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Constraints in Adoption of Recommended Package of Practices of Rainfed Wheat Cultivation in Madhya Pradesh

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ABSTRACT

The study was conducted in the jurisdiction of Integrated Watershed Management (Watershed Development) Programme under rainfed areas of Madhya Pradesh. It was purely based on the primary data, which was collected from 1285 randomly drawn respondents who were personally interviewed using pre-tested interview schedule. Farmers were found cultivating wheat at commercial level by the information and technological backstopping of Agriculture Universities, Department of Agriculture and *Krishi Vigyan Kendras etc.* but still there was yield gap (YG) III of 26.83 per cent between potential (35q/ha) and average farmer yield (25.61q/ha), a gap of 1.1 per cent (YG-I), and 26.00 per cent (YG -II) was found between potential (35q/ha) & highest farmers yield (34.61q/ha), and between highest (34.61q/ha) & average farm yield (25.61q/ha). There were several constraints which farmers found in adoption of recommended package of practices of wheat production technologies.

Key word: Wheat, Adoption Pattern, Yield Gap and Constraints.

INTRODUCTION

The state of Madhya Pradesh has achieved the "Krishi Karman Award" for the 4th consecutive year (2014-15), previously on excelling in wheat production (2013-14) and excelling in food grain production (2011-12 & 2012-13). Wheat is the second most important staple food after rice consumed by 65 per cent of the population in India and is likely to increase further due to changes in food habits. It has been described as the "King of Cereal" India has second rank in world wheat production. The world wheat production is now pegged at 732 million tones (FAO, 2016). In India, wheat occupied 31465.6 thousand Hectares with production of 93506.5 thousand tonnes and productivity of 2750kg/ hectare (GoI. 2014-15). Madhya Pradesh contribute 5.06 per cent production of wheat in the country with 6002.0 thousand hectares area, 17103.9 thousand tonnes production and productivity of 2850 Kg./hectare (GoI. 2014-15). Madhya Pradesh has earned a name for its high production and quality wheat. Farmers of Madhya Pradesh are moving towards scientific farming with the help of technology. Riding on a multi-pronged strategy to boost agriculture production, Madhya Pradesh is eyeing to surpass Punjab in wheat production this year. Assured canal irrigation, covering fellow land under cultivation, warehousing and infrastructure, credit management, agriculture extension and technology, fertilizer supply management, increased seed replacement rate and above all regular electricity supply has already yielded 2850 Kg./Hectare of wheat in the year 2014-15 anonymous 2016. Adoption of agricultural technologies differs from farmer to farmer which refers to both mental acceptance and also covers the use of new agricultural technologies. Adoption is defined as the use of recommended agricultural technologies on continuing basis (Singh *et al.*, 2012). This can be achieved by using high yielding management practices (Yang *et al.*, 2008), and closing yield gaps (YG) between farmers' actual yield and potential yield (Cassman *et al.*, 2003; Licker *et al.*, 2010; Tilman *et al.*, 2011; Mueller *et al.*, 2012). Minimizing yield gaps in major crops by using optimal management practices may lead to improvements in production, while offering both environmental benefits and economic value. Assessing the yield gaps in major field crops can help us understand yield variability, yield potential, and the input use efficiency of major crops and may indicate appropriate pathways for improving agricultural efficiencies (Fischer *et al.*, 2009; Carberry *et al.*, 2013; Van Ittersum *et al.*, 2013). It has been notice that inspire of various technological innovation, the differences between potential yield under rainfed condition, highest yield of the fame and normal yield under farmers' practice are widened. The management practices and input use are

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likely to be influenced by various socio-economic factors. Keeping these facts in mind, the present study was undertaken to quantify the yield gap of wheat between actual, highest yield by the farmers and average yield and also to identify their adoption pattern and constraints faced by them which hindered increased wheat production of the state.

