Potential for integrated farming systems for improving productivity in saline and waterlogged soils

CENTRAL SOIL SALINITY RESEARCH INSTITUTE

Regional Research Station, Lucknow

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ISSUE-2

To develop the reclamation technology in waterlogged sodic soils.

STRATEGIES

Identify constraints, development of viable technology.

PROGRAMMES

Agri-aquaculture based farming system research through appropriate land modification in water logged sodic soil in the adjoining of main canal by harnessing the seepage water.

Feasibility of summer crops for exploiting the shallow ground water in the adjoining area of the main canals.

Evaluation of multi lateral interceptor drains to control seepage to minimize waterlogging and salt build up.

Sub- surface drainage (horizontal and vertical) for reclamation of waterlogged sodic soil.

Water Balance

Water Balance Component of the Pond was computed with the help of following equation

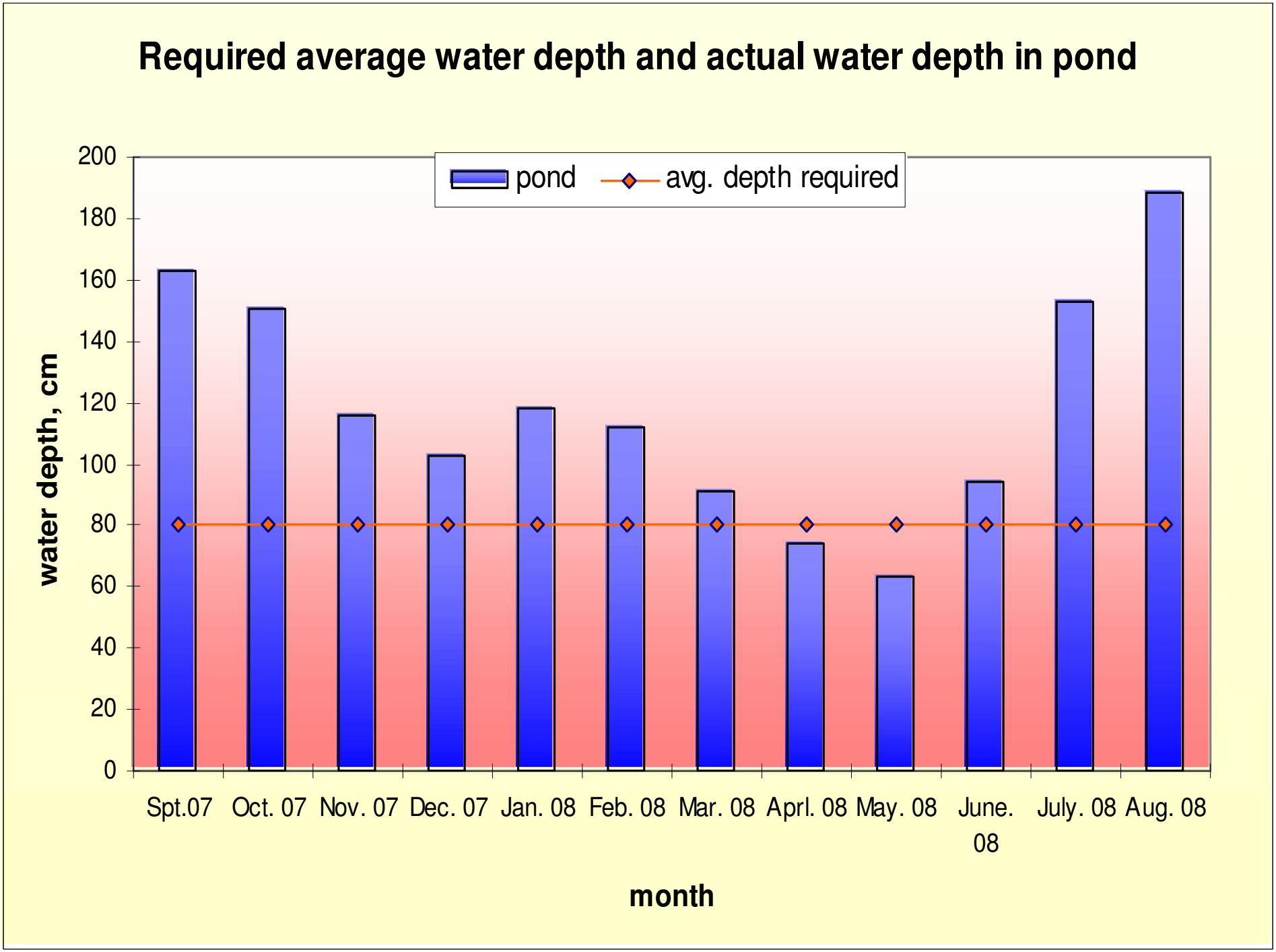
$$VS_m = \sum VR_m - \sum VE_m - \Delta S_m \qquad (1)$$

