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Adoption of rice production practices in different water reaches of canals

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Abstract

Water is the most essential component of the environment and holds a unique status in it. One-third of our country's total geographical area is drought-prone because we are dependent upon the monsoons which can be wavering. Water should be provided in drought-prone areas not only for human and cattle consumption but also for irrigation. Water has inimitable characteristics that determine that it can be allocated and use as a resource in agriculture. For irrigation, agricultural use of water is itself contingent on land resources. Water is the most exquisite and essential source of ecosystems and agricultural production. However, the world constitution, water being the most essential natural resource.

Keywords: Head reach, mid reach, tail reach, irrigation

Introduction

Reservoirs are the structure created to store surplus water during wet periods, which can be used for irrigating arid lands or for in irrigation during less rainfall period. One of the major advantages of creating reservoirs is that water flows can be managed as per agricultural demand and requirements of the various regions over the year. Reservoirs render indelible services to the mankind in fulfilling irrigation requirements on a larger extent. In developing countries, where larger part of land is arid zone, need reservoirs for meeting their irrigation requirements. There is a severe necessary for construction of more reservoir based projects in spite of various measures developed in conserving water through other advancements in irrigation technology. Reservoir is used for collecting the monsoon rain water, which is mainly used in irrigation. A Reservoir is observed to be significantly important in the rainfed agriculture. Economical change, technological change and social change of the farmers are the impact which can be expected from reservoirs.

Location of the study area

This study was conducted in Mahanadi reservoir canal irrigation system of Chhattisgarh state during the years 2017-18 and 2018-19. Out of the 7 canal system, 4 were considered for this study namely Mahanadi main canal, Mandhar branch canal, Baloda branch canal and Lawan branch canal, as, it is very difficult to cover entire 7 canal system. Accordingly, total 28, 14, 17 and 21 distributaries belonging to Mahanadi main canal, Lawan branch canal, Mandhar branch canal and Baloda branch canal, respectively were taken for sample collection. 20 farm families (beneficiary of canal irrigation) had been selected randomly from each of the selected village. In this way, total 240 beneficiary families (80 from Head reach, 80 from Mid reach and 80 from the tail reach) and 120 non beneficiary farm families has been selected randomly (40 head reach, 40 mid reach and 40 tail reach).

Method of data collection

The data were collected personally by the researchers in cooperation with gram sahayak and other officials of the blocks by using pre tested interview schedule.

Results and Discussion

Irrigation availability

Results presented in the table 1 indicates the seasonal availability of irrigation. It shows that 73.42 per cent of beneficiaries had reported towards the availability of irrigation facilities for kharif crops. Followed by 21.59 per cent of the respondents had irrigation facility for both kharif and rabi crops, Only 4.98 per cent beneficiary respondents had perennial irrigation facilities.

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On the other side, among non- beneficiaries, 56.47, 29.41 and 14.12 per cent had irrigation facilities from ground water for

both kharif and rabi crops, only for kharif crops and perennial, respectively.

Table 1: Distribution of respondents according to season wise irrigation availability

Sl. No.	Availability of irrigation	Beneficiaries (n=240)		Non- beneficiaries (n=120)	
		F	%	F	%
1	Kharif	221	73.42	25	29.41
2	Kharif and Rabi	65	21.59	48	56.47
3	Perennial	15	4.98	12	14.12

F = Frequency % = Percentage

Existing irrigation pattern for rice crops

The data regarding cultivating rice crop in various irrigation patterns are presented in table 2. It was observed from the data that, 88.56 per cent of beneficiary irrigate their rice crop

from canal. Followed by 11.44 and 29.41 per cent beneficiaries and non- beneficiaries were irrigate through tube well respectively.

Table 2: Distribution of respondents according to irrigation pattern for rice crop

Existing irrigation pattern								
Irrigation sources	Canal		Tank		Well		Tubewell	
	B	NB	B	NB	B	NB	B	NB
	%	%	%	%	%	%	%	%
	88.56	0	0	0	0	0	11.44	29.41
Number of irrigation	upto 2		2 to 4		> 4			
	B	NB	B	NB	B	NB		
	%	%	%	%	%	%		
	0	5.23	100	24.18	0	0		
Time of irrigation	At the time of sowing/planting		flowering stage		At the time of grain formation			
	B	NB	B	NB	B	NB		
	%	%	%	%	%	%		
	92.08	29.20	87.10	27.52	81.76	15.00		
Method of Irrigation	Flood		Sprinkler		Drip		Ridge and Furrow	
	B	NB	B	NB	B	NB	NB	B
	%	%	%	%	%	%	%	%
	100	29.14	0	0	0	0	0	0

