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Maheshwaran K
Department of Soil Science and Agricultural Chemistry, Anbil Dharmalingam Agricultural College and Research Institute, Trichy, Tamil Nadu, India

M Babu
Department of Soil Science and Agricultural Chemistry, Soil and Water Management Research Institute, Thanjavur, Tamil Nadu, India

Correspondence
Maheshwaran K
Department of Soil Science and Agricultural Chemistry, Anbil Dharmalingam Agricultural College and Research Institute, Trichy, Tamil Nadu, India

Studies on the effect of water regimes and organics on nutrients uptake, soil fertility and yield of rice (*Oryza sativa* L)

Maheshwaran K and M Babu

Abstract
Field experiment was conducted at Soil and Water Management Research Institute, Kattuthottam, Thanjavur during *navarai* (December to March) season of 2017 - 2018 to study the effect of water regimes and organics on water use efficiency, water productivity and yield of rice. The field experiment was laid out in split plot design with three replications. The experiment consisted of three water regimes *viz.,* Irrigation on the day disappearance of ponded water (M1), Irrigation on two days after disappearance of ponded water (M2) and Irrigation on five days after disappearance of ponded water (M3) as main plots and six sub plots treatments *viz.*, control (without organic and inorganic) (S1), green manure @ 6.25 t ha-1 (S2), farm yard manure @ 12.5 t ha-1 (S3), vermicompost @ 5 t ha-1 (S4), coir pith compost @ 12.5 t ha-1 (S5) and poultry manure @ 5 t ha-1 (S6). Water regimes and organics significantly influenced nutrients uptake, soil fertility and yield of rice. The maximum values of N, P and K uptake were recorded under irrigation on the day of disappearance of ponded water. Among organic sources, poultry manure @ 5 t ha-1 recorded higher nutrients uptake. Among the interactions, irrigation on the day of disappearance of ponded water with poultry manure @ 5 t ha-1 significantly recorded higher N, P and K uptake. Poultry manure @ 5 t ha-1 registered significantly increases the soil fertility and it was followed by green manure @ 6.25 t ha-1. Irrigation on the day disappearance of ponded water recorded higher yield followed by irrigation on two days after disappearance of ponded water. Among organics, poultry manure @ 5 t ha-1 significantly contributes yield of rice. Irrigation on the day disappearance of ponded water with poultry manure @ 5 t ha-1 registered higher yield.

Keywords: NPK uptake, soil fertility, water regimes, compost, manures, yield, rice

Introduction
Rice scientifically known as Oryza sativa L. belongs to the family of graminae. Rice is the most important staple food in Asia. More than 90 % of the world's rice is grown and consumed in Asia, where 60% of the world's population lives. Rice accounts for between 35-60% of the caloric intake of three billion Asians. Over 150 million hectares of rice are planted annually, covering about 10 per cent of the world's arable land. World population estimated to increase from 6.2 billion in the year 2000 to about 8.2 billion in the year 2030, the global rice demand will rise to about 765 million tonnes, or 533 million tonnes of milled rice. India has the largest area under rice in the world, but its productivity level is 2.2 t ha-1 only.
Judicious use of organic manures and their scientific management is important to sustain the land and to achieve production potential of crops. To feed these large numbers of people high yielding varieties, intensive cultivation, inorganic fertilizers lead from the front. Due to the extensive and improper use of chemical fertilizers in the soil, our soil is degrading to an alarming level, causing an imbalance in the ecosystem and environmental pollution as well (Satyanarayana *et al*., 2002) [19]. This leads to deterioration in soil physical and chemical properties, biological activity and generally in soil health (Mahajan *et al*., 2008) [12].
Hence, the present investigation was taken up to study the effect of water regimes organics on nutrients uptake, soil fertility and yield of ice.

Material and Methods
Field experiment was conducted during navarai (December to March) season of 2017- 2018 at Soil and Water Management Research Institute, Kattuthottam, Thanjavur, Tamil Nadu. The farm is located in New Cauvery Delta zone of Tamil Nadu at 10° 46' N latitude, 79°10' E longitude and at an altitude of 50 m above mean sea level. The soil of the experimental site

was sandy loam in texture having neutral in soil pH (7.02), low in EC (0.180 dS m-1), CEC (10 cmol (p+) kg-1) low in organic carbon (0.50%), low in available nitrogen (212 kg ha-1), high in available phosphorus (29 kg ha-1) and medium in potassium (198 kg ha-1). Short duration rice variety ADT 43 was used as test variety.

