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ADOPTION OF MODERN SESAME PRODUCTION TECHNOLOGIES IN SELECTED AREAS OF BANGLADESH

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Abstract

The study was conducted to assess the extent of adoption along with examine the associated factors and also identify the constraints in adopting modern sesame production technologies by the farmers of five villages of five districts i.e., Kushtia, Chuadanga, Faridpur, Jashore and Narail. Data were obtained from 100 randomly selected farmers in five selected villages of five districts by using an interview schedule. Data were collected during 15 September to 25 October, 2014. Five improved practices were selected to measure the adoption level. The results showed that adoption level of five practices such as adoption of improved seed, adoption of recommended dose of fertilizer, weeding and thinning, irrigation and pesticide use were 38.94, 38.75, 38.15, 35.26 and 32.98 percent, respectively. Considering overall adoption level, it was revealed that more than half (51 percent) of the farmers had low adoption while 37 percent had medium and 12 percent had high adoption of modern sesame production technologies. Results indicated that there were 13 problems which hindered the adoption of modern sesame production technologies by the farmers. Among the problems, three major problems were (i) probability of being caused harm by heavy rainfall or drought (77.3 percent), (ii) problem in harvesting and processing for heavy rainfall (65.3 percent) and (iii) irrigation problem (40.7 percent). It was also found that 37 percent of the farmers faced low problem, while 63 percent faced medium problem and there was no farmer who faced high problem regarding the adoption of modern sesame production technologies.

Key words*:* Adoption, modern technologies, suitability of technology, profitability of technology

Introduction

Edible oils play a very important role in human nutrition. It is not only a high energy food but also a carrier for fat soluble vitamins (A, D, E and K) in the body. Oils are not only important for human diets but also services as important raw material for industrial use such as making soaps, paints, varnishes, hair oils, lubricants, textile auxiliaries, pharmaceuticals etc. Oil cakes and meals are used as animal feeds and manures. The major oilseed crops grown in Bangladesh are mustard, sesame, groundnut and linseed. The major contribution of oil comes from mustard (65%) followed by sesame (10.71%) and groundnut (invisible oil 10.5%) (BBS, 2016).

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Sesame is the second largest source of edible oil in Bangladesh next to mustard both in respect of acreage and production. Sesame is one of the world's oldest spice and oilseed crop grown mainly for its seeds that contain approximately 35-50% oil, 20-25% protein, 20% sugar, 6% fibre and many kinds of minerals. Sesame oil is quality edible oil. The oil is tasteless, odourless and also used as hair oil and as a component of cosmetics. The seed is used in making various food items like cakes, *khaja*, biscuits, etc. Dry plants and leaves are used as fuel and oilcakes as cattle feeds and manures. Sesame has also been used as folk medicine (Brar and Ahuja, 1979) in India and Bangladesh and its oil have been used traditionally to cure various ailments, such as asthma, in "*ayurveda*" since ancient times. It is well known that sesame has nutritive, laxative, demulcent, emollient, diuretic and lactagogue properties (Tylor *et al*., 1988). It may also be employed in the preparation of liniments, plasters, ointments and soaps (Weiss, 1971). The roots, usually unused parts of sesame, contains antifungal compound such as chlorosesamone, hydroxysesamone and 2-3 epoxysesamone (Hasan *et al*, 2000 and 2001). The climate of Bangladesh is more suitable for sesame cultivation and it is grown in almost all districts but grows well in greater Khulna, Faridpur, Pabna, Barisal, Rajshahi, Jashore, Kushtia, Cumilla, Dhaka, Rangpur, Sylhet, and Mymensingh districts. Due to increase of area under cereal crops for meeting the increasing demand of food-stuff, land under oilseed crops has declined and price of oil has gone up. Cultivation of traditional varieties, imbalance use of fertilizers, inability to seed sowing in proper time, non adoption of other production technologies, natural calamities, socio-economic barrier, large yield gap (20-60%), nutrient mining in existing cropping pattern, unavailability of seeds of suitable HYV varieties etc. are the main constraints of maximizing yield of oilseeds. The government of Bangladesh has, therefore, provided priority to the agriculture sector to increase the production of oilseeds by giving subsidy to the farmers on different inputs such as fertilizer, irrigation etc. to achieve self sufficiency in oilseeds. In view of the foregoing discussion, the researcher undertook a study entitled, "adoption of modern sesame production technologies in some selected areas" along with the following objectives - (i) to assess the extent of adoption of modern sesame production technologies (ii) to find out the degree of relationship of different factors with the adoption of modern sesame production technologies, and (iii) to identify the constraints in adopting modern sesame production technologies by the farmers in some selected areas.

