

Appendix 1

Andhra Pradesh (India) – Coastal Aquaculture Mission

TERMS OF REFERENCE

The mission will explore the possibilities of coastal aquaculture development in Andhra Pradesh as to suitable locations, species, seed supply and culture techniques, with special reference to shrimp culture, and will in particular:

- (i) review the activities in shrimp/fish culture by the state of Andhra Pradesh, make recommendations for improvements/further development of ongoing activities and provide technical advice as required, with particular reference to engineering aspects in regard to the activities currently being proposed for implementation;
- (ii) identify a compact geographical area with good potential for coastal aquaculture development and within such area a suitable location for establishing a pilot project for experiment! demonstration of shrimp culture, possibly in combination with finfish in coastal brackish-water ponds, for the benefit of small-scale fish farmers. It is envisaged that planning for the extensive development small-scale pond farming in the identified area will also be undertaken in due course through the pilot project;
- (iii) outline the requirements for establishment and operation of the pilot project with specification of
 - physical facilities
 - technical assistance
 - personnel and organisational set-up
 - training
 - capital and operating costs.

In assessing the requirements, the mission will particularly keep in view the land policies of the government vis-a-vis aquaculture development and the need to develop and demonstrate technology appropriate to the small-scale sector with optimum utilisation of locally available resources and skills.

Appendix 2

ITINERARY

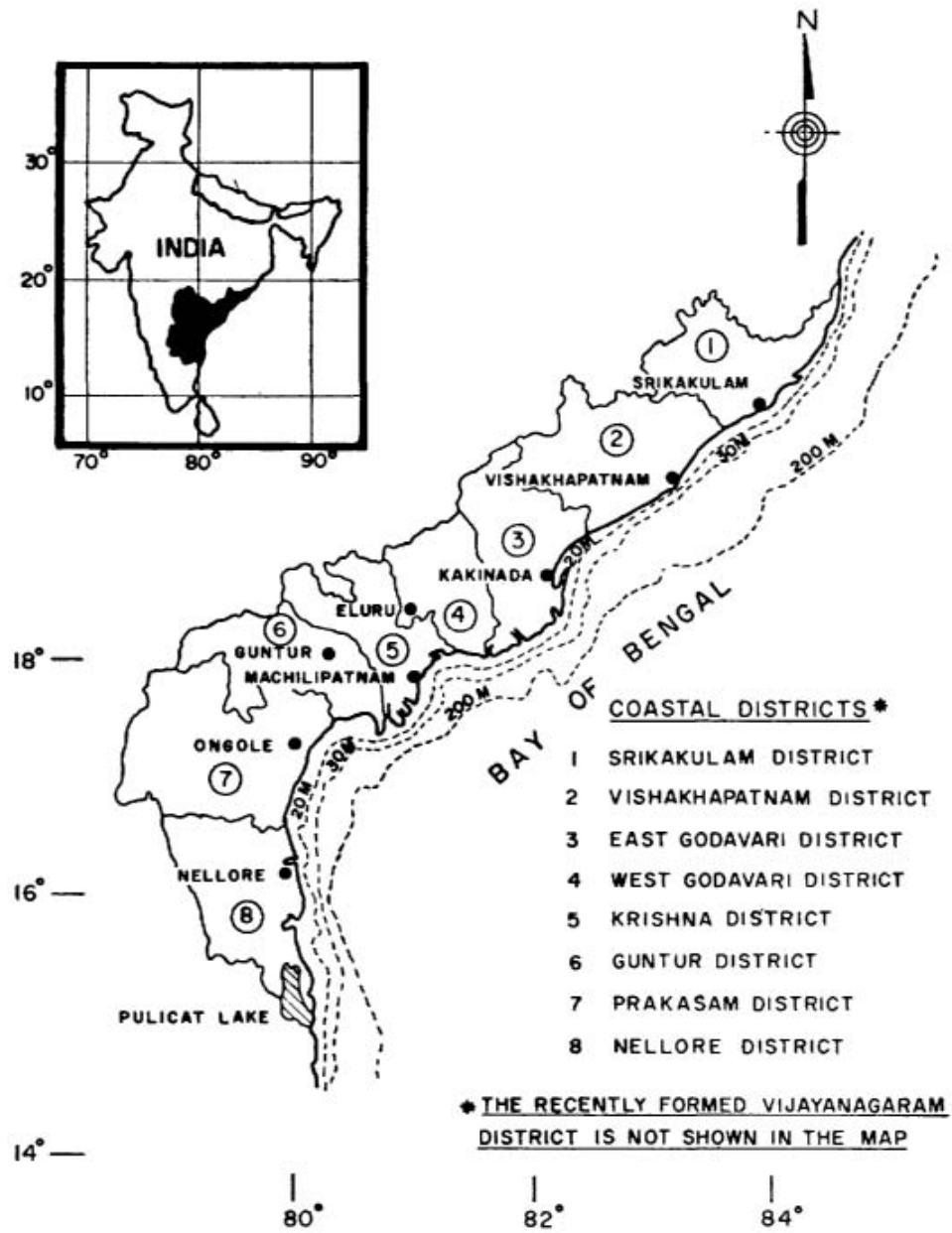
27th January 1981	Departed Jakarta.
28th	Arrived at Madras and held discussions with Mr. V. L. C. Pietersz, Development Adviser, and Dr. M. Karim, Fisheries Adviser of the BOBP.
29th	Mission joined by Dr. Karim and travelled to Hyderabad.
30—31 st	Halt at Hyderabad. Discussions with the Secretary, Forests and Fisheries and Rural Development and officials of the Directorate of Fisheries.
1st February	Mission joined by Mr. M. N. Rao and Mr. D. V. Reddy. Travelled to Machilipatnam (Krishna district).
2—7th	Halt at Machilipatnam. Visited 8 brackishwater sites.
8th	Travelled Machilipatnam — Narsapur (West Godavari district).
9th	Visited five brackishwater sites.
9th	Travelled from Narsapur to Kakinada (East Godavari district).
10—19th	Halt at Kakinada. Visited CIFE, Andhra Pradesh Agriculture University fish farm, brackishwater fish farm of the Andhra Pradesh Fisheries Corporation, CIFRI, private fish farms, brackishwater sites at Corangi, Byravapalem, Amalapuram, etc.
20th	Travelled to Srikakulam.
20—21st February	Halt at Srikakulam. Visit to brackishwater project sites at Calingapatnam (Vomeravalli) and Tekalli.
22—23rd	Travelled to Visakhapatnam and proceeded to Surturpet. Tour in Pulicat lake area.
24th	Travelled to Tirupathi and Hyderabad.
25th	Halt at Hyderabad. Discussion with officials.
26—27th	Travelled to Madras.
28th	Halt at Madras. Report writing. Discussions with FAO officials and fisheries officials, submission of a summary report.
1—5 March	Mission returned to Jakarta.
6th	

Appendix 3

LIST OF PRINCIPAL DOCUMENTS CONSULTED

1. Project for the Development of Small-Scale Fisheries in the Bay of Bengal – Preparatory Phase. FAO: IOFC/DEV/78/44.2.
2. Project Report: Development of Brackishwater Fisheries, Directorate of Fisheries, Andhra Pradesh, Hyderabad.
3. District Statistics of Andhra Pradesh, Bureau of Economic and Fisheries, Andhra Pradesh, India.
4. “A Review of Brackishwater Shrimp Farming in Tamil Nadu and Andhra Pradesh, India.” FAO/UNDP. Small Scale Fisheries Promotion in South Asia, RAS/77/044, Working Paper 33, Madras, 1980.
5. Brackishwater Prawn & Fish Culture Project at Calingapatnam, Srikakulam District, Andhra Pradesh, India.
6. “Status of Coastal Aquaculture in India” by M.J. George, Central Marine Fisheries Research Institute, Cochin 682 018.
7. Note on Brackishwater Fish Farming in West Godavari District.
8. “Brackishwater Fish and Prawn Culture” by S. M. Dwivedi and D. V. Reddy. Central Institute of Fisheries Education, Bombay.
9. Brackishwater Fish Farm of Andhra Pradesh, Fisheries Corporation Limited, Kakinada, India by D. V. Reddy.

