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Changes of farmers knowledge attitude and practices in rice seed production

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Abstract
Present study was undertaken to assess the impact of 'Seed Production Project' of the Department of Agricultural Extension (DAE) by exploring the changes in knowledge, attitude and practices of the beneficiaries. Data were collected by the researchers from randomly selected 205 beneficiaries of 12 villages of three project upazila using pre-designed interview schedule. 'Before-after study without control' method was adopted for assessing the project impacts. Seed production project yielded significant improvement in knowledge, attitude and practices (production, processing and storage) of beneficiaries. They become conscious about 'good quality of seed and seedling', 'optimum seedling age', ' use of balanced fertilizer', 'critical stages of rice for nitrogen application' and 'good quality of seed container'. Focused respondents were moderately to highly maintaining the requirements in production, processing and storage stage to facilitate quality rice seed. However, there is ample scope to improve on proper land selection and preparation, removal of plant debris, storage structure and maintaining atmospheric variables.

Keywords: Rice, Seed, Knowledge, Attitude, Practice, DAE.

1. Introduction

1.1General Background

Rice is the staple dietary item for the people and per capita rice consumption is about 166 kg/year (BBS, 2010)[7]. Rice alone provides 76% of the calorie intake and 66% of total protein requirement (Bhuiyan*et al*., 2002)[8]. It employs about 43.6% of total labor forces (BBS, 2010, HIES, 2009)[7, 20]. Rice covers about 81% of the total cropped area (BBS, 2010)[7]. Rice alone shares about 96% of the total cereal food supply. Furthermore, rice alone contributes about 9.5 % of the total agricultural. In agriculture, seed is a vehicle to deliver almost all agro-based technological innovations so that the farmers can exploit the genetic potential of new varieties. The availability, access and use of seed of adaptable varieties are, therefore, the major determinants to attain the efficiency and productivity of other packages like irrigation, fertilizers and pesticides. This is one of the vital keys to increase crop production, enhance food security and alleviate rural poverty particularly in the developing countries. Good seed alone can maximize yield to the extent of 20-25%. If the seed is capable of giving higher yield, then the use of other inputs like fertilizers, water and pesticides becomes fruitful; otherwise, any input use becomes wasteful (Huda, 2001)[21]. The production of quality seed is thus very important and that is why the Government of Bangladesh has recently given the seed sector a `Topmost Priority' status. The seed industry in Bangladesh comprises both public and private sector initiatives. Among the cereal crops rice, wheat and maize together play a vital role in maintaining food security and hence, the economy of the country. The annual seed demand for each of these three crops is about 313.96, 72.00 and 3.30 thousand tons, respectively but the public sectors can meet up only 23.67, 26.46 and 7.06%, respectively (MoA, 2006).

Quality seed production and preservation at farmers' level following the modern techniques can minimize the seed shortage as well as storage losses. But the farmers' knowledge about the modern technology on seed production, processing and storage are very limited, as they do not follow the appropriate techniques from the beginning of crop production to post-harvest processing. It has been noted that farmers differ from one another in personality, cognitive ability, attitudes and objectives and these differences are likely to be reflected in their management decisions (Austin *et al*., 2001; Power *et al*., 2013)[5, 29]. Therefore, the farmers' homegrown seed is of low quality in terms of purity, germination capacity, vigour, disease and insect resistance. To achieve the aforesaid goals, the government seed production project provided training, technical advices, micro capital grant, credit and marketing for the farmers. The introduction of the project in the community initiated many impacts on livelihood for individual and among households (Anonymous, 2007)[3]. It is important now to explore the impact of the project interventions in relation to changes in knowledge, attitude and practices of the beneficiaries.

1.2 Review of Literature

Azman *et al*. (2013)[6] noted that knowledge can be referred to as organized or processed information or data and is crucial in any innovation process. Knowledge is often created by a combination of education and experience and farmers use knowledge to arrive at decisions that influence agricultural management practices (Mangan and Mangan, 1998; Brosius *et al*., 1986; Grossman, 2003)[25,9,19]. Calvo-Iglesias *et al*. (2006)[12] added that an understanding of farmers' knowledge is useful for understanding changes that occur in the landscape at a local level, especially the terms of changes in land-use and cultural practices. If agricultural change agents do not

understand the knowledge and priorities of producers, improved management will be difficult, if not impossible, to realize (Morales and Perfecto, 2000; Grossman, 2003)[26, 19].

