Bangladesh J. Nuclear Agric. 33 & 34: 107-116 (December, 2020) *ISSN 0258-7130*

FACTORS CONTRIBUTING TO ADOPTION OF MODERN SESAME PRODUCTION TECHNOLOGIES IN SOME SELECTED AREAS

A. F. M. F. Hasan[1], M. B. Rahman[2] and M. R. Haider[1]

Abstract

The study was conducted to assess the extent of adoption and also to determine the contribution of the selected factors to the adoption of modern sesame production technologies by the farmers of five villages of five districts (Kushtia, Chuadanga, Faridpur, Jashore and Narail). Data were obtained from 100 randomly selected farmers in five selected villages of five districts using the interview schedule. Data were collected from the sample during 15 September to 25 October, 2014. 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. Six factors out of 16 contributed significantly to the adoption of modern sesame production technologies by the farmers. The contributing factors were extension media contact, profitability of technology, cropping intensity, suitability of technology, credibility of extension agents andcosmopoliteness and their contributions were 40.7%, 15.2%, 12.3%, 8.9%, 1.6% and 1.8%, respectively. These six variables explained 80.5 percent of total variation in adoption of technological package of practices in relation to the adoption of modern sesame production technologies.

Key words: Credibility of extension agents, risk orientation, suitability of technology and 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 in 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 (69.9%) followed by sesame (8.9%) and groundnut (invisible oil 7.8%) (BBS, 2016).Sesame is the second largest source of edible oil in Bangladesh next to mustardboth 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.

[1]Adaptive Research and Extension Division, Bangladesh Institute of Nuclear Agriculture, Mymensingh-2202, Bangladesh;
[2]Ex-MS Student, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh, *Corresponding author: feroj@yahoo.com

In India and Bangladesh, sesame 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. 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. In Bangladesh it is grown in almost all districts but grows well in greater Khulna, Faridpur, Pabna, Barisal, Rajshahi, JashoreKushtia, Comilla, 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 (20-40%), nutrient mining in existing cropping pattern, unavailability of seeds of suitable HYV varieties etc. are the main constraints of maximizing yield of oilseeds.At present, the domestic production of edible oil can only meet about 20% of the country annual demand and rest is imported which cost more than taka 20 billion. The national average yield of sesame is 0.63 t/ha which is very low compared to potential yield of 1.4 t/ha of modern varieties. 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, “Factors contributing to the adoption of modern sesame production technologies in some selected areas” along with the following objectives. The study was conducted (i) to assess the extent of adoption of modern sesame production technologies by the farmers in some selected areas and (ii) to determine the contribution of the selected factors in explaining the variation of adoption of modern sesame production technologies.

Materials andMethoeds

Study areas and source of data: Considering the sesame growing area the study was conducted in five villages such as Sadarof Kushtia, Alamdanga of Chuadanga, Modhukhali of Faridpur, Bagharpara of Jashore and Lohagora of Narail districts. All the 300 farmers of selected five villages who cultivated sesame constitute 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 DAE of the concerned area. Thus, 100 (33% of population) sesame growers were the sample of the study selected in a stratified way. They 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 was consisted as the independent variable whereas ‘Factors contribution to the 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 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). Adoption Index (AI) for modern sesame production technologies in this study was computed by using the formula developed by Chattapadhyay (1963) and simplified by Ray (1998). Adoption of modern sesame production technologies was measured for recommended package of five practices. 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 was collected throughout 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 analysis. Descriptive analysis 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 (Ray and Mondal, 2004). For computing contribution and variability of the independent variables in predicting adoption, stepwise multiple regression analyses were employed.

Findings and Discussion

Level of adoption

The overall adoption scores of the farmers on five packages of practices ranged from 6.95-80.51 against 0-100. The average adoption score was 36.58 with a standard deviation of 19.21. According to overall adoption score, the farmers were classified into three categories namely, "low adopter" (up to 33), "medium adopter"(34 to 66) and "high adopter" (above 66). The distribution of farmers on the basis of their overall adoption scores is shown in Table1.

Data presented 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 (88%) adoption. These results that the majority of the farmers adopted modern sesame production technologies but they have not adopted the recommended packages practices in full. For clarity of understanding a bar diagram has been presented in Fig. 1.

Table 1. Distribution of the farmers on the basis of their overall adoption

Categories	Farmers		Range	Mean	SD
	Number	Percent			
Low adoption (up to 33)	51	51			
Medium adopter (34 - 66)	37	37	6.95 - 80.51	36.58	19.21
High adopter (above 66)	12	12			
Total	100	100			

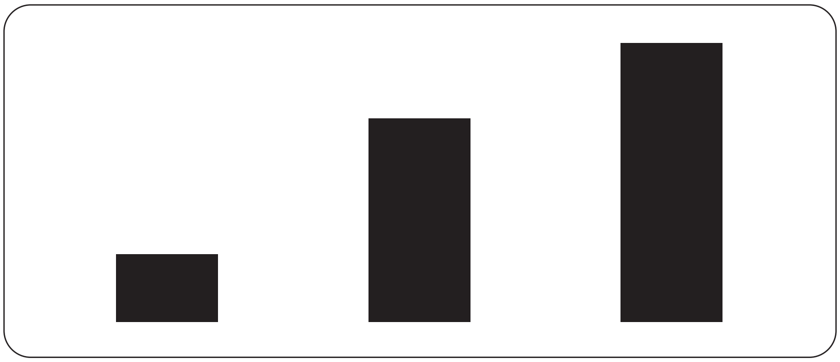

Fig.1. Farmers' adoption of modern sesame production technologies measured according to their extent of adoption.

