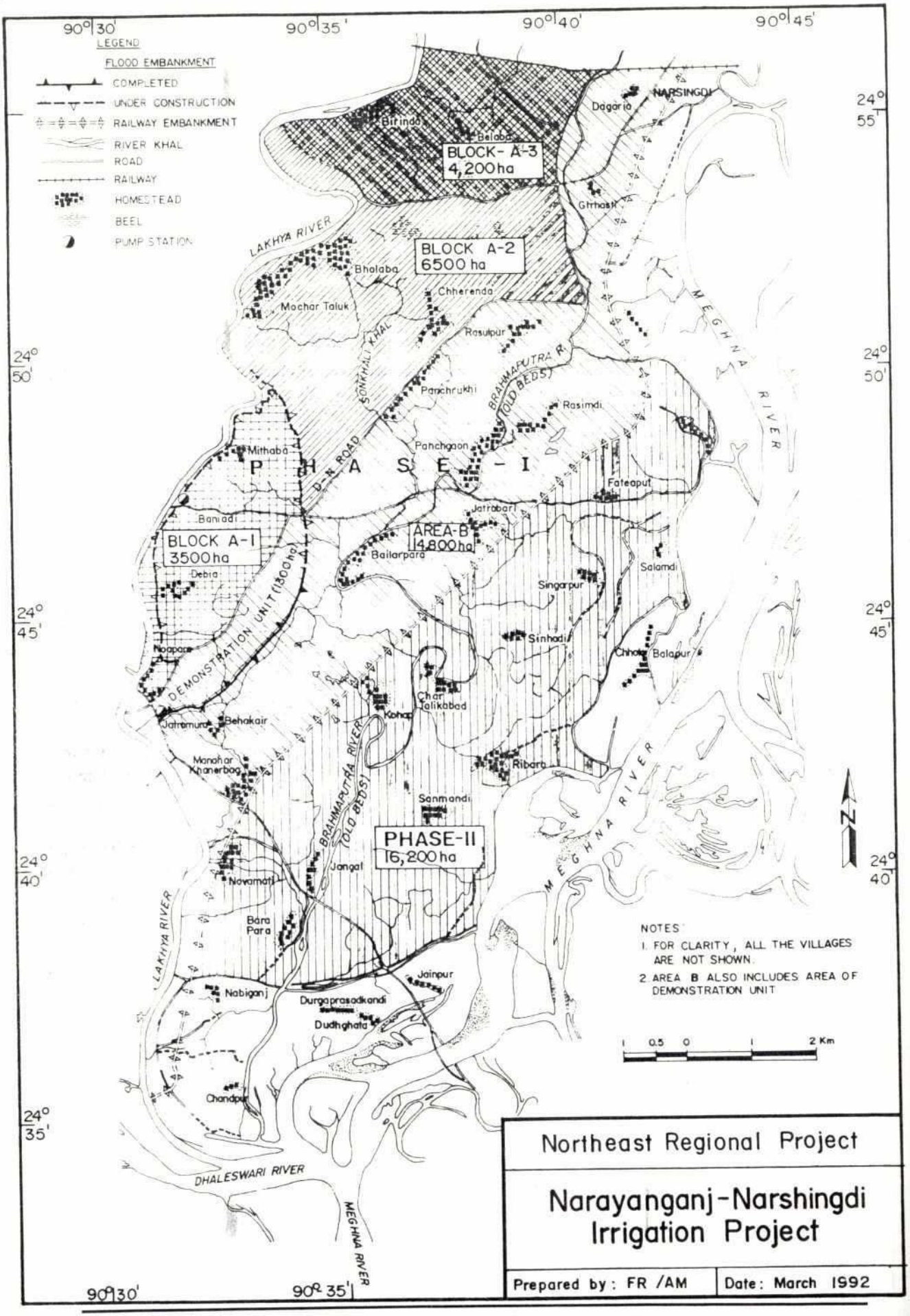
Fish in the *khals* are said to be scarce.

Fishing practices

Fishing activity is minor.

Production trends and project impacts on fisheries

Local people believe that the proposed regulator will have little impact on fisheries.



Northeast Regional Project

Narayanganj-Narshingdi Irrigation Project

Prepared by: FR /AM | Date: March 1992

L.3 FULL FLOOD PROTECTION PROJECTS (WITH PUMPED DRAINAGE AND IRRIGATION)

L.3.1 NARAYANGANJ-NARSHINGDI IRRIGATION PROJECT

Project location and general data

District: Narayanganj and Narsingdi
Thanas: Narsingdi, Rupganj, Araihazar and Baidyer Bazar
Project type: Flood control, drainage and irrigation
Status: Under construction
Net Areas: Demonstration Unit 1,300 ha (completed); Block A-1 of Phase 13,500 ha (on-going); Phase I (balance) 24,200 ha; Phase II 16,200 ha
Population: 826,060

Environment and engineering works

Hydrology (Demonstration Unit): The Project is bordered on three sides by the Meghna-Lakhya Rivers which spill flood water into the project area. Inundation takes place gradually through the early monsoons and the water drains from the Project with the recession of river water levels in November. The land generally slopes from north to south. River banks are generally high and drainage is effected through the Sonakhali Khal and through old beds of the Brahmaputra River which traverse the Project. The left bank of the Lakhya is quite stable but the right bank of the Meghna River is eroding.

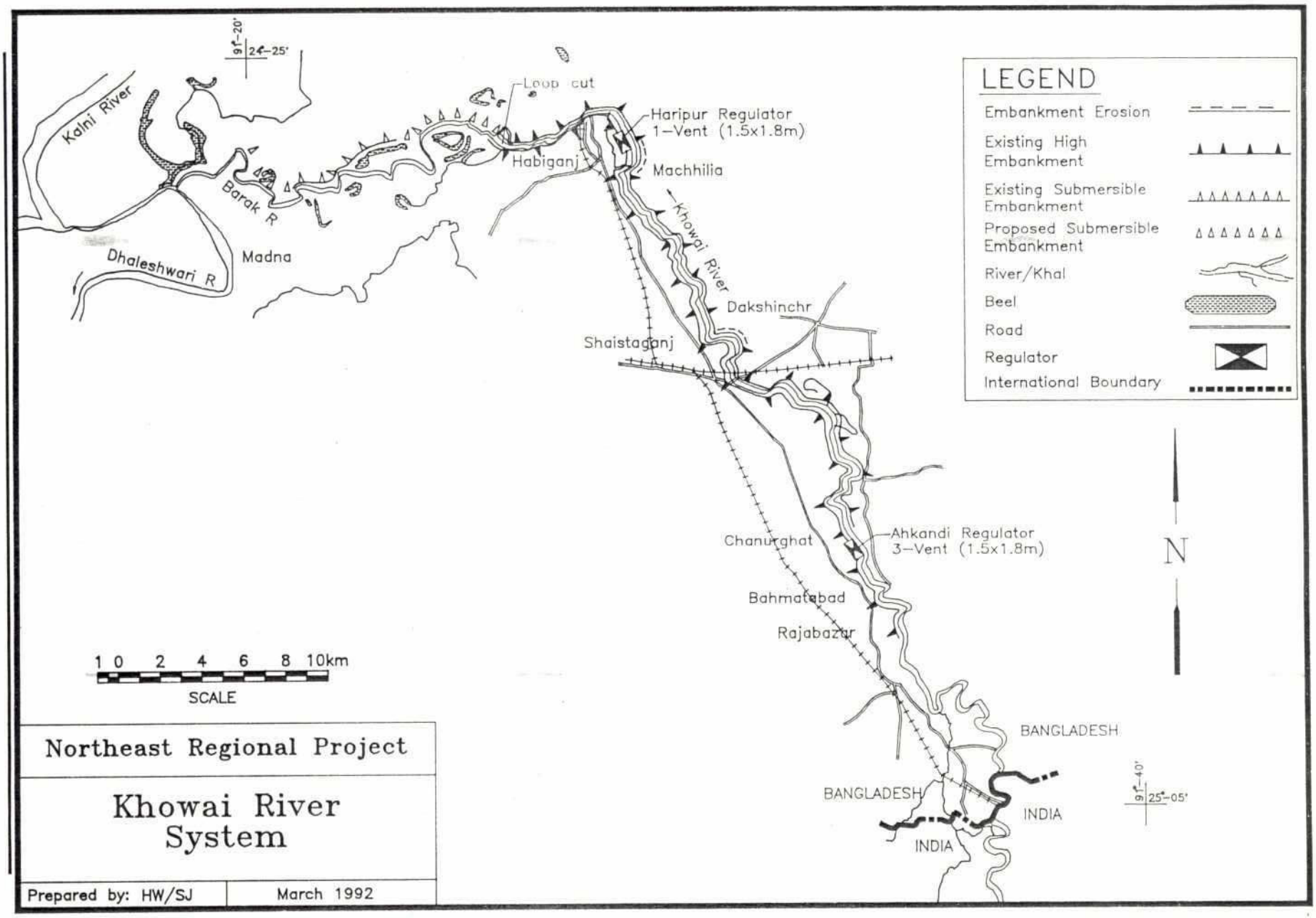
Project concept: The project objective is to limit flood depths to 0.3 meters during the monsoon season. Under normal conditions, the project area floods to depth exceeding 1.8 meters. Under these conditions, only low yielding broadcast *aman* paddy can be grown. The proposed project includes flood embankments to protect the area from external floods; pumping stations to remove surplus rain water during the monsoon season; and the pumping of irrigation water from the Lakhya River in the dry months. The scheme is forecast to increase the cropping intensity from 130 to 250 percent. In 1976, the GOB requested the Government of Japan to assist in an irrigation, drainage and flood control project of some 45,000 hectares in the Narayanganj-Narsingdi area. In response to the request, the Government of Japan appointed the Japan International Co-operation Agency (JICA) to conduct a feasibility study for part of the area; some 29,000 ha (phase - I). Due to its proximity to the Meghna River the study for the remaining (phase II) area was deferred until more data was available. JICA through Japan Engineering Consultant Company Ltd. concluded the study in 1978 and found the project both technically feasible and economically viable. Construction of infrastructure for some 1,300 hectares located in the southern part of the project area called the "Demonstration Unit" started in 1981 and was completed in 1984. The demonstration unit was considered successful and subsequently the GOB formulated an implementation plan for the entire Narayanganj-Narsingdi Irrigation Project. GOB started the construction of embankments, but work was suspended when finances became unavailable. At GOB's request, the Government of Japan, through JICA, then sent their "Basic Design Team" to Bangladesh. The team examined the project's viability and in 1988 they recommended that Block A-1 be implemented. The following year, in 1989, the Government of Japan approved a grant for the project, and construction began in December 1989. This work is on-going.

393

Engineering Works (Demonstration Unit): The main and secondary irrigation and drainage systems have been constructed, but the tertiary system which was to have been constructed by the GOB has not been completed. There is one pump station which houses three vertical pumps, each of which has a capacity of 1.06 m^3/sec. The pumps drain out excess water satisfactorily. The main drainage channel which runs parallel to the eastern embankment is in good condition. Irrigation water supply during the *boro* season has been unsatisfactory apparently because the pumps and the intake canal have been set at to high an elevation. The eastern embankment is in good condition. Weep holes have been provided at a few places to avoid piping. There are no drainage sluices in the eastern embankment. The Dhaka-Narsingdi road acts as a flood embankment and includes five regulators. In 1987, there was an embankment breach which caused extensive crop damage.

Production trends and project impacts on fisheries

The impact on flood plain fisheries has been negative. Local people have stated that the project has eliminated the floodplain fisheries.


91°-20'
24°-25'
Kalni River
Barak R
Dhaleshwari R
Madna
Loop cut
Habiganj
Haripur Regulator
1-Vent (1.5x1.8m)
Machhilia
Khowai River
Dakshinchr
Shaistaganj
Chanurghat
Ahkandi Regulator
3-Vent (1.5x1.8m)
Bahmatabad
Rajabazar
BANGLADESH
BANGLADESH
INDIA
INDIA
91°-40'
25°-05'
LEGEND
Embankment Erosion
Existing High Embankment
Existing Submersible Embankment
Proposed Submersible Embankment
River/Khal
Beel
Road
Regulator
International Boundary
N
1 0 2 4 6 8 10km
SCALE
Northeast Regional Project
Khowai River System
Prepared by: HW/SJ
March 1992

L.4 RIVER CHANNELIZATION PROJECTS

L.4.1 KHOWAI RIVER SYSTEM

Project location and general data

District: Habiganj
Thana: Bahubal, Baniachong, Chunarughat, Habiganj
Type: Full flood control
Status: Under construction
Gross Area: 25,790 ha
Population: 138,600

Environment and engineering works

Hydrology: The project area is located within the Khowai River flood plain. The Khowai River originates in the hills within the Indian state of Tripura. The river enters Bangladesh north of Rajabazar and flows through the center of the Project area in a north westerly direction. The Khowai is a flashy river and prior to project implementation it would over spill its banks numerous times during the pre-monsoon and monsoon seasons. High intensity rainfall within the catchment causes local flooding. The lower part of the project north of Shaistaganj mostly drains overland in a northwesterly direction. It does not drain directly to the Khowai River. Upstream of Shaistaganj, the upper catchment drains towards the river.

Project concept: The Khowai River development objective is to protect the arable lands and properties along both banks of the river. This is to be accomplished by confining the Khowai River floods, which originate from the upper catchment in India, within the rivers banks. The project includes flood embankments along both sides of the entire length of the river. Construction was begun in the mid-1970s. By late 1985, embankments had been completed on both sides of the river from below Habiganj to above Chunarughat.