Attitudes can be strong predictors of behaviors or the acceptance of ideas (Ajzen, 1991; Dietz *et al*., 2005; Arbuckle *et al*., 2013)[2, 15, 4]. Policy-makers have recognized that the way in which farmers adjust to changes in agricultural policy depends moderately on the latter group's attitudes and mind-sets (Gorton *et al*., 2008)[18]. When providing new technology to farmers, understanding their perceptions and attitudes can shed light on why farmers adopt technologies beyond their economic benefits and which industry researchers should focus on to encourage the adoption of these technologies (Adrian *et al*., 2005)[1]. Many historians have argued that the evaluation of farmers' knowledge and perceptions is essential for the development of management strategies that match farmers' aspirations and are thus likely to be adopted (Chitere and Omolo, 1993; Rubia *et al*., 1996; Tanzubil and Yakubu, 1997; Nyeko *et al*., 2002)[13, 30, 33,27]. Yang *et al*. (2005)[35] added that the evaluation of farmers' knowledge, perception and practices regarding a new technology is essential for the development of strategies to sustain the new technology. Elsewhere, Dawoe *et al*. (2012)[14]have argued that farmers' knowledge and perceptions of soils, as well as local indicators of soil quality, are important for the development of technologies and management interventions. Nyeko *et al*. (2002)[27] investigated farmers' knowledge and perceptions of pest problems in agroforestry in Kabale district, Uganda, to provide the information necessary to promote the development of appropriate technologies and strategies to improve local systems of plant protection. Garforth *et al*. (2006)[17] studied farmers' attitudes towards techniques for improving oestrus detection in dairy herds in southwest England to identify the causes of the low implementation rate of this technology and to improve the design of future knowledge transfer activities in this field. Odeyinka *et al*. (2007)[28] investigated crop farmers' perceptions of Moringa oleifera in Nigeria to improve strategies to popularize this plant among Nigerian farmers. Brown and Khamphoukeo (2007)[10] studied farmers' rodent management knowledge, attitudes and practices in the upland and lowland farming systems of the Lao People's Democratic Republic to better understand rodent management problems, which are a serious constraint for low farmers in these farming systems. Litsinger *et al*. (2009)[24]studied how farmers' knowledge, attitudes and practices were elicited in the development of integrated pest management programs for rice in Asia. Stuart *et al*. (2011)[32] studied farmer's knowledge, attitudes and practices related to rodent pests and their management in the lowlands of the Sierra Madre Biodiversity Corridor, Philippines, to understand the attitudes of farmers towards community actions for rodent management. Bruijnis *et al*. (2013)[11] studied dairy farmers' attitudes and intentions towards improving dairy cow foot health to improve the approaches used to address foot disorders in dairy cattle.

Several studies have attempted to investigate farmers' knowledge and attitudes towards new agriculture schemes. Gorton *et al*. (2008)[18]studied farmers' attitudes toward agricultural policy and farming futures in the context of the 2003 Common Agricultural Policy (CAP) reform to provide a better understanding of farmers' attitudes and behavioral intentions and, consequently, to generate insights into likely responses to a policy change. Xu *et al*. (2011)[34] studied the attitudes of farmers toward the New Rural Cooperative Medical Scheme in Northwest China one year after its introduction to guide policy-makers on how to improve the current national policy. Siebert *et al*. (2010) [31] studied the attitudes of farmers towards a policy approach that combines the instrument of set-aside farmland with agri-environmental measures under CAP to achieve environmental goals. The study aimed to determine what types of problems might arise for farmers in the course of implementing this concept as an agri-environmental measure. In the fertilizer context, farmers' local knowledge of soil fertility and management strategies plays a significant role in the fertility maintenance of farmlands (Dawoe *et al*., 2012)[14]. Jia *et al*. (2013)[22] added that knowledge training can help farmers reduce their N fertiliser use. An understanding of farmers' perceptions and attitudes towards the new technology being introduced is essential for a better understanding of the implementation behavior of these farmers (Enyong *et al*., 1999)[16].

1.3 Objectives of the Study

The main objective of this study was to measure the impact of Seed Production Project in changing knowledge, attitude and practices of the beneficiaries. The specific objectives were as follows:

- To assess the status of knowledge, attitude and practices of the beneficiaries before and after the project intervention.
- To measure the differences of knowledge, attitude and practices of the beneficiaries before and after the project intervention.

