FARMERS' AWARENESS ON THE USE OF INDIGENOUS TECHNICAL KNOWLEDGE (ITK) OF SADAR UPAZILLA UNDER JAMALPUR DISTRICT

BY

MD. YOUSUF ALI

DEPARTMENT OF AGRICULTURAL EXTENSION & INFORMATION SYSTEM

SHER-E-BANGLA AGRICULTURAL UNIVERSITY

DHAKA-1207

June, 2020

FARMERS' AWARENESS ON THE USE OF INDIGENOUS TECHNICAL KNOWLEDGE (ITK)OF SADAR UPAZILLA UNDER JAMALPUR DISTRICT

BY

MD. YOUSUF ALI

Registration No. 18-09061

A Thesis

Submitted to the Faculty of Agriculture,

Sher-e-Bangla Agricultural University, Dhaka

In partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE

IN

AGRICULTURAL EXTENSION AND INFORMATION SYSTEM

SEMESTER: JANUARY - JUNE, 2020

Approved by:

Prof. Dr. Md. Rafiquel Islam
Supervisor &
Professor
Department of Agricultural Extension
and Information System
Sher-e-Bangla Agricultural University
Dhaka-1207

Md. Abul Bashar
Co- Supervisor &
Professor
Department of Agricultural Extension
and Information System
Sher-e-Bangla Agricultural University
Dhaka-1207

Dr. Muhammad Humayun Kabir
Professor & Chairman
Department of Agricultural Extension and Information System
Sher-e-Bangla Agricultural University
Dhaka-1207

Department of Agricultural Extension and Information System

Sher-e-Bangla Agricultural University

Sher-e-Bangla Nagar, Dhaka-1207

CERTIFICATE

This is to certify that the thesis entitled, **FARMERS' AWARENESS ON THE USE OF INDIGENOUS TECHNICAL KNOWLEDGE (ITK) OF SADAR UPAZILLA UNDER JAMALPUR DISTRICT** submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka in partial fulfilment of the requirements for the degree of **Master of Science (MS) in Agricultural Extension**, embodies the result of a piece of bona-fide research work conducted by **MD. YOUSUF ALI, Registration No. 18-09061** under my supervision and guidance. No part of this thesis has been submitted for any other degree or diploma.

I further certify that any help or source of information, received during the course of this study has been dully acknowledgement by him.

Dated: JUNE, 2020

Dhaka, Bangladesh

Prof. Dr. Md. Rafiquel Islam
Supervisor &
Professor
Department of Agricultural Extension and Information System
Sher-e-Bangla Agricultural University
Dhaka-1207

Dedicated to

My

Beloved Parents

Acknowledgement

All praises, thanks and gratitude are due to the Almighty Allah for his grace bestowed upon the author for accomplishing this research study.

With boundless love and appreciation, the author would like to extend his heartfelt gratitude and appreciation to all who helped her bring this study into reality. In particular, the researcher takes the opportunity to express thanks to his respectable supervisor, Prof. Dr. Md. Rafiquel Islam Professor, Department of Agricultural Extension and Information System (AEIS), Sher-e-Bangla Agricultural University (SAU), for his noble guidance, constructive criticism, constant stimulation and encouragement through supervision during the course of preparation of this thesis, without which this work would not have been possible.

The author deems it a proud privilege to express his deep sense of gratitude, sincere appreciation and immense thanks to his co-supervisor Md. Abul Bashar, Professor, Department of AEIS, SAU, Dhaka, for his continuous guidance, cooperation, constructive criticism and helpful suggestions in carrying out the research work and preparation of this thesis.

The author also wishes to express sincere appreciation and heartfelt gratitude to Dr. Muhammad Humayun Kabir, Professor and Chairman, Department of AEIS, SAU, for his valuable suggestions, constant cooperation, inspirations and sincere advice to improve the quality of the thesis.

The author is especially grateful to all the respondents, AEO and SAAO in the study area for their cooperation and help in accomplishing the objectives of this research work. The author expresses heartfelt thanks and sincere appreciations to the teachers of the department of AEIS of Sher-e-Bangla Agricultural University for their help and encouragement.

The Author

CONTENTS

LIST OF APPENDIX

FARMERS' AWARENESS ON THE USE OF INDIGENOUS TECHNICAL KNOWLEDGE (ITK) OF SADAR UPAZILLA UNDER JAMALPUR DISTRICT

by Yousuf Ali

ABSTRACT

The main objective of this study was to ascertain farmers' awareness of the use of Indigenous Technical Knowledge (ITKs) for sustainable agricultural development. The study also explored the relationships between farmers' selected characteristics and their awareness of use of ITK for sustainable agricultural development. The study was conducted in six villages of Sadar upazila under Jamalpur district. Data were collected from a sample of randomly selected 124 farmers out of a total population of 1248. The data were collected through personal interviewing by using an interview schedule during the period from 12 January to 10 February, 2020. Appropriate scales were developed in order to measure the variables. Farmers' awareness of the ITKs for sustainable agricultural development was the dependent variable and twelve selected characteristics of the respondents constituted the independent variables. The selected characteristics were age, education, family size, farm size, annual income, cosmopoliteness, organizational participation, training on ITKs, extension media contact, knowledge on ITKs, innovativeness and input Availability. Pearson's Product Moment Correlation Co-efficient (r) was computed to examine the relationship between the concerned variables. Finding revealed that 20.9 percent of the farmers had fully aware of use of ITKs for sustainable agricultural development compared to 77.8 percent partial and 7.2 percent not aware on use of ITKs for sustainable agricultural development. Correlation analysis indicated that five characteristics of farmers, namely age, education, family size, farm size and organizational participation had no significant relationship with their awareness of use of ITKs. Annual family income, cosmopoliteness, Training on ITKs, extension media contact and knowledge on ITKs, Innovativeness and Input Availability ITKs were significant positive relationships with their awareness of use of ITKs for sustainable agricultural development.

CHAPTER I
INTRODUCTION

1.1 General Background of the study

Bangladesh is the most densely populated country in the world where 1,116 persons reside per square kilometer (BBS, 2019). 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. Farmers 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.

Technologies in Bangladesh are developed in the research institutions and experimental farms in better-endowed areas, and attempts are often made to transfer these readymade cost-intensive technology packages to farmers. Therefore, these technologies bring little benefit to the majority of smallholders and sometimes worsen their situation by forcing there into more marginal land while capital-intensive cropping expands over better land. 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.

In reality, technological interventions in Bangladesh's agriculture have given rise to disturbing issues of sustainability (Farouk and Salam, 1996). The negative environmental and social impacts of high external-input agriculture have become continuously obvious in the recent year, at the similar time many disadvantaged communities of small holders are being forced to exploit the resources usable to them so intensively that, here to environment degradation is setting in.

Farmers develop their location specific knowledge and practices of agriculture, natural resource management, human and many other subjects over centuries. This complex traditional beliefs and practices are generally known as Indigenous Technical Knowledge (ITK). ITK should be valued as it comprises a wide range of gathering experience about natural resource management necessary for sustainable agricultural development. Indigenous knowledge is the result of a dynamic potential innovation system that continuous to work for the mankind. Obviously, most of the innovative activities of farmers take place in their fields. ITK farmers of Sierra Leone, conduct field trials, test new seeds under various soil conditions and compare results. Ethiopian farmers maintain their variety performance records, sometimes inscribed on door posts. Bangladeshi farmers developed many varieties of all field and horticultural crops.

The ITK of agriculture in Bangladesh is characterized by long term practical experiences for decreasing environmental risk within farmers own domain using the existing opportunities. The technologies are the means of survival overtime from all the natural calamities like drought, cyclone, tornado, input distribution and pricing which is regular phenomenon of this country.

The traditional technologies which are mostly helpful for small farmers need specialist attention by the scientists and extension worker. A wide investigation by the scientists to improve and utilize the traditional technologies would be beneficial for them (Halim, 1982) with a view to accumulated the informal undocumented knowledge of farmers from different corners of the country, this effort was undertaken. Instead the improving the overall living standard of the farming people that really what was expected from the "green revolution", they have found to benefit a very negligible section of the community. This leads to create discrimination between rich and poor farmers which tends to destabilize the overall socio-economic condition of the farming communities as well. In a constant struggle to survive, farm communities have improved enumerable ways of crop cultivation each adapted to local ecological conditions and inseparably twisted with the local culture.

At present, considerable attention is being given to the farmers' wisdom or indigenous or local knowledge systems in different parts of the world. For some, this knowledge provides a basis for identifying ecologically sustainable options of resource use. For others, these are cheap sources of identifying ideas which have considerable scope for commercial exploitation in agriculture after value addition (Talawar and Singh, 1992). Moreover, through a proper understanding of the technological, sociological and other relevant aspects of ITK, the degree and direction of planned change for the client system could be properly assessed through formal research (Verma and Singh, 1969). Research and conservation on local knowledge is very important in order to achieve higher production of farm components. These priorities the exigency of a growing interest in documenting these local technologies and drawing the attention of researchers, development worker and financial agencies to the advantages of preserving and improving them to achieve higher production. Very little research has been done in Bangladesh on this aspect.

Hence, this study was under taken to investigate the use of indigenous technical knowledge by rural people in farming activities.

1.2 Statement of the problem

Research is often observed as a monopoly of scientists who are steadily pushing forward frontiers of knowledge and developing new technologies. Agricultural research institutes in Bangladesh are seen as the central sources of innovation. Their ideas are passed on to national and regional scientists doing applied and adaptive research, and the products of this research are meant to be spread via extension agents to farmers. Formal institutions of agricultural research and extension are not the sole agents of innovation and dissemination of new technologies. Most agricultural technologies in use in the world today were developed by farmers, not formally by educated scientists. Innovations are developed and diffused by farmers through processes of which many outsiders are completely unaware (Reijntjes *et al.,* 1992).

Farming systems are constant change, as experience is accumulated populations increase or decrease, new opportunities and aspirations arise, and the natural resource deteriorates. These adoptions have not always been adequate and entire cultures have disintegrated as a result.

The awareness of farmers has been well documented by Johnson (1972), Reij *et al.* (1986), Richards (1989), Altieri (1987), Lightfoot (1987), Millington (1987) and McCorkle *et al.* (1987). In current literature, the innovative rural farmers are now accepted as the norm, not the exception and. in recent years, there has been a growing scientific interest in locally developed fanning system and technologies. These are seen as a source of sound ideas, locally adapted cultivars and practices which could lead to sustainable use of local resources

The local or indigenous technical knowledge (ITK) of a farming population living in a specific area is derived from the local people's previous farming ‘experience, both that handed down from previous generations, and that of the recent generations. When a technology developed elsewhere has been incorporated by local farmers as an integral part of their agriculture, it is as much a part of their indigenous technical knowledge as self-developed technologies. Farmer’s practical knowledge about the local ecosystem, about the natural resources and how they interact is reflected in

their farming techniques and in their skill is using the natural resources to gain their livelihood. ITK can be seen as a dynamic and ever-changing accumulation of the collective experience of generations (Reijntjes *el al.,* 1992).

However, many cases illustrate that formal institutions of agricultural research and extension are not the sole agents of innovation and dissemination of new technologies. Empirical evidence from all parts of the world shows that the central source of innovation model does not conform to reality (Roling, 1988; Biggs, 1989; and Chambers *et al.,* 1989). Most agricultural technologies, used in the world today, were developed by farmers, not formally by educated scientists.

It has always been basic to rural people's struggle for survival to produce enough food for the family and to maintain the productive capacity of the natural resources, so that they can continue producing food for the family and for future generations. In order to combat the struggle, technology development through experimentation and integration of new knowledge including ITK has always been a necessary part of farming. The conventional technologies are most useful for the small and marginal farmers need special attention by the scientists and extension workers. A wide investigation by the scientists to recover, improve and utilize the conventional technologies would be beneficial for them (Halim, 1992).

ITK is not static. New techniques developed by a member of the community or introduced from outside, if locally beneficial, spread by word of mouth, imitation or informal education in village meetings, initiation rites etc. and become part of ITK. As new experiences are gained, others lose their relevance because of changing circumstances and needs. The capacity of farmers to manage adapt with the changes become the also part of ITK system. Thus, ITK can be seen as a dynamic and ever-changing accumulation of the collective experience of generations (Reijntjes *et al.,* 1992).

Bangladesh possess a rich heritage of indigenous farming knowledge, though much of which lost during modernization of agriculture. Still this country and people are proud to nurture many myth, believes and traditions (Chowdhury *et al.,* 1996). Agriculture still is the main occupation of the majority people of Bangladesh, as it has been so far thousand years ago. Agriculture alone served the dwellers of this area in changing days when the other means of social survival had been forced out of the

economy by colonial interest.

Awareness of ITK in relation to the environment friendly agricultural practice by the farmers and related aspects in the use of resistant varieties, encouraging production and parasitoids use of light trap, crop rotation, organic farming, etc. are influenced by the demographic and socio-economic characteristics of the farmers. Today environmental concerns and social and economic justice are the most important issue for survival. The sustainability of food and agriculture was regarded as an issue of unparalleled importance. Farmers use modern technologies and chemical fertilizer, pesticide for more production in agricultural sector. Use of modern technology and intensive cultivation, soil loose fertility and less fit for crop production. Use of chemical fertilizer and pesticide lead to increase crop yield but also to an increasing the nitrate in the surface and ground water which indirectly reducing the oxygen supply of fish. Highly nitrogen concentrate turned ground water is also harmful for human health. Water contamination is common in case of pesticide application in fresh water to control weed etc. The effects of pesticide have their effects on non-target species. They can kill some birds and predators etc.

The development of agriculture and sustainability is necessary to feed the future generation but without hampering the environment and depleting the natural resource base. ITK is not harmful for environment but it increases the agricultural production. ITK involves low cost in farming whereas modern farming requires high cost in farm activities. For this reason, farmer awareness is needed to reveal towards use of ITK for sustainable agricultural development. Therefore, the major queries under analysis having been identified, the question central to the present study is focused on the use of some ITK by the farmers. Specifically, it was sought to answer the following questions:

- What are the farmer's awareness of using ITK for sustainable agricultural development?
- what are the selected characteristics of farmers for using ITK?
- What are the relationships between selected characteristics of the farmers with their awareness of the use of ITK?

Considering the foregoing research questions, the researcher undertook the research work entitled, "Farmers' Awareness of the Use of Indigenous Technical Knowledge (ITK) of Sadar Upazilla Under Jamalpur District.

1.3 Objectives of the Study

The following specific objectives were formulated to give proper direction to the study:

- To determine and describe farmer's awareness of using ITK for sustainable agricultural development.
- To describe the selected characteristics of the farmers of using ITK for sustainable agricultural development.
- To explore the relationships between the selected characteristics of farmers and their awareness of the use of indigenous technical knowledge (ITK) for sustainable agricultural development.