COASTAL MAP OF ANDHRA PRADESH



Appendix 5

AREA AND OWNERSHIP OF BRACKISHWATER RESOURCES IN ANDHRA PRADESH*

District	Area by ownership (Ha)						Total
	Fisheries Dept.	Revenue Dept.	Forest Dept.	Salt Dept.	Port Dept.	Private	
1. Srikakulam	346	854	—	1029	200	1503	3932
2. Vizianagaram	—	34	—	—	—	9	12
3. Visakhapatnam	—	714	—	87	—	490	1291
4. East Godavari	—	4274	19533	—	96	935	24838
5. West Godavari	—	1583	—	—	—	1884	3467
6. Krishna	—	16419	8000	—	—	243	24662
7. Guntur	—	254	1310	—	—	31	1595
8. Prakasam	—	1059	—	242	—	111	1412
9. Nellore	—	2690	—	26	—	37	2753
Total	346	27850	28813	1381	296	5243	63962

* Includes land submerged by the highest high tide, but excludes the Pulicat lake.

Appendix 6

TEMPERATURE RANGES BY MONTHS AND STATIONS

(In O°Centigrade)

Sl. No.	Station	Maximum Minimum	January	February	March	April	May	June	July	August	September	October	November	December
1.	Calingapatnam	Maximum	27.6	29.9	32.0	34.1	36.2	33.9	31.2	30.9	32.5	31.3	30.6	27.1
		Minimum	17.9	20.4	23.1	25.5	27.9	27.0	25.4	25.4	25.6	24.5	21.9	19.1
2.	Kakinada	Maximum	29.0	30.4	33.1	36.6	40.2	36.1	32.1	30.7	32.9	33.0	31.1	28.9
		Minimum	20.0	21.4	23.3	25.6	28.8	26.8	25.5	24.9	25.6	25.0	23.4	20.7
3.	Machilipatnam	Maximum	28.3	29.3	31.0	34.1	38.5	35.8	32.7	30.8	34.5	32.4	30.6	28.4
		Minimum	29.5	21.9	23.6	26.0	29.0	27.3	25.6	25.0	26.0	25.2	23.6	21.2
4.	Nelbore	Maximum	30.3	31.5	33.9	37.8	40.1	36.9	35.2	35.2	34.5	33.6	30.4	28.5
		Minimum	20.4	22.5	23.5	26.0	28.9	27.5	26.2	26.2	26.0	25.8	23.5	22.0
5.	Visakhapatnam	Maximum	28.4	29.9	32.9	34.9	37.8	35.5	32.2	31.3	32.9	32.9	31.1	28.8
		Minimum	19.0	20.7	23.4	26.2	28.8	27.9	26.1	25.8	26.1	26.1	22.7	20.4

Appendix 7a**AVERAGE ANNUAL RAINFALL***(in Millimetres)*

Sl.No.	District	1974-75	1975-76	1976-77	1977-78	1978-79
1.	Srikakulam	986	1,215	1,121	1,062	1,070
2.	Visakhapatnam	936	1,390	1,195	1,157	1,018
3.	East Godavari	1,085	1,360	1,426	1,158	1,116
4.	West Godavari	938	1,176	1,339	985	1,177
5.	Krishna	832	1,145	1,137	892	1,415
6.	Guntur	756	917	1,050	941	1,215
7.	Prakasam	755	816	870	713	1,193
8.	Nelbore	804	1,152	1,584	986	1,259
	Coastal Andhra	887	1,146	1,215	987	1,182

Source: Bureau of Economics and Statistics, Andhra Pradesh.

Appendix 7b**RAINFALL BY SEASON***(in Millimetres)*

Year	South-West Monsoon (June to September)	North-East Monsoon (October to December)	Winter period (January and February)	Hot weather period (March to May)	Total
1974-75	522	265	15	46	848
1975-76	944	319	1	40	1,304
1976-77	673	251	Nil	100	1,024
1977-78	502	382	30	53	967
1978-79	830	171	36	113	1,150

Source: Bureau of Economics and Statistics, Andhra Pradesh.

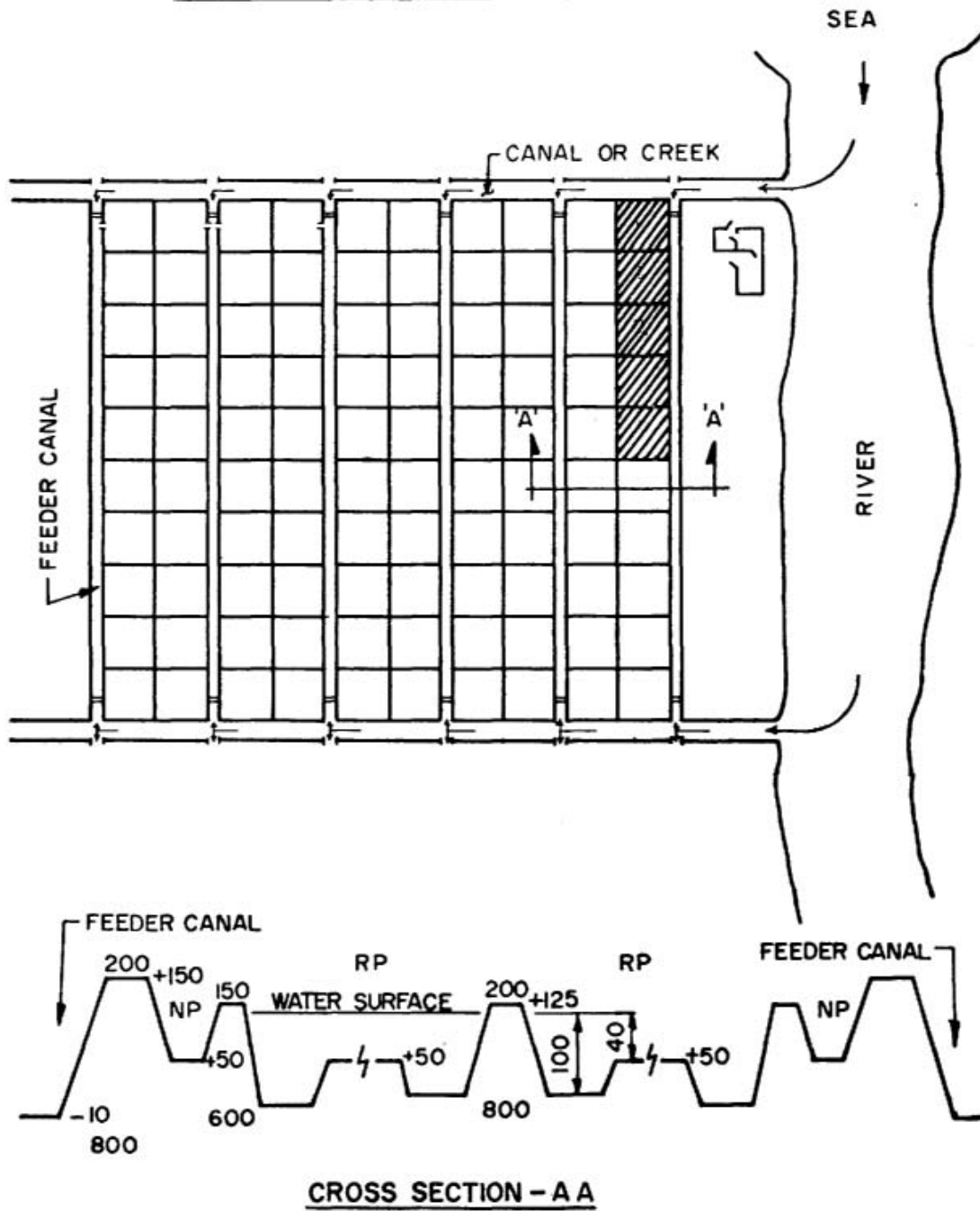
APPENDIX —8 (8A,8B,BC)