2. Methodology

The study was conducted in selected three districts namely Jamalpur, Gazipur and Manikgonj considering highly concentrated rice growing areas. Multistage proportionate random sampling technique was used in this study. At first three districts were selected purposively. Then three upazila of the three districts (one from each districts) were selected randomly. After that six blocks (two from each upazila) were selected on a random basis. Finally twelve villages (two from each block) were also selected randomly. From the selected twelve villages, a list of 467 beneficiaries of government seed production project were listed which constituted the active population for the study. Out of 467 farmers, 205 farmers were selected as sample of the study by following the formula developed Kothari (1990)[23]. Data were collected through pretested interview schedule during March to September 2012 through intensive survey by the researchers. After collection of data, all the information contained in the interview schedule was edited. All the collected data were then checked and cross checked, compiled, coded and entered into the computer for analysis and interpretation using Microsoft Excel and Statistical Package for the Social Sciences (SPSS). Qualitative data were converted into quantitative form.

2.1 Measurement of Knowledge

Knowledge of farmers in before and after the intervention of seed production project was measured using a "Teacher-Made

Test". The test items included 20 questions related to rice seed production technology. The scoring pattern was "2" for correct answer, "1" for moderately correct answer and "0" for wrong reply. The respondents were asked the question and the answers were recorded. Later these answers were evaluated and their total knowledge scores were calculated. To measure the differences of respondent knowledge in before and after the project intervention, paired't' test was employed.

2.2 Measurement of Attitude

Farmers' attitude towards the technology packages was measured using a summated rating (Likert type) scale. The scale was prepared with larger number of items initially and subjecting them to editing and screening in the light of pre-testing so as to include only the relevant items reflecting both positive and negative effect on a five point continuum. The items covered on all aspects related to the application of the given technology. Before administration, the scale was tested for its content validity and sufficient levels of reliability based on the pre-test results. The attitude of a respondent was measured by adding the total scores obtained for twenty item in the scale, by attributing 5 score for 'strongly agree', 4 score for 'agree', 3 score for 'undecided', 2 score for 'disagree' and 1 score for 'strongly disagree' responses in the case of positive items. In the case of negative statements the scoring pattern was reversed. The total scores were calculated by adding individual scores that each respondent obtained for all statements. To measure the differences of attitude in before and after the project intervention, paired't' test was employed.

2.3 Measurement of Practices

Skill can be measured only by performance test. Data collection was done when the crop was not in the field. That's why response of the respondents were recorded whether they had utilized the recommended practices in a high, moderate or low basis. The frequency and percentage of respondents were obtained. The frequency and percentage of respondents ranged from low, medium to high categories. To measure the differences of practices before and after the project intervention, paired't' test was employed.

3. Results and Discussion

3.1 Changes in Knowledge

Knowledge is an important domain to perform a job effectively. 20 knowledge statements were administered to record the responses of the respondents on their level of knowledge they had possessed before and after Seed Production Project.

Data presented in Table 1 reveal that before involvement with Seed Production Project, majority of the respondent couldn't answer most of the knowledge statements about quality seed production except moderate correct answer against'name of the high yielding variety of rice' (51.22%), 'suitable soil for rice' (64.39%), 'name of harmful insects of rice' (69.27%) and 'name of important diseases' (60%). But after involvement with Seed Production Project cent percent of the respondent could correctly mention the name of high yielding variety of rice along with majority correct responses on 'characteristics of good quality seed' (88%), 'important diseases of rice' (50.7%), 'seed rate' (74.6%), 'suitable soil type' (76.6%), 'appropriate moisture content of rice during storage' (72.7%), 'balanced dozes of NPK for rice production' (62.9%), 'harmful insect for rice cultivation' (88.3%), 'important stage of rice for irrigation' (69.3%), 'important stage for roguing' (77.6%) and 'best time to prevent admixture of seed' (64.4%). But still then majority (50.2%) of the respondents didn't have knowledge about the chemicals for seed preservation.

Table 1: Distribution of the respondents according to their level of knowledge on seed production before and after the project intervention

