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Extent of Adoption of Wheat Production Technology in Eastern Plain Zone, Uttar Pradesh

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Abstract

Wheat is a cereal crop which is being cultivated globally. It is the second important food crop grown next to rice. The state of Uttar Pradesh is leading in wheat production which is the resultant of better availability of technology options as well as adoption of recommended production technology by the farmers. However, the Eastern plain zone suffered with low productivity features in comparison to other zones. Therefore, a research study was conducted in the Eastern plain zone of Uttar Pradesh to evaluate the coverage of adoption of recommended wheat production technology among the practicing farmers. The study included multistage sampling. Out of total thirteen wheat growing districts under the Eastern plain zone of Uttar Pradesh, two districts viz., Azamgarh and Jaunpur districts were randomly selected. From each of the selected districts two community blocks were randomly selected. From each of these blocks three villages were randomly selected. Further, 12 farmers were randomly selected from each of the twelve (12) selected villages so as to constitute a sample size of 144 wheat growing farmers for the present study. Data were collected through pre-tested structured schedule by conducting personal interview. Findings revealed that majority of farmers had medium level adoption with respect to the overall wheat production technology. Most of the farmers didn't adopt the recommended practices with respect to recommended varieties, soil and fertility management, seed selection and treatment, sowing methods, water as well as pest and disease management. Independent variables viz., age, family size, size of land holding, annual income, and extension contact and experience in wheat cultivation had positive and significant association with the adoption level of the respondents. Study recommended to organized need based training in specific areas of low adoption in order to motivate the farmers for adopting the latest technical knowledge and skills so that they are able to get higher levels of productivity and profitability.

Keywords:Extent of adoption, wheat technology, U.P.

Extent of Adoption of Wheat Production Technology in Eastern Plain Zone, Uttar Pradesh

Wheat is a cereal grain which is a cultivated worldwide as a staple food. The total area under wheat cultivation globally accounted for 220 million hectares in 2017-18 with a record production of 763.06 million tons of grain. The statistical data reveals that maximum area under wheat lies in India with 29.58 million ha (14%), followed by Russia 27.34 million ha (12.43%), China 24.51 million ha (11.14%) and the USA 15.19 (6.90%). About 45 percent area of wheat crop are covered by countries such as China, USA, Canada, Ukraine and Pakistan. China is leading in production of wheat with 136 million tons, followed by India (99.70 million tons), Russia (84.99 million tons) and the USA (47.35 million tons). China, India, Russia, the USA, Canada, Ukraine and Pakistan together accounted for producing 449 million tons (58%) of wheat at global level. The average yield per hectare is maximum in New Zealand (10 tones/ha), followed by Zambia (7 tones/ha) and Mexico (6 tones/ha). However, the average wheat yield in major wheat-growing countries is significantly low, and only China has maximum yield (5.48 tones/ha) followed by Ukraine (4.06 tones/ha), India (3.37 tones/ha) and the USA (3.12 tones/ha) as reported by Sendhilet al.(2018).

In India, it is the second important food crop grown next to rice. The wheat crop play a key role in human diet across the Worldwide due to chief source of higher protein content. It can be cultivate in every geographical condition. Various wheat products are widely popular globally. Apart from protein content it also contain chief source of fiber, vitamin and carbohydrates.

Materials and Methods

The present research was conducted in the Eastern Plain Zone of Uttar Pradesh to evaluate the adoption on recommended wheat production technology among the cultivating farmers. This zone was selected for the study as it accounted for low productivity of wheat than other wheat growing zones in the state of Uttar Pradesh (India). The state occupies an important place in the polity and economy of India. The economy of U.P is predominately agrarian. Out of thirteen districts in this zone, two districts viz., Azamgarh and Jaunpur were randomly selected for present study. From each of the selected districts two community blocks were randomly selected and further three villages were randomly selected from each of these selected blocks. From each of the selected villages 12 farmers were randomly selected so as to constitute a sample size of 144 wheat growing farmers for the present study. Data were collected through a pre-tested structured schedule by conducting personal interview. Primary data were analyzed using SYSTAT 12 software.

