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Adoption of integrated nutrient management practices by paddy growers in tribal district of Maharashtra state

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Abstract

Study entitled “Adoption of Integrated Nutrient Management Practices by paddy Growers” was undertaken in Gadchiroli district in Vidarbha region of Maharashtra state during year 2019-20. Ex-post facto research design was used for the same. The farmers growing Paddy since last three years consecutively were identified and from each selected village 12 Paddy growers as respondents were selected randomly to constitute sample size of 120 respondents. The data from Paddy growers were collected by personal interview method.

Findings of the study revealed that in case knowledge of paddy growers about integrated nutrient management practices majority of paddy growers (60.83%), were in medium level of knowledge whereas one fourth (25.00%) of the paddy growers possessed low level of knowledge with regards to recommended integrated nutrient management practices. Only 14.17 per cent paddy growers possessed high level of knowledge.

In case overall adoption level of integrated nutrient management practices maximum number of paddy growers (47.50%) were in low adoption level whereas 45.00 per cent paddy growers were in medium level of adoption of integrated nutrient management practices. Only 07.50 per cent paddy growers were in high level of adoption of integrated nutrient management practices.

Keywords: paddy, knowledge, adoption, integrated, nutrient, management

Introduction

Rice (*Oryza sativa* L.) is one of the most important cereal crops in India. Globally, India ranks first in rice area and second in rice production after China. Within the country, rice occupies one-quarter of the total cropped area that contributes about 40 to 43% of total food grain production and continues to play a vital role in the national food. Area under rice cultivation in India was 43.19 million hectares, production of 110.15 million tonnes with productivity of 2550 kg per hectare during 2016-17. In Maharashtra rice is second important crop of the people, which is grown over an area of 1.42 million hectares with an annual rough rice production of 2.66 million tonnes (2017-18). The average productivity of the state is 1.87 tonnes per hectare. Maharashtra ranks 13th place in rice production in country. In Vidarbha region paddy crop is grown mostly in considerable area of about 0.74 million hectares. In Vidarbha region Gadchiroli, Bhandara, Gondia, Chandrapur and some parts of Nagpur and Wardha are the prominent district of paddy cultivation. There is need to increase the productivity of paddy for improvement of financial status of farmers.

The other reasons for low productivity are fluctuation in the rainfall pattern, improper management of recourses (like soil, water and nutrient management), faulty plant protection techniques and weak extension link denying improved technology to paddy growers who continue to follow traditional methods and also may be due to improper nutrient management in paddy crop.

There are various improved cultivation practices recommended namely, sowing time, seed rate, soil preparation, spacing, seed treatment, varieties, fertilizer application, irrigation, intercultural operations, pest and disease management, harvesting etc. In addition to this, there are certain integrated nutrient management practices which includes use of organic manures, inorganic fertilizers and bio-fertilizers, so as to improve soil fertility and increase soil productivity which is ecologically safe.

The concept of integrated nutrient management is the continuous improvement of soil productivity on long term basis through appropriate use of fertilizers and organic manures including green manures and their scientific management for optimum growth, yield and quality of different crops and cropping systems in specific agro-ecological situations.

In agriculture, today there is a wide gap between demand (requirement) of nutrients (NPK) for derived food production and supply of nutrients through supplementary and complementary use of organic and biological sources of nutrients in Integrated Nutrient Management systems. The use of organic manures, crop residues, microbial fertilizers and green manuring are all becomes more essential because of limited availability of chemical fertilizer and their higher prizes.

Paddy is the most prominent crop in Gadchiroli District as most of the farmers in district are solely depending upon the income coming from production of paddy crop. Land in the district is heavy and having a very high-water holding capacity, which is an important requirement for the paddy crop making it the most feasible crop to be taken in the district.

Besides such favourable conditions the productivity of paddy crop in the district is 1166 kg/ha only (Anonymous 2015-16). Which is very less than the national average of 2550 kg/ha. Improper nutrient management may be one of the reasons for

low productivity of paddy crop in the district.

As adoption behaviour of farmers is influenced by various factors and if they are identified, it would be easy to increase area as well as productivity by the use of Integrated Nutrient Management Practices recommended for Paddy.

Methodology

Research design

An exploratory research design of social research was used for the investigation.

Locale of study

The present investigation was carried out in Gadchiroli, one of the tribal district from eastern Vidarbha region of Maharashtra state.