S. No.		BISPP			AISPP		
		High	Moderate	Not at all	High	Moderate	Not at all
1.	Mention 2 (two) characteristics of good quality seed.	2.44	21.95	75.61	88.8	1.5	9.8
2.	Name two high yielding variety of rice.	12.20	51.22	36.59	100	-	-
3.	What is the physical symptom of maturity and harvesting of rice crop?	-	35.12	64.88	6.3	93.7	-
4.	Name 2 (two) criteria for good quality seeding.	-	18.54	81.46	12.7	87.3	-
5.	Name 2 (two) important diseases of rice.	2.93	35.12	61.95	50.7	17.6	31.7
6.	What is appropriate seed rate for raising good quality seeding?	1.95	31.71	66.34	74.6	13.2	12.2
7.	What is the optimum age of seeding for planning?	-	28.29	71.71	17.1	82.9	-
8.	Name two important stages of rice for nitrogen application.	-	38.05	61.95	15.6	84.4	-
9.	Which soil type is suitable for quality rice seed production?	3.90	64.39	31.71	76.6	2.0	21.5
10.	Mention the appropriate moisture content of rice during storage.	-	16.10	83.90	72.7	7.3	20.0
11.	Name two qualities of good container for preservation of seed.	-	43.41	56.59	12.7	87.3	-
12.	Mention the balanced dozes of NPK for rice production.	-	28.29	71.71	62.9	7.3	29.8
13.	Name two important harmful insect for rice cultivation.	1.95	69.27	28.78	88.3	10.2	1.5
14.	Name two important diseases of rice	5.37	60.00	34.63	42.4	23.4	34.1
15.	Do you know the chemicals used for seed preservation?	-	8.78	91.22	21.0	28.8	50.2
16.	Mention two important stage of rice for irrigation.	2.93	34.63	62.44	69.3	7.3	23.4
17.	Name two harmful insect of storage.	2.44	22.93	74.63	43.9	45.9	10.2
18.	What is the important stage for roguing?	6.34	43.41	50.24	77.6	17.6	4.9
19.	Mention two important storage atmospheres for seed production.	1.95	35.61	62.44	49.3	37.6	13.2
20.	Which time is the best to prevent admixture of seed?	4.39	29.27	66.34	64.4	27.3	8.3

BISPP= Before Involvement with Seed Production Project, AISPP= After Involvement with Seed Production Project

Table 2 showed that mean value of knowledge on quality rice seed production after involvement with the Seed Production Project was higher than that of before involvement with the Seed Production Project. Except 'name of important diseases' and 'chemicals of seed preservation', there showed a significant differences in level of knowledge on quality seed production before and after involvement with the Seed Production Project.

Table 2: Comparison of knowledge level of the beneficiaries before and after the project intervention

S. No.	Characters	Mean		Mean diff.	t value	Sig(2 tailed)
		BISPP	AISPP			
1	Mention 2 (two) characteristics of good quality seed.	0.26	1.87	1.60	24.04**	0.000
2	Name two high yielding variety of rice.	0.75	2.00	1.24	14.67*	0.002
3	What is the physical symptom of maturity and harvesting of rice crop?	0.35	1.93	1.58	22.13**	0.000
4	Name 2 (two) criteria for good quality seeding.	0.18	1.87	1.68	26.78**	0.000
5	Name 2 (two) important diseases of rice.	0.40	1.33	0.92	10.43*	0.005
6	What is appropriate seed rate for raising good quality seeding?	0.35	1.61	1.25	15.06*	0.002
7	What is the optimum age of seeding for planning?	0.28	1.82	1.54	21.42**	0.000
8	Name two important stages of rice for nitrogen application.	0.38	1.84	1.46	19.31**	0.000
9	Which soil type is suitable for quality rice seed production?	0.72	1.74	1.02	12.67*	0.004
10	Mention the appropriate moisture content of rice during storage.	0.16	1.52	1.36	17.98**	0.001
11	Name two qualities of good container for preservation of seed.	0.43	1.87	1.43	18.34**	0.001
12	Mention the balanced dozes of NPK for rice production.	0.28	1.55	1.27	15.73*	0.002
13	Name two important harmful insect for rice cultivation.	0.73	1.86	1.13	13.52*	0.003
14	Name two important diseases of rice	0.70	1.19	0.48	5.08	0.007
15	Do you know the chemicals used for seed preservation?	0.08	0.70	0.61	6.97	0.006
16	Mention two important stage of rice for irrigation.	0.40	1.61	1.21	14.09*	0.003
17	Name two harmful insect of storage.	0.27	1.33	1.05	12.72*	0.004
18	What are the important stages for roguing?	0.56	1.72	1.16	13.89*	0.003
19	Mention two important storage atmospheres for seed production.	0.39	1.36	0.96	11.35*	0.005
20	Which time is the best to prevent admixture of seed?	0.38	1.5	1.18	13.96*	0.003

3.2 Changes in Attitude

To assess the attitude of the project beneficiaries towards the quality seed production, 20 attitude statements were administered to seek the response from the beneficiaries. Among the 20 statements, 10 statements were positive and 10 statements were negative. Responses of the respondents are presented in Table 3.