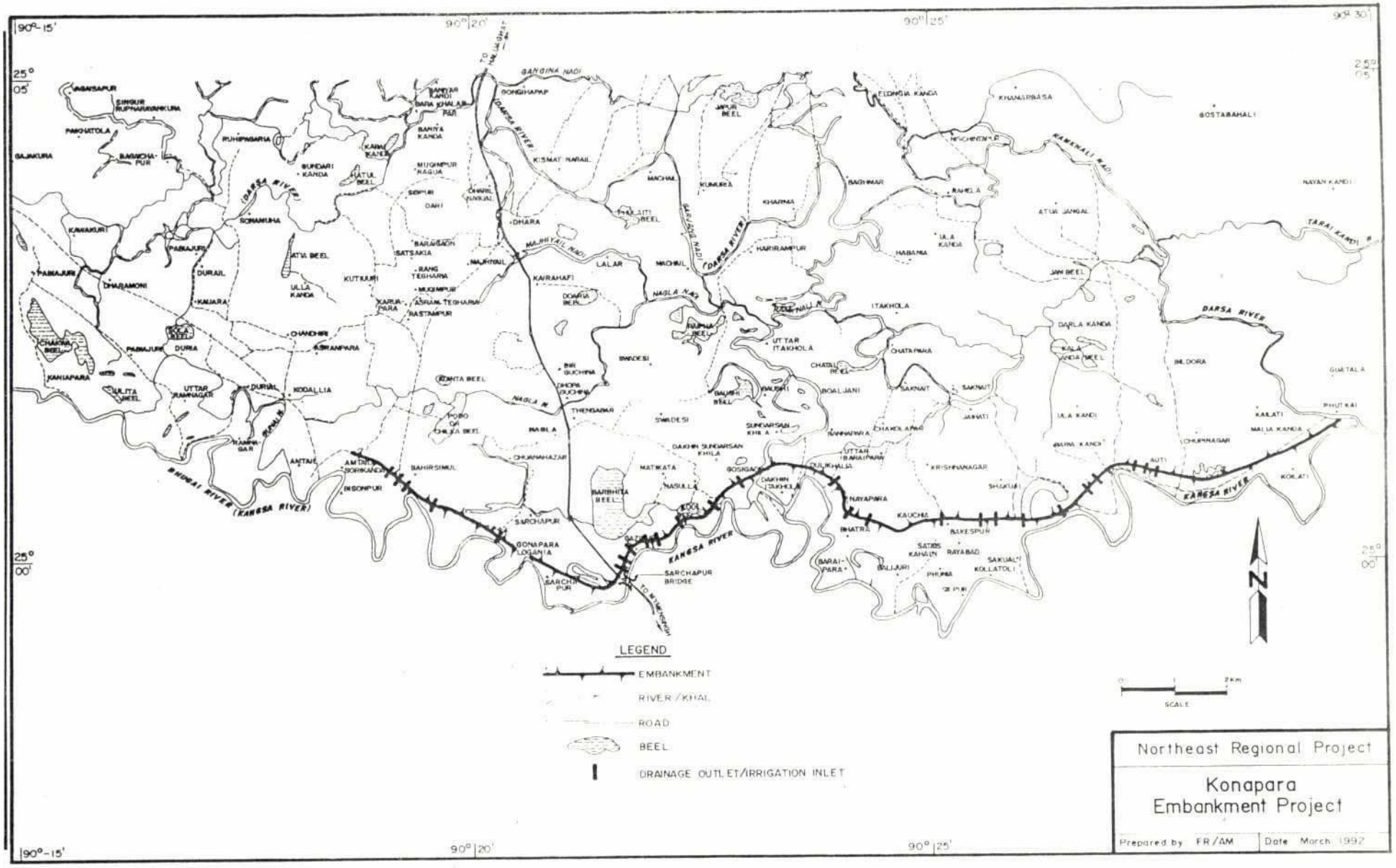
Embankments: The Khowai River Project as it now stands, includes construction of full flood embankments along both banks of the river. Construction of the proposed drainage and irrigation systems, and the barrage has been abandoned. To date, embankments have been constructed along the Khowai River right bank (40 kilometers) from below Habiganj to Chunarughat, and on the left bank (47 kilometers) to Raja Bazar. The remaining section upstream to the Indian border will be embanked as funds become available. The embankments are designed to protect against a flood with a return period of 1 in 50 years. The design, however, is based on pre-1970 records during which time only the in-channel flows were measured. Consequently, the embankments were overtopped and breached in May 1984 and in June 1985, upstream and downstream from Shaistaganj village. At present (1992), a one kilometers long loop-cut channel with high embankments on both sides is under construction downstream of Habiganj. BWDB have acquired the land and the work is being undertaken through a FFW program. BWDB have proposed that submersible embankments (5.6 kilometers in length) be constructed downstream from the loop-cut and connected to the Hangarbhanga Beel embankment. This work would then complete the embanking of the Khowai right bank downstream of Habiganj town. Since mostly a single crop of *boro* is grown in this deeply flooded area, submersible embankments appear a logical proposal.

There are no public cuts in the Khowai River embankments and in general the embankments have been maintained in good condition. However, due to river aggradation and shifting of the channel bed, an extensive maintenance program is required each year. The channel meanders and the embankments is slumping at Machhilia and Dakshinchar on the right bank and at Rahmatabad on the left bank. A loop cut is needed at Dakshinchar and bank protective works are urgently required at the other two locations. BWDB have identified 24 more places where the embankments are prone to erosion.

Structures: Two regulators, the Haripur Regulator and Amkandi Regulator, have been constructed on the Khowai River left embankment. The structures are designed to drain rainfall from local depressions. There are no regulators on the right bank. The Haripur Regulator (1-vent 1.5m x 1.8m) was designed to drain the area enclosed by an old Khowai channel and a loop-cut embankment. The regulator is located east of Habiganj town and was constructed in 1977-78. The structure is equipped with a slide gate on the river side and is in good operational condition. However, the monsoon water levels in the Khowai River are higher as a result of confining the river within its channel and now it is not possible to adequately drain the low-lying basin back to the river. At present, FAP 9(A) is conducting a feasibility study under the Secondary Town Protective Works Project, which includes drainage of the Haripur Regulator basin. Re-excavation of canals that would drain the area to the *beels* west of Habiganj town is one of the alternatives under investigation. The Amkandi Regulator (3-vent 1.5m x 1.8m) conveys local run off into the Khowai River from the basin enclosed by the railway line, a village road and the embankment. The structure has slide gates, is in good operational condition, and is adequate for providing drainage to the area.

Production trends and project impacts on fisheries

There is very little fishing activity in the Khowai River and, reportedly, before project implementation fishing activity was low. Local people have not noticed any impact from the project on floodplain fisheries. However, embankments along the Khowai River prevent fish from reaching shallow floodlands lateral to the river channel to spawn. But fish growth inside embanked areas is good because closing of sluice gates results in higher water levels during the dry season. If the sluice is properly utilized it should not have a negative effect on fish spawning. There is the example of the Mattajuri fishery. It was an unproductive borrow pit before the project, but after the Khowai River embankment was built the fishery was much improved. It now produces 2,000 kg/ha of carp, boal, prawn and magur.


90°-15'
90°20'
90°25'
90°30'
25°05'
25°00'
BANGINA NADI
DARSA RIVER
KAMKHALI KHADI
TARAI KANDI R.
MAHIYAIL NADI
NAGLA NADI
DARSA RIVER
DARSA RIVER
BHUMAI RIVER (KANGSA RIVER)
KANGSA RIVER
KANGSA RIVER
TO TAM LUK DIST.
TO MYMENSINGH
KISMAT NARAIL
MUGIMPUR NAGUA
BARAGACH
SATSAKIA
RANG TEGHARIA
MUKIMPUR
ASRAM TEGHARIA
RASTIMPUR
KUTKURI
KARUA PARA
KAIJARA
DURAIL
PABAJURI
DHARAMONI
CHANDHIR
KRANPARA
KODALLIA
ANTAIL
BAHIRSIMUL
INSONPUR
SARCHAPUR
GONAPARA LOGANIA
SARCHAPUR BRIDGE
KAIJURI BEEL
DOARIA BEEL
KAIRAHATI
LALAR
MADHUL
HARIRAMPUR
HABANA
ITAKHOLA
UTTAR ITAKHOLA
CHATIPARA
DARLA KANDA
BELDORA
GUATALA
PHUTKAI
KAILATI
MALIA KANDA
KORATI
SAKNAT
JANATI
BOALJANI
SWADESI
DAKHIN SUNDARSAN KHILA
UTTAR SUNDARSAN KHILA
MATIKATA
NASULLA
BARBHITA BEEL
GOSIGACHA
DAKHIN DUKHOLA
UTTAR DUKHOLA
NAYAPARA
KAUCHA
BHATRA
BAKESPUR
SAKUAL KOLLATOLI
BALIJURI
PHUPHA
KRISHNANAGAR
SHAKURI
BARAI-PARA
RAYABAD
SATOS KAHALIN
KHANJIBASA
BOSTABAHALI
NAYAN KANDI
ATUA JANGAL
JAM BEEL
ULA KANDA
KHARMA
KUMURA
MACHAL
BAGHMAR
RAHELA
FLOWER KANDA
NEKHENDAR
BAMNA KANDI
BARA KHALAR PAR
BAMIYA KANDA
KANAI KANDA
BURDARI KANDA
HATUL BEEL
SOMPUR
DAHI
CHARIL KUMRAIL
DHARA
RUHIPASARIA
SONAMUKHA
ATUA BEEL
ULLA KANDA
DURIA
UTTAR RAMNAGAR
KANTA BEEL
HOBO OR CHILLA BEEL
BHUMIA BEEL
BAIJHI BEEL
CHATIL BEEL
KALA KANDA BEEL
INR SUCHIYA
DHOPA SUCHIYA
THENGAMARI
MAHLA
CHUANHAZAR
RAMNAGAR
KANIAPARA
CHARRA BEEL
ULITA BEEL
BANGSHA-PUR
PANCHATOLA
SINGUR RUPHARIANKURA
BASANSAPUR
SUNKURA
LEGEND
EMBANKMENT
RIVER / KHAL
ROAD
BEEL
DRAINAGE OUTLET/IRRIGATION INLET
N
0
1
2 Km
SCALE
Northeast Regional Project
Konapara Embankment Project
Prepared by FR/AM
Date March 1992

L.4.2 KONAPARA EMBANKMENT PROJECT

Project location and general data

District: Mymensingh
Thana: Haluaghat
Project type: Full flood control and drainage
Status: Completed 1984, rehabilitation 1988-9
Gross area: 3,480 ha
Benefitted area: 3,120 ha
Population: 23,100

Environment and engineering works

Hydrology: The project area is located on the left bank of the Kangsha, which runs east-west. The embankment extends from Amtail village in the west to the Darsa River in the east. River flood water still enters the area around both ends of the embankment where land levels are low. In particular, the Kangsha flood enters the area by backflow through the Darsa. Various internal roads act as compartmental bunds, however, so there is some flood control benefit from the embankment. To secure the rest of the area against flooding a continuous embankment would be required. Confinement effects from the embankment may slightly raise Kangsha water levels, causing worse flooding in right (unprotected) bank areas. Local people on the left bank state that the project has not affected right bank agriculture, as only *boro* is grown there which is unaffected by the Kangsha flood. Field inspection on the right bank would be required to confirm this.

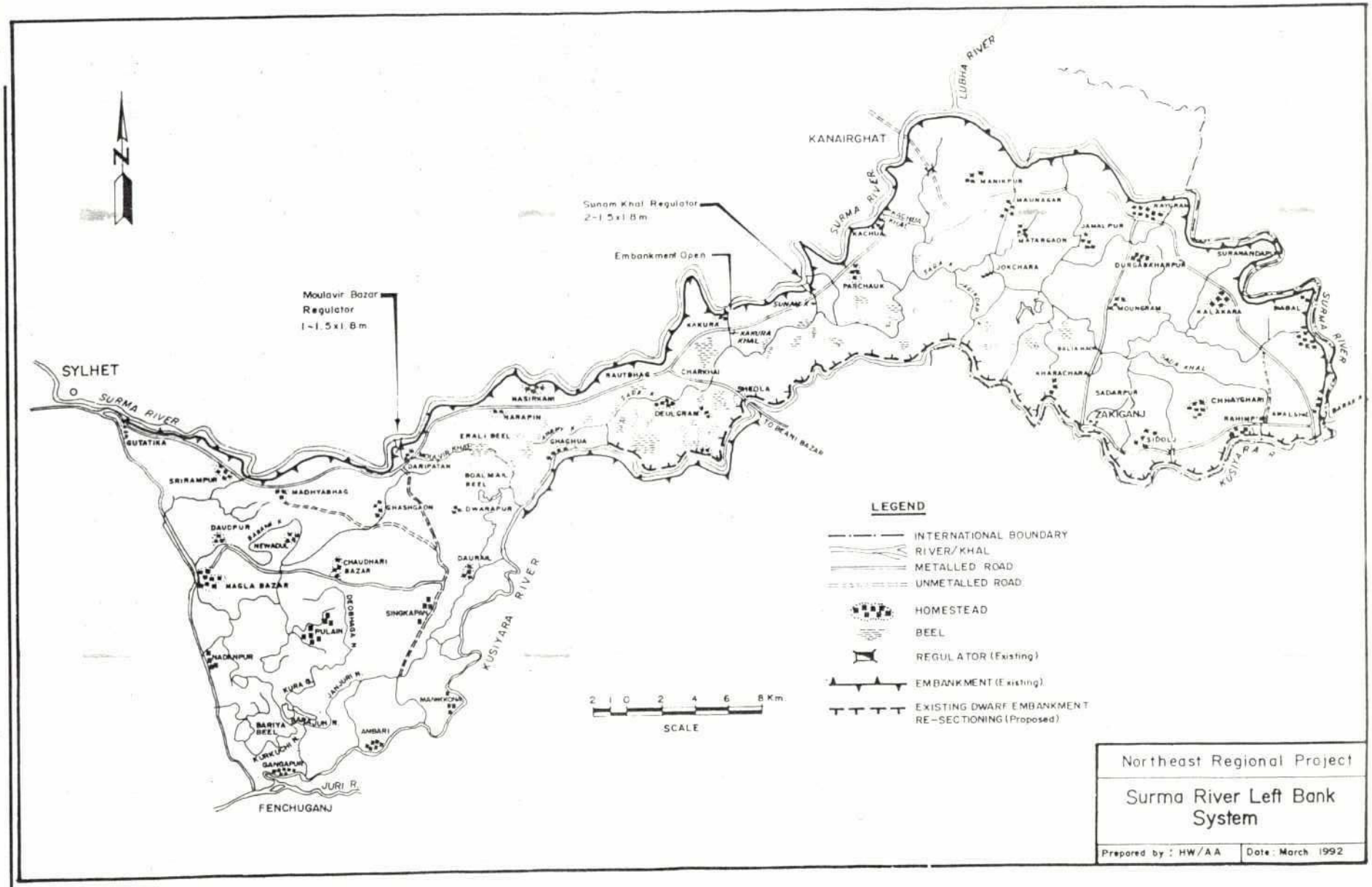
Project concept: The project objective is to protect transplanted *aman* on the left bank of the Kangsha River between Bahir Shimul to Phutkai from damage during the Kangsha monsoon flood. Project works consist of an embankment along the Kangsha left bank from Bahir Shimul to Phutkai and small drainage/irrigation structures. In 1980-1, BWDB started project construction under EIP. In 1983-4, the engineering works were completed. In 1988, the embankment was severely damaged by monsoon flooding. In 1988-9, it was repaired under the EIP Flood Damage Restoration Program.

Embankments: Wave erosion of several reaches of the embankment between Sarchapur Bridge and Bahirshimul was noted during the field visit.

Structures: There are 26 small hydraulic structures (mostly culverts with stoplogs) along the embankment with pipe diameters from 30 cm to 45 cm. The structures are mostly for localized drainage, but a few also serve as low lift pump irrigation inlets. The concrete works are in good condition but many of the structures' fall-boards are either damaged or lost.

Production trends and project impacts on fisheries

During the site visit, no fishermen were available for interview. Local people report that the quantity of fish produced in the area is low and has not changed since project implementation. The status of the Kangsha fisheries adjacent to the project is unknown.