‘Adoption’ was referred to the body of information understood and retained by the respondents about wheat cultivation package and practices recommended by state Agriculture department of Uttar Pradesh. It was measured by calculating ‘Adoption Index’.

$$\text{Adoption Index} = \left(\frac{\text{Total score obtained}}{\text{Maximum possible score}} \right) \times 100$$

Result and Discussion

Adoption of recommended wheat production technology

Table 1 revealed that majority (79.861%) of the respondents possessed medium level of technology adoption followed by high level (15.973%) and low (4.166%) level of adoption respectively. This is also justified by the findings of Islam et al. (2011) who reported that majority of the farmers (69.10 %) had medium level of adoption.

Dimension of wheat production technology adoption among the farmers

Land preparation

Table 2 depicted the adoption level of recommended wheat production technology under land preparation. Majority (34.722%) of the respondents fully adopted the use of rootavator during field preparation. 31.944 percent of them did not use rootavator during the field preparation. It was found that majority (59.027%) did not use urea for decomposing stunts whereas 27.084 per cent and 13.889 per cent of the respondents partially adopted the use of urea for decomposing stunts. In case of every pulverized soil, majority (38.888%) of them fully adopted the practice while 36.112 per cent partially adopted it and 25 per cent of them did not adopt the practice.

Suitable soil

Majority (42.362%) of the respondents partially adopted the required soil parameters followed by 37.5 per cent of the respondents didn't not adopt and 20.138 per cent fully adopting it. Further 40.972 per cent fully cultivated wheat in loam soil followed by (34.723) per cent of

them partially cultivating in loam soil and 24.305 per cent of them did not adopt the relevant practice of wheat cultivation in loam soil.

Varieties

37.5 per cent of the respondents fully adopted PBW-343 variety of wheat, 18.056 per cent partially adopted this variety while 44.444 per cent of them did not adopt this variety at all. It was found that majority (87.5%) of the respondents did not use PBW-443 variety while only 7.638 per cent and 4.862 per cent of the respondents partially and fully adopted this variety respectively. Majority (90.278%) of the respondents did not adopt UP-2338 variety while only 5.556 per cent and 4.166 per cent of the respondents partially and fully adopted this variety. It was also noted that 88.888 per cent of the respondents did not adopt K-0307 variety followed by 11.12 per cent of them who partially adopted and none of the respondents fully adopted this variety.

Healthy seed selection

Majority of the respondents (95.833%) did not adopt healthy seed selection method while only 3.4730 per cent and 0.694 per cent of them partially and fully adopted. For embryos culture method 88.195 per cent respondents didn't adopt it followed by the partial adopter (9.027 %) and full adopters (2.778 %).

Seed treatment

For loose smut of wheat and other soil borndiseases, control measure were not adoptedby (94.445) percent of them followed by the partial adopters (4.167) percent and full adopters

(1.388) percent. In case of wet method 86.805 percent respondents didn't not adopt it followed by 12.5 percent and full adopters were only 0.694 percent.

Sowing time

In case of timely sowing majority of the respondents was partial adopters (47.916%) followed by the full adopters (40.972 percent) and 11.112 per cent were non-adopters.

Seed rate

In case of following recommended seed rate majority of respondents were partial adopters (50%) followed by the full adopters (41.666) percent and (8.334) percent respondents were non-adopters.

Soil treatment

In case of following recommended soil treatment, majority of respondents were non-adopters (83.333%) followed by the partial adopters (15.279) per cent and (1.388) percent were full adopters.

Sowing method

In case of following broadcasting method of sowing, it was fully adopted by majority (59.722) percent followed by non-adopters (25.694) percent and partial adopters (14.584) per cent; sowing on the ridge (bed planting) non-adopters (94.444) percent followed by the partial adopters (4.862) percent and full adopters (0.694) percent; in seed drilling method majority were non-adopters (95.138) percent followed by the partial adopters (4.168) percent and full adopters (0.694) per cent; in case ferti-seed drill method majority were non-adopters (84.722%) followed

by the partial adopters (12.5) percent and full adopters (2.778) percent., in zero tillage method majority of the respondents were non-adopters (86.806) percent followed by 9.028 percent and full adopters (3.472) per cent; in case of sowing in furrow behind the plough majority (90.972%) were non-adopters followed by partial adopters (9.028) percent. None of the respondents fully adopted this practice.