Table 3: Distribution of the respondents according to their attitude towards quality seed production

	Please express your attitude toward the following aspects	BISPP					AISPP				
		SA	A	N R	DA	SDA	SA	A	NR	DA	SDA
(+)	Seed production and preservation technology is important for expansion and increase prod, of modern varieties	2.93	9.76	31.71	46.34	9.27	60.00	23.90	16.10	-	-
(-)	High yielding characteristics of MV seed do not encourage the farmers in cultivating modern variety	12.68	21.95	32.68	20.98	11.71	2.44	10.24	17.56	40.49	29.27
(+)	Exchange of quality seed from farmers to farmers is the best method for availability of modern variety seed	5.85	16.59	37.07	31.71	8.78	32.20	45.85	16.10	5.85	-
(-)	Germination percentage of BADC seed is not always higher then farmers produced seed	20.00	32.68	25.37	21.95	0.00	15.12	22.44	21.46	35.61	5.37
(+)	Scarcity of quality seed and low storage facility hampers production	6.34	18.05	39.51	30.73	10.24	33.17	40.49	16.10	10.24	-
(-)	Roads and transport facility does not helps in distribution of quality seed	12.68	28.29	37.07	18.05	3.90	4.88	16.10	19.51	39.51	20.00
(+)	Roguing is very important of the time of tillering, panicle initiation and also before crop harvest	5.85	17.07	42.44	31.71	2.93	41.46	31.71	13.17	13.66	-
(-)	Demonstration of high yielding modern varieties(MV) do not help in dissemination of modern varieties	7.32	25.85	42.44	21.95	2.44	2.44	4.88	18.54	50.73	23.41
(+)	Quality MV seed supply from BADC is not sufficient	2.93	20.98	36.59	27.32	12.20	27.32	38.05	21.46	10.73	2.44
(-)	Quality seed production does not need much care and management from seeding to harvest	10.24	32.68	42.44	13.17	1.46	0.00	13.17	18.54	40.00	28.29
(+)	Training on seed production technology is helpful for rice growers in seed production, storage and marketing	3.90	11.22	37.07	36.59	11.22	41.95	29.27	18.54	10.24	-
(-)	Increase crop production does not depend on quality seed	10.24	38.54	36.10	11.71	3.41	2.44	20.49	18.54	37.56	20.98
(+)	Unavailability of quality rice seed is one of the main constraints in cultivation of HYV.	-	21.95	37.07	31.71	9.27	20.00	40.49	21.46	18.05	-
(-)	Cultivation of high yielding modern varieties is not always helpful to improve the economic condition of the fanners	13.17	41.46	38.05	6.34	0.98	5.37	19.02	22.93	31.22	21.46
(+)	Admixture of seed must be avoided at the time of threshing,	2.44	27.32	40.00	21.95	8.29	25.37	30.24	26.34	18.05	-

	winnowing and drying										
(-)	Insect and disease infestation is not high during seed production and storage	23.41	42.93	20.49	13.17	0.00	7.80	30.73	21.95	33.17	6.34
(+)	Publicity enhance the marketing of quality seed in great extent	3.41	8.78	22.93	33.17	31.71	31.71	24.39	30.73	13.17	-
(-)	Seed industry development enterprises is laborious and not so profitable	47.80	32.68	15.12	3.41	0.98	33.66	28.29	20.98	11.71	5.37
(+)	Lack of modern seed processing storage techniques deteriorate seed quality in great extent	-	5.85	20.98	22.93	50.24	2.93	23.90	20.49	31.71	20.98
(-)	Intensive cultivation of high yielding modern verity does not exhausts soil fertility	27.32	31.71	21.95	15.61	3.41	4.88	15.12	27.32	37.56	15.12

SA=Strongly Agree, A=Agree, NR=Not reply, DA=Disagree, SDA=Strongly Disagree,

Data contained in Table 3 revealed that before involve with Seed Production Project, except one positive statement regarding seed preservation (46.34 % DA) and some other negative statement i.egermination (32.68 % A), quality seed (38.54 % A), high yielding variety of seed (41.46 % A), insect and disease infestation (42.93 % A), marketing (33.17 % DA) and seed industry (47.80 % SA), most of the respondent didn't reply correctly about the statements of quality seed production techniques. But interestingly after involvement with Seed Production Project, most of the respondents showed agree (A) to strongly agree (SA) against most of the positive attitude statements and disagree (DA) to strongly disagree (SDA) against negative attitude statements. From this table it can be concluded that due project intervention attitude of the respondents has improved positively regarding quality seed production.

To test the significance of differences paired t-test was employed. The result of paired t test has been presented in Table 4. Overall mean weight value of the attitude statements of after involvement with Seed Production Project found higher than that of before involvement with Seed Production Project. Except few statements, all other statements showed significant positive differences between before and after involvement with the Seed Production Project (Table 4).

