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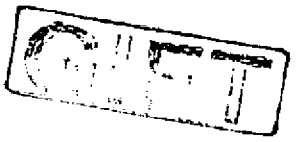
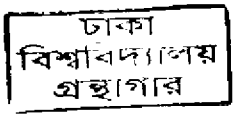


DEDICATED

to

MY PARENTS

Who gave me an enlightened world and asked me to do something great for the society and human beings



Improving Information Services and their Characteristics in the National Agricultural Research System

IMPROVING INFORMATION SERVICES AND THEIR CHARACTERISTICS IN THE NATIONAL AGRICULTURAL RESEARCH SYSTEM

BY

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SUPERVISOR

DR. M. NASIRUDDIN MUNSHI

A THESIS ON THE TOPIC MENTIONED ABOVE SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR AWARD OF THE MASTERS OF PHILOSOPHY OF THE UNIVERSITY OF DHAKA

DEPARTMENT OF INFORMATION SCIENCE AND LIBRARY MANAGEMENT
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তথ্যবিজ্ঞান ও গ্রন্থাগার ব্যবস্থাপনা
বিভাগ
ঢাকা বিশ্ববিদ্যালয়

CERTIFICATE

This is to certify that the thesis entitled "**Improving Information Services and their Characteristics in the National Agricultural Research System**" submitted by Susmita Das for the Degree of Master of Philosophy is an original research done by her under my guidance and supervision and that this thesis has not been submitted either in part or in full by the candidate of any Degree, Diploma, Associateship, Fellowship or other similar title.

It is also certified that this thesis represents an independent work on the part of the candidate.

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Declaration

I hereby declare that this thesis entitled **"Improving Information Services and their Characteristics in the National Agricultural Research System"** is my original work resulting from the investigation for the Degree of Masters of Philosophy, Department of Information Science and Library Management, University of Dhaka. The entire research was carried out by me under the guidance and supervision of Dr. M. Nasiruddin Munshi, Professor, Department of Information Science and Library Management, University of Dhaka.

I further declare that this thesis has not been previously submitted in partial or in full for any Degree or Diploma to any University or Institution.

Susmita

Dhaka
25.04.2011

Susmita Das

Preface

The study presents a keen observation and evaluation of existing information systems and services of the National Agricultural Research System (NARS) of Bangladesh to recommend an improved information management for better services for agricultural scientists.

All the libraries and the information centres of NARS institutes are not up to date with information systems and services. This problem has been found by visiting libraries and the information centres of NARS and through data analysis.

Under the newer challenges, like population growth, lack of agricultural land due to urbanization, climate change, degradation of loss of bio diversity agricultural production system is being threatened. Also potential exists in the science technology in Bangladesh like ICT and global knowledge on information management. Keeping this in view, the agricultural research system has to be re-organized to accelerate knowledge transfer through advanced knowledge of information management.

There are eight chapters in this study. The first one is about the problem, the objectives, the scope, the design, and the nature of the subject. In the second chapter many literature have been reviewed. The third chapter focuses on information systems and services in the field of agriculture in Bangladesh. The existing information systems and services of the National Agricultural Research System (NARS) are explained in another chapter. The chapter six analyzes the survey result. As a key matter of the research, the investigator has proposed a model plan on ARIS (Agricultural Research Information System) for NARS for the better result of information systems and services.

Research in agriculture without information has become difficult. So information services can meet the needs of the scientists, academicians and other professionals to generate appropriate technology and knowledge in their respective field. This was the major idea of the investigator.

Susmita Das

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My feeling can not but have the fullest sense to express my venerable regardful gratitude and the greatest appreciation to my supervisor Dr. M. Nasiruddin Munshi, Professor, Department of Information Science and Library Management, University of Dhaka for his superb guidance, valuable suggestions and enormous support throughout this research work. But for his scholastic direction, advice, constructive criticism and constant encouragement, expertise and consideration, this work would likely not have been matured. So I am greatly indebted to my intellectual supervisor for the entire benevolent attitude towards me to bring this thesis up to its present standard.

