Journal of Agroecology and Natural Resource Management
p-ISSN: 2394-0786, e-ISSN: 2394-0794, Volume 7, Issue 1; January-March, 2020, pp. 11-15
© Krishi Sanskriti Publications
http://www.krishisanskriti.org/Publication.html

Adoptation of Conservation Agriculture by the Farmers in a Selected area of Nabinagarupazila under Brahmanbaria District, Bangladesh

MA Islam[1], MN Uddin[1], S Ali[2] and MG Rabbani[2]

[1]Department of Agricultural Extension Education, Sylhet Agricultural University, Sylhet-3100, Bangladesh
[2]Department of Soil Science, Sylhet Agricultural University, Sylhet-3100, Bangladesh
E-mail: belaltcp@gmail.com

Abstract—*The main objective of the study was to assess the extent of adoption of conservation agriculture by the farmers as the practice is considered as only the means to improve productivity and food security of the country in a sustainable manner. Adoption of conservation agriculture was measured on the basis of 9 different practices which included zero tillage, minimum tillage, strip tillage, use of cowdung, use of quality seed, water management, crop rotation, practice seasonal soil rotation and re-use of surface crop residue in order to reduce soil and environmental degradation while sustaining crop production. Data were collected through personal interviewing from a sample of randomly selected 100 farmers of three villages namely Khagatua, Ratanpur and Shahpur of above mentioned upazila during September to December, 2017. The finding revealed that overwhelming majority (98%) of the respondents had medium to low adoption of conservation agriculture while only 2% had high adoption of this practice. About 80% of the farmers had highly favorable attitude towards the practices like use of organic fertilizers, minimum tillage, crop rotation and re-use of crop residues because these practices impacted on reducing soil erosion, labour cost, time and fuel cost of crop production. Results of correlation analysis indicated that farm size and annual income jointly may influence adoption decision of farmers about conservation agriculture. On the other hand, lack of conservation agriculture knowledge, low crop yield, increased cost for weed management, sale or preferential use of crop residue, inability to control livestock grazing, insufficient credit, and inadequate extension service hindered the adoption of conservation agriculture.*

Keywords: *Conservation agriculture, Different practices, Adoption, Attitude, Farmers.*

1. Introduction

Bangladesh is predominantly an agricultural country. Agriculture is the heart of Bangladesh economy where more than 80% farmers are smallholder having land less than 1.0 hectare. The rural economy constitutes a significant component of the national GDP with agriculture including crops, livestock, fisheries and forestry. In order to feed the increasing population of Bangladesh, priority was given to produce more food through intensification of land usage (Akteruzzaman*et al.*, 2012). For a shorter period, Bangladesh has attained self-sufficiency in food production but long term use of chemical fertilizer and pesticides in conjunction with monoculture of cereal crops without any organic fertilizer result in lack of organic matter content which causes a lot of problems to the soil health. As a result soil fertility and productivity is decreasing day by day (Kafiluddin and Islam, 2008).

In this context, introduction of conservation agriculture practice is becoming increasingly important in overcoming the problems of declining agricultural productivity in a developing country like Bangladesh. Conservation agriculture practice is an approach to manage agro-ecosystems for improved and sustained productivity, increased profits and food security while preserving and enhancing the resource base and the environment. It can be defined as a concept for resource-saving agricultural crop production that strives to achieve acceptable profits together with high and sustained production levels while concurrently conserving the environment. Ali *et al.* (2019) evaluated the status of vermicompost farming in Bangladesh and declared that commercial vermicompost farming has emerged as an alternate profitable farming enterprise for the growers. Conservation agriculture practice and indicated that farmers produced 39% more output in conservation agriculture practice compared to conventional farming practice.

FAO (2007) has determined three key principles in the process of conservation agriculture practice which are continuous minimum mechanical soil disturbance; permanent organic soil cover; and diversified crop rotations. Also, community based movement on conservation agriculture practice may contribute to livelihoods and empowerment of communities (Rahrnan, 2001). Although this farming aims to help farmers to earn more income with reduced amount of labor, irrigation and other high energy external input costs; keep land healthy and productive; and conserve natural environment (Lampkin and Padel, 1994); about 8-10% farmers around the world follow this practice (Parrott et al., 2006; Willer et a1.,2008). In

economic sense conservation agriculture practice performs better than conventional farming. Savings on inputs may help to bring benefits forward by decreasing the cost of crop production. Cover crops may reduce the cost of labor, fertilizer, fuel for subsequent crops and have a positive effect on crop yield. It is possible that using a leguminous cover crop in one crop season can decrease the need for nitrogen fertilizer for the subsequent crop, cutting fertilizer costs over the span of just one season. Bicultural (grass and legume) cover crops can increase crop yields by an average of 21% (Miguez and Bollero, 2005). Crop rotations, especially those involving three or more crops, have a positive effect on the yield of crop compared to traditional crop rotations. A properly managed crop rotation is not associated with any yield decrease; rather it has the greatest potential to increase the yield.