Sampling Procedure

From Gadchiroli District three consecutive talukas namely, Gadchiroli, Chamorshi and Dhanara were selected on the basis of maximum area under paddy cultivation. From each taluka four villages were selected and from each village 10 paddy growers were selected randomly. Thus, from three talukas and 12 villages 120 paddy growers as respondents were selected to constitute sample size of the study.

Results and Discussion

Table 1: Distribution of the respondents according to their practice-wise knowledge about integrated nutrient management practices of paddy.

Sr. No.	Particulars	Knowledge	
		Correct	Incorrect
		Frequency (n=120)	
1	Meaning of Integrated Nutrient Management (INM refers to use of organic, inorganic and biological components in integrated manner)	19 (15.83%)	105 (84.17%)
2	Requirement of essential nutrients for crop growth For example: Nitrogen, Phosphorus, Potassium etc.	62 (51.17%)	58 (48.83%)
3	Soil testing (To know the nutrient level in soil)	94 (78.33%)	26 (21.67%)
4	Application of FYM (10-12 t/ha)	84 (70.00%)	36 (30.00%)
5	Time of application of FYM (30-45 days before transplanting)	52 (43.33%)	68 (56.67%)
6	Application of compost (10 t/ha)	35 (29.17%)	85 (70.83%)
7	Time of application of compost (30-45 days before transplanting)	25 (20.83%)	95 (79.17%)
8	Green leaf manuring crops. (Dhaincha, Sunhemp, Boru etc.)	31 (25.33%)	89 (74.67%)
9	Incorporation of green leaf manure @ 6.25 t/ha.	26 (21.67%)	94 (78.33%)
10	Time of application of green leaf manure (At the time of puddling)	25 (20.83%)	95 (79.17%)
11	Recommended dose of nitrogen fertilizers for Paddy crop. (100-120 kg)	101 (84.17%)	19 (15.83%)
12	Time of application of Nitrogenous fertilizers. (50% @Basal dose+ 25% @Tillering stage+ 25% @Panicle emergence)	89 (74.17%)	31 (25.83%)
13	Use of Urea, DAP brickets. (60% urea+40% DAP). @170 brickets/Ha. 5-6 cm below soil surface in between each square of plant.	02 (01.67%)	118 (98.33%)
14	Recommended dose of Phosphatic fertilizers for paddy crop. (50 kg Phosphorus/ha.)	95 (79.17%)	25 (20.83%)
15	Time of application of Phosphatic fertilizers. (At the time of puddling)	91 (75.83%)	29 (24.17%)
16	Recommended dose of Potassium fertilizers for paddy crop. (50 kg Potassium/ha.)	82 (68.33%)	38 (31.67%)
17	Time of application of Potassium fertilizers. (At the time of puddling)	79 (65.83%)	41 (34.17%)

18	Recommended dose of zinc sulphate @ 10 kg/ha	05 (04.17%)	115 (95.13%)
19	Application of 500 kg of gypsum/ha (as source of Ca and S nutrients) at last ploughing.	03 (02.50%)	117 (97.50%)
20	Seed treatment with bio-fertilizers: Azotobacter/Azospirillum/Phospho-bacteria	12 (10.00%)	108 (90.00%)
21	Application of BGA/Azolla after transplanting.	03 (02.50%)	117 (97.50%)
22	Application of solid FeSO ₄ (30 kg Fe/ha) to overcome iron deficiency.	02 (01.67%)	118 (98.33%)
23	Application of Boron in soluble forms (borax) for rapid treatment (0.5–3 kg B/ha) to overcome boron deficiency.	05 (04.17%)	115 (95.83%)

(Figures in parenthesis indicates percentage)

Data regarding distribution of the respondents according to their practice-wise knowledge about Integrated Nutrient Management practices of paddy presented in Table 1. It is revealed from Table 1 that, majority of the paddy growers (84.17%) had knowledge about recommended dose of Nitrogenous fertilizers; followed by 79.17 per cent paddy growers who possessed the knowledge about recommended dose of phosphatic fertilizers. A little more than three fourth (78.33%) of the paddy growers had knowledge about soil testing. large majority of the respondents (75.83%), (74.17%) and (70.00%) were having knowledge about time of application of phosphatic fertilizers, time of application of nitrogenous fertilizers and knowledge of application of FYM respectively. It was followed by the paddy growers (68.33%), (65.83%) and (61.67%) having knowledge about recommended dose of potassium fertilizers, time of application of potassium fertilizer and recommended dose of compost respectively.

