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Productivity and Profitability of Wheat (*Triticum aestivum* L.) as Influenced by Planting Methods and Nutrient Resources under Eastern Uttar Pradesh

Shailendra Kumar Singh[1], P. J. George[1], Amitesh Kumar Singh[2*], Dinesh Kumar[3] and Amit Kumar Singh[4]

[1]*Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj, U.P., India*
[2]*Agronomy, GVT- Krishi Vigyan Kendra, Godda, Jharkhand, India*
[3]*Department of Agronomy, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, U.P., India*
[4]*Udai Pratap (Autonomous) College, Varanasi, U.P., India*

**Corresponding author*

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A field experiment conducted during 2014-15 and 2015-16 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj (U.P.); to evaluate the productivity and profitability of wheat as influenced by planting methods and nutrient resources eastern Uttar Pradesh. Data revealed that planting methods; system of wheat intensification (SWI) found significantly higher plant height, plant dry weight, leaf area index, grains/spike, 1000-grain weight, grain yield, straw yield and economics of wheat over to FIRBS and conventional method of planting. Application of nutrient sources viz. 75% inorganic fertilizers and 25% vermicompost was recorded maximum plant height, plant dry weight, leaf area index, grains/spike, 1000-grain weight, grain yield, straw yield and economics over to 100% inorganic fertilizers, 50% inorganic fertilizers and 50% vermicompost, 25% inorganic fertilizers and 75% vermicompost and 100% vermicompost.

Introduction

Wheat (*Triticum aestivum* L.) is one of the most important cereal crops of the world after rice. It is eaten in various forms by more than one billion people in the world. Wheat straw is a good source of feed for a large population of the cattle in India. It ranks second in the world among the cereals both in the respect of acreage (231.0 m ha) and production (727.9 metric tonnes) (MOA & FW, GOI 2015- 16). India is the second largest producer of wheat in the world. It is a pre-dominant winter season crop and during 2018-19, production in India was 101.2 million tonnes from an area of 29.6 million ha with a productivity of 3.4 tonnes/ha (ICAR- IIWBR, 2018- 19).

Uttar Pradesh ranks first in respect of wheat crop coverage area (9.6 million ha) and production (30.0 million tonnes) but average productivity is low (3.1 tonnes/ha) (FAO, 2014–15).

Integrated nutrient management plays a key role in maximizing the wheat productivity (Trapathi *et al.,* 2016). The most significant results are obtained, when we use organic manures in the combination of inorganic fertilizers (Patra *et al.,* 1999). Planting of crop on raised beds, usually 70 to 90 cm wide, with 2-3 rows on top of each bed, the furrows between the beds are used for irrigation water application. With this system, the emerging wheat plant form a solid stand in the space between the irrigation furrows. This system does allow the use of furrow for irrigation, which provides better water management and reduce seed rate than the conventional flat bed planting (Jat *et. al.,* 2005). Integrated nutrient management along with modified land configuration technologies like furrow irrigated raised bed (FIRB) planting could help in mitigating the problem to some extent. Since variation in planting pattern modifies macro and micro-environment to which plants are exposed FIRB planting have the potential to improve the productivity of wheat.

