The Andhra Agric. J 60(1): 190-193, 2013

Use and Productivity of Irrigation Water in Tail Region of Canal Irrigation System – An Economic Approach

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ABSTRACT

The study was undertaken to study the optimal water use at farm level in Narasapur canal irrigation system in West Godavari district of AP during 2007-2008. The study revealed that the irrigation intensity and cropping intensity were more in the large sized farms. The percent of area under irrigated dry crops were more predominant in the case of Canal as well as tube well irrigated farms. The study revealed that as the distance of the farm increased, the area under irrigated dry crops also increased. Irrigation intensity and cropping intensity were more in farms which were adjacent to the water resources. The number of installation of tube wells increased with increase in the distance of the farms from the outlet of the supply channel.

Key words : Canal Irrigation System, Economic approch, Irrigation water, Productivity.

Water is a limited resource; its efficient use is very vital and basic to the very survival of the ever increasing population. Every effort must be made to make the best use of available water to make possible a high level of continuous production per unit volume of water, per unit area of cropped land per unit time. In India, canal irrigation systems were designed and being operated with the aim of providing a certain amount of water per hectare to meet the crop water requirements.

In general, location of field determines the availability of water to the farmer. The location of field is reflected in the cropping pattern, because the farmers who are adjacent to the water resources are able to grow high water demanding crops than the farmers at a distant location. The size of the farm will also influence the cropping pattern, irrigation intensity etc. An attempt has been made in this paper to study the pattern of water use and productivity of water for tail region in Narsapur main canal irrigation system in West Godavari District of Andhra Pradesh. The original data required for the study was obtained for the year 1995-96 and it was reviewed in the year 2007-2008

MATERIAL AND METHODS

The total length of the Narsapur main canal irrigation system was divided into three regions namely head, middle and tail based on the distance from the off-take point. In tail region one distributory with a command area of 100 ha. and more but less than 500 ha. was selected for the study. From the chosen distributory, 40 beneficiaries were selected randomly. The water used by the farmers and time taken to irrigate the crop was compiled by fixing a v-notch at different locations. For the purpose of analysis, all forty farmers were post-stratified into two groups according to size of holding and three groups based on the distance of their field location from the outlet of the supply channel. Simple averages and percentages were worked out for size group wise and distance wise cropping pattern. Cobb-Douglas production function of the following type was used for estimating the water used efficiency. Paddy

$Y = a\, x_1^{b1}\, x_2^{b2} \ldots\ldots X_n^{bn}$

Y = gross returns in rupees per ha.
X1 = irrigation water in ha-cm
X2 = labour cost in rupees
X3 = seed cost in rupees
X4 = manure cost in rupees
X5 = fertilizer cost in rupees

RESULTS AND DISCUSSION

1. Pattern of water use

The pattern of water use generally depends upon the availability of water, the area to be irrigated, the kind and varieties of crops grown, season and the cropping pattern.

(A) Size Group- wise Cropping Pattern

It could be observed from the Table 1, that the total area, irrigated area and irrigation intensity were high in second size group i.e. greater than 1.80 ha. It is due to the presence of more number of tube wells.

Table 1. Size group-wise irrigation intensity.

(Area in ha.)

S.No.	Size groups(ha.)	Total No.of farmers	No. of tube wells	Total area	Irrigated area	Irrigation intensity
1	0-1.80	18	3	29.00	19.33	66.65
2	> 1.80	22	17	60.35	49.24	81.59
3	TOTAL	40	20	89.35	68.57	76.74

Table 2. Crops grown with canal as main source of irrigation.

Size group (ha.)	Wet crop		Irrigated dry		Irrigable area (ha.)
	Area (ha.)	Area (%)	Area (ha.)	Area (%)	
0-1.80	08.04	41.20	11.47	58.79	19.51
> 1.80	16.43	33.48	32.63	66.51	49.06
TOTAL	24.47	35.35	44-10	64.31	68.57

Table 3. Crops grown with tube well as main source of irrigation.

Size group (ha.)	Wet crop		Irrigated dry		Irrigable area (ha.)
	Area (ha.)	Area (%)	Area (ha.)	Area (%)	
0-1.80	1.44	7.38	18.07	92.61	19.51
> 1.80	1.66	3.38	47.40	96.61	49.06
TOTAL	3.10	4.52	65.47	95.47	68.57

Table 4. Distance-wise irrigation intensity.

S.No.	Distance of field location (km.)	Total No. of farmers	No. of tube wells	Total Area	Irrigated Area	Irrigation intensity (%)
1	0-1.00	17	2	32.07	25.90	80.76
2	1.01-2.0	10	6	31.02	23.48	75.69
3	2.01 & above	13	12	26.32	19.19	72.91
4	TOTAL	40	20	89.41	68.57	76.69

Table 5. Distance-wise crops grown with canal as main source of irrigation.