Spacing

93.75 per cent didn't adopt recommended spacing for normal time of sowing, only partial adopters (4.862) percent and full adopters (1.388) percent. In case of late sowing, majority didn't adopt (90.973) percent followed by partial adopters (8.333) percent and full adopters (0.694) percent.

Plant population

In case of maintaining recommended plant population /acre of wheat plant, majority (95.834%) didn't adopt followed by partial adopters (4.166 percent) with no full adopters.

Weeding

In case of the weeding for controlling *Phalaris* minor and *Avena fatua* using *isoproturon*, majority did not adopt (75.694%) followed by partial adopters (11.806) percent and full adopters (12.5) percent.

Fertilizers and Manures

Recommended doses of NPK was partially adopted by 57.638 per cent of respondents, followed non-adopters (36.112) percent and only 6.25 per cent full adopted.

Irrigation and water management

In case of the flooding as irrigation method majority (37.5%) were full adopters followed by the non-adopters (35.416) percent and partial adopters (27.084) per cent; in border irrigation full adopters (53.473) percent followed by non-adopters (25.694) percent and partial adopters (20.833) percent.

Water needs during critical stages

For wheat crops water is very important during critical stages. First stage of water needs was C.R.I with majority of full adopters (67.362) percent followed by the partial adopters (30.555) percent and non-adopters (2.083) per cent, second stage was tillering stage where majority were full adopters (66.668) percent followed by the partial adopters (31.944) per cent and non-adopters (1.388) percent, third stage was joint stage where majority were full adopters (47.916) percent followed by the partial adopters (36.111) percent and non-adopters (15.973%).

Insect pest and disease management

In case of disease and pest management about termite control from chlorpyrifos, majority of them were non-adopters (81.25) percent followed by the partial adopters (16.667) percent and full adopters (2.083) per cent. Aphids control from 'thiomethon' majority were non-adopters (81.25) percent followed by the (15.278) percent as partial adopters and full adopters (3.472) per cent. Rust disease control from Zineb or Dithane M-45, majority were non-adopters (83.333) per cent followed by partial adopters (15.973) percent and full adopters (0.694) percent.

Harvesting time, method & handling

Majority (59.723) percent were full adopters for recommended practices of harvesting followed by the partial adopters (18.75) percent and non-adopters (21.527) percent, harvesting through combine non-adopters (75) percent followed by the partial adopters (14.584) percent and full adopters (10.416) per cent.

Storage

Adoption of recommended storage product having moisture content of 10 per cent was adopted by majority as partial adoption (54.861) percent followed by the full adoption (22.916) per cent and non-adoption (22.223) per cent. Further, *KissanKothias* storage was adopted by majority (61.805) per cent as full adopter, followed by the partial adopters (34.722) per cent and non-adopters (3.473) per cent. In case of storing in tin drum, majority (59.028%) were full adopters followed by non-adopters (24.306) percent and partial adopters (16.666) percent.

Correlation between independent variables and extent of technology adoption

Table 3 revealed that the independent variables age, family size, size of land holding, annual income, extension contact and experience in wheat cultivation had positive and significant association with the extent of adoption by the respondents at 5 per cent level of probability, while the independent variable education had positive and significant association with the extent of adoption of respondents at 1 per cent level of probability. The findings implies that higher is the education level, age, family size, size of land holding, annual income, extension contact and experience of the respondents, higher will be the adoption of recommended wheat technology by

the respondents. Social participation, attitude, sources of information utilized, livestock possession were found non-significant.

Multiple regression analysis of predictor variables with response variable extent of wheat technology adoption.

Table 4 revealed that the multiple regression equation which included predictor variables, viz., age, extension contact, experience of wheat cultivation and technical knowledge explained to the extent of 94.4 percent of the variations in the extent of technology adoption by the respondents with respect to the improved package of practices of wheat cultivation. The 'F' value (593.82) was found to be highly significant.