CULTURE POND (TYPE—A)

All figures are in cm unless otherwise stated

APPENDIX— 8A

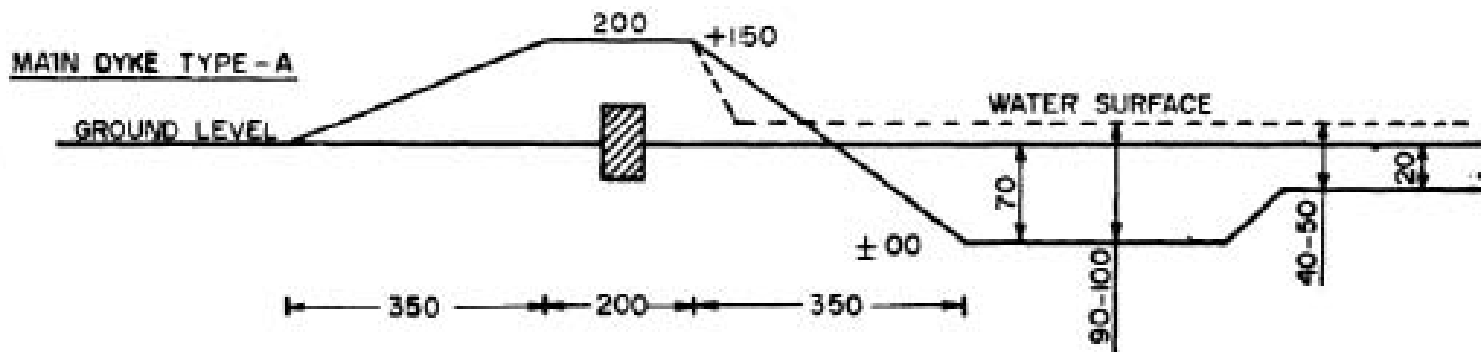
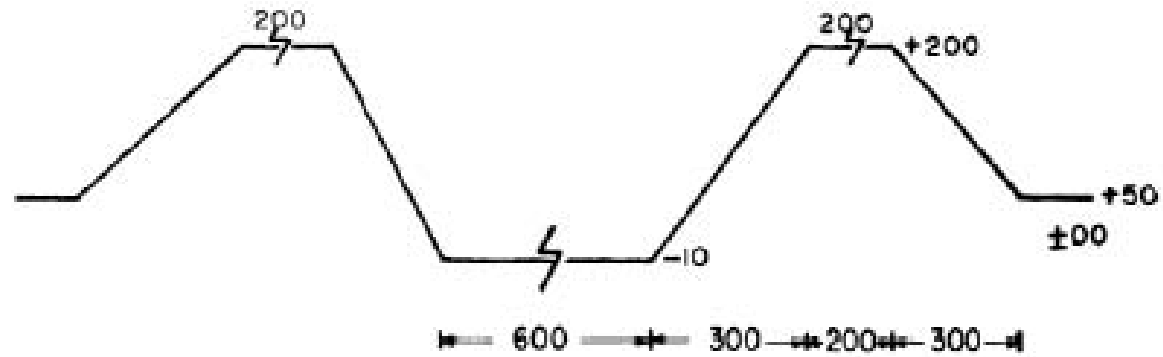
GENERAL LAYOUT OF PONDS COMPLEX



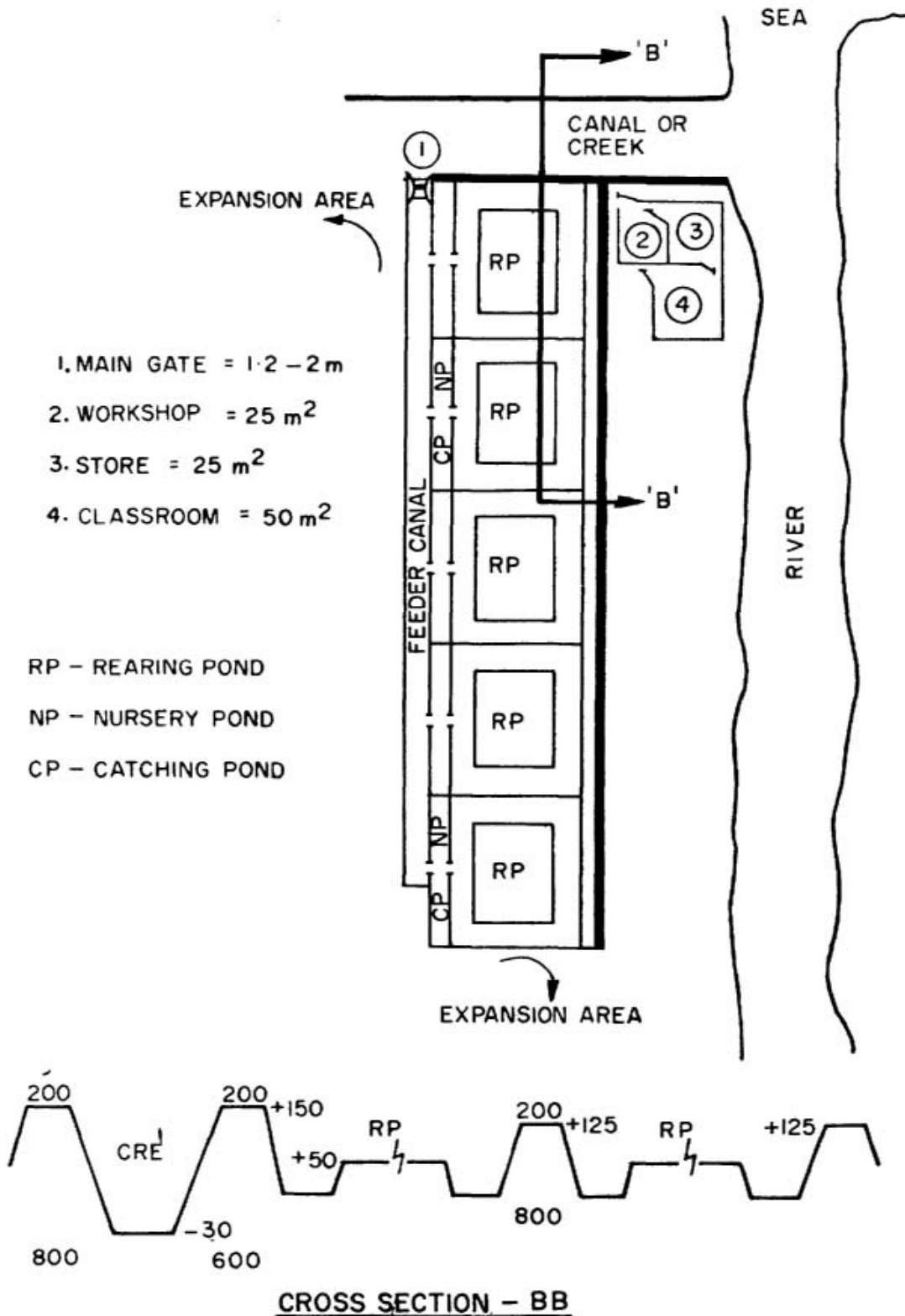
APPENDIX-BA (CONTINUED)

