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Farmers' willingness to use innovative indigenous technical knowledge for plant protection in major crop zones of Bangladesh

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Abstract

The article assessed the farmers' willingness to use selected innovative crop protection Indigenous Technical Knowledge (ITK). Regarding these, data were collected from purposively selected 150 farmers from12 villages of Jessore, Bogra and Comilla districts through a structured interview schedule. It was found that about seventy percent (68.67%) of farmers are willing to use innovative ITKs. However, their awareness was high on ordinary and easy ITKs. Farmers were willing to use ITKs because these are safe for man and crops, low cost and use available local resources. Those who were unwilling to use ITKs (31.33%) found them unknown, lack confidence on performance and difficult in use. Farm size (B= -6.186, p=.015), annual family income (B= -.042, p=.003), information need (B=.194, p=.001) and awareness on ITKs (B=-11.664, p=.000) found the important determinant for shaping farmers' willingness to use innovative crop protection ITKs. Therefore, state extension should promote ITKs for smallholder farmers with sufficient information delivery program and extensive awareness building campaign.

Keywords: Awareness; Field crops; Pest Management Practice; Sustainable Environment; Traditional Knowledge

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1. Introduction

Over the last century, agriculture has witnessed considerable growth and development for soothing global hunger. The development, if not sustainable, is a costly process that usually undermines the quality of nature and the environment. Therefore, achieving sustainable development goals is a global challenge. The convention on Biological Diversity of United Nations (UN) in its article VIII mentioned: "…*respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity*…."(United Nations, 2001).So, harvesting and promoting indigenous or traditional knowledge will help us making this earth sustainable and secure for our existence.

The role of traditional knowledge to protect the biodiversity and in achieving sustainable development goal is slowly being recognized internationally (Gadgil and Folk, 1993). The Austrian philosopher Paul Feyerabend questioned the validity of widespread uses of western science to determine the reality of a particular area. He pointed out, the knowledge in any form can be used onlyits own cultural context (Feyerabend, 1987). Therefore, modern scientific innovation will not bring any desirable change in the society if it is developed ignoring the indigenous technical knowledge (ITK) of that particular society. ITK, over time, sustained and continued in the long run by the use of local people. ITK resists exploitation of local resources and provides survival.It is locally appropriate and inspires the social responsibilities (Ghosh and Sahoo, 2011). Therefore, ITK use and development deserves our care and respect.

Bangladesh is a country of smallholder agriculture (Uddin, 2015) where ITKs are widely practiced. Pervez et al. (2015) disclosed that smallholders of Bangladesh due to their limited resources use low-cost ITKs. They further added that ITKs ensure proper use of household knowledge and other resources which otherwise could be spoiled. Therefore, a better farm economy is ensured through ITKs use. In crop agriculture of Bangladesh, farmers usually apply ITKs for diseases and insect-pest management. However, due to extensive advocacy and promotion of agro-chemicals the traditional ITKs are being eroded silently. Rural Bangladesh had a very rich stock of some millions of ITKs in its different parts. Our half-heartedness and over fascination with modern technologies has mined many ITKs,and we cannot get them back.

In contrast,stress sometimes boosts new ITK development. The recent bamboo tube-well use in India can be an excellent example of this. Conservation and promotional activities can transfer new ITKs to the similar cultural context. ITKs use will be squeezed otherwise. ITKs become squeezed when we treat them inferior. This squeeze-out leads confidence loss among the inheritors and brings irreversible knowledge loss (Howes and Chambers, 1979).

In this circumstance, the present study assumes that innovative ITKs would attract more attention of the users than that of routine-type one. Such innovative ITKs deserve more extensive farmers' awareness for use. Extension of such innovative ITKs use may lessen the pesticides dependency in crop pest management. The farm inputs cost will go down significantly. The improved bio-safety and ecosystem health will ensure a sustainable environment and development as well. Therefore, this supposition needs verification through the users' willingness survey. The study also attempts to describe the factors that shape the willingness of the users.

1.1. The innovation and dynamism in ITKs

ITKs are unique in the way it is developed and used by a specific community (Ndwandwe, 2013). When these unique ITKs come in contact with other individuals for the first time are perceived as innovation. Usually, a certain community does not seek the property rights of those ITKs developed by their ancestor or fellow colleagues. However, modernscientific innovation is institutionally organized (Howes and Chambers, 1979) whereas ITKs are mostly generated by a long time and exist as experiences of local communities. ITK is also a part of the culture and becomes changed when individuals migrate in a new agro-climatic area where they become compelled to invent or accept new ITK (Gupta, 2011). However, some of ITKs are lost, among many reasons, due to ethico-cultural transformation and generated in the same way. By the way, the generation of ITK is a slow-moving process. Over time people test them and select the promising one. The easy access and better cognition of the using procedure have made the local people reliant and habituated with ITKs. People of a given community,as a result, traditionally or subconsciously use ITKs for local decision making.