N
Sunam Khal Regulator
2-1.5x1.8m
Embankment Open
Moulavir Bazar
Regulator
1-1.5x1.8m
KANAIRGHAT
SYLHET
SURMA RIVER
LUBHA RIVER
KUSIYARA RIVER
JURI R.
FENCHUGANJ
GUTATIRA
SRIRAMPUR
MADHYABHAG
DAUDPUR
NEWADA
MAGLA BAZAR
CHAUDHARI BAZAR
GHASHGAON
DARIPATAN
EMALI BEEL
BOALMARI BEEL
DWARAPUR
DAURAL
SINGKAPAN
PULAIN
NADAMPUR
KURA R.
JANJURI R.
BARIYA BEEL
KARKUSHI R.
GANGAPUR
AMBARI
MAINKONA
NASIRKANI
NARAPIN
GHAGHUA
RAUTBHAG
CHARKHAI
DEULGRAM
KAKURA
KAKURA KHAL
SUNAM K.
PASCHAUK
KACHUA
SHEOLA
TAHIRPUR BAZAR
MANIKPUR
MAUNAGAR
MATARGAON
JOKCHARA
JAMALPUR
DURGABHARPUR
MOUNGRAM
BELIAMAN
KHARACHARA
SADARPUR
ZAKIGANJ
SIDDLI
KALAKARA
BABAL
SURAMANDAPI
CHHAYGHARI
RAHIMPUR
KHALSHI
JALUKHAL
2 1 0 2 4 6 8 Km
SCALE
LEGEND
INTERNATIONAL BOUNDARY
RIVER/KHAL
METALLED ROAD
UNMETALLED ROAD
HOMESTEAD
BEEL
REGULATOR (Existing)
EMBANKMENT (Existing)
EXISTING DWARF EMBANKMENT
RE-SECTIONING (Proposed)
Northeast Regional Project
Surma River Left Bank System
Prepared by : HW/AA
Date : March 1992

L.4.3 SURMA RIVER LEFT BANK SYSTEM

Project location and general data

District: Sylhet
Thana: Kanairghat, Sylhet
Project type: Flood control
Status: Ongoing; under construction since 1963
Gross area: 7,000 ha
Net area: 7,000 ha
Population: 50,000

Environment and engineering works

Hydrology : The hydrology of the area is governed by the Surma, Kushiyara, Lubha, and Sada Khal. The Lubha originates in India and flows into the Surma about 3 kilometres upstream of Kanairghat. The Lubha is the main source of Surma dry season flow. It carries substantial flood flows during the pre-monsoon and monsoon seasons. Sada Khal -- the name varies along its length; at the offtake it is called Rahimpur Khal -- is the main drainage channel for the areas between the Surma and Kushiyara Rivers. It originates from the Kushiyara below the bifurcation of the Kushiyara and Surma at Amalshid, and flows into the Kushiyara through numerous branches, all west of Sheola village. Recently, substantial siltation has occurred, particularly around the Charkhai-Sheola road. To alleviate the resulting drainage congestion, local people have been cutting the embankment at old drainage channel sites, and are now demanding construction of regulators at these locations. Surma flood levels have been rising due to siltation below its offtake from the Barak. It becomes almost dry in the low season. The Surma left embankment between Amalshid and Sylhet closed nine spill channels; two others, Sunam Khal and Moulavir Khal, were provided with structures; Kakura Khal remains open (a regulator was planned by IFAD but has not yet been built). The embankment was designed to prevent overbank spill during high river stages so that lands along the left bank would be protected from pre-monsoon and monsoon flood damage. However, due to the large numbers of public cuts in the embankment (see below) and overspill from the Kushiyara River, much of the area is flooded each year.

Project concept: The project objective for the Surma embankment is to protect homesteads, infrastructure, and crops behind the left bank of the Surma River by preventing overbank spill of pre-monsoon and monsoon river floodwater. Existing project works consist of 140 kilometres of embankment, and one one-vent and one two-vent drainage regulator. About 40 years ago, the Surma left embankment, locally called "Surma Dyke", was begun. Various isolated sections were constructed, mainly to protect homesteads along the river. No design records or development plans for these sections are available. Irrigation maps of 1960 show a continuous embankment from Sylhet to Charkhai. In 1963, the embankment from Charkhai to Amalshid was begun, and construction continued intermittently until completion in 1985. The project is currently listed by BWDB as "ongoing", however, since the embankment is currently being re-sectioned and retired in many locations. In 1973, the "*Upper Kushiyara Project*" feasibility report was prepared; the embankment between Amalshid and Charkhai was constructed following designs given there. In the last ten years, Surma embankment works have been financed by IDA.

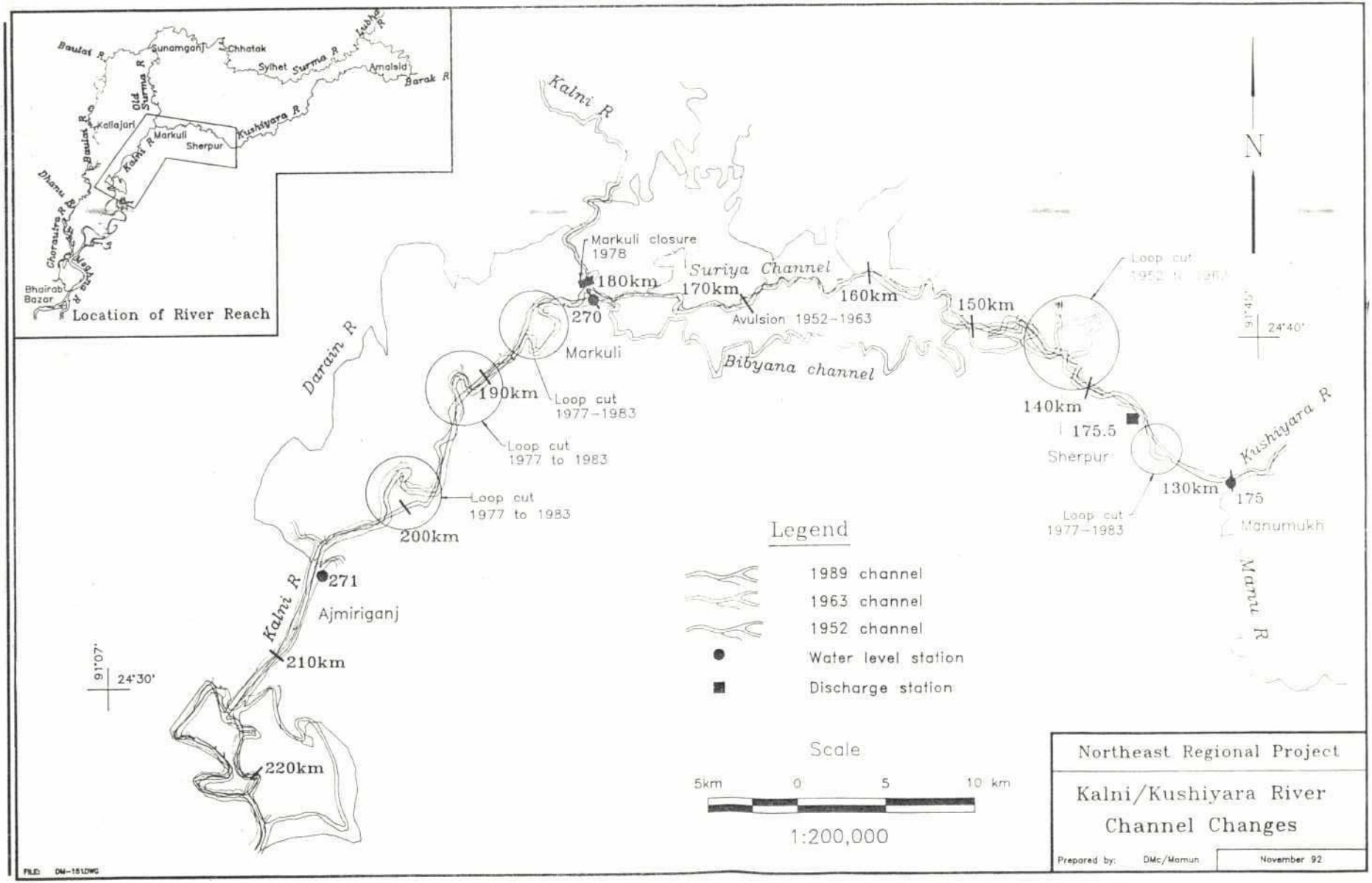
Embankments: The Surma left embankment is some 140 kilometres long. The design criteria include a 4.3 meter crest width, and river-side slopes of 1(V):3(H) and country-side slopes of 1(V):2(H). The 1973 embankment design was for protection against a 1:10 return-period flood. The embankment as constructed varies greatly in height, however: in Sep 91, the time of the field visit, height above water level varied from 0.2 to 2.5 meters. The cross-section also varies greatly. Most of the embankment slopes are grassed, but some sections have exposed earth slopes which are more susceptible to erosion. From Kanairghat to Sylhet, 32 breaches and public cuts were observed; from Amalshid to Kanairghat, six more are reported. Most of the cuts occur at locations adjacent to the more deeply flooded areas, or at locations where a natural drainage channel was closed by the embankment. Boatmen cut the embankment during the monsoon season, and farmers state that they cut the embankment to reclaim low lands along the Surma - by introducing silt-laden flood water they intend to fill the lower areas with silt and increase the fertility of their land. They also state that cutting the embankment is not harmful as the lower areas are flooded from the Kushiyara anyway. BWDB repairs the breaches and cuts in the embankment every year.

Regulators: A two-vent flushing/drainage regulator controls flow at Sunam Khal (1.5 x 1.8 meters) and a single-vent drainage regulator controls flow at Moulavir Khal (1.5 x 1.8 meters). The Sunam Khal regulator has a 4.1 meter wide bridge deck used by vehicles. The Moulavir Khal regulator has a 2.4 meter wide deck used by pedestrians. Both structures are in good operating condition.

Drainage. A section of Moulavir Khal (2.5 kilometres) which drains Erali *beel* into the Surma has been re-excavated.

Production trends and project impacts on fisheries

At present, there are no embankments along the right bank of the Surma River, and the left bank area remains open to flooding from Kushiyara River. With this development scenario, it appears the embankment has had little impact on floodplain fisheries.


Location of River Reach
Baulai R
Sunamganj
Chhatak
Sylhet
Surma R
Kushiyara R
Amalsid
Barak R
Kallajuri
Markuli
Sherpur
Kalni R
Dhanu R
Bhairab Bazar
Kalni R
Markuli closure 1978
180km
270
Suriya Channel
170km
160km
150km
Avulsion 1952-1963
Loop cut 1952 to 1963
Markuli
Bibyana channel
Darain R
190km
Loop cut 1977-1983
Loop cut 1977 to 1983
Loop cut 1977 to 1983
200km
271
Ajmiriganj
210km
220km
140km
175.5
Sherpur
Kushiyara R
130km
175
Manumukh
Loop cut 1977-1983
Manu R
N
24°40'
24°30'
91°07'
Legend
1989 channel
1963 channel
1952 channel
Water level station
Discharge station
Scale
5km 0 5 10 km
1:200,000
Northeast Regional Project
Kalni/Kushiyara River Channel Changes
Prepared by: DMc/Mamun
November 92
FILE: DM-151.DWG

L.4.4 KUSHIYARA RIVER CHANNELIZATION

Project location and general data

District: Sylhet, Sunamganj and Habiganj
Project type: River straightening
Status: Completed
Gross area: 364,200 ha
Population: 2,226,807

Environment and engineering works

Hydrology: The Kushiyara River has evolved over the last 200 years from a minor distributory channel to the present situation, where it carries two-thirds of the Barak River inflows during the monsoon season. Channel instability and changes have continued to occur over the last 40 years. One of the most important changes occurred just downstream of Sherpur between 1952-63 when the Kushiyara abandoned the Bibiyana channel and shifted northwards into the Suriya channel. This avulsion eroded approximately 60 million m^3 of sediment from the 30 km long Suriya channel and deposited the material downstream in the Kalni River.

Project concept: To straighten the Kushiyara River channel to expediate river transportation by loop cutting. The loop cuts, and also the shift into the Suriya channel, shortened the river's course by about 25 km between Sherpur and Ajmiriganj.

Engineering works: A series of loop cuts were constructed along the Kalni River between Markuli and Ajmiriganj during the period 1977-83. The loop cuts appear to have been constructed by making a narrow pilot channel through the neck of the meanders. Although some widening has occurred along these excavations, the artificial channels are still considerably narrower and experience noticably higher velocities than natural channel reaches. It appears cohesive bank sediments have prevented the channels from developing a full cross section. This shortening has also steepened the river's gradient during pre-monsoon and post-monsoon flow conditions.

Other developments that have affected flows and sedimentation patterns include:

- A closure was constructed across the Kalni River upstream of its junction with the Kushiyara in 1978 to prevent pre-monsoon spills from the Kushiyara into the Central Basin haors. Flows now drain westward into the Chamti River, then into the Darain River before finally flowing into the Kushiyara around Ajmiriganj.

- The outfall of the Darain River around Ajmiriganj was closed in 1992; as a result the entire pre-monsoon discharge is now flowing through a small channel of the Old Surma River to the Baulai in the West;

- The channels located east of the projects also flow through the same small section of the Old Surma River via the Darain due to severe siltation of their outfalls.

Fishery resources

It is estimated that about 90 fish species inhabit the area. The main species are as follows:

Table L33: Abundance of Fish Species by Group in the Kushiyara River

BOROMAACH	CHOTOMAACH
Catla, Rui, Mrigel, Air, Gonia, Boal, Rita, Pangas Chital, Gazar K.Baush, Shoal Ilish etc.	Pabda, Koi, Punti, Baim Singhi, Magur, Tengra, Gulsha, Chapila, Laso, Bheda, Lati, Bacha, Poa Keski, Chela, Jhainja Foli, Mola, Gutum,Icha Bajori, Shilon, Chanda, Kaikkya, Kholisha, Gharua etc.

Fish composition of the project area is dominated by miscellaneous species (55-65%) followed by carps (25-30%) and catfish (5-10%). The Kushiyara channel is a major migration route in the region for carp. Some long distance migratory species such as the giant fresh water prawn and Ilish are also widespread in the rivers and floodplains of the western part of the project area. Prawn fry migrate towards the floodplain from the sea for grazing, while Ilish migrate primarily for spawning.

Fishing practices

Fishing is an important activity in the project area and competition over the fish resource is increasing. There are an estimated 12,000 to 15,000 traditional fisherman households in the project area. The non-traditional fishermen are mainly an emerging group from the landless and poor agriculturists. They fish in open water especially during monsoon months and sell their catch. Such non-traditional fishermen are increasing and nearly 35-40% of the households, especially from the deeply flooded haor area, are reportedly engaged in catching fish.

Floodplain fisheries is the main source of living for the poor people living in the project area particularly in the late monsoon period when there are no other sources of income.

During the dry season young fish overwinter in the river *duars* and in the deeper *beels*. The role of river *duars* is becoming increasingly more important as many of the beels are gradually silting-up. At present, 10 are located between Markuli and Madna. A number of these *duars* have been partially infilled with sediment.

Installation of *katha* along river banks is common to attract fish; usually *hizal*, *koroch*, *jarul*, *jam*, *shewra* are used. Various types of nets and gear (Ber jal, Kona jal, Phash jal, Bhesal jal, Thela Jal, Uther jal) as well as hooks and lines are commonly used for fishing in the area.

A small portion of the fish catch is processed and exported. Ajmiriganj Fish Industries Ltd started operation in 1972. It is a large fish processing plant with a daily freezing capacity of four mt/day. The ice plant has a capacity of 10 mt/day. The plant exported 262 mt of fish during 1992. Eight ice plants are also present in the project area for fish preservation and marketing.