1.4 Justification of the Study

Agriculture and environment has a close relationship. We need improved agricultural production keeping the environment healthy and friendly. Indigenous technical knowledge (ITK) is an appropriate package of technology in farming activities which is most economical and less hazardous to the environment. As most of the farmers of Bangladesh are poor, they could hardly adopt-modern technology for farming activities. According to FAO, the environmental problems of developing countries are largely due to overexploitation of lands, extension of cropping and deforestation (Alexandratos, 1988). Some large irrigated areas are seriously affected by salinity. Increased use of pesticides and artificial fertilizers are also creating environmental problems, particularly the degradation of soil texture including soil fertility and the scarcity of fuel-wood indicate the graveness of the situation. Referring to the no desert areas, 43 percent of Africa, 32 percent of Asia, and 19 percent of Latin America is at the risk of desertification (FAO, 1984).

It has been found in different countries of the world that in addition to beneficial effect, the improved agricultural practices have tremendous influence on environmental pollution and Bangladesh is not exception to this (Sattar, 1994).

Agriculture in Bangladesh started taking the form of intensification since mid 1960s through seed-fertilizer-water technology (Hossain *et al.,* 1990).

Indigenous technical knowledge use status is very low in farming of Bangladesh. ITks is a negative sign for agriculture. Major causes to minimize the use of indigenous technical knowledge are the over use of agriculture practices (chemical inputs, hybrid seeds, irrigation), mechanization based on fossil fuels.

Warren (1991) reviewed the role of ITK in three project situations and found that project success is linked to deliberate incorporation of ITK components. The author also stated that many types of indigenous knowledge and decisions making system are useful for sustainable agricultural development. The ITK of farmers are considered as important source of information about the local farming systems, experience, institutions, culture etc. and it also proved that this knowledge plays significant role in designing of formal and efficient extension service (Sharland, 1991).

ITK is highly effective and applicable for farm management for the scientists and extension workers and crop producers, which are most economical and less hazardous to the environment. For enhancing the dissemination of indigenous technologies to the end users both scientist and extension personnel should work hand to hand. Researcher should conserve and identify indigenous technologies appropriate for farming activities which extension people make available to the farmers. These can be done through a variety of appropriate extension teaching method.

A scientific analysis for successful identification of the ITKs and an understanding of the phenomena related to the objectives of the study, the researcher believes invaluable document to various government, autonomous, and non-government organizations to plan, organize and generate appropriate technologies for sustainable agricultural development.

Although the findings of this study will be applicable to Pourasava union under Sadar upazila of Jamalpur district, it is desired that the findings may also have applicable to other areas of Bangladesh were the physical, socioeconomic, and other cultural conditions do not differ much from those of the study area. The findings may also be beneficial to the field worker of agricultural extension service providers to

develop strategies of action for conserving friendly farm environment with the rural people. Lastly the researcher believes that the findings and recommendations of this study will be helpful in formulating extension programs for decreasing risk of production, health and environment. The knowledge and skill gained by the researcher in conducting the study would help him in conducting similar study.

1.5 Assumptions of the Study

Following assumptions (Goode and Halt, 1952) were in the mind of the researcher during conducting the study:

- The respondents included in the sample were capable of furnishing suitable responses to the questions included in the interview schedule.
- The responses furnished by the respondents were believable.
- The researcher who acted as an interviewer was well conscious of the social and cultural environment of the study area. Hence, the data collected by the researcher were free from bias and the respondents furnished their idea without hesitations.
- Views and opinions furnished by the respondents included in the sample were the representative views and concept of the whole population of the study area.
- The respondents selected for the study were capable to satisfy the quarries of research.
- The information sought by the researcher disclosed the real situation to satisfy the objectives of the study.

1.6 Limitations of the Study

The present study was undertaken with a view to having an understanding of the use of ITKs with regard to sustainable agricultural development by the farmers. In order to conduct the research in a meaningful way, it became necessary to impose some limitations in certain aspects of the study. Considering the time, money, labor and other essential resources available to the researcher, the following limitations have been accomplished throughout the study:

- The study was confined to six villages namely Rashidpur, Ramnagar, Bagabaid, Poschim Fulbaria, Kompopur, Chandra, Pathalia of pourasava union under Sadar upazila of Jamalpur district.
- Characteristics of the farmers were many and varied but only twelve characteristics were selected for investigation in this study.
- There are many indigenous farming technologies cultivated by the farmer in farming but only thirty indigenous technologies were selected for measuring the extent of their use.
- There were various people in the study area, but only the people who were involved in farming activities were considered for this study.
- Population for the present study was kept limited within the heads of farm families in the study area, because they were the decision makers in their respective families in respect of use of ITKs in farming activities.
- Sustainability of the documented ITKs was not based on scientific rationale.
- The present study highlights new dimensions of research in the field of agricultural extension in Bangladesh, and so the researcher could not provide enough evidence in equipping his study report with connected literature reviews.

1.7 Definition of Key Terms

Certain ‘terms’ have been used in this research report that need to be defined properly so that the findings as well as other contents of the study report become well-clarified to its users.

Environment: Environment is a process which covers biological and non-biological, manufactured and social environment that affects and supports the growth of life of individual or group of individual as well as all kinds of flora and fauna.

Agricultural activities: These are referred to the works done by farmers for agricultural production directly or indirectly. Agricultural activities combined crop production, fish production, animal production etc.

Awareness: Awareness has been explained as one's consciousness about an object or thing or various situation in his surroundings. It refers to the orientation of various methods and materials in relation to ITK.

Cosmopoliteness: It is explained as the orientation of an individual external to his own social system. Empirically it is referred to the number of times a person pays visits to places other than his own locality.

Green revolution technology: This referred to the agricultural technologies introduced during decade 1960's which are relying on modern variety, agrochemicals, and fuel based mechanization. The main objective of introducing green revolution technologies was to boost up agricultural production at the fastest possible rate.

Extension media contact: This *term referred to one's* becoming accessible to the effect of extension contact through various extension teaching methods.

Knowledge: Literally knowledge means knowing or what one knows about a subject, fact, person etc. Knowledge, however, refers to the amount of information about an idea an object or person which a person knows. Regarding technological aspect, knowledge comes when an individual is exposed to a technology's existence and achieve some understanding of how it functions.

Organizational participation: Organizational participation of an individual refers to his association and participation in different organizations within a specified period of time with a view to serving the society voluntarily toward improvement.

Technology: Technology is a design for instrumental action that minimizes the uncertainty in the cause-effect relationship involved in achieving a desired outcome.

Indigenous technical knowledge (ITK): ITK in the present study refers to the sum total of knowledge and practices which are depended on people's accumulated experiences in dealing with situations and problems in different aspects of life, and such knowledge and practices are special to a particular culture. ITK may surround uncountable premises such as, agriculture, resource management, food and nutrition, education, and so on. The author, owing to his cost and time constraints, have conducted his investigation on ITKs related to the selected dimension of agriculture (crop cultivation, livestock production, and fish production) only for keeping himself in line with his dimension of expertness and field of interest.

CHAPTER II

REVIEW OF LITERATURE

In this chapter, reviews of the literature related to the major study are presented. It may be relevant here to mention that a good number of research activities regarding farmers' traditional knowledge system have been made in various countries of the world. This chapter constructed three sections in the following manner: in the first section use of ITK by the farmers and its concept have been presented, in the second section findings in connection with the relationships between independent variables and dependent variables and in the last section a conceptual framework of the study has been formulated to conduct the present study in the right direction.

2.1 Concept, Significance and Use of ITKs

2.1.1 Concept of ITK

The concept of ITK has been manifested by different terms by different researchers. The terms used are 'indigenous knowledge', 'traditional knowledge', 'indigenous technology', 'local knowledge system', 'farmer's ingenuity and wisdom', 'ethno science', 'local science', "traditional science', 'people's science', and 'village science. However, some reviews relating to the concept of ITK have been presented below:

According to Warren (1991) "Indigenous knowledge is local knowledge that is unique to a given culture or society. This knowledge is the information base for a society; it facilitates communication and decision making. Indigenous knowledge is dynamic which changes through indigenous creativity and innovativeness as well as through concept with other knowledge system."

The local or indigenous knowledge (IK) of a farming population living in a specific area is derived from the local people past farming experience, both that handed down from previous generations and that of the present generations. When a technology developed elsewhere has been incorporated by local farmers as an integral part of their agriculture, it is as much a pail of their indigenous knowledge as self-developed technologies. Farmers' practical knowledge about the local ecosystem and how they interact- is reflected in their farming techniques and in their skill in using the natural resources to gain their livelihood (Reijntjes *et al.,* 1992).

Whatever the implications of using these different terms, there is significant unity in the recognition that rural communities in Africa and other parts of the Third World have profound and detailed knowledge of the ecosystem and species (the natural environment) which they are in contact with and cultural settings within their respective environments. They have also developed effective ways of ensuring that this knowledge and the physical resources of the environment are used sustainably. Ethno science or folk science or ITK is therefore the form of shared environmental knowledge, beliefs and rules and techniques for productive activities.

Thrupp (1987) stated that indigenous knowledge is far more than merely what is reflected in technical method. It also entails many insights, perceptions and intuitions related to the environment, often including lunar or solar cycles, astrology, and meteorological and geological conditions. This 'folk wisdom' is usually integrated with belief systems and cultural norms, and expressed in traditions and myths. Also traditional methods of communication, e.g. through songs or proverbs, and traditional structures for social organization and cooperation form part of the local knowledge system. Such knowledge systems are not always easily understood by people trained in western science.

Chowdhury *et al.* (1996) asserted of ITK as indigenous people and farmers develop their location specific knowledge and practices of agriculture, natural resource management, human and animal health care and many other subjects for centuries. The complex of knowledge, traditional beliefs and practices are generally known as indigenous or traditional knowledge.

2.1.2 Significance of ITK

Scientists, development workers as well as policy planners round the globe are now in a consensus that emphasizing and evaluating local technologies would have the way for a sustainable agricultural development. The following reviews would make one understand the significance of ITK in order to achieve sustainability in agriculture:

Verma and Singh (1969) stated that indigenous knowledge has undergone evolutionary process and is built form and based on thousands of years of experience. Traditional wisdom is time tested and understanding the dimension of technology of clienteles help ascertaining the degree and direction of change through

formal research.

Talawar and Singh (1992) argued that abstracting the science underlying indigenous knowledge system would help us understand the concept and practices depicting the elements of sustainability to integrate with the modern information system for efficient resource management.

Reijntjes *el al.* (1992) reported that in recent years, there has been a growing scientific interest in locally-developed farming systems and technologies. These are seen as a source of sound ideas, locally adapted cultivars and practices which could lead to sustainable use of resources.

Sharland (1991) referring to the statements of Warren (1991) pointed out that agricultural scientists accept that indigenous technical knowledge must be reassessed for introducing new agricultural technology, as farmers have a wealth of information of their own environment which should be taken into account. The author also opined that indigenous technologies used by one society to solve problems can also be used to solve problems faced by another society in a similar agro-ecosystem in another part of the world. The knowledge is valuable national resource its systems are dynamic and continually influenced by internal creativity and experimentation as well as by contact with external systems. It helps assure that the end users of agricultural development projects are involved in developing technologies appropriate to their needs. It is cost effective as well as it builds development efforts enhancing sustainability and capacity building.

Thrupp (1987) informed that now a day's some researchers and development workers have recognized that rural people have a great richness of knowledge about their resources, environments and farming practices and likewise are often experimenters, risk takers, innovators, intensifiers, diversifiers, and practitioners of great common sense, who have remarkable capacities to adapt to change and constraints of evolving their technologies over time. This technical knowledge of the fanner has been ignored by the researchers, planners, and development workers. Rather top-down approaches are being tried with least success and quite often displacing of neglecting resource-poor people of the rural society.

Gupta (1990) holds that the knowledge produced by peasants, pastoralists, artisans and women in the household laboratory-the kitchen-is an important source of

generation of technologies for sustainable development. Existing the frontiers of science is possible by building upon some of functional, intuitive, composite recipes of peasant culture.

Chowdhury *et al.* (1996) suggested that indigenous knowledge should be valued as it comprises a storehouse of accumulated experience about natural resource management essential for sustainable agricultural development.

Altieri (1996) referring to Andean Agriculture cited that, "many scientists are beginning to show interest in traditional agriculture as they search for ways to remedy the deficiencies of modem agricultural development, recognizing that indigenous farmers and their systems may hold massages of hope for the future of Andean agriculture".

Shah (1994) stated that indigenous systems may not work in every situation but the integration of local and external technologies can result in appropriate solutions.

Rist (1991) argued that many of the indigenous techniques are traditional, at the same time they can be regarded as modern in the sense of a sustainable agriculture.Various development projects have shown the importance of building upon existing farmers knowledge and decision making process.

Warren (1991) has surveyed the role of ITK in three project situations and found that:

i) In some projects ITK provided an improved approach to managing natural resources.

ii) There were cases where projects ignored local technologies could not achieve success.

iii) Projects success was linked to deliberate incorporation of ITK, components.

2.1.3 Use of indigenous Technical Knowledge

In this section, literature review relates to the use of indigenous farming technologies in various aspects of crop, fishery and livestock production. ITK is an important source of information about the local fanning system, experiences, institutions, culture etc. Above all, producers' knowledge and needs from the basis for change within the farming community (Reijntjes *et al.,* 1992).

Crop production

It was reported that damp sand application in the crop field reduces soil pH (Anonymous, 1994). de Schlippe (1956) reported that the sites of termite mounds are particularly good for growing sorghum and cowpea.

Wilken (1987) found that, use of ant refuse in Zaachilla and Mexico to fertilize high-value crops such as tomatoes, chili and onions. In India, ash applied in seedbed and in onion fields before sowing and planting helps in development and improvement of quality of bulbs. Farmers believe that this helps in soil reclamation (Anonymous. 1994).

Altieri (1987) and Thurston (1990) opined that traditional crop selection, planting times and cultivation practices often reflect efforts to minimize insect damage.

The following indigenous pest control techniques are very effective (Anonymous, 1994):

- Mint leaves emit a pungent smell, which repels insects.
- Chilies and other hot peppers can be used on vegetables against the caterpillars, aphids, flies, ants and other pests.
- Neem is effective against caterpillars and weevils on soybeans.
- Pyrethrum acts as a botanical insecticide against caterpillars, aphids, flies, ants and other pests.
- Wood ash sprinkled on seedlings, helps repel cutworms.

The use of diluted cattle urine as pesticide has been reported by many. Lohar (1952) advocated that diluted urine was very effective in controlling powdery mildew on broad leaf mustard Doutt (1964) observed a century-old practice among citrus growers in China is to place nests of the predacious ant *(Oecophylla smaragdmi F.)*

in orange trees to reduce insect damage. The citrus growers even install interconnecting bamboo rods as bridges for the ants to move from tree to tree.

Koradia (1996) reported that uses of empty shells of cotton ball control a noxious weed *Cyperus rotundus.*

Gomathinayagam, a progressive ecological farmer of Puliyanagudi village in Tamil Nadu identifies that the strong odour of *Cycas* sp. cones repels earthen bug from rice crop in the milky stage (Anonymous, 1994).

Hossain and Alam (1993) reported that the farmers in Kazirshimla of Mymensingh district. Bangladesh use the following indigenous techniques of pest control in crops:

- Haphazard planting of crops to reduce the infestation of certain weeds.
- Criss-cross hanging of banana leaf thread above brinjal plot to prevent bird attack.
- Digging deep ring around cabbage, cauliflower and tomato seedling to inhibit cutworm attack.
- Spreading sawdust over banana beetle.
- Using powdered seeds of 'peetraj *(Amoora rohutika)* as insecticide.

