IRRIGATION WATER QUALITY IN CHEWING TOBACCO AREAS OF TAMIL NADU

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One hundred and thirty nine irrigation water samples collected from 65 chewing tobacco growing villages of Dindigul, Karur, Tirupur, Nagapattanam, Cuddalore and Erode districts of Tamil Nadu were analysed for pH, EC, calcium, magnesium, sodium, carbonates, bicarbonates and chlorides. From the data Residual Sodium Carbonate (RSC) and Sodium Adsorption Ratio (SAR) values were computed and water quality classes were determined. The main source of irrigation in the chewing tobacco growing districts of Tamil Nadu is open wells/ bore wells. Irrigation water samples are alkaline in Dindigul, Karur, Tirupur and Cuddalore districts. In Nagapattanam, 39% of water samples tested were neutral and 61% were alkaline. In Erode district 53% samples were neutral and remaining 47% were alkaline.

In Dindigul district, 19% samples for EC were in C2 category, 63% were in C3 category and 18% in C4 category. In Nagapatnam, Cuddalore and Erode district majority samples are in C3category. InKarur and Tirupur districts 100% waters samples were in C2 category. Chlorides in all the irrigation water samples irrespective of the district were high. In Dindigul district, SAR was low (<10) in 82%, medium in 13%, high in 3% and very high in 2% water samples. SAR was low in all the samples of Nagapattanam, Cuddalore, Karur,Tirupur and Erode districts. In Nagapattanam district, RSC was low in 89% samples and medium in 11% samples, while all the samples of Dindigul, Cuddalore, Erode, Tirupur and Karur districts were low in RSC. Majority of irrigation water samples in Dindigul district were in C3S1 water class followed by C2S1. Irrigation waters of Karur and Tirupur districts were in C2S1 category. Majority of water samples in Nagapatnam, Cuddalore and Erode districts were C3S1 category. Irrigation waters of Karur and Tirupur districts can be used safely for irrigation. In Dindigul, Erode, Cuddalore and Nagapatnam districts majority of water samples have EC in the range of 0.75 to 2.25 dS/m and SAR < 10, slight to moderate restrictions need to be imposed by reducing the quantum for irrigation water through scientific irrigation management approaches like drip irrigation to contain the salinity and chloride levels in soil for better management of chewing tobacco.

INTRODUCTION

In order to attend the expected increase in food production, irrigated area need to be increased with quality irrigation water. At present 10% of the irrigated area is affected with irrigation induced problems (Salinity, Sodicity and water logging) and while converting the new areas under irrigation, the problem will be intensified. Irrigated agriculture is dependent on adequate water supply of usable quality as the physical and mechanical properties of the soil *viz.,* soil structure and permeability, which are very sensitive to the type of exchangeable ions present in irrigation waters. Poor quality water can be responsible for slow growth, poor quality of the crop and, in some cases, can result in the gradual death of the plants. High soluble salts in irrigation waters can directly injure roots, interfering with water and nutrient uptake. Irrigation with waters having high soluble salts leads to accumulation in plant leaf margins, causing burning of the edges. Water with high alkalinity can adversely affect the pH of the growing medium, interfering with nutrient uptake and causing nutrient deficiencies. Hence irrigation with good water quality is essential for yield improvement in crops, maintenance of soil productivity, protection of the environment and is a critical aspect of crop production. Water quality should be tested to ensure its acceptability to plant growth and to minimize the risk of discharging pollutants to surface or ground water. The most important factors to determine the

Key words : Irrigation water quality, chewing tobacco, SAR

suitability of water use in agriculture are pH, total soluble salts, cations (Ca^{+2}, Mg^{+2}, Na^{+1}), and anions (Cl^{-1}, CO_3^{-2}, HCO_3^{-1}).