Modalities of such farming have been described in a good number of literatures. A modest attempt has been made research on farm-level economic impacts of conservation agriculture practice in Ecuador and found that here to review the previous research studies which are: Nguema*et al.* (2013) conducted a specific cover crops/ crop rotations and reduced tillage designed to reduce soil erosion and increase so organic matter that can lead to increased incomes for farm households; Lai *et al.,* (2012) conducted a comparative economic and gender, labor analysis of conservation agriculture practice in tribal villages within Kendujhar district of Odisha state, India and revealed that legume rotation without minimum tillage was more profitable than legume rotation with minimum tillage, which was comparatively more profitable than conventional agriculture; Mazvimavi*et al.* (2072) performed a productivity and efficiency analysis of maize under conservation agriculture practice in Zimbabwe and indicated that farmers produced 39% more output in conservation agriculture practice compared to conventional farming practice; Uddin *et al.* (2011) evaluated the status of organic farming in Bangladesh and declared that commercial organic farming has emerged as an alternate profitable farming enterprise for the growers; and Dhaliwal and Singh (2004) evaluated the socioeconomic impacts of zero-tillage technology on wheat for different locations in nine erstwhile districts of Punjab, India and observed a significant decline in the cost of production due to less use of farm machinery, labor, agro-chemicals and higher yield due to less lodging of crop.

The literature reviews mentioned indicate that most of the studies debt with either crop profitability or productivity in conservation agriculture practice but these are not linked to the circumstance of Bangladesh. Therefore, to minimize the research gap, this study would be helpful at evaluating the impact of conservation agriculture practice on crop profitability and productivity in Bangladesh as compared to traditional agriculture, as well as examining the factors influencing adoption of this farming practice by the farming community in Bangladesh.

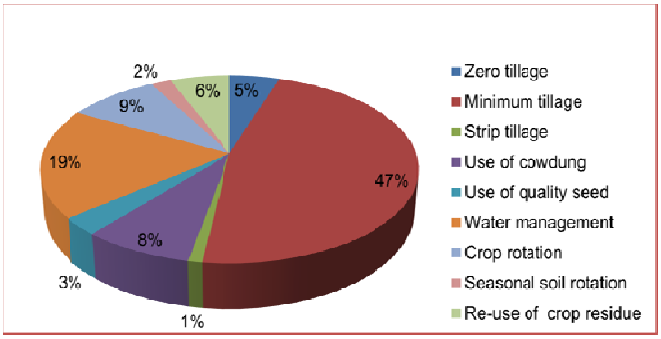

Figure Pie chart of adoption conservation agriculture practices component

2. Methodology

The study was conducted in Nabinagarupazilla of Brahmanbaria district under Chittagong division, Bangladesh. The study covered a range of soils and cropping systems for the evaluation of conservation agriculture practices of Nabinagarupazilla in Brahmanbaria district. Data and information were gathered through personal interview, focus group discussion (FGD), household survey, and case studies. Focus group were consisted of different sections of people such as two wheel Power tiller, machinery and spare parts sellers, owners, operators, and few conscious local community people. On the other hand, quantitative and qualitative data and information were gathered from the randomly selected users and service providers of machineries through conducting household survey using pre-tested interview schedules, some suitable case studies of successful service providers was conducted to supplement the study. Data were collected through personal interviewing from a sample of randomly selected 80 farmers of three villages namely Khagatua, Ratanpur and Shahpur of above mentioned upazila during September to December, 2017. After collection of data, they were coded, compiled, tabulated and analyzed in accordance with the objectives of the study. Qualitative data were transferred into quantitative data by means of suitable scoring techniques and local units were converted into standard units. The statistical measures such as number and percentage distribution were used for describing the variables. The coded data were put into the computer for statistical analysis. The SPSS computer package was used for processing and analyzing the data. For describing the variables of the study, the respondents were classified into appropriate categories. In developing categories, the investigator was guided by the nature of date and general considerations prevailing in the social system. For exploring the relationship between selected characteristics of the respondents and adoption of conservation agriculture computed through correlation analysis.