Fish production

Fisheries are one of the major components of agricultural activities, playing a significant role in nutrition, employment, income generation, foreign exchange earnings and in the economy of Bangladesh as a whole. At present it contributes 4percent of total Gross Domestic Product (GDP), 9 percent of foreign exchange earnings and 75 percent of the daily per capita animal protein intake (Ali, 1997).

In addition to the main cultivated species there are many indigenous breeds of fish that play an important role in the nutrition of the population. These fish are classed as small indigenous species although not all fish within this classification are particularly small. Of the 260 species of fresh water fish found locally, over 140 species are classified as Small Indigenous Species (SIS) and account for over BO percent of the Total catch, consumed by the poorer section, as preferred species.

Chowdhury *et al.* (1996) observed that the farmers in Lalmonirhat and Rajshahi use the following techniques for fish cultivation:

- The intestines of beef cattle, goats, ducks and poultry are grinned and fed to the fish rearing in the ponds,
- After cleaning the poultry den the stools are given to the fish,
- For increasing fish production cow dung is applied in the ponds and stirring is done with the help of fishing net, and
- Lime, banana plant, branches of neem is thrown in the pond to prevent fish diseases. Kerosene is spread over aquatic weeds to destroy them.

In Sunamganj, paddy husk is given in the pond by the farmers as fish food. In Joydebpur area termite mounds grow quickly and cause lot of damage. Women and children collect these mounds, break them into small pieces and throw in pond (Chowdhury *et al., 1996).*

Ducks, fish, frogs and snakes are traditionally used to control insects in rice cultivation in many parts of the world (Reijntjes *et al*., 1992).

Livestock production

In Peru, ethno veterinary concepts and practices, many of which have real therapeutic and prophylactic values, are used extensively by women. For example, a large number of remedies are effective in assuaging diarrhea or in preventing parasitic infections (Mc Corckle *et al.,* 1987).

Sick cow or goat suffering from indigestion and loose motion can get relief by feeding them fresh leaves of wood apple. Raw turmeric mixed with small amount lime wrapped in banana leaf is feed to the cow to get relief from indigestion (Chowdhury *et al., 1996).*

In Sunamganj to cure indigestion of cattle, warm boiled rice mixed with paddy husk is fed to them. To cure indigestion and gas formation of cattle, juice extracts of ‘shati’ *(Cercuma amada)* leaves, raw turmeric and zinger is fed. This is very much effective for instant control (Chowdhury *et al,* 1996).

To cure infection of wounds formed on the shoulder *of* draft animal, ointment made by ‘motiharitobacco’ and ‘pathar chun' is applied and bandaged (Chowdhury *et al.,*

1996).

To cure gas formation and indigestion of goat, water from local smoking pipe (Hookah) is fed to the goat. The dose is 1/4 to 1/2 liter depending on the size and age of the goat (Chowdhury *et al.*, 1996).

Chowdhury *et al. (1996)* found that warm boiled rice mixed with a few drops of kerosene is fed to the poultry as prevention for different diseases and he also reported that rural women hatch eggs of improved exotic variety under local hen to raise better quality chickens.

Chowdhury *et al. (1996)* reported that snails are collected from the crop fields, shells are broken and the farmers cut the flesh into small pieces, which is fed to young ducklings. This is good quality protein and helps the duckling to grow quickly.

2.2 Studies Concerning the Relationship of the Farmers Awareness

2.2.1 Age and Awareness

Nur-e-Firdouse (2003) found that age of the rural women had no significant relationship with their awareness on agricultural extension service.

Faruque (2002) found that age the farmers were related to their extent of use of ITK. The positive trend, however, indicate that the use of ITKs increased with the increased age of farmers.

Khan (2002) found that age of the farmers had a significant positive relationship with their awareness on adverse effect on rice monoculture.

Sutradhar (2002) found that age of the respondents had no significant relationship with their awareness on environmental degradation.

Kashem and Mikuni (1998) found a significant negative correlation between the age of the Bangladeshi farmers and their perception about benefits of using the Indigenous technical knowledge (ITK). Hanif (2000) found that in his study there was a positive significant relationship between age of the respondents and their awareness on environmental pollution in case of farmer field school (FFS).

He also found that there was a negative insignificant relationship between age of the respondents and their awareness on environmental pollution.

Naher (2000) in her study found that there was no relationship between age of rural women and their participation in homestead vegetable cultivation, post-harvest practices, poultry raising and goat rearing, while the activities in vegetable, cultivation are mostly participated by the younger housewives.

Islam *et al.* (1998) conducted a survey to determine the awareness of farmers on environmental and obtained a negative correlation with the awareness on environmental pollution.

Hamid (1997) made a survey to determine the awareness of farmers on environment. He found that age of the farmers had negative relationship with the awareness on environmental pollution.

Islam (1996) found that age of the farmers had significantly negative relationship with their extent of use of ITK.

2.2.2 Education and Awareness

Nur-e-Firdouse (2003) found that academic qualification of the rural women had a significant positive relationship with their awareness on agricultural extension service.

Faruque (2002) found that the level of education of the farmers was related to their extent of use of ITK. The negative trend, however, implied that high educated farmers used ITKs to a smaller extent.

Sutradhar (2002) found that academic qualification of the respondents had a significant positive relationship with their awareness on environmental degradation.

Khan (2002) found that level of education of farmers had no relationship with their awareness on adverse effect on rice monoculture.

Hanif (2000) found that in this study there was a positive significant relationship between education of the respondents and their awareness on environmental pollution.

Hossain (1999) found that education of the fanners had significant positive relationship with the awareness on environmental degradation.

Islam *et al.* (1998) observed that education of the farmers had significant positive relationship with the awareness on environmental pollution.

Kashem and Mikuni (1998) did not find any relationship between education of the farmers and their perception about benefits of using ITK.

Hamid (1997) found that education of the fanners had positive relationship with the awareness on environmental pollution in both case of the progressive and less progressive village.

Islam (1996) observed that there was no relationship between education and extent of use of ITK of the farmers.

Miah and Rahman (1995) found that the level of education of the farmers had positive significant relationship with the awareness on farming environment.

2.2.3 Family Size and Awareness

Nur-e-Firdouse (2003) found that the rural women with the large family size were less aware on agricultural extension service.

Sutradhar (2002) found that family size of the respondents had a significant positive relationship with their awareness on environmental degradation.

Faruque (2002) found that there was relationship between the family size and extent of use of ITK of the respondent.

Khan (2002) found that family size of fanners had no relationship with their awareness on adverse effect on rice monoculture.

Hanif (2000) found that in his study there was a positive significant relationship between family size of the respondents and their awareness on environmental pollution.

Islam (1996) observed that family size of fanners had a significantly negative relationship with their extent of use of ITK. Rao (1976) also observed similar findings between the family size of the farmers and their adoption of some selected agricultural technologies.

Miah and Rahman (1995) found that family size of the farmers and awareness regarding fanning environment were not significant.

Akanda (1994) showed that family size of the rural women had a significant positive relationship with their participation in the cultivation of homestead vegetables and fruit trees.

Halim and McCarthy (1985) reported that women performed different types of economic activities like post-harvest, vegetable gardening, livestock care etc.

2.2.4 Farm Size and Awareness

Faruque (2002) found that the farm size of the respondents unrelated with their extent of use of ITK in rice cultivation.

Sutradhar (2002) found that farm size of the respondents had a significant positive relationship with their awareness on environmental degradation.

Khan (2002) found that farm size of the farmers had no relationship with their awareness on adverse effect of rice monoculture.

Hanif (2000) found that there was a negative insignificant relationship between farm size of the respondents and their awareness on environmental pollution.

Kashem and Mikuni (1998) did not find any significant relationship between farm size and perception about benefits of using ITK among Bangladeshi and Japanese farmers.

Hamid (1997) found that area under cultivation of the farmers had insignificant relationship with the awareness on environmental pollution.

Islam (1996) found that the farm size of the farmers had a significant negative relationship with their extent of use of indigenous technical knowledge (ITK).

Miah and Rahman (1995) revealed that farm size of the fanners and awareness regarding farming environment were not significant.

Akanda (1994) revealed that fann size of the rural women had positive significant relationship with their participation in the cultivation of homestead vegetables and fruit trees.

2.2.5 Annual family Income and Awareness

Sutradhar (2002) found that annual income of the respondents had a significant positive relationship with their awareness on environmental degradation.

Faruque (2002) found that annual income of the respondents was significant relationship with their extent of use of ITK in rice cultivation.

Khan (2002) found that annual income of farmers had no relationship with their awareness on adverse effect of rice monoculture.

Hanif (2000) found that in his study there was a negative insignificant relationship between annual income of the respondents and their awareness on environmental pollution.

Hossain (1999) found that family income of the farmers had significant positive relationship with their perception on environmental degradation.

Hamid (1997) found that annual income of the fanners had significant positive relationship with the awareness on environmental pollution in case of the less progress village but it was insignificant in case of progressive village.

Islam (1996) found that a negative and significant relationship between annual income of the farmers and their extent of use of ITK.

Akanda (1994) showed that family income of the rural women had a significant relationship with their participation in the cultivation of homestead vegetables and fruit trees.

2.2.6 Cosmopoliteness and Awareness

Faruque (2002) found that cosmopolitness of the respondents had a negative significant relationship with their extent of use of ITK in rice cultivation. Khan (2002) found that cosmopolitness of the farmers had no relationship with their awareness on adverse effect of rice monoculture.

Hanif (2000) found that in his study there was a negative insignificant relationship between cosmopolitness of the respondents and their awareness on environmental pollution.

Islam *et al.* (1998) found that cosmopolitness of the farmers had no significant effect on farmer's awareness on environmental pollution.

Kashem and Mikuni (1998) did not find any significant relationship between farm size and perception about benefits of using ITK among Bangladeshi and Japanese farmers.

Hamid (1997) observed a positive relationship between cosmopolitness of farmers and their awareness on environmental pollution.

2.2.7 Organizational participation and awareness

Khan (2002) found that organizational participation of the farmers had no relationship with their awareness on adverse effect of rice monoculture.

Faruque (2002) found that organizational participation of the farmers had no relationship with their extent of use of ITK in rice cultivation.

Sutradhar (2002) found that organizational participation of the respondents had no relationship with their awareness on environmental degradation.

Hanif (2000) found that in his study there was a insignificant relationship between organizational participation of the respondents and their awareness on environmental pollution in case of farm field school fanners.

Islam *et al.* (1998) found that cosmopoliteness of the farmers had no significant effect on farmer's awareness on environmental pollution.

Hamid (1997) observed a positive relationship between awareness of fanners and their organizational participation in case of less progressive village and found no no relation in. case of progressive village.

Islam (1996) reported that organizational participation of the fanners had no relationship with their extent of use of indigenous technical knowledge

2.2.8 Extension Media contact and Awareness

Khan (2002) found that extension media contact of the farmers had a highly significant relationship with their awareness on adverse effect of rice monoculture.

Faruque (2002) found that the extension media contact of the farmers was correlated to their extent of use of ITK in rice cultivation.

Sutradhar (2002) found that communication exposure of the respondents had a significant positive relationship with their awareness on environmental degradation.

Hanif (2000) found that in his study there was a positive significant relationship between extension contact of the respondents and their awareness on environmental pollution in case of farm field school farmers.

Islam (1996) observed in his study that a significant and positive relationship between the media exposure of the farmers and their extent of use of indigenous technical knowledge.

Halim (1982) and Bashar (1993) found no relationship between contact with extension workers and farmer's adoption behavior regarding improved crop production practices.

2.2.9 Knowledge and Awareness

Sutradhar (2002) found that knowledge on the use of modem agricultural techniques of the respondents had a significant positive relationship with their awareness on environmental degradation.

Khan (2002) found that knowledge on rice cultivation of the farmers had a highly significant positive relationship with their awareness on adverse effect of rice monoculture.

Alam (1996) observed that the knowledge on homestead forestry of the farmers were related to their awareness regarding the consequences of homestead deforestation. Islam *et al.* (1998), Hanif (2000), Islam and Kashem (2000), Hoque (2001), Kashem (2001) and Sutradhar (2002) found similar results in their respective studies.

2.2.10 Innovativeness and awareness

Hossain (1999) relationship between innovativeness of the farmers and perception on the effect of agro-chemicals an environment.

Therefore, the above studies suggest that there may be positive relationship between these concerned variables.

2.3 The Conceptual Framework

The prime objective of the present study was to have an understanding about awareness of the use of ITKs by farmers in farming. In Bangladesh most of the land is being used for agricultural activities to meet the need of growing population years after years. These practices result in a number of adverse effects on environment. Reports of many research findings recognized soil quality deterioration, health hazards due to environmental pollution, deterioration of socio-economic condition of rural people. The change agent should try to motivate the client to change their thoughts and behavior. So before taking any extension programmed we should know their present status of understanding, feelings, actions and potentials in this respect.

It is important to know and understand what the concepts of ITKs are and what beneficial role ITKs can play in farming and what is farmers' reaction about the issue. This study, thus attempts to address the matter that what does the farmer get benefit from using ITKs in fanning.

It is evident from the past studies that every occurrence or phenomenon is the outcome of a number of variables which may or may not be interdependent or interrelated with each other. In the other words, no single variable can contribute wholly to a phenomenon. Variables together are the cause and the phenomenon is effect and thus, there is cause-effect relationship everywhere in the universe.

Scientists round the world now held the common view of incorporating the ITK into the ongoing modern practice to achieve sustainable agricultural development. It is obvious now a day that the introduction of modern technologies has created enormous social and ecological problems which seem to endanger the sustainability of agricultural development. The necessity of getting of alternative has been realized in the recent years. Before the modem technologies were introduced, farmer used to maintain their agricultural sector by their own knowledge and means. It is logical to assume that the ITK conceive certain sustainability criteria. ITK utilized local available resources, are well adopted to the local agro-eco system, cheep, accessible to all categories of farmers and held many others. Similar attributes which are the prerequisites for achieving a sustainable agricultural development.

The conceptual framework was kept in mind in farming the structure arrangement for the dependent and independent variables. It also included the other factors that may play probable role in this case. The awareness of use of indigenous technologies was considered as dependent variables and their ten personal, socio-economic, socio--cultural and psychological characteristics were selected as independent variable for investigation in the present study. In the light of the foregoing discussions, a conceptual framework has been developed for this study, which is diagrammatically shown in the Figure. 2.1.