CROSS SECTIONS OF FEEDING CANAL
AND MAIN DYKE OF TYPE A MODULE

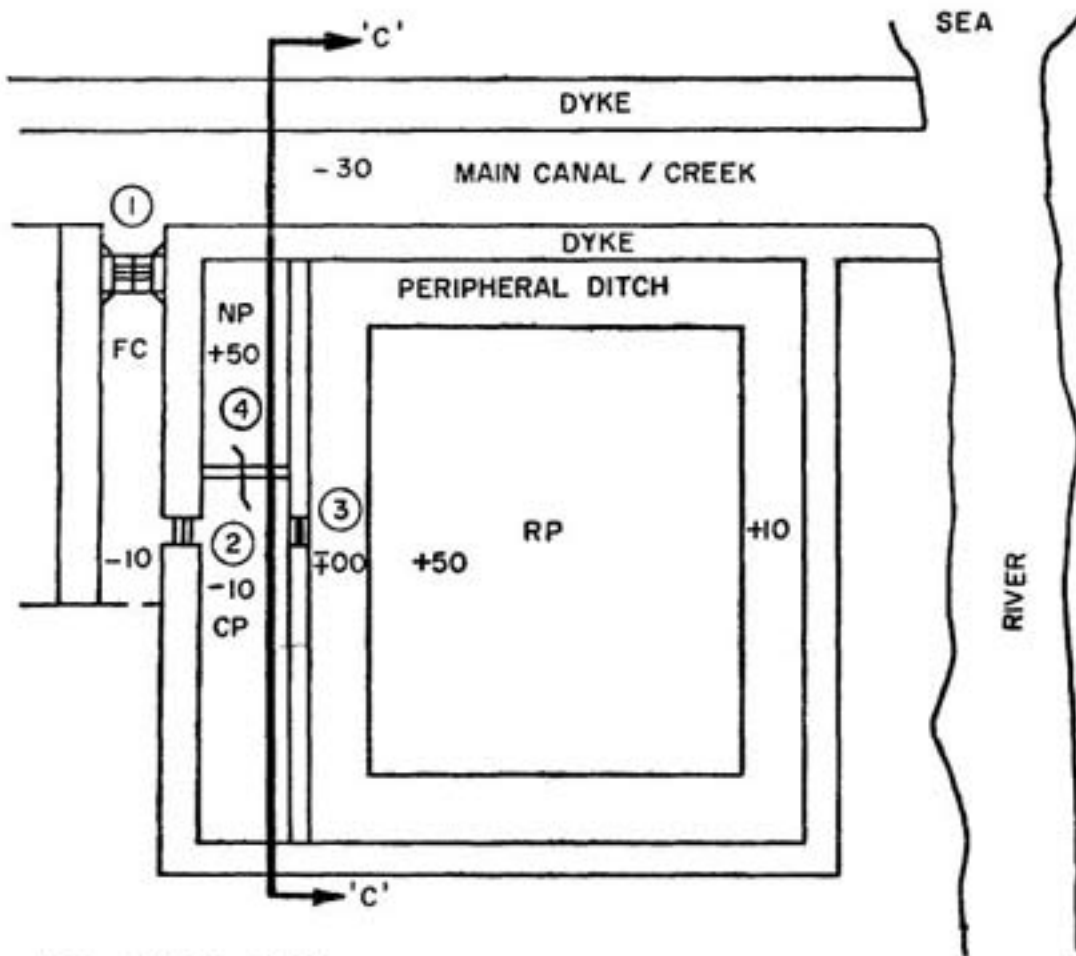
[19]



ENLARGED PLAN OF FIVE-POND PILOT PROJECT



DETAILED VIEW OF SINGLE POND UNIT



FC - FEEDER CANAL

NP - NURSERY POND - 200 m²

CP - CATCHING POND - 300 m²

RP - REARING POND - 9500 m²

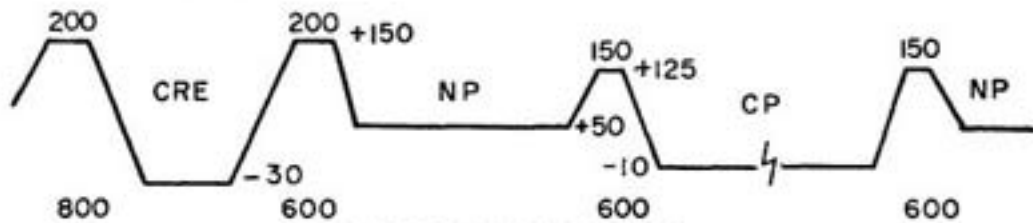
1. MAIN GATE - 2 m - WIDE
2. CATCHING POND GATE - 1 m - WIDE
3. REARING POND GATE - 1 m - WIDE
4. NURSERY POND GATE / PIPE