With regards to knowledge about, Integrated Nutrient Management practices such as time of application of FYM, time of application of compost and idea about requirement of essential nutrients for crop growth, the knowledge possessed by paddy growers was (59.16%), (56.67%) and 51.17 per cent respectively.

Little more than one fourth (25.33%) paddy growers had knowledge about green leaf manuring crops while little more than one fifth (21.67%) had knowledge about recommended dose of green leaf manures and only 20.83 per cent paddy growers knew about time of application of green manuring crops. Also, the knowledge about meaning of Integrated Nutrient Management Practices was possessed by 15.83 per cent paddy growers.

The knowledge possessed by paddy growers about Integrated Nutrient Management Practices such as use of urea+DAP brickets, recommended dose of zinc sulphate and recommended dose of Gypsum was found to be (01.67%), (04.17%) and 02.50 per cent respectively. Very few paddy growers (02.50%), (01.67%), (04.17%) and 10.00 per cent had knowledge about INM practices such as application of BGA/Azolla, application of solid FeSO₄, application of Boron and seed treatment with bio-fertilizers respectively.

Table 2: Distribution of the respondents according to their level of knowledge.

Sr. No.	Knowledge	Respondents (n=120)	
		Frequency	Percentage
1.	Low	30	25.00
2.	Medium	73	60.83
3.	High	17	14.17
	Total	120	100.00

The data with regards to level of knowledge possessed by the paddy growers about recommended INM practices furnished in Table 2, it is indicates that higher proportion of paddy growers (60.83%), were in medium level of knowledge whereas 25.00 per cent paddy growers possessed low level of knowledge with regards to recommended integrated nutrient management practices. Only 14.17 per cent paddy growers possessed high level of knowledge.

These findings of the present study are in the line with Jayshree Umale (2010) ^[2], Sagane (2010) ^[4], Dhenge (2013) ^[1] and Shambharkar (2018) ^[5] who reported that, majority of respondents had medium level of knowledge.

Table 3: Distribution of the respondents according to their adoption of integrated nutrient management practices of paddy.

Sr. No.	Integrated Nutrient Management practices (INM)	Adoption		
		Complete	Partial	No adoption
		Frequency (n=120)		
1	Soil testing	24 (20.00%)	66 (55.00%)	30 (25.00%)
2	Recommended dose of FYM/ha in paddy crop. (10-12 t/ha)	51 (42.50%)	32 (26.67%)	37 (30.83%)
3	Time of application of FYM. (30-45 days before transplanting)	46 (38.33%)	28 (23.33%)	46 (38.33%)
4	Application of compost (10 t/ha)	12 (10.00%)	22 (18.33%)	86 (71.67%)
5	Time of application of compost (30-45 days before transplanting)	11 (09.16%)	12 (10.00%)	97 (80.83%)
6	Application green leaf manure @ 6.25 t/ha.	13 (10.83%)	13 (10.83%)	94 (78.33%)
7	Time of application of green leaf manure (At the time of puddling)	12 (10.00%)	13 (10.83%)	95 (79.17%)
8	Recommended dose of nitrogenous fertilizers for paddy crop. (100-120 kg)	71	30	19

		(59.16%)	(25.00%)	(15.83%)
9	Time of application of Nitrogenous fertilizers (50% @Basal dose+ 25% @Tillering stage+ 25% @Panicl emergence)	59 (49.16%)	30 (25.00%)	31 (25.83%)
10	Use of Urea+DAP brickets. (60% urea+40% DAP). @170 brickets/Ha. 5-6 cm below soil surface in between each square of plant.	01 (00.83%)	01 (00.83%)	118 (98.33%)
11	Recommended dose of Phosphatic fertilizers for paddy crop. (50 kg Phosphorus/ha.)	51 (42.50%)	44 (36.67%)	25 (20.83%)
12	Time of application of Phosphatic fertilizers. (At the time of puddling)	78 (65.00%)	10 (08.33%)	32 (26.67%)
13	Recommended dose of Potassium fertilizers for paddy crop. (50 kg Potassium/ha.)	49 (40.83%)	33 (27.50%)	38 (31.67%)
14	Time of application of Potassium fertilizers. (At the time of puddling)	68 (56.67%)	21 (17.50%)	31 (25.83%)
15	Recommended dose of zinc sulphate @ 10 kg/ha	02 (01.67%)	02 (01.67%)	116 (96.67%)
16	Application of 500 kg of gypsum/ha (as source of Ca and S nutrients) at last ploughing.	02 (01.67%)	01 (00.83%)	117 (97.50%)
17	Seed treatment with bio-fertilizers: Azotobacter/Azospirillum/Phospho-bacteria	01 (00.83%)	02 (01.67%)	117 (97.50%)
18	Application of BGA/Azolla after transplanting.	01 (00.83%)	02 (01.67%)	117 (97.50%)
19	Application of solid FeSO ₄ (30 kg Fe/ha) to overcome iron deficiency.	00 (00.00%)	01 (00.83%)	119 (97.50%)
20	Application of B in soluble forms (borax) for rapid treatment (0.5–3 kg B/ha) to overcome boron deficiency.	03 (02.50%)	02 (01.67%)	115 (97.50%)