METHODOLOGY

The study was carried out by Agro Economic Research Centre in the jurisdiction of Integrated Watershed Management Programm (IWMP) rainfed areas of Madhya Pradesh. It was purely based on the primary data, collected through pre-tested interview schedule from the respondents through survey method. All the 33 watershed development areas from 32 districts under IWMP were selected in the State. A list of all the beneficiaries was prepared in ascending order and clarified them into marginal (<1 ha), small (1 to 2 ha), medium (2 to 5 ha) and large (>5 ha) categories and 10 per cent or minimum 10 beneficiaries from each category were selected randomly under the watershed development area. Thus, 1285 beneficiaries were selected for the study which covered 18.18 per cent of total actual beneficiaries and more than 30 per cent of total watershed command area of Madhya Pradesh as indicated in Table 1. Following tools were used to analyze the yield gap, which were already used by Santosh *et al.*, (2015).

Table 1: Number of selected beneficiaries in different size of farms

Agro -Climatic Zone	Selected No. of IWMP	Marginal	Small	Medium	Large	Total
Vindhya Plateau	6	85	57	48	21	211
Central Narmada Valley	1	10	10	10	9	39
Jhabua Hills	2	22	23	18	3	66
Kymore Plateau	6	90	64	55	46	255
Nimar Plains	2	20	20	20	1	61
Northern Hill of Chhattisgarh	1	10	10	10	10	40
Satpura Hills	2	20	20	20	14	74
Bundelkhand region	3	42	45	33	20	140
Gird Region	3	43	33	24	20	120
Malwa Plateau	7	89	80	71	39	279
Madhya Pradesh	**33**	**431**	**362**	**309**	**183**	**1285**

Yield gap – I – It is the different between the potential yield (Yp) & the highest farm yield (Yh)- = $\frac{Yp - Yh}{Yp}$ X 100

Yield gap – II- It is the different between the highest farm yield (Yh) & the average farm yield (Ya)- = $\frac{Yh - Ya}{Yh}$ X 100

Yield gap – III- It is the different between the potential yield (Yp) & the average farm yield (Ya)-= $\frac{Yp - Ya}{Yp}$ X 100

Where: Yp =Potential yield, Yh =Highest farm yield Ya =Average farm yield

RESULTS AND DISCUSSION

The yield gap, adoption and Constraints which affected the yield increase of wheat in Madhya Pradesh were analyzed.

Yield gap analysis

The yield gap analysis of wheat for different size of sampled farmers was carried out and results are presented in table 2. A considerable yield gap III of 26.83 per cent between potential (35 q/ha) and average farmer yield (25.61 q/ha) was found on an average wheat grower's field. Out of the total yield gap yield gap-III, a gap of 1.1 (yield gap-I) and 26.00 per cent (yield gap-II) was found between potential (35 q/ha) & highest, farmers yield (34.61 q/ha), and between highest & average farm yield (25.61 q/ha), respectively. These results were found to similar with minor variation in all the categories of farmers. The findings of singh *et. al.*, (2013) also matched with these results.

Table 2: Yield gap analysis of rainfed wheat in Madhya Pradesh

Particulars	Unit	Marginal	Small	Medium	Large	Overall
Potential Yield		35	35	35	35	35
Highest Farm Yield	q/ha	34.52	34.56	34.88	34.48	34.61
Average Farm Yield		25.4	25.48	26.04	25.51	25.61
Yield Gap-I		0.5 (1.4)	0.4 (1.3)	0.1 (0.3)	0.5 (1.5)	0.4 (1.1)
Yield Gap-II		9.1 (26.42)	9.1 (26.27)	8.8 (25.34)	9.0 (26.02)	9.0 (26)
Yield Gap III		9.6 (27.43)	9.5 (27.20)	9.0 (25.60)	9.5 (27.11)	9.4 (26.83)

Figures in parentheses show per cent yield gap.

The yield gap-I denotes that recommended packages and practices (RPP) for wheat production yet not been found to be transferred fully to an average wheat grower's farm due to soil and climatic difference in experimental field and farmer's field, while yield gap II was found due to various socio-economic constraints present in the study area. These yield gaps were found to be less in medium size of farms as compared to other size of farms.