REQUIRED WATER DEPTH IN :-

REARING POND = 40 cm

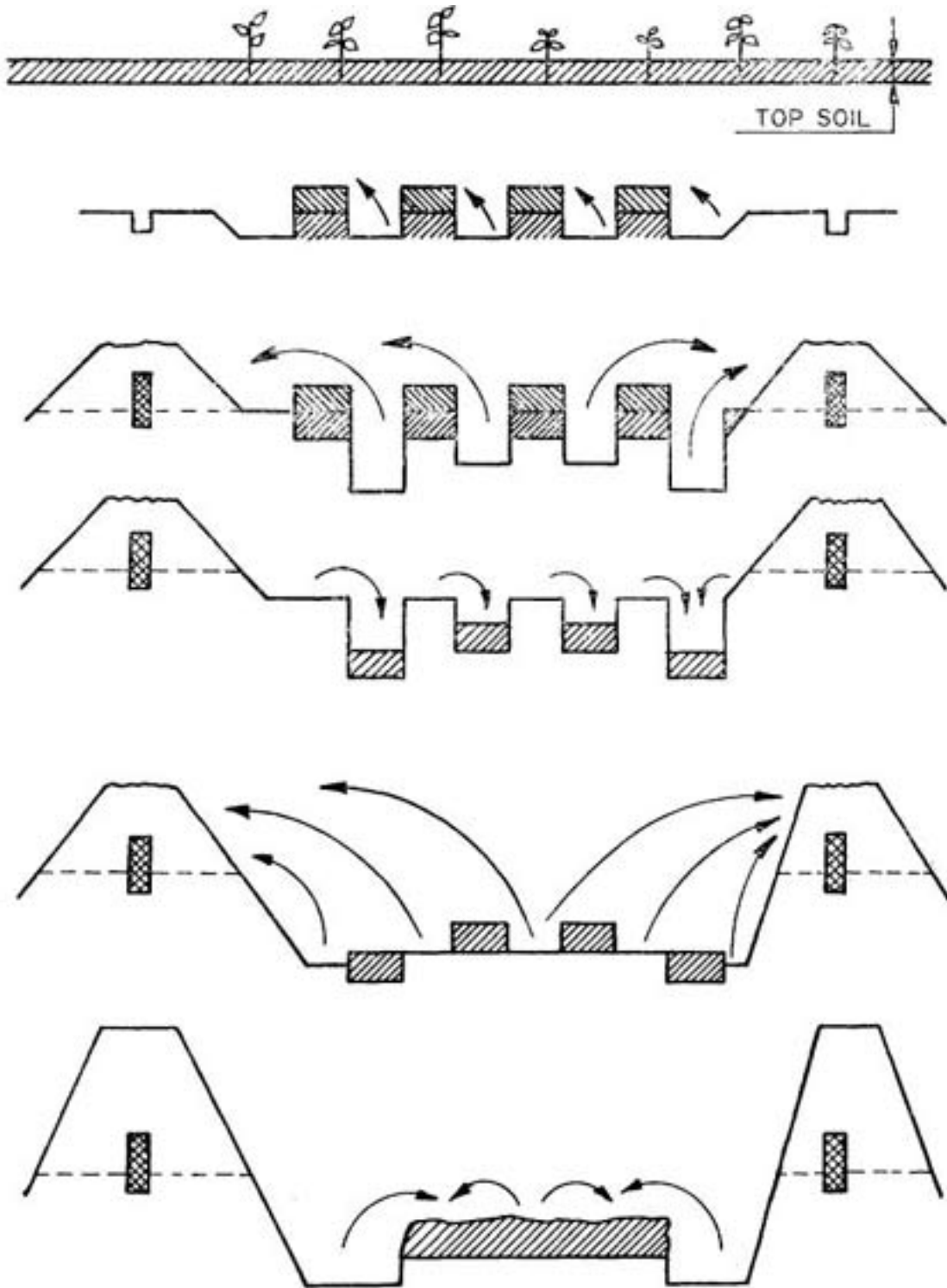
NURSERY POND = 30-40 cm

CANAL = 120 cm



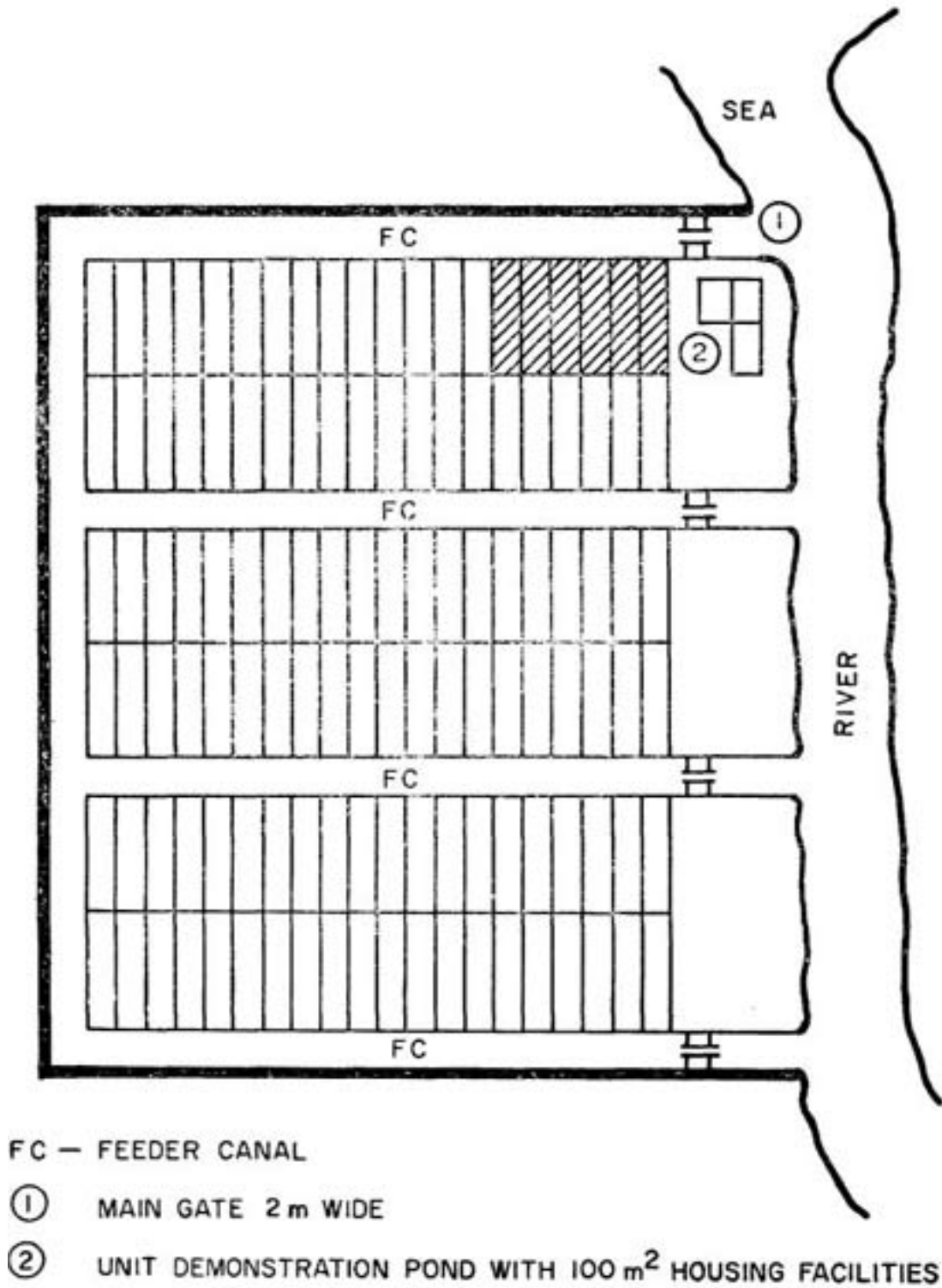
CROSS SECTION - C C

METHOD OF EXCAVATION TO CONSERVE TOP SOIL

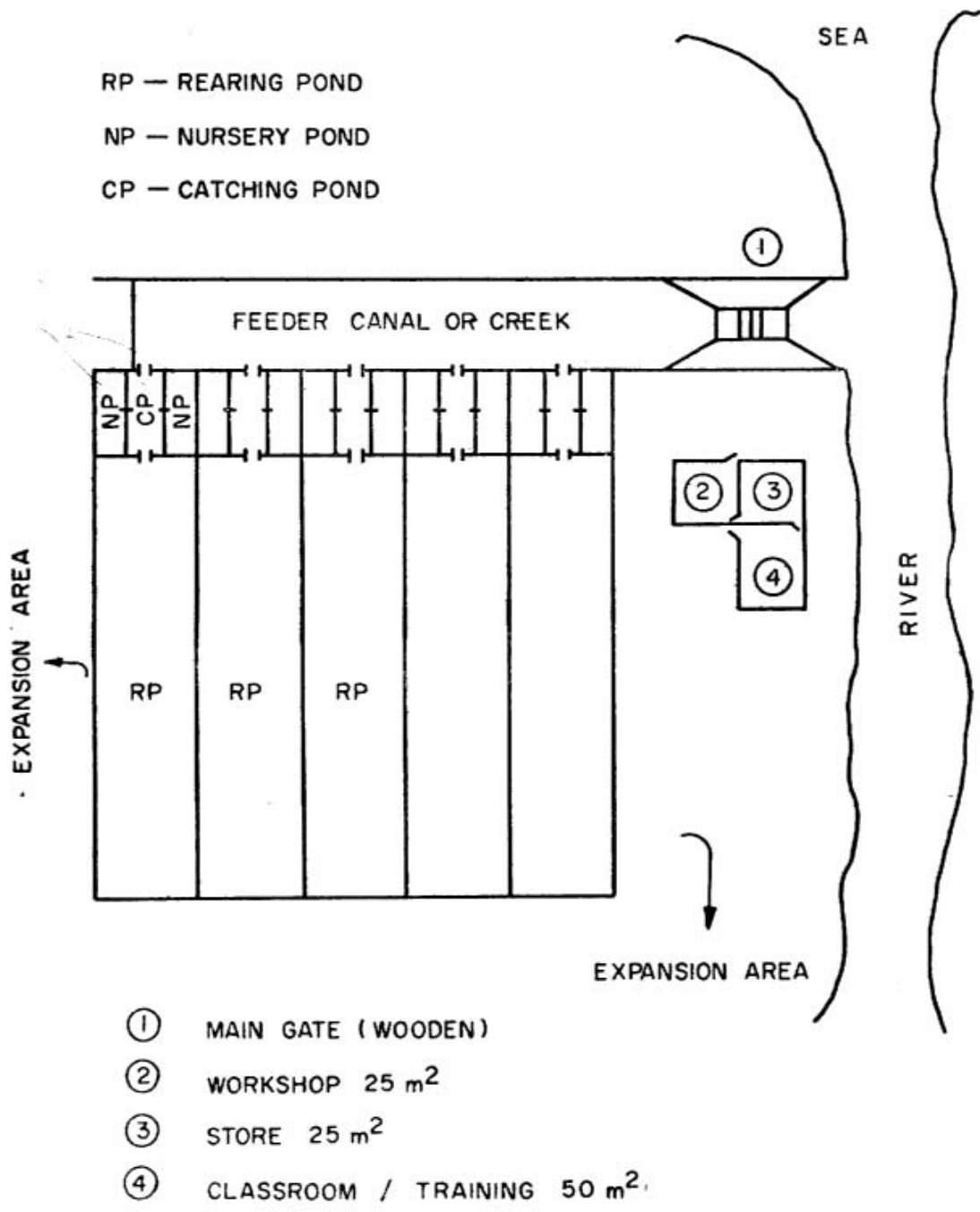


APPENDIX-IO (IOA ,IOB ,IO C)
CULTURE POND (TYPE—B)
All figures are in cm unless otherwise stated