Materials and Methods

Study areas and source of data

Considering the sesame growing area the study was conducted in five villages of Sadar upazila of Kushtia; Alamdanga of Chuadanga; Modhukhali of Faridpur; Bagharpara of Jashore and Lohagora of Narail district. All the farmers of selected five villages of project areas who cultivated sesame constituted the population of the study. A list of sesame growers of selected villages was prepared with the help of local Sub-Assistant Agriculture Officer (SAAO) of Department of Agricultural Extension of the concerned area. The list

comprised of 305 farmers which served as the population of the study of each selected villages. Out of them, 33% of the farmers were selected following random sampling method. Thus, 100 sesame growers were the sample of the study. These 100 growers were considered as the representative of the five villages of respective districts.

Variables of the study and their measurement

Age, education, family size, farm size, cropping intensity, family annual income, training exposure, extension media contact, innovativeness, cosmopoliteness, organizational participation, agricultural knowledge on sesame cultivation, credibility of extension agents, risk orientation, suitability of technology and profitability of technology were consisted as the independent variables whereas 'adoption of modern sesame production technologies in some selected areas' was considered as the dependent variable of the study. The selected modern technologies were consisted of recommended package of five practices. The five practices were adoption of improved seed, adoption of recommended rate of fertilizer, adoption of weeding and thinning, adoption of irrigation and adoption of pesticide use. These five practices were selected to measure the adoption level. It was measured on the basis of the extent of adoption of modern sesame production technologies by the farmers for a period of two years (2013 & 2014). An Adoption Index (AI) for modern sesame production technologies was computed by using of Chattapadhyay (1963) and simplified by Ray (1998). The adoption score was expressed in percentage. The Adoption Index (AI) of sesame grower could range from 0 to 100, where 0 indicate no adoption and 100 indicate highest adoption.

Data collection and statistical analysis

Data were collected through using the interview schedule from the respondents during Sep 15 to Oct 25, 2014. Data were collected by the researcher himself through interview schedule from the farmers of the selected villages. The interview was conducted with the respondents individually in their respective houses. The SPSS (Statistical Package for Social Science) computer package was used to perform data management. Descriptive analytical parameters such as mean, range, number and percentage, standard deviation and rank order were used whenever necessary. Pearson's Product Moment Correlation Coefficient (r) was computed to explore the relationships between the dependent and independent variables.

Results and Discussion

Adoption of Modern Sesame Production Technologies by the Farmers

Adoption level on five practices have been computed separately and presented in Table 1. These practices were adoption of improved seed, adoption of recommended rate of fertilizer, adoption of weeding and thinning, adoption of irrigation and adoption of pesticide use.

Table 1. Adoption level of five recommended package of practices for adoption of modern sesame cultivation technologies

Recommended practices	Measuring unit	Score Ranges	Category	Farmers (%)	Mean	SD
Adoption of improved seed	Percentage	7.26 – 93.07	Low (up to 33)	50	38.94	22.28
			Medium (34-66)	36		
			High (above 66)	14		
Adoption of recommended dose of fertilizer	Percentage	7.26 – 93.07	Low (up to 33)	50	38.75	22.02
			Medium (34-66)	37		
			High (above 66)	14		
Adoption of weeding and thinning	Percentage	7.26 – 88.67	Low (up to 33)	50	38.15	21.37
			Medium (34-66)	36		
			High (above 66)	14		
Adoption of irrigation	Percentage	7.26 - 82.44	Low (up to 33)	53	35.26	18.00
			Medium (34-66)	39		
			High (above 66)	8		
Adoption of pesticide use	Percentage	0 – 80.51	Low (up to 33)	55	32.98	15.62
			Medium (34-66)	44		
			High (above 66)	1		
Overall adoption	Percentage	6.95 – 80.51	Low (up to 33)	51	36.58	19.21
			Medium (34-66)	37		
			High (above 66)	12		