VSm **= monthly volume of upward/downward seepage from the pond, L3**
VRm **= monthly volume of rainfall water, L3**
VEm **= monthly volume of water evaporated from pond, L3**
ΔSm = monthly change in pond water storage, L3

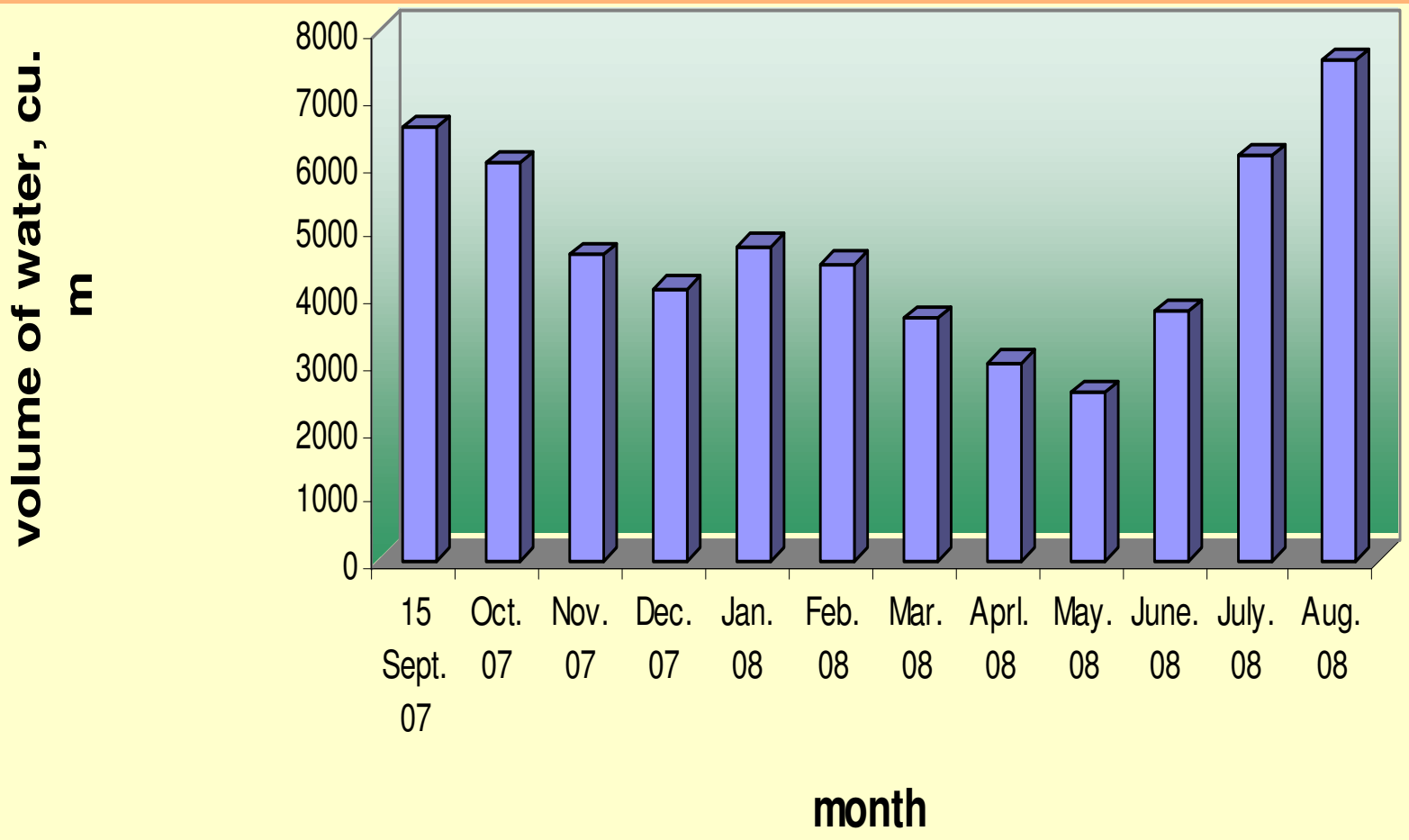
Following equation was used for computing the Monthly Water Balance

