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Factors Affecting Adoption of Improved Soybean Production Technology in Dewas District of Madhya Pradesh, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The oilseed legume soy, after groundnut and rapeseed & mustard, has become India's third-most significant oilseed crop in terms of area, production and productivity over the past 40 years. The bulk of India's tiny and marginal farming communities were transformed socio-economically by the use of soybeans, which also made a considerable contribution to the country's oil economy. Production technology for this miracle crop is also continuously upgrading with time. Thus, the present investigation was conducted in five villages of Kannod block of Dewas district of Madhya Pradesh to look after the factors affecting adoption of improved soybean production technology. Six blocks make up the Dewas district: Bagli, Dewas, Kannod, Khategaon, Sonkatch, and Tonkhurd.

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Out of them, Kannod block was specifically chosen since, over the past 10 years, the area under soybean crop has increased while productivity has steadily decreased in this block. With the help of a structured interview schedule, data was collected purposely from 105 farmers. For calculating relationships between dependent and independent variables correlation coefficient was used. Results of the study revealed that out of thirteen variables, eleven variables were significantly and positively related with factors affecting adoption of Improved Soybean Production Technology. Two variables i.e. age and farming experience were found significantly and negatively related with factors affecting adoption of Improved Soybean Production Technology. Majority of soybean farmers 63.81% reflected medium level of adoption regarding improved production technology. In constraint analysis, lack of on-time availability of improved varieties of seed followed by higher cost of inputs (seed, insecticide, fertilizer and implements) were two major constraints faced by 70.48% and 59.05% soybean farmers respectively. These findings provide insights for future research on factors affecting adoption of improved production technology by soybean farmers.

Keywords: Soybean farmers; factors affecting adoption; improved production technology.

1. INTRODUCTION

The miracle crop of the twenty-first century, soy (*Glycine max*), is mostly farmed as a rainfed kharif season crop. It serves as a significant source of food, raw materials for domestic businesses and exports of goods. Up until the early 1970s, soybean cultivation in India was relatively unknown; today, it is a significant oilseed crop. Soybean had played a pivotal role in the socio-economic transformation of the majority of small and marginal farming communities of central India and continued to contribute significantly to the oil economy of India [1]. In fact, soy oil is majorly used in meals all over the globe. Due to its many applications in human and animal nutrition as well as its function in improving soil, it is the most significant legume in the world.

A significant source of protein (40%) and oil (20%), soybean are a type of legume that may help India's problems with nutrition security. India is the fifth-largest producer of soybean in the world, out of all the nations that produce the crop. The Jawahar Soybean varieties which are developed by Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur, Madhya Pradesh are presently covering more than 92 percent of soybean acreage of the country [2]. Eighty-nine percent of the domestic soybean production in India is accounted for by the two states Madhya Pradesh and Maharashtra. In Madhya Pradesh it accounts for more than 50 percent of the cropped area during *kharif* season and therefore a major portion of farmers' income is dependent on this crop which is having 95 percent marketable surplus [3]. In terms of both horizontal spread and the expansion and development of soy-based enterprises, Madhya Pradesh's Malwa plateau has been the centre of soybean development. There are around 22 to 25 lakh well-cultivated soybean acres in the Malwa climatic zone alone. This makes it obvious that this area has control over the state's future soybean production.

Despite the country's tremendous development in soybean production and area, there are significant changes from year to year. The country's soybean production has fluctuated by roughly 22-23% over the course of the decades that have been examined. The instability in soybean output was found to be very significant and has been escalating in recent decades, even in the major soybean-producing states. As per the government data, Madhya Pradesh produces very little soybean per acre as compared to its actual potential yield [4,5]. This is only a result of farmers' ignorance, lack of information, and extensive usage of less productive technologies, which is seen in their production. Use of improved seed, seed rate, seed treatment, sowing time, recommended dose of fertilizer, weed control and plant protection measure gives a higher yield as compared to farmer's practice [6]. Partial adoption could not give the relative advantage as expected, which can be demoralizing for the farmer for adoption of technology [7]. Increase in agricultural production, economic and social benefits are directly dependent on the extent to which farmers use the improve technology [8]. Front Line Demonstration (FLD's) played a very important role to disseminate recommended technologies resulting in an increased yield at farmers' level and proved the potential of technology [9]. In order to increase the level of adoption, farmers must be made knowledgeable about technologies [10]. The spread and adoption of

