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A study on adoption of recommended practices in soybean cultivation among the farmers of Rajnandgaon district of Chhattisgarh

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Abstract
The adoption process is actually one type of decision making in which a farmer decide to full use of an innovation as the best course of action available. Large scale adoption of innovation is essential feature of agricultural development. Hence, the present study was conducted to determine the extent of adoption of recommended practices in soybean cultivation among the farmers of Rajnandgaon district of Chhattisgarh during the year 2021-22. A total of 150 soybean growers from 10 villages of two blocks of Rajnandgaon district were considered as respondents. Pre-tested interview schedule in Hindi was used for collection of data and collected data were analyzed using appropriate statistical tools. The findings of the study reveals that maximum numbers of the soybean growers (54.66%) were used Line sowing method for soybean cultivation. Based on multiple responses, majority of the soybean growers (86.67%) were grown JS-9560 as improved variety for soybean cultivation. Majority of the soybean growers had average adoption regarding sowing method (48.67%), Seed rate (45.33%), Irrigation management (44.00%), Storage management (40.67%), Land preparation (40.00%), Selection of improved varieties (34.00%) and Manure and fertilizer management (33.33%). Out of total soybean growers majority (58.00%) of them had medium extent of adoption of recommended practices in soybean cultivation with 48.23 percent of overall adoption index. This study aims to derive recommendations for policy makers and adoption researchers that timely technological information should be disseminated in order to increase the level of adoption of recommended practices in soybean cultivation among the farmers.

Keywords: Soybean cultivation, improved varieties, sowing methods, extent of adoption

Introduction
The Soybean (US) or Soya bean (UK) (*Glycine Max* L. Merril) is a leguminous crop and belongs to family *Fabaceae* with sub family *Faboideae*. It is known as the "Wonder Crop and Golden Bean" of the twentieth century due to its high nutritive value and various uses such as human food, cooking oil, different soya based food products and industrial product. It is an excellent health food and contains about 40 to 42 percent quality protein and 20 to 22 percent cholesterol free oil. Soybean protein is receiving more attention than any other source of protein today among human beings for health point of view and as source of income. Besides, it contains several vitamins, calcium, phosphorous and iron, they are ideally suited for human beings.

In Chhattisgarh soybean occupies 0.08 mha area with production of 0.086 million tons with average productivity of 1.16 tons ha^{-1}. Soybean can be grown successfully during *kharif* season in Chhattisgarh. In recent past, cultivation of soybean has been gaining popularity in Chhattisgarh. The important soybean growing districts are Bemetara, Rajnandgaon, Durg, Raipur, Mungeli and Kawardha. Rajnandgaon district of Chhattisgarh is one of the important soybean growing districts. The increase in area under soybean crop in Rajnandgaon has brought changes in social as well as economic conditions among the farmers. The area under soybean crop of this district is 24,568 hectares with total production of 21,915 tones and the average yield of soybean in Rajnandgaonis 892 kg ha^{-1} (C.G. Department of Agriculture, 2020).

Increasing agricultural productivity through the adoption of improved agricultural technologies and practices has been considered one of the viable means for achieving economic growth and agricultural transformation. In this way, a growing number of improved soybean production technologies has been developed and promoted in recent decades to address a diverse set of goals which directly benefit soybean growers. Adoptions of improved technologies and production practices are important drivers of development of soybean growers.

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Good production practices and technology adoption are vital if soybean farmers are to obtain optimum yields. The adoption process is actually one type of decision making in which a farmer decide to full use of an innovation as the best course of action available. Large scale adoption of innovation is essential feature of agricultural development. However, some farmers adopt all the recommended practices, while, some others don't. The personal, social and economic aspects of the farmers play a major role in their adoption process. Hence, in this context the present research "A study on adoption of recommended practices in soybean cultivation among the farmers of Rajnandgaon District of Chhattisgarh" was undertaken to measure the extent of adoption of recommended practices in soybean cultivation and locating the technological status among the soybean growing farmers.

Research Methodology
The present study was carried out in the Rajnandgaon district of Chhattisgarh state during the year 2021-22. From Rajnandgaon district, two blocks namely Khairagarh and Chhuikhadan were purposively selected for the study, because maximum numbers of soybean growers were available in these blocks. From each selected blocks, 5 villages were selected purposively on the basis of maximum number of soybean growers. In this way, a total of 10 (2 X 5 = 10) villages were considered for selection of respondents. From each selected villages, 15 soybean growers were considered as respondents for the collection of data. In this way, a total of 150 (10 X15 = 150) farmers from 10 villages of two blocks were considered for the study. Data were collected personally by using structured interview schedule.