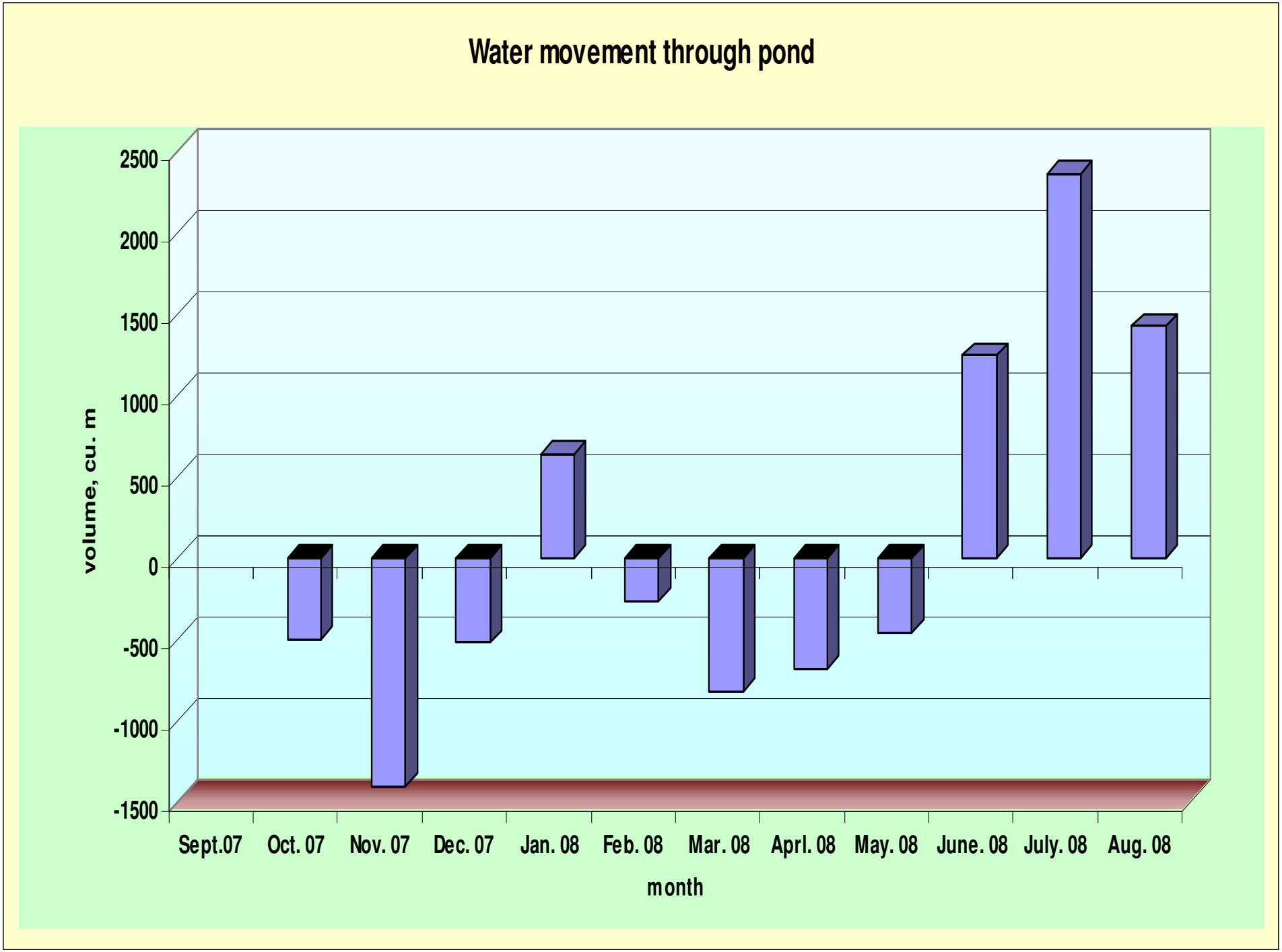
$$VT_m = VI_m + VR_m + VM_{s-upward} \qquad (2)$$

