Table 2. Reduction in bund section with provision of *murum* filter.

Soil type	Soil depth (cm)	Presently recommended section (m^2)	Bund section to be kept with provision of *murum* filter (m^2)	Percentage reduction in cross section
Shallow soil	0-8	0.95	0.77	18 94
	8-25	1 20	0 92	23.33
Medium deep soil	25-50	1.45	1.08	25.51
	50-100	2.15	1.50	30.23

It will further be seen that, by provision of *murum* filter, there is possibility of reducing the presently recommended bund sections from 18.94 to 30.23 per cent depending upon the soil type. This will ultimately result in reducing the cost of construction of the bunds proportionately.

Authors are grateful to Prof. S. D. Kulkarni and Dr. N. D. Patil for their useful suggestions while conducting the projects.

REFERENCE

GADKARY, D. A. 1966. Desirability of review of the present technique of contour bunding work. Silver Jubilee Souvenir Soil Con. of Agril. Eng. Agril. Dept. M. S. 73-75.

SATPUTE, K. V. 1966. Why 13.75 sq. feet section for contour bunds. Silver Jubilee Souvenir. Soil Con. & Agril. Eng. Agril. Dept M. S. 104-106.

https://doi.org/10.29321/MAJ.10.A02525

Madras Agric. 71. (9) 610-613. September 1984.

A COMPARATIVE STUDY OF ASSESSING THE QUALITY OF UNDERGROUND IRRIGATION WATER OF BILAGI TALUKA, BIJAPUR DISTRICT OF KARNATAKA STATE BY USDA AND AYERS METHODS

H.T. CHANNAL*, S.J. PATIL**, N. VASUKI* and N. SRINATHREDDY***

One hundred water samples from different wells were collected and analysed to assess for its quality both by USDA and Ayers methods. The majority waters studied were C_4S_1 (36%), C_3S_1 (34%) and C_1S_1 (21%), and they were of $Na\text{-}HCO_3$ type. Permeability of the soil may be affected due to high Na but not due to low salt concentration of the waters studied.

In Karnataka, the area irrigated by open wells amount to nearly 28 percent of the total irrigated area and the quality of such ground water is of particular importance in arid zone. Bijapur with less than 500 mm annual rainfall is one of the dry districts of Karnataka state where irrigation is mainly through

*Department of Soil Science, College of Agriculture, Dharwad

**Regional Research Station, Mudagere.

***Advance Centre for Research on Black Cotton Soils of Karnataka Regional Research Station Dharwad.

groundwater. Considering that a sizeable area of this district is under irrigation provided by the open wells and also taking into stock the paucity of information on the quality of the irrigation water, the present study was taken up.

MATERIAL AND METHODS

Irrigation water samples from 100 open wells located at different places of Bilagi taluka collected for the present study were analysed for pH, Electrica Conductivity water soluble cations viz, Sodium, potassium, calcium and Magnesium and anions namely chlorides carbonates and bicarbonates by standard methods as per Richards (1954). Adjusted SAR (sodium absorption ratio) and RSC (Residual sodium carbonate) were compnted as per the methods suggested by Ayers (1977) and Eaton (1950).

$$\text{Adj. SAR} = \frac{Na}{\sqrt{\frac{Ca + Mg}{2}}} (1 + (8.4 - pHc)$$

where

$pHc = (pK'_2 - pK'c) + p(Ca + Mg) + p(Alk)$

$(pK'_2 - PK'c)$ is obtained from using the sum of Ca + Mg + Na in me/1.

p(Ca + Mg) is obtained from using the sum of Ca + Mg in me/1.

p(Alk) is obtained from using the sum of CO_3 + HCO_3 in me/1,

$RSC = (CO_3 + HCO_3) - (Ca + Mg)$

RESULTS AND DISCUSSION

Table-1 shows that the pH of irrigation waters varied from 7.7 to 9.2 and EC ranged between 250 to 3500μ mhos/cm. This indicates that the water samples have medium to high amounts of salts (35 and 57% respectively). Among the cations, a large variation was noticed with respect to sodium content (0.87 to 37.84 me/1), followed by calcium (0.6 to 8.4 me/l), magnesium (0.2 to 8.0 me/1). This indicates that nearly 89 per cent of the samples studied were low in sodium hazard while about 10 per cent fall under medium category as USDA classification (Table 2).