Adoption is refers as the decision making process through which an individual passes from first knowledge of an innovation to final decision to adopt. In present investigation, it refers to the actual adoption of recommended practices in soybean cultivation. The measurement of the respondent's adoption was based on the full use of recommended practices in soybean cultivation at the time of interview. The whole practices of soybean cultivation were categorized under 15 components *viz.* land type and,land preparation, selection of improved varieties, seed rate, seed treatment, sowing method, spacing of rows and plants, time of sowing, application of manure and fertilizer, irrigation management, weed management, insect-pest and disease management, harvesting & threshing management and storage management. It was measured in terms of scores and responses were recorded on five point continuum, in which the weightage of 5 was given for very high knowledge and weightage of 4, 3, 2, and 1 were given for above average, average, below average, and very low adoption, respectively. On the basis total scores obtained by each respondent from all practices, adoption index was developed for each respondent by using the following formula:

$$AIi = \frac{Oi}{S} \times 100$$

Where,
AIi = Adoption index of ith respondent.
Oi = Total adoption score obtained by i[th] respondent
S = Total obtainable score

On the basis of adoption index (AI), respondents were categorized into the following three categories

Categories	Score
Low (up to 33.33)	1
Medium (33.34 to 66.66)	2
High (above 66.66)	3

Results and Discussion
Sowing methods used by farmers for soybean cultivation
Suitable method of sowing with optimum seed rate may increase productivity of any of the crop. In this way, sowing methods used by farmers are also very important in case of soybean cultivation. Based on multiple responses, methods of sowing used by soybean growers at sampled area are show in Table 1. The results reveals that maximum number of the soybean growers (54.66%) were used Line sowing method for soybean cultivation, whereas, 41.33 percent of the soybean growers were used Broadcasting method followed by 8.00 percent of them were used Ridge and furrow method and Only 1.33 percent of the soybean growers were used Broad bed and furrow method of sowing for soybean cultivation.

Table 1: Distribution of respondents according to sowing methods used for soybean cultivation

(n=150)

Categories	Frequency	Percentage
Broadcasting	62	41.33
Line sowing	82	54.66
Ridge and furrow	12	8.00
Broad bed and furrow	02	1.33

*Data are based on multiple responses

Use of improved varieties
Crop cultivation by using improved varieties play pivotal role to get higher yield by increasing the productivity of the crop per acre. Farmers in the study area were also using various improved varieties of soybean in order to get higher productivity. The data regarding use of improved varieties by soybean growers is presented in Table 2. The finding reveals that the improved varieties of soybean were grown by 86.67 percent of the soybean growers. Based on multiple responses, majority of the soybean growers (86.67%) were grown JS-9560 as improved variety for soybean cultivation followed by improved varieties of soybean *viz.* JS-9305 and JS-335 were grown by 21.33 and 12.00 percent of the soybean growers, respectively. Local varieties of soybean were grown by only 13.33 percent of the soybean growers in study area.

Table 2: Distribution of respondents according to use of improved varieties of soybean

(n=150)

Categories	Frequency	Percentage
Local Varieties	20	13.33
Improved Varieties	130	86.67
JS-9560*	98	65.33
JS-9305*	32	21.33
JS-335*	18	12.00

*Data are based on multiple responses

Extent of adoption of recommended practices in soybean cultivation

It is clearly visible that innovative technologies have tremendously impacted on agricultural development around the world. The use of technology in agriculture has opened up a whole new world of possibilities for the farmers, helping them as agricultural operations make easier, improve their production and productivity and more. However, the introduction of new technology in agriculture is not easy and is usually met with a lot of resistance from farmers who are comfortable doing their work in a specific way that they don't want to change. It is fact that agricultural technology adoption is not a one-off static decision, rather it involves a dynamic process in which information gathering, learning and experience play pivotal roles, particularly in the early stage of adoption. In this way, present study is an effort to determine the extent of adoption of recommended practices in soybean cultivation.

The results on practice wise extent of adoption of recommended practices in soybean cultivation among the soybean growers are presented in Table 3. It indicates that 13.33 percent of the soybean growers had very high level of adoption regarding Harvesting management followed by high level of adoption was reported by soybean growers for practices like Time of sowing (12.67%), Storage management (12.00%), Seed rate (10.67%), Land type (8.67%), Irrigation management (8.00%) and Land preparation (6.00%). As regards to above average level of adoption among soybean growers about recommended practices in soybean cultivation is concerned, about 42.66 percent of the soybean growers were having above average level of adoption about Land type followed by 38.67, 30.66, 24.67, 24.67 and 23.33 percent of the soybean growers had said that they had above average level of adoption regarding Harvesting management, Time of sowing, Selection of improved varieties, Storage management and Land preparation respectively.