(Figures in parenthesis indicates in percentage)

Distribution of the respondents according to their adoption of integrated nutrient management practices of paddy depicted in Table 16. It is apparent from Table 16, that most of the respondents (65.00%), (59.16%) and (56.67%) were in complete adoption of integrated nutrient management practices such as timely application of phosphatic fertilizers, use of recommended dose of nitrogenous fertilizers and timely application of potassium fertilizers. It was followed by the respondents (49.16%), (42.50%) and (42.50%) were in complete adoption of integrated nutrient management practices such as timely application of nitrogenous fertilizers, recommended dose of FYM/ha and recommended dose of phosphatic fertilizers respectively.

As regards to the practices such as, recommended dose of potassium fertilizers, timely application of FYM and soil testing were having complete adoption of (40.83%), (38.33%) and (20.00%) respectively. However meager percentage of paddy growers found to be adopting integrated nutrient practices such as application of compost (10.00%), timely application of compost (09.16%), application of green leaf manure per hectare (10.83%) and timely application of green leaf manure (10.00%) respectively. It was further followed by very few percentages of paddy growers who were found in complete adoption list of INM practices such as Use of Urea+DAP brickets (60% urea+40% DAP) @170 brickets/Ha. 5-6 cm below soil surface in between each square of plant (00.83%), recommended dose of zinc sulphate (01.67%), application of 500 kg gypsum/ha. (01.67%), seed treatment with bio-fertilizers (00.83%), Application with BGA/Azolla (00.83%) and application of Boron (02.50%) respectively.

However, it is observed that nearly 55.00 per cent of the paddy growers were in partial adoption of soil testing. Besides that, less percentage of paddy growers were found to be having partial adoption of integrated nutrient management practices such as recommended dose of FYM/ha in paddy crop (26.67%), time of application of FYM (23.33%), Application of compost (18.33%), recommended dose of nitrogenous fertilizers for paddy crop (25.00%), time of

application of Nitrogenous fertilizers (25.00%), recommended dose of Phosphatic fertilizers for paddy crop (36.67%), recommended dose of potassium fertilizers for paddy crop (27.50%), time of application of Potassium fertilizers (17.50%) respectively. It is also found that, majority of the paddy growers have not adopted following integrated nutrient management practices such as recommended dose of zinc sulphate (96.67%), application of 500 kg of gypsum/ha (95.00%), seed treatment with bio-fertilizers (97.50%), application of BGA/Azolla (97.50%), application of solid FeSO₄ (99.17%), and application of Boron (95.83%) respectively.

Table 4: Distribution of the respondents according to their level of adoption.

Sr. No.	Adoption levels	Respondents (n=120)	
		Frequency	Percentage
1.	Low	57	47.50
2.	Medium	54	45.00
3.	High	09	07.50
	Total	120	100.00

The data with regards to level of adoption of integrated nutrient management practices by paddy growers furnished in Table 4, indicates that, relatively higher proportion of paddy growers (47.50%) were in low adoption level whereas 45.00 percent paddy growers were in medium level of adoption of integrated nutrient management practices. Only 07.50 per cent paddy growers were in high level of adoption of integrated nutrient management practices.

Thus, it could be inferred that, majority of the paddy growers had low level of adoption of integrated nutrient management practices.

These findings in accordance with the findings of Meshram (2008) [3] who reported that majority of paddy growers had low adoption of paddy practices.

Conclusion

The findings of the study revealed that, the paddy growers

(60.83%) were observed in medium level of knowledge about Integrated Nutrient Management practices, whereas most of the respondents (47.50%) were having low level of adoption. Therefore, it is implicated that, Department of Agriculture with collaboration of Agricultural University paddy scientists and 'paddy seed companies' personnel should organize awareness or training programme for the paddy growers about Integrated Nutrient Management practices of paddy.

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