Production trends and project impacts on fisheries

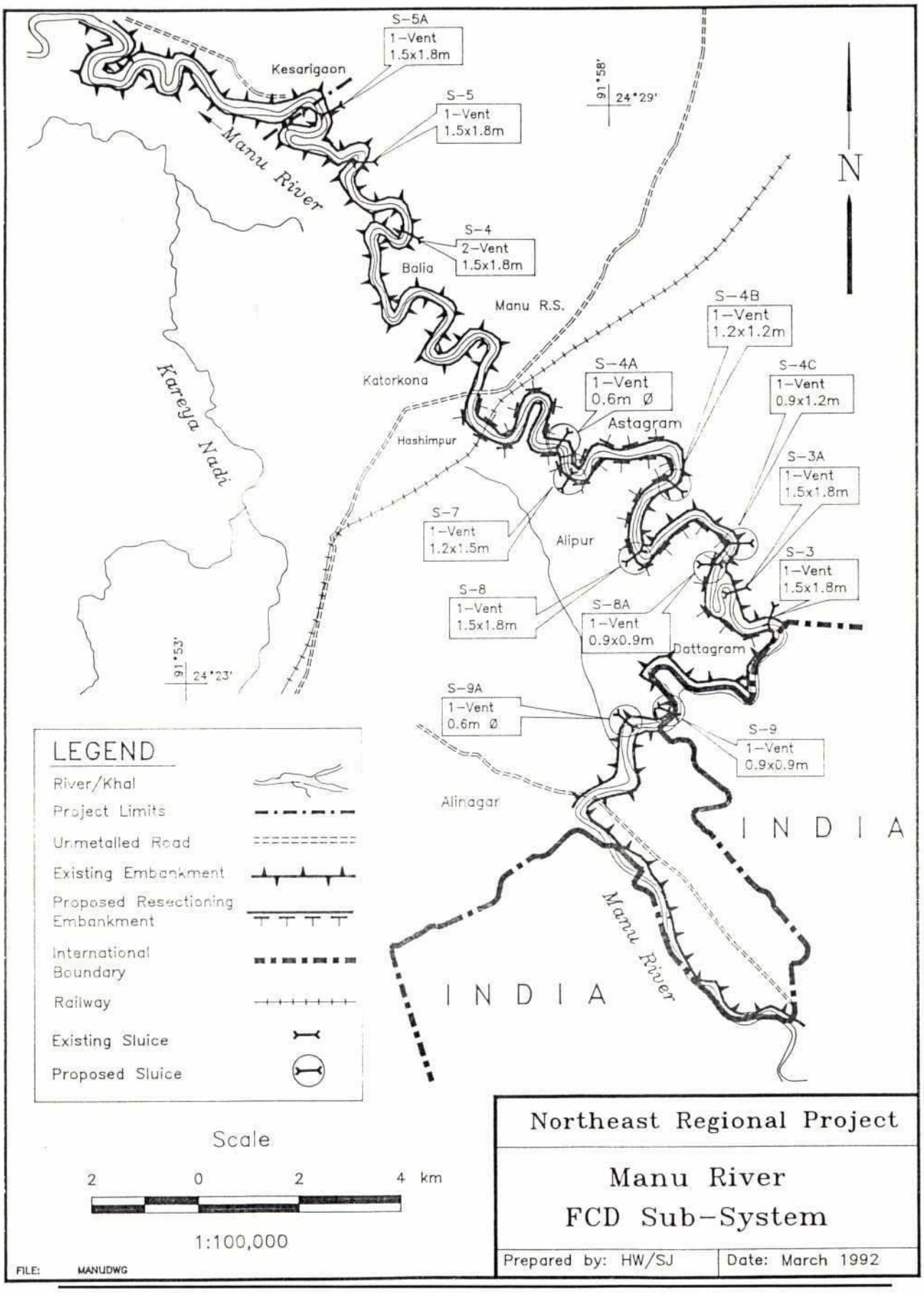
Open water fisheries resources are important; they contribute 91.5% of the total catch (floodplain 52%, beel 31%, river 8.5%), while closed water fisheries contributed only 8.5%. Subsistence fishing occurs mainly during the monsoon season and large scale beel fishing occurs from December to March. Fish production in the project area has reportedly declined by 25-30% over the last five years. At a production rate of 200 kg/ha, present fish production for the project area (13,329 ha) is estimated at 2,666 t.

Heavy siltation of the Kushiyara and adjacent fisheries such as Bheramona is a major cause for the decline in fish production. Mr. Saleh Ahmed, master of the ML FARHAD, a passenger launch having a draught of 1.8 meters, has been navigating the Sherpur-Madna route for the last 19 years. He states the Kushiyara River is gradually silting up. The reach between Sherpur and Markuli is still in fairly good condition, but navigation between Markuli and Ajmiriganj is difficult and the reach between Ajmiriganj and Madna has not been navigable by his launch for the last five years. He also indicated that no dredging work has been done since the independence of Bangladesh. However, a dredger fleet came to Madna in 1991, stayed three months, and then left without doing any work.

Loop cutting has resulted in many duars (characteristically situated in the upper curvature of the loops) becoming isolated and cut of from the river channel. Aggradation of sediments in the channel downstream from Markuli has filled in other duars.

Other causes for the decline include:

- gradual conversion of permanent beels to seasonal beels.
- juvenile fishing/overfishing by illegal gears/nets.
- increased fish disease.
- construction of embankments and regulators on fish migratory routes.
- increased agricultural area encroaching into water bodies and use of insecticide.


S-5A
1-Vent
1.5x1.8m
Kesarigaon
S-5
1-Vent
1.5x1.8m
91°58'
24°29'
Manu River
N
S-4
2-Vent
1.5x1.8m
Balia
Manu R.S.
S-4B
1-Vent
1.2x1.2m
S-4A
1-Vent
0.6m Ø
S-4C
1-Vent
0.9x1.2m
Katorkona
Kareya Nadi
Hashimpur
Astagram
S-3A
1-Vent
1.5x1.8m
S-7
1-Vent
1.2x1.5m
Alipur
S-3
1-Vent
1.5x1.8m
S-8
1-Vent
1.5x1.8m
S-8A
1-Vent
0.9x0.9m
Dattagram
91°53'
24°23'
S-9A
1-Vent
0.6m Ø
S-9
1-Vent
0.9x0.9m
Alinagar
INDIA
INDIA
Manu River
LEGEND
River/Khal
Project Limits
Unmetalled Road
Existing Embankment
Proposed Resectioning Embankment
International Boundary
Railway
Existing Sluice
Proposed Sluice
Scale
2 0 2 4 km
1:100,000
FILE: MANUDWG
Northeast Regional Project
Manu River
FCD Sub-System
Prepared by: HW/SJ
Date: March 1992

L.4.5 MANU RIVER FCD SUB-SYSTEM

Project location and general data

District: Moulvi Bazar
Thana: Rajanagar
Project tpe: Flood control and drainage
Status: Completed
Gross Area: 1,615 ha
Net Area: 1,433 ha
Benefitted Area: 840 ha
Population: 7,210

Environment and engineering works

Hydrology: The Project is located within the flood plain of the upper Manu River. The river is flashy and over spills its banks frequently during the pre-monsoon season. In addition to over bank spill, the area floods as a result of short duration, intense rainfall in the adjacent Tripura hills. The water of the river is very turbid with a strong current.

Project concept: The project purpose is to increase crop production by protecting crops from flooding in the vicinity of the Manu River upstream of the Manu railway bridge. This is to be achieved with embankments along both banks of the Manu River. Regulators equipped with automatic flap gates are to provide for local run-off. The project area is located along both banks of Manu River upstream from Manu railway bridge, and on the right bank of the Manu River downstream of the bridge. The cultivable area extends from the Manu River to the outliers from the Tripura hills. The latter are covered with forest or tea gardens. The Manu River is a flashy river which over spills its banks numerous times during the pre-monsoon and monsoon seasons. In the 1970's local farmer groups constructed low embankments along the banks of the Manu River. These low embankments extended from the international boundary at Sharifpur Union to Katarkona village. From 1977 onwards, the embankments were re-constructed and then maintained under various FFW programs. To provide drainage, five drainage regulators were constructed in the Manu right embankment between 1984 and 1987 (S-3, S-3A, S-4, S-5 and S-5A). These were constructed by BWDB under IDA Credit 955-BD. Two regulators were constructed by the local authority in the Manu left embankment. In 1989 the sub-project was approved for rehabilitation under an SSFCDI Project and a feasibility report was prepared. The proposed rehabilitation works include:

- re-sectioning of about 20 kilometers of embankments (out of 34.7 kilometers);
- construction of two additional regulators and one culvert along the right embankment; and,
- construction of five additional sluices on the left embankment.

The re-sectioning of embankments is presently being carried out under FFW, and is scheduled for completion in 1992. The construction of sluices will be carried out under an IDA Credit 1870-BD.

Embankments: The existing embankments, which are not included in the re-sectioning program, are in good condition. The re-sectioning work carried out by FFW is of good quality.

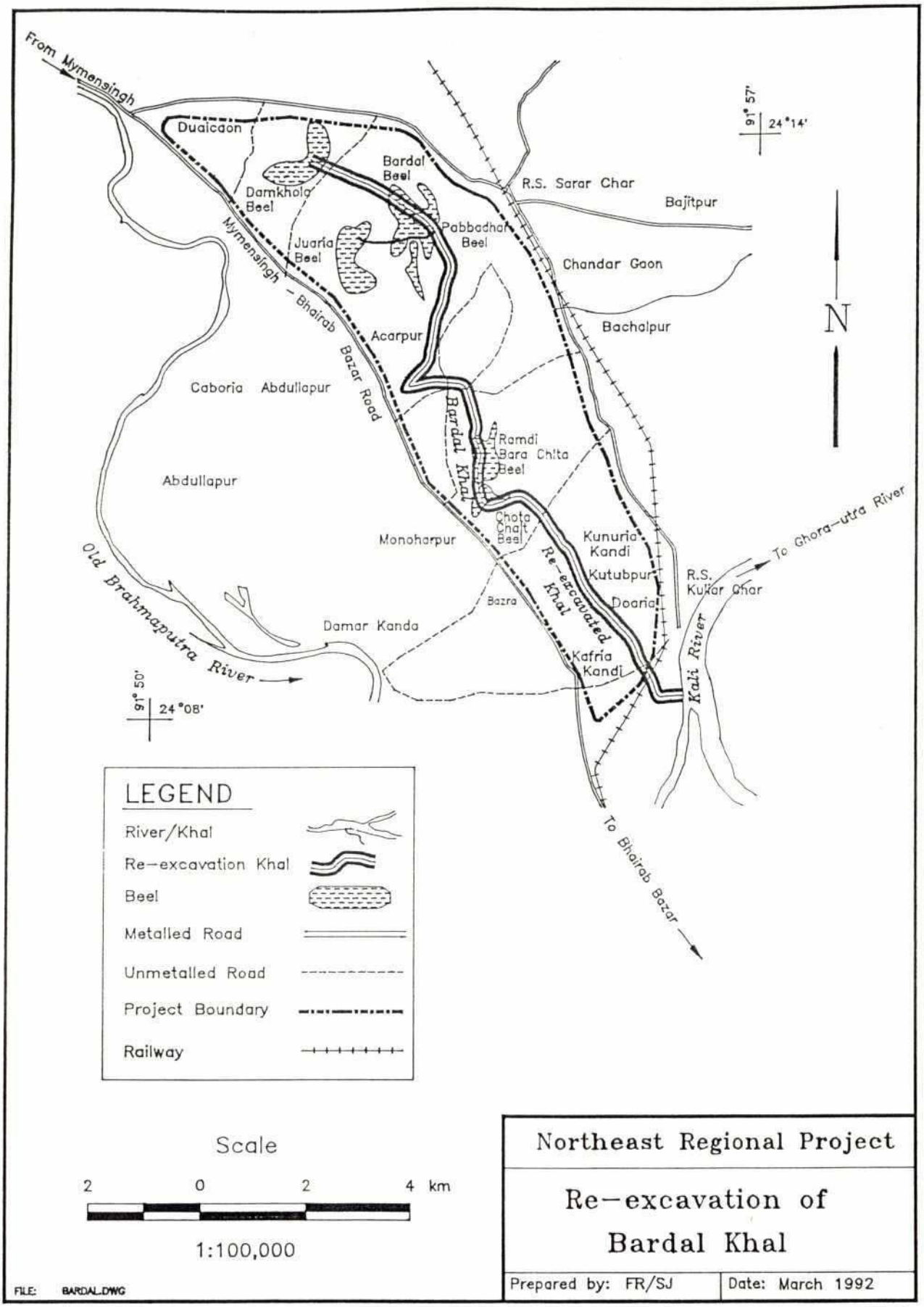
Regulators: The old regulators appeared to be in good condition. Farmers have reported that the gates leak but there are no visible signs of physical damage. Two new regulators (S-7 and S-8) have been completed and the remaining five regulators and the one culvert are under construction.

Production trends and project impacts on fisheries

Due to confinement by the embankments, the water level of the Manu River at Katarkona now increase by up to about 5m over a 24 hr period due to spate rainfall. Both turbidity and velocity are high. These new environmental conditions would not seem to be favorable for fisheries. Production has declined up to 25% during the monsoon, and a very negligible amount of fish is caught during the dry season. The low level of local production has led to fish being supplied from other parts of the district for local consumption. Due to the decline in fish abundance in the Manu River the fishermen of Tukli and Mathapura villages have changed their profession.

It is difficult to separate the impacts of this project from those of the Manu River Irrigation Project (see Appendix M), since they affect the upstream and downstream reaches, respectively, of the same river. The fish stocks can be assumed to move freely (or at least, had been able to move freely in the past) along the entire channel and out into the Kushiyara River. People in the Katarkona area are not getting any benefit from the barrage during the dry season due to the low water level, but the flood control embankments protect their houses and crops from the floods during the monsoon. People no longer catch large fish since the construction of the barrage.