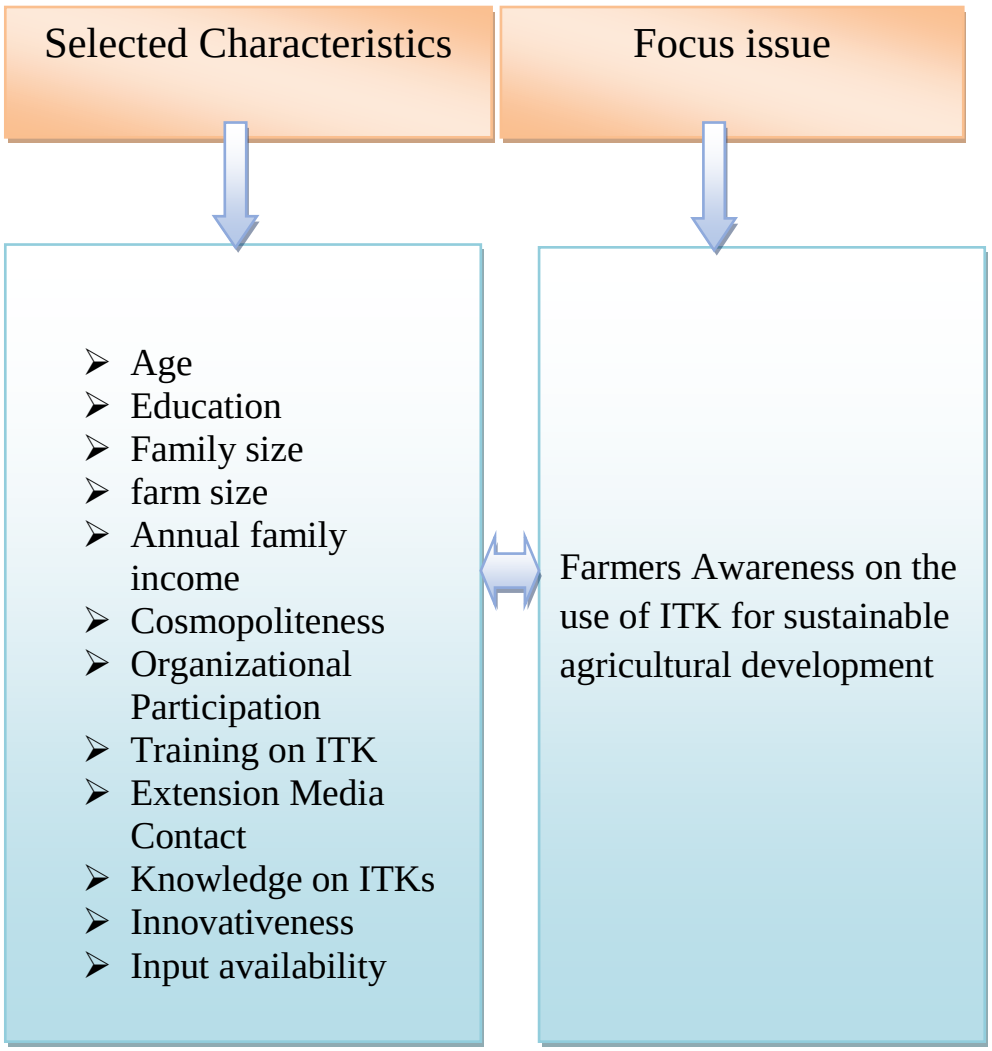

Figure 2.1 The conceptual framework of the study

CHAPTER III
METHODOLOGY

Methods and procedures used for collection and analysis of data are very necessary for any scientific research. It requires a careful consideration before conducting a study. The researcher has big responsibility to clearly describe as to what sorts of research design, methods he would follow in collecting valid and reliable data and to analyses and explain those to arrive at right conclusion. The methods and procedures followed in conducting this study have been considered in this chapter. Further, the chapter involves the operational format and comparative reflection of some variables used in the study. Also statistical methods and their practice have been mentioned in the later section of this Chapter.

3.1 The Locale of the Study

The study was conducted in six villages namely Rashidpur, Ramnagar, Poschim Fulbari, Kompopur, Chandra and Pathalia of Pourasava union under the Sadar upazila of Jamalpur district. A map of Bangladesh showing the Jamalpur district is presented in figure 3.1 and a map of Sadar upazila showing the study area is presented in figure 3.2

3.2 Population and Sampling Design

The Pourasava Union consists of 20 villages among which six villages were purposively selected. Six villages have a total population of 1248. The researcher himself with the cooperation of Sub-Assistant Agriculture Officer. One farmer (who mainly operated the farming activities of the family) from each of the farm families was considered as the respondent. From this population, 10 percent was selected randomly as sample of the study. Thus, the sample size became 124. A reserve list of 12 respondents was prepared for use in case of any missing during collection of data.

Table 3.1 Distribution of population and sample of farmers in the study area

Name of village	Total number of population	Sample	Reserve list
Rashidpur	210	21	2
Ramnagar	205	20	2
Poschim Fulbari	300	30	3
kompopur	170	17	2
Chandra	215	22	2
Pathalia	148	14	1
Total	1248	124	12

3.3 Selection of Variables

Before setting the variables of the study, the researcher himself visited the study area and talked to the farmers. Based on his experiences, review of concerned literature and with the research supervisor, the researcher selected 12 characteristics of the farmer as selected characteristics. These included: age, education, family size, annual family income, farm size, cosmopoliteness, organizational participation, training on ITK, extension media contact and knowledge on ITK, Innovativeness and Input Availability. Farmers' awareness of the use of indigenous technical knowledge (ITK) for sustainable agricultural development was the dependent variable of this study. However, this variable had five aspects: ITK for crop production, ITK for fish production, ITK for livestock production, environmental aspect and sociocultural aspect.

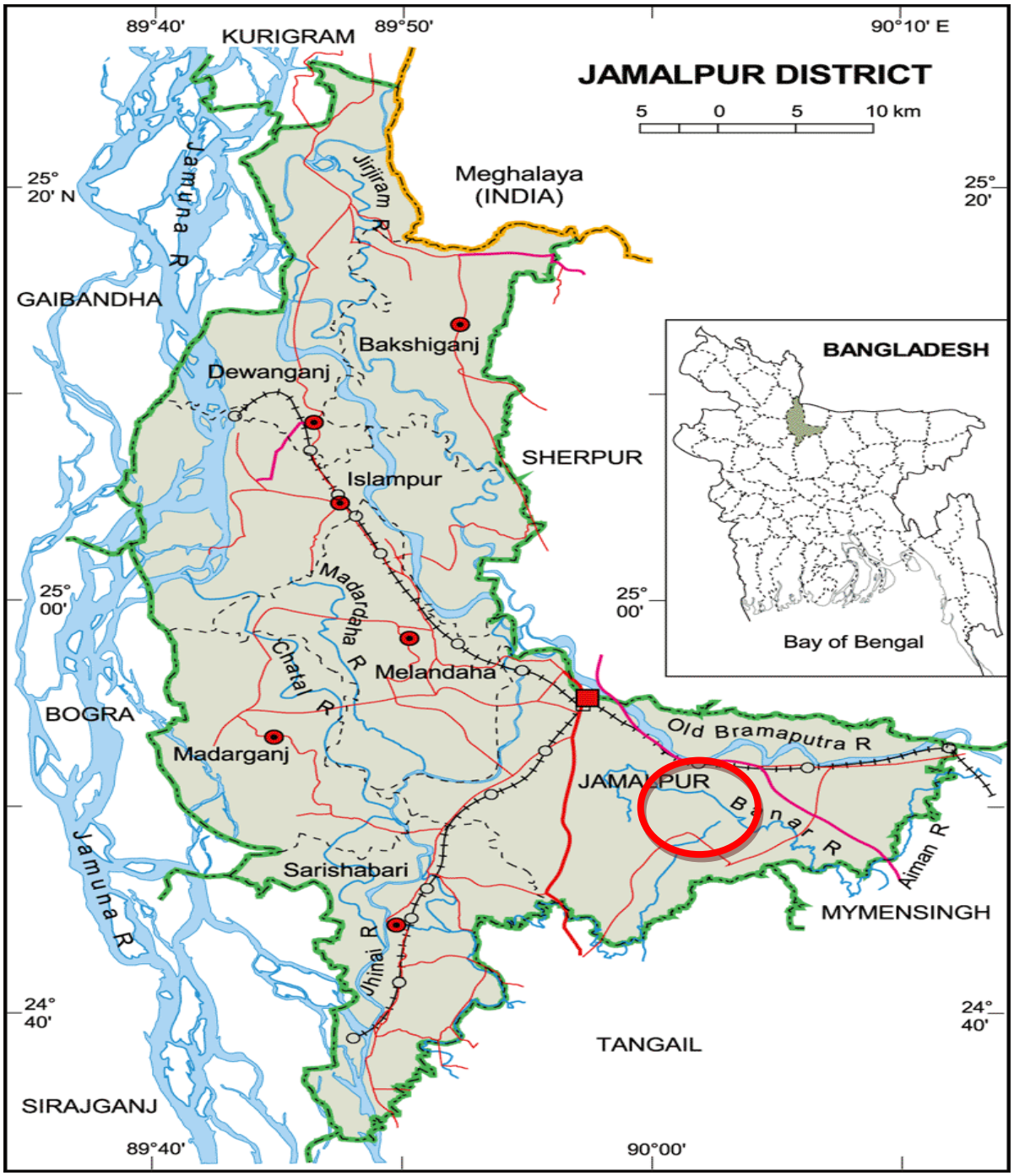

Figure 3.1 Map of Jamalpur District Showing Sadar upazila

Figure 3.2 Map of Sadar Upazila showing the study area

3.3.1 Measurement of focus issue

The dependent variable of the study was the farmers' awareness on the use of indigenous technical knowledge for sustainable agricultural development. This variable was measured by calculating an ITK Use Score of awareness following the scale developed by Khan (2002)., such as crop, fishery, livestock, environmental aspect and socio-cultural aspect were identified on the basis of field survey and consultation with the farmers of the study area. These five aspects were selected to measure the awareness of use of ITKs by the farmers. The respondents were asked to appraise their awareness of use to each of the five aspects along a three-point rating scale: “fully aware”, “partially aware”, and “not aware”. Scores were assigned to these responses in the order of 2, 1 and 0 respectively. The Three-point scale used in this measurement need to be narrated to enable one to make sense of the implicit ideas that each of the point holds.

Fully aware: this point introduces characteristics of the use of a particular ITK by a respondent exclusive of this means when the necessity and scope of using those ITK arises. The term “fully aware” referred to full acquaintance with the benefit of using their connected with ITK.

Partially aware: it mentioned to partial acquaintance with the benefit of using their relevant ITK.

Not aware: this point is also self-explanatory. It was employed in case the farmers never aware to a particular ITK.

3.3.2 Measurement of selected characteristics

3.3.2.1 Age

The age of a respondent was measured in terms of actual years from his birth to the time of interview on the basis of fanners' statement. A score of one (1) was assigned for each year of his age (Mamun, 2004). Question on this variable appears in item 1 in the interview schedule *(Appendix-A*).

3.3.2.2 Level of Education

The level of education of a respondent was measured by the years of schooling completed as indicated by his response to item 2 of the interview schedule *(Appendix- A).* A score of one (1) was assigned for each year of schooling

completed. If a respondent did not know how to read and write, his education score was taken as zero (0) but could sign his name only then he got a score of (0.5), 1 for class one, 2 for class two and so on (Sheheli. 2003).

3.3.2.3 Family size

The family size of a respondent was measured in terms of family members on the basis of his response to the items no.3 in the interview schedule. If a respondent had 5 members in his family, his family size score was taken as 5.

3.3.2.4 Farm size

The farm size of the respondents was computed in hectares using the following formula (Hasan. 2006):

$$FS = A+B+1/2(C+D) + E$$

Where, FS= Farm size

A=Homestead

B = Own land under own cultivation

C = Land given to others as borga

D = Land taken from others as borga

E = Land taken from others as lease

Question on this variable may be seen in item 5 in the interview schedule *(Appendix*-A).

3.3.2.5 Annual Family Income

Annual income of a respondent was measured in taka on the basis of total yearly earnings in Taka from agriculture and other sources by himself and other members of his family as provided in response to item 5 of the interview schedule *(Appendix A).* The price of other enterprises (i.e. cows, goats, poultry, fishes etc.) was also added to the price. Earnings of each respondent himself or other members from different sources (like service, business, and labour) were also included in calculating the income. Yearly earnings from farming and other sources were added together to obtain total income of a respondent. The earnings from these sources were added together for computation of annual income score. A score of one (1) was assigned for each one lack Taka (Mamun, 2004).

3.3.2.6 Cosmopoliteness

The term cosmopoliteness was used to refer to the orientation of an individual external to his own social system. Cosmopoliteness of a respondent was measured in terms of his nature of rating scale served these purposes. The cosmopoliteness score was computed for each respondent to determine the degree of his cosmopoliteness on the basis of his visits to seven different places. The weights assigned for visits to each of the following seven different places are as follows:

Place to visit	**Frequency of visit**	**Weightage**
1 .Market place or friends or relatives or other known person house located outside of his own village /month	Not even once a month	0
	4 times a month	3
	3 times a month	2
	2 times a month	1
2. Visit to other Union Parishad	Not even once a year	0
	10 times a year	3
	5 times a year	2
	3 times a year	1
3. Own upazila sadar/month	Not even once a month	0
	2 times a month	3
	4 times a month	2
	5 times a month	1
4. Other upazila sadar/month	Not even once a month	0
	1 times a month	3
	3 times a month	2
	5 times a month	1
5. Own district sadar/three months	Not even once per three month	0
	3 times per three month	3
	2 times per three month	2
	1 times per three month	1
6. Other district sadar/three months	Not even once per three month	0
	At least once per three month	1
	2 times per three month	2
	4 times per three month	3
7. Capital city/year	Not even once a year	0
	At least once a year	1
	2 times a year	2
	4 times a year	3

The cosmopoliteness score of a respondent was calculated by adding together the weights obtained for his visits to all the seven types of places. The cosmopoliteness

score of the individuals could range from 0-21 while 0 indicated no cosmopoliteness and 21 indicated very high cosmopoliteness (Mamun, 2004). This variable appears in item no. 6 in interview schedule *(Appendix-A).*

3.3.2.7 Organizational participation

Organizational participation of a respondent was measured on the basis of the nature of his involvement and duration of participation in various organizations operating in the study area. The researcher identified seven such organizations as shown in item 7 in the interview schedule *(Appendix-A).* For computing organizational participation score a formula used by Parveen (1995) was followed.

The following formula was used:

Organizational participation score =Σ (A x D)

Where, A= Participation score

D= Duration score

Organizational participation scores were assigned in the following manner for activities of individual respondents in each group or organization:

Nature of participation	Scores assigned
No participation	0
Ordinary member	1
Executive committee member	2
Executive committee officer	3

Duration scores were assigned in the following manner:

Duration of participation	Scores assigned
Nil period	0
1 Year	1
2 Years	2
3 Years and above	3

Organizational participation score of a respondent was obtained by adding the scores According to the above-mentioned formula for his participation in the respective organization.

3.3.2.8 Training on ITK

Training on ITK of a respondent was measured in terms of receiving training by the concerned Organizations including duration of time. When a respondent does not take any training on ITK then he got score of (0), for one month 1, for two months 2 and so on. This variable appears in item no. 8 in the interview schedule (Appendix-A)

3.3.2.9 Extension Media Contact

In this study, the extension media contact score was computed for each respondent on the basis of his extent of contact with 13 selected extension media as ascertained from his responses to question 9 in the interview schedule *(Appendix-A)* and it was measured in the following manner.