VTm **= total monthly volume of pond water**
VIm **= initial pond storage**
VRm **= monthly volume of rainfall water**
VMs **= upward/downward seepage**


Required average water depth and actual water depth in pond
pond
avg. depth required
water depth, cm
200
180
160
140
120
100
80
60
40
20
0
Spt.07
Oct. 07
Nov. 07
Dec. 07
Jan. 08
Feb. 08
Mar. 08
Aprl. 08
May. 08
June. 08
July. 08
Aug. 08
month

Pond water balance




Water movement through pond
2500
2000
1500
1000
500
0
-500
-1000
-1500
volume, cu. m
Sept.07
Oct. 07
Nov. 07
Dec. 07
Jan. 08
Feb. 08
Mar. 08
Aprl. 08
May. 08
June. 08
July. 08
Aug. 08
month

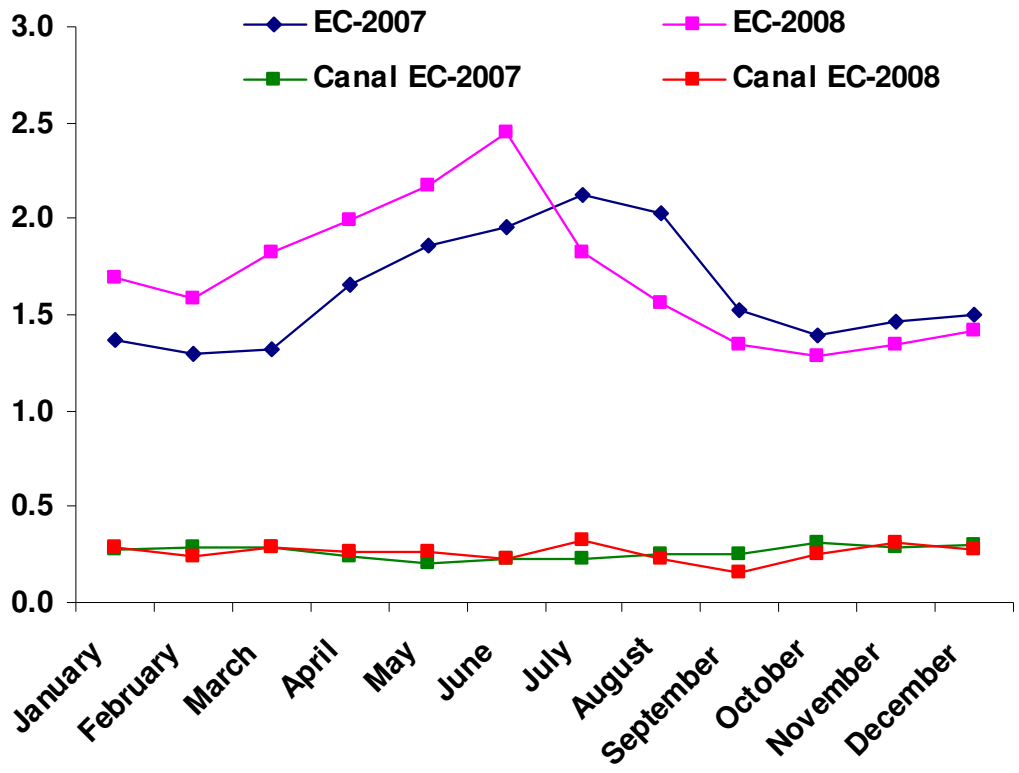


Fig. Yearwise change in EC of pond water