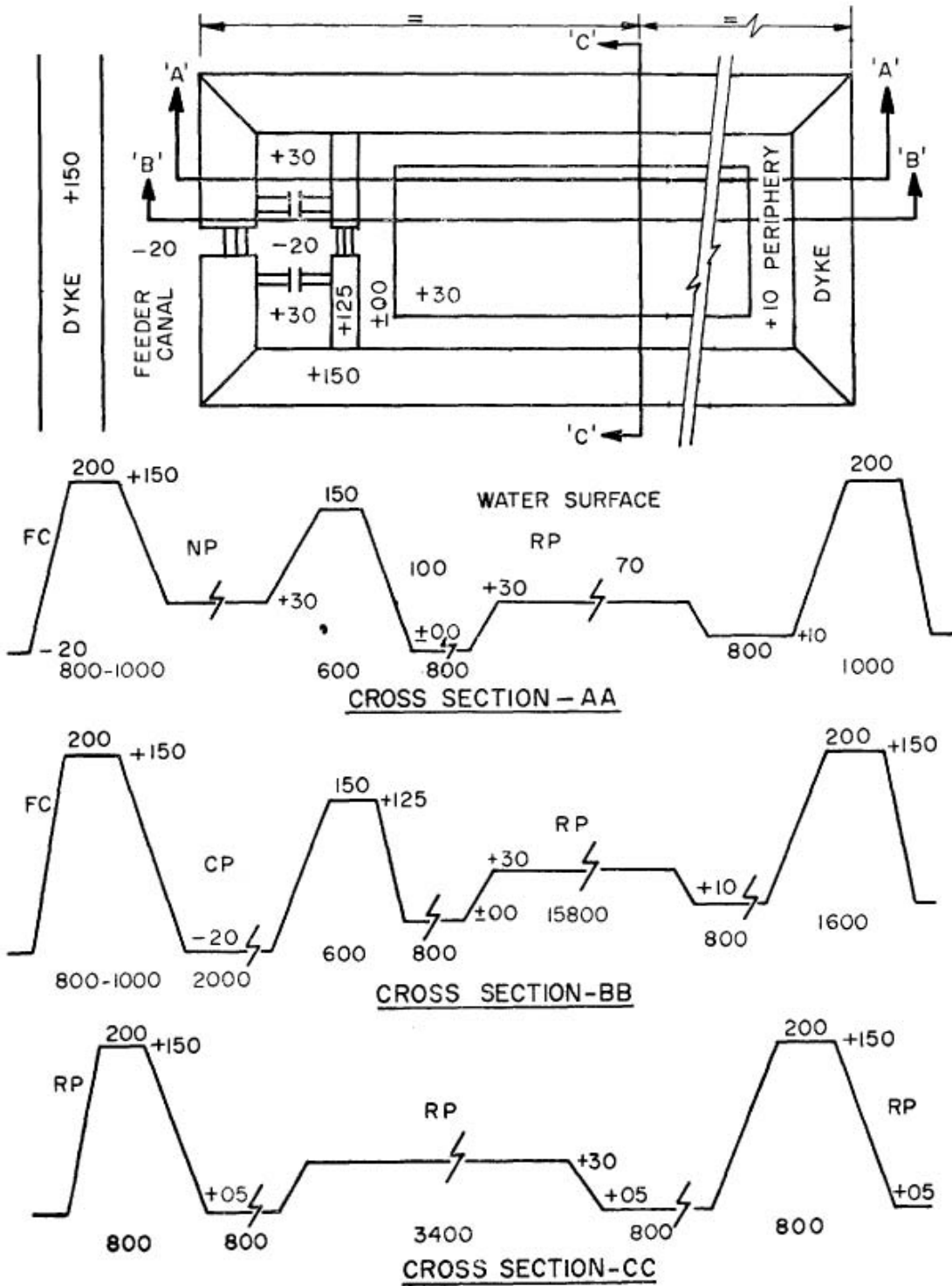
APPENDIX A
GENERAL LAYOUT OF PONDS COMPLEX