Items of extension contact	**Nature of** extension contact	**Score assigned**
1.NGOs worker (s)	0 times/year	0
	0 time/ month but a few/ year	1
	2-3 times per month	2
	4 or more times per month	3
2.SAAO	0 times/year	0
	0 time/ month but a few/ year	1
	2-3 times per month	2
	4 or more times per month	3
3. Agricultural input dealer	0 times/year	0
	0 time/ month but a few/ year	1
	3-4 times per year	2
	5 or above times per year	3
4. Upazila Agricultural Officer/ Agricultural Extension Officer	0 times/year	0
	1-5 times/year	1
	At least 1 -2 times/month	2
	At least 1 time/month	3
5. Upazila Fisheries Officer/ Livestock Officer	0 times/year	0
	1 -5 times/year	1
	At least 1 -2 times/month	2
	At least 1 time/month	3
6. Participation in group Discussion	0 times/year	0
	1 time/year	1
	2-4 times/year	2
	5 or more times/year	3
7. Participation in demonstration meeting	0 times/year	0
	1 time/year	1
	2-4 times/year	2
	5 or more times/year	3
8. Participation in field day	0 times/year	0
	1 time/year	1
	2-4 times/year	2
	5 or more times/year	3
9. Participation in training Programme	0 times/year	0
	1 time/year	1
	2-4 times/year	2
	5 or more times/year	3
10. Listening Agricultural Program in Radio	Not even once/month	0
	1-2 times/month	1
	3-5 times/month	2
	5-6 times/month	3

11. Watching agricultural programme in television	0 times/year	0
	1-2 times/month	1
	1-3 times/week	2
	4 or more times/week	3
12. Reading agricultural Magazine	0 times/year	0
	1 -2 times/year	1
	3-4 times/year	2
	5 or more times/year	3
13. Observing agricultural folk song, fair etc.	0 times/year	0
	1 time/year	1
	2-3 times/year	2
	4 or more times/year	3

Extension media contact score was determined by summing the scores of all the 14 communication media. Extension media contact score could range from 0 to 39, where zero (0) indicated no media contact and 39 indicated the highest media contact (Mamun. 2004).

3.3.2.10 Knowledge on ITKs

Knowledge on the use of indigenous technical knowledge was measured hy using ten (10) questions in open form as show in the item no. 10 of the interview schedule. Same score was assigned for each of the question. The total assigned score of all the questions was 20. If a respondent was able to provide a correct answer to a question, he could receive full score of two (2) for that particular question. Accordingly, a respondent could receive zero (0) for wrong answer, and half or partial score was one. The total score obtained by a respondent was considered as the knowledge score on the use of indigenous technical knowledge of the respondent.

3.3.2.11 Innovativeness

Innovativeness of the respondents was measured with innovativeness score on the basis of adoption of ten selected agricultural practices by the respondents. Scores were assigned as 0 score for within 4 years after hearing, 1 score for within 3 years after hearing, 2 score for within 2 years after hearing, 3 score for within 1 years after hearing It is shown in the item no.11 in the interview schedule.

3.3.2.12 Input Availability

Input availability of the respondents was measured on the basis of availability of six selected agricultural inputs to the respondants.0 score for not available, 1 score for

available at time, 2 score for easily available, 3 score for always available. It is shown in the item no.12 in the interview schedule.

3.4 Statement of Hypotheses

A hypothesis is a conjectural statement of the relation between two or more variables which can be put to a test to determine its validity. Hypothesis are always in declarative sentence form and they are related, either generally or specifically from variables to variables (Kiplinger, 1973). In broad sense hypotheses are divided into two categories: (a) Research hypothesis and (b) Null hypothesis.

3.4.1 Research hypothesis

Research hypothesis states a possible relationship between the variables being studied or a difference between experimental treatments that the researcher expects to emerge. The research hypothesis was formulated as ‘there were significant relationships between the selected characteristics of the farmers and their awareness of use of Indigenous Technical Knowledge (ITks) in agricultural activities.

3.4.2 Null hypothesis

A null hypothesis states that there is no relationship between the concerned variables the null hypothesis was formulated as ‘there were no significant relationships between the selected characteristics of the farmers and their awareness of use of Indigenous Technical Knowledge (ITKs) in agricultural activities.

3.5 Research Instrument for Data Collection

An interview schedule was used as the research instrument in order to collect relevant information from the respondents. The schedule was carefully designed keeping the objectives of the study in mind. The questions and statements content in the schedule were simple, direct and easily understandable by the farmers without giving rise to any doubt and misunderstanding in their mind.

The interview schedule was pre-tested with ten farmers in actual field situation before finalizing the same for collection of data. Some minor corrections, additions and alterations were made in the schedule based on pre-test experiences. The schedule was then multiplied in its final form for the collection of data.

In addition to that, the researcher visited the whole study area and physically talked to the most innovative and experienced farmers of the Union. This extensive and

laborious survey coupled with the information accumulated in the initially constructed interview schedule helped the researcher make a list of ITKs being frequently used by the Farmers. Since the respondents for the present study were Bangladeshi, the schedule was designed in Bengali language. This helped the respondents understand the schedule and furnish information in a consistent and systematic manner. An English version of the interview schedules are enclosed at *Appendix-A.*

3.6 Collection of Data

Data for this study were collected through interview of sampled farmers. The interview schedule prepared earlier by the researcher was used to gather information. The researcher sought help from SAAO with in the study area for getting local support and establishing rapport during interviewing of farmers. Researcher also obtained cooperation from the members of the Union Parishad of respective villages, local leaders and school teachers during collection of data. Before going to respondents for interview, they were informed verbally to ensure their availability at the proper place as per scheduled date and time. If any respondent failed to understand any question, the researcher took care to explain the issue. When original respondents were repeatedly unavailable for data collection, the reserved listed respondents were interviewed. Excellent co-operation and co-ordination was obtained from all respondents who were in the field during data collection. Data for this study were collected through personal interview by the researcher himself during 12 January to 10 February, 2020.

3.7 Compilation of Data

After completion of field survey all the interview schedules were compiled, tabulated and analyzed according to the objectives of the study. In this process, all the responses in the interview schedules were given numerical coded values. Local units were converted into standard units. The responses to the question in the interview schedule were transferred to a master sheet to facilitate tabulation. Tabulation and cross tabulations were done on the basis of categories developed by the investigator himself.

3.8 Data Processing

After completing the field survey, all data were coded, compiled & tabulated following the objectives of the study. All local units were converted into standard units. In case of qualitative data, proper scoring technique was followed to convert the data into quantitative form. All the individual responses to all questions of the interview schedule were transferred into a master sheet to simplify tabulation, categorization and organization.

3.9 Statistical Procedures or Analysis

The data collected were analyzed according to the objectives of the study. For regulating the qualitative data were converted into quantitative data by means of suitable scoring technique. The analysis was performed using SPSS (Statistical Package for Social Sciences) computer package and the statistical measures such as range, means, standard deviation, number and percentage distribution were used to describe the variables. Pearson's Product Moment coefficient of correlation (r) was used to describe the relationships between the concerned variables. At highest five percent (0.05) level of probability and one percent (0.01) level of probability were used for the rejecting of null hypothesis.

CHAPTER IV

RESULTS AND DISCUSSION

In this Chapter findings of the study and their logical interpretations have been presented according to the objectives of the study. Findings have been discussed in relation to other similar studies wherever these were applied. The Chapter has been divided into four sections. The first section deals with the farmer's awareness of the use of ITKs for sustainable agricultural development in study area. The second section deals with selected characteristics of farmers. The third section deals with the relationships between selected characteristics of the farmers and their awareness of use of ITKs for sustainable agricultural development in study area. While the fourth section deals with problem in using ITKs in farming activities to achieve sustainable agricultural development.

4.1. Farmers Awareness of the Use of ITKs for Sustainable Agricultural Development

Five aspects were considered in the study for determining the awareness of ITK of the farmers. These were for crop production, fish production, livestock production, environmental development, socio-cultural development.

Table 4.1 Aspect-wise farmer awareness of use of ITKs for sustainable Agricultural development

Aspects of ITK	Score		Mean	Std. Dev.
	Min.	Max.		
Crop production	16	26	20.77	2.23
Fish production	8	12	10.27	1.29
Livestock production	4	8	5.77	0.83
Environmental aspect	3	7	5.06	0.87
Socio-cultural aspect	2	4	3.34	1.03

4.1.1 Awareness of use of ITKs for crop production

The average awareness score regarding use of ITKs for crop production was 20.77 and the standard deviation was 2.23 (Table 4.1). Distribution of farmers based on awareness score regarding use of ITKs for crop production has been shown in Table 4.2. Farmers were categorized as no awareness, partial awareness, and full awareness.

From the Table 4.2, it is found that 16.9 percent of farmers had no awareness, 70.9 percent of farmers had partial awareness and 11.9 percent of farmers have full awareness about the use of ITKs for crop production.

4.1.2 Awareness of use of ITKs for fish production

The average awareness score regarding use of ITKs for fish production was found as 10.27 and the standard deviation was 1.29 (Table 4.1). Distribution of farmers based on awareness score regarding use of ITKs for fish production has been shown in Table 4.2. Farmers were categorised as no awareness, partial awareness, and full awareness.

Table 4.2 Categorization under different parameter

Parameter (measurement unit)	Categories	No.	%
Crop production (score)	No awareness (0-9)	21	16.9
	Partial awareness (10-18)	88	70.9
	Full awareness (> 18)	14	11.9
Fish production (score)	No awareness (0-9)	37	29.9
	Partial awareness (10-11)	58	46.8
	Full awareness (>11)	29	23.4
Livestock production (score)	No awareness (0-4)	3	2.4
	Partial awareness (5-6)	95	76.6
	Full awareness (> 6)	26	28.2
Environmental development (score)	No awareness (0-4)	37	29.8
	Partial awareness (5-6)	85	68.6
	Full awareness (>6)	2	1.6
Socio-cultural aspect (score)	No awareness (0-2)	33	26.6
	Partial awareness (3-4)	73	58.9
	Full awareness (>4)	18	14.5

From the Table 4.2, it is found that 29.9 percent of farmers have no awareness, 46.8 percent of farmers have partial awareness and 23.4percent of farmers have full awareness about the use of ITKs for Fish production.

4.1.3 Awareness of use of ITKs for livestock production

The average awareness score regarding use of ITKs for livestock production was found as 5.77 and the standard deviation was 0.83 (Table 4.1). Distribution of farmers on the basis of awareness score regarding use of ITKs for livestock production has been shown in Table 4.2. Farmers were categories as no awareness,

partial awareness and full awareness.

From the Table 4.2, it is found that 2.4 percent of farmers have no awareness, 76.6 percent of farmers have partial awareness and 28.2 percent of farmers have full awareness about the use of ITKs for livestock production.

4.1.4 Awareness of use of ITKs for environmental development

The average awareness score regarding use of ITKs for environmental development was found as5.06 and the standard deviation was 0.87, (Table 4.1). Distribution of farmers on the basis of awareness score regarding use of ITKs for environmental development has been shown in Table 4.2. Farmers were categories as no awareness, partial awareness, and full awareness.

From the Table 4.2, it is found that 29.8 percent of farmers have no awareness, 68.6 percent of farmers have partial awareness and 1.6 percent of farmers have full awareness about the use of ITKs for environmental development.

4.1.5 Awareness of use of ITKs for socio-cultural development

The average awareness score regarding use of ITKs for socio-cultural development was found as 3.34 and the standard deviation was 1.03, (Table 4.1). Distribution of farmers on the basis of awareness score regarding use of ITKs for socio-cultural development has been shown in Table 4.2. Farmers were categorised as no awareness, partial awareness, and full awareness.

From the Table 4.2, it is found that 26.6 percent of farmers have no awareness, 58.9 percent of farmers have partial awareness and 14.5 percent of fanners have full awareness about the use of ITKs for socio-cultural development.

4.1.6 Overall farmers' awareness of the use of ITKs for sustainable agricultural development

Overall awareness score was estimated by summing the scores obtained against all of the aspects of farmer awareness. The overall average awareness score was 40.10, the standard deviation was 6.29. The observed awareness score was ranged from 19 to 52. Based on the level of awareness of use of ITKs for sustainable agricultural development, the respondent farmers were categorized as no awareness, partial awareness and full awareness.

Table 4.3, Distribution of farmers' awareness of the use of ITKs for sustainable agricultural development

Respondents			Mean	Std. dev.
Categories	**No.**	%		
No awareness (20-30)	9	7.2	40.10	6.29
Partial awareness (31-45)	89	77.8		
Full awareness (Above 45)	26	20.9		
Total	124	100		

The findings clearly indicate that 77.8 percent of the respondents had partial awareness, 7.2 percent had no awareness and 20.9 percent had full awareness of use of ITKs for sustainable agricultural development. Karim (2002) and Khan (2002) found similar distribution in their respective studies. It was observed in the study area while collecting the data that there were less facilities to aware of use of ITK for sustainable agricultural development. Moreover, the respondents of this study area was used less of ITKs for sustainable agricultural development. But they keep desire to use of ITKs for sustainable agricultural development to increase the livelihood improvement

4.2 Characteristics of the Farmer

There were various characteristics of the farmer that could influence their awareness of the use of ITKs for sustainable agricultural development. In the present study, 12 (twelve) characteristics of the farmers were selected as independent variables, which included their age, education, family size, farm size, annual family income, cosmopoliteness ,organizational participation, training on ITK, extension media

contact, and knowledge on ITKs, innovativeness, input availability. The salient features of characteristics of the respondents have been presented in Table 4.4.

4.2.1 Age

Age of the farmer ranged from 20 to 60 years with a mean of 38.2 years and standard deviation of 11.8. However, based on their age the farmers were classified into three categories as young, middle-aged and old. The Table 4.4 revealed that 37.8 percent of the farmers were middle-aged, 36.2 percent were young and 25.9 percent of them were old-aged. Karim (2002), Faruque (2002), Sheheli (2003) found similar distribution in different age categories in their respective studies.

A close look into the data indicates that approximately half of the respondents were middle aged and 36.2 percent were young aged and rest of them was old aged. It was observed from the research that most of the old farmer was very award on use of ITKs in farm activities.

4.2.2 Education

The level of education of the respondents ranged from 0 to 12, the average being 4.56 with a standard deviation of 4.02. According to national standard of classification, among the respondents. 21.8 percent were illiterate, 41.9 percent had education at primary level, 28.20 percent had education at secondary level and 8.06 percent of them had education at higher secondary level. Data presented in Table 4.4 indicate that 41.9 percent of the respondents of the study area secured primary level of education. The present literacy rate of the country is 74.4 percent. Karim (2002), Faruque (2002), Sheheli (2003) and Mamun (2004) found similar distribution in different education categories in their respective studies.

