

Effect of Balanced Application of N, P, K and Deficient Zinc and Micronutrients in Increasing Crop Yields: IMPHOS Experience from On-Farm Trials

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INTRODUCTION

The World Phosphate Institute with headquarters at Casablanca, Morocco is a scientific, non-profit, non-commercial and non-government organization having a global mission to promote sustainable growth of phosphate in meeting the food demand of world population. IMPHOS is supporting an on-farm demonstration project 'Micro-nutrients Based Balanced Fertiliser Use for Increasing Crop Production' in India in collaboration with two Fertiliser Industries viz, Chambal Fertilisers and Chemicals Limited (CFCL) and Shriram Fertilizers and Chemicals (SFC) for three years period starting from summer, 2009. The CFCL is operating the project in districts of Uttar Pradesh, Rajasthan and Madhya Pradesh, while the SFC is conducting the demonstrations in Haryana, Rajasthan and Uttar Pradesh.

METHODS

The mandate of the project is essentially to lay out demonstrations in the farmers' fields to show them the benefits of applying balanced fertilizers, including Zn and other micro-nutrients. During the two summer (2009 & 2010) and the winter of 2009-10, a total of 189 demonstration trials (23 on rice, 17 on wheat, 10 on potato, five on sorghum in Uttar Pradesh, eight on rice, four on wheat in Haryana, 11 on rice, 13 on wheat, 33 on mustard, 35 on cotton in Rajasthan, 15 on rice, 15 on wheat in Madhya Pradesh) were laid out. The three treatments consisted of: (i) Farmer own practice in use of fertilisers; (ii) State-recommended doses of fertilisers; and (iii) Soil test-based fertilisers including Zn and other micronutrients.

RESULTS AND DISCUSSION

The crop yields from all sites were recorded (Table 1). The yield in all crops increased with fertiliser application based on State recommendations compared to farmer practice. Application of N, P, K, Zn and other micronutrients based on soil test recommendations further increased the yield over State recommended levels. On average, in Uttar Pradesh, with soil test based fertilisers including Zn and other micronutrients use over the farmer own practice, the yield increased by 23.9, 14.5, 8.7 and 12.7 % in rice, wheat, potato and sorghum, respectively. In Haryana, this increase was 12.7 and 10.2% in rice and wheat, respectively. Similarly, in Rajasthan, these increases were 4.2, 4.5, 17 and 13.1 % in rice, wheat, mustard and cotton and in Madhya Pradesh 8.4 and 15.4 % in rice and wheat, respectively. A series of field days and crop seminars were organized at the demonstration sites for the benefit of the farmers of the area.

Deficiencies of micronutrients, especially Zn, Cu, Fe, Mn and B, besides N, P, and K in soils of India has been documented repeatedly (Motsara, 2002; Singh, 2001, 2007, 2009). The extent of Zn deficiency is 60.5, 45.7, 21 and 44.2 % in soils of Haryana, Uttar Pradesh, Rajasthan and Madhya Pradesh, respectively. The crops in these soils respond significantly to the Zn and other micronutrients applied. The results obtained in these on-farm trials confirm previous findings already reported.

Table 1. Mean yield (t/ha) of various crops in different treatments in States

<u>State</u>	<u>Crop</u>	<u>T - 1</u>	<u>T - 2</u>	<u>T - 3</u>	<u>% increase with T-2 over T-1</u>	<u>% increase with T-3 over T-1</u>
Haryana	Rice(8)	3.45	3.56	3.89	3.2	12.7
	Wheat(4)	1.67	1.74	1.84	4.2	10.2
U.P.	Sorghum(5)	2.83	2.83	3.19	-	12.7
	Paddy(23)	4.43	5.09	5.51	14.9	23.9
	Wheat(17)	1.61	1.71	1.85	6.4	14.5
	Potato(10)	18.4	17.8	20.00	3.3	8.7
Rajasthan	Paddy(11)	5.68	5.79	5.98	3.6	4.2
	Wheat(13)	2.50	2.58	2.68	3.1	4.5
	Mustard(33)	1.20	1.23	1.41	4.6	17
	Cotton(35)	13.9	14.6	15.7	5.2	13.1
M.P.	Paddy(15)	2.51	2.52	2.73	0.4	8.4
	Wheat(15)	1.30	1.30	1.50	-	15.4

T - 1= Farmer practice; T - 2 = State recommended; T- 3 = Soil test;
U.P. = Uttar Pradesh; M.P.= Madhya Pradesh; () = No. of trials.

CONCLUSIONS

The results from these demonstration activities convinced the farmers that crop yield with balanced use of fertilizers including Zn and other micro-nutrients based on soil tests increases crop yields.

ACKNOWLEDGEMENT

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