During the past two decades, productivity gains from the prevailing wheat technologies with their heavy input-dependence have unfortunately been decreasing. Wheat yield gains have slowed to only 1.1% per annum in India (Suryvanshi *et al.,* 2013). Diminishing returns suggest that some new directions are needed so that wheat production in India can meet the future food demands of an ever-growing population in a sustainable manner. Farmers already encounter multiple constraints of water supply, declining soil quality, and rising costs of agro-inputs. The impact of these factors is compounded by the pressures and hazards of climate change. Under the circumstances, alternative methods of crop establishment and management that could cope with these conditions – giving higher yield at less cost, with less water requirements, and with more resilience to climatic stresses – are desirable and should be evaluated. Such benefits have been reported with a methodology for wheat production that derives from a methodology what is known as the System of Rice Intensification (SRI) (Stoop *et al.,* 2002). The extrapolated methodology of System of Wheat Intensification (SWI) warrants investigation to see to what extent the reports of its advantages – agronomic, economic, social, and environmental – can be validated under experimental conditions. The experience of farmers in Bihar and some other states of India who have undertaken SWI crop management suggests that it over opportunities for higher production per unit of inputs, such as seeds, water, fertilizer, land, labor, and capital (Abraham *et al.,* 2014). But there has been no systematic scientific evaluation of SWI with appropriate controls and replications. The principles of SRI, which include early and healthy plant establishment with either direct seeding or transplanting, reducing competition among crop plants through wider spacing, careful application of water to maintain moist aerobic soil conditions, increasing soil organic matter, and active soil aeration to promote the growth of roots and beneficial soil organisms, have been shown to increase the productivity of a number of crops (Dhar *et al.,* 2016). In India and Ethiopia, changes in the management for a variety of crops are improving food security and are being scaled up with several hundred thousand households now producing wheat, finger millet, mustard, legumes, and other crops with alternative methods (Behera *et al.,* 2007). Production strategies for SRI when applied to wheat (SWI) have often been considered as labor-intensive for widespread adoption. But resource-poor farmers who can achieve more yields from their small landholdings find that the additional effort and care in crop management with these alternative agronomic systems is compensated for by higher net returns and improvements in food security. Moreover, the concepts and principles of SRI and SWI are amenable to a considerable degree of mechanization, as demonstrated in Pakistan Punjab (Sharif, 2014). SWI plants are reported by farmers to be more robust, more resistant to pests and diseases, and more tolerant of adverse climatic conditions like drought and hail storm, which are increasingly important considerations. Researchers in a number of countries have contributed to a scientific understanding of the factors involved in SRI management for rice, for example, Zhao *et al.,* (2009) and Thakur *et al.,* (2010, 2011). But thus far, there has been no rigorous evaluation of SWI methods applied to wheat, a crop of worldwide importance and of great significance in India. This prompted a 2-year, on-station experiment using standard methods of agronomic evaluation conducted at the Indian Agricultural Research Institute (IARI) in New Delhi. This study compared the performance of standard recommended practices (SRP) currently recommended by Indian wheat scientists with the methods of SWI management for growing a widely planted improved variety of wheat. Because SWI is an innovation of recent origin, the literature that can be cited on it is unfortunately sparse. However, this made a proper empirical evaluation all the more important to conduct and report, since if there would be positive results, these should encourage further research and the build-up of a substantial literature on SWI.

Materials and Methods

Experimental details

Field experiments were conducted during winter seasons of the 2014-15 and 2015-16 at the research farm of Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj (U.P.) located at 25^0 24' 42" N latitude and …81^0 50' 56" E longitude, and 98 m above mean sea level (MSL). The experimental site was generally sandy loam in texture (61.5% sand, 17.8% silt, and 20.7% clay), slightly alkaline in reaction (pH 7.60), with an electrical conductivity value of 0.24 dS m^{-1}. The soil was low in organic carbon (0.38%), nitrogen (182.4 kg ha^{-1} and 185.6 kg ha^{-1}), medium in phosphorous (11.8 kg ha^{-1} and 12.4 kg ha^{-1}), and fairly high in ammonium acetate extractable potassium (163.3 kg ha^{-1} and 165.0 kg ha^{-1}).

Three cultivation methods in main plot and five nutrient management practices in sub plot treatments were tested in a split plot design, with three replications. Cultivation methods are namely system of wheat intensification (SWI); furrow-irrigated raised bed system (FIRBS); and conventional method (CM) with direct-seeded crop establishment planted with spacing 20 × 20 cm, having just 25 plants m^{-2}. In the planned set of experiments, FIRBS was included for comparison with SWI because it conserves seed, water, and nutrients while having comparable yield with conventional method. In this system, three rows of wheat are sown on raised beds of 55 cm width and 15 cm height. A furrow of 30 cm was prepared between the beds for irrigation. Nutrient management practices are 100% RDN through inorganic fertilizer; 75% RDN + 25% RDN through Vermicompost; 50% RDN + 50% RDN through Vermicompost; 25% RDN +75% RDN through Vermicompost; 100%RDN through Vermicompost. The plot sizes were all 4m×5m (20 m^2). The SHUATS improved variety of wheat ‘AAI-4’ was sown on 15 and 17 November, during the 2014 and 2015 and harvested on 19 and 21 March during the 2015 and 2016 seasons, respectively. During the 2014-15 crop season, 40.8 mm of rainfall was received, while in 2015-16 an unusually high rainfall of 176.3 mm was recorded.

Statistical tools and techniques

Data were subjected to analysis of variance (ANOVA). A combined ANOVA over two growing seasons was performed for growth, yield and different indices. The ANOVA was performed using a split plot design with 15 treatments and replicated three times. Treatment mean differences were separated and tested by Fisher's protected least significant difference (LSD) at a significance level of p = 0.05. The values are reported as means of the two growing seasons (Cochran and Cox, 1957).