Discussion on five recommended package of practices

Adoption of improved seed

The adoption of improved seeds of the respondents ranged from 7.26 to 93.07 against the possible range of 0 to 100. The average adoption was 38.94 with a standard deviation of 22.28. Based on the adoption scores the respondents were classified into three categories: “low adoption” (up to 33), “medium adoption” (34-66), and “high adoption” (above 66). The distribution of respondents according to their adoption of improved seeds has been shown in Table 1. Data contained in Table 1 revealed that the highest proportion (50 percent) of farmers fell under the low adoption category, while 36 percent had medium adoption and 14 percent had high adoption. Thus an overwhelming majority of the farmers had medium to high adoption. It is a good signal for the programme of yield maximization of sesame.

Adoption of recommended rate of fertilizer

The adoption of recommended rate of fertilizer of the respondents ranged from 7.26 to 93.07 against the possible range of 0 to 100. The average adoption was 38.15 with a standard deviation of 22.02. Based on the adoption scores the respondents were classified into three categories: “low adoption” (up to 33), “medium adoption” (34-66), and “high

adoption" (above 66). The distribution of respondents according to their adoption of recommended rate of fertilizer has been shown in Table 1. Data contained in Table 1 revealed that the highest proportion (50 percent) of farmers fell under the low adoption category, while 37 percent had medium adoption and 13 percent had high adoption. Thus an overwhelming majority of the farmers had low to medium adoption.

Adoption of weeding and thinning

The adoption of recommended rate of fertilizer of the respondents ranged from 7.26 to 88.67 against the possible range of 0 to 100. The average adoption was 38.15 with a standard deviation of 21.37. Based on the adoption scores the respondents were classified into three categories: "low adoption" (up to 33), "medium adoption" (34-66), and "high adoption" (above 66). The distribution of respondents according to their adoption of weeding and thinning has been shown in Table 1. Data contained in Table 1 revealed that the highest proportion (50 percent) of farmers fell under the low adoption category, while 36 percent had medium adoption and 14 percent had high adoption. Thus an overwhelming majority of the farmers had low to medium adoption.

Adoption of irrigation

The adoption of irrigation of the respondents ranged from 7.26 to 82.44 against the possible range of 0 to 100. The average adoption was 35.26 with a standard deviation of 18.00. Based on the adoption scores the respondents were classified into three categories: "low adoption" (up to 33), "medium adoption" (34 to 66), and "high adoption" (above 66). The distribution of respondents according to their adoption of irrigation has been shown in Table 1. Data contained in Table 1 revealed that the highest proportion (53 percent) of farmers fell under the low adoption category, while 39 percent had medium adoption and 8 percent had high adoption. Thus an overwhelming majority of the farmers had low to medium adoption.

Adoption of pesticide use

The adoption of recommended rate of fertilizer of the respondents ranged from 0 to 80.51 against the possible range of 0 to 100. The average adoption was 32.98 with a standard deviation of 15.62. Based on the adoption scores, the respondents were classified into three categories: "low adoption" (up to 33), "medium adoption" (34 to 66), and "high adoption" (above 66). The distribution of respondents according to their adoption of pesticide use has been shown in Table 1. Data contained in Table 1 revealed that the highest proportion (55 percent) of farmers fell under the low adoption category, while 44 percent had medium adoption and only 1 percent had high adoption. Thus an overwhelming majority of the farmers had low to medium adoption. The findings indicate that many farmers in the study area did not regularly use balanced fertilizer. This might be due to fact that like other crops, farmers in general, were not serious about using balanced fertilizer.