Experiment was laid out in split plot design with three replications. Irrigation on the day disappearance of ponded water (M1), irrigation on two days after disappearance of ponded water

(M2) and irrigation on five days after disappearance of ponded water (M3) are water regimes used as main-plot treatments. Various organic sources viz., control (without organic and inorganic) (S1), green manure @ 6.25 t ha-1 (S2), farm yard manure @ 12.5 t ha-1 (S3), vermicompost @ 5 t ha-1 (S4), coir pith compost @ 12.5 t ha-1 (S5) and poultry manure @ 5 t ha-1 (S6) were imposed as sub-plot treatments.

The growth and yield attributes of rice were recorded. Each individual plot was separated with buffer cannels for proper maintenance of the treatments. The irrigation water was measured with the parshall flume. In order to evaluate the effect of water regimes and organics on nutrients uptake, soil fertility and yield, the data were statistically analyzed using "Analysis of variance test". The critical difference at 5% level of significance was calculated to find out the significance of different treatments over each other (Gomez and Gomez, 1984) [6]. Yield and yield parameters were calculated after harvest at maturity.

Soil samples were collected and processed from each plot as per the treatments schedule after the harvest for pH, EC, CEC, available NPK and organic carbon content. pH and EC were determined by soil water suspension (1:2:2) (Jackson, 1973) [9], CEC was determined by Neutral normal ammonium acetate (Piper, 1966) [17], available nitrogen was determined by alkaline permanganate (Subbiah and Asija, 1956) [26], phosphorous was determined by 0.5 M Sodium bicarbonate (Olsen *et al*., 1954), potassium was determined by flame photometry (Stanford and English, 1949) [25] and organic carbon was determined by wet chromic acid digestion (Walkley and Black, 1934) [28].

Five randomly selected plants from each net plot were oven dried and used for chemical analysis then straw and grains were separated from each other and were powdered and sieved for determination of NPK. Nitrogen content was determined by by microkjeldhal method (Humphries, 1956) [8]. Phosphorus was determined by Vanadomolybdate phosphoric yellow colour method and observation was recorded at 430 nm using Spectrophotometer instrument (Jackson, 1973) [9] and potassium content was determined by diacid digested extract with the digital flame photometer (Jackson, 1973) [9].

$$\text{Nutrient uptake (kg ha}^{-1}\text{)} = \frac{\text{Nutrient content (\%)}}{100} \times \text{Dry weight (kg ha}^{-1}\text{)}$$

Results and discussion

Effect on nutrients uptake

Water regimes and organics significantly influence the N, P and K uptake by rice at various growth stages of rice. (Table. 2, 3 and 4)

Table1: Initial characteristics of experimental field soil

S. No	Parameters	Unit	Content
I. Physical properties			
1. Particle size analysis			
	i. Sand	%	73.30
	ii. Silt	%	10.20
	iii. Clay	%	16.50
2.	Soil textural classes	-	Sandy loam
3.	Bulk density	Mg m-3	1.23
4.	Particle density	Mg m-3	1.81
5.	Pore space	%	49.0
II. Physico chemical properties			
6.	pH	-	7.02
7.	EC	dS m-1	0.18
8.	Cation Exchange Capacity (CEC)	cmol (p+) kg-1	15.00
III. Chemical properties			
9.	Available N	kg ha-1	212
10.	Available P	kg ha-1	29
11.	Available K	kg ha-1	198
12.	Organic carbon	%	0.5

Table 2: Effect of water regimes and organics on N uptake (kg ha-1) at various growth stages of rice

Active tillering					Flowering				Harvest			
Treatments	M1	M2	M3	Mean	M1	M2	M3	Mean	M1	M2	M3	Mean
S1	17.1	14.0	12.0	14.4	63.8	61.0	56.3	60.4	44.3	40.4	36.0	40.2
S2	55.3	40.0	45.1	46.8	81.0	71.2	65.5	72.6	92.5	75.1	67.3	78.3
S3	40.3	35.2	31.0	35.5	75.1	65.3	62.0	67.5	78.0	67.0	62.0	69.0
S4	48.0	38.0	33.0	39.7	78.0	68.3	64.1	70.5	86.0	70.1	62.1	72.7
S5	37.1	32.0	27.0	32.0	73.0	65.0	61.0	66.3	77.5	67.4	62.5	69.1
S6	55.1	46.2	45.0	48.8	85.0	73.6	67.2	75.3	96.0	81.2	74.0	83.7
Mean	42.0	34.0	32.0		76.2	67.4	62.7		79.0	67.0	61.0	