Profound gratitude and sincere appreciation are offered to Dr. Wais Kabir, a renowned scientist at national and international level and the Executive Chairman of Bangladesh Agricultural Research Council, Dhaka, for his continuous inspiration and relentless persuasion to resume seemingly incomplete task. I am thankful to Dr. Mohammad Nurul Alam, Senior Program Specialist, SAARC Agriculture Centre for his guidance and cooperation in making the research success.

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I am also grateful to Dr. Abul Kalam Azad, Director, SAARC Agriculture Centre, Dr. Paresh Chandra Golder, Chief Scientific Officer of BARC, Dr. Md. Abul Kasem, Director, PIU, NATP, BARC, Dr. M. Baktear Hossain, Principal Scientific Officer of BARC , Dr. H. H. D. Fonseka, SPS (Crops),SAC and other scientists of BARC and SAC for their co-operation and mental encouragement. I thank all the staff of BARC too for their assistance.

I would like to express my gratitude and thanks to all of my teachers, officers and staffs in the Department of Information Science and Library Management, University of Dhaka for their cooperation, support and help during the course of my studies.

I would like to give heartiest thanks to Rafique Mostafa Kamal, the Principal Librarian of BARC for his constructive advice and inspiration. I wish to express my sincere appreciation to all librarians and library professionals of NARS institutes for providing adequate data and information in the period of my field study.

My happiness knows no bound to express my thanks to my husband, Mr. Paritosh Mondal, Assistant Professor of English, Bhawal Badre Alam Govt. College for his cordial assistance in completing the work. His sacrifice, inspiration and contribution in completion of the study are counted remarkably. My emotional inspiration is my loving son, Prodipta Mondal who sacrificed his precious moment.

For the investigation of my work I had to depend on different national and international publications. I am really indebted to the authors whose work I have in this research work.

I can't but give thanks to all of my friends working in different institutions, who have given support during my research.

I owe to my living parents, loving sisters and my father and mother in laws for having patience to be with me in completing the great work.

Above all, I would like to thank and praise the Almighty God, the supreme Ruler of the Universe, who enabled me to make my dream a reality.

Susmita Das

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LIST OF ABBREVIATIONS / ACRONYMS

AARC2	Anglo-American Cataloging Rules-2
ADB	Asian Development Bank
AEZ	Agro Ecological Zone
AGORA	Access to Global Online Research in Agriculture
AGRIS	International Information Systems for the Agricultural Sciences and Technologies
AGRIINDEX	Agricultural Index
AGRICOLA	Agricultural Online Access
AIC	Agricultural Information Center
ALA	American Library Association
ARLIS	Agricultural Research Library Information System
ARI	Agricultural Research Information
ARISNET	Agricultural Research Information System Network
ARFIS	Agricultural Research Financial Information System
ARPIS	Agricultural Research Personnel Information System
ARIS	Agricultural Research and Information System
AVRDC	Asian Vegetable Research Development Center
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BARIL	Bangladesh Agricultural Research Institute Library
BAI	Bangladesh Agricultural Institute
BAURES	Bangladesh Agricultural University Research System
BFRI	Bangladesh Fisheries Research Institute
BFRI	Bangladesh Forest Research Institute
BFRIL	Bangladesh Fisheries Research Institute Library
BFRIL	Bangladesh Forest Research Institute Library
BINA	Bangladesh Institute of Nuclear Agriculture
BINAL	Bangladesh Institute of Nuclear Agriculture Library
BJRI	Bangladesh Jute Research Institute
BJRIL	Bangladesh Jute Research Institute Library
BRRI	Bangladesh Rice Research Institute
BRRIL	Bangladesh Rice Research Institute Library
BLRI	Bangladesh Livestock Research Institute