Results and Discussion

Growth and yield attributes

System of wheat intensification (SWI) found significantly higher growth *viz.* plant height, leaf area index and plant dry matter accumulation, yield attributes *viz.* grains/spike and 1000-grain weight of wheat over to FRIBS and conventional method of planting during both the year of experimentation.

The higher yield attributes of SWI planting may be ascribed to higher dry matter production and translocation and the conversion of photosynthates in to reproductive parts. Fine tilth and better aeration causing less penetration impedance was responsible for better root development there by producing higher yield attributes. Similar beneficial effect of bed planting on yield attributes of wheat has been reported by Jani *et al.,* (2008).

Application of nutrient sources viz. 75% inorganic fertilizers and 25% vermicompost was recorded maximum growth *viz.* plant height, leaf area index and plant dry matter accumulation, yield attributes *viz.* grains/spike and 1000-grain weight over to 100% inorganic fertilizers, 50% inorganic fertilizers and 50% vermicompost, 25% inorganic fertilizers and 75% vermicompost and 100% vermicompost during both the year of experimentation. It thus indicated that combined use of organic manure (vermicompost) and fertilizer was more useful than chemical fertilizers alone, particulately with respect to tillers/m^2 in wheat. Our finding confirm the results of Singh *et al.*, (2013). In SWI number of tillers per plant is found 4-5 times more than conventional methods as well as higher test weight were recorded respectively. This may be due to wider spacing and proper aeration under SWI. Higher effective tillers grains per spike and 1000 grain weight of wheat were observed in SWI over conventional method. Thus, it evident that combined use of RDN and vermicompost favored better plant growth parameters, which eventually reflected in improved values of yield attributes in our study. Our results confirm the findings of Rathor and Sharma (2010).

Grain, straw yield (kg/ha) and harvest index (%)

Effect of planting method viz., system of wheat intensification (SWI) found significantly grain yield (4784 and 5076 kg/ha) of wheat over to FIRBS (4640 and 4924 kg/ha) and conventional method (4270 and 4531 kg/ha) of planting during both the year of experimentation.

The increase in grain yield of wheat under SWI could be attributed to higher yield attributes whereas, the increase in biological yield was due to higher plant height, dry matter accumulation. Similar results were also reported by Sagar and Naresh (2019).

Table.1 Effect of planting methods and nutrient resources of growth and yield attributes of wheat

Treatment	Plant height (cm)		Dry weight (g/hill)		LAI at 80 DAS		Grains/spike		Test weight (g)	
	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
Planting method										
System of Wheat Intensification	94.9	99.3	71.8	74.8	2.4	2.5	42.5	45.6	41.1	41.6
Furrow Irrigation Raised Bed System	92.1	95.9	69.8	72.8	2.1	2.3	41.3	44.5	40.0	40.5
Conventional Method	84.9	89.5	65.4	68.2	1.9	2.0	38.0	41.2	37.2	37.6
SEm±	1.8	1.9	0.9	1.0	0.07	0.08	0.4	0.53	0.46	0.47
C.D.(P=0.05)	7.2	7.4	3.5	3.8	0.28	0.32	1.7	2.10	1.79	1.86
Nutrient sources										
100% RDN through inorganic fertilizer	99.8	104.4	77.4	80.7	2.6	2.7	45.7	48.8	44.0	44.5
75% RDN + 25% RDN through Vermicompost	101.5	105.9	78.3	81.6	2.6	2.8	46.6	49.7	44.8	45.3
50% RDN + 50%RDN through Vermicompost	90.2	94.1	69.3	72.3	2.0	2.2	40.9	44.0	39.6	40.0
25% RDN +75% RDN through Vermicompost	85.1	88.8	62.3	65.0	1.8	1.9	36.5	39.6	35.6	36.0
100%RDN through Vermicompost	76.5	81.4	57.6	60.1	1.6	1.7	33.3	36.4	33.2	33.6
SEm±	1.7	1.8	0.9	0.9	0.07	0.07	0.4	0.50	0.45	0.48
C.D.(P=0.05)	5.1	5.2	2.6	2.7	0.21	0.22	1.40	1.46	1.32	1.41

Table.2 Effect of planting methods and nutrient resources of grain yield, straw yield and harvest index of wheat