	S Ed	CD (p=0.05)	S Ed	CD (p=0.05)	S Ed	CD (p=0.05)
M	0.54	1.6	1.14	3.1	1.12	3.1

S	0.84	1.7	0.75	1.5	0.57	1.2
M at S	0.76	1.9	1.37	3.0	0.93	1.9
S at M	0.81	1.7	1.30	2.7	0.99	2.0

Main plot

M1: Irrigation on the day disappearance of ponded water
M2: Irrigation on two days after disappearance of ponded water

Sub plot

S1: Control (without organic and inorganic)
S2: Green manure @ 6.25 t ha-1
M3: Irrigation on five days after disappearance of ponded water S3: Farm yard manure @ 12.5 t ha-1
S4: Vermicompost @ 5 t ha-1
S5: Coir pith compost @ 12.5 t ha-1
S6: Poultry manure @ 5 t ha-1

Table 3: Effect of water regimes and organics on P uptake (kg ha-1) at various growth stages of rice

	Active tillering				Flowering				Harvest			
Treatments	**M1**	**M2**	**M3**	**Mean**	**M1**	**M2**	**M3**	**Mean**	**M1**	**M2**	**M3**	**Mean**
S1	6.00	5.04	4.18	5.07	16.08	13.51	11.20	13.60	21.57	17.75	14.33	17.88
S2	7.21	6.34	5.99	6.51	19.25	16.99	16.05	17.43	26.39	22.92	21.53	23.61
S3	6.61	5.71	4.81	5.71	17.71	15.30	12.89	15.30	24.00	20.42	16.84	20.42
S4	6.89	6.05	5.51	6.15	18.47	16.21	14.77	16.48	25.11	21.77	19.62	22.17
S5	6.28	5.39	4.52	5.40	16.83	14.45	12.11	14.46	22.69	19.14	15.68	19.17
S6	7.50	6.66	5.82	6.66	20.10	17.85	15.60	17.85	27.54	24.20	20.86	24.20
Mean	6.75	5.87	5.14		18.07	15.72	13.77		24.55	21.03	18.14	

	S Ed	**CD (p=0.05)**	**S Ed**	**CD (p=0.05)**	**S Ed**	**CD (p=0.05)**
M	0.10	0.29	0.28	0.77	0.37	1.03
S	0.05	0.12	0.20	0.41	0.19	0.39
M at S	0.09	0.20	0.33	0.69	0.37	0.87
S at M	0.09	0.19	0.35	0.71	0.33	0.68

Main plot

M1: Irrigation on the day disappearance of ponded water
M2: Irrigation on two days after disappearance of ponded water
M3: Irrigation on five days after disappearance of ponded water

Sub plot

S1: Control (without organic and inorganic)
S2: Green manure @ 6.25 t ha-1
S3: Farm yard manure @ 12.5 t ha-1
S4: Vermicompost @ 5 t ha-1
S5: Coir pith compost @ 12.5 t ha-1
S6: Poultry manure @ 5 t ha-1

Table 4: Effect of water regimes and organics on K uptake (kg ha-1) at various growth stages of rice

	Active tillering				Flowering				Harvest			
Treatments	**M1**	**M2**	**M3**	**Mean**	**M1**	**M2**	**M3**	**Mean**	**M1**	**M2**	**M3**	**Mean**
S1	20.1	17.1	15.1	17.4	62.5	52.5	43.5	52.8	99.0	84.2	80.0	87.7
S2	30.0	27.0	22.0	26.3	75.0	66.0	62.3	67.8	130.0	112.5	114.2	119.0
S3	26.0	23.1	18.0	22.4	68.8	59.4	50.1	59.4	119.1	103.8	93.4	105.6
S4	28.1	25.0	19.1	24.1	71.7	63.0	57.4	64.0	125.0	108.1	114.1	116.0
S5	26.2	23.0	18.0	22.4	65.4	56.1	47.0	56.2	119.0	103.2	93.3	105.2
S6	32.8	29.0	24.1	28.6	78.1	69.3	60.6	69.3	139.0	116.0	108.1	121.0
Mean	27.2	23.0	19.4		70.2	61.0	53.5		121.9	104.6	100.5	