B = Beneficiaries NB= Non- beneficiaries % = Percentage

It was also revealed that cent per cent beneficiaries and 24.18 non- beneficiaries irrigated their rice crop for 2 to 4 times and remaining 5.23 per cent of the non- beneficiaries irrigated up to 2 times. About 92.08 per cent of the beneficiary respondents irrigate their rice crop at the time of sowing followed by 87.10 per cent at flowering stage and 81.76 per cent at the time of grain formation stage of the crop. Regarding non- beneficiaries, 29.20, 27.52 and 15.00 per cent respondents were irrigate the rice crop at the time of sowing, flowering stage and at the time of grain formation

respectively. Data also revealed that cent per cent of beneficiary and 29.14 per cent of non beneficiary used flood method for irrigating the rice fields.

Sowing method of rice

The table 3 reveals that majority (81.25%) of the head reach rice growing respondents were using transplanting method, followed by 27.50, 18.75, and 2.50 per cent respondents were using broadcasting, lehi and SRI method, respectively for the rice establishment.

Table 3: Distribution of respondents according to sowing method of rice in different water reaches of canal

Sl. No.	Sowing Method of rice	Head reach (n=80)		Mid reach (n=80)		Tail reach (n=80)	
		F	%	F	%	F	%
1	Transplanting	65	81.25	48	60.00	26	32.50
2	Broadcasting	22	27.50	28	35.00	36	45.00
3	SRI	02	2.50	NA	NA	NA	NA
4	Lehi Method	15	18.75	27	33.75	34	42.50

F= Frequency %= Percentage

*Data based on multiple responses

Moreover, 60, 35 and 33.75 per cent of the mid reach respondents were using transplanting, broadcasting and lehi methods, respectively. None of the mid reach respondents were using SRI method. The findings also indicated that majority (45%) of the tail reach respondents were using broadcasting method, followed by 42.50 per cent were using lehi and 45 per cent were using transplanting method for sowing of rice.

Seed rate of rice

Table 4 depicts distribution of respondents on the basis of seed rate of rice in different water reaches of canal. It showed that out of total respondents, using transplanting method by 15.38, 20.83 and 20 per cent of the head, mid and tail reach rice growers, respectively were using seed rate up to 40 kg/ha. Also 27.69 per cent respondents in head reach, 25.00 per cent in mid reach and 15 per cent in tail reach were using 41 to 50 kg/ha seed rate of rice in transplanting method. While, 56.92

per cent from head reach, 54.17 per cent from mid reach and 65 per cent from tail reach respondents were using more than

50 kg/ha seed rate.

Table 4: Seed rate of rice used by respondents in different water reaches of canal

Sl. No.	Method of sowing	Seed rate (kg/ha)	Head reach (n=80)		Mid reach (n=80)		Tail reach (n=80)	
			F	%	F	%	F	%
1	Transplanting	Upto 40	10	15.38	10	20.83	05	20.00
		41 to 50	18	27.69	12	25.00	08	15.00
		More than 50	37	56.92	26	54.17	13	65.00
2	Broadcasting	Upto 80	04	18.18	12	45.61	16	47.06
		81 to 90	07	31.82	09	34.21	10	29.41
		More than 90	11	50.00	06	22.81	08	23.53
3	SRI	Upto 10	01	50.00	NA	NA	NA	NA
		More than 10	01	50.00	NA	NA	NA	NA
4	Lehi Method	Upto 60	04	26.67	18	64.29	08	11.54
		61 to 70	03	20.00	07	25.00	05	7.69
		More than 70	08	53.33	03	10.71	23	80.77

F = Frequency % = Percentage

Out of total respondents using broadcasting method, 18.18 per cent head reach, 45.61 per cent mid reach and 47.06 per cent tail reach respondents were using up to 80 kg/ha seed rate. About 81 to 90 kg/ha of seed rate was used by 31.82 per cent head reach, 34.21 per cent mid reach and 29.41 per cent tail reach respondents. While, more than 90 kg/ha of seed rate was used by 50 per cent, 22.81 per cent and 23.53 per cent of head, mid and tail reach respondents, respectively. In case of SRI method, half of head reach respondents were using seed rate up to 10 kg/ha and other half were using more than 10 kg/ha seed rate of rice.