BLRI L	Bangladesh Livestock Research Institute Library
BSRI	Bangladesh Sugarcane Research Institute
BSRIL	Bangladesh Sugarcane Research Institute Library
BTRI	Bangladesh Tea Research Institute
BTRIL	Bangladesh Tea Research Institute Library
CAS	Current Awareness Service
CABI	Commonwealth Agricultural Bureau International
CARIS	Current Agricultural Research Information System
CCC	Classified Catalogue Code
CD-ROM	Compact Disc Read Only Memory
CFP	Central Focal Point
CGIAR	Consultative Group on International Agricultural Research
DAE	Department of Agricultural Extension
DDC	Dewey Decimal Classification
DLS	Department of Livestock Services
DOF	Department of Fisheries
FAO	Food and Agricultural Organization
FADCP	Food and Agricultural Council of Pakistan
FRILDC	Fisheries Research Institute Library and Documentation Centre
FSR	Farming System Research
FSRD	Farming System Research Development
GB	Governing Board
GDP	Gross Domestic Product
GIS	Geographical Information System
HYV	High Yielding Variety
IAEA	International Atomic Energy Agency
ICAR	Indian Council of Agricultural Research
ICARDA	International Center for Agricultural Research in the Dry Areas
ICT	Information Communication Technology
IPCC	Inter Governmental Panel on Climate Change.
IRRI	International Rice Research Institute
ISD	Information System Development
IT	Information Technology
LAN	Local Area Network
MIS	Management Information System
M. Phil.	Master of Philosophy
M. S	Master of Science
MV	Modern Variety
NAIS	National Agricultural Information System

NARS	National Agricultural Research System
NGO	Non-Government Organization
OPAC	Online Public Access Catalogue
P C	Personal Computer
Ph. D.	Doctor of Philosophy
RAS	Readers Advisory Services
SAC	SAARC Agriculture Centre
SCA	Seed Certificate Agency
SDI	Selective Dissemination of Information
SPSS	Statistical Package for Social Sciences
SRRI	Soil Resource Research Institute
TEEAL	The Essential Electronic Agricultural Library
TPS	True Potato Seed
UCD	University of California Davis General Library
UDC	Universal Decimal Classification
UGC	University Grants Commission
WAN	Wide Area Network
WB	World Bank
WWW	World Wide Web

CHAPTER 1

INTRODUCTION & METHODOLOGY

Chapter 1

Introduction & Methodology

1.1 Preamble

Bangladesh is characterized as an agrarian country where agriculture plays an important role in economy and livelihood. More than eighty percent of the total population directly or indirectly is engaged in a wide range of agricultural activities for their livelihood. The agriculture sector contributes around 21% of the country's Gross Domestic Product (GDP) and generates employment of about 60% of the total labour force (Year Book of Agricultural Statistics of Bangladesh, 2009).

In one hand, agriculture being the largest income and employment generating sector, its contribution towards alleviating poverty is significant. On the other hand, its role in meeting the challenge, achieving self-sufficiency in food production and fostering sustainable economic development is remarkable (BARC, 2008).

It is fact that to achieve increased productivity in agriculture could not be achieved through traditional farming system with the rapid increase in population and high pressure on land. To achieve the present requirement of agricultural products, alleviate poverty and ensure self-reliance in rural communities on sustainable basis, a mechanism through agricultural research is to be developed.

For developing the nation's agricultural sector, it is very much essential not only on the generation of new scientific and technical information but also ensuring supply of right information to the agricultural scientists and researchers at right time. To improve support for continued quality research, the scientific community also needs various types of information from home and abroad. Therefore, timely delivery of this information, although a bit complex task, has been ever demanding.

With a view to improving and strengthening the information services in our agricultural research systems the study has been undertaken. This study is an attempt to assess, evaluate and analyze the existing information services in the National Agricultural Research Systems and to suggest possible remedial measures and their characteristics for

the improvement of the existing information services which can serve the agriculturalists and the researchers properly.

1.2 Statement of the Problem

Information is a systematic body of knowledge organized in such a way that conveys or tends to convey message(s). The process of transferring this information from the originator in right time may be provided in response to the specific requirement of the intended users namely, policy makers, scientists, educationists, extensionists, farmers etc. This may also be provided in anticipation of a group or community of users.

