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System Interventions for Improving Water and Land Productivity of Sone Canal

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ABSTRACT

In Bihar 87 per cent farmers come under marginal and small categories including share croppers due to unawareness about latest recommendation and technologies. The average productivity of the rice and wheat is 2 t/ha and 1.9 t/ha respectively. Which is less then the national average yield of rice and wheat i.e. 2.05t/ha and 2.7t/ha respectively. The prevailing practice of late transplanting severely fails to exploit potential rainfall in rice cultivation results in heavy loss of water, soil and nutrients through excess run-off. The late rice harvesting delaying the wheat sowing, which takes place very late up to first week of January, severely reduce the yield of wheat. Keeping afore-mentioned production constraint, the study was conducted with objective of system interventions for improving water and land productivity of Sone Canal. The impact of system interventions reported that the area under improved cultivation of rice & wheat was increased from 2.5 ha to 20 ha in four villages in first years. In 2004, the spread has been found to be 200 villages for rice crop. Farmers' motivation and function of Water User Association was found to be geared up due to such intervention package. This enabled efficient use of water and use of quality inputs and scientific operation for crop cultivation.

In British India, Bihar had upper hand in agriculture production and during post independence period its production could not enhanced as per expectations. Data shows rice and wheat is the major crops of the state and possesses about 71 per cent of total cultivated area of the country, but produces about 6.41 per cent of total food grains. The average yield of rice and wheat cropping system are 1.30-1.99 t/ha as against the experimental yield of 7.21-3.96 t/ha, obtained experimental plots at Sabour (Bihar). Even though the state is rich in soil and water resources, the existing gap in experiemental and average yields of rice-wheat-cropping system is hardly 50 per cent of Punjab and Haryana. Participation of farmers in a system approach result in enhancing productivity, motivate farmers and trigger a movement through pad option of newer methods and new technologies for enhancing productivity and income. Thus, there is a considerable scope to increase the water productivity that could result in increased production of rice and wheat in Bihar.

The state possesses all sorts of natural resources but inefficient planning, poor development of surface water resources severely dwindled the production potential from surface water based major, medium and minor irrigation in Bihar is 4181.9 thousand hectare (49.8% of total cultivated area) compared to Punjab and Haryana, having 256.5 thousand hectare (84%), 2117 thousand hectare (69.4%), respectively that shows how far behind the state is.

Development of ground water resource is also on lowest in Bihar compared to the leading states despite very rich in ground water potential. Shallow tube-well density in Bihar is having only 9. 34 tubewell per sq km as compared to 12.36 in Punjab.

The socio-economic and political constraints absence of land ceiling training and education, lack of credit facility, crop insurance, non-availability of quality inputs and farm implement, absence of proper marketing facility and sluggish development are the major repercussions worsened the situation and severally diminished the productivity of the state. Within these dominating constraints with available meagre infrastructure resources and services, constraints for low

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water productivity technologies is to be transferred to the farmers to harness such high potential of water and land resources.

Constraints Identified for low water productivity

Keeping afore mentioned production obstac;es the Directorate of Water Management Research, Patna organized group meeting in Sone Canal System of Patna District in 1998 with farmers of RP-channel & Majhouli distributaries, comparise 20 and 29 villages and covering 3022 ha & 4311 ha, respectively. The critical analysis of the interactive meetings revealed other production constraints to rice-wheat production system as (i) delay in seedling raising and transplanting in rice, and late sowing of wheat due to non-availability of canal water in and its inedequate distribution, ineffective use of rain-water, inadequate number of shallow tube-wells, and lack of conjunctive use of different irrigation waters. It is revealed from the fact that out of 200 farmers surveyed during 1998 only 28.5 per cent had completed transplanting upto 21 July and 71.5 per cent upto 25th August (table 1) (ii) cultivation of inappropriate and wheat cultivars; (iii) imbalance and limited application of fertilizers, (iv) inadequate and lack of awareness about plant protection measures; (v) non-availability of seed drill and other farm implement; and (vi) lack of proper technical guidance and support from development agencies.

Having studied the average of 70 years rainfall pattern of Patna district it was found that maximum rainfall occurs from June to September. The farmers of the command area raise seedlings between last weeks of June to 2nd week of July and transplant upto 3rd week of August and harvesting takes place between last week of November to 2nd week of December. Thus rain utilization according to the date of transplantation is 40 to 60 per cent only.

Thus, the prevailing practice of late transplanting severely fails to exploit potential rainfall in rice cultivation result in heavy loss of water, soil and nutrients through excess run-off. The late rice harvesting delaying the wheat sowing, which takes place very late up to first week of January, severely reduces the yield of wheat.

Table 1: Trend of transition of rice transplantation during per (1998) and post intervention (1999) period.