Treatment	Grain yield (kg/ha)		Straw yield (kg/ha)		Harvest index (%)		Production efficiency (kg/day/ha)	
	2014-15	2015-16	2014-15	2014-15	2014-15	2015-16	2014-15	2015-16
Planting method								
System of Wheat Intensification	4784	5076	7177	7379	39.97	40.77	38.3	40.6
Furrow Irrigation Raised Bed System	4640	4924	6985	7165	39.91	40.75	37.1	39.4
Conventional Method	4270	4531	6510	6740	39.56	40.14	34.2	36.2
SEm±	32	34	47	55	0.19	0.11	0.25	0.27
C.D.(P=0.05)	125	133	186	217	0.74	0.43	1.00	1.06
Nutrient sources								
100% RDN through inorganic fertilizer	5165	5481	7739	8016	40.02	40.62	41.3	43.8
75% RDN + 25% RDN through Vermicompost	5234	5554	7828	8100	40.06	40.68	41.9	44.4
50% RDN + 50%RDN through Vermicompost	4587	4868	6933	7146	39.83	40.51	36.7	38.9
25% RDN +75% RDN through Vermicompost	4098	4349	6233	6386	39.66	40.50	32.8	34.8
100%RDN through Vermicompost	3737	3966	5719	5826	39.51	40.47	29.9	31.7
SEm±	30	32	47	56	0.23	0.15	0.24	0.26
C.D.(P=0.05)	88	94	137	163	0.67	0.44	0.71	0.75

Table.3 Effect of planting methods and nutrient resources of economics

Treatment	Cost of cultivation (Rs./ha)	Gross return (Rs./ha)		Net return (Rs./ha)		B: C Ratio		Economic efficiency (Rs./day/ha)	
		2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
Planting method									
System of Wheat Intensification	50682	138737	145330	88055	94648	1.76	1.89	704	757
Furrow Irrigation Raised Bed System	52132	134756	141024	82624	88892	1.60	1.73	661	711
Conventional Method	52507	124665	130952	72158	78445	1.39	1.51	577	628
SEm±	0.016	806	983	806	983	0.015	0.018	6.44	7.86
C.D.(P=0.05)	0.063	3163	3859	3163	3859	0.059	0.071	25.30	30.88
Nutrient sources									
100% RDN through inorganic fertilizer	48272	149718	157305	101446	109033	2.10	2.26	812	872
75% RDN + 25% RDN through Vermicompost	50023	151602	159225	101579	109202	2.03	2.19	813	874
50% RDN + 50%RDN through Vermicompost	51774	133451	139928	81678	88154	1.58	1.70	653	705
25% RDN +75% RDN through Vermicompost	53525	119540	125022	66016	71497	1.23	1.34	528	572
100%RDN through Vermicompost	55276	109286	114030	54010	58755	0.98	1.06	432	470
SEm±	0.021	703	924	703	924	0.013	0.018	5.62	7.39
C.D.(P=0.05)	0.061	2051	2696	2051	2696	0.038	0.051	16.41	21.56

Application of nutrient sources viz. 75% inorganic fertilizers and 25% vermicompost was recorded maximum grain yield (5234 and 5554 kg/ha) over to 100% inorganic fertilizers (5165 and 5481 kg/ha), 50% inorganic fertilizers and 50% vermicompost (4587 and 4648 kg/ha.), 25% inorganic fertilizers and 75% vermicompost (4049 and 4480 kg/ha) and 100% vermicompost (3737 and 3966 kg/ha) during both the years.

Effect of planting method viz., system of wheat intensification (SWI) found significantly straw yield of wheat over to FIRBS and conventional method of planting during both the year of experimentation. Application of nutrient sources viz. 75% inorganic fertilizers and 25% vermicompost was recorded maximum straw yield over to 100% inorganic fertilizers, 50% inorganic fertilizers and 50% vermicompost, 25% inorganic fertilizers and 75% vermicompost and 100% vermicompost during both the year of experimentation. Effect of planting method viz., system of wheat intensification (SWI) found significantly harvest index of wheat over to FIRBS and conventional method of planting during both the year of experimentation. Application of nutrient sources viz. 75% inorganic fertilizers and 25% vermicompost was recorded maximum harvest index over to 100% inorganic fertilizers, 50% inorganic fertilizers and 50% vermicompost, 25% inorganic fertilizers and 75% vermicompost and 100% vermicompost during both the year of experimentation. Abraham *et al.,* (2014) reported an increase of 18-67% grain and 9-27% straw yield of wheat at farmer field in SWI as compare to broadcast method. The results of experiments represent that SWI methods are superior than conventional line sowing of wheat with improved recommended practices and far superior to usual farmers practice. The total amount of irrigation water used in conventional line sowing of wheat was 60mm more than SWI method. It was due to higher irrigation depth. Summarized the results from wheat sown under SWI in farmers field reported that a 30% water saving is observed in SWI in comparison with conventional method of sowing.