The data also revealed that 26.67, 64.29, and 11.54 per cent of head, mid and tail reach rice growers were using up to 60 kg/ha seed in lehi method. Followed by 20 per cent of head reach, 25 per cent of mid reach and 7.69 per cent of tail reach respondents were using 61 to 70 kg/ha seed rate, respectively. Similarly, 53.33 per cent of head reach, 10.71 per cent of mid reach and 80.77 per cent of the tail reach growers were using more than 70 kg/ha of seed rate.

Average seed rate of rice

The data regarding the distribution of respondents according to average seed rate of rice (kg/ha) in the study area are compiled in Table 5. In head reach the findings stated that, average 45 kg/ha seed rate was used in transplanting method. Followed by 98 kg/ha, 7 kg/ha, 73 kg/ha seed rate were used in broadcasting, SRI, and lehi method respectively.

The data further indicated that in mid reach, the average seed rate used was 48 kg/ha in transplanting, 97 kg/ha in broadcasting, and 63 kg/ha in lehi method. It was also apparent from the table that 49 kg/ha in transplanting, 100 kg/ha in broadcasting and 85 kg/ha seed rate was used in lehi method in tail reach by the respondents.

Table 5: Average use of seed rate of rice in different sowing method (Kg/ha)

Sl. No.	Method of sowing	Head reach (n=80)	Mid reach (n=80)	Tail reach (n=80)
1	Transplanting	45	48	49
2	Broadcasting	98	97	100
3	SRI	07	NA	NA
4	Lehi Method	73	63	85

F = Frequency % = Percentage

Seed treatment of rice

The data compiled in table 6 reveals that majority of the farmer did not use seed treatment in their field. Only 15 per

cent of the beneficiaries treated their seeds with chemical method. Whereas 11.10 per cent from head reach, 16.67 per cent from mid reach and 30.56 per cent from tail reach respondents used carbendazim + mancozeb for seed treatment.

Table 6: Distribution of respondents according to adoption of seed treatment of rice in different water reaches of canal

Sl. No.	Chemical Method	Head reach (n=80)		Mid reach (n=80)		Tail reach (n=80)	
		F	%	F	%	F	%
1	Carbendazim + Mancozeb	04	11.10	06	16.67	11	30.56
2	Thyrum	02	5.56	03	8.33	03	8.33
3	Biozyme	03	8.33	04	11.11	0	0

F = Frequency % = Percentage

Thyrum was used by 5.56 per cent of head reach, 8.33 per cent of mid reach and 8.33 per cent of tail reach respondents. Further, 8.33 per cent in head reach, 11.11 per cent in mid reach and none of the tail reach respondents were used biozyme chemical. Majority of the respondents used Carbendazim+ Mancozeb for treating their seeds.

Application of manures and fertilizers in rice

The finding regarding usage of manures and fertilizers in rice crops in different water reaches, compiled in table 7 shows that in case of nitrogen application 12.50, 22.50 and 28.75 per cent of the respondents used below-recommended doses in head, mid and tail reach respondents respectively. About 36.25 per cent of head reach, 28.75 per cent of mid reach and 23.75 per cent of tail reach respondents were applied recommended dose of nitrogen. Followed by 51.25 per cent from head reach, 48.75 per cent from mid reach and 47.50 from tail reach farmers used above-recommended quantity of nitrogen.

In case of phosphorous, majority (26.25%) of the head reach, 31.25 per cent of mid reach and 36.25 per cent of tail reach respondents were using below-recommended quantity. Followed by 43.75 per cent of the head reach, 45 per cent of the mid reach and 46.25 per cent of the tail reach beneficiaries who applied recommended dose of nitrogen. Similarly 30 per cent from head reach, 23.75 per cent from mid reach and 17.50 per cent from tail reach respondents used above-recommended quantity of phosphorus.

