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Developments in the Water Management of Rice Crop in Andhra Pradesh

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Water is a critical and valuable resource in agriculture. Its availability is decreasing year after year due to droughts and ever increasing demands in major irrigation projects, severe scarcity is occuring. So there is an imperative need to efficiently use it to provide the benefits of irrigation to as large an area as possible.

Rice is the most important crop of Andhra Pradesh as it covers the maximum area. With surplus production it earned the title of 'Annapurna' for Andhra Pradesh state. This crop utilises lions share of the irrigation water in the state as it covers nearly two thirds of the irrigated area. Nearly 96% of rice crop grown in Andhra Pradesh is irrigated and its water requirements are very high. So even a small saving resulting from efficient management of irrigation water in rice is going to provide substantial saving of this key input in agriculture. So water management studies in rice shall receive the highest priority.

The author after his retirement from the Agricultural University worked as senior consultant in the scheme 'Agricultural intensification programme' a world bank financed project on irrigation, in the office of the commissioner and Director of Agriculture Andhra Pradesh, Hyderabad. This article is based on the data collected and analysed during that period.

Rice is normally grown keeping standing water in the field continuously. Available literature from the experiments conducted in India and some other countries indicated that scheduling irrigation to rice crop when the water just disappears from the field is as good as continuous submergence. But the farmers in Andhra Pradesh are not adopting such water saving methods, as water was available in plenty particularly in the deltas and major commands. Further, water charges are collected from the farmers on area basis. But the situation has vastly changed. Severe drought conditions resulting in water scarcity occurred in Andhra Pradesh continuously for 3 years (2001-02 to 2003-04). Rice could not be grown under conditions of continuous submergence. Rotational irrigation system was followed by scheduling irrigation once in a week. Irrigation could be scheduled only after complete disappearance of water from rice fields even in command areas of major rivers like Godavari, Krishna and Penna. However, the rice yields were not adversely affected in most areas. The duty of water for rice stood at about 100 acres against normal of 70 acres per cusec in different commands.

To understand and document the over all effects of rotational irrigation on water saving and rice yields, the particulars of irrigation water used and rice productivity in the 3 major deltas of Godavari, Krishna and Penna rivers, were gathered and analysed for 6 years covering 3 drought years (2001-02 to 2003-04) and 3 normal years (1998-99 to 2000-01). The salient observations are presented below.

Godavari Delta:

There is no dearth of water in the *Kharif* season in any year in Godavari delta. Water scarcity was experienced in this delta during the Rabi seasons of 2000-01 to 2002-03. The area irrigated per TMC of water used was the highest in 2000-01 (4595 ha). The of yields Rabi rice during that year were 4195 and 4319 kg/ha in East and West Godavari districts respectively. These yield levels were higher than the yields of the preceding normal year. Of course, yield increases cannot be attributed to water management alone.

Table 1. Irrigation water used in the 6 years period in Godavari Delta (Rabi).

Year	Area (lakh ha)	Water releases (TMC)	Area (ha.) irrigated per TMC
1998-99	4.02	132	3045
1999-00	3.92	108	3630
2000-01	3.86	84	4595
2001-02	3.86	99	3898
2002-03	2.20	72	3055
2003-04	3.79	162	2340

Table 2. Irrigation water used in the 6 years period in Krishna Delta (Karif).

Year	Area (lakh ha)	Water releases (TMC)	Area (ha.) irrigated per TMC
1998-99	5.21	142	3669
1999-00	5.22	156	3346
2000-01	5.22	158	3303
2001-02	4.97	124	4008
2002-03	4.65	113	4115
2003-04	4.54	82	5536

Table 3. Irrigation water used in the 6 years period in Penna Delta (*Karif*).

Year	Area (lakh ha)	Water releases (TMC)	Area (ha.) irrigated per TMC
1998-99	0.99	29	3413
1999-00	0.95	27	3518
2000-01	0.99	29	3413
2001-02	0.99	15	6600
2002-03	0.66	12	5500
2003-04	0.81	11	7363

Normal Command areas (lakh ha)
Godavari delta system – 4.16
Krishna delta system – 5.30
Penna delta system – 1.00

Krishna delta:

Krishna and Guntur districts mainly get the benefits of irrigation in Krishna delta system. For study purpose, Krishna district alone was considered. Water scarcity occurred during the Kharif season of 2001-02 to 2003-04. Rice cultivation in Rabi season is not occupying appreciable area in Krishna delta.