ITK is traditional not due to its old age but due to the way it is originated and used.Traditional does not mean that it is static but a checking door through which innovation comes out (Ghosh and Sahoo, 2011). Use of *Neem* (*Azadirachta indica*) plant as medicines and pesticides is a traditional practice. Modern science has proved the fidelity of *Neem*. *Neem*, now in the commercial industry, are widely used as anticholinergic, analgesic, antihistaminic, antihelminthic, antipyretic, antiprotozoal, bactericidal, antiviral, fungicides,contraceptives, insecticides and insect repellents (Bhat, 2008). The cosmetic, hair oil, shampoo, soap,tooth pastes, lubricant and propellant companies are extensively using *Neem* plant parts (Bhat, 2008). ITKs sometimes provide clue for innovation development. The traditional or conventional plant breeding is a 10,000 years old practice(Jauhar, 2006)through which nutritional improvement and development of quality protein of maize have been achieved (Vasal, 2002; Vasal et al., 2006). Therefore, ITKs are the foundation on which the modern breeding industries have been established. Being traditional ITKs are dynamically providing solutions for many current problems e.g. climate change adaptation(Swiderska et al., 2011), disaster risk reduction, agro-ecosystems (Moyo, 2010) and forest conservation(Gadgil et al., 1993), food security and natural resources management (IFAD, 2016).

ITK is a dynamic knowledge that continuously changes, modified and adopted with the local situation, culture and religious belief of a given community (Pushpangadan et al., 2002). All ITKs in its first instance can be regarded as a result of a scholarly process of making order out of the disorder. Such a diligently developed knowledge always have had aided in practical human needs (Levi-Strauss, 1966). Indigenous or traditional knowledge has been reinvented as a healthy model for the prospective relationship between nature and human (Mazzocchi, 2006). It is realized that ITKs strengthen the innovation system of the community essential for conservation of biodiversity and culture in the face of stress (Wekesa et al., 2016).

2. Methodology

The study was conducted in some 12 villages of Jessore, Comilla and Bogra districts of Bangladesh. Historically these three districts are the most famous for all sorts of agricultural production and thereby selected

purposively. Jessore as a floodplain area is situated in the southwest part of the country and bordering with India. Bogra covers an extensive area of rivers floodplain and tract of Barind area placing at the northern part of the country. Comilla remains close to the center of the county with good communication with the capital city. Cropping intensity of these three districts is almost double than that of the national average (186%). Therefore, pest management activities with ITKs are more visible in these areas of Bangladesh.

The researchers purposively identified 150 farmers are taking 50 from each of the three districts for an interview. The interview was administered with a structured interview schedule. Data was collected with the pre-tested instrument from January to March of the year 2017. The collected data were then processed for analysis.

The independent variables considered for this study were age, education level, family size, familyfarm size, annual household income, training experience, information need and awareness of the farmers on selected innovative ITKs. Independent variables were measured through an appropriate scale depending on the nature of the variables (Table 1). The dependent variable was farmers' willingness to use selected innovative ITKs. Farmers' willingness to use (WTU) was measured through binary choice questions- "yes" for willing and "no" for not willing to use some of those selected innovative ITKs. Before judging the willingness of the farmers, list of 20 selected innovative ITKs were explained for their awareness. WTU assumed the value 1 for willing and 0 for otherwise. Descriptive statistics such as mean (M), standard deviation (SD), mode etc. were used to assess the characteristics of the respondent. Logistic regression model were employed for determining the factors influences the willingness of the farmers. Uddin et al. (2016) in a Bangladeshi study also used a logit model in analyzing a binary willingness of the farmers. The logistic regression model is established on the principle that the likelihood of willingness to use, Pi rests on a vector of known variables (Xi) and vector of the unknownvariable (β). Thus:

$$P\text{i} = F(Zi) = F(\alpha + \beta Xi) = 1/[1+\exp(-Zi)] \quad \text{.....(1)}$$

Where,

$F(Zi)$ –Normal density function for the likely value of Zi;

α – Intercept; and

βXi– Accommodation of explanatory variables, in a manner that:

$$Zi = \log[Pi/(1-Pi)] = \beta_0+\beta_1X_1+.....+\beta_nX_n+\varepsilon \quad \text{.....(2)}$$

Where,

Zi = Natural logarithm of choice for the i^{th} observation;

ε = Error term.