The title of the thesis, 'Improving Information Services and their Characteristics in the National Agricultural Research System" means the improving quality of existing information services and their nature depending on the available facilities and capacity of the institutes of the National Agricultural Research System. In this thesis, comprehensive attempts have been made to find out the present status of information services in the NARS and valuable recommendations are made for the improvement of the information services to fulfill the mission/vision of National Agricultural Research System.

1.3 Objectives of the Study

The present study is an attempt to improve the quality of existing information services depending on the available resources and facilities and capacity of the institutes of the National Agricultural Research System.

The objectives of the study are:

- To identify the existing resources and facilities in the NARS;
- To identify the requirement of the scientists and professionals working in the NARS;
- To design an improved and sustainable information network system for the National Agricultural research organization for access and effective use of agricultural information;
- To identify existing services provided by the organizations so that the information systems can be strengthened;
- To make strong suggestions for the sustainable improvement of the services;
- To know the attitudes of agricultural scientists towards introducing modern agricultural information system and the use of modern technology in dealing with agricultural information;

- To identify the problems associated with the automated electronic information services.

1.4 Scope of the Study

The study will be confined to the information services of the National Agricultural Research System (NARS) Institutes in Bangladesh. The study is based on the existing facilities and the capacity of the individual institute. Some suggestions will be provided to introduce or improve information services and their characteristics in the National Agricultural Research System in Bangladesh. The Present study concentrates on a review of the following issues:

- Available literature of information services and modern techniques of Information system;
- Status of the information centres and libraries of the NARS Institutes;
- Present status and existing facilities of information services in the NARS Institutes;
- Survey of the libraries and information centres in the NARS Institutes;
- A model plan for designing an improved information network system for the national agricultural research organization for access and effective use of agricultural information;
- Recommendations for smooth running of the proposed model plan for improving information services in the NARS Institutes;
- A conspicuous idea of the characteristics of remedial measures for the betterment of information services;
- Integration of library information system to the Management Information System (MIS).