new technology is therefore essential for increasing agricultural productivity, it might be said. The area planted with soybeans in Madhya Pradesh is steadily growing, but the crop's productivity and yield are on the decline. If we throw some light on the causes of the decline in soybean productivity, we will see that the cultivation of soybean is now experiencing a number of unfavourable conditions. As a result, from an economic perspective, farmers do not benefit greatly. To study the gap between adoption of improved soybean production technology by the farmers and technologies recommended by research institutes, the research, "Factors affecting adoption of Improved Soybean Production Technology in Dewas District of Madhya Pradesh" is carried out.

2. RESEARCH METHODOLOGY

The present study was conducted in Dewas district of Madhya Pradesh. Dewas district comprises six blocks namely, Bagli, Dewas, Kannod, Khategaon, Sonkatch and Tonkhurd. Out of these, Kannod block was purposely selected because area under soybean crop in the past ten years is increasing in this block but production is decreasing continuously. From the selected block five villages namely Bahirawad, Chaplasa, Kalwar, Nanasa and Piplani were selected purposely on the basis of highest number of soybean farmers. Two percent of the soybean farmers from each village were purposely selected for the study. Thus, the sample size of the study comprises 105 farmers. Soybean farmers in the aforementioned villages served as the primary source of data collection. The primary data was collected by personally contacting all respondents. A standardised interview schedule was used to collect data. The interview questions were ordered logically and were simple, direct inquiries that were directly related to the objective of the study. The secondary data was gathered from several government agencies, including the block development office, district agriculture office, block agriculture office, periodicals and other publications. Using a three-point continuum, *i.e.* full, partial and no adoption, soybean producers' adoption of improved production technology was assessed. Both quantitative and qualitative data were gathered. To tabulate qualitative data and interpret quantitative data in terms of percentage, the predetermined categorization strategy was utilized. As statistical tools for data collection and analysis, the study used frequency, percentage, mean, standard deviation and correlation coefficient.

3. RESULTS AND DISCUSSION

Out of thirteen variables, eleven variables viz. education, annual income, area under soybean crop, land holding, scientific orientation, economic motivation, material possession, risk orientation, contact with extension agent, mass media exposure and knowledge level of soybean farming are significantly and positively related with factors affecting adoption of Improved Soybean Production Technology in Dewas district of Madhya Pradesh. Two variables, age and farming experience are found significantly and negatively related with factors affecting adoption of improved soybean production technology in Dewas district of Madhya Pradesh.

Table 1. Coefficient of correlation of profile characteristics of soybean farmers with adoption of improved soybean production technology

Independent Variables	Correlation coefficient (‘r’)
Age	-0.1041*
Education	0.4767*
Annual income	0.7849*
Area under soybean crop	0.8913*
Land holding	0.9026*
Farming experience	-0.0359*
Scientific orientation	0.5989*
Economic motivation	0.6000*
Material possession	0.6979*
Risk orientation	0.8619*
Contact with extension agent	0.9394*
Mass media exposure	0.6416*
Knowledge level of soybean farming	0.8033*