Tobacco is grown on wide range of soil and climatic conditions and its irrigation requirement vary not only with the deficiency in soil moisture and atmospheric aridity but also with different tobacco types (Gopalachari, 1984). Tobacco being a mesophyte, about 80-85% of plant weight is water but it can tolerate drought more than excess of moisture as it has fairly deep and vigorous root system. Giving one or two irrigations with good quality water between 30th and 50th day is helpful in increasing the yield. Jones *et.al.* (1960) observed that irrigations at planting and when the crop is at knee height stage aids in rapid growth. In traditional black soils of Andhra Pradesh, it was found beneficial to irrigate cigarette tobacco to field capacity when soil moisture was fallen to 60% in the available range with water containing 30 ppm chlorides. Chewing tobacco is one of the important commercial crop grown Tamil Nadu in an area of 11900 ha producing 31.4 million Kgs. Important districts cultivating chewing tobacco in Tamil Nadu were Dindigul, Nagapatnam, Cuddalore, Erode, Tirupur and Karur districts. The present investigation was intended to assess the water quality of chewing tobacco growing districts of Tamil Nadu to assess their suitability.

MATERIAL AND METHODS

In order to assess the irrigation water quality, water samples (139 nos) were collected from sixty five chewing tobacco growing villages of Dindigal, Karur, Nagapatnam, Cuddalore, Erode and Tirupur districts where chewing tobacco is grown in Tamil Nadu (Table 1). The main source of irrigation water are open/ tube/ bore wells. These irrigation waters were analysed for pH, EC, chlorides, carbonates, bi-carbonates sodium, calcium and magnesium. From the data Sodium Adsorption Ratio (SAR) and Residual Sodium Carbonate (RSC) values were computed, and irrigation water classes were determined (Dhyan Singh *et al.*2000).

RESULTS AND DISCUSSION

Dindigul District: Atotal no of 62 water samples were collected from 30 villages and were analysed for different parameters. Results revealed that irrigation waters were alkaline (98%) and the pH of the irrigation waters ranged from 7.5 in Odapatty to 8.4 in G. Nadupatti villages**.** Total soluble salts as measured by electrical conductivity ranged from 0.46 to 4.2dS/m in Ambilikai and Sullerumbu villages respectively. Based on the total soluble salts majority of water samples (63%) were in C3 category, 19% samples were in C2 category, and 18% in C4 category. Irrigation waters were very high in chlorides and they were in the range from 79 to 2224 ppm in Ambilikai and Kandasamuthrapatty villages respectively. In general RSC values were low because of low CO_3^{-2} and HCO_3^{-1} compared to Ca^{+2} and Mg^{+2} and SAR values ranged from 1.01 to 33.53 in P.Sukkampatty and S.G. Pudur villages respectively. SAR is low in 82% of waters and medium in 13% waters and high in 5%. Water quality classes ranges from C_2S_1 to C_4S_4**.** Majority of irrigation water samples in Dindigul district were in C3S1 (47%) water class followed by C2S1 (18%)

Karur and Tirupur: A total no of 18 water samples were collected from two villages in Karur (3 No. s) and six villages in Tirupur (15 Nos) districts and were analysed for irrigation water quality parameters. Irrigation water of both the districts was alkaline. Based on the total soluble salts all the water samples (100%) of the two districts were in C2 category and they were good quality waters and can be utilised for irrigation purpose. Chlorides were high in Karur district as well as Tirupur districts, however in Tirupur district, some villages *viz.*,Uttukkuli and Koduvai have the low chlorides which are suitable to irrigate any of the agricultural crops. As the total soluble salts and SAR were low compared to other districts, all the water samples were under the C_2S_1 category.

Nagapattanam, Cuddalore and Erode: A total no of 36 water samples were collected from 10 villages in Nagapatnam district, four samples from three villages in Cuddalore district, 19 samples from 14 villages in Erode district. In Nagapattanam district, 42% of waters tested were neutral and 58% were in alkaline range and the values ranged from 7.1 in Nallan Kuthagai to 8.1 in Palayavaram. Total soluble salts were in the range of 0.83 in Palayavaram to 2.24 in Kodiakadu and they were classified C3 category. Chlorides were in the range