413



LEGEND

- River/Khal
- Re-excavation Khal
- Beel
- Metalled Road
- Unmetalled Road
- Project Boundary
- Railway

Scale

2 0 2 4 km

1:100,000

FILE: BARDAL.DWG

Northeast Regional Project

Re-excavation of Bardal Khal

Prepared by: FR/SJ | Date: March 1992

L.5 RIVER AND KHAL RE-EXCAVATION PROJECTS

L.5.1 BARDAL KHAL RE-EXCAVATION

Project location and general data

District: Kishoreganj
Thana: Kuliarchar & Bajitpur
Project type: Drainage improvement
Status: Begun 1983, completed 1988
Gross area: 3,520 ha
Net area: 2,460 ha
Population: 37,050

Environment and engineering works

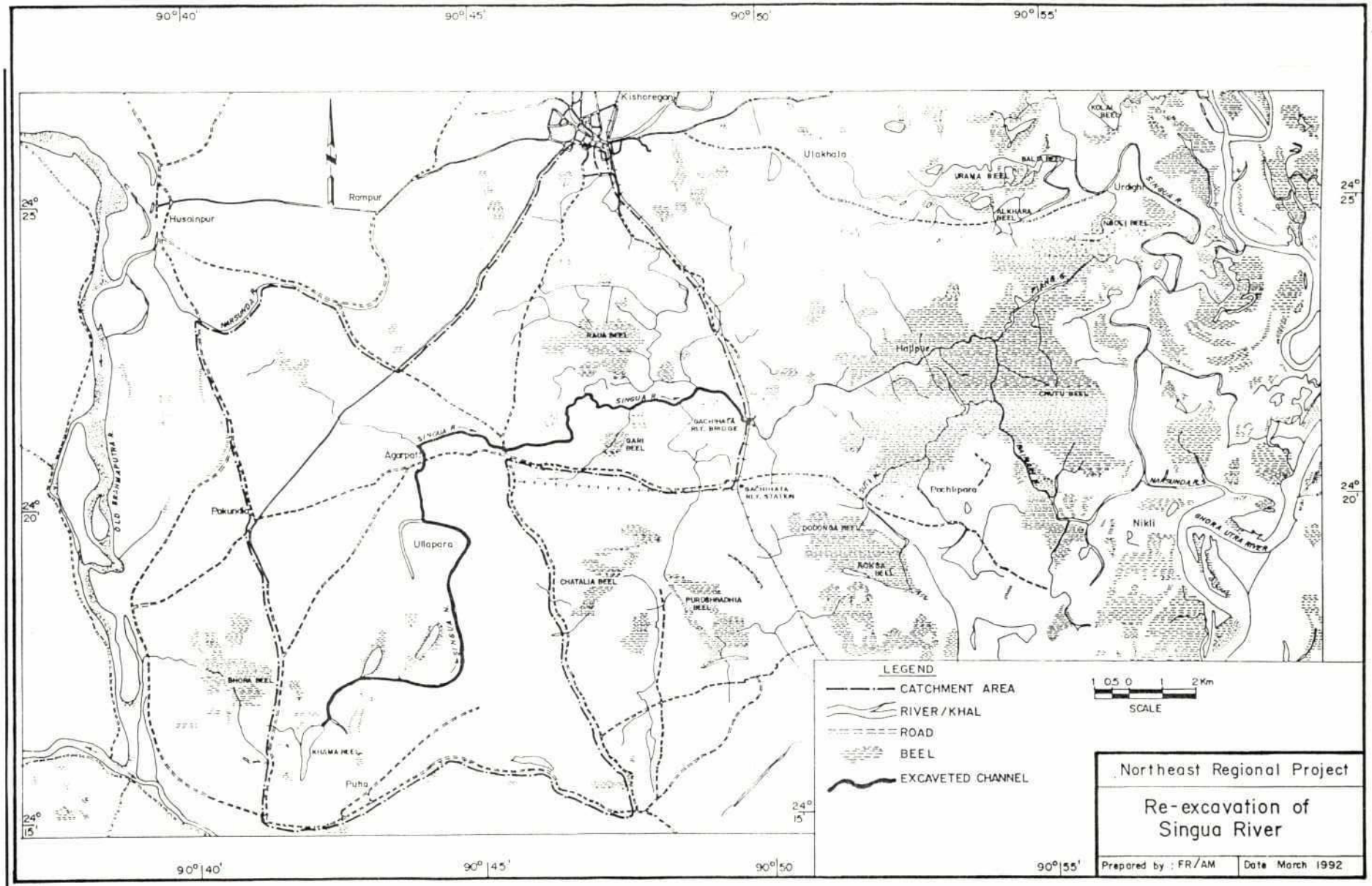
Hydrology: Bardal Khal falls into the Kali Nadi, a tributary of the Ghora-Utra (name of Upper Meghna along this particular reach), at the bottom of the Sylhet depression; the pre-monsoon flash floods are nearly spent by the time they reach the project area. During the pre-monsoon period, river levels are low and drainage is possible, but during the monsoon water backs up from the Meghna and the project area cannot drain. Post-monsoon, evacuation begins as soon as the Meghna starts to fall.

Project concept: The project objective was to improve drainage so that *boro* crops could be planted earlier, and to reduce pre-monsoon flood damage to this crop. The area drains to the southeast through Bardal Khal, and is bounded by road and railway embankments on all sides. There are several *beels* in the area. The project consisted of re-excavation of 16 kilometres of Bardal Khal, from Domkhola Beel in the northwest to Kalni Nadi in the southeast. In 1983-4, partial re-excavation was accomplished by EIP: 4 kilometres were fully re-excavated and the remaining 12 kilometres to higher than design bed level due to high ground water levels. In 1987-88, the remaining excavation was completed under FFW.

Engineering Works: Sections of the Bardal Khal that were visited during a field trip to Sararchar village have maintained good section.

Production trends and project impacts on fisheries

No fishermen were available to be interviewed during the field visit. Local people state that fishery activities have increased since re-excavation of the *khal*.


90°40'
90°45'
90°50'
90°55'
24°25'
24°20'
24°15'
Kishoregonj
Rampur
Husainpur
Pakundia
Agarpur
Ullapara
Ulakhola
Hajipur
Pachipara
Nikli
Urdighi
BHORA UTRA RIVER
SINGUA R.
NARSUNDA R.
PARAN R.
SINDURIA R.
KOLAI BEEL
URANA BEEL
BALIA BEEL
ALKHARA BEEL
NAOKI BEEL
RAJA BEEL
GARI BEEL
CHUTU BEEL
DODONGA BEEL
ROKSA BEEL
CHATALIA BEEL
PURBHADHIA BEEL
BHORA BEEL
KHUMA BEEL
Puba
GACHHATA RLY. BRIDGE
GACHHATA RLY. STATION
LEGEND
CATCHMENT AREA
RIVER/KHAL
ROAD
BEEL
EXCAVETED CHANNEL
1 0.5 0 1 2Km
SCALE
Northeast Regional Project
Re-excavation of Singua River
Prepared by : FR/AM
Date March 1992

L.5.2 SINGUA RIVER RE-EXCAVATION

Project location and general data

District: Kishoreganj
Thana: Pakundia and Katiadi
Project type: Drainage improvement
Status: Begun 1980, completed 1985
Gross area: 4,920 ha
Net area: 3,200 ha
Population: 53,770

Environment and engineering works

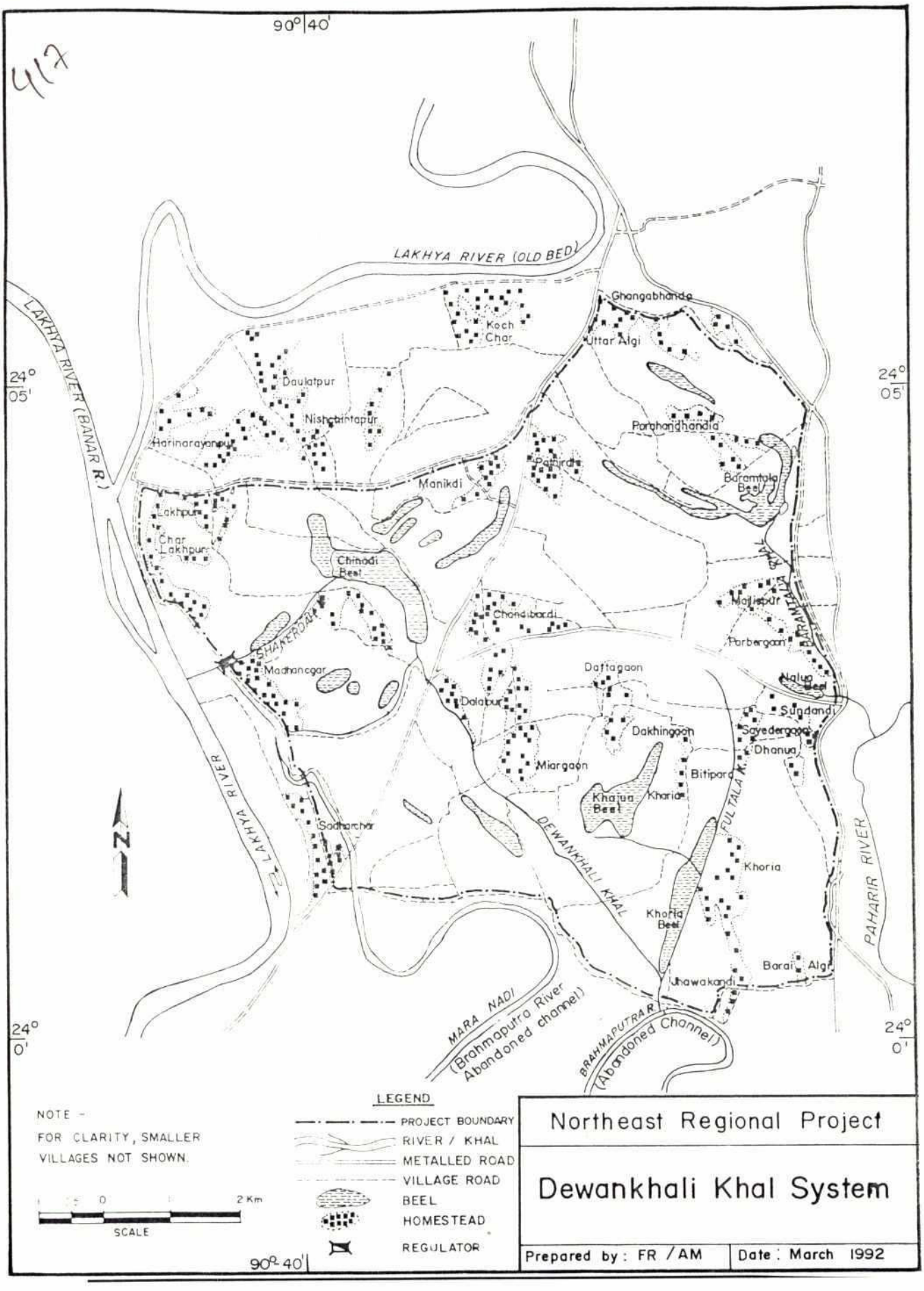
Hydrology: The Singua River, a spill channel of the Old Brahmaputra River, is the project area's main natural drainage channel. It inter-connects many *beels*, both directly and by side channels. Its flow has been totally cut off from the Old Brahmaputra due to heavy siltation at the offtake. Drainage capacity has been reduced by siltation, public encroachment, and farming in the channel bed on the upper reaches.

Project concept: The project objective is to alleviate drainage congestion by re-excavating Singua River from Khama *beel* to Gachihata Railway Bridge. In 1980, the project was initiated by BWDB. In 1985, re-excavation was completed.

Engineering works: The Singua channel was inspected at Maijhat. The channel is in good condition and seems to meet the design section.

Production trends and project impacts on fisheries

No fishermen were available for interview, but local people state that fish production increased after project implementation.


90°40'
LAKHYA RIVER (OLD BED)
LAKHYA RIVER (BANAR R.)
Koch Char
Ghangabhanda
Uttar Algi
Daulatpur
Nishchintapur
Harinarayanpur
Manikdi
Pathirda
Parghandhandia
Baramtola Beel
Lakhpur
Char Lakhpur
Chinadi Beel
Chandibardi
Majlispur
Parbergaon
Madhancgar
Daftagaon
Dalalpur
Nalua Beel
Sundandi
Dakhingaon
Sayedergaon
Dhanua
Miargaon
Bitipara
Khajua Beel
Khaira
Sadharchar
DEWANKHALI KHAL
FUL TALA K.
Khoria
Khoria Beel
PAHARIR RIVER
Barai Alga
Jhawakandi
MARA NADI
(Brahmaputra River Abandoned channel)
BRAHMAPUTRA R.
(Abandoned Channel)
24° 05'
24° 0'
N
NOTE -
FOR CLARITY, SMALLER VILLAGES NOT SHOWN.
0
2 Km
SCALE
LEGEND
PROJECT BOUNDARY
RIVER / KHAL
METALLED ROAD
VILLAGE ROAD
BEEL
HOMESTEAD
REGULATOR
Northeast Regional Project
Dewankhali Khal System
Prepared by : FR / AM
Date : March 1992

L.5.3 DEWANKHALI KHAL SYSTEM

Project location and general data

District: Narsingdi
Thana: Shibpur
Project type: Drainage improvement
Status: Begun 1989, completed 1990
Gross area: 2,700 ha
Net area: 1,600 ha
Population: 31,400

Environment and engineering works

Hydrology: Rainfall runoff from higher land drains down into the *beel*, which drains in turn through Shakerdah Khal into the Lakhya River, through Dewankhali Khal into an abandoned channel of the Old Brahmaputra, and through Baramtala Khal into the Paharia River. Flood water from the Old Brahmaputra can only enter the area from its major distributary the Lakhya, via Shakerdah Khal. The abandoned channel, once a spill channel of the Old Brahmaputra, now receives only local runoff. The Paharia is a hill stream originating near the project.

Project concept: The project objective is to relieve drainage congestion of accumulated pre-monsoon rainfall thereby preventing damage to *boro* crops. The project consists of re-excavation of four drainage channels. A regulator constructed in 1955 on Shekerdah Khal prevents river inflow and retains water in the dry season. Village roads along the rivers function as flood embankments. In 1955, a regulator was constructed by the Ministry of Irrigation on Shekerdah Khal at Madhanagar. In 1989-90, BWDB re-excavated Shekerdah Khal, Dewankhali Khal, Fultala Khal, and Baramtala Khal. Since then, BWDB desilts these canals every three to four years under FFW.

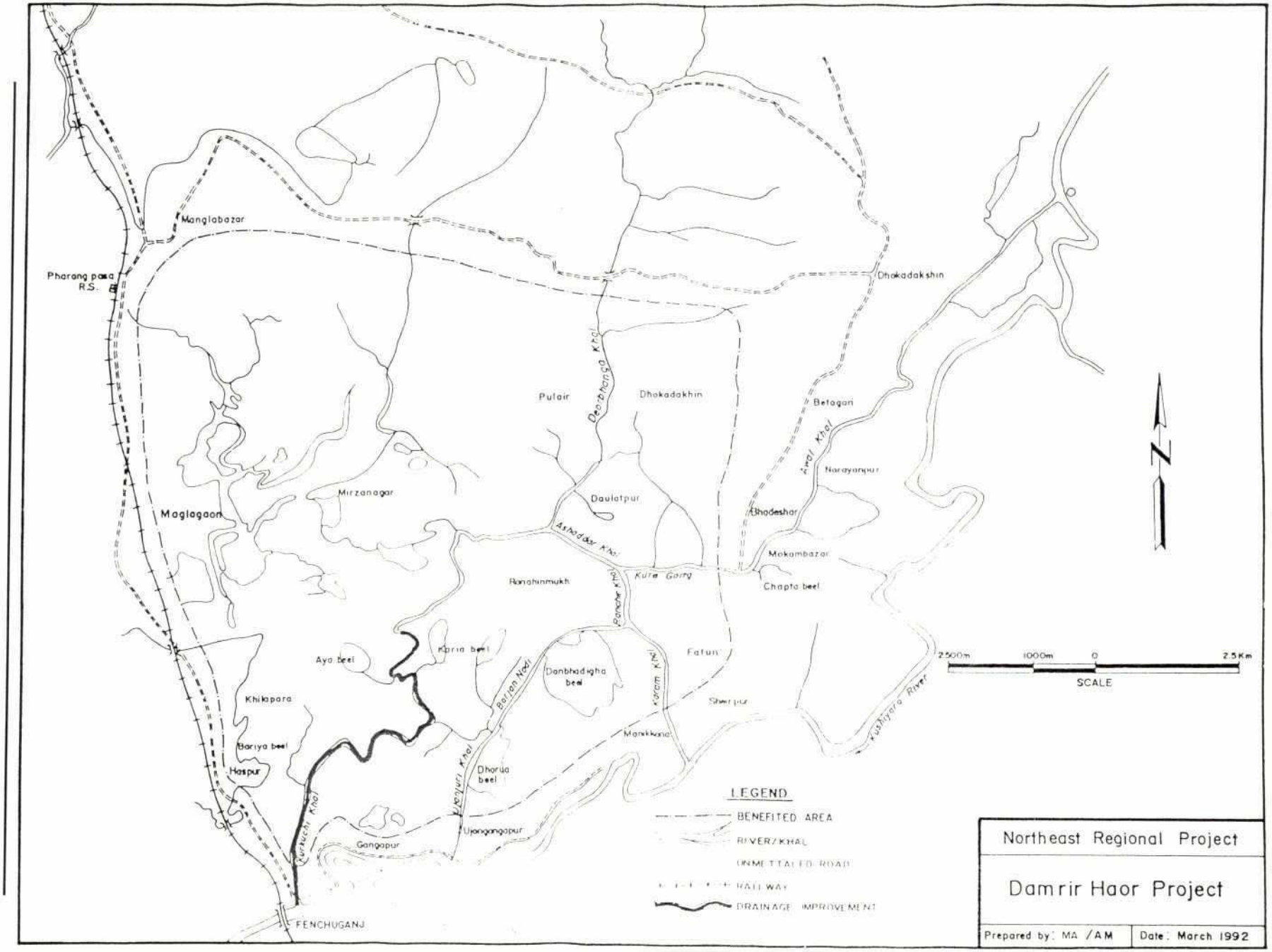
Regulator: The regulator, despite its age, is in good operational condition. It is fitted with vertical lift steel gates. Protective works on the country and river sides are in good condition.