ENLARGED PLAN OF FIVE-POND PILOT PROJECT

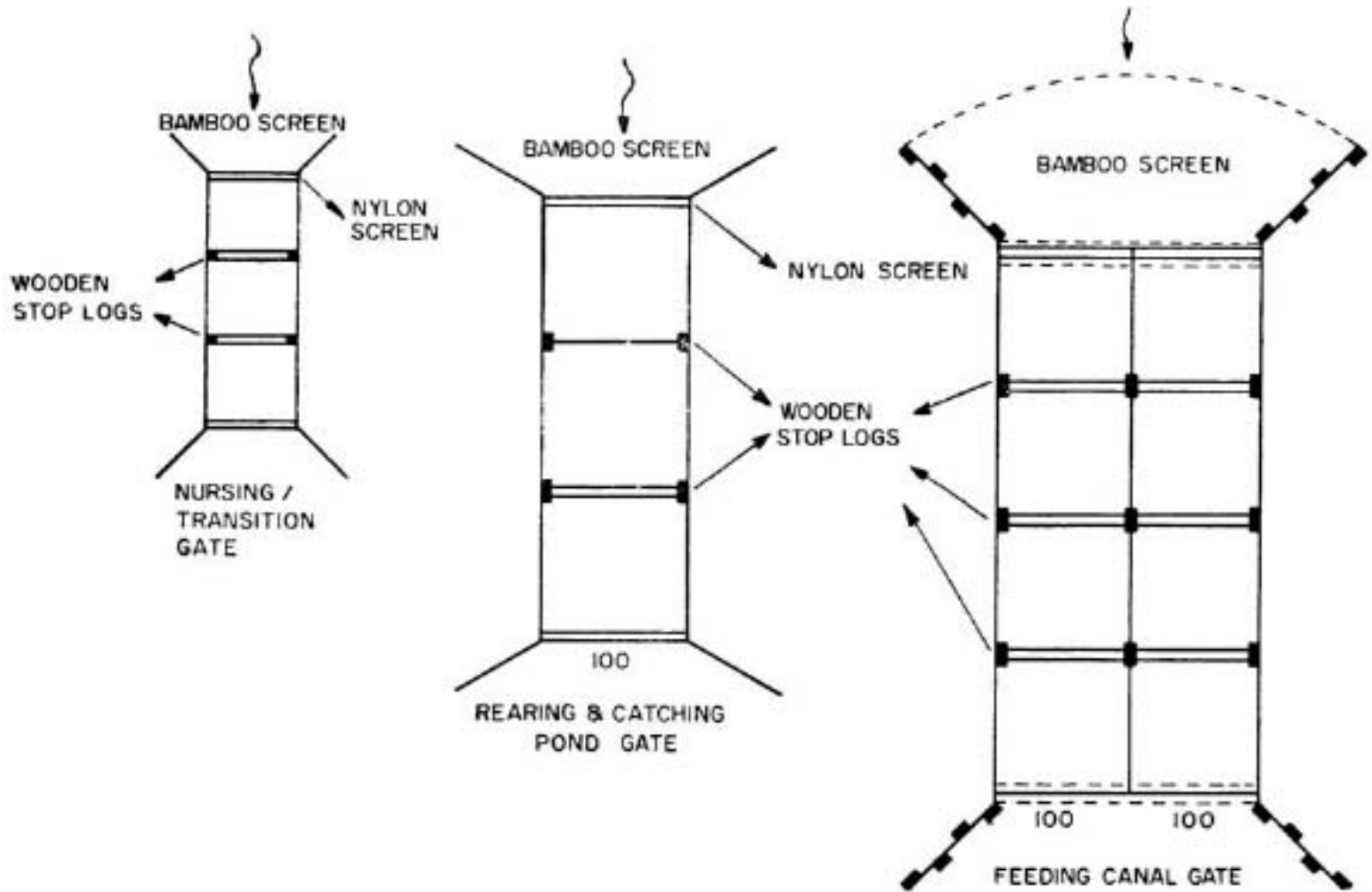


DETAILED VIEW OF SINGLE POND UNIT

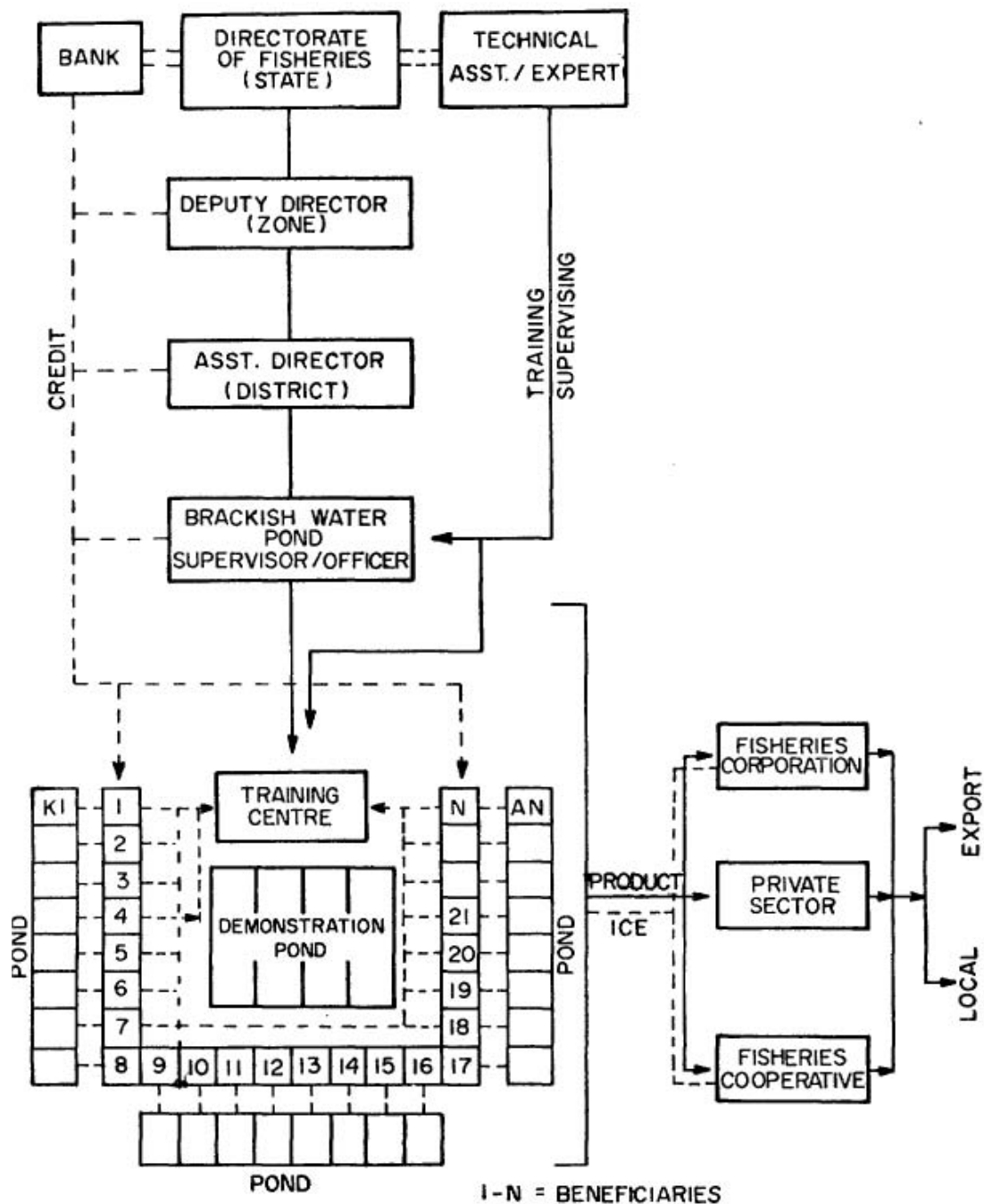


APPENDIX —II

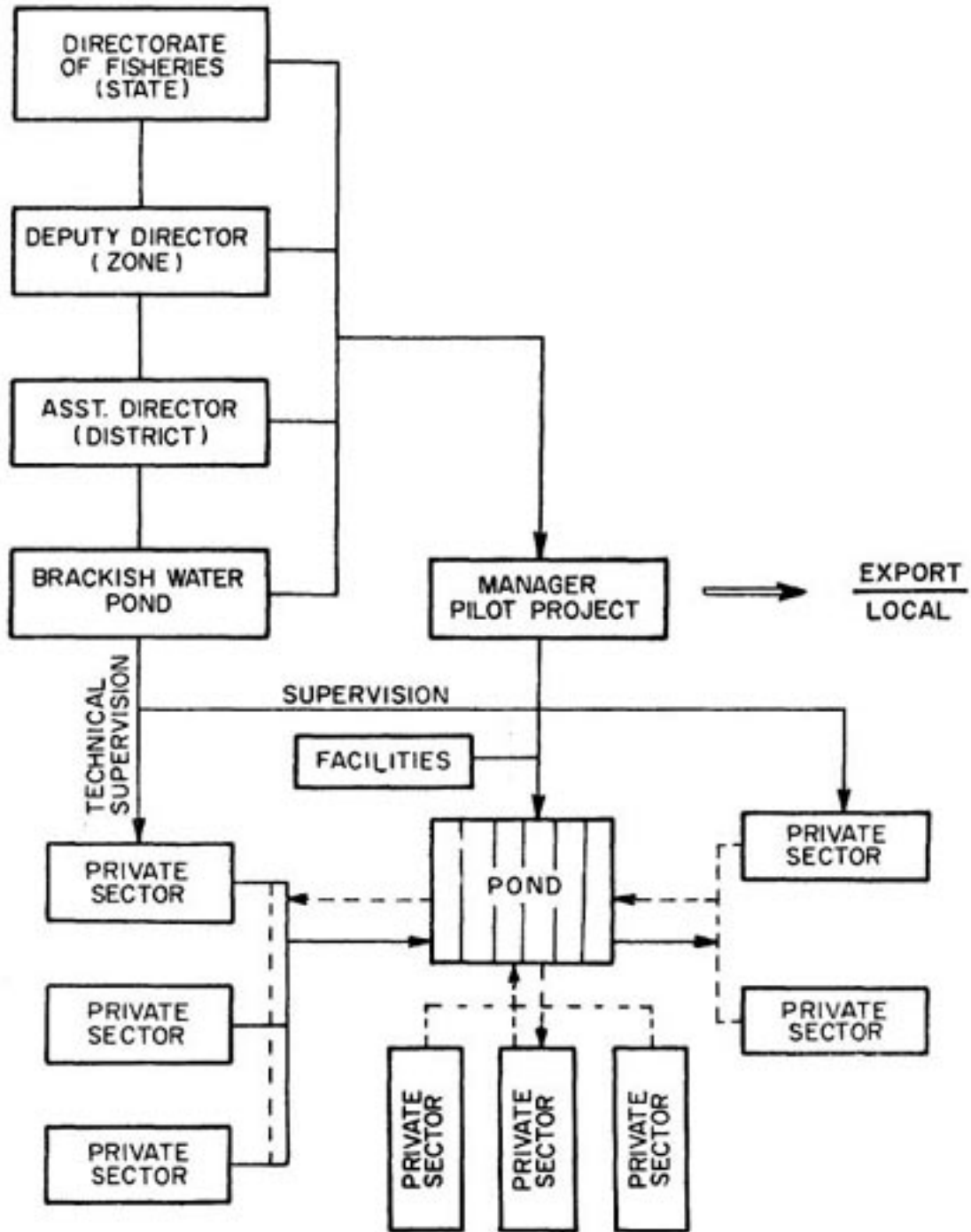
DESIGNS OF WATER CONTROL STRUCTURES FOR TYPE A & B PONDS



ORGANIZATION OF PROJECT MANAGEMENT UNIT



ORGANISATION OF NUCLEUS INDUSTRY



Appendix 14

COST ESTIMATES FOR TYPE A PILOT PROJECT (5x1 ha ponds)

1. Investment cost:

– Excavation: 15,000 m ³ soil at Rs. 2.50/m ³	Rs.	37,500
– Main gate (1) secondary gates (10), gate/pipes (5)	Rs.	8,000
– Mangrove clearing	Rs.	7,000
– Equipment, nets, carpentry tools, limnological kits etc.	Rs.	2,500
– Pump*	Rs.	10,000
– Miscellaneous	Rs.	10,000
	Rs.	75,000

2. Annual operating cost:

– Seed :- Shrimp: 50,000 x 2 crops x Rs. 0.05	Rs.	5,000
Milkfish: 25,000 x 2 crops x Rs. 0.015	Rs.	750
– Fertilizer:		
Urea 500 kg x 2 crops x 2 Rs./kg	Rs.	2,000
TSP 250 kg x 2 crops x 2 Rs./kg	Rs.	1,000
Cowdung 5 tonne x 2 crops x 50 Rs./tonne	Rs.	500
– Pesticide 5 kg x 2 crops x 50 Rs./kg	Rs.	500
– Harvesting 2 crops x Rs. 750	Rs.	1,500
– Levelling 2 crops x Rs. 600	Rs.	1,200
– Fuel & Oil	Rs.	1,800
– Maintenance cost of pumping	Rs.	1,000
	Rs.	15,250

* The pump will be replaced after ten years.

Appendix 15

COST ESTIMATES OF TYPE B PILOT PROJECT (5 ponds x 1 ha)

1. Investment:

– Excavation $\pm 37,000$ m ³ soil x 2.5 Rs./m ³	Rs.	92,500
– Main gate (1) secondary gates (10) sluices (10)	Rs.	7,500
– Mangrove clearing	Rs.	5,000
– Equipment (nets etc.)	Rs.	2,500
– Miscellaneous	Rs.	7,500
	Rs.	1,15,000

2. Annual operating cost:

– Seed (shrimp) : 100,000 x Rs. 0.05 x 2 crops	Rs.	10,000
– Fertilizer:		
Urea 500 kg x 2 Rs./kg x 2 crops	Rs.	2,000
TSP 250 kg x 2 Rs./kg x 2 crops	Rs.	1,000
Cowdung 5 tonne x 50 Rs./tonne x 2 crops	Rs.	500
– Pesticide 5 kg x 50 Rs./kg x 2 crops	Rs.	500
– Harvesting Rs. 600 x 2 crops	Rs.	1,200
– Levelling Rs. 650x2 crops	Rs.	1,300
	Rs.	16,500

Appendix 16

**CASH FLOW FOR ONE UNIT CONSISTING OF FIVE ONE-HECTARE
BRACKISHWATER PONDS OF TYPE A USED FOR POLY CULTURE OF SHRIMP AND FINFISH**

No.	Item	Year	1	2	3	4	5	6	7	8	9	10	11	12
<i>Cash inflow:</i>														
	1. Sales of fish (4 Rs./kg)		7000	12000	15000	20000	25000	25000	25000	25000	25000	25000	25000	25000
	2. Sales of shrimp (35 Rs./kg)		8750	13125	21875	26250	43750	43750	43750	43750	43750	43750	43750	43750
			15750	25125	36875	46250	68750	68750	68750	68750	68750	68750	68750	68750
	3. Credit (investment cost plus working capital)		86500	—	—	—	—	—	—	—	—	—	—	—
