

## Rural Women's Awareness on Indigenous Technical Knowledge: Case of Northern Bangladesh

A.K.M. Kanak Pervez<sup>1</sup>, Qijie Gao<sup>2\*</sup> and Md. Ektear Uddin<sup>3</sup>

*College of Humanities and Development Studies, China Agricultural University,  
2 Yuanmingyuan Xilu, Beijing, China*

*\*Fax: 86-10-6273-1492*

*E-mail: <sup>1</sup><pervezakm@gmail.com>, <sup>2</sup><gaoqj@cau.edu.cn>, <sup>3</sup><ektearcau@gmail.com>*

**KEYWORDS** Agricultural Extension. Farm Women. Sustainable Agriculture. Traditional Knowledge

**ABSTRACT** The central attention of the research is to examine rural women's awareness on Indigenous Technical Knowledge (ITK) and the reasons behind its use. Along with eight focus group discussions, 150 rural women were randomly interviewed. About seventy percent of the respondents were familiar with selected ITKs. The poor farm women were using ITKs as easy and low-cost options. Though many of them are not aware about sustainable agriculture, they use ITKs to make the best utilization of their resources and capabilities. Age, education, annual family income, cosmopolitanism, organizational participation and knowledge on ITKs revealed important determinants of awareness. The paper recommends revision of the current education policy with special focus on rural needs. To have greater impact on sustainable development, modern technologies should be developed around the ITK-based knowledge. Agricultural extension and mass media can play vital roles to channelize the importance of ITKs.

### INTRODUCTION

Bangladesh is the most densely populated country in the world where 1,237.51 persons reside per square kilometer (EC 2015). In terms of Indigenous Technical Knowledge (ITK) the country is regarded as one of the richest, due to a range of ethnic communities, multiplicity of culture, history and values. Like other developing countries in this subcontinent, the country primarily consists of agrarian land with 47.50 percent of the labor force dependent on agriculture, which contributes to 16.33 percent of the GDP of the country's total economy (BER 2014). Nowadays people are progressively using modern agricultural practices for maximizing production. As a result, the traditional way of cultivation has been decreasing. It is also observed that rural women have been contributing to conserve and use ITKs for a long time. Around forty-six percent of the farming population in Bangladesh is female (FAO 2011), though Bangladeshi people are not appreciative of women in

agricultural production, particularly outside the house (FAO 2003). This is partly because of cultural norms that value female seclusion and undervalue female labor (Kabeer 1994; Rahman 2000a). Women participation in agriculture has increased over time from 1999-2000 to 2005-2006 and women participation in agriculture has increased by about fifteen percent (Sraboni et al. 2014). They are still using ITKs in their farming practice as it is easier to adopt in comparison with modern technology. Modern technologies are particularly based on science and technology. In contrast, ITKs are the basis for local-level decision-making in agriculture, healthcare, food, natural resource management and other activities in rural communities. Such knowledge is passed down from generation to generation in day to day living. Indigenous knowledge has value not only for the culture in which it evolves but also for scientists and planners striving to improve conditions in rural localities (Warren 1991). Currently, due to excessive introduction of modern scientific knowledge, numerous ITKs are at high risk of becoming extinct. Many poor and illiterate farmers are unable to cope with modern technologies. Modern technologies bring short-term benefit for the farmers by the cost of environmental degradation in the long run.

In Bangladesh women play a vital role as caregiving channel of ITKs dissemination. If rural

---

*Address for correspondence:*

Qijie Gao  
College of Humanities and Development Studies,  
China Agricultural University,  
2 Yuanmingyuan Xilu, Beijing, China  
Fax: 86-10-6273-1492  
E-mail: gaoqj@cau.edu.cn

women do not preserve and reinject ITKs into livelihood systems, they are bound to be mislaid. Thus, rural women are continuously playing their roles in development and conservation of the ITKs. They are playing an important part in the conservation of ITKs. Conway (1997) in this regard said, '*Given enough time, everything that is old will become new again.*' There is a need for ITKs to be reinvented and to ensure the maximum utilization for the future uses. Recently, masses are becoming conscious enough about the dreadful effect of pesticide use. Moreover, the increasing landlessness and poor socio-economic status of the rural farmers is propelling them to choose the alternative option of low input agriculture. That is why numerous indigenous technologies related to agriculture such as intercropping, seed germination, weed and pest control, diversity of crop, preservation of seeds, fish and animal production, breeding, soil conservation, irrigation, and water conservation are important for achieving sustainable development. This realization seeks special attention from extension experts, researchers, policymakers as well as international organizations. Therefore, the study on ITKs and its documentation is particularly important for a country because, i) ITKs may have significant utilities if explored, ii) ITKs are alternatives, which can be widely adaptable, iii) they are easier, secured and inexpensive to adopt than those of modern technology, iv) ITKs are an alternative to harmful chemicals, and v) ITKs are environment friendly and play a vital role in sustainable development.

The agricultural system cannot be totally transformed into scientific and mechanized production systems only for higher yields. Therefore, one cannot stop the use of ITKs due to poor yield and slow action in pest management. Additional research is needed to conserve, modify and improve the performance of ITKs to make it available for all. Modern technologies should be developed and based around ITKs to assist poor and illiterate farmwomen in becoming more educated on sustainable agricultural development. Use of ITKs over the centuries has made it popular and women are accustomed to use ITKs. However, it is needful to use ITKs objectively in achieving sustainable development. This paper therefore, intends to discover how the rural women are aware of ITKs both in its contents and functions.