Overall adoption of modern sesame production technologies

The adoption of modern sesame production technologies of the respondents ranged from 6.95 to 80.51 against the possible range of 0 to 100. The average adoption was 36.58 with a standard deviation of 19.21. Based on the adoption scores the respondents were classified into three categories: "low adoption" (up to 33), "medium adoption" (34 to 66), and "high adoption" (above 66). The distribution of distribution of respondents according to their adoption of improved seeds has been shown in Table 1. Data contained in Table 1 revealed that the highest proportion (51 percent) of farmers fell under the low adoption category, while 37 percent had medium adoption and 12 percent had high adoption. Thus an overwhelming majority of the farmers had low to medium adoption. For clarity of understanding a bar diagram has been presented in Fig. 1.

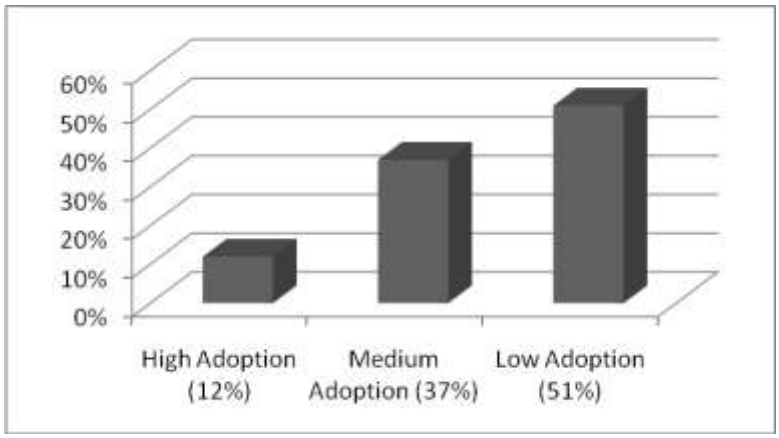

Fig.1. Farmers' adoption of modern sesame production technologies measured according to their extent of adoption.

Factors related to adoption

Relationship between the selected sesame growers' characteristics & other factors (16 factors) and their adoption of modern sesame production technologies were ascertained by the Pearson's product moment coefficient of correlation and the summary of the result has been presented in Table 2.

Out of sixteen characteristics, thirteen namely: education of the farmers, farm size of the farmers, cropping intensity, family annual income, training exposure of the farmers, extension media contact, innovativeness, cosmopoliteness, agricultural knowledge on sesame cultivation, credibility of extension agents, risk orientation, suitability of technology, profitability of technology had significant and positive relationship with their adoption of modern sesame production technologies and rest three factors namely age, family size and organizational participation shown no significant relationship with their adoption.

Table 2. Co-efficient of correlation of the selected characteristics of the respondents and their adoption of modern sesame production technologies (N = 100)

Selected characteristics of the farmers and others factors	Co-efficient of correlation ('r')
Age	0.047
Education	0.209*
Family Size	- 0.166
Farm Size	0.252*
Cropping Intensity	0.466**
Family Annual Income	0.203*
Training Exposure	0.580**
Extension Media Contact	0.574**
Innovativeness	0.376**
Cosmopoliteness	0.223*
Organizational Participation	0.154
Knowledge on sesame cultivation	0.307**
Credibility of the extension agents	0.401**
Risk Orientation	0.365**
Suitability of the technology	0.206*
Profitability of the technology	0.522**

***** = Correlation is significant at the 0.05 level (2-tailed).
****** = Correlation is significant at the 0.01 level (2-tailed).

Constraints faced by the Farmers in adoption of modern sesame production technologies

As many as 13 constraints were included in constraints confrontation scale. The constraints score ranged from 9 to 25 against the possible range of 0 to 39. The mean and standard deviation of the score were 14.92 and 3.11, respectively (Table 3).

Table 3. Distribution of sesame growers according to their constraint confrontation

Categories	No. of Farmers	Mean	SD
Low (up to 13)	37		
Medium (14-26)	63	14.92	3.11
High (>26)	0		

Rank order of the constraints confrontation by the sesame growers

The extent of constraints faced by the farmers in adopting modern sesame production technologies in terms of Constraints Facing Index (CFI) along with their rank order based on the CFI have been presented in the Table 4. Farmers gave their responses as high, medium, low and not at all against each problem included in problem confrontation scale.