Adoption pattern of different production technologies

Adoption pattern of different recommended production technologies was observed for wheat at

various categories of farmers in the study area. It was observed that all the respondents adopted HYVs of wheat but only 5.68, 3.19, 3.19 per cent farmers were found using the treated seeds with fungicide, azotobactor and phosphorus solubilizing bacteria respectively. None of the farmers was found have adopted the System of Wheat Intensification (SWI) for sowing of wheat in area under study. The majority of farmers were found to adopt line sowing (67.44%) and 32.61 per cent of them were still following the broadcasting method of seed sowing.

Table 3: Adoption of different inputs/technologies in wheat by Farmers (%)

	Particulars	Marginal	Small	Medium	Large	Overall
Seed		100	100	100	100	100
Seed treatment	Azotobactor	2.55	4.14	2.91	3.28	3.19
	Phosphorus solubilized bacteria	2.78	3.87	2.91	3.28	3.19
	Fungicide	3.94	5.52	6.47	8.74	5.68
Sowing of methods	System of wheat intensification (SWI)	0.00	0.00	0.00	0.00	0.00
	Line sowing	73.33	67.5	59.03	69.88	67.44
	Broad casting	56.37	22.7	23.9	27.45	32.61
Fertilizers	Urea	62.65	74.31	69.58	69.95	68.64
	Di-ammonium phosphate	60.32	67.40	66.99	61.75	64.12
	Murate of Potash	6.26	7.46	8.74	6.56	7.24
	Single super phosphate	6.73	7.18	8.09	8.74	7.47
Micro nutrients	Gypsum	3.71	2.76	3.24	5.46	3.58
	Zinc	5.34	5.80	5.50	6.56	5.68
	Sulphur	0.93	0.28	0.00	1.09	0.54
Plant protection	Insecticide	2.55	1.66	3.88	4.37	2.88
	Fungicide	0.70	0.28	0.97	1.64	0.78
	Weedicide	12.99	13.81	20.06	20.77	16.03

Majority of farmers adopted recommended dose of Urea (68.64%) and Di-Ammonium Phosphate (64.12%) and only 7.47 and 7.47 per cent of wheat growers found to have applied recommended doses of Super Phosphate and Murate of Potash. The application of micro nutrients i.e. Zinc, Gypsum and Sulphur in cultivation of wheat were found to be adopted by as low as 5.68, 3.58 and 0.54 per cent of total respondents respectively. In case of adoption of plant protection chemicals, only 16.03, 2.88 and 0.78 per cent were found to apply weedicide, insecticide and fungicide respectively in the study area Table 3.

Constraints in adoption of recommended package of practices of crops

The constraints in wheat production technologies have been observed during the course of investigation. The constraints prevailed in the area under study are classified according to crop production technologies i.e. seed and sowing, seed treatment, manures and fertilizer, micro nutrients and plant protection chemicals Table 4.

Seed and sowing

The cent percent farmers were found to experience the non-availability of desired variety of seeds, used HYV of seeds but were not able to adopt the HYVs of their needs mainly due to lack of information about them followed by lack of seed drill & machinery, low germination as reported by 74.32, 22.28, 18.29 and 2.18 per cent respondents, respectively. Majority of farmers are still following broadcasting method instead of line sowing and SWI method due to unavailability of seed drill and machinery on hiring basis. It was also observed during the investigation that all the farmers although used HYVs of wheat but majority of them did not know the name of the variety (Table 4).

Seed treatment

The constraints related to adoption of seed technologies by the respondents are presented in the Table 4. It is observed that majority of farmers were not able to treat seeds with Azotobactor, Phosphorus Solubilize Bacteria (PSB) and fungicides due to unavailability at the time of sowing (39.93%), non availability of good quality of culture (41.24%) and lack of knowledge about method of seed treatment (12.62%) in the study area.

