

EXPERIMENT NO. 18.4.3.5 (SAF/18/5)			
1.	Title of Experiment	:	Growth assessment of carps with respect to species ratio and boundary planation of trees under freshwater conditions
2.	Background information	:	The main objective of the pond fish farming is to increase the productivity of water, land and associated resources while contributing to increased food fish production. Fish based integrated farming system enterprises may include crop, livestock, poultry, fish, agroforestry etc. A farm as a unit is to be considered and planned for effective integration of the enterprises to be combined with crop production activity combination of one or more enterprises with cropping. When these components are carefully chosen, planned and executed, gives greater dividends than a single enterprise, especially for small and marginal farmers. Fish farming can be combined with agriculture, animal husbandry and irrigation practices, which can lead to optimization of resources and ultimately resulting into higher production and net profits. Hence, basic guidelines for setting up a fish farm covers the selection of a proper site, of farm type and of fish species to be cultured including fish nutrition, health, reproduction, harvesting, post-harvesting aspects, target quantity per harvest etc.
3.	Objectives	:	1.To study growth of different fish species as influenced by species ratio under fresh water pond condition. 2. To assess the physico- chemical parameters of fish water.
4.	Investigators:	:	PI: 1. Dr. M. B. Tandel, Assistant Professor (Forestry) Co-PI: 1. Dr. M. R. Parmar, Assistant Professor (AF) 2. Dr. S. M. Patel, Assistant Professor (AF) 3. Dr. D. P. Patel, Assistant Professor (NRM) Associates: 1. Dr. Harish Solanki, Assistant Professor (F) (Fisheries College)
5.	Location and agro climatic sub region	:	Dandi Farm, NAU, Navsari
6.	Name of Res. Scheme & B.H.	:	A pilot Project for development of Aqua-Agroforestry model for coastal area of South Gujarat, Dandi B. H. 12030
7.	Year of experimentation	:	Commencement Year = 2022-23

8.	Crop & Variety or Thematic area	:	<i>Catla catla</i> (Catla), <i>Labeo rohita</i> (Rohu), <i>Ctenopharyngodon idella</i> (Grass Carp) and <i>Cirrhinus mrigala</i> (Mrigal)
9.	Experiment details:		
	a. Design	:	CRD (large plot technique) Analysis will be carried out as per CRD
	b. Treatment	:	4
	c. Repetition	:	5
	d. Treatment details	:	T ₁ : 2 Catla : 6 Rohu : 1 Mrigal : 1 Grass Carp : Subabul T ₂ : 2 Catla : 6 Rohu : 1 Mrigal : 1 Grass Carp : Mix Plantation T ₃ : 4 Catla : 3 Rohu : 3 Mrigal : 0 Grass Carp : Subabul T ₄ : 4 Catla : 3 Rohu : 3 Mrigal : 0 Grass Carp : Mix Plantation
10.	Progress Report	:	- Monthly observations on fish length, weight and width were recorded and data are presented in Table – 1, 2 and 3. - Observations on boundary plantation were recorded and data are presented in Table – 4, 5, 6 and 7. - Data on water quality parameters were recorded and data are presented in Table – 8. - Data on total amonical nitrogen and NO₂^{-N} is under progress