Table 4. Ranked order of the constraints faced by the farmers in adopting modern sesame production technologies

Sl No.	Constraints	High (3)	Medium (2)	Low (1)	Not at all (0)	CFI	RO
1.	Irrigation problem	3	37	39	21	40.67	3
2.	Input cost	0	2	73	25	25.67	9
3.	Problem in getting credit	0	3	36	61	14.00	12
4.	Problem in getting technical information	0	0	62	38	20.67	10
5.	Lack of suitable land for sesame cultivation	0	33	38	29	34.67	4
6.	Lack of availability of improved seeds	1	7	62	30	26.33	8
7.	Problem in marketing	0	0	28	72	9.33	13
8.	Problem for low market demand	0	3	54	43	20.00	11
9.	Constraints in harvesting and processing for heavy rainfall.	26	50	18	6	65.33	2
10.	Problem for low market price	4	7	61	28	29.00	6
11.	Probability of being caused harm by heavy rainfall or drought	43	49	5	3	77.33	1
12.	Attack of insects and diseases	0	0	100	0	33.33	5
13.	Lack of farm labours	3	10	60	27	28.67	7

Notes: CFI= Constraints Facing Index, RO = Rank order

Data presented in the Table 4 indicated that among the problems, "probability of being caused harm by heavy rainfall or drought" had the highest score and accordingly it has been ranked in the first position. "Constraints in harvesting and processing for heavy rainfall" was the second most crucial constraints of the farmers in adopting modern sesame production technologies. These two constraints occur due to natural causes on which no control of human being. Human being could avoid these two constrains by the following of early cultivation practices. The third cited problem was "irrigation problem". There were not sufficient deep tube wells and available water in the rivers which was the cause of these constraints. Other constraints according to rank order are lack of suitable land for sesame cultivation, attack of insects and diseases, problem for low market price, lack of farm labours, lack of availability of improved seeds, input cost, problem in getting technical information, problem for low market demand, problem in getting credit, problem in marketing.

Conclusion

Findings of the study revealed that the highest proportion (51 percent) of the farmers had low adoption of modern sesame production technologies and an average adoption quotient was 36.58. Again 37 percent of the respondents were in medium category and only

12 percent respondents were in high adoption category. It could be concluded from the findings that there remains an ample scope to improve farmers' level of adoption regarding modern sesame production technologies. Among the thirteen identified constraints, probability of being caused harm by heavy rainfall or drought and constraints in harvesting and processing for heavy rainfall are the main constraints. As these constraints are natural and out of jurisdiction of intervening agencies, these may hinder the adoption of modern sesame production technologies. Some factors played a very significant role in adopting modern sesame production technologies. These factors were: suitability of technology, profitability of technology, risk orientation, credibility of extension agents and cropping intensity. All of these factors contributed positively and significantly to the adoption of modern sesame production technologies. These factors could be called as key to the success of any extension efforts.

Based on the above findings the following recommendations are put forward for maximizing production of modern sesame:

- Training exposure and extension media contact of the sesame growers showed high significant and positive relationship with their adoption of modern sesame production technologies. Farmers' level of knowledge should be increased through training, extension contact and other extension methods, in order to develop clear understanding about the use and benefit of technologies.
- Frequent contact with extension media can make farmers more innovative and cosmopolitan which will ultimately lead to their adoption of modern sesame production technologies. Hence, the concern authorities should take cognizance of these facts and take necessary steps to increase the frequency of extension contact of the farmers' and to provide necessary training sessions to the farmers.
- Increased adoption rate of modern sesame production technologies are important for meeting the national demand of edible oil. To achieve higher degrees of adoption of modern sesame production technologies, the farmers' knowledge, attitude and perception have to be increased. Henceforth, DAE and other extension service providing organizations should be given more emphasis to take necessary steps to increase knowledge and perception level of farmers for dissemination and adoption of modern sesame production technologies. For this regard Government and non-government organizations should provide effective training program on modern sesame production packages for the farmers at regular intervals to build their farming skills.
- DAE should strengthened the field level services by the field workers (SAAOs) to give farmers proper information, suggestions and advice regarding adoption of modern sesame production technologies.

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