### ITK Researches in Bangladesh

ITKs are one of the key resources for agricultural extension systems and processes of natural resources management. Thus, research on ITKs is essential in the country. On the one hand, ITKs provide a suitable alternative to chemical agriculture, while on the other it creates opportunities for poor and illiterate farmers by means of economic benefit and easy adaptation. The National Environment Management Action Plan (NEMAP 1995) has recommended the use of ITKs as a means of maximizing land use efficiency. Furthermore, the New Agricultural Extension Policy (NAEP 1996) also stated ITKs as an environment friendly agriculture technology and advised agriculturists and scientists to continue their research in this area. Compared to the importance of ITKs, a limited research has been conducted in Bangladesh. The first book published on ITKs in Bangladesh is entitled '*Indigenous Agricultural Tools and Equipment in Bangladesh*' by the Bangladesh Agricultural Research Council (BARC 1982). This book provides a detailed description of different ITKs. Detailed and scientific works on ITKs in Bangladesh started in the late 1990s and one of the pioneer works was conducted by Sillitoe et al. (1998) to search the methodology for ITKs documentation. In addition to this, Quddus (2000) described the role of indigenous knowledge in sustainable development. He provided a framework for indigenous knowledge-based research and development programs highlighting the importance of the data bank.

ITKs have different uses in Bangladesh. For example, the use of plants and plant parts for human and livestock health is incredibly common. Researchers also conducted researches on these aspects. Zuberi (1998) proved that ITKs are sources of traditional medicine and strongly associated with sustainable use of biodiversity. He recommended for documentation of ITKs and emphasized on the training of NGO workers for this purpose. Rahman et al. (2000) worked on ITK knowledge and practice of tribal people. In that paper, the researchers documented thirty-four plant species being used by the *Chakma* tribe for treatment of various diseases. Lalon (2000) described the detailed use of an indigenous plant *Neem* and its parts for example, leaves, fruits, *Neem* cake, bark, wood, and honey and showed how they can be used to cure human

diseases and control insects and pests in crops. Rahman (2010) carried out his research on uses of ITKs in herbal medicines by tribal people in Bangladesh. He described the applications of ITKs for skin diseases like boils, eczema, scabies, septic abscess, itching and skin allergy, burns, chicken pox, warts and leucoderma, fungal and bacterial infections, including healing cuts and wounds. Along with medicinal use, ITKs are also being utilized for other purposes, for example, the Disaster Risk Reduction (DRR), Natural Resource Management (NRM). DRR, on the basis of use of ITKs, has been longstanding within the history of the country. Uddin and Rahman (2013) investigated the use of Traditional Ecological Knowledge (TEK) on the flow and the erosion processes of Jamuna River, where they found that TEKs work to protect river banks from erosion and play a vital role in management activity during emergency situations. DIPECHO-V (2010) reported ITKs use as a programmatic tool within the community-based disaster risk reduction project to strengthen community-based disaster mitigation initiatives. Rahman and Kamal (n.d.) analyzed and documented indigenous practices to predict the occurrence of natural hazards, as well as methods employed to avoid loss of life and assets. It ensures availability of potable water, the continuation of livelihood activities and access to medical care and nutrition during disaster. NRM and forest conservation have significant importance in Bangladesh, people of this country have engaged such kind of activities for a long period of time. In this regard Mohiuddin and Alam (2011) found eight ITKs of tribal people that protect forest plants from insects and borer attacks, which sustain the vegetation in catchment areas. They also suggested that the economy, livelihood and culture of the tribal people are closely interlinked with the natural resources. Rahman (2000b) described the slash and burn technology of indigenous agroforestry practices in Bangladesh, which is popularly known as '*jhum*' where perennial trees and annual vegetable crops are grown together.

Fishery and livestock rearing with the help of ITKs are incredibly common in Bangladesh. Both fisherman and fish traders use some technologies for their convenience. Shah and Townsley (1998) found that traditional fish traders and fishermen in central Bangladesh developed a system of carp polyculture without intervention

from extension agencies by intensive use of existing water bodies, well adapted to local conditions. Hasan et al. (2009) identified the extent of ITKs uses in fisheries and livestock. They selected nine ITKs used widely in fisheries and 25 ITKs in livestock components. Chadwick et al. (1998) carried out research on water resource management and indigenous knowledge in Bangladesh, and concluded that every farmer and every fisherman manages water resources, both individually and cooperatively. All these people have built an intimate knowledge of how their environment operates around them and have developed appropriate, often complex, systems of management. This knowledge is not universal, but is rather localized, differing by locality, groups and individuals.

Ghosh (2002) conducted his research on ITK, livelihood and decision-making strategies of floodplain farmers wherein farmers applied their indigenous knowledge in making farm related decisions. He concluded that due to various constraints, farmers cannot always go with their preferred choice and look for alternatives. The floodplain is a risk prone area and farmers need flexible options to make suitable coping decisions, however options are limited as crop diversity has been decreased significantly due to the domination of High Yielding Variety (HYV) paddy and increased other agriculture risks, such as water congestion in the heel and decreasing soil fertility. Rahman (2012) identified the extent of the practice of the indigenous knowledge system by the farmers in the crop field where he found 50 ITKs, utilized by the farmers in their agricultural practice.

## METHODOLOGY

No single research method is efficient enough to examine a research problem, therefore, for precise description of research findings effectively (Chow et al. 2010), the mixed method approach has been chosen as a famous paradigm (Tashakkori and Teddlie 2003; Clark 2005) that has been recognized as a revolution in the history of methodology (Johnson et al. 2007). The study was conducted in three districts of northern Bangladesh. Three villages namely, Jatholida, Piarapur and Kashipur were selected purposely from the Bogra, Gaibandha and Rangpur districts, respectively. The purposive selection of the study area was due to proximity and familiarity of the

locale to the researchers. These areas cover the Karatoya-Bangali floodplain, active Brahmaputra-Jamuna floodplain and Tista meander floodplain, the three important agro-ecological zones (AEZs) of Bangladesh. Of the 30 AEZs, most of them belong to piedmont, tract, basin, haor and beel areas, which are less productive than river floodplain areas (Uddin et al. 2014). Basin, beel and haor are low-lying areas and remain submerged for longer period each year. Piedmont and Tract cover higher topographic areas of unproductive soil. Therefore, the study area bears immense agricultural importance. Over the centuries the rural women in these areas have been keenly engaged in agricultural activities as compared to the other parts of the country. A list of 200 women was selected from each village with the help of the respective *union parishad*<sup>2</sup> office. The population of the study was 600, which were picked from the national polling list. From the list the researchers used a random sample of 50 women from every village, therefore the total sample was 150. Rapport building is important for reliable data. Thus, the researchers took help from the women workers of the community center to introduce themselves to the rural women. Data was collected from respondents using a structured interview, a face-to-face setting from December 2014 to March 2015 along with eight Focus Group Discussions (FGDs) with many informal interviews, field notes and observations to gain a deeper understanding about the research problems.