S.No.	Period	Rice field (%) transplanted 1998	1999	Cumulative (%) transplanted 1998	1999
1	July 1-7	0.0	12.5	0.0	12.5
2	July 8-14	9.5	34.5	9.5	47.0
3	July 15-21	19.0	29.5	28.5	76.5
4	July 22-28	46.5	10.5	75.0	87.5
5	July 29-4 Aug	15.5	8.0	90.5	95.0
6	Aug 5-11	4.0	5.0	94.5	100
7	12-18	5.5	0	100	0

System Interventions

On the basis of above constraints and considering the average rainfall of 70 years rainfall pattern emphasis was given on optimization of the period of rice transplanting by advancing the raising of nursery by 15-20 days starting from the last week of May to first week of June using three irrigations by tube well water and transplanting it in the last week of June to middle of July for maximum utilization of rain water and to save the farmers 2-3 irrigations in the last phase of crop growth. Farmers were advised to use suitable rice cultivars for short, and long duration cultivations. Sowing of normal 1/3 of existing high rate in nursery beds of rice, use of balanced fertilizers (NPL and Zinc) for raising seedling and for main crop as compared to unbalanced nitrogen, use was advocated.

The farmers were advised to transplant recommended seedlings per hill (2-3) as against their practices of 8-12 seedlings per hill at proper distance by maintaining 33 hills/m2 for long and 44 hills/m2 for short duration varieties. Suitable plant protection measures were used for rice and wheat. Recommended irrigation practices for rice (5cm ponding at 3 days after disappearance of ponded water) and wheat (four irrigation

at critical stages) under recommended field layout were advised to save the water against field to field irrigation having high depth of submergence.

Thus, the interventions were on: (i) Use of ground water for timely raising of seedling with scientific method (ii) Timely transplanting of rice by July for efficient use of rain and canal water, high yield and timely availability of land for wheat sowing (iii) Use of recommended nutrients plant protection measures and irrigation practices for rice and wheat to enhance yield and productivity. (iv) Community operations like raising of seedlings and effective collaboration of Water Use Association (WUA) with canal authority for proper distribution of available canal water (vi) Motivation of farmers through group contact, training and use of mass media like gosthi and field days.

To authenticate our recommended production package six demonstrations at five locations were laid in the commands of RP Channel-5 and Majhaouli distributaries in 1999-2000.

Impact of System Interventions

The package interventions has the following impacts:

1. Rainwater utilization was enhanced from 40-60 per cent to 80-90 per cent (Table 2).

Table 2. Effect of rice transplanting on utilizing of seasonal rain water by rice crop district-Patna, under Sone Canal Command (1999-2000).

Rice transplanting	Seasonal rain water utilization by rice crop	
	depth (mm)	per cent
Timely planting with improved practices		
June 20- July 01	1163	100.0
July 01-08	1022	87.8
July 09-15	961	82.6
July 16-22	928	79.8
July 23-29	784	67.4
July 30- Aug 5	660	56.7
Aug 6-12	615	52.9
Aug 13-19	490	42.0
Aug 20-26	424	36.4
Aug 27-02 Sep	400	34.4
Farmers practices		
July 20- Aug 5	749	64.3
Aug 6-16	608	52.3
Aug 17-27	426	36.6
Aug 28- Sep 06	394	34.0

2. Canal water use was optimize by saving of 30-40 per cent water and additional area of 20-25 per cent could be irrigated with same quantity of water.

3. Importance conjunctive use of waster was realized to increase crop yield and to harness the potential of natural resources.

4. Increase in the rice yield from 3.15 t/ha to 6.05 t/ha and wheat yield from 2.0 t/ha to 5.1 t/ha was found which could enhance the water use efficiency to double.

5. The area under improved cultivation of rice & wheat was increased from 2.5 ha to 20 ha in four villages in 1999. In 2000 the spread has been found to be 200 villages for rice crop.

6. Farmers' motivation and function of Water Use Association was found to be geared up due to such intervention package. This enabled efficient use of water and use of quality inputs and scientific operation of crop cultivation.

Table 3. Effect of package intervention on grain yield of rice and wheat in the Distt. Patna under Sone Command.

Period	Rice yield (t/ha)	Wheat yield (t/ha)
Per inception-1998	3.15 (66)	2.0 (52)
Post inception-1999		
On-farm trial	6.76 (6)	6.0 (6)
Adopter farmers	6.05 (22)	5.1 (15)
Non-adopter farmers	3.17 (66)	2.2 (32)

No. of farmers sampled are given in parenthesis.

CONCLUSION

As narrated above, the package interventions resulted into rain water utilization, optimized canal water use, increased rice and wheat yield, area expansion and functioning of water user association. Such package should be promoted for benefit of the farming community.

REFERENCES

Das, P.K. and N. Subhash (2000). Personal Communication, Directorate of Water Management Research, Patna.

Singh, V.P. A.S.R.A.S. Shastri, S.S.Beghel, J.L. Chaudhary. (1996). Agroclimatic Atlas of Eastern India, 1, IGAU, Raipur.