Relationship between the Selected Growers's characteristics & other factors and their Adoption of Modern Sesame Production Technologies.

The relationship between the selected sesame growers' characteristics & other 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.

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).

Out of sixteen factors, thirteen factors 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 of the factors (age, family size of the farmers, organizational participation) shown no significant relationship with their adoption.

Contribution of selected independent variables to the adoption

The result of correlation analyses did not reflect effects and contributions of various factors (independent variables) to the adoption of modern sesame production technologies (dependent variable). For computing contribution and variability of the independent variables in predicting adoption, stepwise multiple regression analyses were employed in the present study. According to Draper and Smith (1981) the method of stepwise multiple regression analysis is to insert variables in turn until the regression equation is satisfactory. The stepwise multiple regression analysis indicated that out of sixteen variables, thirteen variables had significant relationship with the adoption in the Pearson correlation test. However all of the sixteen variables were used in the stepwise regression analysis but out of 16 only 6 variables finally entered in the model and contribution of these 6 variables were statistically significant. The whole model of six variables explained 80.5 percent of total variation in adoption of packages of practices in relation to the adoption of modern sesame production technologies. Remaining 10 variables were excluded from the model as their F values or tolerance was too small to continue. The computed results of stepwise multiple regression analysis is shown in Table 3.

Table 3. Changes in multiple R^2 for enter of a variable into the step-wise multiple regression analysis models for adoption

Variables entered in steps	R^2	R^2 Change	Variation Explaining Percentage	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)
Extension Media Contact (X_8)	0.407	-	40.7	.320**	0.204**
Profitability of technology (X_{16})	0.559	0.152	15.2	.660*	0.175*
Cropping Intensity (X_5)	0.682	0.123	12.3	.227**	0.467**
Suitability of technology (X_{15})	0.771	0.089	8.9	1.483**	0.327**
Credibility of extension agents (X_{13})	0.788	0.016	1.6	.271*	0.152*
Cosmopoliteness (X_{10})	0.805	0.018	1.8	.545*	0.194*

Coefficient of multiple determinant (R^2)= 0.805, Constant = -76.880, F Value = 36.561**

* = Significant at the 0.05 level of probability; ** = Significant at the 0.01 level of probability

Viewing at the significant contributions of the six variables to the variations in adoption, the researcher concluded that each of the six variables had significant effect on the adoption of modern sesame production technologies. The explicit form of the concerned regression equation is as follows:

$Y = -76.880 + 0.320X_8 + 0.660\,X_{16} + 0.227X_5 + 1.483X_{15} + 0.271X_{13} + 0.545X_{10} + e$

Where, Y=Adoption of modern sesame production technologies
X_8 = Extent of extension contact, X_{16} = Profitability of technology, X_5 = Cropping intensity, X_{15} = Suitability of technology, X_{13} = Credibility of extension agents, X_{10} = Cosmopoliteness and e = Error Term

Since the F value or tolerance of other 10 variables were too small to continue, it may be assumed that whatever contribution is there, it was due to six variables included in the stepwise regression model. The contributions of different variables are discussed below:

1. **Extension Media Contact:** Extension media contact of the farmers had a positive and highly significant relationship with their adoption of modern sesame production technologies. It indicates that the more extension media contact the farmers had, the more was their adoption of modern sesame production technologies. The extension contact strengthened the base of their knowledge, which definitely acts as motivator towards adoption of new technologies. Hussen (2001), Chowdhury (1997) also found the similar findings. This variable contributed the highest among all other variables, which accounted for 40.7 percent in predicting adoption. The adoption would be increased by 0.320 units with the one unit increase in "extension media contact" as indicated by the regression coefficient (0.320).

2. **Profitability of technology:** Profitability of technology of the farmers had a positive and highly significant relationship with their adoption of modern sesame production technologies. It means the technologies with higher profitability had higher adoption of modern sesame production technologies. Pathak and Majumdar (1985) study supports this findings. The perception about the profitability of technologies is important because a strong incentive and reward for any new act generally motivate the farmers. When they embank on the very high yield and profit given modern sesame varieties and package of practices might served as a strong force to convince the farmers and motivate them to go for these varieties and technologies. This variable contributed 15.2percent in predicting adoption. Based on regression coefficient (0.660) the adoption would be increased by 0.660 unit with the one unit increase in "Profitability of technology".