Table 4.4 Main Feature of the Characteristics of farmer (n=124)

Characteristics (measurement unit)	Range		Respondents				Std. Devi.
	Possible	Observed	Category	No.	per cent	Mean	
Age (year)		20-60	Young (20-32)	45	36.2	38.22	11.89
			Middle age (33-45)	47	37.8		
			Old age (>45)	32	25.9		
Education (year of schooling)		0.0-12	Illiterate (0)	27	21.8	4.56	4.02
			Primary (0.5-5)	52	41.9		
			Secondary (6-10)	35	28.20		
			Higher secondary (>I0)	10	8.1		
Family size (number of member)		1-10	Small (1-4)	29	23.38	5.52	1.51
			Medium (5-7)	78	62.90		
			Large (8-10)	17	13.8		
Annual income (“00,000”TK)		1-12	Low (1-2.30)	44	35.48	3.19	1.94
			Medium (2.31-5.50)	68	54.83		
			High (> 5.50)	12	9.67		
Farm size (hectare)		0.5-5.87	Small (0.5-1)	44	35.48	1.79	1.22
			Medium (1.01-2.75)	52	41.93		
			Large (>2.75)	28	22.58		
Cosmopoliteness (score)		2-27	Low (2-9)	18	14.51	12.77	4.1
			Medium (10-17)	92	74.19		
			High (>17)	14	11.29		
Organizational Participation (score)		0-6	No participation (0)	36	31.94	2.90	1.76
			Low (0.1-2)	15	9.20		
			Moderate (3-4)	40	32.25		
			High (>4)	33	26.61		
Extension media contact (score)	0-42	2-32	Low (2-16)	11	8.87	23.27	3.72
			Medium (17-26)	77	62.09		
			High (>26	36	29.03		
Knowledge on ITKs (score)	0-20	6-18	Low (10- 12)	37	29.83	13.45	2.335
			Medium (13-15)	80	64.51		
			Medium (13-15)	80	64.51		

Training on ITK (Days)			Low (0-3)	58	46.7	2.99	2.712
			Medium (3.1-12)	64	51.61		
			High (>12)	2	1.61		
Innovativeness (Score)	0-40	12-36	Low (12-19)	24	19.35	26.33	6.78
			Medium 20-31)	65	52.41		
			High (>31)	35	28.22		
Input Availability (Score)	0-18	7-18	Not available (0-4)	20	12.25	12.83	4.782
			Low (0-5)	35	27.31		
			Medium (6-12)	50	42.21		
			High (>12)	19	9.99		

national. The findings indicate that 41.9 percent of the farmers had primary level education. It is assumed that literate farmers are more progressive and innovative than those of illiterate farmers with respect to use of ITKs for sustainable agricultural development.

4.2.2 Family size

Family size of the selected farmers ranged from 1 to 10 with mean 5.52 and standard deviation 1.51 (Table 4.4). Farm families were categorized as small, medium, large. More than three-fifth (62.90 percent) of the respondent families was medium, 13.8 percent were large. 23.38 percent were small (Table 4.4). This may be due to poor adoption of family planning measures by the respondents or prevalence of more joint family system in the study area. Karim (2002), Faruque (2002), Sheheli (2003) found similar distribution in different family size categories in their respective studies.

4.2.3 Annual family income

Annual family income of the respondents ranged from 1 to 12 with a mean of 3.19 and standard deviation of 1.94 (Table 4.4). On the basis of annual family income, the respondents were divided into three categories. Table 4.4 shows that the highest (54.83 percent) proportion of the farmer had medium annual family income while 9.67 percent and 35.48 percent of them had high and low annual family income respectively. Faruque (2002), Sheheli (2003) and Mamun (2004) found similar distribution in different annual family income categories in their respective studies.

Findings reveal that most (54.83 percent) of the respondents had low to medium annual family income, which had positive relationship with farm size, number of earning member in the family. Income is associated with purchasing power of an individual. This may lead to the farmers to use environment friendly practice than the environment degrading practice. Thus, they may knowingly or unknowingly help to check environment hazard through using such technologies.

4.2.4 Farm size

Farm size of the respondents ranged from 0.0 to 5.87 hectares and the mean being 1.79 with a standard deviation of 1.22. According to the farm size occupied by the respondents, they were classified into three categories as shown in Table 4.4.

Table 4.4 shows that little less than two-fourth of the respondents (41.93 percent) had

medium farm size while only 22.58 percent of them had large and 35.48 percent of small. It indicates that most of the families (about 41.93 percent) possess a medium sized cultivable land. Karim (2002), Sheheli (2003) and Mamun (2004) found similar distribution in different farm size categories in their respective studies. In Bangladesh the farm size of the farmer is decreasing day by day. For this reason there were only a few (22.58 percent) large farm families.

4.2.5 Cosmopoliteness

Average cosmopoliteness score was 12.77 range within from 2 to 21 and standard 4.104 (Table 4.4). From Table 4.4, it is found that more than half (74.19 percent) of farmers had medium cosmopoliteness compared to 11.29 percent having high and 14.51 percent low cosmopoliteness. As a result, the most (74.19 percent) of the farmers in the study area were medium cosmopoliteness. Mamun (2004), Sheheli (2003) found similar distribution in different cosmopoliteness categories in their respective studies.

Because this study was conducted in educated area and the researcher observed that the most of the farmers were engaged in various types of social organizations and thus it was not surprising to get such a picture of cosmopoliteness.

4.2.6 Organizational participation

Organizational participation scores of the respondents ranged from 0 to 6 with a mean of 2.90 and standard deviation of 1.76 (Table 4.4). On the basis of organizational participation scores, the respondents were divided into three categories. Data contained in Table 4.4, show that most of the respondents (41.12 percent) had low participation while 32.25 percent had moderate and 26.61 percent of them had high participation in different organizations. Karim (2002) found similar distribution in different organizational participation categories in his studies.Organization participation helps an individual to find out solution to their own problems as well as other social problems. Most of the respondents of the study area had low organizational participation. Farmers having low participation might have less interest to do or to say something on same platform. More participation in organizational activities increases the awareness of use of ITK for sustainable agricultural development.

4.2.7 Extension Media Contact

From Fable 4.4, it is found that more than three-fifth (62.09 percent) of the fanners had medium contact with extension media compared to 8.87 percent having low and 29.03 percent high contact with extension media. Karim (2002) and Mamun (2004) found similar distribution in different extension media categories in their respective studies.

It indicates that farmers maintained sufficient extension contact because the study area was near to the Upazila Headquarters, also the extension agent, agriculture officer specially SAAO etc and other extension media such as radio, TV always maintained good relation with them and give different information about sustainable agricultural development. As higher portion of the farmers were educated with primary and secondary level, they had medium exposure to various extension contact methods.

4.2.8 Knowledge on ITKs

Average knowledge on ITKs score was 13.45 ranging from 10 to 32 and standard deviation was 2.335 (Table 4.4). Farmers were categorized as low knowledge, medium knowledge and high knowledge on ITKs.

From Table 4.4, it is found that more than half (64.51 percent) of the farmers had medium knowledge on ITKs compared to 5.64 percent of their having high and 29.83 percent, low knowledge on ITKs. Karim (2002) found similar distribution in different knowledge on ITKs categories in their respective studies.

Agricultural knowledge on ITK was poor among those farmers who had poor education. It was assumed that there is an urgent need to take appropriate programmed by various GOs and NGOs to increase knowledge on ITKs in relation to sustainable agricultural development.

4.2.10 Training on ITK

Average Training on ITKs score was 2.99 ranging from 0 to 24 and standard deviation was 2.712 (Table 4.4). Farmers were categorized as low, medium and high training on ITKs.

From Table 4.4, it is found that more than half (51.61 percent) of the farmers had medium training on ITKs compared to 1.61 percent of their having high and 46.7

percent, low training on ITKs. Karim (2002) found similar distribution in different training on ITKs categories in their respective studies.

4.2.11 Innovativeness

Innovativeness on ITKs score was 26.33 ranging from 12 to 36 and standard deviation was 6.78 (Table 4.4). Farmers were categorized as low, medium and high Innovativeness on ITKs.

From Table 4.4, it is found that more than half (52.41 percent) of the farmers had medium Innovativeness on ITKs compared to 28.22 percent of their having high and 19.35 percent, low Innovativeness on ITKs. Karim (2002) found similar distribution in different Innovativeness on ITKs categories in their respective studies.

4.2.12 Input Availability

Input Availability on ITKs score was 16.31 ranging from 7 to 48 and standard deviation was 5.253 (Table 4.4). Farmers were categorized as low, medium and high Input Availability on ITKs.

From Table 4.4, it is found that more than half (65.32 percent) of the farmers had medium Input Availability on ITKs compared to 1.61 percent of their having high and 33.06 percent, low Input Availability on ITKs. Karim (2002) found similar distribution in different Input Availability on ITKs categories in their respective studies.

4.3 Relations between each of the characteristics of the farmers and their awareness of use of ITKs for sustainable agricultural development

Pearson's Product Moment Coefficient of Correlation (r) was computed in order to explore the relationships between the selected characteristics of the farmers and their awareness of use of ITKs for sustainable agricultural development. The coefficient of correlation (r) was used to test the null hypothesis regarding the relationship between any two concerned variables. The null hypothesis was formulated as H_0: There is no relationship between the selected characteristics of the farmer and their awareness of use of ITKs for sustainable agricultural development. The result of co-relation test between the dependent and independent variables has been presented in Table 4.5.

However, the correlation matrix of dependent and independent variables for the farmers has been presented in Appendix-B in order to have a clear exploration of the Inter-correlation among the variables.

4.3.1 Age and awareness of use of ITKs

The correlation coefficient between age of the farmer and their awareness of use of ITKs for sustainable agricultural development was -.178 as shown in Table 4.5. Based on the computed 'r' value the relationship between age and their awareness of use of ITKs for sustainable agricultural development was no significant and followed a negative trend. Hence, the concerned null hypothesis could not be rejected. Thus, it was concluded that with the increase in age, their awareness of use of ITKs for sustainable agricultural development decrease.

Khan (2002), Hanif (2002), and Akanda (1994) found similar relationship between age and awareness in their respective studies. ITK is the fruit of the accumulated experience of generations involved through an interplay problems and solutions. The more a man is experienced the more it is likely that he would turn into a store house of traditional knowledge and practice. Because of higher experience is a function of higher age.

Table 4.5 Relationship between dependent and independent variables

	'r' value with 122 df
Age	__- .187*
Education	-.180
Family size	-.135
Farm Size	-.208
Annual family income	.116
Cosmopoliteness	.021
Organizational participation	-.151
Training on ITK	.045
Extension media contact	0.444**
Knowledge on use of ITKs	.147
Innovativeness	.281**
Input availability	.410**

** Significant at the 0.01 level * Significant at the 0.05 level

4.3.2 Education and awareness of use of ITKs

The correlation coefficient between educations of the farmer and their awareness of use of ITKs for sustainable agricultural development was -0.180 as shown in Table 4.5. Based on the computed 'r' value the relationship between education and their awareness of use of ITKs for sustainable agricultural development was no significant and followed a negative trend. Hence, the concerned null hypothesis could not be rejected. Thus, it could be said that at least for the present study, education of the respondents was not significantly associate with their awareness of use of ITKs for sustainable agricultural development.

Education is the process of development of the mind of an individual and it increases his power of observation, integration, understanding, decision making and adjustment of new situation. It has individual to become rational, conscious and get useful information to solve their day to day problem through different source of information such as reading leaflets, books, magazines, journals and other printing materials.

4.3.3 Family size and awareness of use of ITKs

The correlation coefficient between family size of the farmer and their awareness of use of ITKs for sustainable agricultural development was -125 as shown in Table 4.5. Based on the computed 'r' value the relationship between family size and their awareness of use of ITKs for sustainable agricultural development was no significant and followed a negative trend. Hence, the concerned null hypothesis could not be rejected. Thus, it could be said that at least for the present study, education of the respondents was not significantly associate with their awareness of use of ITKs for sustainable agricultural development.

Large family means greater cost and consumption. It is conceivable that farmers of a large family tend to look for short-term high production oriented technologies. ITKs are not doubt marked with poor production ability if not the long term ecological and social cost benefit ratios are taken under consideration.

4.3.4 Farm size and awareness of use of ITKs

The correlation coefficient between farm size of the farmer and their awareness of use of ITKs for sustainable agricultural development was -192 as shown in Table 4.5. Based on the computed 'r' value the relationship between farm size and their awareness of use of ITKs for sustainable agricultural development was no significant and followed a negative trend. Hence, the concerned null hypothesis could not be rejected. Thus, it was decided that farm size of the farmer was not associated significantly with The farmers of large farm size visit various place of important outside their own social system as well as come more in contact with various information media and they also interacted with various personnel in organization. These farmers develop negative awareness of use of ITKs for sustainable agricultural development.

4.3.5 Annual family income and awareness of use of ITKs

The correlation coefficient between annual family income *of* the respondents and their awareness of use of ITKs for sustainable agricultural development was 0.104 as shown in Table 4.5. Based on the computed 'r' value the relationship between family income and their awareness of use of ITKs for sustainable agricultural development was significant and followed a positive trend. Hence, the concerned null hypothesis was rejected. Thus, it could be said that family income of the farmer was significantly associated with their awareness of use of ITKs for sustainable agricultural development.

Higher annual family income of the farmers makes them more courageous to awareness of use of ITKs for sustainable agricultural development. Moreover, they can meet up the family needs at the expense of their income.

4.3.6 Cosmopoliteness and awareness of use of ITKs

The correlation coefficient between cosmopoliteness of the farmer and their awareness of use of ITKs for sustainable agricultural development was 0.029 as shown in Table 4.5 Based on the computed '*r' value* the relationship between cosmopoliteness and their awareness of use of ITKs for sustainable agricultural development was significant. Hence, the concerned null hypothesis was rejected. Thus, it was inferred that cosmopoliteness of the farmer significantly associated with their awareness of use of ITKs for sustainable agricultural development.

Cosmopolite farmers visited various place of important outside their own social system as well as come more in contact with various information media and they also interacted with various personnel in organization.

4.3.7 Organizational participation and awareness of use of ITKs

The correlation coefficient between organizational participation of the respondent farmer and their awareness of use of ITKs for sustainable agricultural development was -.149 as shown in Table 4.5. Based on the computed 'r' value the relationship between organizational participation and their awareness of use of ITKs for sustainable agricultural development was no significant. Hence, the concerned null hypothesis was not rejected. Thus, it was inferred that organizational participation of the fanner did not significantly associated with their awareness of use of ITKs for sustainable agricultural development.

4.3.8 Training on ITK

The correlation coefficient between training *of* the respondents and their awareness of use of ITKs for sustainable agricultural development was 0.104 as shown in Table 4.5. Based on the computed 'r' value the relationship between training and their awareness of use of ITKs for sustainable agricultural development was significant and followed a positive trend. Hence, the concerned null hypothesis was rejected. Thus, it could be said that training of the farmer was significantly associated with their awareness of use of ITKs for sustainable agricultural development.

4.3.9 Extension media contact and awareness of use of ITKs

The correlation coefficient between extension media contact and their awareness of use of ITKs for sustainable agricultural development was 0.460 as shown in table 4.5. Based on the computed 'r' value the relationship between extension media contact and their awareness of use of ITKs for sustainable agricultural development highly significant. Hence, the concerned null hypothesis was rejected. Thus, it was inferred that extension media contact of the farmer significantly associated with their awareness of use of ITKs for sustainable agricultural development.

4.3.10Knowledge on ITKs and awareness of use of ITKs

The correlation coefficient between knowledge on use of ITKs of the farmer and their awareness of use of ITKs for sustainable agricultural development was 0.154 as

shown in Table 4.5. Based on the computed ‘r’ value the relationship between knowledge on use of ITKs and their awareness of use of ITKs for sustainable agricultural development was significant and followed a positive trend. Hence, the concerned null hypothesis was rejected. Thus, it could be said that with better knowledge on use of TI'Ks the respondents their awareness of use of ITKs increased.