1.5 Methodology of the Study

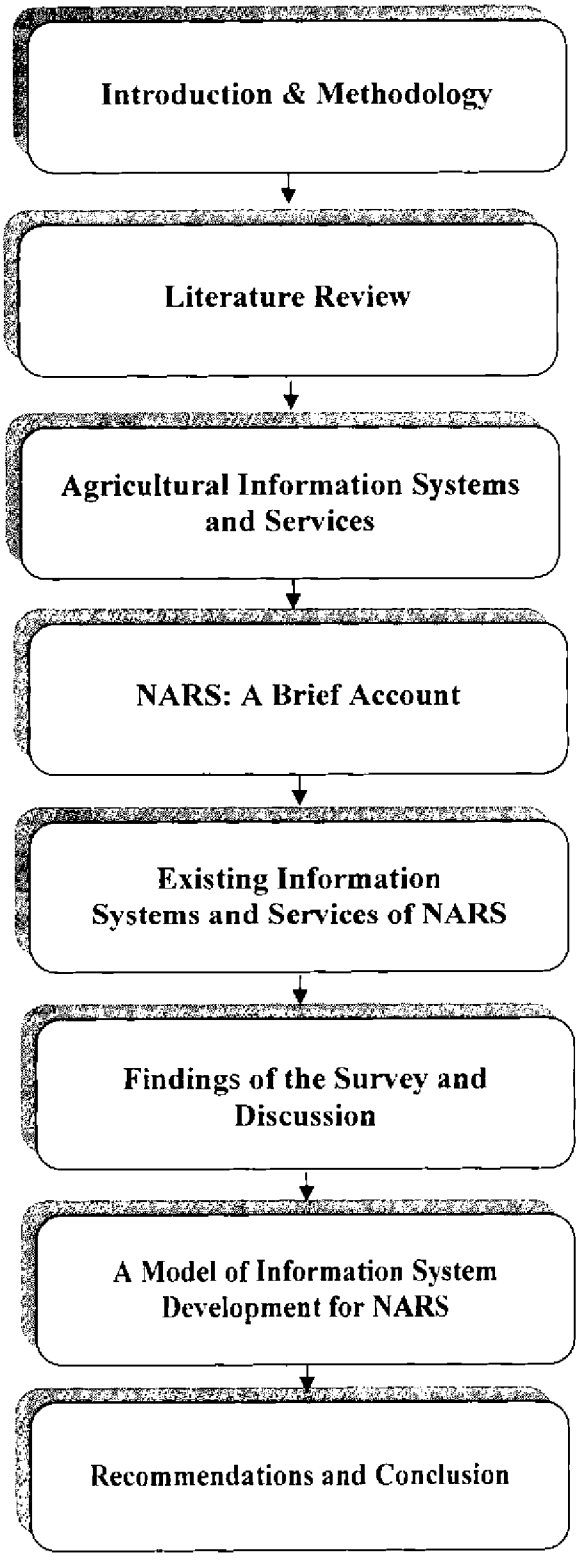
1.5.1 Nature of the Study

Every research work follows a particular methodology. This study, of course exploratory in nature, goes with primary data collection through questionnaire survey, data processing and analysis, literature search, etc. Besides, some other traditional/conventional methods have been applied. Furthermore exploratory study helps in formulating appropriate hypothesis that is generally tested in conclusive study prepared based absolutely on published secondary data.

1.5.2 Design of the Study

A schematic diagram is presented below indicating the steps followed in carrying out the present study.

Figure – 1.1 Design of the Study Plan



1.5.3 Sample Design

A. For ensuring representative ness from NARS libraries and information centres and considering the functions, activities, operations, services and usefulness to the users, information center and libraries of the National Agricultural Research System were selected and brought under the investigation. The name of the libraries, year of establishment and location are presented in the following table:

Table 1.1 Name of the Sample Library and Information Centres

SL No.	Name of the Library	Year of Established	Location
01.	Agricultural Information Centre (AIC) of (BARC)	1973	Dhaka
02.	Bangladesh Agricultural Research Institute (BARI)	1970	Gazipur
03.	Bangladesh Rice Research Institute (BRRI)	1970	Gazipur
04.	Bangladesh Jute Research Institute (BJRI)	1951	Dhaka
05.	Bangladesh Institute Nuclear Agriculture (BINA)	1973	Mymensingh
06.	Soil Resource Development Institute (SRDI)	1962	Dhaka
07.	Bangladesh Sugarcane Research Institute (BSRI)	1974	Ishurdi
08.	Bangladesh Livestock Research Institute (BLRI)	1986	Savar
09.	Bangladesh Forest Research Institute (BFRI)	1955	Chittagong
10.	Bangladesh Fisheries Research Institute (BFRI)	1987	Mymensingh
11.	Bangladesh Tea Research Institute (BTRI)	1957	Srimangal

B. Two hundred (200) sample library users from different Agricultural Research Institutions have been interviewed through a semi-structured questionnaire. Users were selected applying judgmental sampling technique.

1.5.4. Data Collection Instrument

Based on the review of literature, two sets of structured questionnaire have been designed to collect data and information. One was prepared for the survey of the sample libraries and other for the interview of the library users. Both the questionnaires were duly pre-tested and finally structured keeping in view the objectives of the study.

1.5.4.1 Literature Search and Analysis

Several studies reported are supported to enrich the proposed study. Such as the various agricultural indexing and abstracting tools like AGRIS, AGRINDEX, CABI and

agricultural information available on CD-ROM related to agriculture have been consulted. Ten years dissertations abstracts both M Phil and Doctoral of library and information science available in the Dhaka University Library in Dhaka, have also been consulted. Besides, the investigator has systematically made a literature search from the 10 years Library Herald, Journal of the Delhi Library Association. The types of literature identified and located are books, monographs, periodical articles, proceedings, reports, doctoral dissertations, etc. Besides different websites used in this study are located by means of search engines and databases of different agricultural libraries and identified the following URL: www.google.com, MSN etc. These materials have been analyzed for the research study.