**Significant at 0.05 level of probability*

It is observed that there was a negative and significant relationship between the age of soybean farmers and their adoption level regarding improved soybean production technology. This may be because young minds are more flexible in adopting changes in comparison to older ones. There was a positive and significant correlation between education of soybean farmers and their adoption level. This finding signifies that as the educational level of farmers increases, their adoption level regarding improved production technology increases and vice versa. The probable reason for this might be

the fact that- 'Education opens up the mindset of people and motivates them to upgrade themselves by adopting latest innovations.' Regarding the annual income of soybean farmers, it was found to have a positive and significant relationship with their adoption level. The probable reason for this might be that as the income of an individual increases it becomes easy for him to replace the old technologies with newer ones. The area under soybean crop was also found positive and significant with their adoption level. The reason behind might be that, as the area under cultivation becomes large, annual income of the farmer increases and it becomes easy to adopt improved production technology. There was a positive and significant relationship between land holding of soybean farmers with their adoption level. The probable reason for this might be that higher land holding provides higher income which makes it easy to adopt improved technologies even at higher cost.

There was a negative and significant correlation between farming experience of soybean farmers with their adoption level regarding improved production technology. This might be because the higher experience comes with older age and increase in age results in low adoption level. In relation to the scientific orientation of soybean farmers with their adoption level. This finding signifies that as the scientific orientation of farmers increases, their adoption level regarding improved production technology also increases and vice versa. Economic motivation and material possession of soybean farmers found to be positive and significant with their adoption level. Because, the more a person will be motivated economically, the more he will be interested in adopting the improved production technology. Risk orientation of soybean farmers with their adoption level found significant. The reason for this might be that higher risk takers are usually early adopters who do not wait a lot to adopt new and improved production technology. The correlation coefficient of contact with extension agents of soybean farmers with their adoption level regarding improved production technology was found positive and significant. The farmers who had higher extension contact were found being more motivated to adopt an upgraded technology. Though, contact with extension agents was found to be positive and significant with the adoption level. There was a positive and significant relationship between mass media exposure and knowledge of soybean farmers with their adoption level regarding improved production technology because people with more exposure to mass media tend to have more about the latest innovations which eventually lead them to adopt the innovation at its early stages.

Table 2. Distribution of soybean farmers according to their adoption level of different components of improved soybean production technology

S. No.	Categories	No. of respondents	Percentage
1	Low	17	16.19
2	Medium	67	63.81
3	High	21	20.00
	Total	105	100.00

The study reveals that out of total soybean farmers, 16.19 per cent respondents had low adoption level, 63.81 per cent respondents had medium adoption level and about 20.00 per cent respondents were observed with high adoption level of improved soybean production technology. Majority of the soybean farmers 63.81 percent showed medium adoption level regarding improved production technology.

Adoption of Improved Soybean Production Technology was measured on eight components namely land selection and preparation, seed and sowing management, fertilizer application management, irrigation management, weed management, plant protection management, harvesting and threshing management and storage management.

Full adoption is witnessed for plant protection management by 25.71% soybean farmers followed by weed management by 21.90%, fertilizer application management by 20.95%, seed and sowing management by 20.00%, irrigation management by 18.10%, land selection and preparation along with harvesting and threshing management by 16.19% and storage management by 13.33 % soybean farmers respectively. It was found that the farmers having full adoption of improved production technology are those who possess higher education, have higher annual income and have regular contact with extension agents.

Partial adoption of improved production technology is witnessed for weed management by 71.43 percent soybean farmers followed by seed and sowing management by 68.57%,