Personal characteristics of the rural women such as their age, education, annual family income, family farm size, cosmopolitanism, organizational participation and knowledge on ITK were

selected as the independent variables of the study. Appropriate scales were developed to measure the independent variables (Table 1). The dependent variable of the study was the rural women's awareness on ITKs. A list of 30 selected ITKs related to crop, fisheries and livestock were used to check the awareness level of rural women. The respondents were asked to indicate their awareness to each ITK along a three-point rating scale with options for "fully aware", "partially aware", and "not aware". Scores were assigned to these responses in the order of 2, 1 and 0, respectively. Data was analyzed by using computer software SPSS (Statistical Package for Social Science) 21.0 version. Linear regression model was employed following the enter method to assess the relationship between awareness of rural women on ITKs and their socio-demographic characteristics. For qualitative data, a thematic approach was used to analyze it.

## RESULTS

### Socio-demographic Characteristics

The results of the descriptive analysis summarized in Table 1 show that the majority of rural women were middle aged. Most of them had a primary level education whereas very few women had higher education. The average family farm size of the respondents was about one hectare. Average annual family income was 111.37 thousand BDT<sup>3</sup>. Cosmopolitanism of rural women was low ( $M=6.54$ ). The observed score for organizational participation by rural women was very low (0-14) in comparison with the possible score (0-63). The mean knowledge score on ITKs

**Table 1: The socio-economic characteristics of rural women**

Variable and scoring technique	Range		SD	Mean	Mode
	Possible	Observed			
Age (1 for each year)	-	19-68	11.49	41.18	45
Education (0 = illiterate, 0.5 = sign only, 1 for each of schooling,)	-	0-12	3.22	4.92	8
Farm size (Hectare)	-	0.40-3.45	0.44	1.01	1
Annual family income ('000 BDT)	-	48-245	31.66	111.37	120
Cosmopolitanism (frequency of visit to different place, 0= never, 1= rarely, 2= occasionally, 3= frequently)	0-15	0-14	3.19	6.54	8
Organizational participation = $\sum$ position weight (0, 1, 2, 3) X duration weight (0, 1, 2, 3)	0-63	0-14	3.75	3.76	0.00
Knowledge on ITKs (0= incorrect, 1= partial, 2= correct answer)	0-20	0-19	3.23	11.88	10.00

( $M=11.88$ ) shows that rural women possess good knowledge on ITKs application.

### Awareness of Rural Women on ITKs

The rural women's awareness score on ITKs varies from 16 to 54 against a possible range of 0 to 60 whereas the mean and standard deviation are 36.95 and 8.90, respectively. Based on the mean and standard deviation, the rural women's awareness was categorized into three (Table 2). The highest proportion (68.67%) of the respondents was moderately aware about ITKs application, whereas only 12.67 percent and 18.67 percent had low and high awareness, respectively.

**Table 2: Distribution of respondents according to their score of awareness**

Categories	<i>f</i> ( <i>N</i> =150)	%	<i>M</i>	<i>SD</i>
Low awareness ( $\geq 25$ )	19	12.67	36.95	8.90
Medium awareness (26-45)	103	68.67		
High awareness (46-60)	28	18.66		

The detailed awareness score and the rank order in respect of particular ITKs are represented in Table 3. Among 30 ITKs, 'Feeding molasses and table salts to cattle' obtained the highest score

**Table 3: Rural women awareness on selected ITKs**

S. No.	ITKs	Awareness level			Score	Rank
		FA	PA	NA		
<i>Crop Related ITKs</i>						
1	Using <i>neem</i> ( <i>Azadirachta indica</i> ) leaves to store grains	73	66	11	212	2
2	Soaking vegetable seed in water for better germination	70	61	19	201	7
3	Garlic-potato intercropping to reduce pest attack	79	47	24	205	5
4	Using farm yard manure in the crop field	70	56	24	196	10
5	Use of fish cleaning water at the base of bottle gourd vine	58	59	33	175	22
6	Application of ash in leafy vegetable to control aphid	62	58	30	182	18
7	Setting scarecrow in the field for controlling rodents	48	63	39	159	28
8	Hand pollination in cucurbit vegetable	54	65	31	173	23.5
9	Use of <i>neem</i> extract as pesticides	68	43	39	179	20
10	Watering of rodent hole to control them	38	60	52	136	30
<i>Fisheries Related ITKs</i>						
11	Application of cow dung in the pond as fish feed	74	56	20	204	6
12	Use of rice husk as fish feed	71	67	12	209	4
13	Application of segmented banana plants for cleaning pond water	75	47	28	197	9
14	Use of banana leaves as feed of carp fish	58	70	22	186	15.5
15	Application of poultry litter in the pond as fish feed	67	44	39	178	21
16	Drying of excess fish for lean period	54	62	34	170	26
17	Planting Mahogany tree beside the pond to control fish disease	70	46	34	186	15.5
18	Application of food wastages in the pond as feed	66	57	27	189	12
19	Dragging fishing net for aeration	55	63	32	173	23.5
20	Use of oil cakes in the pond for rapid growth of fish	44	53	53	141	29
<i>Livestock Related ITKs</i>						
21	Feeding the flesh of oyster and snail to duck	63	58	29	184	17
22	Feeding contraceptive pill for controlling Newcastle of poultry	80	51	19	211	3
23	Feeding molasses and table salts to cattle	82	49	19	213	1
24	Feeding the <i>katanate</i> grass to livestock for improving lactation	78	44	28	200	8
25	Use of bamboo case to protect ducklings from snatch birds	61	58	29	180	19
26	Deeping eggs in water for assessing the hatching quality	67	53	30	187	14
27	Feeding seeded banana to cattle for curing loose motion	67	54	29	188	13
28	Using earthen pot for laying and hatching eggs of poultry	65	41	44	171	25
29	Use of biscatali grass as repellent of body lice of cattle	75	44	31	194	11
30	Feeding <i>hukkah</i> * water to control worms of goat	54	56	40	164	27