Table 4: Major constraints as perceived by the farmers in adoption of wheat production technology

Constraints	Marginal	Small	Medium	Large	Overall
Seed and sowing					
Lack of Information of HYV	46.00	35.86	48.34	39.55	42.44
Low germination of Seed	2.55	1.93	1.94	2.73	2.18
Unavailability of desired variety of seed	74.01	74.31	73.14	76.5	74.32
Lack of Seed drill & machinery	22.56	21.73	21.94	22.87	22.28
Seed Treatment					
Unavailability at the time of sowing	44.58	35.11	38.65	38.71	39.93
Lack of knowledge about method of seed treatment	13.31	13.36	11.59	11.29	12.62
Non availability of good quality of culture	37.77	46.18	39.61	43.55	41.24
Manure & Fertilizers					
Unavailability of FYM and Compost	81.82	93.1	94.67	88.46	88.57
High cost of fertilizers	36.31	29.43	24.39	18.52	27.16
Unavailability at the time of sowing	15.63	8.57	12.2	33.33	16.15
Lack of know ledge about Proper dose of fertilizers	12.5	14.66	12.2	28.57	16.98
Lack of capital	18.75	17.14	12.44	5.13	13.36
No Requirement as they were using manures	32.81	42.86	48.78	28.57	37.89
Micro nutrients					
High cost of micro nutrients	26.84	25.85	27.38	21.27	25.66
Unavailability at the time of sowing	8.35	7.38	5.54	9.49	7.57
Lack of knowledge about Proper dose of micro nutrients	30.13	33.23	29.89	35.44	31.59
Lack of capital	4.05	3.38	5.17	2.53	4.09
No Requirement	50.63	50.15	52.03	51.27	51.09
Plant prote ction chemicals					
No severe pest problems in last year	71.43	68.82	71.53	55.81	69.26
Harmful to human	5.73	3.94	7.19	4.87	5.43
Lack of information	16.45	16.47	21.17	32.56	19.42
High cost of plant protection chemicals	66.08	61.42	55.67	52.48	58.91

Manure & fertilizers

The majority of farmers reported that they did not apply recommended doses of manures in their field owing to nonavailability of FYM & compost (88.57%) at their farm. Farmers were not able to apply recommended dose of fertilizers in wheat due to lack of knowledge about recommended doses of fertilizers (16.15%), non-

availability at the time of sowing (16.15%), lack of capital (13.36%) and high cost of fertilizer (27.16%). Only 37.89 per cent respondents reported that fertilizers were not required for cultivation of wheat as they were using organic manures in their fields (Table 4).

Micro nutrients

The sampled farmers were not able to apply micro nutrients in cultivation of wheat due to lack of knowledge (31.59%), unavailability at time (7.57%), high cost of micro nutrients (25.66%) and lack of capital (4.09%). The majority of farmers (51.09%) also reported that micro nutrients are not required for cultivation of crops due to the fact that they did not of test them soil from soil testing labs.

Plant protection chemicals

The majority of respondents were not found to apply plant protection chemicals *i.e.* insecticides, pesticides, fungicides and weedicides in cultivation of wheat due to no severe problem of insect, pest, diseases was observed and weeds was not found last year (69.29%), lack of information (19.42%), chemicals are harmful to human health (5.43%) and High cost of plant protection chemicals (58.91%). These finding are similar for all size of farm and no remarkable deviation was found across different farm sizes.

CONCLUSIONS

It is clear from the above results that there was yield and adoption gap with recommended packages of practices of wheat production in the study area. There were several constraints, which farmers experienced in wheat production in the area under study. Hence, it is the high time that extension workers ought to evaluate their efforts and lay more emphasis on methods and results demonstrations of modern technology of wheat in the area. It is also observed during the course of investigation that the majority of farmers were not aware of the toll free number (1800-180-1551), name of the HYVs they cultivated in their field etc. All the farmers used the same variety across the villages. Hence, afforts should be made to popularize toll free number among the farmers and encourage them to cultivate different type of varieties of wheat *i.e.* early, mid and late duration in different field situations. This way they shall not only minimize their crop risk but also shall insure higher farm income.

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