Effect of planting method (Table 2) viz., system of wheat intensification (SWI) found significantly production efficiency of wheat over to FIRBS and conventional method of planting during both the year of experimentation. Application of nutrient sources viz. 75% inorganic fertilizers and 25% vermicompost was recorded maximum production efficiency over to 100% inorganic fertilizers, 50% inorganic fertilizers and 50% vermicompost, 25% inorganic fertilizers and 75% vermicompost and 100% vermicompost during both the years. Overall, combined application of RDN and organic manure like vermicompost helped wheat crop better in enhancing the grain yield and harvest index over sole application of chemical fertilizers (RDN). Shah and Ahmad (2006), and Singh *et al.,* (2012).

Economics

Data showed on table 3 effect of planting method viz., system of wheat intensification (SWI) found significantly gross return, net return and B: C ratio of wheat over to FRIBS method and conventional method of planting during both the year of experimentation. Effect of nutrient sources viz. 75% inorganic fertilizers and 25% vermicompost was recorded maximum gross return, net return and B: C ratio over to 100% inorganic fertilizers, 50% inorganic fertilizers and 50% vermicompost, 25% inorganic fertilizers and 75% vermicompost and 100% vermicompost during both the years. Even application of organic manure (vermicompost) with RDN proved much better over RDN alone, particularly with respect to the gross income, net income and benefit: cost ratio. Yadav and Kumar (2009) also reported similar results.

Effect of planting method significantly highest economic efficiency in SWI over FRIBS method; conventional method and nutrient sources viz. 75% inorganic fertilizers and 25% vermicompost was recorded maximum economic efficiency over to 100% inorganic fertilizers, 50% inorganic fertilizers and 50% vermicompost, 25% inorganic fertilizers and 75% vermicompost and 100% vermicompost during both the years.

It can be thus concluded that System of wheat intensification (SWI) proved more productive and remunerative and could be recommended for maximum profit under Eastern Uttar Pradesh. Combined application of recommended dose of fertilizer (RDN) along with vermicompost in wheat was better option over RDN alone. Furthermore, considering the economics of different nutrient sources, application of 75% RDN + 25% RDN vermicompost was the best option for wheat cultivation.

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References

Abraham B., Araya H., Berhe T., Edwards S., Gijja B., Khadka R.B., Koma Y.S., Sen D., Sharif A., Styger F., Uphhoff N. and Verma A. 2014. The system of crop intensification reports from the field on improving agricultural production, food security and resilience to climate change for multiple crops. *Agriculture and food security*, 3(4): 1-12.

Anonymous, 2018. Ministry of Agriculture and Farmers Welfare, Government of India [Internet].https://eands.dacnet.nic.in/Advance_Estimate/4th_Adv_Estimates2017-18_Eng pdf [Accessed: 25 December 2018].

Behera U.K., Sharma A.R. and Pandey H.N. 2007. Sustaining productivity of wheat–soybean cropping system through integrated nutrient management practices on the Vertisols of central India. *Plant Soil*, 97:185–199.

Cochran WG, Cox GM. 1957. Experimental designs. 2nd ed. New York: Wiley publication.

Dhar S., Barah B.C., Vyas A.K. and Uphoff N. 2016. Comparing system of wheat intensification with standard recommended practices in northwestern plain zone of India, *Archives of Agronomy and Soil Science*, 62(7): 994-1006.

Jani P.P., Tanwar S.P.S. and Singh S.M. 2008. Performance of durum wheat (*Triticum durum*) varieties under varying sowing methods and input levels. *Indian Journals of Fertilizers* 4(7): 71-73.

Jat M.L., Samar Singh, Rai H.K., Chhokar R.S., Sharma S.K. and Gupta R.K. 2005. Furrow Irrigated Raised Bed (FIRB) Planting Technique for Diversification of Rice- Wheat System in Indo-Gangetic Plains. *Japan Association for International Collaboration of Agriculture and Forestry* 28(1): 25-42

Patra A., Panda D., Patra B.C. and Karnatar A.J. 1999. Effect of FYM, zinc and NPK fertilizer on yield component and yield of wheat after winter rice in West Bengal. *Journal of Inter academicia*: 1–6.