Table – 1: Monthly variation in fish length (cm) under different treatment

Months	T ₁				T ₂				T ₃				T ₄			
	Fish length (cm)				Fish length (cm)				Fish length (cm)				Fish length (cm)			
	C.	R.	M.	G.	C.	R.	M.	G.	C.	R.	M.	G.	C.	R.	M.	G.
AUG	3.50	2.80	3.10	2.90	3.00	3.10	3.00	3.10	3.00	2.90	3.00	00	3.40	3.20	2.90	00
SEPT	3.50	3.80	4.10	3.90	4.00	4.20	4.00	4.00	4.20	4.20	4.10	00	3.60	3.90	3.80	00
OCT	4.30	4.20	4.80	4.60	4.40	4.10	4.90	4.80	4.90	4.80	5.10	00	5.00	5.10	5.00	00
NOV	5.80	5.90	6.10	5.70	5.90	5.90	6.20	6.00	6.10	5.80	6.10	00	6.50	6.40	6.40	00
DEC	8.00	7.80	7.50	7.80	9.20	7.10	7.40	7.20	8.00	7.90	8.20	00	7.90	7.80	7.00	00
JAN	8.50	8.50	8.20	9.00	9.00	8.00	12.00	7.50	10.00	8.00	8.00	00	10.00	8.00	7.90	00
FEB	8.90	8.77	8.78	9.82	9.13	8.46	8.53	8.12	10.30	8.80	9.35	00	10.21	8.45	8.57	00
MARCH	9.08	9.07	9.07	10.48	9.46	8.98	8.92	8.90	10.60	9.11	9.94	00	10.41	8.83	9.08	00
APRIL	9.51	9.48	9.57	10.92	9.64	9.37	9.42	9.52	10.8	9.71	10.44	00	10.75	9.07	9.62	00
MAY	9.96	9.94	10.06	11.54	9.87	9.77	9.87	10.10	11.04	10.26	10.81	00	11.03	9.54	9.91	00
JUNE	10.36	10.49	10.67	11.94	10.46	10.44	10.47	10.70	11.54	10.91	11.29	00	11.36	10.04	10.46	00
JULY	10.77	10.96	10.89	12.56	10.80	10.82	10.80	11.11	12.03	11.44	11.83	00	11.67	10.50	10.85	00
AUG	11.06	11.51	11.37	12.95	11.08	11.46	11.53	11.71	12.50	12.01	12.26	00	11.92	11.02	11.41	00
SEPT	11.48	12.00	11.83	13.67	11.40	11.82	11.92	12.13	12.72	12.71	12.90	00	12.43	11.42	11.87	00
OCT	11.95	12.50	12.07	14.22	11.92	12.08	12.49	12.73	13.05	13.28	13.90	00	12.90	12.05	12.16	00
NOV	12.44	13.05	12.67	14.90	12.32	12.82	12.92	13.56	13.51	14.72	14.69	00	13.36	12.61	12.74	00
DEC	12.75	13.82	13.16	15.50	12.87	13.49	13.43	13.95	13.77	15.67	15.41	00	13.78	13.01	13.22	00
JAN	13.07	14.07	13.96	16.26	13.25	14.22	14.04	14.78	14.23	16.44	16.15	00	14.06	14.06	14.02	00

**T₁: 2 Catla : 6 Rohu : 1 Mrigal : 1 Grass Carp : Sababul, T₂: 2 Catla : 6 Rohu : 1 Mrigal : 1 Grass Carp : Mix Plantation,
T₃: 4 Catla : 3 Rohu : 3 Mrigal : 0 Grass Carp : Subabul T₄: 4 Catla : 3 Rohu : 3 Mrigal : 0 Grass Carp : Mix Plantation**