4.3.11 Innovativeness and awareness of ITKs

The correlation coefficient between innovativeness of the respondents and their awareness of use of ITKs for sustainable agricultural development was 0.397 as shown in Table 4.5. Based on the computed ‘r’ value the relationship between innovativeness and their awareness of use of ITKs for sustainable agricultural development was highly significant and followed a positive trend. Hence, the concerned null hypothesis was rejected. Thus, it could be said that innovativeness of the farmer was significantly associated with their awareness of use of ITKs for sustainable agricultural development.

4.3.12 Input availability and awareness of ITKs

The correlation coefficient between Input availability *of* the respondents and their awareness of use of ITKs for sustainable agricultural development was 0.437 as shown in Table 4.5. Based on the computed ‘r’ value the relationship between Input availability and their awareness of use of ITKs for sustainable agricultural development was highly significant and followed a positive trend. Hence, the concerned null hypothesis was rejected. Thus, it could be said that Input availability of the farmer was significantly associated with their awareness of use of ITKs for sustainable agricultural development. ITKs by the farmers. The issues that might be dealt which are input and technical information supply, training, motivation campaign and others.

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Findings

The major findings of the study have been summarized in the following sections.

5.1.1 Farmers awareness of use the of ITKs for sustainable agricultural development

More than half (70.9 percent) of the farmers were found as partial awareness about the use of ITKs for crop production. 11.9 percent of the farmers were found as full awareness of the use of ITKs for fish production.16.9 percent of the farmers were no aware about the use of ITKs for environmental development. Nearly half (58.9 percent) of the farmers were found as partial aware about the use of ITKs for socio-cultural development.

The overall mean awareness score was found to be 40.10. 77.8 percent of the farmers had partial awareness compared to 7.2 percent not awareness and 20.9 percent full awareness of the use of ITKs for sustainable agricultural development.

5.1.2 Characteristics of the farmer

Age

Among the respondents 37.8 percent were middle aged, 36.2 percent were young and 25.9 percent of them were old-aged. The mean age of respondents was 38.22 and the standard deviation of 11.89.

Education

21.8 percent respondents were illiterate, 41.9 percent had education at primary level, 28.2 percent had education at secondary level and 8.06 percent of them had education at higher secondary level. . The mean education of respondents was 4.56 and the standard deviation of 4.02.

Family size

The family size of the farmers was 62.90 percent of the respondent family consisting 5 to 7 members. 62.90 percent were medium, 13.8 percent of the families were large, and 23.38 percent were small. The mean family size of respondents was 5.52 and the standard deviation of 1.51.

Farm size

The highest proportion (41.93 percent) of the respondents had medium farm size, 35.4 percent had small farm size and 22.58 percent had large farm size. The mean family size of respondents was 1.79 and the standard deviation of 1.22.

Annual income

54.83 percent were medium annual income, 9.67 percent high income and 35.48 percent low income. . The mean annual income of respondents was 3.19 and the standard deviation of 1.94.

Cosmopoliteness

The cosmopoliteness of the farmers was (74.19 percent) fanners had medium cosmopoliteness compared to 14.51 percent low and 11.29 percent high cosmopoliteness. The mean annual income of respondents was 12.77 and the standard deviation of 4.108

Organizational Participation.

Most (41.12 percent) of the fanners had low participation compared to 26.61 percent high and 32.25 percent medium participation. The mean organizational participation of respondents was 2.90 and the standard deviation of 1.766.

Training on ITK

Training on ITKs was found about half (51.61 percent) of the respondents had medium training on ITKs compared to 1.61 percent high and 46.7 percent low training on ITKs. The mean Training on ITKs of respondents was 2.99 and the standard deviation of 2.712.

The Extension Media Contact

The media contact of the farmers was Three-fourth (62.09 percent) of the farmers had medium extension contact compared to 8.87 percent low and 29.03 percent high extension contact. The mean media contact of respondents was 23.27 and the standard deviation of 5.10.

Knowledge on ITKs

The knowledge on ITKs of the farmers was (64.51 percent) of the respondents had medium knowledge on ITKs compared to 5.64 percent high and 29.83 percent low knowledge on ITKs. The mean knowledge on ITKs of respondents was 13.45 and the standard deviation of 2.335.

Innovativeness on ITKs

Innovativeness on ITKs was found about half (52.41 percent) of the respondents had medium knowledge on ITKs compared to 28.22 percent high and 19.35 percent low knowledge on ITKs. The mean Innovativeness on ITKs of respondents was 26.33 and the standard deviation of 6.789.

Input availability

Input availability on ITKs was found more than half (65.32 percent) of the respondents had medium Input availability e on ITKs compared to 1.61 percent high and 33.06 percent Input availability on ITKs. The mean Input availability on ITKs of respondents was 16.31 and the standard deviation of 5.253.

5.1.3 Relationship between the farmers' characteristics and awareness of use the of ITKs

Twelve personal and social characteristics were selected as independent variables and the dependent variable was farmer awareness of the use of ITKs for sustainable agricultural development.

Annual income, cosmopoliteness, training on ITks, extension media contact, knowledge on ITKs, innovativeness, and input availability knowledge on ITKs had significant positive relationship with their awareness of the use of ITKs for sustainable agricultural development.

5.2 Conclusions

Based on the findings of the study and their logical interpretations the following conclusions were made:

1. Overall farmers' awareness of use the of ITKs for sustainable agricultural Development of the study were 77.8 percent partial compared to 7.2 percent no aware and 20.9 percent full aware in use the of ITKs for sustainable agricultural development .

2. Annual family income, cosmopoliteness, training on ITk, extension media contact, knowledge on ITKs, innovativeness and input availability knowledge of the respondents were positive and significantly correlated with their awareness of the use of ITKs for sustainable agricultural development.

3. The findings indicate that majority (41.9 percent) of the farmers were primary to secondary educated and compared to 21.8 percent illiterate and very little (8.06 percent) of them were of higher secondary level. A significant portion of the respondents were illiterate.

4. Half (54.83 percent) of the respondents in the study have medium annual income compared to 9.67 percent high and 35.48 percent low. Their family income had significant relationship with their awareness of the use of ITKs for sustainable agricultural development.

5. Annual income, cosmopoliteness, training on ITk, extension media contact, knowledge on ITKs, innovativeness, input availability knowledge had significant relationship with their awareness of use the of ITKs for sustainable agricultural development. It may be thought that Annual income, cosmopoliteness, training on ITk, extension media contact, knowledge on ITKs, innovativeness, input availability knowledge stand on the way to be aware of use of ITK in farming.

6. A good number of problems at different levels were found hindering the farmers to the use of ITKs. Apart from few problems, majority of these were created due to lack of farmers' proper knowledge and experience. As those problems more or less fell under jurisdiction of different relevant GOs and NGOs; these organizations could play a significant role by helping to improve farmers' awareness of use the of ITKs for sustainable agricultural development.

5.3 Recommendations

Based on the findings and conclusions of the study, the following recommendations could be made:

1. Farmers' awareness of the use of ITKs in fanning activities was not satisfactory. So proper motivational program and training might be provided for the farmers by the DAE and concerned NGOs to increase their awareness of the use of ITKs.
2. Fanners' awareness on ITKs depends heavily on availability of information and required co-operation and communication between scientists, extension workers and fanners. Extension and education play a central role in this vital communication process. So, study on ITKs may be carried out at local levels of Bangladesh.
3. Majority of the farmers were found at primary and secondary[7] levels education. Therefore, farmers can take advantages of different printing materials i.e., book, booklet, leaflet, posters etc. So they are supposed to increase awareness through utilization of printed materials towards the use of ITKs for sustainable agricultural development.
4. Rural fanners faced a major problem in awareness of the use of ITKs for sustainable agricultural development due to inadequate knowledge and experience. Thus special care may be taken by concerned NGOs and DAE motivate and train the rural fanners.

5.4 Recommendations for Future Research

During the study conducted it was felt that more investigations are needed for clear understanding of the farmers' awareness of the use of ITKs for sustainable agricultural development. Following suggestions are put forwarded for further investigations:

1. In the present investigation only 12 independent variables were studied. There are some other important characteristics of the farmers that could not be included in this study. In future research, attempts should be made to include more influential independent variables.

2. The present study is conducted in the Sadar upazila of Jamalpur district. A similar study should also be conducted in any other upazilas of Bangladesh. Out of 12 (twelve) independent variables i.e. only four variables age, family size, farm size and knowledge on ITKs were found to the correlated in this study. As the environmental issues are complex and requires a broader knowledge base, it is recommended that to address this issue a variety of methods should be employed in future so that a wide range of audiences be aware of this and can meet the challenge of environmental degradation in a more befitting way.
3. So far only few studies have been conducted particularly to assess extent of farmers' awareness of the use of ITKs for sustainable agricultural development. Further studies considering other ITKs practice in farming activities that might affect their awareness.

REFERENCES

Akanda. M.W. 1994. Participation of Rural Women in Different Farm and Non-farm Activities in two Selected Villages of Mymensingh District. *M.S. (Ag.Ext.Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Alexandratos, N. (Ed.). 1988. World Agriculture toward 2000: an FAO Study. Rome, FAO/ Belhaven Press.

Ali, M. Y. 1997. *Fish, Water and People: Reflections of Inland Open Water Fisheries Resources of Bangladesh.* UPL: Dhaka.

Altieri, M.A. 1987. *Agroecology: The Scientific Basis of Alternative Agriculture.* Boulder/London: Westview/ITI.

Altieri. M. 1996. Indigenous Knowledge Re-valued in Andean Agriculture. *ILEIA Newsletter.* 12(1): 7.

Anonymous. 1994. Indigenous Knowledge, as quoted In: *Extension Digest. 2(1):* 2.

Anonymous. 1994. Indigenous Techniques. *Extension Digest. 2(1):* 16-21.

Anonymous. 1994. Integrating Indigenous Knowledge and Research In: *Extension Digest. 2(1): 9. Bangladesh Journal of Agricultural Science.*

Bashar. M.K. 1993. Adoption of Intercropping in Sugarcane Cultivation. *M.Sc. (Ag.Ext.Ed.) Thesis,* Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Biggs, S.D. 1989. A Multiple Source of Innovator Model of Agricultural Research and Technology Promotion *In: Agricultural Administration (Research and Extension) Network Paper 6.* London: ODI.

Chambers, R,, Pacey, A. and Thrupp, L. A. 1989. Farmer First. Fanner Innovation and Agricultural Research. London. Intermediate Technology Publications.

Chowdhury, D.N., S.M. Elias and N.U. Ahmed. 1996. *Indigenous Technologies Used by Women in Bangladesh.* A draft paper presented at the workshop on Achievements of the Gender Research and Training Project. 25-26 May 1996. Bangladesh Agricultural Research Council (BARC), Dhaka. Bangladesh.

De Schlippe, P. 1956. *Shifting Cultivation in Africa:* the Zande System of Agriculture. London: Routledge and Kegan Paul. *Development.* London: Cambridge University Press.

Doutt, R.L. 1964. The Historical Development of Biological Control. DeBach, P. and E.I. schlinger, E.I. (eds.) *Biological control of insect pests and weeds.* New York: Reinhold. pp. 21-41.

FAO. 1984. *Traditional (indigenous) Systems of Veterinary Medicine for Small Farmers in Nepal.* Bangkok: FAO-RAPA.

Farouk,*S.M. and M.U. Salam. 1996. Sustainable Agriculture in Bangladesh Addressing Issues through Human Resource Development. *The Journal of Rural Development.* 26(1): 1-21.

Faruque, O.M. 2002. Use of Indigenous Technical Knowledge (ITK) by the Farmers in Rice Cultivation. *M.S. (Ag.Ext.Ed.) Thesis*, Department of Agricultural Extension Education. Bangladesh Agricultural University, Mymensingh.

Goode, W.J., and P.K. Hatt. 1952. *Methods in Social Research.* New York: McGraw-Hill Book Company, Inc.

Gupta, A.K. 1990. Scientists' Views of Farmers' Practices in India: Barriers to Effective Interaction. *In: Chambers, R. (ed.) Farmer First.* London: Intermediate Technology Publications.

Halim, A. 1982. Schooling, Extension and Agricultural Production. *Bangladesh Journal of Agriculture*, six&7: 5 7-6 1.

Halim, A. 1992. Research and Extension in Support of the Small Farmers. *Proceedings of the Regional Workshop on Small Farmer.* CIRDAP, FAO and the Commonwealth Secretariat. Dhaka.

Halim, A. and F.E. McCarthy. 1985. *Women Labour in Rural Bangladesh: A Socio-Economic Analysis.* Graduate Training Institute. Bangladesh Agricultural University, Mymensingh.

Hamid, M.A. 1997. Farmers Awareness on Environmental Pollution: A Study in Bangladesh. *Asia Pacific Journal of Rural Development*, VII (2): 107-117.

Hanif, M.A. 2000. Comparative Analysis between FFS and non FFSs Farmers Regarding Environmental Awareness. *M.S. (Ag.Ext.Ed.) Thesis,* Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Hasan, M.K. 2006. Participation in Farming Activities by Conventional and Organic Farmers. *M.S. (Ag.Ext.Ed.) Thesis,* Department of Agricultural Extension Education, Bangladesh Agricultural University. Mymensingh.

Hoque, M.K. 2001. Environmental awareness and Problem Conformation of the FFS Farmers in Practicing IPM. *M.S. (Ag.Ext.Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, 64

Hossain, S.M.A. and A.B.M.M. Alam. 1993. Farmers Ingenuity and Indigenous Knowledge in Developing Sustainable Farming System. In: *Fanning System Research: A Training Manual*, Graduate Training Institute. Bangladesh Agricultural University. Mymensingh.

Hossain. M.M. 1999. Farmers Perception of the Effects of Agro-chemicals on Environment. *M.S. (Ag.Ext.Ed.) Thesis*, Department of Agricultural Extension Education. Bangladesh Agricultural University. Mymensingh.

Islam, M.M., Akanda, M.B. and M.G.R. 1998. Farmers Awareness on Environmental Pollution. *Bangladesh Journal of Training and Development*, 11 (1 & 2): 33-38.

Islam, M.S. and M.A. Kashem. 2000. Correlates of Farmers Awareness on the Environmental Pollution. *Bangladesh Journal of Training and Development.* 13(1 & 2):7-14

Islam. M.M. 1996. Farmers' Use of Indigenous Technical Knowledge in the Context of Sustainable Agricultural Development. *MS. (Ag.Ext.Ed.) Thesis,* Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Islam. M.M., M.B. Ahmed and M.G.R. Akanda. 1998. Farmers Awareness on Environmental Pollution. *Bangladesh Journal of Training and Development.* 1l (l&2):33-38

Johnson, A. W. 1972. Individuality and Experimentation in Traditional Agriculture. Human Ecology. 1(2): 149-159.