	S Ed	**CD (p=0.05)**	**S Ed**	**CD (p=0.05)**	**S Ed**	**CD (p=0.05)**
M	0.40	1.2	1.10	3.0	1.81	5.7
S	0.34	1.0	0.61	1.2	0.89	1.8
M at S	0.62	1.8	1.15	2.6	1.59	3.9
S at M	0.58	1.2	1.05	2.1	1.55	3.5

Main plot

M1: Irrigation on the day disappearance of ponded water
M2: Irrigation on two days after disappearance of ponded water
M3: Irrigation on five days after disappearance of ponded water

Sub plot

S1: Control (without organic and inorganic)
S2: Green manure @ 6.25 t ha-1
S3: Farm yard manure @ 12.5 t ha-1
S4: Vermicompost @ 5 t ha-1
S5: Coir pith compost @ 12.5 t ha-1
S6: Poultry manure @ 5 t ha-1

Nitrogen uptake (kg ha-1)

Irrigation on the day of disappearance of ponded water recorded significantly higher nitrogen uptake (42.0, 76.2 and 79.0 kg ha-1) which was followed by irrigation on two days after disappearance of ponded water (34.0, 67.4 and 67.0 kg ha-1). Invariably, Irrigation on five days after disappearance of ponded water registered lower nitrogen uptake (32.0, 62.7 and 61.0 kg ha-1) among all the treatments.

Among the organics, poultry manure @ 5 t ha-1 resulted in significantly increase the N uptake (46.8, 75.3 and 83.7 kg ha-1) followed by green manure @ 6.25 t ha-1 (S2) (16). Lowest N uptake (14.4, 60.4 and 40.2 kg ha-1) was observed in control (without organic and inorganic) (S1).

Significant interaction was observed at different growth stages of rice. Irrigation on the day of disappearance of ponded water with poultry manure @ 5 t ha-1 registered higher nitrogen uptake (55.1, 85.0 and 96.0 kg ha-1). Lower nitrogen uptake was registered in irrigation on five days after disappearance of ponded water with control (without organic and inorganic) (12.0, 56. 3 and 36.0 kg ha-1).

Phosphorus uptake (kg ha-1)

Irrigation on the day of disappearance of ponded water recorded significantly higher phosphorus uptake (6.75, 18.07 and 24.55 kg ha-1) which was followed by irrigation on two days after disappearance of ponded water (5.87, 15.72 and 21.03 kg ha-1). Invariably, Irrigation on five days after disappearance of ponded water registered lower nitrogen uptake (5.14, 13.77 and
18.14 kg ha-1).

Various organics had significantly influenced the phosphorus uptake. Among the organics, poultry manure @ 5 t ha-1 resulted in significantly increase the phosphorus uptake (6.66, 17.85 and 24.20 kg ha-1) followed by green manure @ 6.25 t ha-1 (6.51, 17.43 and 23.61kg ha-1). Lower phosphorus uptake was observed in control (without organic and inorganic) (5.07, 13.60 and 17.88 kg ha-1).

Significant interaction was observed at different growth stages of rice. Irrigation on the day of disappearance of ponded water with poultry manure @ 5 t ha-1 registered higher phosphorus uptake (7.50, 20.10 and 27.54 kg ha-1). Lower phosphorus uptake was registered in irrigation on five days after disappearance of ponded water with control (without organic and inorganic) (4.18, 11.20 and 14.33 kg ha-1).

Potassium uptake (kg ha-1)

In water regimes, irrigation on the day of disappearance of ponded water recorded significantly higher potassium uptake (27.2, 70.2 and 121.9 kg ha-1) which was followed by irrigation on two days after disappearance of ponded water (23.0, 61.0 and 104.6 kg ha-1). Invariably, Irrigation on five days after disappearance of ponded water registered lower potassium uptake (19.4, 53.5 and 100.5 kg ha-1).

In organics sources, poultry manure @ 5 t ha-1 resulted in significantly increase the potassium uptake (28.6, 69.3 and 121.0 kg ha-1) followed by green manure @ 6.25 t ha-1 (26.3, 67.8 and 119.0 kg ha-1). Lower potassium uptake was observed in control (without organic and inorganic) (17.4, 52.8 and 87.7 kg ha-1).