The results in Table 3 also shows that 48.67 percent of the soybean growers had average adoption regarding Sowing method whereas, average adoption was found among 45.33, 44.00, 42.67, 40.00, 34.00 and 33.33 of the soybean growers for recommended practice *i.e.* Seed rate, Irrigation management, Storage management, Land preparation, Selection of improved varieties and Manure and fertilizer management respectively. In case of below average level of adoption, it was found that majority of the soybean growers (52.57%) had below average level of adoption regarding Disease management followed by below average level of adoption was reported by soybean growers for practices *i.e.* Insect management (51.33%), Weed management (50.00%), Seed treatment (40.00%), Spacing of rows and plants (39.33%), Selection of improved varieties (30.66%) and Manure and fertilizer management (28.00%). It can observe from Table 3 that the soybean growers had very low level of adoption regarding selected practices of soybean cultivation *i.e.* Disease management (20.00%), Weed management (18.66%) and Insect management (18.00%).

Table 3: Distribution of respondents according to their extent of adoption of recommended practices in soybean cultivation (n=150)

Name of practices	Extent of adoption				
	Very low	Below average	Average	Above average	Very high
	F (%)	F (%)	F (%)	F (%)	F (%)
Land type	12 (8.00)	24 (16.00)	37 (24.67)	64 (42.66)	13 (8.67)
Land preparation	15 (10.00)	31 (20.67)	60 (40.00)	35 (23.33)	09 (6.00)
Selection of improved varieties	10 (6.67)	46 (30.66)	51 (34.00)	37 (24.67)	06 (4.00)
Seed rate	14 (9.33)	27 (18.00)	68 (45.33)	25 (16.67)	16 (10.67)
Seed treatment	26 (17.33)	60 (40.00)	49 (32.67)	11 (7.33)	04 (2.67)
Sowing method	13 (8.67)	38 (25.33)	73 (48.67)	21 (14.00)	05 (3.33)
Spacing of rows and plants	25 (16.67)	59 (39.33)	47 (31.33)	13 (8.67)	06 (4.00)
Time of sowing	18 (12.00)	34 (22.67)	33 (22.00)	46 (30.66)	19 (12.67)
Manure & fertilizer management	23 (15.33)	42 (28.00)	50 (33.33)	31 (20.67)	04 (2.67)
Irrigation management	17 (11.33)	30 (20.00)	66 (44.00)	25 (16.67)	12 (8.00)
Weed management	28 (18.67)	75 (50.00)	35 (23.33)	10 (6.67)	02 (1.33)
Insect management	27 (18.00)	77 (51.33)	34 (22.67)	09 (6.00)	03 (2.00)
Disease management	30 (20.00)	79 (52.67)	31 (20.67)	08 (5.33)	02 (1.33)
Harvesting management	09 (6.00)	25 (16.67)	38 (25.33)	58 (38.67)	20 (13.33)
Storage management	08 (5.33)	26 (17.33)	61 (40.67)	37 (24.67)	18 (12.00)
Overall adoption index = 48.23%					

*F=frequency % = percentage

Overall extent of adoption of recommended practices in soybean cultivation

The overall extent of adoption of the soybean growers was operationalized by combining the adoption scores obtained by them in each practice of soybean cultivation. The result on distribution of the soybean growers according to their overall extent of adoption regarding recommended practices in soybean cultivation is presented in Table 4. Out of total soybean growers majority (58.00%) of them had medium extent of adoption of recommended practices in soybean cultivation, whereas, 24.00 and 16.00 percent of them had low and high extent of adoption, respectively. It can be conclude from the above results that majority of the soybean growers in study area showed medium extent of adoption regarding recommended practices in soybean cultivation. Medium extent of adoption found among those soybean growers who were educated, possessed medium to large land holding belonged to medium to higher income group, had better utilization of information sources and better attitude toward soybean crop. Overall adoption index worked out and it was found to be 48.23 percent among soybean growers for recommended practices in soybean cultivation (Table 3). These findings were in line with the findings of Verma *et al.* (2019) [9], Dupare *et al.* (2019) [4] and Bhawel *et al.* (2020) [3].

Table 4: Distribution of respondents according to their overall extent of adoption of recommended practices in soybean cultivation

(n=150)

Categories	Frequency	Percentage
Low (up to 33.33)	36	24.00
Medium (33.34 to 66.66)	87	58.00
High (above 66.66)	27	18.00

Conclusions

The technology adoption process, in general, is complex but it becomes more complicated in case of a packaged technology that contains several components complementing each other. Large scale adoption of innovation is essential feature of agricultural development. However, some farmers adopt all the recommended practices, while, some others don't. The personal, social and economic aspects of the farmers play a major role in their adoption process. As per the findings of the study, it can be concluded that practice-wise adoption among soybean growers was average regarding Storage management, Sowing method, Irrigation management, Seed rate, Manure and fertilizer management, Land preparation, and Selection of improved varieties. It was observed that majority of the soybean growers had medium extent of overall adoption of the soybean production technology

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