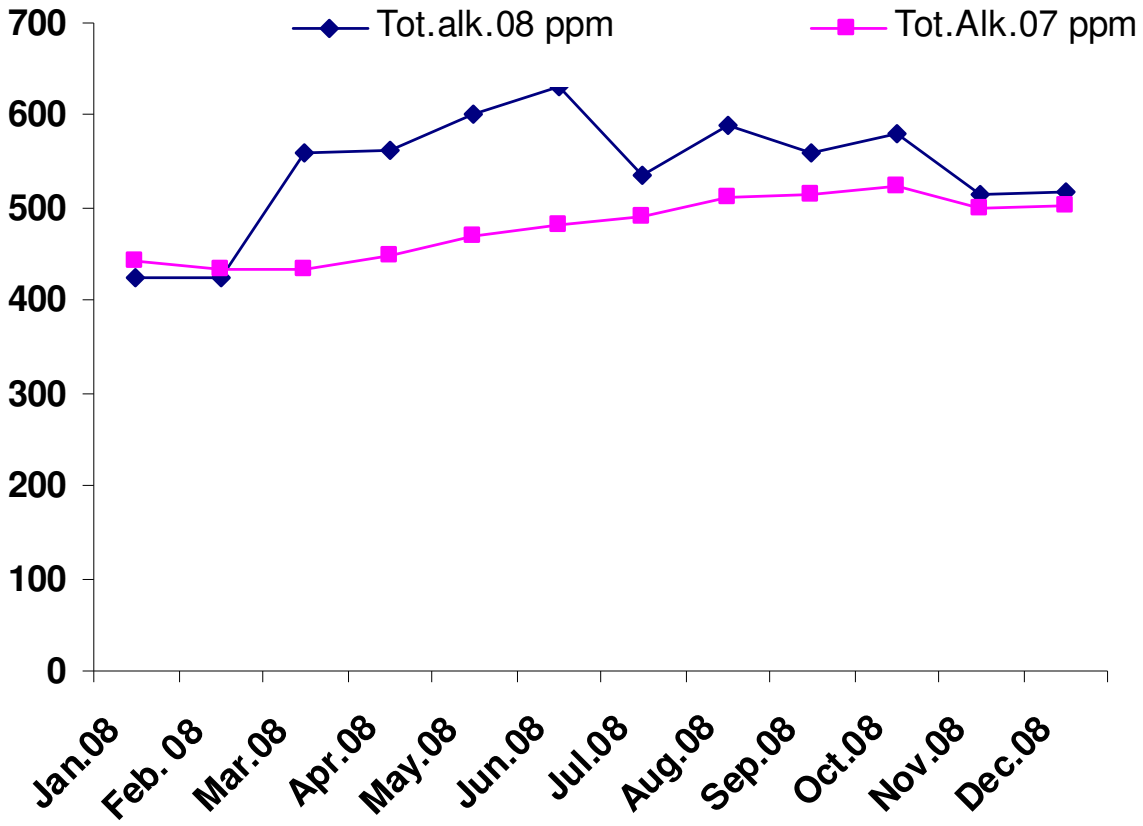


Fig. Yearwise change in Carbonate and bicarbonate alkalinity of pond water

Performance of different crops on embankments of pond

Important parameters of water in pond

Particulars	Period (2008)		
	Jan 10	May 07	Aug 29
Dissolved Oxygen	7.4	6.9	6.8
Air Temperature	22.0	35.6	39.2
Water Temperature	21.2	33.0	38.0

Growth of fish

Name of Fish	Duration/Parameters					
	Jan 10, 2008		May 07, 2008		Aug 29, 2008	
	Weight (gm)	Length (cm)	Weight (gm)	Length (cm)	Weight (gm)	Length (cm)
Silver carp	75.0	14.0	255	27.0	375	42.0
Katla	45.0	5.5	62.4	17.5	400.0	30.0
Rohu	115.0	10.0	230	23.5	287.5	33.5
Mrigal	20.0	6.5	55.0	17.5	337.5	35.5
Common Carp	13.5	11.5	195.5	23.5	375.0	45.0