Table 4: Comparison of level of attitude of the beneficiaries before and after intervention of the Seed Production Project

S. No.	Please express your attitude toward the following aspects	Mean		Mean diff.	t value	Sig (2tailed)
		BISPP	AISPP			
1.(+)	Seed production and preservation technology is important for expansion and increase prod, of modern varieties	2.51	4.44	1.93	18.23**	.000
2.(-)	High yielding characteristics of MV seed do not encourage the farmers in cultivating modern variety	3.03	2.16	-0.87	9.56*	.004
3.(+)	Exchange of quality seed from farmers to farmers is the best method for availability of modern variety seed	2.79	4.04	1.25	13.34**	.001
4.(-)	Germination percentage of BADC seed is not always higher then farmers produced seed	3.51	3.06	-0.44	5.17	.008
5. (+)	Scarcity of quality seed and low storage facility hampers production	2.94	3.97	1.02	11.62*	.003
6.(-)	Roads and transport facility does not helps in distribution of quality seed	3.28	2.46	-0.81	8.97*	.004
7.(+)	Roguing is very important of the time of tillering, panicle initiation and also before crop harvest	2.91	4.01	1.10	12.45**	.001
8.(-)	Demonstration of high yielding modern varieties (MV) do not help in dissemination of modern varieties	3.14	2.12	-1.01	11.34*	.002
9.(+)	Quality MV seed supply from BADC is not sufficient	2.75	3.77	1.02	11.34*	.002
10.(-)	Quality seed production does not need much care and management from seeding to harvest	3.37	2.17	-1.20	12.69**	.001
11.(+)	Training on seed production technology is helpful for rice growers in seed production, storage and marketing	2.60	4.03	1.43	15.68**	.000
12.(-)	Increase crop production does not depend on quality seed	3.40	2.46	-0.95	10.07*	.003
13.(+)	Unavailability of quality rice seed is one of the main constraints in cultivation of HYV.	2.72	3.62	0.91	9.98*	.003
14.(-)	Cultivation of high yielding modern varieties is not always helpful to improve the economic condition of the fanners	3.60	2.56	-1.04	11.45*	.003
15.(+)	Admixture of seed must be avoided at the time of threshing, winnowing and drying	2.94	3.63	0.69	7.09*	.005
16.(-)	Insect and disease infestation is not high during seed production and storage	3.77	3.00	-0.76	8.56*	.005
17.(+)	Publicity enhance the marketing of quality seed in great extent	2.19	3.75	1.56	15.01**	.000
18.(-)	Seed industry development enterprises is laborious and not so profitable	4.23	3.73	-0.50	5.72	.007
19.(+)	Lack of modern seed processing storage techniques deteriorate seed quality in great extent	1.82	2.56	0.74	8.07*	.004
20.(-)	Intensive cultivation of high yielding modern verity does not exhausts soil fertility	3.64		-1.07	12.53*	.002

3.3 Changes in Practices

Quality seed requires intensive management practices in entire production, processing and storage period of seed. From this consideration responses of the respondents were counted on different practices they followed in production, processing and storage condition before and after the intervention of Seed Production Project.

3.3.1 Changes in Production Practices

There are 13 different practices considered as standard practices for quality seed production at farm level. Responses of the respondents on these 13 production practices were counted based on their level of utilization before and after the intervention of Seed Production Project.

Table 5: Changes in practice of seed production technologies by the respondents in the study area

S. No.	Technologies	BISPP			AISPP		
		Low	Moderate	High	Low	Moderate	High
1.	Selection of Seed plot (Leveled, weed free)	85.9	14.1	-	-	46.8	53.2
2.	Preparation of Land (Well prepared)	88.3	11.7	-	-	52.2	47.8
3.	Selection of Variety (high yielder, disease resistant)	90.2	9.8	-	1.5	39	59.5
4.	Seed Treatment (Chemical)	92.7	7.3	-	3.9	41	55.1
5.	Time of Planting (Normal planting time)	80.5	8.3	11.2	-	33.7	66.3
6.	Seed rate (Lower seed rate)	78.5	10.2	11.2	-	27.3	72.7
7.	Method of sowing/Transplanting (In rows)	76.1	8.8	15.1	-	25.4	74.6
8.	Fertilization (Balanced)	73.2	17.1	9.8	-	35.6	64.4
9.	Irrigation (As per requirement)	76.1	17.1	6.8	-	26.8	73.2
10.	Weeding (Good and effective weed control)	80.5	3.4	16.1	-	26.8	73.2
11.	Roguing (Adequate time)	85.4	14.6	-	-	31.2	68.8
12.	Disease and insect control	80	20	-	-	19	81
13.	Harvesting of Seed crops(Seed is fully matured)	82.4	17.6	-	-	23.4	76.6

Low = < 33 % use, Moderate = 33 to 66 % use, High = above 66 % use

Data presented in Table 5 reveals that most of respondents in different study area had low utilization of modern seed production techniques before involvement of quality Seed Production Project. But after intervention of quality Seed Production Project by DAE, except land preparation (moderate use) most of the respondents were able to highly utilize other quality seed production technique. Among all the production techniques, 81 % respondent highly followed disease and insect control technique having due involvement with quality Seed Production Project.