All through the analysis process computer software SPSS (statistical package for social science) 16.0 version was used.

3. Findings and discussion

3.1. Crop farmers' demographic profile of the study area

Analysis of some selected characteristics in Table 1 shows that most of the farmers were in their middle age (45). It is revealed that the youngest one was 15 years old and the oldest one was 82 years old while the mean age was about 42 years. Farmers' education level ranged from illiterate to Master degree. The mean schooling level was class seven,andthe highest number of farmers belonged to class ten category. On an average, most of the farmers lived in the large family. In the case of land holding farmers were landless (<0.2 ha) to large size farm owner (>3 ha), however, most of them were the marginal landholder (0.21-0.6 ha). Income variation among the farmers' family was very high (6-500 thousand taka). However, their mean family annual income from all sources was about 80 thousand taka. Their average training experience on agriculture is 2 days, but most of them did not have any training. The mean of training need (46) indicates that farmers have a high degree of training need on different aspects of crop production ranging from land preparation to processing and marketing. Based on mean values (36.95) farmers' awareness on ITK can be labelled as moderate. The detailed of farmers ITK awareness can be found in the next chapter.

Table 1. Salient Features of Farmers Characteristics

Farmers characteristics	Measurement techniques	Possible Range	Range Observed	Mean	Standard deviation	Mode
Age	Full years old	0~	15-82	42.02	11.45	45.00
Education level	Year of schooling	0-22	0-18	7.23	4.84	10.00
Family size	Number of member	0~	2-10	5.81	1.92	6.00
Farm size	Hectare	0~	.04-3.6	0.67	0.39	0.60
Annual family income	Thousand taka	0~	6-500	80.28	70.32	90.00
Training experience	Number of days	0~	0-38	2.08	5.76	0.00
Information need	Rated score	0-64	22-64	46.00	9.52	52.00
Awareness on ITK	Rated score	0-80	9-70	36.95	10.69	32.00

3.2. Features of the selected crop protection ITKs

1- *Flattering Polythene Bag:* During *boro* rice season farmers set some stick in rice field and tie some flying polythene-bag at the top of the stick. Usually small and medium-sized polythene-bags are connected with those sticks using strong and light thread. The thread lets the flying bag flattering in the blowing air which makes an unpleasant sound. Therefore, many farmers use this ITK for repelling rice pests. This practice is revealed in rice Green Leaf Hopper (GLH) and Brown Plant Hopper (BPH) management in Comilla region of Bangladesh.

2- *Burnt Mobil Trap:* Burnt Mobil is a sticky substance and a suffocation agent to common small insects-pests. Many people treat it as a useless product. The innovative farmers, however, use it for

making insect killing trap. The torn polythene is drenched in burnt Mobil pot and let it placed in a crop field. Some farmers use small vessel instead of polythene. When small and soft-bodied insects like GLH, BPH or aphids come in contact, they become trapped and die. This practice is found in the Northern districts of Bangladesh.

3- *Smoking Vessel:* Farmers sometimes use the smoking vessel to control the cucurbit fruit fly. Usually, well-dried coconut shell and rice husk are taken in an earthen-vessel and fire is set to create smoke. Smoking suffocates fruit fly,and they easily fend off from the field. This ITK is very effective for controlling the fruit fly of bitter gourd.

4- *Tobacco Powder/Solution:* This ITK is used for controlling many rice pests. Farmers combine tobacco powder with urea fertilizer or sand and broadcast the mixer in a rice field. To be effective, the rice field must retain adequate water. In the absence of water, farmers sometimes mix tobacco powder with water and spray that solution to the paddy field. It makes the insects weak and thereby reduces the crop damage. Farmers of Patuakhali district usually use this ITK for controlling rice leaf-eating caterpillar and yellow stem borer.

5- *Earthing-up the Base of Vegetable Plants:* It helps reducing nursery bed diseases of vegetable seedling such as the root rot and damping-off diseases of brinjal, tomato, cauliflower, cabbage, bottle gourd etc. Raising the plant base by earthing-up from the furrow facilitates optimal irrigation management and keeps optimal moisture around the plant base. Farmers of vegetable growing region such as Jessore, Bogra and Comilla widely use this practice.