Note: FA= Fully Aware, PA= Partially Aware, NA= Not Aware, \**hukka*= traditional instrument for tobacco smoking



(213). The other prominent ITKs include 'Using neem (*Azadirachta indica*) leaves to store grains' and 'Feeding contraceptive pills for controlling Newcastle disease in the poultry', which ranked 2<sup>nd</sup>(212) and 3<sup>rd</sup>(211), respectively. Almost every woman prefers to practice these ITKs because of its low cost attributes. 'Use of rice husk as fish feed', and 'Garlic-potato intercropping to reduce pest attack' were well accepted ITKs by rural women, the awareness score against these were 209 and 205 respectively.

#### Relationship between the Selected Characteristics of the Respondents and Their Awareness on ITKs

The regression result (Table 4) represents that among seven, six variables such as age, education, annual family income, cosmopolitanism, organizational participation and knowledge on ITKs show a significant relationship with the rural women's awareness on ITKs, whereas only family farm size does not show any significant relation. Age and awareness of rural women on ITKs have a significant positive relationship ( $B=0.094$ ) at 0.024 level of significance. It means that older women are more aware about ITKs in their agriculture practices than younger women. In contrast, education and awareness of women revealed negative significant relationship ( $B=-0.74$ ) at 0.00 level of significance. Thus, the findings show that less educated people are more aware on ITKs. Annual family income also has a negative significant relation ( $B=-0.05$ ) with rural women's awareness on ITKs. Rural women's awareness was negatively influenced by their cosmopolitanism ( $B=-0.43$ ) and organizational participation at 0.005 and 0.004 levels of significance, respectively. On the contrary, knowledge on ITKs has a highly positive significant rela-

tion with awareness of rural women ( $B=0.39$  at 0.004 level of significance).

#### Why do Rural Women Prefer to Use ITKs in Bangladesh?

Warren and Meehan (1980) opined that ITKs differ according to locality, age, sex, education, specialization, aptitude, and economic class. A small number of reports and papers written on women's ITKs are insignificant compared with a lot of literature available on that of men (Niamir 1990). Thus, this paper intends to examine the women's awareness of ITKs in Bangladesh with a firm belief that ITKs are extraordinarily important for the rural women. The farm women are not economically empowered enough to use costly technologies of modern kinds. During a group discussion a poor women replied:

*I don't have enough money to buy pesticides so I use ash to control insect (aphid) of bean. Moreover, I have available ash to use. Similarly I used poultry litter for planting 'Lao' (bottle gourd) instead of expensive fertilizer (Momena Begum 55, December, 2014).*

It is noteworthy to realize from her comments that poor rural women also try to properly utilize the available household waste and farm by-products using their traditional knowledge. For example, rural women use their fish cleaning water in the bottle gourd plants, which otherwise could pollute the environment if dealt with indiscriminately. At the same time they have other works, which are compulsory for them. It is their responsibility to manage food for the household, cooking, and rearing children. For this reason, they normally produce vegetable in their small yard area and rear some domestic birds or animals such as goat or sheep. When they face different types of problems in their vegetable garden or animal

**Table 4: Regression results for awareness of ITKs by rural women for sustainable agriculture**

Variables	B	SE	$\hat{a}$	t	Sig.
(Constant)	44.62	2.83		15.76	.000
Age	.09	.041	.12	2.28	.024
Education	-.74	.18	-.27	-4.12	.000
Annual Family Income	-.05	.021	-.191	-2.58	.011
Farm Size	-1.51	1.37	-.08	-1.10	.272
Cosmopolitanism	-.43	.15	-.15	-2.83	.005
Organizational Participation	-.55	.17	-.23	-3.26	.001
Knowledge on ITKs	.39	.13	.14	2.92	.004

R= 0.85, R<sup>2</sup>= 0.723, Adjusted R<sup>2</sup>=0.71, F= 53.00

rearing, they normally try to solve these problems by themselves using their ITK skills. For example, they use the *Maya tablet*<sup>4</sup> for controlling *Ranikhet*<sup>5</sup> disease. Due to restricted movement in market places they have very little access to improved agricultural inputs, which push them to use ITKs. An interested woman expressed her willingness in ways as follows:

*I want to plant eggplant in my homestead but, I cannot go to market to buy that. I told my husband to buy some seedlings but he forgot. At last I plant local gourd as I had preserved seed of that only (Anjuara 42, January, 2015).*

In a FGD during mid-January 2015, the researchers learned that women use ranges of ITKs for preserving seeds. Shefali (48) said, '*I preserved black gram seeds in air tied earthen pot along with dry sands*', while Maleka (65) said, '*I preserved rice seeds in big earthen pot with neem leaf to repeal pest*', and Popy (38) said, '*I hang the dried garlic plant with roof along with bulb*'. There were many responses regarding seed preservation using ITKs. However, when they were asked, why seeds were not preserved using cold storage, an old woman replied with a bit annoyance:

*The cold storage is far away, even, I don't know where it is. It will take time and money to go there. Moreover, I need to preserve very small amount of different kinds. Can I put all together in one bag? (Asma Khatun 68, January 2015).*

Asma's response indicates that convenience in terms of labor and cost reinforces them to make the decision to use ITKs. Ghosh (2002) also coined ITK use as a decision-making process where available choices exist. Moreover, the use of ITKs is independent to external cost and dependent to self-sufficient knowledge base of the community, therefore, sustained over the centuries.