Drainage channels: The drainage channels are in good condition, but water hyacinth growing in the channels is reducing their hydraulic capacity. These plants should be removed to restore the channels to their design capacity.

The road embankment has reportedly been breached at a few locations and minor repairs are required.

Production trends and project impacts on fisheries

Local people state that fish were not plentiful in the *beels* before the project, and that this is still the case.


Manglabazar
Pharang para R.S.
Maglagaon
Mirzanagar
Pulair
Dhakadakhin
Dhakadakshin
Daulatpur
Ranghinmukh
Aya beel
Karia beel
Danbhadigha beel
Khilapara
Hariya beel
Haspur
Dhorua beel
Gangapur
Ujangangapur
Mankkona
Fatun
Sherpur
Betagan
Narayanpur
Shadeshar
Mokambazar
Chapta beel
Kura Garg
Ashaddar Khal
Ranchar Khal
Barjan Nadi
Kusiyara River
FENCHUGANJ
2500m
1000m
0
2.5Km
SCALE
LEGEND
BENEFITED AREA
RIVER/KHAL
UNMETTALED ROAD
RAILWAY
DRAINAGE IMPROVEMENT
Northeast Regional Project
Damrir Haor Project
Prepared by: MA /AM
Date: March 1992

L.5.4 DAMRIR HAOR PROJECT

Project location and general data

District: Sylhet
Thana: Fenchuganj, Golabganj, Sylhet
Project type: Drainage
Status: Ongoing
Gross area: 18,212 ha
Net area: 7,285 ha
Population: 127,410

Environment and engineering works

Hydrology: The benefitted area is not well defined; roughly, it occupies the southwest part of Damrir Haor, and consists of the Kurkuchi Khal drainage basin, and part of the Ujanjuri Khal, Awal Khal, and Karam Khal basins. The area is bounded by the banks of the Kushiyara to the south and by high land, road and railway embankments elsewhere. Kurkuchi and Ujanjuri *khals* are open to the Kushiyara. Pre-monsoon flood water enters through the Kurkuchi before the *boro* harvest but does not cause significant damage. Flood water enters through the Ujanjuri after the harvest. Karam Khal is closed each year by a temporary cross-dam built by local people. These khals serve as high water spill channels of the Kushiyara River during the monsoon season. Any future development that changes Kushiyara water levels (e.g. confinement of Kushiyara River) will have a direct impact on internal water levels. The project area slopes generally to the southeast and drainage is effected through the Karam, Ujanjuri, and Kurkuchi Khals.

Water bodies: The project contains a number of low-lying beels which are frequently flooded by Kushiara River through the Kurkuchi Khal, Kura gang, Karam Khal and Ujanjur Khal. The beels/jalmohals are as follows: Kaisna, Chalnia, Dewdhar, Shebaramar Khal, Chatla, Agalpar, Badaura, Itna, Nolua, Shailka, Hashadubi, Showla, Barna, Awa, Sonadubi, Bachakuri, Kurkuchi, Baraawa, Hawachara, Patamedi and Dalarduba. Water resistant trees (now grown very large) were planted on the road sides of Sylhet-Fenchuganj highway. The main trees are Koroch, Barun, Mera, and Hizol. The trees were planted by the Roads and Highways authority to protect the road from waves of the Damrir haor on one side and Dubrir haor on the other. Now these trees not only protect the road, but have also created an unique shelter for the birds.

Project concept: The project purpose is to reduce damage to *boro* and *t. aman* crops by improving pre- and post-monsoon drainage. Re-excavating the Kurkuchi Khal will allow earlier planting of *boro* so that it can be harvested before pre-monsoon flash floods; and will relieve pre-monsoon rainfall flooding. In 1982, the re-excavation of Kurkuchi Khal was proposed by BWDB (Sylhet O&M Division). In 1983, the project was recommended for inclusion in the 1984 EIP program by an EIP appraisal mission. In 1984-6, it was implemented.

Initial re-excavation of 5.4 kilometres was completed in 1986. In 1990-1, FFW again re-excavated 3 kilometres of the original 5.4 kilometres and extended the excavated reach of the Khal by 0.85 kilometres to 6.25 kilometres in total. This was excavated only to 15 metre bed width, not the full 26 metre design bed width due to limited FFW wheat allocation. In the (1991-2) construction season, BWDB is re-excavating the 6.25 kilometres and extending the excavated reach of the Khal by 0.75 kilometres for a total excavated length of 7kilometres. This excavated width will again be 15 meters.

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Engineering works: The Kurkuchi Khal banks are mostly formed of clayey material. As such they are stable (little side-caving), and maintenance consists of straight-forward silt clearance.

Fishery resources

Presently abundant fish species are bheda, bacha, rani, guzi, mola, icha, air, kalibaus, boal, shoal, gazar, rui, catla, fali, chanda, chirka and baim. The following species are more or less extinct in the area: chital, mohashoal, nandin and pangas.

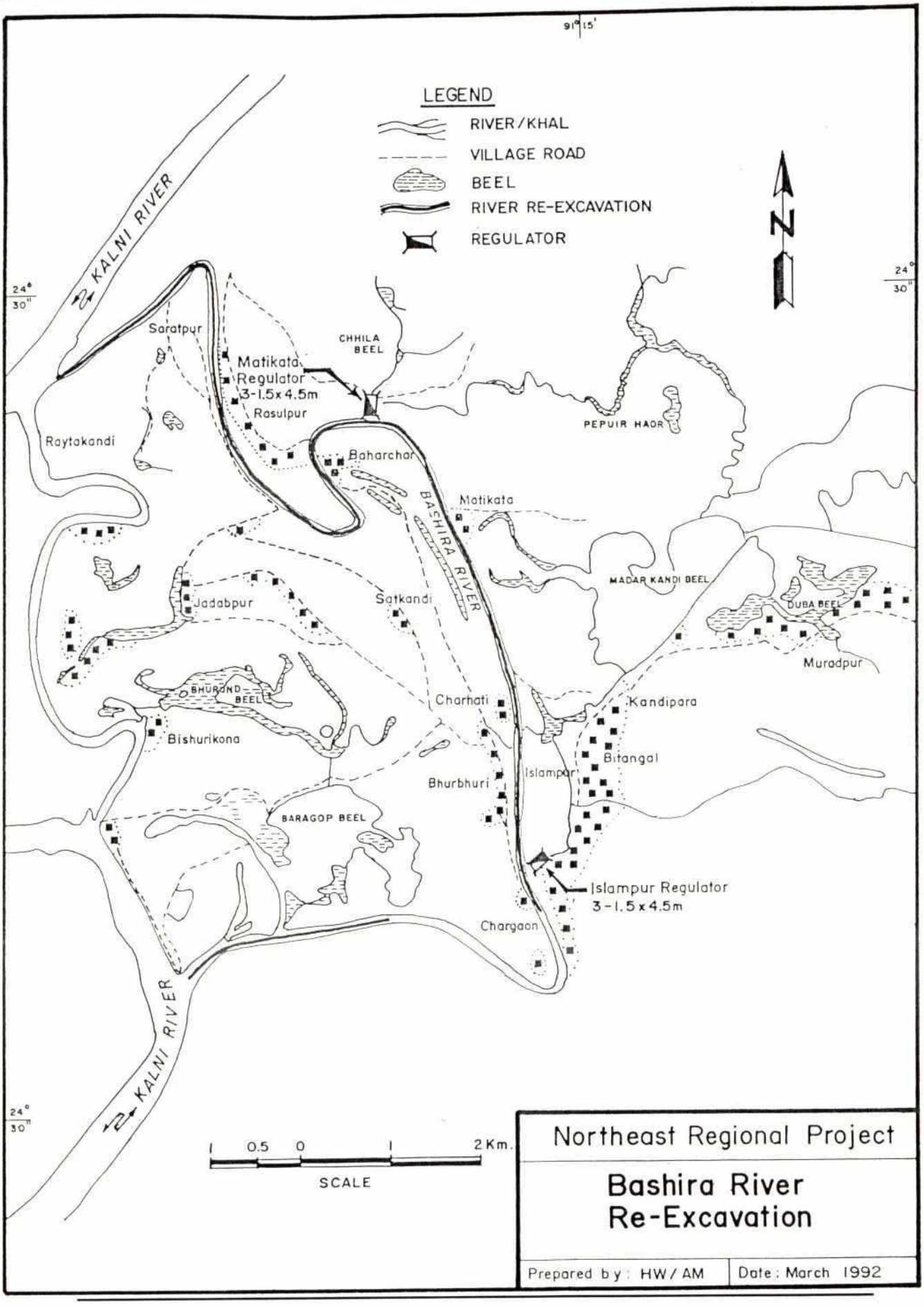
Fishing practices

Fishing gear used at present are Khora jal, Kona ber jal, Long line and Chai. In addition, current jal and chat jal are frequently used in Chatal beel area.

Production trends and project impacts on fisheries

Fishermen in the area say there has been no change in the fishery. At present the main problem of the area is siltation. During the flood, river waters carry large quantities of silt into the project. In the open areas silt has settled and results in frequent flooding during March and April. There is less water during the months of December and January.

Farmers say that Karam Khal and Ashadur Khal (an internal *khal* northwest of Karam Khal) have silted up and request that they be re-excavated.


91°15'
LEGEND
RIVER/KHAL
VILLAGE ROAD
BEEL
RIVER RE-EXCAVATION
REGULATOR
N
24° 30"
KALNI RIVER
Saratpur
Matikata Regulator 3-1.5x4.5m
Rasulpur
CHHILA BEEL
PEPUIR HAOR
Raytakandi
Baharchar
Matikata
BASHIRA RIVER
MADAR KANDI BEEL
DUBA BEEL
Muradpur
Jadabpur
Satkandi
BHURAND BEEL
Charhati
Kandipara
Bishurikona
Bitangal
Islampur
Bhurbhuri
BARAGOP BEEL
Islampur Regulator 3-1.5x4.5m
Chargaon
KALNI RIVER
0.5 0 1 2 Km.
SCALE
Northeast Regional Project
Bashira River Re-Excavation
Prepared by: HW/AM
Date: March 1992

L.5.5 BASHIRA RIVER RE-EXCAVATION

Project location and general data

District: Habiganj
Thana: Ajmiriganj and Baniachong
Project type: Flood control drainage and irrigation
Status: Completed
Gross Area: 7,150 ha
Flood Control area: 1,900 ha
Irrigation area: 1,600 ha
Population: 32,310

Environment and engineering works

Hydrology: The Bashira River is a left bank loop channel of the Kalni River which is the lower reach of the Kushiyara River. It is located near the Barak-Khowai Rivers outfall into the Kalni River. During the pre-monsoon season, the flood regime of the Bashira is governed by the Kushiyara River. During the monsoon season, the Bashira River area is also flooded from overbank spill of the Barak-Khowai River. Hydrology in the area is also influenced by backflows from the lower Meghna and it remains inundated through August and September.

Water bodies: 10-12 years before there were a number of beel/jalmohals (including three river duars) within the area. At present most of the jalmohals are silted up. Water colour was found to be muddy with silt.

Project concept: The Project was conceived to prevent pre-monsoon flooding, to provide efficient controlled post-monsoon drainage and water retention for irrigation. The project area is low-lying with several *beels* and *haors* and is bordered to the south and west by the Kalni and Bashira Rivers. These rivers have high banks which do not overtop but deliver water into the Project area by smaller channels; namely, the Matikata and Islampur Khals. Water enters the Project area via these *khals* and damages the standing *boro* crop. Two regulators, each having three vents, were constructed across these khals to prevent entry of pre-monsoon floods and to retain water at the end of the monsoon as required, and the khals were re-excavated to improve drainage. The need for improved drainage was recognized by BWDB in the early 1980's. Matikata and Islampur Khals were re-excavated in 1981-82 as part of the Food-For-Work program. With the completion of this initial work, it was apparent that additional work would be required. BWDB proposed that regulators be installed at Islampur and Matikata Khals under IDA (Credit 955-BD). Construction started in 1984 and the regulators were completed in 1988. Also during this time period (1983-1988), re-excavation of the Bashira River was carried out through the Food-For-Work program.

Engineering works: There are no flood embankments in the project area. The Kalni and Bashira River banks contain most of the pre-monsoon floods. The banks along the interior *khals* have also been raised by re-excavated spoil material. Matikata Regulator has three vents, each 1.5 meters wide by 4.5 meters high. This structure is out of operation. Farmers use earth to retain water in place of the wooden fall-boards which are missing. The Islampur Regulator is the same size and design as the Matikata Regulator. There are no wooden fall-boards at the site and this structure too is out of operation. The closure on Islampur *khal* was breached in 1989 and has

not yet been repaired. Regulators of the type found in the Bashira Project are commonly used within many of the *haor* projects. They are designed to prevent inflow of pre-monsoon floods and following *boro* harvest the fall-boards are removed and water is allowed to enter the basin. This is to equalize water levels on both sides of the embankment before it is overtopped by the pre-monsoon flood. During the monsoon, the regulator remains open. In the post-monsoon season, after the basin water has drained to a desired level, the fall-boards are installed to retain water for winter irrigation. The hydraulic and the structural designs are adequate but the operation of the fall-boards is difficult. It is relatively easy to install fall-boards at the end of the monsoon season for water retention, because water depths are low. However, to remove them during the early monsoon when water depths can exceed several meters is generally not possible. Hence the design flushing capacity of the regulator is not fully utilized.

Fishery resources

Before silting up of the river, the following species were abundant within the project area: boal, ghagot, rui, ghonia, chapila, kajuli, batashi, chela, poa and golda chingri. In the winter, all species are very scarce except for boal. During the flood, season most of the smaller varieties are still present, but abundance is very reduced.