Rathor, S.A. and Sharma, N.L. 2010. Effect of integrated nutrient management on productivity and nutrient uptake in wheat and soil fertility. *Asian Journal of Soil Science* 4(2): 208– 210.

Sagar V.K. and Naresh R.K. 2019. Effect of crop-establishment methods and irrigation schedules on growth and yield of wheat (*Triticum aestivum* L.). *Indian Journal of Agronomy* 64: 210–217.

Shah, Z. and Ahmad, M.I. 2006. Effect of integrated use of farm yard manure and urea on yield and nitrogen uptake of wheat. *Journal of Agricultural and Biological Science* 1(10): 60– 65.

Sharif A. Styger F. Uphhoff N. and Verma A. 2014. The system of crop intensification reports from the field on improving agricultural production, food security and resilience to climate change for multiple crops. *Agriculture and food security*, 3(4): 1-12.

Sharma I, Sendhil R, Chatrath R. 2014. Deciphering the role of wheat production and protection technologies for food and nutrition security. 53rd All India Wheat & Barley Research Workers' meet and International Seminar on Enhancing Wheat & Barley Production with special emphasis on Nutritional Security, Jawaharlal Nehru Krishi Vishwa Vidyalaya (JNKVV), Jabalpur (M.P.)

Sharma I., Sendhil R. 2015. Domestic production scenario of wheat. In: Souvenir of Roller Flour Millers Federation of India Platinum Jubilee Celebration pp. 18-20.

Sharma I., Sendhil R. 2016. Wheat Production in India—A Decadal Synopsis [Internet]. Available from: http://www.FnBnews.com

Sharma I., Sendhil R., and Chatrath R. 2015. Regional disparity and distribution gains in wheat production. In: Souvenir of 54th AIW&B Workers Meet, Sardarkrushinagar Dantiwada Agricultural University, Gujarat.

Singh, J.P., Kaur, J., Mehta, D.S. and Narwal, R.P. 2012. Long-term effect of nutrient management on soil health and crop productivity under rice–wheat cropping system. *Indian Journal of Fertilisers* 8(8): 28–48.

Singh, V., Singh, S.R., Singh, S. and Shivay, Y.S. 2013. Growth, yield and nutrient uptake by wheat (*Triticum aestivum* L.) as effected by bio fertilizers, FYM and nitrogen. *Indian Journal of Agricultural Sciences* 83(3): 110–111.

Stoop W.A., Uphoff Norman and Kassam Amir. 2002. A review of agricultural research issues raised by the system of rice intensification (SRI) from Madagascar: opportunities for improving farming systems for resource-poor farmers. *Agricultural Systems*, 71: 249–274.

Suryawanshi P.K., Patel J.B. and Kumbhar N.M. 2013. Yield and economics of wheat (*Triticum aestivum* L.) influence by SWI techniques with varying nitrogen levels. *International Journal of Agricultural Sciences*, 9(1):305-308

Thakur A.K., Rath S., Patil D.U. and Kumar A. 2011. Effects on rice plant morphology and physiology of water and associated management practices of the system of rice intensification and their implications for crop performance. Paddy Water Environ 9:13–24

Thakur A.K., Rath S., Roychowdhury S. and Uphoff N. 2010. Comparative performance of rice with system of rice intensification (SRI) and conventional management using different plant spacings. J Agron Crop Sci 196:146–159

Tripathi, S.C., Chander, Subhash and Meena, Raj Pal. 2016. Maximizing wheat yield through integrated use of farmyard manure and fertilizers. *SAARC Journal of Agriculture* 14(1): 103–110.

Verma V.K., Chaudhry S., Singh V., Gupta S.K. and Harvansh, K. 2014. Effect of integrated soil fertility management practices on production and productivity of wheat in alluvial soils of Central Plain Zone of U.P. *International Journal of Agricultural Science* 10(2): 735–738.

Yadav D.S. and Kumar A. 2009. Long-term effect of nutrient management on soil health and productivity of rice–wheat system. *Indian Journal of Agronomy* 54(1): 15–23.

Zhao L.M., Wu L.H., Li Y.S., Lu X.H., Zhu D.F. and Uphoff N. 2009. Influence of the system of rice intensification on rice yield and nitrogen and water use efficiency with different N application rates. Exp. Agric. 45:275–286

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