3. Results and Discussion

The characteristics of the farmers are described in this section which focused study as farmers' socio-economic profile. The selected characteristics included their age, level of education, farm size, family size, annual income, communication

exposure, farming experience and attitude towards conservation agriculture practices. The salient features of the characteristics of farmers were shown in Table 1.

Table 1: Socio-economic characteristics of the selected farmers

Sl. No.	Characteristics	Unit of measurement	Possible range	Observed range	Mean	Standard deviation
1	Age	Year	Unknown	22-85	52.37	13.68
2	Level of education	Year of schooling	Unknown	0-16	4.26	3.87
3	Farm size	Hectare	Unknown	0.42-4.01	1.16	0.72
4	Family size	No. of persons	Unknown	2-13	6.40	2.18
5	Annual family	'000' Taka	Unknown	58-760	257.27	132.54
6	Communication exposure	Score	0-42	7-23	12.81	2.32
7	Farm experience	Years	Unknown	3-70	27.18	14.43
8	Attitude towards conservation agriculture practices	Score	Unknown	-7.00-12.00	4.71	2.73

Table 2: Correlation co-efficient between the selected characteristics of the respondents and their Adoption of Conservation Agriculture practice

Characteristics of the farmers	Correlation of co-efficient value (r) value with adoption	Tabulated value significant		Remarks
		0.05 Level	0.01 level	
1. Age	- 0.071	0.196	0.256	Insignificant
2. Education	0.050			Insignificant
3. Farm size	0.463**			Positively significant at 0.01 level
4. Family size	- 0.050			Insignificant
5. Annual income	0.213*			Positively significant at 0.05 level
6.Communication exposure	- 0.016			Insignificant
7. Farming experience	0.067			Insignificant
8. Attitude towards conservation agriculture practice	- 0.035			Insignificant

* Significant at P> 0.05 (tabulated r = 0.196) ** Significant at P > 0.01 (tabulated r = 0.256)

The purpose of this section is to examine the relationship between the selected eight characteristics of the respondents towards their adoption of conservation agriculture' The selected characteristics included: age, level of education, farm size, family size, annual income, communication exposure, farming experience and attitude towards conservation agriculture practices. Each of the characteristics of the farmers constituted the independent variables while adoption of conservation agriculture was the dependent variable of this study. The relationship between age and educational level of the farmers and their adoption of conservation agriculture was measured by testing the null hypothesis "There is no relationship between age and educational level of the farmers and their adoption of conservation agriculture". It means that age had no effect and educational level had lower effect on adoption of conservation agriculture practice.

The computed Correlation co-efficient value of farm size and annual family income was found higher ‘r’ value than the tabulated value at 0.01 and 0.05 level of probability was statistically significant. Hence, the null hypothesis was rejected and it was concluded that the adopter of the farmer's conservation agriculture practice could vary positively significantly with the variation of their farm size and annual family income.

It is indicated that the computed Correlation co-efficient value of Family size, communication exposure, farming experience and farming attitude were found smaller ‘r’ value than the tabulated value at 0.05 level of probability was not statistically significant. Hence, the null hypothesis was accepted and it was concluded that the adopter of the farmer's conservation agriculture practice did not vary significantly with the variation of their family size.

The information presented in below showed that the extent of adoption of conservation agriculture practice was mostly hindered due to low yield due to minimum tillage, ever weed infestation due to minimum tillage, crop residue was not used as fuel, increased cost for weed management and so on. Data contained in the table 3, reveals shows that the adopters mostly face the problem 'Ever weed infestation due to minimum tillage. Weed is not uprooted in minimum tillage. Increased cost for weed management. But farmer cannot do that due to follow crop rotation. The other problems according their computed score were less production due to minimum tillage, inadequate training facilities, crop residues cannot used as animal feed, Lack of cooperation, crop residues cannot used as fuel, lack of proper knowledge and crop rotation boring is work.

From below chart here highest number of adoption of conservation agriculture practice are minimum tillage which was 19% and lowest number was strip tillage that is 1%. Maximum number of farmers in this Upazila are concern about the adoption of conservation agriculture practice but their accepting tendency is low.