Fishing practices

Current jal, Konaber jal, thela jal, jhaki jal, chai and long lines are the main gears used in the open water. Catch records are given below:

Table L34: Daily Catch by Gear

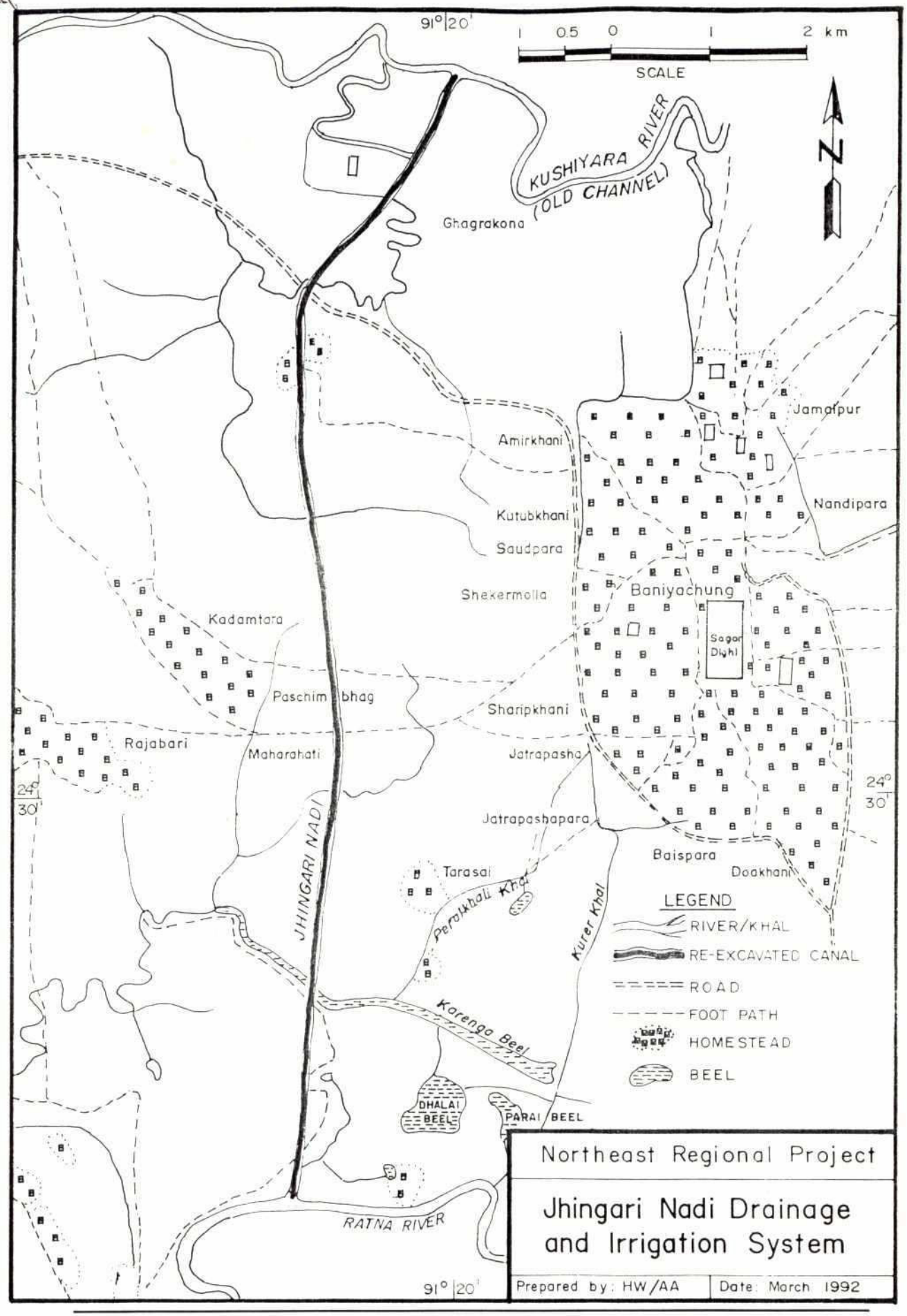
Gear Type	Species Caught	Daily Catch (per gear unit)
Current jal	Carp fry, Puti, Shingi, Magur, Cheng, Lati, Ghagot	2-5 kg (night time)
Konaber jal	Chela, Chapila, Carp fry, Kaikka, Icha	4-5 kg (daytime)
Jhaki jal	Tengra, Lati, Cheng	1-2 kg (daytime)
Thela jal	Icha, Chanda	0.5-1 kg (daytime)
Chai	Golda chingri, Tengra	1-3 kg (day and night time)

Project beneficiary villages are Demikandi, Roshulpur, Anandapur, Rahela, Matikata, Bethongol, Sreemongalkandi, Baharchar, Biramchar, Boirati and Kumri.

Production trends and project impacts on fisheries

There are no flood embankments in the project area. It is a river re-excavation project which should in theory have a positive impact on fisheries as the river bed will hold more water round the year. However fishermen have reported that there has been a decline in the fish catch from the *beels of* possibly 50% over the last three years. They stated that fish disease was the main

cause for the decline. Other probable causes include sedimentation, over-exploitation and violation of the fish regulations. Most of the people of Ajmiriganj and Baniachong have stated that a submersible embankment around the haor is not a permanent solution for flood protection and keeping the environment as it was. They put emphasis on river re-excavation projects as 40-50 years before there was no early flooding in the area. They also maintain that river re-excavation and river straightening process will increase the water storage capacity within the river. As a result water flow should sharply increase and ultimately mitigate the sedimentation process in the area. Sedimentation in this area has increased after the construction of flood protection structures further upstream.


91°|20'
1 0.5 0 1 2 km
SCALE
N
KUSHIYARA RIVER (OLD CHANNEL)
Ghagrakona
Jamalpur
Amirkhani
Nandipara
Kutubkhani
Saudpara
Shekermolla
Baniyachung
Sagar Dighi
Kadamtara
Paschim bhag
Sharipkhani
Rajabari
Maharahati
Jatrapasha
24° 30'
Jatrapashapara
Baispara
Doakhani
Tarasai
JHINGARI NADI
Perokhali Khal
Kurer Khal
Karenga Beel
DHALAI BEEL
PARAI BEEL
RATNA RIVER
LEGEND
RIVER/KHAL
RE-EXCAVATED CANAL
ROAD
FOOT PATH
HOMESTEAD
BEEL
Northeast Regional Project
Jhingari Nadi Drainage and Irrigation System
Prepared by: HW/AA
Date: March 1992

L.5.6 JHINGARI NADI DRAINAGE AND IRRIGATION SYSTEM

Project location and general data

District: Habiganj
Thana: Baniachung
Project type: Drainage and irrigation
Status: Completed
Gross Area: 4,260 ha
Net area: 3,600 ha
Population: 18,960

Environment and engineering works

Hydrology: The Jhingari Nadi canal is about 30 meters wide and 11 kilometers long. Historically, the old Kushiyara and the Ratna Rivers had separate drainage basins, divided by slightly higher land near Kadamtara village. Two drainage systems still exist: the *khals* which drain the *beels* in the northern part to the Kushiyara River; and the *beels* in the southern part which drain to the Ratna River. At present, Jhingari canal flows in one direction: to the south. During the monsoon period the whole area, with the exception of Baniachung town, is deeply flooded.

Project concept: The project was conceived to improve the drainage of low lying *beels* in the area and to enhance surface water availability for winter season irrigation. This was to be accomplished by re-excavating the Jhingari Nadi. This is a small Project and consists of the area on both banks of the Jhingari Nadi which is about 11 kilometers in length and which passes adjacent to or through *beels* such as *Karenga Beel*, *Dhalai Beel*, and *Parai Beel*. The Jhingari Nadi connects the old Kushiyara River channel in the north with Ratna River in the south. The channel is also a source of water for low lift pumps irrigating *boro* paddy along the channel banks. The Jhingari Nadi canal was first excavated with Food For Work assistance in 1974-78 under the then Government's Canal Digging Program. Neither feasibility studies nor planning reports are available, even at the offices of the Habiganj Water Development Division. Re-excavation of Jhingari Nadi is being studied with a view to including it under the Systems Rehabilitation Project.

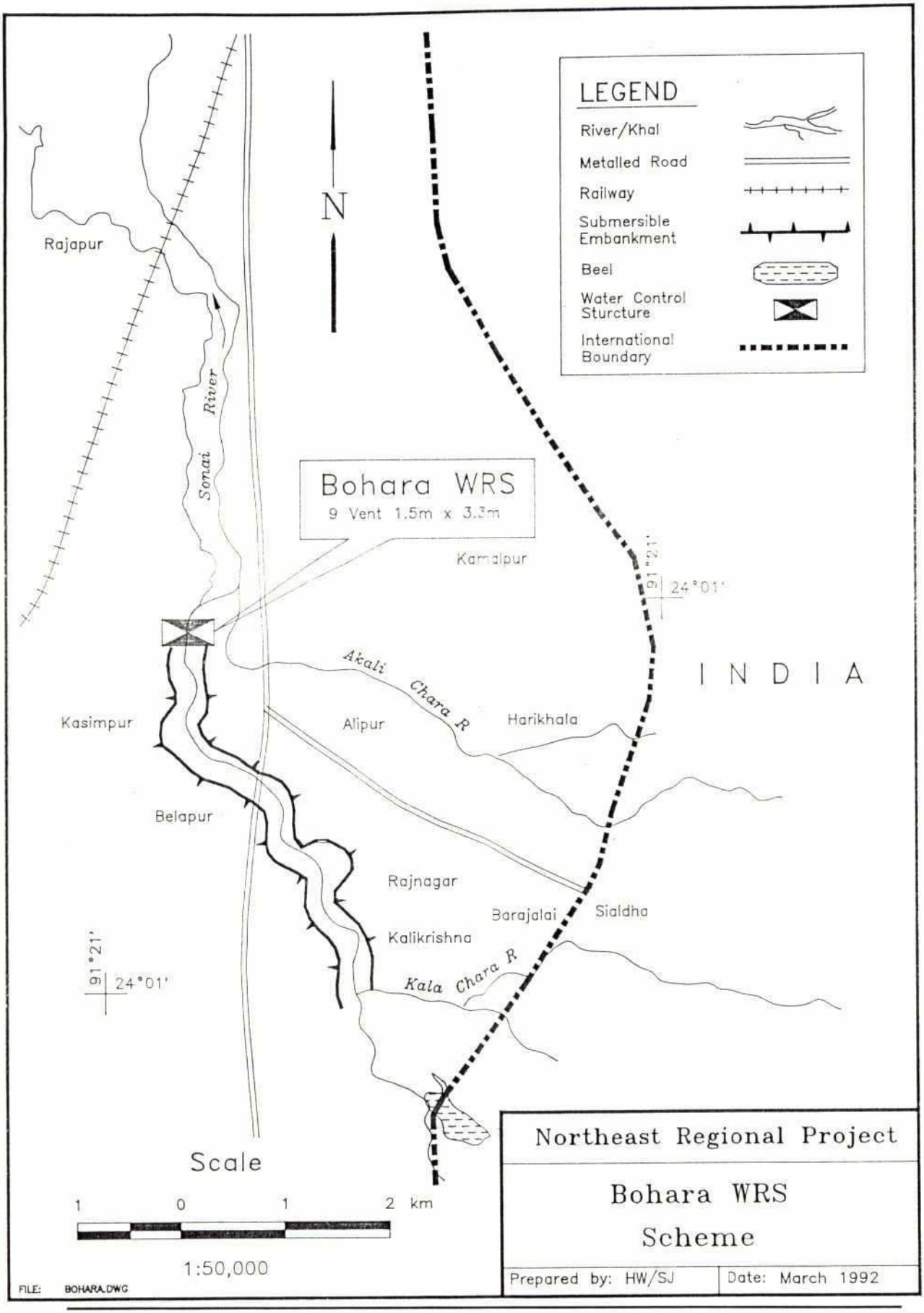
Engineering works: Local people claim that the canal is silted at both ends and hence, post-monsoon drainage from the area is slow.

Fishing practices

There are no major fisheries in the project area. A few of the perennial *beels* in the area are leased out by the local government authorities.

Production trends and project impacts on fisheries

Fishermen at the *beels* have stated that there has been a decline in the fish population. They attribute the decline mainly to fish disease.


LEGEND
River/Khal
Metalled Road
Railway
Submersible Embankment
Beel
Water Control Sturcture
International Boundary
N
Rajapur
Sonai River
Bohara WRS
9 Vent 1.5m x 3.3m
Kamalpur
91°21'
24°01'
INDIA
Akali Chara R
Kasimpur
Alipur
Harikhala
Belapur
Rajnagar
Barajalai
Sialdha
Kalikrishna
Kala Chara R
Scale
1 0 1 2 km
1:50,000
FILE: BOHARA.DWG
Northeast Regional Project
Bohara WRS
Scheme
Prepared by: HW/SJ
Date: March 1992

L.6 WATER RETENTION STRUCTURE PROJECTS

L.6.1 BOHARA WRS SCHEME

Project location and general data

District: Habiganj
Thana: Madhabpur
Project type: Irrigation
Status: Completed
Gross Area: 285 ha
Net area: 210 ha
Population: 2,030

Environment and engineering works

Project concept: The project concept was to retain water in the Sonai River for winter season irrigation by constructing a Water Retention Structure. About 100 hectares adjacent to the structure were intended to benefit from gravity irrigation through small irrigation inlets constructed in the embankments, while about 110 ha located further upstream was to be irrigated using low lift pumps. Historically, farmers constructed five temporary, earthen cross-dams on the Sonai River to retain water for winter irrigation. The small cross-dams would wash out annually during pre-monsoon storms releasing the ponded water. All to often, this occurred well before the *boro* crop was harvested, leaving the farmers with their crops susceptible to drought damage. The farmers requested the Bangladesh Water Development Board to provide a more secure solution. With Food For Work, in 1982 and 1983, the BWDB constructed 6.0 kilometres of flood embankments (about 3 kilometres on each river bank). These embankments, originally intended to protect *boro* crops from pre-monsoon flash floods, would also retain river water for irrigation. Then, to replace three of the earthen cross-dams, a water retention structure (nine vent, 1.5 meters x 2.7 meters) was constructed at Bohara on the Sonai River during 1984-86. This was financed under IDA Credit 955-BD. The structure design dictated that two hundred wooden fall-boards would be used to retain water. In March 1986, the local farmers requested that the fall-boards be replaced by a gate system, which would be easier to operate. The Project was subsequently modified. The modifications included the installation of steel gates, construction of an operation deck, construction of two additional irrigation inlets, and structural repairs. This work was financed under IDA Credit 1870-BD in 1989/90.

Structure: The scheme was inspected on 15 January 1992. The Bohara WRS has nine rectangular vents in the centre and three triangular vents on each side, positioned on the sloping wing walls. There have been many structural failures in Bangladesh with this type of design and an updated design is used for newer structures. The structure size appears adequate. Under a rehabilitation program, steel gates were provided for the nine rectangular vents, but the side vents were not modified and the wooden fall boards were retained. In early 1992, the steel gates were in place, the side vents were closed with rectangular fall boards and covered with earth on the upstream side.

At the time of the field visit, it was observed that a one metre depth of water was retained in the channel, and the gravity intakes were about 0.5 meters above the water line. Farmers and BWDB officials have stated that water cannot be retained because of excessive leakage through the gates. However, the gate seals appear adequate (there was about 2 to 3 l/s leakage in only two out of nine gates) and there was no leakage over the triangular side closures. Local farmers also blame upstream withdrawal for the shortage of irrigation water.