Abdullah and Zeidenstein (1982) discovered that rural women in Bangladesh traditionally save money secretly to tackle unwanted events in the future when they would have no access to money. Therefore, they hide their savings in bamboo holes, or in the earthen bank instead of formal financial institutions. Many rural women are not technically sound enough due to the lack of functional education. In many cases they are handicapped in using technology as they are unable to follow the written guidelines. Facilitation and advisory services are also out of access to the farm women of Bangladesh. The researchers asked a farmwoman why she did not use bal-

anced fertilizer for better production. She replied meticulously:

*I do not know the actual dose of chemical fertilizer. If I put much, the plants may die. Therefore, I use farm yard manure according to my experiences. (Chamili 56, January 2015).*

This finding indicates that ITK use is a matter of long experience, which the rural women learn as a way of life. Poverty is the common guest in many rural families where women shoulder the responsibility of arranging meals for the entire family members. This situation is usual where the male member migrates outside for earning. During FGD a woman said that:

*For the last two days we did not have any vegetable to eat with rice. I was thinking how I can feed my minor child. Then I remembered that I kept some sidol<sup>6</sup> in my home. I cooked it yesterday. Today I have cooked mocha (inflorescence of banana). (Nargis 36, December 2014)*

The emerging public health concern against widespread pesticide use pushed people to go back to indigenous ways of food cultivation. An educated farm woman expressed her anxious saying:

*I am seriously worried about my child's health. I am no longer buying exotic fruits from market which are preserved with poison. Even, I have decided not to buy brinjal, bitter gourd and the vegetable those are produced with pesticides. Rather, I will cultivate vegetable and fruits in my homestead using farmyard manure. This food will also offer better taste (Nahar 32, January 2015).*

However, very few women are objectively aware of the use of ITKs in achieving sustainable environment and healthy life. ITKs use has become habitual to rural women due to centuries of experiences and tradition associated with it. The overall analysis shows that ITKs use by farm women is a livelihood approach, which provides an alternative way of living during difficulties (Ghosh 2002), ensures proper use of household resources including knowledge, capabilities and access, minimizes the cost of production (Jalal 2009), improves food security, offers better health and environment conditions, and thereby promotes sustainable development (Quddus 2000).

## DISCUSSION

According to the findings, the respondents were mostly middle aged since both young and

elderly rural women felt shy to speak with an outsider. It is also true that younger women were not aware of various possessions regarding household matters. Elderly women on the other hand, thought that they were incapable of furnishing the information with proper language. Therefore, middle-aged women were pushed by the families for the interview. The mean education level of rural women was up to primary level. This is because women are inadequately empowered in Bangladesh and they are facing barriers from multilevel social subsystems such as family, financial, educational, sociocultural, political, and governmental (Nahar 2008; UN 2014). The findings show that the average family farm size was low due to the excessive population growth and infrastructure development, and the per capita land holding is reducing day by day (Islam 2013). Rural women's participation in the organization and their cosmopolitanism levels were also very low. The rural women in Bangladesh are socially restricted to move alone at mass gathering place like markets, government offices or district headquarters, which is normally occupied by men in countryside. Due to sociocultural barriers, stereotypes for example, women are less interested in participating in a male dominated organization (Uddin 2015). Most of the rural women have some basic knowledge regarding crop cultivation, livestock rearing and aquaculture as they grasp these experiences from childhood. Some ITKs are extremely common in Bangladesh and almost all households used them frequently. The current research also finds that the knowledge of rural women on ITKs is quite higher. Presently government and mass media in Bangladesh are campaigning against pesticides use in food production. Therefore, rural women are becoming more aware about the negative effects of pesticide use. The agricultural extension projects like Integrated Pest Management (IPM), Integrated Crop Management (ICM) and the recently introduced Integrated Farm Management (IFM), include farmwomen as fifty percent beneficiaries. These projects are working for awareness development against the negative impact of pesticides on environment and human health. Thus, as a suitable alternative to chemicals, rural women are becoming more aware on ITKs application.

Rural women's awareness level on ITKs was moderately high although they did not get any formal education about this. The ITKs are derived from many years of experiences and tradi-

tionally transmitted by the social system where family plays the vital role. Normally girls in rural area help their mother with their daily works. These kinds of activities help them learn the basic use and application procedures of ITKs. In Bangladesh, the formal education system is far away from ITKs even though it has been proved that incorporation of this knowledge base into agricultural research and extension system can promote sustainable agricultural development (Rajasekaran 1993). Incorporation of ITKs in formal education system will broaden the horizon of awareness which in turn will ensure eco-friendly environment and sound health (Kazmi et al. 2014). The ITKs awareness level of rural women to different subsectors of agriculture (crop, fisheries and livestock) differs non-significantly (Table 3). Multi-functionality is very common among the smallholder farmers in Bangladesh to meet their basic demand of limited resources. Due to increasing pressure of population, smallholder farms are expanding vertically (Mamun 2011). The result also revealed that the women's awareness tremendously connected with household agriculture.