Table 3: Distribution of the farmers according to rank order of problem confrontation by the farmer's extent of hindrance caused in farming

Sl. No.	Problems	Very much 3	Much 2	Little 1	Not at all 0	Computed score	Rank order
1	Low yield due to minimum tillage	0	16	82	2	114	3
2	Ever weed infestation due to minimum tillage	90	10	0	0	290	1
3	Crop residues cannot used as animal feed	2	1	44	53	52	5
4	Crop residues cannot used as fuel	0	2	31	67	35	7
5	Crop rotation is boring practices	0	0	10	90	10	9
6	Increased cost for weed management	49	50	0	1	247	2
7	Inadequate training facilities	1	8	73	18	92	4
8	Lack of proper knowledge	0	3	27	70	33	8
9	Lack of cooperation	1	4	40	55	51	6

4. Conclusion

- Adoption behavior of the farmers in relation to conservation agriculture practices is not satisfactory but majority of the farmers had highly favorite attitude towards this practice.
- Significant relationship for both farm size and annual income with the conservation agriculture revealed that higher market price of the produce of the conservation agriculture would enhance adoption of this practice.
- Agricultural knowledge boost up farmers participation in adopting to practice conservation agriculture and development agricultural sector.

5. Recommendation

-In order to increase adoption of conservation agriculture practices by the farmers, it is necessary for the Government and the development agencies to provide adequate technical support, extension service in addition to education, income generating opportunity.

-The present study age, Level of education, family size, communication exposure/ farming experience and attitude towards conservation agriculture practices had no significant relationship with their adoption of conservation agriculture practice. In this connection further verification is necessary.

-Research should also be undertaken to identify the factors causing hindrance towards adoption of conservation agriculture practices.

-Massive and relevant training prograrnme should be conducted for the farmers to upgrade their awareness and understanding of the knowledge about adoption of conservation agriculture practices. The various GOs and NGOs should be involved in the conduction of training programme.

References

[1] Akteruzzaman M, Jahan H, Haque M D 2012: Practices of conservation agricultural technologies in diverse cropping systems in Bangladesh. Bangladesh j. Agic. Econs., 35 (1-2), pp. 143-144.

[2] Dhaliwal H S, Singh J 2004: Socio-economic impact of zero-tillage technology in wheat in Punjab. Centre for Advancement of Sustainable Agriculture, National Agriculture Science Centre, New Delhi, India.

[3] FAO 2007: Food and Agriculture Organization of the United Nations

[4] Kafiluddin A, Islam M S 2008: Fertilizer distributions, subsidy, marketing, promotion and agronomic use efficiency scenario in Bangladesh. Presented at IFA Crossroads Asia-Pacific 2008, Melbourne, Australia.

[5] Lai C, Chan C, Halbrendt J, Shariq L, RouI P, Idol T, Ray C, Evensen C 2012: Comparative economic and gender, labor analysis of conservation agriculture practices in tribal villages in India. International Food and Agribusiness Management Review, 15(1), PP. 73-86.

[6] lampkin N H, Padel s 1994: The economics of organic farming. An international perspective. Cab International, Oxon, U.K

[7] Mazvimavi K, Ndlovu P V, Henry A, Murendo C 2012: Productivity and efficiency analysis of maize under conservation agriculture in Zimbabbwe. Presented at international Associassion of Agricultural Economists Conference, FoZ do Iguacu, Brazil.

[8] Miguez F E, Bollero G A 2005: Review of corn yield response under winter cover cropping systems using meta-analytic methods. Crop Science, 45(6), pp. 2318.

[9] Nguema A, Norton G W, AlwangJ,Taylor D B, Barrera V, Bertelsen M 2013: Farm-level economic impacts of conservation agriculture in Ecuador. Experimental Agriculture, 49 (1), PP. 134-147.

[10]Parrott N, Olesen J E, Hogh-Jensen H 2006: Certified and non-certified organic farming in the developing world,. Global development of organic agriculture: Challenges and Prospects. CAB International, Wallingford, Oxon.

[11] Rahman M S 2001: Knowledge, Attitude and Adoption of the Farmers Regarding Aalok 6201. Hybrid Rice in Sadar TJpaziTa of Mymensingh District. (Unpublished Master's Thesis). Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

[12] S Ali and MA Kashem. 2019. Vermicompost production and marketing system from different organic materials using of the earthworm to ensure soil health. 10th One health Bangladesh Conference, 2019. Abstract book. 76p.

[13]Uddin M N, Ahmed S, Halim G M A 2011: Status of organic farming in Bangladesh. Country paper submitted to regional workshop on "ANSOFT' of AFACI PAN-ASIAN Project, RDA, Suwon, Korea.

[14] Willer H, Yusi M, Menzler, Sorensen N 2008: The world of organic agriculture statistics and emerging trends 2008, main results. The World of Organic Agriculture, Bonn.