Irrigation on the day of disappearance of ponded water with poultry manure @ 5 t ha-1 registered higher potassium uptake (32.8, 78.1 and 139.0 kg ha-1). Lower potassium uptake was registered in irrigation on five days after disappearance of ponded water with control (without organic and inorganic) (15.1, 43.5 and 80.0 kg ha-1). This was due to better dry matter production due to reduced stress and nutrient availability to the crop. This was agreement with findings of sreelatha *et al*., (2006) [23], Luikham *et al*. (2004) and Grigg *et al*., (2000) [7].

Effect on soil fertility Effect on physical property Bulk density

Bulk density is an indicator of soil compaction. It’s calculated as the dry weight of soil divided by its volume. Bulk density reflects the soil ability to function for structural support, water and solute movement and soil aeration.

The results of the investigation showed that water regimes and organic sources significantly influenced the bulk density of post harvest soil and the results are furnished in Table.5.

Bulk density in post harvest soil was not influenced by the different water regimes of all three water regimes are on par with each other.

Bulk density of post harvest soil was significantly influenced by the various organic sources. All the organic sources significantly decrease the bulk density of the post harvest soil. Higher bulk density (1.38) was recorded under control (Absolute) (S1).

There was no significant interaction occurs between water regimes and various organics in respect of bulk density of post harvest soil. This was due to organics incorporated soils and this was attributed to the buildup of soil organic matter and better soil structure. Several studies (Kannan *et al*., 2005; Natarajan, 2007) [10, 15] revealed that organic manure increases water holding capacity, pore space and decreases bulk density of soil. Manickam, (1993) [13] concluded that the added organic residues to the soil undergo microbial decomposition and in this process, various organic acids and other products of decay like polysaccharides are released which act as strong binding agents in the formation of large and arable aggregates. This was in agreement with findings of Srikanth *et al*. (2000) [24]. Single application of organics may not help to decrease the bulk density of the soil considerably but continuous application of organics may decrease the bulk density of soil considerably by accumulation organic matter in to the soil by the way increasing the soil pore space.

Effect on physico-chemical properties of soil

Soil reaction (pH), Electrical conductivity (EC) and Cation exchange capacity (CEC) of post harvest soil

Physico-chemical properties are key factors for crop growth for nutrients release and subsequently availability. Water regimes and various organics sources influence the physico-chemical properties such as soil reaction (pH), electrical conductivity (EC) and cation exchange capacity (CEC) of the post harvest rice soil and the results are furnished in Table.5

Soil pH, electrical conductivity and cation exchange capacity were not significantly influenced by water regimes.

There was no significant difference in physico-chemical properties of the post harvest soil in various organics source applied treatments and are on par with each other but superior over control. Similar findings are reported by Patil *et al*. (2003) [16]. This could be ascribed to the acidifying effect of various organic acids (amino acid, glycine, cystein and humic acid) or acid forming compounds and CO2 that were released from decomposition of organic manures. Similar reasons were attributed by Brady and Weil (2005) [5] and Natarajan (2007) [15]. The reduction in EC might be due to leach out of salts by the organic acids released by the organic sources (Anand, 1992) [2]. Addition of organic sources enhances the CEC of the soil by nutrient release and availability. There was no significant interaction occurs in water regimes and organics in respect of physico-chemical properties of soil.

Table 5: Effect of water regimes and organics on physical and physico-chemical properties of post harvest soil

Bulk density (Mg m-				3)	pH				EC (dS m-1)				CEC (cmol (p+) kg-1)			
Treatments	**M1**	**M2**	**M3**	**Mean**	**M1**	**M2**	**M3**	**Mean**	**M1**	**M2**	**M3**	**Mean**	**M1**	**M2**	**M3**	**Mean**
S1	1.43	1.27	1.43	1.38	7.73	7.74	7.74	7.74	0.194	0.195	0.195	0.195	15.79	15.78	15.78	15.78
S2	1.25	1.25	1.24	1.25	7.68	7.71	7.71	7.69	0.181	0.182	0.182	0.181	17.71	17.68	17.65	17.68
S3	1.25	1.25	1.26	1.25	7.69	7.70	7.70	7.70	0.180	0.181	0.181	0.181	17.38	17.34	17.34	17.35
S4	1.26	1.26	1.27	1.26	7.69	7.71	7.71	7.70	0.182	0.182	0.181	0.182	17.50	17.48	17.46	17.48
S5	1.25	1.26	1.27	1.26	7.70	7.70	7.70	7.71	0.180	0.181	0182	0.181	17.30	17.31	17.30	17.30
S6	1.24	1.25	1.24	1.24	7.68	7.68	7.68	7.68	0.179	0.179	0.180	0.179	17.98	17.93	17.91	17.94
Mean	1.28	1.26	1.29		7.70	7.71	7.71		0.183	0.183	0.184		17.27	17.25	17.24	