6- *Planting across the Wind Direction:* This practice helps plant from lodging and shatteringloss. It also controlsairbornediseases of many crops including powdery mildew and loose smut of wheat. Farmers all over the country knowingly or unknowingly use this ITK.

7- *Detergent Solution:* Considering the harmful effect of pesticides, the farmers do not use them for controlling vegetable pest. In that case, farmers spray detergent solution over the small and soft-bodied insects like an aphid, jassid, white fly etc. Removing these vectors also helps reducing viral disease outbreak.

8- *Removing Diseased Plant Parts*: Some farmers remove infected plant parts such as die-back infected branch and gall infected on the trunk by surgery and apply lime-copper sulphate paste to the wound for curing. Thisis widely used for fruit trees.

9- *Cow Dung-Urine Solution:* Farmers sometimes this unique method of pest management in rice. The cow dung and urine are diluted with adequate water for making a spray-able solution. The solution is then sprayed over the standing paddy field for controlling fungal infection and insects' infestation. Farmers also believe that it increases the taste of rice.

10- *Burning Nursery Bed with Crop Residues and Farm Waste:* Seedlings at nursery bed usually get infected by various soil-borne diseases such as damping-off, wilt, root rot etc. To get relief from these diseases, farmers sometimes burn the bed with farm waste and dried crop residues.

11- *Hanging Dead Bird:* Hanging dead martin or crow over the crop field makes the othersalive bird feared and their harmful attack decrease accordingly.

12- *Stitching the Anus of Rat:* At first, a single rat is caught using a trap. The anus of the rat is then stitched tightly so that it cannot excrete. It causes a terrible situation for that rat. As a result, the rat runs wildly across the field. This fearsome situation threatens other rats and they flew away from the crop field.

13- *Bishkatali Plant:* Bishkatali *(Polygonum hydropiper)* plant is cut into pieces and pounded for extraction. A little water is added with that extract. Pulse seed, especially the mung bean, are soaked in extract and sundried successively before sowing in the main field. This practice significantly reduces the fungal disease of mung bean particularly the Alternaria leaf spot.

Alternatively, the cut pieces of the plant can be incorporated with the soil to serve the same purpose.

14- *Black Berry Leaf Extract:* Black Berry leaves are pounded to collect extract. The extract is diluted with adequate water. Seeds of cereal crops are soaked in that extract before sowing in the field. This also ITK helps in reducing fungal diseases of cereal crops.

15- *Setting Banana Sacker:* The young banana plant is set in the crop field to control the rodents. Usually, owl likes to sit on the banana plant at night and prey the rodents. Porcupine on the other had avoids banana plant due to the possibility of fixing the spine with the soft banana plant.

16- *Bending Rice Plant:* During *aman* season particularly in a hot cloudy day, the attack of ear cutting caterpillar increases dramatically. At that time some farmers bend the rice plant which reduces the attack significantly.

17- *Application of Ash:* The sucking and leaf-eating insects are managed by ash application. For example, thrips, aphid and jassid are repelled through ash application. It also reduces the spreading of viral diseases by controlling the vectors.

18- *Ploughing and Exposing Land for Sun-Drying*: Farmers believe that sun drying of land disinfects the soil. Nematodes and other soil-borne pathogens are killed by exposing them to open sunlight.

19- *Spiny Stem of Jujube/Mander:* The rice plants are mildly beaten with thorny stem of Jujube or Mander to unfold the rolled leaf infested by leaf roller. It also significantly reduces the attack of rice hispa in the field.

20- *Molasses Trap:* Insecticide is mixed with molasses and placed in a crop field. The leg and wing of moth insects fixed with molasses and cannot move. If some insects like fruit fly move away they immediately die because of toxicity.

3.3. farmers awareness on selected ITKs

Farmers' awareness status on selected ITKs has been placed in Table 2. It shows that farmers had very good awareness (94.67%) on a rodent (R=1)and Jassid/Aphid (R=2) control using banana sacker and ash respectively. Prevalence of these pests are everywhere in Bangladesh. On the other hand banana plant and ash are also available at every household. Therefore, farmers became easily habituated to use those ITKs. Farmers (92%) also had good orientation to use polythene (R=3) as a repellent to sound-sensitive pests like birds, rodent and other large animal pests. They were also aware (74.67%) about use of spiny stem in controlling rice hispa (R=4). Very recent, after commencing commercial fruits cultivation, farmers (70%) learnt to hang dead bird for repealing other birds (R=5). More than half of the respondents (58.67%) are aware about using tobacco powder solution as insecticides (R=6). About same proportion (58%) of the farmers knows that bending ripen rice plant refrains caterpillar cutting the ear (R=7). A good number of farmers (58%) have an innovative idea that stitching the anus of rat makes it wild that creates fear for others (R=8) and evacuate thereby.Many farmers (55.33%) are well-aware that ploughing and exposing land for sun drying control nematode and soil-borne diseases (R=9). A significant number of farmers (53.33%) discovered that abundantly grown biskatali weed extract can be used as a seed treating fungicide (10). However, ratings on these selected ITKs show that farmers has more awareness to ordinary and easy accessible ITKs and less awareness to recent ITK innovations like, plant parts surgery and application of healing paste (R=20), fecal product (R=18), molasses trap (R=17), repellent smoking (R=16), mobile trap (R=15), and detergent use