The area irrigated per TMC of water in Krishna delta during the Kharif seasons of the 3 water searce years of 2001-02 to 2003-04 was consistently higher than the earlier normal 3 years. The highest was in Kharif 2003-04 (5536 ha per TMC). Rice yields in Krishna district during 2001-02 and 2002-03 were as good as in normal years of water supply. However there was decrease in 2003-04

Table 4. Rice productivity (kg/ha) in deltaic districts during the 6 years period.

Year	East Godavari Rabi	West Godavari Rabi	Krishna Kharif	Nellore Kharif
1998-99	4361	4494	2789	3101
1999-00	4180	4153	3089	3106
2000-01	4195	4319	3088	3117
2001-02	4525	4682	2915	3161
2002-03	4622	4327	3121	3280
2003-04	5257	4872	2368	2782

Table 5. Rainfall (in mm) during south west and north east monsoon periods (June to December) in four coastal districts during 1988 to 2003.

Year	East Godavari		West Godavari		Krishna		Nellore	
	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual
1988	1071	1061	1029	1446	936	1156	992	914
1999	1071	1109	1029	1014	936	934	992	700
2000	1071	912	1029	905	936	974	992	811
2001	1071	921	1029	762	936	805	992	1184
2002	1071	640	1029	571	936	547	992	777
2003	1071	987	1029	922	936	940	992	773

Source: Rice yields – An outline of Agriculture situation in Andhra Pradesh
Bureau of Economics and statistics, Govt. of A P
Water releases – irrigation and CAD Department, Andhra Pradesh, Hyderabad.

perhaps due to late plantings, cyclone damage and large area (5536 ha) to be irrigated with each TMC of water. Normally one TMC of water is required to irrigate 2500 ha of rice.

Penna delta:

Penna delta irrigates the area in Nellore district. The area irrigated per TMC of Water during the 3 drought years (2001-02 to 2003-04) was higher than the preceding three normal years. However there was no depression in *Kharif* rice yields during 2001-02 and 2002-03. But there was considerable reduction in the yield during 2003-04, perhaps due to planting of rice in unmanageable area of 0.81 lakh hectares which has to be irrigated with just 11 TMC of water (with one TMC to irrigate 7363 ha).

Rainfall:

The rainfall during the South West and North East monsoon periods was less than normal during the water scarcity years 2000 to 2002 in Godavari districts. During 2001 to 2003, when water scarcity occurred in Krishna and Penna deltas, the rainfall received was less than normal in 2001 and 2002 in Krishna district and 2002 and 2003 in Nellore district. The deficit was as high as 41% in Krishna district during 2002. The cyclone rains in December 2003 accounted for normal rainfall in that year. The cyclone caused considerable damage to rice crop and the young pulse crop.

Crop cultivation in areas not covered by rice:

In Godavari delta nearly 48% of the normal area could not be planted with rice in the *rabi* season of 2002-03 due to scarcity of irrigation water. Some such areas were covered with pulse or green manure crops. Maize was grown in a limited area where bore wells existed. Bulk of the area remained fallow.

In Krishna district also 6 to 14% of the normal Kharif rice area could not be planted during

2001-03. Some of these areas were covered with maize and sesamum wherever ground water was available. Much of the area was left fallow. In Penna delta also the situation was similar.

Weed Management in Rice:

Weed growth in rice crops will be severe when standing water is not maintained in the field. Farmers will pose this question when we say that continuous submergence is not required for rice crop. Nowadays lot of efficient weed management herbicides are available in granular form for application in rice fields. So the weed problem can be easily tackled at lesser cost with herbicides.

Conclusion:

Scheduling irrigation to rice crop immediately after complete disappearance of water from the field is as good as continuous submergence (as normally practiced by farmers) in deltaic situations. This was also evident from no reductions in yield of rice crop when ever the water supply was regulated druing the scarce years of water release. Further, there should be some regulatory mechanism to price the water on quantum basis rather than on area basis to active the densired objective.

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