of 71 ppm in NallanKuthagai to 1028 ppm in Kodiakadu villages. In Erode district, 53% samples were in neutral and 47% were alkaline in reaction and the values ranged from 7.0 in Pudur to 8.2 in Chennimalai villages. Total soluble salts were in the range of 0.61 in Chennimalai to 2.36 in Olagadam, Mandri T. Kottai and Pugaiellai Reddiur villages and they were in category of C3 (74%) and C4 (21%). Chlorides were in the range of 140 in Bavanisagar and 1540 ppm in Kasiyur villages. All the water samples of Cuddalore were alkaline in reaction and chlorides were also high. Among the three districts, Nagapatnam has got lower chlorides compared to other districts. Sodium Adsorption Ratio (SAR) was low in all the samples of Nagapattanam (range is 2.07-7.97), Cuddalore (range is 4.77-6.85) and Erode districts (range is 1.84-7.00). Residual sodium carbonate (RSC) was low in 89% samples and medium in 11% samples in Nagapatnam, while all the samples of Cuddalore and Erode district were low, indicating that Carbonates and bicarbonates are dominating in the three villages *viz.,* A.Puram, P.Annal West and MuthalimaduThittu villages of Nagapatnam district and in rest of the villages Calcium and Magnesium ions dominates the carbonates and bicarbonates. In Nagapatnam and Cuddalore districts SAR values were in low range in all the villages. In Erode district, three villages Kemmayapatti, Olagadam, Mandri T. Kottai and Pugaiellai Reddiur villages were in C4S1 class, rest of the villages were in C3S1 class. In Nagapatnam district, 94% villages were in C3S1 and only two villages (6%) viz., Kodiakadu and Muthaliyar Kuthagai were C4S1 category.

Majority of water samples in the six districts were alkaline. Water with high pH does not always have high alkalinity. These higher pH levels are typically not a problem unless the alkalinity exceeds the acceptable range. High alkalinity, not pH, exerts the most significant effects on growing medium fertility and plant nutrition. Total soluble salts in Karur and Tirupur districts and 19% samples in Dindigul district, and 5% in Erode districts have the soluble salts in the range of 0.25 -0.75dS/m (C2 category) and it can be used for irrigation except for salt sensitive crops (Richards,1954). Majority of samples in Dindigul, Nagapatnam, Cuddalore and Erode district have EC in the range of 0.75 - 2.25 dS/m. These waters can be used under good management and favourable drainage conditions. In Dindigul district 18% samples have EC > 2.25 dS/m and they can not be used for irrigation to chewing tobacco. Except in few villages majority of the waters have high chlorides (> 50ppm). The concern with chloride is the possibility of excessive foliar absorption under furrow irrigation and leaf edge burn will be occur excessive root uptake in sensitive plants. If Cl^{-1} concentrations are less than about 100 ppm, there is no concern from excessive foliar absorption. If Cl^{-1} concentrations are less than about 150 ppm, there is no concern about toxicity resulting from root uptake. As chewing tobacco is non-cigarette type and is being used for chewing purpose, higher chlorides > 50 ppm will not be a problem as it was the case with cigarette type. Wherevers waters are highly saline, with high chlorides there is a need to reduce the quantum of irrigation water through scientific management practices like drip irrigation to contain the salinity and chloride levels in soil and tobacco leaf and to sustain the soil health on a long term basis. In the irrigation waters of all the districts under study RSC values were low indicating the lower concentration of CO_3^{-2} and HCO_3^{-1} which may not influence the plant growth medium for nutrient supply. SAR values in all the districts were low except in Dindigul district where 13% samples are in medium and 5% samples are high and hence there will not be any adverse effect of sodium on plant growth. High sodium acts to inhibit plant uptake of calcium, and may result in excess leaching of calcium and magnesium from growing media. Irrigation water classes vary between C_2S_1 to C_4S_4. Where ever irrigation waters are C_2S_1 they are good quality waters and they can be used for tobacco or other crops. Irrigation waters of C3S1 category, water is to be used judiciously, where ever soils have good drainage capacity. Irrigation waters of C4S4 category should not be used for irrigation as water quality significantly affects both the yield and water use efficiency. The decreases in yields by using low quality water were 39.2% and 17.6% in tomato for the first and second season, respectively (Abdulrasoul M. AL-Omrani *et.al.*2010). Crop growth components and yields of lettuce and Chinese cabbage were significantly affected by saline irrigation water and continuous application of saline irrigation water resulted in Na^+

accumulation in both soil and crops (Hanseok Jeong, *et.al* 2016).