(R=14). Pervez et al. (2015) in their ITK research also mentioned that ITK use depends on available resources, needs and interest of the users and simplicity in handling the technology. However, theoretically, innovations spread through an innovation-decision process among society. Therefore, exposure and awareness to innovative ITKs take time.

Table 2. Awareness of farmers on selected innovative ITKs

Sl.	Nature of ITKs	Aware	Unaware	Mean	Rank
		FA+A+LA	UA+FUA	(M)	(R)
1	Flattering Polythene Bag	138 (92.00%)	12 (8.00%)	3.27	3
2	Use of Burnt Mobil Trap	58 (38.67%)	92 (61.33%)	1.31	15
3	Setting Smoking Vessel	49 (32.67%)	101 (67.33%)	1.09	16
4	Use of Tobacco Powder/Solution	88 (58.67%)	62 (41.33%)	2.15	6
5	Earthing-up Base of Vegetable Plants	76 (50.67%)	74 (49.33%)	1.71	11
6	Planting Across the Wind Direction	66 (44.00%)	84 (56.00%)	1.53	12
7	Use of Detergent Solution	55 (36.67%)	95 (63.33%)	1.3	14
8	Removing Diseased Plant Parts	24 (16.00%)	126 (84.00%)	0.55	20
9	Use of Urine and Cow Dung Solution	37 (24.67%)	113 (75.33%)	0.93	18
10	Burning Nursery Bed Residues	53 (35.33%)	97 (64.67%)	1.17	13
11	Hanging Dead Bird	105 (70.00%)	45 (30.00%)	2.49	5
12	Stitching the Anus of Rat	87 (58.00%)	63 (42.00%)	2.08	8
13	Use of Bishkatali	80 (53.33%)	70 (46.67%)	1.9	10
14	Black Berry Leaf Extract	26 (17.33%)	124 (82.67%)	0.61	19

15	Setting Banana Sacker	142 (94.67%)	8 (5.33%)	3.58	1
16	Bending Rice Plant	87 (58.00%)	63 (42.00%)	2.09	7
17	Use of Ash	134 (89.33%)	16 (10.67%)	3.52	2
18	Ploughing and Exposing Land	83 (55.33%)	67 (44.67%)	2.07	9
19	Use of Spiny stem of Jujube	112 (74.67%)	38 (25.33%)	2.77	4
20	Use of Molasses Trap	46 (30.67%)	104 (69.33%)	1.07	17

Note: FA=Fully Aware, A=Aware, LA=Less Aware, UA=Unaware, FUA=Fully Unaware, M=Mean of five-point scale, R=Rank on the basis ofmean

3.4. Farmers willingness to use innovative ITKs

Farmers were categorized into willing and unwilling in terms of ITK use. Result shows that about 69 percent farmers are willing and 31 percent are unwilling to use innovation ITKs in crop pest management (Fig. 1). Farmers were further asked to identify the main reasons of their willingness and unwillingness to use innovative ITKs (Table 3).

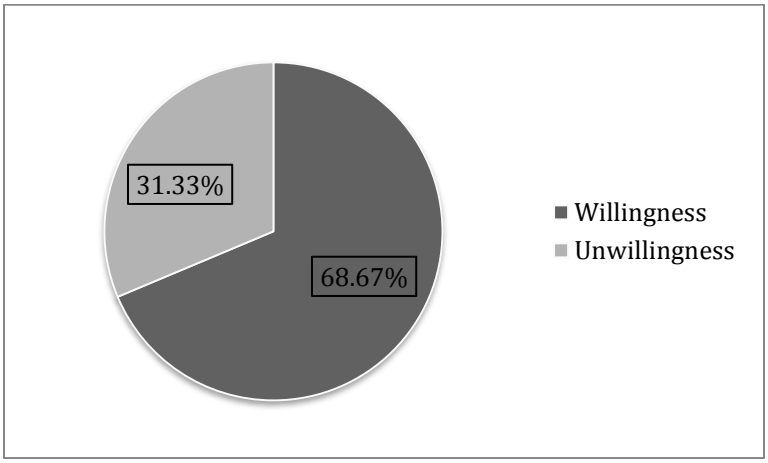

Figure 1. Classification of farmers in terms ofwillingness to use innovative ITKs