	S Ed	CD (p=0.05)	S Ed	CD (p=0.05)	S Ed	CD (p=0.05)	S Ed	CD (p=0.05)
M	0.023	NS	0.01	NS	0.003	NS	0.32	NS
S	0.033	0.07	0.18	0.36	0.004	0.008	0.46	0.93
M at S	0.059	NS	0.31	NS	0.006	NS	0.78	NS
S at M	0.057	NS	0.31	NS	0.007	NS	0.79	NS

Main plot

M1: Irrigation on the day disappearance of ponded water
M2: Irrigation on two days after disappearance of ponded water
M3: Irrigation on five days after disappearance of ponded water

Sub plot

S1: Control (without organic and inorganic)
S2: Green manure @ 6.25 t ha-1
S3: Farm yard manure @ 12.5 t ha-1
S4: Vermicompost @ 5 t ha-1
S5: Coir pith compost @ 12.5 t ha-1
S6: Poultry manure @ 5 t ha-1

Chemical properties of post harvest soil
Available N, P and K content in soil

The N, P and K are most important nutrients, without any one of which plants could not survive. Soil often lack these nutrients, either naturally or as a result of over cultivation or other environmental factors. In case, where soil are lacking, nutrients must be put into the soil in order to create the ideal environment for optimal plant growth.

The available N, P and K content of post harvest rice soil doesn't significantly influences by water regimes (Table.6.)

Available N, P and K content in post harvest soil was significantly influence by different organic sources of post harvest soil. Poultry manure @ 5 t ha-1 resulted in significantly higher available N, P and K content in post harvest soil (248, 38 and 248 kg ha-1 respectively) followed by green manure @ 6.25 t ha-1 (237, 34 and 236 kg ha-1 respectively). Lower available N, P and K content in post harvest soil (202, 22 and 171 kg ha-1 respectively) was observed in control (without organic and inorganic). There was no significant interaction occurs in water regimes and various organics on available N, P and K content in post harvest soil. Similar findings were also reported by Amanullah *et al*. (2006); Prasanthrajan *et al*., (2008) [18]; Babu and Reddy (2000) [3] and Sudhakar *et al*., (2002) [27].

Table 6: Effect of water regimes and organics on soil available NPK (kg ha-1) and organic carbon (%) status of post harvest soil

Nitrogen (kg ha-1)					Phosphorous (kg ha-1)				Potassium (kg ha-1)				Organic carbon (%)			
Treatments	**M1**	**M2**	**M3**	**Mean**	**M1**	**M2**	**M3**	**Mean**	**M1**	**M2**	**M3**	**Mean**	**M1**	**M2**	**M3**	**Mean**
S1	204	201	200	202	23	22	22	22	181	170	162	171	0.45	0.44	0.43	0.44
S2	239	233	239	237	35	34	34	34	239	235	233	236	0.58	0.58	0.57	0.54
S3	225	221	219	222	28	29	29	29	209	205	203	206	0.56	0.57	0.57	0.57
S4	233	230	229	231	33	33	32	33	221	220	219	220	0.57	0.57	0.57	0.57
S5	215	210	208	211	29	28	28	28	201	198	196	198	0.58	0.57	0.58	0.58
S6	248	248	247	248	39	38	38	38	250	248	247	248	0.59	0.58	0.56	0.58
Mean	227	224	224		31	31	31		217	213	210		0.56	0.55	0.53	

	S Ed	CD (p=0.05)	S Ed	CD (p=0.05)	S Ed	CD (p=0.05)	S Ed	CD (p=0.05)
M	3.92	NS	0.54	NS	3.54	NS	0.009	NS
S	2.51	5	0.79	1	5.01	10	0.012	0.03
M at S	4.43	NS	1.44	NS	8.90	NS	0.024	NS
S at M	4.36	NS	1.38	NS	8.68	NS	0.022	NS

Main plot

M1: Irrigation on the day disappearance of ponded water
M2: Irrigation on two days after disappearance of ponded water
M3: Irrigation on five days after disappearance of ponded water

Sub plot

S1: Control (without organic and inorganic)
S2: Green manure @ 6.25 t ha-1
S3: Farm yard manure @ 12.5 t ha-1
S4: Vermicompost @ 5 t ha-1
S5: Coir pith compost @ 12.5 t ha-1
S6: Poultry manure @ 5 t ha-1