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Table 1: Details of the villages and districts of water samples collection in Tamil Nadu

S. No.	Name of the District	Name of the Village	No. of water Samples collected	S. No.	Name of the District	Name of the Village	No. of water Samples collected
1	**Dindigul**	A.Sukkampatti	1	35	**Tirupur**	Moolanaur	2
2		Kandasamuthrapatty	2	36		Kulathuoaayam	2
3		Sathianathapuram	1	37		Konadarasampalyam	2
4		Lakshmanapatty	1	38		Koduvai	6
5		Konur	5	39		UttuKKuli	2
6		Ammapatty	2	40		Salakkadai	1
7		Bangarupuram	1				15
8		Thasavanaickanpatty	1	41	**Nagapatnam**	NanianKuthagai	3
9		Sullerumbu	2	42		NallanKuthagai	3
10		G.Nadupatti	1	43		Palayavaram	5
11		Thippampatty	1	44		PeriyaKuthagai	2
12		Kethayurambu	1	45		A.Pulam-4	1
13		Muthunayackanpatty	2	46		Pannal West	2
14		P.Sukkampatty	1	47		Kodiakadu	10
15		Muthunayackanpatty	1	48		MuthaliyarKuthagai	4
16		Puliyurnatham	5	49		MuthalimaduThittu	5
17		P.N.Kalluppatty	4	50		Kodiakorai	1
18		Kulipatti	1				36
19		P.Kulioatti	2	51	**Cuddalore**	Sivapuri	1
20		Odapatty	4	52		J. Pattinam	2
21		Venkatapuram	2	53		Ammapatti	1
22		Javvadupatti	3				4
23		Moonur	2	54	**Erode**	Anthiyur	1
24		S.Navamarathupatty	1	55		Poyangkuttai	1
25		S.G.Pudur	3	56		Vellithirupur	1
26		Esanatham	2	57		Pattlur	2
27		Thangachiampatty	1	58		Kemmayampatti	2
28		Kosavapatty	6	59		Olagadam	2
29		Kapilipatty	1	60		Mandri T. Kottai	1
30		Ambilikai	2	61		PugaiellaiReddiur	1
			62	62		Pudur	1
33	**Karur**	Akilanadapuram	1	63		BavaniSagar	1
34		Venkitapuram	2	64		Sadumugai	1
			3	65		PunjaiPuliampatti	2
				66		Kasiyur	2
				67		Chennimalai	1
							27
						Total	**139**

Table 2. Irrigation water quality parameters of chewing tobacco growing Districts of Tamil Nadu

S.No.	Village Name	pH	EC (dS/m)	Chlorides (ppm)	RSC	SAR	Water class
			Dindigul District				
1	A.Sukkampatti	7.93	0.79	184	Low	1.62	C3S1
2.	Kandasamuthrapatty	7.56	3.1	2224	Low	8.21	C4S2
3.	Kandasamuthrapatty	7.66	2.4	1372	Low	7.58	C4S2
4.	Sathianathapuram	7.62	1.7	676	Low	3.42	C3S1
5.	Lakshmanapatty	7.86	4.1	448	Low	3.80	C4S1
6.	Konur	7.92	0.9	332	Low	2.03	C3S1
7.	Konur	8.03	1.5	732	Low	3.34	C3S1
8.	Konur	7.92	2.4	1164	Low	8.48	C4S2
9.	Konur	8.21	0.8	172	Low	1.77	C3S1
10.	Konur	7.89	2.3	1280	Low	14.4	C4S3
11.	Ammapatty	8.28	1.9	560	Low	3.54	C3S1
12.	K.Ammapatty	8.06	2.2	1220	Low	7.96	C3S2
13.	Bangarupuram	8.36	2.3	908	Low	10.19	C4S3
14.	Thasavanaickanpatty	8.06	0.9	308	Low	3.01	C3S1
15.	Sullerumbu	8.09	1.5	704	Low	10.69	C3S2
16.	Sullerumbu	8.02	4.2	504	Low	4.52	C4S1
17.	G.Nadupatti	8.46	1.1	228	Low	3.14	C3S1
18.	Thippampatty	8.26	1.0	196	Low	1.35	C3S1
19.	Kethayurambu	8.00	1.0	208	Low	1.83	C3S1
20.	Muthunayackanpatty	7.50	1.5	720	Low	2.45	C3S1
21.	Muthunayackanpatty	7.98	1.1	804	Low	4.09	C3S1
22.	P.Sukkampatty	7.62	1.1	104	Low	1.01	C3S1
23.	Muthunayackanpatty	7.99	1.3	276	Low	2.59	C3S1
24.	Puliyurnatham	7.80	2.2	808	Low	7.03	C3S1
25.	Puliyurnatham	7.78	2.4	824	Low	7.35	C4S2
26.	Puliyurnatham	7.86	1.4	492	Low	6.67	C3S1
27.	Puliyurnatham	7.61	1.9	780	Low	9.32	C3S2
28.	Puliyurnatham	7.81	1.6	152	Low	1.91	C3S1
29.	P.N.Kalluppatty	7.89	1.3	152	Low	4.38	C3S1
30.	P.N.Kalluppatty	7.93	1.1	80	Low	2.62	C3S1
31.	P.N.Kalluppatty	8.20	1.1	148	Low	3.60	C3S1
32.	P.N.Kalluppatty	8.36	1.0	152	Low	5.07	C3S1
33.	Kulipatti	7.96	1.7	672	Low	14.9	C3S3
34.	P.Kulipatti	7.61	1.9	672	Low	5.29	C3S1
35.	P.Kulipatti	7.83	1.9	580	Low	8.56	C3S2
36.	Odapatty	7.86	2.1	848	Low	15.15	C3S3
37.	Odapatty	7.47	1.8	448	Low	7.19	C3S2
38.	Odapatty	7.83	1.3	192	Low	3.72	C3S1
39.	Venkatapuram	7.76	1.4	536	Low	7.49	C3S1
40.	Venkatapuram	7.55	1.8	692	Low	8.09	C3S2
41.	Odapatty	8.21	1.6	212	Low	5.45	C3S1
42.	Javvadupatti	7.8	2.1	936	Low	12.17	C3S2
43.	Javvadupatti	7.7	2.0	544	Low	4.08	C3S1
44.	Javvadupatti	7.9	1.5	236	Low	3.47	C3S1