Table – 2: Monthly variation in fish weight (g) under different treatment

Months	T ₁				T ₂				T ₃				T ₄			
	Fish weight (g)				Fish weight (g)				Fish weight (g)				Fish weight (g)			
	C.	R.	M.	G.	C.	R.	M.	G.	C.	R.	M.	G.	C.	R.	M.	G.
AUG	10.0	7.0	8.0	10.0	8.0	7.0	9.0	7.0	11.0	9.0	8.0	00	9.0	7.0	8.0	00
SEPT	60.0	15.0	15.0	18.0	110.0	18.0	15.0	16.0	80.0	22.0	12.0	00	85.0	18.0	12.0	00
OCT	120.0	40.0	35.0	30.0	120.0	30.0	30.0	25.0	150.0	25.0	28.0	00	140.0	38.0	38.0	00
NOV	100.0	50.0	45.0	50.0	90.0	45.0	35.0	35.0	220.0	50.0	45.0	55	190.0	40.0	48.0	00
DEC	250.0	70.0	75.0	80.0	195.0	95.0	90.0	90.0	200.0	80.0	100.0	00	200.0	90.0	95.0	00
JAN	190.0	95.0	100.0	90.0	200.0	150.0	120.0	100.0	250.0	100.0	110.0	00	210.0	100.0	100.0	00
FEB	241.0	151.0	153.0	155.0	255.0	198.0	195.0	162.0	290.0	201.0	201.0	00	271.0	162.0	156.0	00
MARCH	295.0	200.0	240.0	247.0	311.0	250.0	239.0	252.0	356.0	277.0	289.0	00	343.0	205.0	203.0	00
APRIL	379.0	280.0	300.0	297.0	373.0	296.0	292.0	304.0	400.0	310.0	346.0	00	390.0	268.0	267.0	00
MAY	420.0	324.0	356.0	356.0	425.0	351.0	354.0	387.0	486.0	395.0	439.0	00	402.0	307.0	314.0	00
JUNE	485.0	381.0	397.0	402.0	470.0	396.0	402.0	445.0	533.0	463.0	504.0	00	471.0	390.0	385.0	00
JULY	517.0	449.0	469.0	485.0	526.0	454.0	478.0	502.0	595.0	523.0	578.0	00	528.0	455.0	468.0	00
AUG	587.0	510.0	532.0	545.0	590.0	514.0	546.0	572.0	676.0	594.0	603.0	00	576.0	500.0	533.0	00
SEPT	633.0	600.0	597.0	600.0	645.0	602.0	600.0	609.0	720.0	683.0	659.0	00	615.0	598.0	595.0	00
OCT	694.0	685.0	657.0	675.0	700.0	690.0	669.0	685.0	793.0	742.0	744.0	00	695.0	679.0	660.0	00
NOV	774.0	750.0	708.0	719.0	780.0	757.0	722.0	749.0	882.0	813.0	803.0	00	763.0	736.0	713.0	00
DEC	810.0	804.0	785.0	792.0	827.0	816.0	790.0	813.0	942.0	900.0	895.0	00	836.0	800.0	784.0	00
JAN	900.0	879.0	875.0	890.0	897.0	896.0	856.0	900.0	1000.0	980.0	959.0	00	900.0	898.0	868.0	00

**T₁: 2 Catla : 6 Rohu : 1 Mrigal : 1 Grass Carp : Sababul, T₂: 2 Catla : 6 Rohu : 1 Mrigal : 1 Grass Carp : Mix Plantation,
T₃: 4 Catla : 3 Rohu : 3 Mrigal : 0 Grass Carp : Subabul T₄: 4 Catla : 3 Rohu : 3 Mrigal : 0 Grass Carp : Mix Plantation**

Table – 3: Monthly variation in fish width (cm) under different treatment

Months	T ₁				T ₂				T ₃				T ₄			
	Fish width (cm)				Fish width (cm)				Fish width (cm)				Fish width (cm)			
	C.	R.	M.	G.	C.	R.	M.	G.	C.	R.	M.	G.	C.	R.	M.	G.
AUG	3.90	2.30	2.40	2.30	3.00	2.40	2.20	2.50	3.80	3.00	2.80	00	2.40	2.40	2.40	00
SEPT	5.60	2.90	3.00	3.00	5.10	2.80	2.50	3.00	4.90	2.90	2.80	00	4.90	2.80	2.90	00
OCT	5.20	3.00	3.10	3.20	5.20	3.40	3.00	3.20	5.90	3.10	3.00	00	5.70	3.10	3.00	00
NOV	5.80	3.10	3.50	4.00	5.50	4.00	4.00	3.50	6.00	3.90	2.90	00	5.90	3.20	3.10	00
DEC	6.30	4.00	3.00	4.00	6.50	4.00	4.10	4.50	6.80	4.00	3.50	00	6.00	4.00	3.80	00
JAN	6.50	4.20	4.00	4.50	6.80	5.00	4.20	5.00	7.00	6.00	4.40	00	6.50	4.50	4.00	00
FEB	6.72	4.41	4.36	4.63	7.01	5.24	4.60	5.21	7.32	6.38	4.80	00	6.88	4.60	4.25	00
MARCH	6.97	4.53	4.57	4.79	7.30	5.33	4.91	5.35	7.45	6.41	5.13	00	7.11	4.75	4.59	00
APRIL	7.29	4.64	4.71	4.95	7.51	5.41	5.09	5.42	7.62	6.57	5.46	00	7.35	4.83	4.80	00
MAY	7.55	4.71	5.35	5.06	7.69	5.53	5.35	5.50	7.83	6.61	5.75	00	7.52	4.93	5.12	00
JUNE	7.65	4.82	5.41	5.49	7.76	5.64	5.72	5.89	8.18	6.73	5.96	00	7.60	5.04	5.47	00
JULY	7.65	5.07	5.78	5.99	7.89	5.71	5.89	6.27	8.39	6.82	6.31	00	7.71	5.34	5.70	00
AUG	8.33	5.37	6.06	6.59	8.17	5.92	6.16	6.54	8.55	7.06	6.75	00	7.93	5.65	5.92	00
SEPT	8.50	5.67	6.59	6.84	8.32	6.13	6.68	6.92	8.60	7.12	7.07	00	8.25	5.89	6.37	00
OCT	8.67	5.99	6.80	7.33	8.56	6.31	7.10	7.17	8.74	7.51	7.22	00	8.47	6.16	6.86	00
NOV	8.82	6.45	7.09	7.81	8.93	6.91	7.67	7.60	9.13	8.01	7.78	00	8.65	6.68	7.22	00
DEC	9.19	6.77	7.47	8.00	9.39	7.39	8.06	7.96	9.58	8.51	8.39	00	8.82	6.95	7.65	00
JAN	9.47	7.08	7.80	8.43	9.51	7.58	8.55	8.29	9.80	8.77	8.89	00	9.16	7.30	8.08	00