The relation between age and awareness of rural women implies that the older women were more aware on ITKs. This is exceptionally practical in Bangladesh, as younger people are more inclined to use modern technical knowledge, information technology, electronic and mass media. The modern media generally do not pay attention to dissemination of ITKs rather provides a huge emphasis on the latest technologies. This leads them to get quicker results by using modern technology although ITKs are still effective. Khan (2002), Hanif (2002), Jalal (2009), Jahan (2014) and Ashraf et al. (2015) found similar relationships in their respective studies. Educated people highly exposed to modern information and technology with a strong affinity and skill to use them, considered ITKs to be obsolete and were reluctant to use them. Thus, this variable shows a negative significant relationship with awareness levels of women. Jahan (2014) found the similar relation between education and the awareness level of the farmer. In addition, the results revealed that women from rich families are less aware on ITKs. This is because the rich families have more access to media and can afford to use expensive external inputs for production maximization. Hamid (1997), Islam and Kashem (2000), Jalal (2009) and Jahan (2014) found a parallel as-



sociation between annual family income and awareness in their studies. Cosmopolitanism significantly affects awareness of rural women. Latest issues in the society are easily accessible to cosmopolitan women as they find more opportunities to see and learn from the new experience. The new technological experiences replace the ITKs from the mind of cosmopolitan people or illusively refrains them to go for outdated ITKs. On the other hand, due to low cosmopolitanism rural women have very low experience with the latest technologies. Thus, their only source of knowledge is the family and their ancestors. This finding is consistent with Khan (2002), Saha (2008), Jahan (2014). Similarly, organizational participation provides some scope to learn a lot about new farm knowledge by means of exchanging views. In contrast, knowledge on ITKs has a highly positive significant relation with awareness of rural women. Awareness is a precondition of gaining knowledge by the individual. Therefore, a positive association between rural women's knowledge and awareness is fair and obvious. Islam and Kashem (2000), Khan (2002), Sutradhar (2002), Jalal (2009), De et al. (2014), Jahan (2014) and Khalesi et al. (2015) in their respective studies also found a similar relationship between knowledge and awareness.

Rural women were using ITKs in agricultural activities due to five key reasons that the researchers obtained in the findings. The reasons are, i) women were not economically empowered in rural Bangladesh, thus they did not have enough money to buy agricultural inputs from market, ii) they were maximizing their limited resources, iii) due to social barriers they had a little access to the markets, thus they were bound to manage their needs from the family resources, iv) they did not have adequate knowledge in modern agricultural practices, and v) scarcity of family food also lead them to use ITKs as a tool for the fulfillment of family food need. These reasons express the practical situations of rural women in Bangladesh. Generally economic activities are performed by men here, women do not have easy access to income-generating activities. Agarwal (2008) described the Bangladeshi women's situation as, *'within the family, women's resistance is seen to be directed in one hand, against inequalities in resource distribution and control, and on the other hand, against the authority exercised by family members such as husbands and parents-in-laws.'*

This statement is suitable for clarification of the low economic ability of rural women. Thus it is their exceptional capabilities to manage household need by maximizing their own resources. They utilize unnecessary materials in different important purposes, for example, they were preserving vegetable seeds for next year inside the dried matured bottle gourd fruits (Rahman 2012). On the other hand, society does not help them with their role even though as it acts as a barrier to go to common places like markets, their access to positions of influence and power is limited, their occupational choices are narrower, hence, their earnings are lower than those of men (Nawaz 2013). Thus, they are bound to manage their needs from within the household using ITKs. Furthermore, education levels of rural women are low. They have little technical knowledge to practice their household agriculture with modern equipment and inputs because they have less contact with extension agents regarding farming systems and limited training facilities (Uddin 2009). Moreover, they are the most accountable person for many needs. They hold all responsibilities to feed others members of the family. Thus, they are contributing in the food security, environment and nutrition of Bangladesh (Islam and Uddin 2014). When they feel the scarcity of food in household, they try to manage it by using ITKs. As a result, these indigenous knowledge bases are becoming the significant part in their livelihood.

## CONCLUSION

Many international organizations are advocating the development of indigenous knowledge bases for a sustainable environment and development. In this regard, the present study assessed the awareness levels of rural women. The finding shows that most of the rural women were moderately aware about ITKs. They have significant awareness in all subsectors of agriculture. Though their awareness serves the purpose of sustainable agriculture, they are truly unaware of environmental issues in many cases. ITKs are related to poor peoples' livelihoods and a special way of adjusting the materials and economic demands due to its low cost attributes. Rural women make the best utilization of many household resources for productive purpose that might be waste otherwise. Traditionally ITKs are considered backdated. People do not treat ITKs as a

modern element of agriculture. The current research finds that education, organizational participation and cosmopolitanism have a negative relation with the rural women's awareness on ITKs. This is very interesting because the education system of Bangladesh is far away from ethnic and traditional knowledge. Thus, ITKs are informally learned from family and community. Similarly, cosmopolitanism and organizational participation negatively affect the awareness on ITKs. The reason is that the political and professional leaders are not aware about the importance of ITKs. Sustainable agriculture is possible when people become objectively aware about their own indigenous knowledge base.

### RECOMMENDATIONS

ITKs are the indispensable elements for sustainable agriculture. Thus, more research on ITKs is needed for ensuring environment friendly production. The study seeks attention to planned investment on ITK-based research and extension for sustainable development. It also recommends setting up an educational curriculum on the basis of rural needs. Agricultural extension should have mass campaign for increasing awareness to maintain the ecosystem health and improvement of livelihoods. Development of organic food markets for fair price and a certification agency to protect consumers' rights deserve adequate focus by the government.

### NOTES

- 1 Neem is also known as the Indian lilac, scientific name: *Azadirachta indica*, Family Meliaceae
- 2 Union *porishad* are the lowest unit of local government in Bangladesh.
- 3 BDT is the currency of Bangladesh, popularly known as taka, 1 USD = 78 BDT approximately.
- 4 Maya tablet is one kind of a birth control pill, and the rural women obtained these from community health workers.
- 5 Ranikhet is infectious disease that causes massive death of poultry birds in a particular season every year. Technically this disease is called Newcastle.
- 6 Sidol is a food made of small raw fish and sheath of wild aroid. These two are grinded together and dried in the sun to make a pie. When rural women have sufficient raw fish, they make sidol for use in the lean season.

### REFERENCES

Abdullah T, Zeidenstein SA 1982. *Village Women of Bangladesh: Prospects for Change*. Oxford: Pergamon Press.