Table 7: Effect of water regimes and organics on grain yield (kg ha-1), straw yield (kg ha-1) and harvest index of rice

Grain yield (kg ha-1)					Straw yield (kg ha-1)			
Treatments	**M1**	**M2**	**M3**	**Mean**	**M1**	**M2**	**M3**	**Mean**
S1	2793	2516	2260	2523	3491	3145	2825	3154
S2	4980	4545	4282	4602	6225	5681	5353	5753
S3	4432	4223	3900	4185	5540	5279	4875	5231

S4	4665	4423	4097	4395	5831	5529	5121	5494
S5	4180	4077	3833	4030	5225	5096	4791	5037
S6	5332	4590	4334	4752	6665	5738	5418	5940
Mean	4397	4062	3784		5496	5078	4731	

	S Ed	CD (p=0.05)	S Ed	CD (p=0.05)
M	80.15	225	95.14	263
S	54.73	112	77.77	159
M at S	95.46	207	131.22	280
S at M	94.80	194	134.70	275

Main plot

M1: Irrigation on the day disappearance of ponded water
M2: Irrigation on two days after disappearance of ponded water
M3: Irrigation on five days after disappearance of ponded water

Sub plot

S1: Control (without organic and inorganic)
S2: Green manure @ 6.25 t ha-1
S3: Farm yard manure @ 12.5 t ha-1
S4: Vermicompost @ 5 t ha-1
S5: Coir pith compost @ 12.5 t ha-1
S6: Poultry manure @ 5 t ha-1

Organic carbon

The results of the investigation showed that water regimes and organic sources significantly influenced the organic carbon status after harvest of crop and the results are depicted in Table.6.

Organic carbon content in post harvest soil doesn't have any influence by different water regimes of post harvest soil.

Organic carbon content in post harvest soil was significantly influenced by various organic sources application. All the organic sources significantly increase the organic carbon content there are on par with each other. Decrease the organic carbon content was recorded in control (without organic and inorganic) (S1) (0.44 %).

There was no significant interaction occurs in water regimes and various organics on organic carbon content in post harvest soil. This was due to continuous and slow release of organic carbon in to the soil. This is in conformity with the results noted by Sheeba and Kumarasamy (2001) [20] and Singh *et al*. (2001) [22].

Effect on grain and straw yield

The grain yield and straw yield of rice was greatly influenced by the water regimes and organic nutrient management practices (Table.7.). Among the three water regimes, irrigation on the disappearance of ponded water recorded higher grain and straw yield of 4397 and 5496 kg ha-1 respectively. However, it was comparable with irrigation on two days after disappearance of ponded water. Whereas, irrigation on five days after disappearance of ponded water recorded

significantly lesser grain and straw yield of 3784 and 4731 kg ha-1 respectively. Irrigation on the day disappearance of ponded water recorded higher grain and straw yield (16.20 and 13.86% respectively) than irrigation on five days after disappearance of ponded water. (Table.6). in organic nutrient management practices greatly influenced the rice grain and straw yield. Among various organic sources, poultry manure @ 5 t ha-1 recorded higher grain and straw yield (4752 and 5940 kg ha-1 respectively) and it was followed by green manure @ 6.25 t ha-1. Control (without organic and inorganic) recorded lower grain and straw yield (2523 and 3154 kg ha-1 respectively). Irrigation on the disappearance of ponded water with poultry manure 5 t ha-1 significantly recorded higher grain and straw yield (5332 and 6665 kg ha-1 respectively) it was comparable with irrigation on the disappearance of ponded water with green manure 6.25 t ha-1 and lower grain and straw yield (2260 and 2825 kg ha-1 respectively) were observed under irrigation on five days after disappearance of ponded water. Similar trends were observed by Siddaram (2009) [21], Manjunatha (2010) [14] and Belder *et al*., (2005) [4].

Conclusion

The results of study indicated that, the water regimes and organics significantly influence the all parameters, irrigation on the day of disappearance of ponded water with poultry manure

@ 5 t ha-1 recorded higher N, P and K uptake and yield of rice. With respect of soil fertility water

regimes doesn't influence significantly, but various organic sources poultry manure @ 5 t ha-1 significantly increase the available N, P, K and organic carbon content of post harvest soil over the control (without organic and inorganic).

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