3. **Cropping Intensity:** Cropping Intensityof the farmers had a positive significant relationship with their adoption of modern sesame production technologies. This means that the farmers with high cropping intensity, the more were their rate of adoption due to cultivate short duration crop varieties such as Binadhan-7, Binamasur-5,Binatil-1, Binatil-2 etc in their fields. This variable contributed 12.3 percent in predicting the adoption. According to regression coefficient (0.227) the perception would be increased by 0.227 units with the one unit increase of "Cropping Intensity".

4. **Suitability of technology:** The result indicates that adoption will be increased with the increase of suitability of technologies. Technological suitability influences in adopting

new technologies. These are: proper knowledge about technology, adequate rainfall, and improved varieties appropriate to the land and climate, control over the unwanted volume of water during monsoon, adequate water holding capacity of the soil and drainage facilities. Hence, agro-ecological suitability of any technology enhances its adoption. This variable contributed 8.9 percent in predicting the adoption. According to regression coefficient (1.483) the perception would be increased by 1.483 units with the one unit increase of "Suitability of technology".

5. **Credibility of extension agents:** Credibility of extension agents to the farmers had a positive and highly significant relationship with their adoption of modern Sesame production technologies. The effectiveness of sources in communicating developmental information to the rural people depends on the people's perception of the credibility of the sources. This variable contributed 1.6 percent in predicting the adoption. The adoption would be increased by 0.271units with the one unit increase in "Credibility of extension agents" as indicated by the regression coefficient (0.271).

6. **Cosmopoliteness:** Cosmopoliteness of the farmers had a significant relationship with their adoption of modern Sesame production technologies. This variable contributed 1.8 percent in predicting the adoption. According to regression coefficient (0.545) the perception would be increased by 0.545 units with the one unit increase of "Suitability of technology". Similar findings were also observed by Chowdhury (1997). Cosmopoliteness changes farmers' attitude and make them active and also have a good orientation with new technologies. They get different information of latest technologies from different institutions and offices or from other sources. The farmers who have high cosmopoliteness i.e. out-going nature are more advanced to adopt modern sesame cultivation technologies.

All of the above six variables were considered as important in predicting the independent variable. Findings of the stepwise regression analysis revealed that extension media contactwas the most important factor which strongly influenced the adoption of modern sesame production technologies. Next important variable was profitability of technology followed by cropping intensity, suitability of technology, credibility of extension agents and cosmopoliteness. All of the factors contributed positively and significantly towards the adoption. It means adoption would be higher with the increase of these variables. Other variables pertaining to different elements of adoption namely age, education, family size, farm size, family annual income, training exposure, innovativeness, organizational participation, knowledge on sesame cultivation and risk orientation did not show any significant contribution to the adoption prediction in relation to modern sesame production technologies as these variables did not enter in the stepwise regression model. From these above findings it is apparent that above mentioned 10 variables had either minimum contribution or due to their multi-colinearity stepwise regression model excluded these variables from analysis.

Conclusion

Based on the findings the following recommendations put forward for maximize 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 makes 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.

References

BBS. 2016. Statistical Year Book of Bangladesh. Bangladesh Bureau of Statistics, Statistics Division, Ministry of Planning, Government of People's Republic of Bangladesh.

Chattapadhyay, S.N. 1963. A Study of Some Physchological Correlates of Adoption of Information in Farming. Ph.D. Thesis. Jadavpur University, Calcutta.

Chowdhury, M.S.A. 1997. Adoption of Selected BINA Technologies by the Farmers of Boyra Union in Mymensingh District. *M.S. (Ag.Ex.Ed.) Thesis,* Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Draper, N.R. and SmithH. 1981. Applied Regression Analysis. New York: John Wiley and Sons Inc.

Hasan, A.F.M. F., Begum, S., Furumoto, T.and Fukui, H. 2000. A New Chlorinated Red Napthoquinone from roots of *Sesamumindicum*. Biosci.Biotechnol.Biochem., 64: 873-874.

Hasan, A.F.M. F., Furumoto, T., Begum, S.and Fukui, H. 2001. Hydroxysesamone and 2, 3-epoxysesamone from roots of *Sesamumindicum*. Phytochemistry. 58: 1225-1228.

Hussen, M.A. 2001. Farmers' knowledge and adoption of modern sugarcane cultivation practices. *M.S.* (Ag.Ext,Ed) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Pathak, S. and MajumdarA.K. 1985. A Study of Psychological Factors Associated with Attitude, Knowledge and adoption of Suphala (unpublished master's thesis). Department of Agricultural Extension, Bidhan Chandra KrishiViswavidyalay, West Bengal, India.

Ray, G. L. andMondal, S. 2004. Research Methods in Social Sciences and Extensive Education (2nd ed.), New Delhi: Kalyani Publications.

Ray, G. L. 1998. Extension Communication and Management, Third Edition. Calcutta: NayaProkash.