Distance of field location (km.)	Wet crop		Irrigated dry		Irrigable Area (ha.)
	Area (ha.)	Area (%)	Area (ha.)	Area (%)	
0-1.00	11.46	44.25	14.44	55.75	25.90
1.01-2.0	8.52	36.28	14.96	63.71	23.48
2.01 & above	6.73	35.07	12.46	64.49	19.19
TOTAL	21.81	31.80	44.56	64.98	68.57

The size group-wise crops grown with canal as main source of irrigation (Table 2) revealed that the proportion of wet cropped area (Paddy, Sugarcane) and irrigated dry crops (Banana, Turmeric, Green gram and Black gram) area is 35.35 and 64.31 per cent, respectively. An increase in the percentage of irrigated dry crops was found irrespective of the size of the farm.

Crops grown with tube well as main source of irrigation (Table 3) indicated that the per cent of irrigated dry crops were more in both size groups and also it accounts 95.47 per cent of area (Palanisami and Thornton, 1981).

(B) Distance-wise Irrigation Intensity

The cropping pattern was also influenced by the field location and its distance from the supply channel. The distance was measured with respect to the location of the field from the outlet of the supply channel. The distribution of area based on the supply channel was presented in Table4.

From the above table, it was observed that the irrigation intensity was reduced as the distance of the farm from the source of water increased (Shareef 1989)

Distance-wise crops grown with canal as main source of irrigation was presented in the Table 5.

From the above Table, it was noted that as the irrigation distance increased percentage of wet cropped area decreased and the percentage of irrigated dry crops increased.

The distance-wise crops grown with tube well as main source of irrigation was presented in the Table 6.

It could be observed from the table 6 that area under irrigated dry crops was more with tube-well as main source of irrigation.

II. Water use efficiency

Water use efficiency could be studied more reliably with the help of marginal productivity analysis. A perusal of table 7 revealed that the regression coefficients of irrigation water and fertilizer cost were significant at 1 per cent level, and it indicate that for every increase by one rupee the gross value of crop out put increased by 0.1451 per cent The coefficients of labour ($_{x2}$) seed cost (x3) $_{and}$ manure cost (x4) were not significant. This would indicate that these were not significantly contributed to increase in the value of output and

Table 6. Distnace-wise crops grown with tube well as main source of irrigation.

Distance of field location (km.)	Wet crop		Irrigated dry		Irrigable area (ha.)
	Area (ha.)	Area (%)	Area (ha.)	Area (%)	
0-1.00	5-61	21.66	20.29	78.33	25.90
1.01-2.0	2.85	12.13	20.63	87.86	23.48
2.01 & above	1.61	8.38	17.58	91.61	19.19
TOTAL	10.07	14.69	58.50	85.31	68.57

Table 7. Results of regression analysis on paddy crop.

Particulars	Variables	Bi	S.E.	t-value	Significant level
Gross return (Rs.)	Y				
Irrigation water (ha.cm)	X1	0.1451	0.0350	4.145	*
Labour cost (Rs.)	X2	0.0418	0.1254	0.333	NS
Seed cost (Rs.)	X3	0.0568	0.0905	0.6279	NS
Manure cost (Rs.)	X4	0.0261	0.0185	1.4140	Ns
Fertilizer cost (Rs.)	X5	0.2378	0.0445	5.3404	*

R^2 = 0.65 * Significant at 1 per cent level N = Number of sample
N = 40 NS = Non significant

Table 8. Marginal value product to opportunity cost for paddy crop.

S.No.	Particulars	MVP	OC	MVP /OC
1	Irrigation water (X1)	11.64	1.00	11.64
2	Labour (X2)	0.11	1.00	0.11
3	Seed (X3)	0.77	1.00	0.77
4	Manure (X4)	0.74	1.00	0.74
5	Fertrilizer (X5)	1.88	1.00	1.88

excessive utilization of these inputs. Farmers has to apply irrigation water as well as fertilizers to increase the productivity.

The following Table 8 indicates that the ratio of marginal value product to factor cost was found to be higher than unity for irrigation water fertilizer indicating scope to increase the use of these inputs in order to obtain higher returns and profits.

CONCLUSION

In conclusion, it can be stated that irrigation intensity and cropping intensity were more in the large sized farms. The per cent of area under wet crops was more in large sized farms.. In the case of tube well irrigated farms, the per cent of area under irrigated dry crops were more predominant. The study revealed that as the distance of the farm increased, the area under irrigated dry crops also increased. Irrigation intensity and cropping intensity were more in farms which were adjacent to the water source. The number of installation of tube wells increased with increase in the distance of the farms from the outlet of the supply channel.

The Production function reveals that there exist potentialities for maximizing the level of crop output through resource allocation. The MVP of irrigation and fertilizer were favourable and it calls for stream line the delivery system includes credit and fertilisers. This situation calls for rationalization of water distribution. The analysis also revealed that the productivity of wet and irrigated dry crops were higher, wherever irrigation from canal and tube well water existed. This suggested large scale ground water development to supplement the canal water. Further, farmers also need a continuing programme of information, guidance and education on water management and irrigated agriculture under the existing irrigation systems.

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(Received on 27.10.2011 and revised on 14.12.2011)