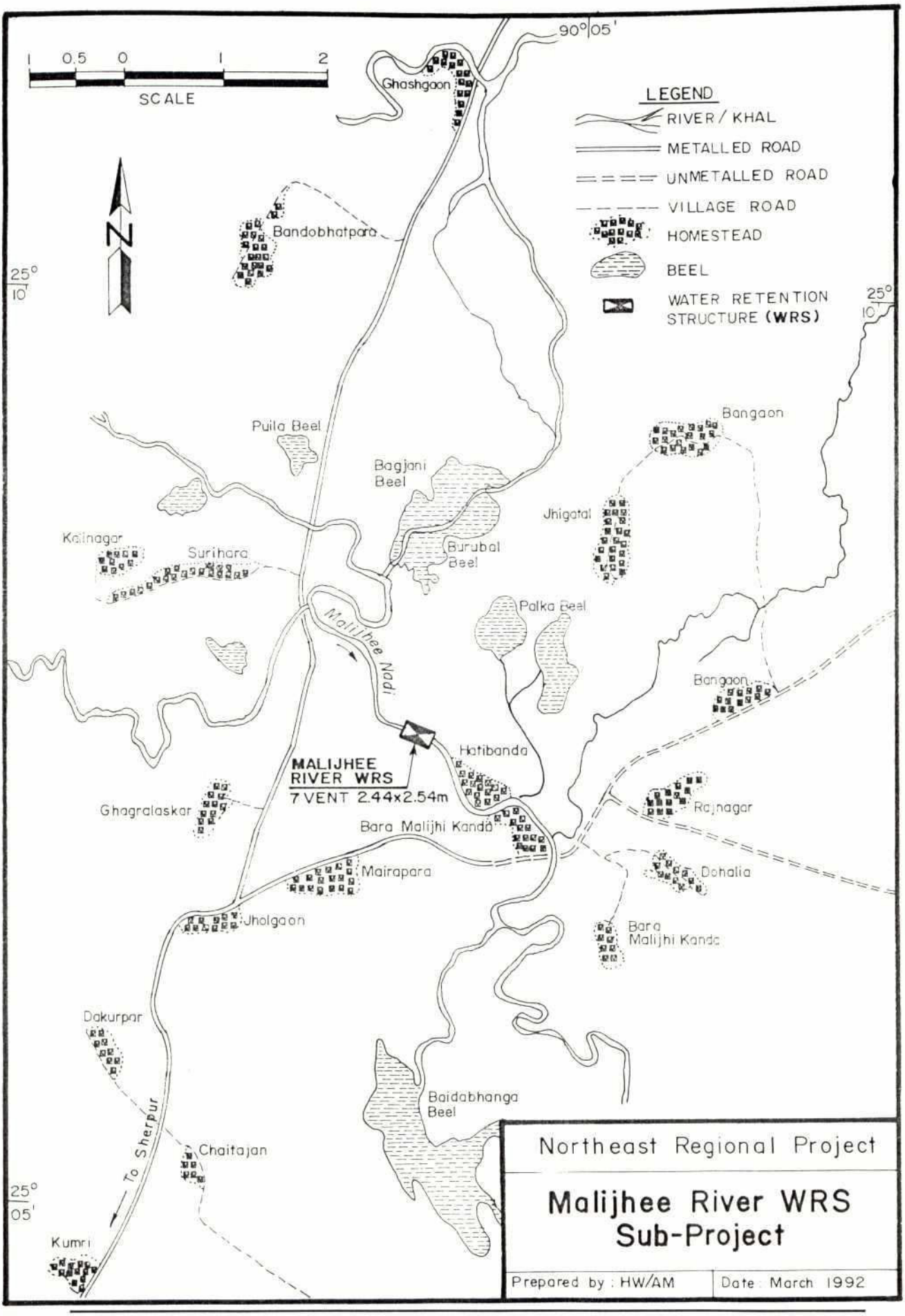
Embankment: The embankment on the left bank of Sonai River is eroding approximately 100 meters upstream of the structure (over a length of about 80 meters). Downstream of the structure on the right bank, the brick protective work has been eroded. BWDB have proposed that the embankment be repaired and that the gates be replaced. There appears to be no need to replace all the gates, but remodelling of the side vents to accommodate rectangular gates could serve a useful purpose. The gates could then be closed earlier at the end of the monsoon, thereby retaining more water when the river flow is higher.

Fishing practices

There is little fishery activity in the project area.

Production trends and project impacts on fisheries

The structure appears not to have altered the fish habitat in the Sonai River.


1 0.5 0 1 2
SCALE
90°05'
Ghashgaon
LEGEND
RIVER / KHAL
METALLED ROAD
UNMETALLED ROAD
VILLAGE ROAD
HOMESTEAD
BEEL
WATER RETENTION STRUCTURE (WRS)
N
25° 10'
Bandobhatpara
Puila Beel
Bagjani Beel
Kalnagar
Surihara
Burubal Beel
Jhigatal
Bangaon
Palka Beel
Malijhee Nadi
MALIJHEE RIVER WRS
7 VENT 2.44x2.54m
Hatibanda
Ghagralaskar
Bara Malijhi Kanda
Rajnagar
Mairapara
Dohalia
Jholgaon
Bara Malijhi Kanda
Dakurpar
To Sherpur
Baidabhanga Beel
Chaitajan
25° 05'
Kumri
Northeast Regional Project
Malijhee River WRS Sub-Project
Prepared by : HW/AM
Date : March 1992

L.6.2 MALIJHEE RIVER WRS SUB-PROJECT

Project location and general data

District: Jamalpur
Thana: Jhenaigati
Project type: Drainage and irrigation
Status: Completed 1986
Gross area: 6,650 ha
Net area: 2,820 ha
Population: 40,780

Environment and engineering works

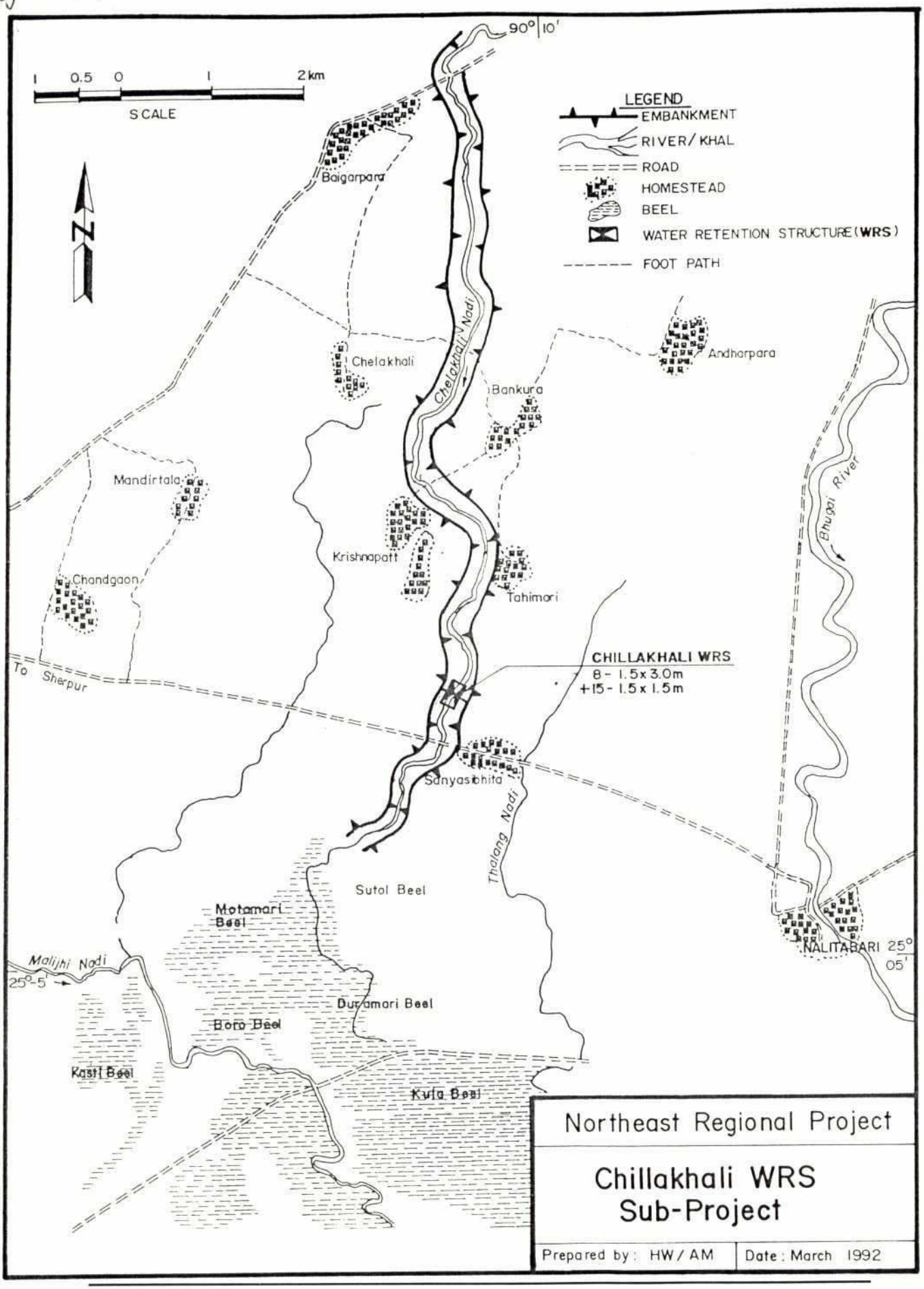
Hydrology: The Malijhee River is a flashy river originating in the Garo hills in India. Flooding is not considered a major problem in the area, though occasionally flash floods do spill over the banks causing some damage to standing crops. Irrigation water shortage limits the expansion of winter cropping and appears to be the main constraint to increased agricultural production. A large area is being irrigated by shallow tube wells and deep tube wells, however, which is more reliable than low lift pump irrigation. Siltation is not presently a problem in the Malijhee basin. The Ranjana-Malijhee Project proposal to embank the lower section of the Malijhee may adversely affect the Malijhee basin upstream of the WRS: the confinement may cause flood levels to rise, exposing a larger area of the basin to flood damage.

Project concept: A water retention structure was constructed on the Malijhee River to restore/enhance water availability to low lift pump and manual lift irrigation during the dry season. Previously the river had been re-excavated to improve drainage, which lowered water levels in the channel during the irrigation season. In 1979-80, the Malijhee was re-excavated by BWDB under FFW (Order No. NE-/71). During Feb 83-Jun 86, a seven-vent (2.44m x 2.54m) water retention structure constructed on the Malijhee.' In Apr 88, repairs were completed of monsoon damage that occurred in Aug 86: the channel closure and protective blocks were washed away and the wing walls undermined. During 9-12 May 88 flash floods, the gates were not opened and the structure was damaged again. This damage has not yet been repaired. Additional development is being proposed for the vicinity of the Malijhee WRS. In 1989, a feasibility report for the "Ranjana-Malijhee FCD Sub-project" was prepared for the BWDB Small Schemes Project. This project consists of embankments on Ranjana Khal east of the Malijhee WRS basin; embankments on the Malijhee downstream from the WRS; flushing and drainage regulators; an irrigation canal to divert water from the Malijhee at the existing WRS, and re-excavation of drainage *khals*.

Engineering works: The monsoon flood damage in 1986 suggests that the WRS is too small.

Fishing practices

There are no commercial fisheries in the project area.


90° 10'
1 0.5 0 1 2km
SCALE
N
LEGEND
EMBANKMENT
RIVER/ KHAL
ROAD
HOMESTEAD
BEEL
WATER RETENTION STRUCTURE (WRS)
FOOT PATH
Baigarpara
Chelakhali
Chelakhali Nadi
Bankura
Andharpara
Mandirtala
Krishnapatt
Tahimari
Chandgaon
Bhugai River
To Sherpur
CHILLAKHALI WRS
8 - 1.5x3.0m
+15 - 1.5x1.5m
Sanyasibhita
Thalang Nadi
Sutol Beel
Motamari Beel
Malijhi Nadi
25°-5'
Duramari Beel
Boro Beel
Kasi Beel
Kuta Beel
NALITABARI
25° 05'
Northeast Regional Project
Chillakhali WRS Sub-Project
Prepared by: HW/AM
Date: March 1992

L.6.3 CHILLAKHALI SUB-PROJECT

Project location and general data

District: Jamalpur
Thana: Nalitabari
Project type: Flood control and irrigation
Status: Completed
Gross Area: 1,440 ha
Net Area: 1,200 ha
Population: 7,860

Environment and engineering works

Hydrology: All the piedmont rivers tend to carry high sediment loads during floods — the amount being proportional to water depth and discharge. Embankments tend to concentrate sediments within the rivers channel. This tends to raise bed levels and when there is a breach, large volumes of sediment are deposited on agriculture land. Aggradation is taking place along the Chillakhali River channel within the embanked floodway. It appears that the river is aggrading at the same rate upstream and downstream of the water retention structure. The channel bed, between the embankments, is now about 1.5 metres higher than the protected land outside the embankments. Sections of the river upstream of the water retention structure were surveyed in 1985. At that time, the river channel bed and the ground elevation outside the embankment were of an equal level. River aggradation, upstream of the structure, was observed during construction of the water retention structure in 1987. However, at that time, there was little siltation in the river downstream of the road bridge, which was not embanked. At present, not two years after embankment completion, channel conveyance capacity has been severely impaired by sediment deposition.

Project concept: The Project was constructed to control flash floods, reduce sediment deposition on arable land, and to provide winter season irrigation facilities. To achieve these goals, embankments were constructed along both banks of the Chillakhali River and a water retention structure was constructed across the channel. Chillakhali River is a perennial river which originates in the Assam hills. The steep catchment and intense rainfall result in flash floods carrying large volumes of sediment. Historically, farmers would construct earthen cross-dams to impound water for irrigation but the often un-seasonal flash floods would destroy these dams. The ponded water behind the dams would be released making it impossible to irrigate crops through the remainder of the season, standing crops would be inundated for a period of time, and large volumes of sediment deposited on the fields. At the request of local farmers, about 14 kilometres of embankments were constructed along the Chillakhali River from Sanyashivita village to Tajurabad village in 1981/82. The work carried out by BWDB under the Food-for-Work program

In August 1982, BWDB proposed that a permanent water retention structure be constructed over the Chillakhali River at Kachubari and that four irrigation inlets be included in the embankments for gravity irrigation. An eight vent, three metre high water retention structure was completed in 1985 under IDA Credit 955-BD. The early monsoon floods (of 1985) did not damage the structure, but in August that year the structures protective works were destroyed by the peak floods. The embankments were also breached in three places downstream of the structure, and

938

'the closure on the original channel was washed out. In 1985/86, damage to the water retention structure was repaired and the closure was rebuilt. However, as the closure was re-constructed with mostly sandy material, it failed again during the 1986 monsoon flood. The structure design was reviewed and a further, 15 vents (1.5 meter wide by 1.5 meter high) were added to the original structure during 1986-88. During 1988-90, the flood embankments were extended about seven kilometres further downstream to the Sherpur road crossing at Gullarpar.

Engineering works: The water retention structure (original 8-vent plus additional 15-vent) is in good structural condition, but it is not being utilized. Stop logs were installed in the first year after the structure was completed. Since the structure does not include an operating deck, the stop logs are extremely difficult to remove. It is most likely that the local farmers abandoned the structure as it was impractical to handle the large number of stop logs.

Farmers subsequently reverted to building temporary, earthen cross-dams to retain river water for irrigation. A Jamalpur BWDB engineer indicated that the Local Project Committee is unable to operate the structure due to social problems. Specifically, several local groups are more interested in constructing their own dams and charging fees from the local farmers than in utilizing the BWDB structure. The irrigation inlets have been silted up and are no longer operable. The flood embankments upstream of the water retention structure and downstream of the road bridge are in good condition. However, the intermediate embankment (between the water retention structure and the bridge) is being severely eroded by the river at several locations.

Fishery resources

There are no fisheries in the project area.