- Agarwal B 2008. Gender, resistance and land: Inter-linked struggles over resources and meanings in South Asia. *The Journal of Peasant Studies*, 22(1): 81-125. DOI: 10.1080/03066159408438567
- Ashraf S, Khan GA, Ali S, Iftikhar M 2015. Socio-economic determinants of the awareness and adoption of citrus production practices in Pakistan. *Ciência Rural*, DOI: /dx.doi.org/10.1590/0103-8478 cr20131227
- BARC 1982. *Indigenous Agricultural Tools and Equipment in Bangladesh*. Bangladesh Agricultural Research Council, Ministry of Agriculture. Dhaka: Government of the Peoples' Republic of Bangladesh.
- BER 2014. *Bangladesh Economic Review (BER)*. Ministry of Finance, Government of the Peoples' Republic of Bangladesh, Dhaka.
- Chadwick MT, Soussan JG, Alam SS, Mallick DL 1998. *Understanding Indigenous Knowledge: Its Role and Potential in Water Resources Management in Bangladesh*. Leeds: University of Leeds.
- Chow MYK, Quine S, Li M 2010. The benefit of using mixed method approach- qualitative with quantitative – to identify client satisfaction and unmet needs in an HIV healthcare centre. *AIDS Care: Psychological and Socio-Medical Aspects of AIDS/HIV*, 22(4): 491-498. DOI: 10.1080/09540120 903214371.
- Clark PVI 2005. *Cross-disciplinary Analysis of Use of Mixed Methods in Physics Education Research, Counseling Psychology and Primary Care*. PhD Thesis, Unpublished. Lincoln: University of Nebraska-Lincoln.
- Conway K 1997. *Improving Crop Resistance: A New Plant Breeding Technique Borrows From the Past*. IDRC Reports, Ottawa: IDRC.
- De A, Goswami A, Mazumder D 2014. Study on relationship of independent variables with knowledge and awareness level of livestock farmers engaged in IVLP bone crushing units. *International Journal of Development Research*, 4(7): 1380-1383.
- DIPECHO-V 2010. *Indigenous Knowledge and Practices on Mitigation in the Upazilas of Mirzagonj and Pathargata*. Dhaka: Community Based Disaster Risk Reduction Project.
- EC 2015. *Bangladesh ECHO Factsheet, European Commission's (EC) Humanitarian Aid and Civil Protection department (ECHO)*. Brussels: EC.
- FAO 2003. *Gender, Key to Sustainability and Food Security, Plan of Action: Gender and Development*. Rome: Food and Agriculture Organization of United Nations.
- FAO 2011. *Women in Agriculture Closing the Gender Gap for Development*. The State of Food and Agriculture. Rome: Food and Agriculture Organization of United Nations.
- Ghosh GP 2002. *Indigenous Knowledge, Livelihood and Decision-making Strategies of Floodplain Farmers in Bangladesh*. PhD Thesis, Unpublished. Durham: University of Durham.
- Hamid MA 1997. Farmers awareness of environmental pollution: A study in Bangladesh. *Asia Pacific Journal of Rural Development*, 7(2):107-117.
- Hanif A 2002. *Comparative Analysis between FFS and Non FFS Farmers Regarding Environmental Awareness*. Master Thesis, Unpublished. Mymensing: Bangladesh Agricultural University.