Karim. M .A. 2002. Awareness Level of IPM Farming about Environmental Friendly Agricultural Practice in Selected Area of Mymensingh District. *M.S. (Ag.Ext.Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Kashem. A. 2001. Farmers Awareness on the Effect of Insecticides on Environment: A Study in Kalihati Upazila under Tangail District. *M.S. (Ag.Ext.Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Kashem. M.A and H. Mikuni, 1998. Towards Sustainable Agricultural Development: Use of Indigenous Technical Knowledge (ITK) by the Farmers of Bangladesh and Japan. Research Monograph No.2, Development of Farm Economics and Management, Hiroshima University, Japan.

Khan. A.M.M. 2002. Farmers Awareness on Adverse Effects of Rice Monoculture *M.S. (Ag.Ext.Ed.) Thesis*, Department of Agricultural Extension Education.

Koradia, D. 1996. Survey of Grassroots Innovations Part XVI. *Honey Bee*, 7(3): 16.

Lightfoot. C. 1987. Indigenous Research and On-farm Trials. *Agricultural Administration and Extension.* 24: 79-89.

Lohar. D.P. 1952. Fungicidal Value of Cattle Urine. Occasional Paper (unpublished), LRARC.

Mamun, A.M. 2004. Fanners Knowledge and Attitude Towards the Use of Indigenouse Technical Knowledge for Crop Protection. *M.S. (Ag.Ext.Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University. Mymensingh.

McCorkle, C.M., R.H. Brandstetter and G.D. McClue. 1987. *A case study on farmer innovations and communication in Nigeria.* Washington DC: Academy for Educational Development.

Miah. M.A.M. and Rahman, M.M. 1995. Farmer Awareness regarding Change in the Farming Environment. A research Article Accepted for Publication in:

Milington, A. 1987. Soil Conservation and Shifting Cultivators. *ILEIA Newsletter.3(1):* 15-16 and 3(2): 18-19.

Naher. K. 2000. Participation of Rural Women in Homestead Agriculture in a Selected Area of Gazipur District. *M.S (Ag.Ext.Ed.) Thesis*, Department of Agricultural Extention Education, Bangladesh Agricultural University. Mymensingh.

BBS. (2019). 'Statistical Yearbook of Bangladesh. Bangladesh Bureau of Statistics', Statistics Division. Ministry of Planning, Government of the People's Republic Bangladesh.

BER. (2014). 'The Bangladesh Economic Review', Statistics Division. Ministry of Finance, Government of the People's Republic Bangladesh.

Nur-e-Ferdouse. 2003. Awareness of Rural Women on Agricultural Extension Services. M.S. (Ag.Ext.Ed.) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Reij, C., S. Turner and T. Kuhlman. 1986. *Soil and Water Conservation in Suh-Saharan Africa: Issues and Options.* Amsterdam: CDCS/IFAD.

Reijntjes, C., B. Haverkort and A. Waters-Bayer. 1992. (eds.) *Farming for The Future an Introduction to Low-External-input and Sustainable Agriculture.* London and Basingstoke: The Macmillan Press Limited.

Richards, P. 1989. *Farmers also Experiment: Neglected Intellectual Resource in African Science. Discovery and Innovation 1989 1 (1) 19-25*

Rist, S. 1991. Revitalising Indigenous Knowledge. *ILEA Neusletter.* 3/91:22.

Roling, N. 1988. *Extension Science: Information Systems in Agricultural*

Shah. P. 1994. Local Institutions and Pars-Professionals in Watershed Management. *ILEIA Newsletter. 10(2):* 70-73.

Sharland, R.W. 1991. Using Indigenous Knowledge in a Subsistence Society, In: Warren *et al.* (eds.) *Indigenous Knowledge Systems, the Cultural Dimension DeiWopnient.* London: Kegal Paul.

Sheheli, S. 2003. Use of Indigenouse Faming Teshnologies by a Rural Women in Mymensingh. *M.S. (Ag.Ext.Ed.) Thesis*, Department of Agricultural

Extension Education, Bangladesh Agricultural University, Mymensingh.

Sutradhar, C.N. 2002. Farmer Awareness on Environmental Degradation Caused by the Use of Modem Agricultural Technologies. *M.S. (Ag.Ext.Ed.) Thesis*, Department of Agricultural Extension Education. Bangladesh Agricultural University. Mymensingh.

Talawar. S. and Singh, Y.P. 1992. Indigenous Knowledge System: Climate and Crop- Pest-Climate Interactions. *Indian Journal of Extension Education.* 28(1&2):I-7.

Thrupp, L.A. 1987. *Building Legitimacy of Indigenous Knowledge: Empowerment for Third World People or Iscientized Packages' to be Sold by Development Agencies.* Paper Presented at IDS Workshop on Farmers and Agricultural Research: Complementary Methods, 26-37 July 1987. University of Sussex. Brighton, U.K.

Thurston, H.D. 1990. Plant Disease Management Practices of Traditional Farmers. *Plant Diseases.* 74(2):96-102.

Verma, M.R. and Y.P. Singh. 1969. A Plea for Studies in Traditional Animal Husbandry. *Allahabad Farmer.* 43(2):93-98.

Warren, D.M. 1991. *Using Indigenous Knowledge in Agricultural Development.* World Bank, Washington.

Wilken. G.C. 1987. Good Farmers: Traditional Agricultural Resource Management in Mexico and Central America *Berkeley:* University of California Press.

APPENDIX-A

(English version of the interview schedule)

Department of Agricultural Extension and Information system

Sher-E-Bangla Agricultural University, Dhaka-1207

An interview schedule for a research study entitled -

FARMER'S AWARNESS ON THE USE OF INDIGENOUS TECHNICAL KNOWLEDGE (ITK) OF SADAR UPAZILLA UNDER JAMALPUR DISTRICT

(Please answer following questions. Your information will be kept confidential and will be used

for research purpose only)

Name of the respondent: **Respondent No…….**

Village: **Upazila:**

Union: **District:**

1. **Age**

What is your present age? ..... Years

2. **Educational qualification**

a) Can't read and write: .....

b) Can sign only: .....

c) I read up to class: .....

d) I took non-formal education up to class ..... equivalent

3. **Family Size**

Family size including yourself……..

4. Farm size

Please furnish information about your farm size:

SL NO	Land Type	Area	
		Local unit(Decimal)	Hectre
1	Homestead area including pond (A)		
2	Own land under own cultivation (B)		
3	Land given to others as borga (C)		
4	Land taken from others as borga (D)		
5	Land take from others as lease		
Total = A+B+1/2(C+D)+E			

5. Annual family income

Please state the income from following specific sources during the last year

Sl. No:	Sources of income	Total value
	A. On farm income	
1.	Agriculture	
2.	Fisheries	
3.	Livestock	
	B. Off farm income	
1.	Business	
2.	Services	
3.	daily labour	
4.	Remittance	
5.	Others(If any)	
	Total (A+B)	

6. **Cosmopoliteness**

Please indicate your frequency of communication outside of your locality.

Sl No.	Place of visit	Number of visit
1.	Relative or other known person located outside of your own village/month	
2.	Own Upazila town/month	
3.	Other Upazila town/month	
4.	Own District Town/three month	
5.	Other District town/Three month	
6.	Visit to other Union Porishad	
7.	Capital city/Year	

7. **Organizational Participation**

Do you involve with any organization/institutions?Yes No.

If yes please mention the nature and duration of your participation in the following organizations.

Sl no.	**Name of the organizations**	Nature of duration of participation					
		Ordinary member	Duration (years)	Executive Committee member	Duration (years)	Executive Committee officer	Duration (years)
1.	NGO committee						
2.	Market Committee						
3.	Village Defense Committee						
4.	Cooperative Society						
5.	School Committee						
6.	Madrasha/mosque committee						
7.	Others						

8. Training on ITK

Have you any training on ITK1.Yes 2. No

If Yes, then mention the following information

Sl no.	Concerned Organization	Duration Training
1.	DAE	
2.	NGO	
3.	Others	

9. **Extension Media Contact**

Please indicate your frequency of contact with the following media

Sl no.	Name of communiaction Media	Frequency of Contact			
		Regulary	Occasionally	Rarely	Not at all
Individual contact					
1.	NGO Worker	4 or more	1-3	O time/month	O times/year

		times/month	times/month	but a few /year	
2.	SAAO	4 or more times/month	1-3 times/month	O time/month but a few /year	O times/year
3.	Agricultural Input Dealer	4 or more times/month	1-3 times/month	O time/month but a few /year	O times/year
4.	Upazila Agricultural Officer /Additional agricultural Officer/ Agriculture Extension Officer	At least one time/month	At least one or two times/month	1-5 times/ year	O times/year
5.	Upazila Fisharies Officer /Upazila livestock Officer/ Veterinaryl Surgeon	At least one time/month	At least one or two times/month	1-5 times/ year	O times/year
Group contact					
1.	Participation in group discussion	5 or more times/year	2-4 times/year	1 time/year	O times/year
2.	Participation in field day/farmer's rally	5 or more times/year	2-4 times/year	1 time/year	O times/year
3.	Participation in demonstration meeting	5 or more times/year	2-4 times/year	1 time/year	O times/year
4.	Participation in training programme	5 or more times/year	2-4 times/year	1 time/year	O times/year
Mass contact					
1.	Watching Agricultural programme	4 or more times/week	1-3 times/week	1-2 times/month	O time/month
2.	Observing Agricultural folk song	4 or more times/week	2-3 times/week	1 times/month	O time/month
3.	Listening Agricultural Programme	4 or more times/week	1-3 times/week	1-2 times/month	O time/month
4.	Reading Agricultural Magazine(Krisi Katha/Leaflet/booklet	5 or more times/week	3-4 times/week	1-2 times/month	O time/month

10. Knowledge on ITKs

Please answer the following questions.

Sl no.	Questions	Marks	Achieved
1.	How ITKs reduce environmental hazards?	2	
2.	Why you use lime in the unclean water pond?	2	
3.	What you use to treat a cow for shoulder scab?	2	
4.	Do ITKs cause harm to the environment, if no, then how?	2	
5.	Identify some crops that could be cultivated as inter crop to protect insect infestation	2	
6.	What are the uses of cowdung mixed water in boro rice field?	2	
7.	How storage insects could be controlled without using pesticide?	2	
8.	What are the uses of tobacco dust,cattle urine and ashes in crop cultivation	2	
9.	How bamboo sticks or branches of tree work for controlling insects in crop field?	2	
10.	Mention the name of four items of ITKs by which insect infestation of crop field can be controlled	2	

11.Innovativeness

Please furnish information about the extent of uses of the following technologies

Sl no	**Name of technology**	**Nature of the innovativeness**				**Never used**
		Within 1 year after hearing	**Within 2 year after hearing**	**Within 3 year after hearing**	**Within 4 year after hearing**	
1	BRRI dhan 29					
2	Use of green manure crops					

3	Tree plantation in recommendation way					
4	Use of granule area					
5	Use of power tiller					
6	Use of weedicide					
7	Use of insecticide					
8	Use of power pump					
9	Use of hybrid variety					
10	Use of compost					

12. Input Availability

Give your opinion aginst each of the following facilities mentioned in the table

Sl no	**Name of the inputs**	**Always Available(3)**	**Easily available(2)**	**Available at time(1)**	**Not available(0)**
1	Fertilizer				
2	Quality seed				
3	Farm machineries				
4	Irrigation facilities				
5	Insecticides				
6	Others				

13. Awareness of the use of Indigenous Technical Knowledge (ITK)

Please state the extent of your awareness against each of the following ITKs

Sl no	Statement on ITKs	Awareness		
		Fully Aware	Partially Aware	Not Aware
Crop Production				
1.	Mulching garlic fields with the straw or			

	water hyacinth for preserv moister ing soil			
2.	Cereals,pulses and oil seeds are put in and indigenous storage structures			
3.	Storing by mixing with the dust of dried neem leaves to repeal stored grain pest			
4.	Vegetable seeds are soaked in water for some time before sowing in the bed for rapid germination			
5.	Using the skeleton of dried bottle gourd to store different types of seeds			
6.	Perching in rice fields to let the birds sit and eat away insects			
7.	Visiting the potato field early in the morning to detect and to kill potato cut worm			
8.	Applying fish cleaning water at bean and cucurbit plants bases for enchaned and better growth of the plants			
9.	Spreading ash in leafy vegetable to control insect (mainly aphid) and better growth of vegetable			
10.	Intercropping garlic and potato to minimize pest attack			
11.	Applying the excreta of poultry birds at bean and cucurbit plant bases for enhanced and better growth of the plants			
12.	Harvesting Garlic during or after the emergence of flowering stalk to improve storage quality			
13.	Potatoes preserve in sand layers for long time storing			
Fish Production				
14.	Applying Cowdung in the pond to feed the fish			
15.	Applying rice kura in the pond as fish feed			
16.	Applying Mustard oil cake in the pond to feed the fish			

17.	Using banana leaves in the pond to feed grasscraps			
18.	Applying lime in the pond to clear the unclean water			
19.	Capplying the excreta of poultry birds in the pond to feed the fish			
Livestock production				
20.	Feeding the flesh of mollus and snail to duck			
21.	Applying black ash of dry cell mixed with coconut or mustard oil into the shoulder scab of the cow for recovery			
22.	Feeding the mixer of katanoty and shiru grass to livestock for improving lactation			
23.	Using turmaric dust with hukka water to cure gas formation of livestock			
24.	Applying leaf extract of custard apple to control body lice of livestock			
Environmental Aspect				
25.	ITKs Cause no harm to the environment			
26.	The quantity of beneficial organism and useful insects are being decreasing in effect of gradual pesticide use			
27.	Intensive and continuous cultivation leads depletion of consequence the quality of organic matter in the soil.			
28.	By adopting crop rotation favorable agricultual environment can be created.			
Socio – cultural Aspects				
29.	ITK and related folklore are being lost because of modern technology			
30.	The role of women in Farming activities is decreasing day by day because of lack of ITKs			

Signature of Interviewer

Date:.....

APPENDIX B: CORELATION MATRIX

Variables	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	Y
X_1	1												
X_2	.031	1											
X_3	.316**	.061	1										
X_4	.002	.232**	-.017	1									
X_5	-.183*	-.139	-.134	.181*	1								
X_6	-.214*	.235**	.078	-.036	.076	1							
X_7	.169	.155	-.011	.023	-.105	-.143	1						
X_8	-.259**	.004	-.162	.056	.143	-.215*	.061	1					
X_9	-.230*	-.122	-.009	-.074	.145	.121	-.135	-.226*	1				
X_{10}	-.304**	-.070	-.213	.022	.319**	-.069	-.158	.464**	-.122	1			
X_{11}	-.179*	-.072	.031	-.172	.196*	.335**	-.176	.036	.199*	.003	1		
X_{12}	-.300**	-.211	-.336**	-.074	.203	-.093	-.011	.344**	.147	.417**	.136	1	
Y	-.187*	-.180*	-.135	-.208	.116	.021	-.151	.045	.444**	.147	.281**	.410**	1

*Correlation is significant at 0.05 level of probability

** Correlation is significant at 0.01 level of probability

X_1 = Age

X_2= Educational qualification

X_3= Family size

X_4= Farm size

X_5= Annual family income

X_6= Cosmopoliteness

X_7= Organizational participation

X_8= Training on IKT

X_9= Extension media contact

X_{10}= Knowledge on IKT

X_{11}=Innovativeness

X_{12}= Input Availability

Y= Awareness of use of Indigenous Technical Knowledge(ITk)