To measure the differences in production practices before and after intervention of project, paired t test was done. Results of paired‘t’ test has been presented in Table 6.

Table 6: Comparison between production practices before and after project intervention in the study area

S. No.	Technologies	Mean		t- value	Sig.(2 tailed)
		BISPP	AISPP		
1.	Selection of Seed plot (Leveled, weed free)	1.1415	2.5317	-39.896**	.000
2.	Preparation of Land (Well prepared)	1.1171	2.4780	-38.127**	.000
3.	Selection of Variety (high yielder, disease resistant)	1.0976	2.5805	-38.768**	.000
4.	Seed Treatment(Chemical)	1.0732	2.5122	-36.090**	.000
5.	Time of Planting (Normal planting time)	1.3073	2.6634	-27.325**	.001
6.	Seed rate (Lower seed rate)	1.3268	2.7268	-29.039**	.001
7.	Method of sowing/Transplanting (In rows)	1.3902	2.7463	-23.190*	.002
8.	Fertilization (Balanced)	1.3659	2.6439	-23.363*	.002
9.	Irrigation (As per requirement)	1.3073	2.9122	-31.477**	.000
10.	Weeding (Good and effective weed control)	1.3561	2.7317	-24.295*	.002
11.	Roguing (Adequate time)	1.1463	2.7659	-44.185**	.000
12.	Disease and insect control	1.2000	2.8098	-47.133**	.000
13.	Harvesting of Seed crops (Seed is fully matured)	1.1756	2.6878	-46.185**	.000

Table 6 revealed that mean value of different production practices before and after project intervention showed a mark differences where mean value of after project intervention was higher than mean value of before the project intervention. It also revealed that there is a significant difference in changing production practices before and after the project intervention.

3.3.2 Changes in Processing Practices

Effective processing is also a prerequisite for quality seed production. Hence, 12 different practices related to seed processing were considered as standard seed processing technique. Responses of the respondents in changing seed processing practices after involvement with the Seed Production Project has been presented in Table 7.

Table 7: Changes in practice of seed processing technologies by the respondents in the study area

S. No.	Technologies	BISPP			AISPP		
		Low	Moderate	High	Low	Moderate	High
1.	Removal of plant debris, like chaff, straw, flower parts, stem, leaf or other plant materials	87.8	12.2	-	-	65.4	34.6
2.	Separation of seed from non-seed materials	94.1	5.9	-	-	30.7	69.3
3.	Removal of seeds of others crops	87.4	12.2	-	-	26.3	73.7
4.	Removal of seeds of common and noxious weeds	88.3	11.7	-	-	26.3	73.7
5.	Removal of seed which is of an undesirable quality	91.7	8.3	-	-	21.5	78.5
6.	Separation of different varieties of the same crop	91.7	8.3	-	-	32.2	67.8
7.	Minimize of labor and operating cost	91.2	8.8	-	-	32.2	67.8
8.	Prevention of contamination of Seed lost	91.2	8.8	-	-	27.8	72.2
9.	Maintain uniform quality throughout the Seed lot	94.1	5.9	-	-	42.4	57.6
10.	Maintenance of lot identity.	93.7	6.3	-	-	37.6	62.4
11.	Maintenance of pre-leaning, basic cleaning and upgrading	79.5	20.5	-	-	29.3	70.7
12.	Seed treatment	88.8	11.2	-	-	41.5	58.5

Data presented in Table 7 reveal that most of the respondents opined that they had lowly maintained all the seed processing technique before the intervention of quality Seed Production Project. But after intervention of the project, except 'removal of plant debris, like chaff, straw, flower parts, stem, leaf or other plant materials' (moderate use) most of the respondents opined that they were able to highly utilize all required techniques for processing of seed. After the involvement of Seed Production Project, majority (78.5%) of the respondents highly practiced 'removal of seed which is of an undesirable quality' and 73.7 percent respondents highly practiced 'removal of seeds of others crops' and 'removal of seeds of common and noxious weeds'.

To measure the differences in seed processing practices before and after intervention of project, paired t test was done. Results of paired 't' test has been presented in Table 8.