Conclusion

The findings of the study revealed that most of the wheat growing farmers had medium level of adoption with respect to the adoption of wheat production technology. Practice wise adoption revealed that most of farmers adopted the traditional method of harvesting, addressed some of the aspects of water requirements of wheat and followed the broadcasting method of sowing, whereas; most of them didn't adopt important practices like, irrigation at critical stages of milking and dough stage, insect pest management practices, maintaining requisite plant population, appropriated sowing and seed treatment methods, seed viability test in order to select healthy seeds for sowing and assured production, adoption of recommended wheat varieties viz., PBW-443, UP-2338 and K-307. It was also revealed that variables age, extension contact, experience in wheat cultivation and technical knowledge possessed by the respondents were found important in explaining the variations in the extent of technology adoption with

respect to the improved package of practices of wheat cultivation. The study recommended to organize need based training in specific areas of low adoption which may be helpful in creating awareness, reinforcing technical competence demonstrating adequate level of self-confidence to motivate them in order to adopt the latest technical knowledge and skills and augment higher levels of productivity and profitability.

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Table 1. Distribution of the respondents based on level of adoption.

N=144					
Sl. No.	Level of adoption	Frequency	Percentage	Mean	SD
1.	High (write score)	23	15.973	288.597	141.557
2.	Medium (score)	115	79.861		
3.	Low (score)	6	4.166		
	Total	144	100		

Table2. Extent of recommended technology adoption by wheat growing farmers (N= 144).

Sl. No.	Practices	Extent of Adoption					
		Full adoption		Partial adoption		No. adoption	
		Frequency	%	Frequency	%	Frequency	%
1.	Land preparation						
	i) Use of rotavator in field	50	34.722	48	33.334	46	31.944
	ii) Decomposing paddy stunts by urea 15-20 kg	20	13.889	39	27.084	85	59.027
	iii) Sowing of seeds after pulverization of soil	65	38.888	52	36.112	27	18.75
2	Suitable soil						
	i) Wheat cultivation in heavy soil	29	20.138	61	42.362	54	37.5
	ii) Wheat cultivation in loam soil	59	40.972	50	34.723	35	24.305
3.	Varieties						
	i) PBW-343 Production: 60-65 q/ha	54	37.5	26	18.056	64	44.444
	ii) PBW-443 Production: 50-55 q/ha	7	4.862	11	18.056	126	87.5
	iii) U.P-2338	6	4.166	8	5.556	130	90.278
	iv) K-307	0	0	16	11.112	128	88.888
4.	Healthy seed selection						
	i) Seed viability test	1	0.694	5	3.473	138	95.833
	ii) Embryo culture method – takes about 7-10 days judged by counting the number of germination embryos	4	2.778	13	9.027	127	88.195
5.	Seed treatment						
	i) Seed treatment for loose smut and other soil disease control to carboxin 37.5% + thayram 37.5% D.S/W.S 3.0g/kg seed	2	1.388	6	4.167	136	94.445
	ii) 2% salt wet method (200g salt with 10 l litre water)	1	0.695	18	12.5	125	86.805
6.	Sowing time						
	i) Sowing seed from November first week to second week	59	40.972	69	47.916	16	11.112
	ii) Late sowing till 25 December	9	6.25	89	61.806	46	31.944
7.	Seed rate						

	i) Seed rate 100 kg /ha	60	41.666	72	50	12	8.334
	ii) Late sowing seed rate 125 kg/ ha	13	9.027	87	60.418	44	30.555
8.	Soil treatment						
	i) Control of soil disease and seed disease by bio-pesticides Tricodermaviride 1% W.P 2.5 kg /ha 60-70 kg and use of dung manure 8-10 shed dry after last ploughing	2	1.388	22	15.279	120	83.333
9.	Sowing method						
	i) Broad casting method	86	59.722	21	14.584	37	25.694
	ii) Sowing on the ridge	1	0.694	7	4.862	136	94.444
	iii) Drilling method	1	0.694	6	4.168	137	95.138
	iv) Ferti seed drill method	4	2.778	18	12.5	122	84.722
	v) Zero tillage	5	3.472	14	9.722	125	86.806
	vi) Furrow behind in plough (Kera, Pora, Keep).	0	0	13	9.028	131	90.972
10	Spacing plant to plant & row to row)						
	i) Normal sowing plant to plant and row to row spacing	2	1.388	7	4.862	135	93.75
	ii) Late sowing plant to plant and row to row	1	0.694	12	8.333	131	90.973
11.	Plant population						
	i) 490000/ha	0	0	6	4.166	138	95.834
12.	Weeding						
	i) Control of Phalaris minor and Avenafatua, by isoproturon 75% W.P 1.25kg /ha	18	12.5	17	11.806	109	75.694
	ii) Control of broad leaf Krishna nil, Satyanashi, hirankhuri and bathua by 2,4 D sodium salt 80% technical 625g/ha	8	5.556	20	13.888	116	80.556
13.	Fertilizers and manures						
	i) N.P.K 150:60:40	9	6.25	83	57.638	52	36.112
	ii) Use of 60q/ha manures before sowing 15 days	13	9.027	88	61.111	43	29.862
	iii) Nitrogen ½ first dose at the time of sowing	9	6.25	100	69.444	35	24.306
	iv) Nitrogen 1/3 use after first irrigation	4	2.777	97	67.362	43	29.861
	v) ¼ nitrogen use after second irrigation	2	1.388	72	50	70	48.612
14.	Irrigation and water management						
	i) Flooding irrigation	54	37.5	39	27.084	51	35.416
	ii) Border irrigation	77	53.473	30	20.833	37	25.694
	iii) Digging method of drainage	1	0.694	6	4.168	137	95.138