45.	Moonur	7.9	1.9	828	Low	13.03	C3S3
46.	Moonur	8.0	1.9	564	Low	5.21	C3S1
47.	S.Navamarathupatty	8.2	2.6	1140	Low	25.14	C4S4
48.	S.G.Pudur	8.1	3.0	1576	Low	33.53	C4S4
49.	S.G.Pudur	8.2	2.9	700	Low	23.07	C4S4
50.	S.G.Pudur	8.2	2.1	448	Low	10.40	C3S2
51	Esanatham	8.1	0.578	532	Low	3.72	C3S1
52	Esanatham	8.0	0.543	584	Low	3.90	C2S1
53	Thangachiampatty	8.2	0.602	1190	Low	3.74	C2S1
54	Kosavapatty	8.2	0.602	1012	Low	4.04	C2S1
55	Kosavapatty	8.2	0.602	944	Low	3.65	C2S1
56	Kosavapatty	8.2	0.507	1772	Low	3.78	C2S1
57	Kosavapatty	8.1	0.484	1222	Low	4.30	C2S1
58	Kosavapatty	8.0	0.484	1876	Low	3.79	C2S1
59	Kosavapatty	8.2	0.484	482	Low	3.96	C2S1
60	Kapilipatty	8.4	0.531	248	Low	4.43	C2S1
61	Ambilikai	8.0	0.460	962	Low	4.06	C2S1
62	Ambilikai	8.3	0.472	79	Low	3.63	C2S1
	Nagapatnam District						
1.	NanianKuthagai	7.9	1.30	323	Low	3.98	C3S1
2.	NanianKuthagai	7.1	1.42	292	Low	4.46	C3S1
3.	NanianKuthagai	7.2	1.42	213	Low	3.52	C3S1
4.	NallanKuthagai	7.1	1.18	71	Low	2.52	C3S1
5.	NallanKuthagai	7.6	1.18	118	Low	3.79	C3S1
6.	NallanKuthagai	7.7	1.06	59	Low	2.85	C3S1
7.	Palayavaram	7.7	0.83	106	Low	4.79	C3S1
8.	Palayavaram	8.1	0.94	99	Low	4.49	C3S1
9.	Palayavaram	7.5	2.01	272	Low	4.98	C3S1
10.	Palayavaram	7.3	1.42	450	Low	4.00	C3S1
11.	Palayavaram	7.6	1.42	319	Low	5.68	C3S1
12.	PeriyaKuthagai	7.7	1.53	619	Low	7.61	C3S1
13.	PeriyaKuthagai	7.7	1.65	288	Low	5.62	C3S1
14.	A.Pulam-4	7.2	1.53	245	Medium	5.92	C3S1
15.	Pannal West	7.3	1.53	319	Low	7.41	C3S1
16.	Pannal West	7.8	1.65	240	Medium	7.10	C3S1
17.	Kodiakadu	7.9	1.77	316	Low	5.40	C3S1
18.	Kodiakadu	7.9	1.53	188	Low	4.27	C3S1
19.	Kodiakadu	7.3	2.01	816	Low	6.65	C3S1
20.	Kodiakadu	7.2	1.77	156	Low	4.52	C3S1
21.	Kodiakadu	7.2	1.30	96	Low	3.89	C3S1
22.	Kodiakadu	7.8	1.30	168	Low	2.07	C3S1
23.	Kodiakadu	7.5	1.89	940	Low	7.39	C3S1
24.	Kodiakadu	7.4	1.77	320	Low	4.87	C3S1
25.	Kodiakadu	7.4	1.89	420	Low	5.10	C3S1
26.	Kodiakadu	7.6	2.24	1028	Low	7.97	C4S1
27.	MuthaliyarKuthagai	7.8	1.30	200	Low	4.40	C3S1
28.	MuthaliyarKuthagai	7.8	1.53	440	Low	7.77	C4S1
29.	MuthaliyarKuthagai	7.5	1.42	188	Low	4.28	C3S1
30.	MuthaliyarKuthagai	7.4	1.18	148	Low	4.11	C3S1
31.	MuthalimaduThittu	7.8	1.53	372	Low	5.22	C3S1
32.	MuthalimaduThittu	7.7	1.65	360	Low	5.00	C3S1