T₁: 2 Catla : 6 Rohu : 1 Mrigal : 1 Grass Carp : Sababul, T₂: 2 Catla : 6 Rohu : 1 Mrigal : 1 Grass Carp : Mix Plantation,
T₃: 4 Catla : 3 Rohu : 3 Mrigal : 0 Grass Carp : Subabul T₄: 4 Catla : 3 Rohu : 3 Mrigal : 0 Grass Carp : Mix Plantation

Table - 4: Tree growth parameter on boundary plantation of fish ponds

Sr. No.	T ₁ : 2 Catla : 6 Rohu : 1 Mrigal : 1 Grass Carp : Sababul			
	Tree name	DBH (cm)	Crown Diameter (m)	Height (m)
1.	Subabul (<i>Leucaena leucocephala</i>)	10.53	3.54	8.09

Table – 5: Tree growth parameter on boundary plantation of fish ponds

Sr. No.	T ₂ : 2 Catla : 6 Rohu : 1 Mrigal : 1 Grass Carp : Mix Plantation			
	Tree name	DBH (cm)	Crown Diameter (m)	Height (m)
1.	<i>Thespesia populnea</i>	12.80	3.45	4.50
2.	<i>Azadirachta indica</i>	7.40	1.80	5.40
3.	<i>Tectona grandis</i>	13.70	3.60	11.40
4.	<i>Ziziphus mauritiana</i>	22.10	5.00	6.70
5.	<i>Leucaena leucocephala</i>	8.90	3.62	6.30

Table – 6: Tree growth parameter on boundary plantation of fish ponds

Sr. No.	T ₃ : 4 Catla : 3 Rohu : 3 Mrigal : 0 Grass Carp : Subabul			
	Tree name	DBH (cm)	Crown Diameter (m)	Height (m)
1.	Subabul (<i>Leucaena leucocephala</i>)	18.08	6.31	9.88

Table – 7: Tree growth parameter on Boundary Plantation of fish ponds

Sr. No.	T ₄ : 4 Catla : 3 Rohu : 3 Mrigal : 0 Grass Carp : Mix Plantation			
	Tree name	DBH (cm)	Crown Diameter (m)	Height (m)
1.	<i>Ziziphus mauritiana</i>	14.70	3.44	7.05
2.	<i>Leucaena leucocephala</i>	9.70	2.45	8.26
3.	<i>Azadirachta indica</i>	23.27	6.11	8.45
4.	<i>Tamarindus indica</i>	30.025	7.60	9.47
5.	<i>Casuarina equisetifolia</i>	19.43	5.29	9.83

Table – 8: Water quality parameters of fish ponds

Treatments	pH	EC	K+ (me/l)	Ca + Mg (me/l)
T ₁	7.34	0.55	0.28	2.43
T ₂	7.38	0.56	0.28	2.50
T ₃	7.05	0.61	0.34	3.13
T ₄	7.11	0.65	0.33	3.13