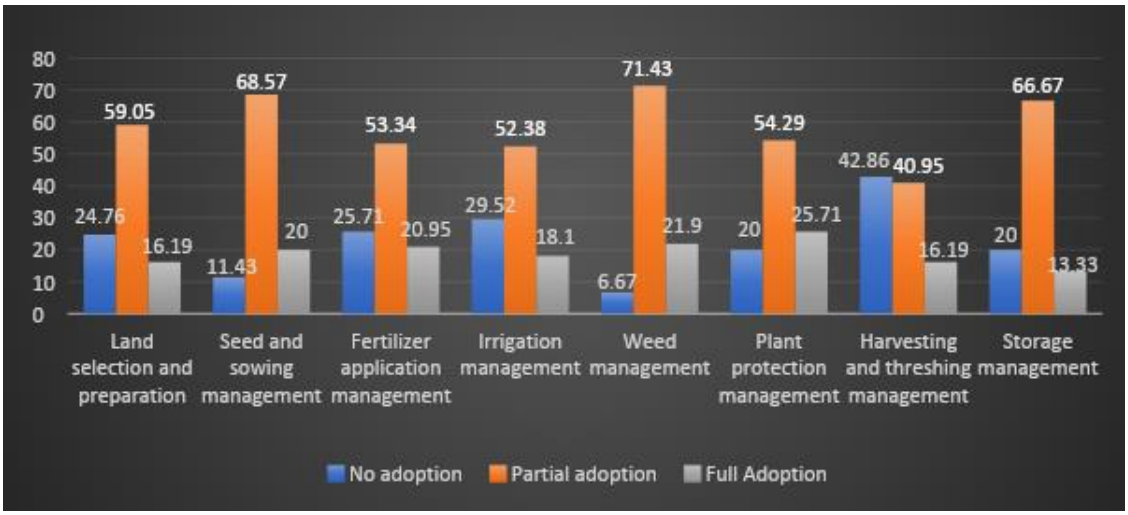

Fig. 1. Distribution of soybean farmers according to their responses regarding adoption of improved soybean production technology

Table 3. Constraints perceived by soybean farmers in adoption of improved production technology

S. No	Constraints	Frequency	Per cent	Rank
1.	Unavailability of improved varieties of seed on time	74	70.48	I
2.	High cost of inputs	62	59.05	II
3.	Irregular visit of extension workers	60	57.14	III
4.	Higher cost of cultivation	55	52.28	IV
5.	Lack of proper information about latest technologies	42	40.00	V

storage management by 66.67%, land selection and preparation by 59.05%, plant protection management by 54.29%, fertilizer application management by 53.34%, irrigation management by 52.38% and harvesting and threshing management by 42.86% soybean farmers respectively. The farmers with partial adoption level were found to have partial or less mass media exposure, medium education level and moderate economic motivation.

No adoption of improved soybean production technology is witnessed for harvesting and threshing management by 42.86% soybean farmers followed by irrigation management by 29.52%, fertilizer application management 25.71%, land selection and preparation by 24.76%, plant protection management along with storage management by 20.00%, seed and sowing management by 11.43% and weed management by 6.67% soybean farmers respectively. Age of the farmers above 50 years who were traditional in nature even having higher farming experience were found to have no adoption of improved production technologies. Farmers having low annual income, less knowledge of soybean farming and lower material possession were also found having no adoption of improved production technology.

To determine the challenges faced by soybean farmers in adopting better production technologies, many responses were collected**.** Among several problems faced by the respondents in the table 3, the highest percentage of respondents (70.48%) opined that they feel lack of on-time availability of improved varieties of seed followed by higher cost of inputs (seed, insecticide, fertilizer and implements) (59.05%), irregular visit of extension workers (57.14%), higher cost of cultivation (52.28%) and lack of proper information about latest technologies (40.00%), which were ranked first, second, third, fourth and fifth respectively.

4. CONCLUSION

It is concluded that age of the soybean farmers and their farming experience were two major factors that significantly and negatively affected the adoption of improved soybean production technology whereas the remaining eleven

variables positively and significantly affected the adoption of improved soybean production technology. Plant protection management was the variable with highest adoption by soybean farmers whereas harvesting and threshing management was the lowest adopted recommended variable regarding improved production technology by soybean growers. The majority of soybean farmers *i.e.* 63.81 percent were found to have medium adoption level regarding improved production technology followed by high adoption and low adoption by 20 percent and 16.19 percent farmers respectively. The proportional benefit of partial adoption could not be achieved as anticipated. Therefore, in order to achieve higher adoption of technologies by the farmers, soybean farmers should be made aware of enhanced production technology through awareness campaigns and timely demonstrations should be made available.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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