Cost benefit ratio of different cropping systems

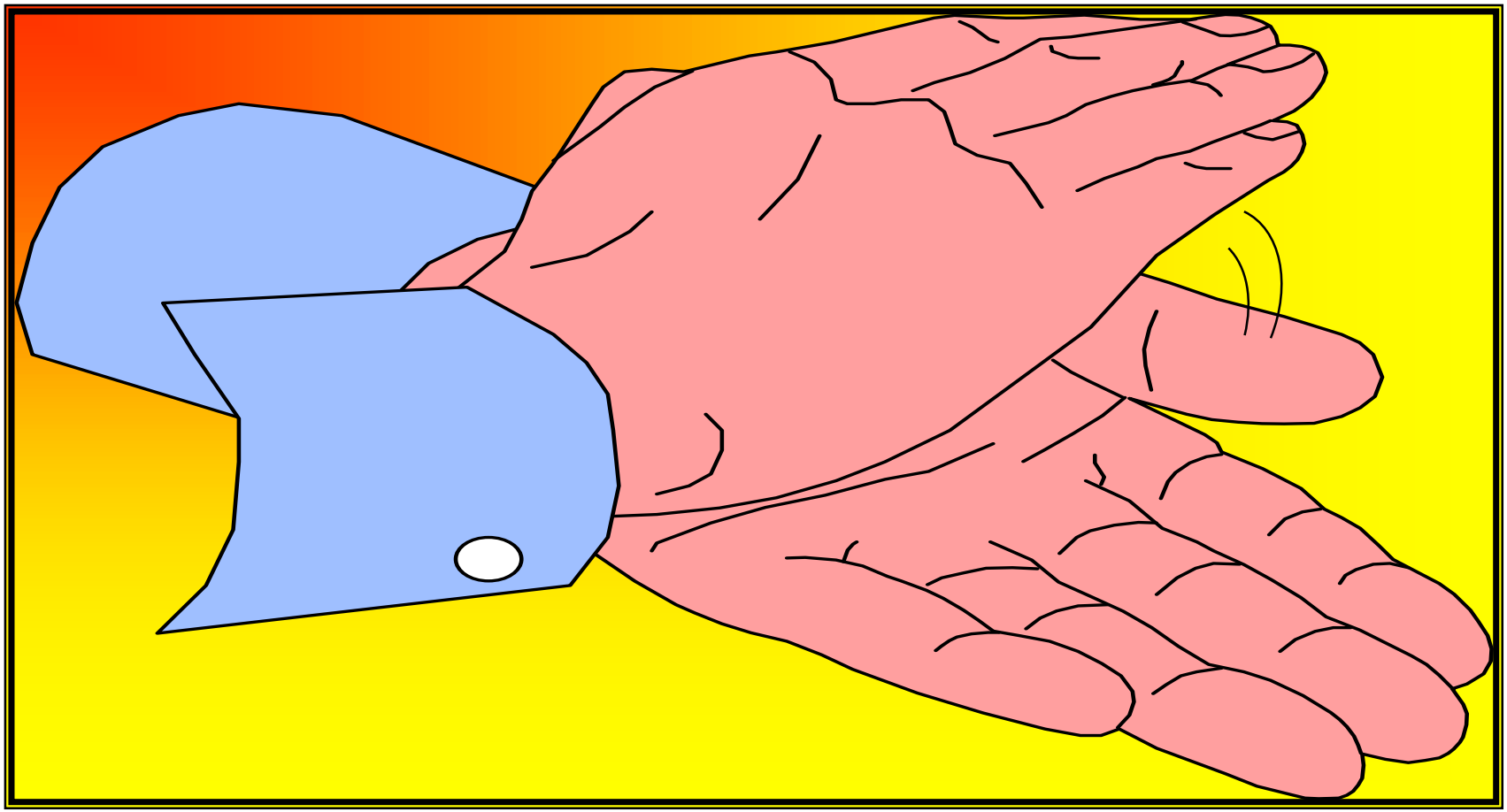
Crops	Area (m^2)	Yield (kg)	q/ha	Gross income	Cost of cultivation	Net return	B:C ratio
Rice	1183	594.2	50.2	32134	16700	15434	1.92
Wheat	1583	517.6	36.4	33160	14300	18860	2.31
Sorghum	500	830.5	166.0	13280	6500	6780	2.04
Onion	216	110.3	50.9	40736	21200	19536	1.92
Garlic	72.91	40.2	34.6	69200	22600	46600	3.06
Brinjal	44.75	34.5	75.9	37985	17400	20585	2.18
Mustard	700	60.7	8.8	15750	9600	6150	1.64

Cost benefit ratio of different cropping systems

Crop rotation	Net return	B:C ratio
Rice-Wheat	34294	2.10
Rice-Mustard	21584	1.82
Sorghum-Wheat	25640	2.23
Maize-Onion	19536*	1.92
Chilli-Garlic	46600	3.06
Fish	127775	3.58

*Maize crop was damaged by blue bulls

Total energy (MJ ha^{-1}) input and output of different cropping systems

Cropping system	Human labour	Diesel	N, P and K	Seeds	Irrigation	Total input	Energy output	Ratio
Rice-wheat	182	5330	19868	2352	12387	40140	209363	5.21
Rice-Mustard	171	6751	19696	838	8784	36190	169786	4.96
Sorghum-wheat	133	5228	12334	1941	5358	24994	101525	4.06
Chilli-garlic	530	4089	19767	11522	5416	41324	53722	1.30

Thank you very much for your attention