	iv) Herringbone method of drainage	0	0	12	8.334	132	91.666
15.	Water need during critical stages						
	i) First irrigation 20-25 DAS, critical stage	97	67.362	44	30.555	3	2.083
	ii) Second irrigation 40-45 DYS, till ring stage	96	66.668	46	31.944	2	1.388
	iii) Third irrigation 60-65 DAS, joint stage	69	47.916	52	36.111	23	15.973
	iv) Fourth irrigation 80-85 DAS, flowering stage	1	0.694	20	13.888	123	85.418
	v) Fifth irrigation 100-105 DAS, milking stage	0	0	2	1.388	142	98.612
	vi) Sixth irrigation 115-120 DAS, dough stage	0	0	8	5.556	136	94.444
16.	Insect pest and disease management						
	i) Control of termite by chlorpyriphas 20 E.C 2-3 litre /ha	3	2.083	24	16.667	117	81.25
	ii) Control of aphids by thymomithon 25% E.C 1 litre/ha 750 litre water	5	3.472	22	15.278	117	81.25
	iii) Control of rust by zineb or Dithane M-45 0.2% (2kg/1000 litre/ water)	1	0.694	23	15.973	120	83.333
17.	Harvesting time, methods & handling						
	i) General harvesting march to April become hard and dry brittle	86	59.723	27	18.75	31	21.527
	ii) Combine	15	10.416	21	14.584	108	75
	iii) By riper	32	22.224	20	13.888	92	63.888
	iv) By thresher power driven	76	52.779	12	8.333	56	38.888
	v) By sickle	101	70.138	17	11.806	26	18.056
18.	Storage						
	i) 10% moisture - ideal storage	33	22.916	79	54.861	32	22.223
	ii) KissanKothi	89	61.805	50	34.722	5	3.473
	iii) In tin drum	85	59.028	24	16.666	35	24.306

Table 3. Correlation of independent variables with adoption level

No.144

Sl. No.	Variables	Coefficient Correlation
1	Age	0.230**
2	Education	0.210*
3	Family size	0.380**
4	Social participation	0.142 ^{NS}
5	Size of land holding	0.269**
6	Annual income	0.210**
7	Attitude	0.036 ^{NS}
8	Extension contact	0.327**
9	Sources of information utilized	0.077 ^{NS}
10	Experience in wheat cultivation	0.399**
11	Livestock possession	0.039 ^{NS}
12	Training exposure	0.166*

** Significance at 1% α , * Significance at 5% α , ^{NS} - Non - significant

Table 4. Multiple regression analysis of predictor variables with response variable (No. 144)

Sl. No.	Variables	b	SE (b)	t
1.	Age	-0.434	0.2666	-1.63Ns
2.	Extension contact	8.07	2.708	3.14**
3.	Experience in wheat cultivation	0.690	0.269	2.56*
4.	Technical Knowledge	1.228	0.028	42.88**

a = 52.072**, F = 593.82**, R² = 0.944

** Significance at 1% α , * Significance at 5% α , ^{NS} - Non - significant