Table 1 Chemical composition (ranges) of water samples collected from various underground locations.

a)	pH	7.7–9.2
b)	EC (μmhos/cm)	250–3500
c)	Cations (me/1)	
	i) Na	0.87–37.84
	ii) Ca	0 60–8.40
	iii) Mg	0.20–8.0
	iv) K	0.019–3.88
d)	Anions (me/1)	
	i) CO_3	1.94–5.82
	ii) HCO_3	2.91–17.76
	iii) Cl	0.019–3 88

Among the anions studied the variation in concentration of chlorides was large (1.8-23.4 me/1) (Table-1). But on the basis of RSC, 62 per cent of the samples are not suitable for irrigation purpose while 9 percent marginal and only 29 per cent were in the safe limit (Table-2). As per USDA classifications, the majority of water samples studies can be grouped under C_3S_1 (36%), C_3S_1 (34%) and C_1S_1 (21%).

Table 2 Classification of underground water as per USDA

Water quality guidelines	EC (μmhos/cm)	SAR	RSC	Irrigation classes
Low	2*	89	29	$C_1S_1 = 2$
	(100—250)	(<10)	(<1.25)	$C_2S_1 = 34$
Medium	35	10	9	$C_2S_2 = 1$
	(250—750)	(10—18)	(1.25—2.5)	$C_3S_1 = 36$
High	57	—nil—	62	$C_3C_4 = 21$
	(750—2250)	(18—26)	(>2.5)	$C_3S_3 = 1$
Very high	6	1	—nil—	$C_4S_2 = 1$
	(2250)	(>26)		$C_4S_4 = 3$

*Per cent values
Figures in parentheses indicate range.

Table 3 Interpretation of water of Bilagi taluka as per the guidelines given by Ayers (1977)

	Salinity	Permeability	Specific ion toxicity				Miscellaneous
Water quality	ECw	ECw	Adj.	Root absorption		Foliar	Bicarbonate
guidelines	(μmhos/cm)	(μmhos/cm)	SAR	Sodium (Adj. SAR)	Chloride (me/1)	Sodium (me/1)	(me/1)
No problem	37*	82	31	11	45	15	1
	(<750)	(>500)	(<6)	(<3)	(<4)	(<3)	(<1.5)
Increasing	62	18	26	48	44	85	42
problem	(750—3000)	(<500)	(6—9)	(3—9)	(4—10)	(>3)	(1.5—8.5)
Severe problem	1	—nil—	43	41	11	nil	57
	(>3001)	(<200)	(>9)	(>9)	(>10)		(>8.5)

* Per cent values.
Figures in parentheses indicate range.

A general evaluation of water samples were also made by interpreting in terms of problem related constituents viz. salinity, permeability, toxicity and miscellaneous as described by Ayers 1977). Nearly 62 per cent samples were in the 'increasing problem' group while 37 per cent under 'no problem' group with regard to salinity (Table-3). Results show that the permeability of the soils may be affected in the soils of this region severely due to high Na content (Adj.SAR 43%). but not due to low salt concentration. Nearly 82 per cent of the samples fall under 'no problem' group of permeability with respect to salinity. Not even a single well water came under severe problem' category. Sodium was the specific ion causing the toxicity to an extent 41 per cent (Table-3) than compared to chloride (11%). Results also reveal that 85 per cent of the samples fall under 'increasiag toxicity' problem group (foliar) due to sodium. Foliar absorption of such waters may lead to leaf burn under low humidity coupled with high evaporation conditions.

Majority of the waters were rich in bicarbonates and severe problem due to bicarbonate ion was to the tune of 57 per cent which shows that the irrigation waters studied were of mostly sodium-bicarbonata type.

REFERENCES

AYERS, R.S. 1977. Quality of water for irrigation. J. of irrign. and Drainage Division. 103 No. IR-2 135-154.

EATON, F.M. 1950. Significance of carbo, nates in irrigation waters. *Scil Sci., 69-*123-138.

RICHARDS, L.A., 1954 Hand Book No.60, U. S. Dept. Agric. washington, D.C. U.S.A.