33.	MuthalimaduThittu	7.6	1.65	368	Low	5.04	C3S1
34.	MuthalimaduThittu	7.7	1.30	396	medium	6.02	C3S1
35.	MuthalimaduThittu	7.9	1.53	360	medium	6.19	C3S1
36.	Kodiakorai	8.0	1.53	420	Low	5.08	C3S1
	Cuddalore District						
1	Sivapuri	7.4	1.30	236	Low	4.77	C3S1
2.	J. Pattinam	7.5	1.65	892	Low	6.85	C3S1
3	J. Pattinam	7.6	1.53	340	Low	5.95	C3S1
4	Ammapatti	7.8	1.53	380	Low	5.12	C3S1
	Erode District						
1	Anthiyur	7.7	1.65	180	Low	6.32	C3S1
2	Poyangkuttai	7.9	1.53	764	Low	2.48	C3S1
3	Vellithirupur	7.7	1.89	292	Low	3.60	C3S1
4	Pattlur	7.9	1.65	792	Low	2.67	C3S1
5	Pattlur	7.9	2.12	776	Low	4.25	C3S1
6	Kemmayampatti	7.4	2.36	796	Low	3.70	C4S1
7	Kemmayampatti	7.7	2.12	936	Low	3.88	C3S1
8	Olagadam	7.6	2.24	680	Low	4.01	C3S1
9	Olagadam	7.7	2.36	712	Low	4.15	C4S1
10	Mandri T. Kottai	7.3	2.36	472	Low	4.38	C4S1
11	PugaiellaiReddiur	7.4	2.36	752	Low	3.55	C4S1
12	Pudur	7.0	2.24	467	Low	4.50	C3S1
13	BavaniSagar	7.2	1.77	140	Low	2.89	C3S1
14	Sadumugai	7.2	2.24	732	Low	7.00	C3S1
15	PunjaiPuliampatti	7.1	1.53	252	Low	1.84	C3S1
16	PunjaiPuliampatti	7.1	1.89	772	Low	4.89	C3S1
17	Kasiyur	7.2	1.77	156	Low	4.40	C3S1
18	Kasiyur	7.4	2.24	1540	Low	5.36	C3S1
19	Chennimalai	8.2	0.613	1040	Low	3.68	C2S1
	Karur District						
1	Akilanadapuram	8.2	0.554	868	Low	4.09	C2S1
2	Venkitapuram	8.3	0.472	366	Low	4.22	C2S1
3	Venkitapuram	8.0	0.460	481	Low	4.08	C2S1
	Tirupur District						
1	Moolanaur	8.3	0.472	486	Low	4.62	C2S1
2	Moolanaur	8.4	0.472	378	Low	5.58	C2S1
3	Kulathuoaayam	8.0	0.495	1164	Low	3.90	C2S1
4	Kulathuoaayam	8.3	0.448	206	Low	4.61	C2S1
5	Konadarasampalyam	8.2	0.424	192	Low	4.26	C2S1
6	Konadarasampalyam	8.1	0.460	892	Low	4.23	C2S1
7	Koduvai	8.0	0.413	68	Low	3.92	C2S1
8	Koduvai	8.3	0.483	60	Low	3.82	C2S1
9	Koduvai	8.2	0.554	370	Low	3.77	C2S1
10	Koduvai	8.0	0.613	790	Low	3.66	C2S1
11	Koduvai	8.0	0.613	738	Low	3.66	C2S1
12	Koduvai	8.1	0.625	1004	Low	3.66	C2S1
13	UttuKKuli	8.0	0.554	362	Low	3.80	C2S1
14	UttuKKuli	8.2	0.413	26	Low	3.50	C2S1
15	Salakkadai	8.2	0.401	80	Low	3.15	C2S1