	Total cash inflow (1 +2+3)		102250	25125	36875	46250	68750	68750	68750	68750	68750	68750	68750	68750
	<i>Cash outflow:</i>													
	1. Investment		75000	—	—	—	—	—	—	—	—	—	10000	—
	Operating Cost													
	—Seed		5750	5750	5750	5750	5750	5750	5750	5750	5750	5750	5750	5750
	— Fertilizer		3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
	— Pesticide		500	500	500	500	500	500	500	500	500	500	500	500
	—Harvesting		1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
	—Levelling		1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
	—Fuel/oil		1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
	—Maintenance		1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
	2. Total operating cost		15250	15250	15250	15250	15250	15250	15250	15250	15250	15250	15250	15250
	3. Interest (12%)		10380	10380	10380	9340	8300	7270	6230	5190	4150	3110	2080	1040
	4. Principal repayment		—	—	8650	8650	8650	8650	8650	8650	8650	8650	8650	8650
	II. Total cash outflow (1+2+3+4)		100630	25630	34280	33240	32200	31170	30130	29090	28050	27010	35980	24940
	III. Net cash flow (I-II)		1620	(505)	2595	13010	36550	37580	38620	39660	40700	41740	32770	43810

[31]

Appendix 17

CASH FLOW FOR ONE UNIT CONSISTING OF FIVE ONE-HECTARE PONDS OF TYPE B USED FOR MONOCULTURE OF PRAWN/SHRIMP

No.	Item	Year1	2	3	4	5	6	7	8	9	10	11	12
	<i>Cash inflow:</i>												
	1. Sales of shrimp (35 Rs./kg)	17500	28875	43750	70000	87500	87500	87500	87500	87500	87500	87500	87500
	2. Credit (investment cost, working capital)	125750	—	—	—	—	—	—	—	—	—	—	—
I	Total cash inflow (1+2)	143250	28875	43750	70000	87500	87500	87500	87500	87500	87500	87500	87500
	<i>Cash outflow:</i>												
	1. Investment cost	115000	—	—	—	—	—	—	—	—	—	—	—
	Operating Cost:												
	—Seed	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
	— Fertilizer	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
	— Pesticide	500	500	500	500	500	500	500	500	500	500	500	600
	—Harvesting	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
	— Levelling	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300
2.	Total operating cost	16500	16500	16500	16500	16500	16500	16500	16500	16500	16500	16500	16500
	3. Interest (12%)	15090	15090	15090	13580	12070	10565	9055	7545	6035	4525	3020	1510
	4. Principal repayment	—	—	12575	12575	12575	12575	12575	12575	12575	12575	12575	12575
II	Total cash outflow												
	(1+2+3+4)	146590	31590	44165	42655	41145	39640	38130	36620	35110	33600	32075	30585
III.	Net cash flow (I-II)	(3340)	(2715)	(415)	27345	46355	47860	49370	50880	52390	53900	55405	56915