- Hasan SS, Sultana S, Khalil MI, Mazumder MDH 2009. Identification and use of indigenous technologies by the farmers in fisheries and livestock components, *Bangladesh Res Pub J*, 2(1): 351-360.
- Islam F, Uddin MN 2014. Role of Women for Food Security and Environment in Bangladesh. *Paper presented in IFOAM Organic World Congress 2014* in Istanbul, October 13 to 15 2014.
- Islam MR 2013. Causes and consequences of agricultural land losses of Rajshahi District, Bangladesh. *IOSR Journal of Environmental Science, Toxicology and Food Technology*, 5(6): 58-65.
- Islam MS, Kashem MA 2000. Correlates of farmers' awareness on the environment pollution, Bangladesh. *Journal of Training and Development*, 13(1 and 2): 7-14.
- Jahan MN 2014. *Farmers' Awareness of the Use of Indigenous Technical Knowledge (ITK) for Sustainable Agricultural Development*. Master Thesis, Unpublished. Rajshahi: University of Rajshahi.
- Jalal MS 2009. *Farmers' Awareness of the Use of Indigenous Technical Knowledge*. Master Thesis, Unpublished. Mymensingh: Bangladesh Agricultural University.
- Johnson RB, Onwuegbuzie AJ, Turner LA 2007. Towards a definition of mixed method research. *Journal of Mixed Methods Research*, 1(2): 30-35.
- Kabeer N 1994. Women's labour in the Bangladesh garment industry: Choices and constraints. In: C Fawzi El-Solh, J Mabro (Eds.): *Muslim Women's Choices: Religious Belief and Social Reality*. Oxford: Berg Publishers, pp.164-183.
- Khalesi N, Anjom FS, Rezaeizadeh G, Farahan Z 2015. Evaluation of parents' awareness and knowledge about problems and issues related to their premature infants in an Iranian hospital. *Open Journal of Nursing*, 5: 465-469.
- Kazmi T, Chaudhry AG, Ahmed A, Khan SE 2014. Farmers beliefs about indigenous farming practices and sustainable agricultural development. *Pakistan J Agric Res*, 27(1): 51-57.
- Khan AMM 2002. *Farmers Awareness on Adverse Effects of Rice Monoculture*. Master Thesis, Unpublished. Mymensingh: Bangladesh Agricultural University.
- Lalon LM 2000. In praise of indigenous neem tree. In: P Sillitoe (Eds.): *Indigenous Knowledge Development in Bangladesh: Present and Future*. Dhaka: the University Press Limited, pp. 69-72.
- Mamun SA, Nusrat F, Debi MR 2011. Integrated farming system: prospects in Bangladesh. *J Environ Sci and Natural Resources*, 4(2): 127-136.
- Mohiuddin MM, Alam MK 2011. Opportunities of traditional knowledge in nature resource management: Experience from Chittagong hill tracts, Bangladesh. *Indian Journal of Traditional Knowledge*, 10(3): 474-480.
- NAEP 1996. *New Agricultural Extension Policy*. Ministry of Agriculture. Dhaka: Government of the People's Republic of Bangladesh.
- Nahar Y 2008. *Perspectives of Educated Expatriate Bangladeshi Women about Post-Secondary Education: The Barriers Encountered and the Strategies They Have Employed*. Master Thesis, Unpublished. Ontario: Queen's University.
- Nawaz F 2013. Bargaining with poverty: An empirical review on some rural women in Bangladesh. *Stud Home Com Sci*, 7(2): 87-94.
- NEMAP 1995. *National Environment Management Action Plan*. Ministry of Environment and Forest. Dhaka: Government of the People's Republic of Bangladesh.
- Niamir M 1990. *Herder's Decision-Making in Natural Resource Management in Arid and Semi-Arid Africa, Community Forestry Note 4*. Rome: Food and Agriculture Organization (FAO) of United Nations.
- Quddus MA 2000. Use of indigenous knowledge in sustainable development of Bangladeshi farm forestry. In: P Sillitoe (Ed.): *Indigenous Knowledge Development in Bangladesh: Present and Future*. Dhaka: the University Press Limited, pp. 55-62.
- Rahman KS, Kamal MM (n.d.). Local Wisdom: Indigenous Practices for Mitigating Disaster Loss. *Project Report*. Khulna: Program for Strengthening Household Access to Resources (PROSHAR).
- Rahman S 2000a. Women's empowerment in Bangladesh agriculture: Composition, determinants and scope. *Journal of Rural Studies*, 16(4): 497-507.
- Rahman MA 2000b. Tree pathology and Bangladeshi agro-forestry In: P Sillitoe (Ed.): *Indigenous Knowledge Development in Bangladesh: Present and Future*. Dhaka: University Press Limited, pp. 55-62.
- Rahman MA 2010. Indigenous knowledge of herbal medicines in Bangladesh: Treatment of skin diseases by tribal communities of the hill tracts districts, Bangladesh. *J Bot*, 39(2): 169-177.
- Rahman MA, Khisa A, Uddin SB, Wilcock CC 2000. Indigenous knowledge of plant in a hill tracts tribal community and its role in sustainable development. In: P Sillitoe (Ed.): *Indigenous Knowledge Development in Bangladesh: Present and Future*. Dhaka: the University Press Limited, pp. 73-76.
- Rahman MM 2012. Practice of indigenous knowledge system by the farmers in marinating ecosystem in Bangladesh. *J of Agricultural Sciences*, 57(3): 155-165.
- Rajasekaran B 1993. *A Framework for Incorporating Indigenous Knowledge Systems into Agricultural Research and Extension Organizations for Sustainable Agricultural Development in India*. PhD Thesis, Unpublished. Iowa: Iowa State University.
- Saha BP 2008. *Use of ITKs in Agricultural Practices by the Farmers of Paba Upazila Under Rajshahi District*. Master Thesis, Unpublished. Rajshahi: University of Rajshahi.
- Shah WA, Townsley P 1998. An indigenously developed pond aquaculture system in Bangladesh. *Grassroots Voice*, 1(1): 16-22.
- Sillitoe P, Dixon P, Barr JFF 1998. Indigenous knowledge research on the floodplains of Bangladesh: The search for a methodology. *Grassroots Voice*, 1(1): 5-15.
- Sraboni E, Malapit HJ, Quisumbing AR, Ahmed AU 2014. Women's empowerment in agriculture: What role for food security in Bangladesh? *World Development*, 61: 11-52.
- Sutradhar CN 2002. *Farmer Awareness on Environmental Degradation Caused by the Use of Modern Agricultural Technologies*. Master Thesis, Unpub-

- lished. Mymensingh: Bangladesh Agricultural University.
- Tashakkori A, Teddlie C 2003. *Handbook of Mixed Methods in Social and Behavioural Research*. California: Thousand Oaks, Sage.
- Uddin ME 2015. *Effect of Community-Based Paid Extension on Livelihood of Smallholder Dairy Farmers: Case of Southwest Bangladesh*. PhD Thesis, Unpublished. Beijing: China Agricultural University.
- Uddin ME, Gao Q, Rashid MU 2014. Crop farmers' willingness to pay for agricultural extension services in Bangladesh: Cases of selected villages in two important agro-ecological zones. *The Journal of Agricultural Education and Extension*, DOI: 10.1080/1389224x.2014.971826,
- Uddin MN 2009. Knowledge of Women in Activities Related to Farming System in Agrarian Community of Bangladesh. *Vocational Education Research Report No. 6*, Nagoya: University of Nagoya.
- Uddin MN, Rahman MM 2013. Traditional ecological knowledge and erosion process in braded Jamuna River in Bangladesh. *Indian Journal of Traditional Knowledge*, 12(3): 427-440.
- UN 2014. *Assessment of Women's Livelihood Needs in Three Eco-zones of Bangladesh*. Dhaka: UN Women Bangladesh.
- Warren DM 1991. Using Indigenous Knowledge for Agriculture Development. *World Bank Discussion Paper 127*, Washington D.C: World Bank.
- Warren DM, Meehan PM 1980. Applied ethno-science and dialogical communication in rural development. In: DW Brokensha, DM Warren, O Werner (Eds.): *Indigenous Knowledge System and Development*. Maryland: University Press of America, pp. 321-327.
- Zuberi MI 1998. Indigenous knowledge associated with traditional medicine and sustainable use of biodiversity in Bangladesh. *Grassroots Voice*, 1(1): 23-26.