Table 8: Comparison between seed processing practices before and after project intervention in the study area

S. No.	Technologies	Mean		t value	Sig.(2 tailed)
		BISPP	AISPP		
1.	Removal of plant debris, like chaff, straw, flower parts, stem, leaf or other plant materials	1.1220	2.3463	-41.919**	.000
2.	Separation of Seed from non-seed materials	1.0585	2.6927	-48.457**	.000
3.	Removal of Seeds of others crops	1.1220	2.7366	-47.385**	.000
4.	Removal of Seed which is of an undesirable quality	1.0829	2.7854	-53.186**	.000
5.	Separation of different varieties of the same crop	1.0829	2.5854	-46.413**	.000
6.	Minimize of labor and operating cost	1.0878	2.6780	-46.185**	.000
7.	Prevention of contamination of Seed lost	1.0878	2.7220	-48.457**	.000
8.	Maintain uniform quality throughout the Seed lot	1.1122	2.5756	-43.362**	.000
9.	Maintenance of lot identity.	1.0634	2.6244	-44.926**	.000
10.	Maintenance of pre-leaning, basic cleaning and upgrading	1.2049	2.7073	-42.919**	.000
11.	Seed treatment	1.0585	2.6780	-42.143**	.000

3.3.3 Changes in Storage Practices

Storage is most important stage to maintain quality of seeds. Farmers of Bangladesh are not so conscious to maintain good storage condition. That's why eight different practices were selected as recommended storage technology. Responses of the Respondents were recorded on their level of practice of these selected technology during storing the seeds in a before and after project intervention situation (Table 9).

Table 9: Changes in practice of seed storage technologies by the respondents in the study area

S. No.	Technologies	BISPP			AISPP		
		Low	Moderate	High	Low	Moderate	High
1.	Storage structured maintained to prevent rain, water and grain injury	88.3	11.7	-	-	48.3	51.7
2.	Storage atmosphere clean, dry and cool	90.7	9.3	-	-	48.8	51.2
3.	Storing of high quality Seeds such as cleaned, treated and highgerminationand vigor	90.7	9.3	-	-	35.6	64.4
4.	Seeds are undamaged	94.1	5.9	-	-	16.6	83.4
5.	Storages seeds are cleaned	75.6	24.4	-	-	20	80
6.	Maintenance of safe moisture limits	87.8	12.2	-	-	34.6	65.4
7.	Proper sanitation is maintained	87.8	12.2	-	-	33.2	66.8
8.	Effective and adequate pest control measure maintained.	88.8	8.8	2.4	-	28.3	71.7

From the data in Table 9, it was revealed that before the involvement of Seed Production Project most of the respondents had low access to modern techniques of seed storage but after the project involvement they opined that they were able to maintain modern techniques of seed storage. Among the eight different seed storage practices, highest proportion of practice was found in 'storage seeds are undamaged' (83.4%) and 80 percent respondents declared

high practice of 'storage seeds are cleaned' after the intervention of project.

To measure the differences in seed storage practices before and after intervention of project, paired 't' test was done. Results of paired 't' test has been presented in Table 10.

Table 10: Comparison between seed storage practices before and after project intervention in the study area

S. No.	Technologies	Mean		t- value	Sig (2 tailed)
		BISPP	AISPP		
1.	Storage structured maintained to prevent rain, water and grain injury	1.1171	2.5171	-40.817	.000
2.	Storage atmosphere clean, dry and cool	1.0927	2.5122	-41.085	.000
3.	Storing of high quality Seeds such as cleaned, treated and high germination and vigor	1.0927	2.6439	-44.546	.000
4.	Seeds are undamaged	1.0585	2.8341	-60.791	.000
5.	Storages seeds are cleaned	1.2439	2.8000	-44.733	.000
6.	Maintenance of safe moisture limits	1.1220	2.6537	-43.843	.000
7.	Proper sanitation is maintained	1.1366	2.7171	-44.363	.000
8.	Effective and adequate pest control measure maintained.	1.1220	2.6683	-41.753	.000

Table 10 revealed that mean value of the processing practices found higher in case of after the project intervention than before the project intervention. Among the different practices highest difference was found in case of 'storages undamaged seed' and lowest difference was found in 'Storage structured maintained to prevent rain, water and grain injury'. It also revealed that there is a significant difference of seed storage practices between before and after the project intervention.

4. Conclusion and Recommendation

Seed Production Project interventions of DAE have played significant positive roles in changing knowledge, attitude and practices regarding quality rice seed production. Improvement in knowledge, attitude and practices due to project intervention clearly emphasizes the importance of improving agricultural knowledge, attitude and practice level of the beneficiaries through undertaking different activities such as training, demonstration, motivational tour etc. Moreover, still there prevail scopes for further improvement. Improvement of profitability in seed production should be considered as the integrated outcome of the knowledge, attitude and practice dimensions.

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