Results show that farmers are willing to use innovative ITKs because these are safe for human health (100%). Above ninety percent(94.17%) farmers feel that ITKs are low cost. About 80% farmers use ITKs because these are also harmless to crops. Many other farmers use them because of proper utilization of available resources (73.78%) and easy to learn and use (71.84%). Among the unwilling farmers, the entire

group did show unwillingness due to their ignorance. The next important reason for unwillingness is lack of confidence on ITKs effectiveness (80.85%). Other farmers felt that ITKs are poor in performance (57.45%), take time to be effective (42.55%) andlaborious in handling (29.78%).

Table 3. Reasons of willingness and unwillingness in using innovative ITKs

Sl.	Reasons of willingness	No. (N=103)	%		Reasons of unwillingness	No. (N=47)	%
1	Low cost	97	94.17		Ignorance	47	100.00
2	Easy to learn and use	74	71.84		Lack of confidence	38	80.85
3	Safe for health	103	100.00		Poor performance	27	57.45
4	Available resources	76	73.78		Time consuming	20	42.55
5	Harmless to crop	82	79.61		Labourous	14	29.78

3.5. Determinants of farmers' willingness to use innovative ITKs

Table 4. The relationship between farmers' characteristics and willingness to use innovative ITKs

Predictors	B	Exp(B)	S.E.	Wald	Sig.
Age	.047	1.048	.042	1.235	.267
Education level	.136	1.146	.105	1.689	.194
Family size	-.365	.694	.290	1.586	.208
Farm size	-6.186	.002	2.548	5.892	.015
Annual family income	-.042	.959	.014	8.816	.003
Training experience	-.067	.935	.194	.121	.728
Information need	.194	1.214	.059	10.868	.001
Awareness level	.249	1.283	.068	13.455	.000
Constant	-11.664	.000	3.914	8.881	.003
-2 Log likelihood=44.9, Cox & Snell R^2=0.61, Nagelkerke R^2=0.86, p=0.00					

The results of the logistic regression analysis in Table 4 reveal the determinants of farmers' willingness to use innovative ITKs. The result shows that farm size, annual family income, information need and awareness level are important determinants of farmers' willingness to use innovative ITKs. Age, education, family size and training experiences, on the other hand, are not the significant determinants of farmers' willingness to use ITKs. However, this study differs with Mafimisebi et al. (2012) where age, education level and family size was

found as positive determinants of ITK use by the farmers. Mafibisebi and Oguntade (2011) added that senior members of the community are the custodians of ITKs and skilful users as well. Farm size is negatively relatedwith the willingness(B= -6.186, p=.015) that means small farmers are more willing to use innovative ITKs. These farmers are relatively weak and have less money for crop care. Therefore, they mostly rely on low-cost ITK. Annual family income further proves that less income farmers group are more interested to use ITKs (B= -.042, p=.003). Rich farmers are commercial produces and use expensive agro-chemicals for quick remedy of their crop problems. Pervez et al. (2015), Mafimisebi et al. (2012), Mafimisebi and Oguntade (2011), Mafimisebi and Oguntade (2010), also found that small farmers and low-income peoples are common users of ITKs. The ignorant farmers, who need more information, use more ITKs as compared to the educated farmers (B=.194, p=.001). However, the farmers who have sufficient awareness (B=-11.664, p=.000) on the environment and health use more ITKs for crop protection.

4. Conclusion

ITKs are innovative in creation but used traditionally. Though not all, some ITKs seek farmers' attention due to their innovative actions. Majority farmers of the study areasare willing to use innovative ITKs for crop protection although their awareness is high on less innovative ITKs. However, among them, small farmers with less income are more willing to use ITKs because of low cost, easy to learn and use of locally available resources. Information need and awareness level are also significantdeterminants of farmers' willingness to use innovative ITKs. Considering the need and preference of smallholder farmers who are the majority, state extension should promote ITKs for crop care. Information needs of the farmers should be meet up and extensive awareness building programme should take for supporting crop protection ITKs in Bangladesh.

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