Table 7: Distribution of respondents according to manures and fertilizers application in rice farming

Sl. No.	Nutrient	Manures and Fertilizers	Head reach (n=80)		Mid reach (n=80)		Tail reach (n=80)	
			F	%	F	%	F	%
1	Nitrogen	Below recommended	10	12.50	18	22.50	23	28.75
		Recommended	29	36.25	23	28.75	19	23.75
		Above recommended	41	51.25	39	48.75	38	47.50
2	Phosphorus	Below recommended	21	26.25	25	31.25	29	36.25
		Recommended	35	43.75	36	45.00	37	46.25
		Above recommended	24	30.00	19	23.75	14	17.50
3	Potash	Below recommended	22	27.50	27	33.75	31	38.75
		Recommended	37	46.25	36	45.00	34	42.50
		Above recommended	21	26.25	17	21.25	15	18.75
4	Manures	Below recommended	11	50.00	12	66.67	07	63.64
		Recommended	06	27.27	04	22.22	02	18.18
		Above recommended	05	22.73	02	11.11	02	18.18

F = Frequency % = Percentage

Regarding application of potash, 27.50, 46.25 and 26.25 per cent of the respondents in head reach were applying below recommended, recommended and above recommended dose respectively. About mid reach growers, 33.75 per cent used below recommended, 45 per cent were using recommended and 21.25 per cent were applying above recommended dose of potash. Similarly, 38.75, 42.50 and 18.75 per cent of the respondents were applying below recommended, recommended and above recommended dose of potash in tail reach, respectively. In case of manures application, majority (50%) of the head reach, 66.67 per cent from mid reach and 63.64 per cent from tail reach respondents, were using below recommended quantity. Also 27.27 per cent of head, 22.22 per cent of mid and 18.18 per cent from tail reach respondents used recommended, and 22.73, 11.11 and 18.18 per cent of respondents were using above recommendation of manures in head, mid and tail reach, respectively.

Application of major nutrients in rice

The data pertaining to the applied average nutrient (kg/ha) in rice crop are presented in table 8 which shows that average 97, 94 and 92 kg/ha nitrogen was applied in head, mid and tail reach respondents respectively. Further, 64 kg/ha phosphorus was used in head, 62 kg/ha in mid reach and 61 kg/ha in tail reach respondents. In case of potash, 55, 52 and 50 kg/ha were used in head, mid and tail reach respondents respectively.

Table 8: Average nutrient application (kg/ha) in different water reaches for rice cultivation

Sl. No.	Nutrients	Average nutrients application (Kg/ha)		
		Head reach (n=80)	Mid reach (n=80)	Tail reach (n=80)
1	Nitrogen	97	94	92
2	Phosphorus	64	62	61
3	Potash	55	52	50

F = Frequency % = Percentage

Overall Adoption index of rice

Adoption index measures the extent of adoption at the time of the survey. It is used in the study of multiple practices to measure adoption and intensity of adoption of improved production packages at the time of the survey. Regarding adoption index of rice in beneficiaries and non-beneficiaries, shown in table 9, it reveals that improved varieties (96.75%), irrigation management (92.67%), seed rate (91.63%), insect management (78.29%) diseases management (81.68%) and were found to be good adoption index. Manures and fertilizers management, sowing method, weed management and seed

treatment were recorded having low adoption index with 75.25, 73.86, 71.88 and 61 per cent in beneficiaries.

Regarding highest adoption level by non-beneficiaries, the data revealed 94.24 per cent by improved variety, followed by seed rate (86.52%), disease management (74.25%), manures and fertilizers (68.68%), insect management (66.58%) were found to be having good level of adoption in rice. Low level adoption was found in weed management (62.36%), sowing method (61.83%) irrigation management (57.58%) and seed treatment (55%). The overall adoption index among beneficiary respondents was 80.33 per cent as compared to 69.67 per cent overall adoption index among the non-beneficiary respondent.

The test of significant between cropping intensity of beneficiary respondents and non-beneficiary respondents (Z test) was calculated and difference was found significant at 0.05 level of probability which means, the null hypothesis (there is no significant difference of overall adoption index between beneficiary and non-beneficiaries framers of canal irrigation) is rejected.

Table 9: Adoption of various production practices of rice

Sl. No.	Major Practices	Beneficiaries (n=240)	Non-beneficiaries (n=120)
1	Improved Variety	96.75	94.24
2	sowing Method	73.86	61.83
3	Seed rate	91.63	86.52
4	Seed treatment	61.00	55.00
5	Irrigation Management	92.67	57.58
6	Manures and Fertilizers	75.25	68.68
7	Weed Management	71.88	62.36
8	Insect Management	78.29	66.58
9	Disease Management	81.68	74.25

Overall adoption index of rice: Beneficiaries (80.33%)

Overall adoption index of rice: Non-beneficiaries (69.67%)

Z test, (table value = 1.64),

Calculated Value = 1.82*

* Significant at 0.05 level of probability

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