Table 3 : Irrigation Water quality in chewing tobacco growing districts of Tamil Nadu (Ranges and Average values)

SNo	Name of the District	No of Villages Surveyed	No of water Samples Collected	Range /Average	pH	EC dS/m	Chlorides (ppm)	SAR	Water class
1	Dindigul District	30	62	Range	7.5-8.5	0.79-4.2	104-2224	1.01-33.5	C_2S1 –C4S4
				Average	7.9	1.84	638	7.68	
2	Nagapattanam	10	36	Range	7.1-8.1	0.83-2.24	1.69 -29.0	2.06- 7.97	C_3S_1
	Nagapattanam			Average	7.58	1.50	9.22	5.11	
3	Cuddalore	3	4	Range	7.42-7.81	1.30-1.65	6.65-25.13	4.76- 6.85	C_3S_1
	Cuddalore			Average	7.59	1.50	13.0	5.67	
4	Erode	14	19	Range	7.04-7.90	1.53-2.36	3.94-43.49	1.83- 7.00	C_2S_1 to C_3S_1
	Erode			Average	7.46	2.02	17.6	4.10	
5	Karur	2	3	Range	8-8.3	0.46-0.56	366-868	4.08-4.22	C_2S_1
	Karur			Average	8.0	0.5	590	4.13	
6	Tirupur	6	15	Range	8.0-8.4	0.41 -0.62	26-1164	3.82 – 5.58	C_2S_1
	Tirupurr			Average	8.16	0.51	527	4.08	
		65	**139**						

Table 4: Irrigation water summaries of Chewing tobacco districts, Tamil Nadu

S. No	Name of the district	pH			EC			chlorides	
		Acidic	Neutral	Alkaline	C1	C2	C3	C4	<50	>50
1	Dindigul	0	2	98	0	19	63	18	0	100
2	Nagapattanam	0	42	58	0	0	100	0	0	100
3	Cudddalore	0	50	50	0	0	100	0	0	100
4	Erode	0	53	47	0	5	74	21	0	100
5	Karur	0	0	100	0	100	0	0	0	100
6	Tirupur	0	0	100	0	100	0	0	0	100

C1:<0.25dS/m, C2: 0.25-0.75 dS/m, C3:0.75-2.25dS/m, C4: >2.25 dS/m

Table 5: Irrigation water summaries of Chewing tobacco districts, Tamil Nadu

S. No	Name of the district	SAR				RSC			Water Class							
		< 10	10-18	18-26	> 26	Low	Medium	High	C2 S1	C3 S1	C3 S2	C3S3	C3 S4	C4 S1	C4 S2	C4 S3	C4 S4
1	Dindigul	82	13	3	2	100	0	0	18	47	12	5	0	3	7	3	5
2	Nagapattanam	100	0	0	0	89	11	0	0	94	0	0	0	6	0	0	0
3	Cudddalore	100	0	0	0	100	0	0	0	100	0	0	0	0	0	0	0
4	Erode	100	0	0	0	100	0	0	5	74	0	0	0	21	0	0	0
5	Karur	100	0	0	0	100	0	0	100	0	0	0	0	0	0	0	0
6	Tirupur	100	0	0	0	100	0	0	100	0	0	0	0	0	0	0	0