1.5.4.2 Visit the NARS Institutes

The investigator took several visits to the different institutes of National Agricultural Research System in order to know the existing facilities, strength and weakness of agricultural information services in connection with this research work. The investigator personally surveyed and studied ten NARS libraries in different places in Bangladesh and one information center of BARC.

1.5.4.3 Questionnaire Method

Questionnaire method usually adopted in social research obtains information with the help of a questionnaire. A questionnaire is essentially skillful communication of objectives into set of questions intended to be answered in writing.

The researcher has made maximum efforts for collecting relevant data from agricultural scientists and researchers in NARS Institutes libraries of Bangladesh by employing the traditional method of empirical social science research i.e. questionnaire method. A structured questionnaire with both closed and few open options were administrated to elicit both quantitative as well as qualitative information from the respondents relevant to the study in the light of their observations and experiences. The relevance and utility of each item was also carefully examined before their inclusion in the questionnaire.

1.5.5 Variables of the Study

Based on the analysis of the general and specific objectives of the present study eleven broad categories of variables for libraries and one for information centers and twenty seven specific variables for users were identified.

The variables and indicators emerging out of the questionnaire for NARS libraries and Information centers and the library users have been shown in Tables 1.2 and 1.3 respectively.

Table-1.2 Variables and Indicators (NARS Libraries and Information Center)

Type of Variable (s)	Indicators
Institutional information	Name of the institute, name of the library/information, address of the library, type of library, name of the librarian, designation (service grade), highest qualification of the librarian, working hours of the library, area of the library, management of library, library statistics, library inventory of equipments, strength of library staff etc.
Library users	Teachers, students, administrators, scientists, researchers, policy makers, average number of users,
Library collections	Books, reports ,thesis, conference/ workshop, proceedings, manuscripts, periodicals, reports ,audio-visual materials, (video, digital text, other), major areas of collection like crop science, agro-processing, fisheries, livestock, natural resources, agri-business, ICT etc. volumes added during last 5 year, any special materials like AGRIS, AGRI index, AGRICOLA, CABI
Library finance and budgeting	Library expenditure for the 5 years, sources of library collection, sources of finance for the library-internal/outside Bangladesh, Government, BARC, UGC, FAO, methods for the allocation of budget
Service of the library/information centre	Reference services, CAS (Current Awareness Service), SDI (Selective Dissemination of Information), inter-library loan services, indexing and abstracting services, reprographic services, internet services, CD ROM services, online library services
Acquisition (methods of book purchase)	By inviting quotations, appointing vendors, from local book market, other source

Processing	Use of classification scheme for processing library materials-dewey decimal classification, colon classification, universal decimal classification, others and use of cataloguing codes-ALA, AACR-AACR-2 and other codes.
Circulation	Register, brown system, network system
Inter-library loan services/resource sharing	Average book loan or other materials in weeks-, getting the information for the users when they need-by sending persons, by writing letters, by telephone, by-mail, by all means
Infrastructural facilities	Computer hardware-,scanner, reprographic equipment, audiovisual equipment and others, name of software used, and opinion about the existing facilities, data processing, retrieval, circulation, clerical and administrative work
Library network	Participation of the library in resource sharing networks-local, national, regional and the international and the importance of networking of agricultural information system in Bangladesh

Table-1.3 Variables and Indicators (users)

Types of Variable (s)	Indicators
Users profile	Name, sex, age, name of the institute, qualification, status, specialization
Use of library	Purpose of library visit –regarding general books, for research purpose, searching periodicals articles, use of IT, reference materials, current information, seminar proceedings, periodicals etc. The way you get the information concerning your research topic-by scanning abstracting and indexing periodicals, by sharing with colleagues, by attending technical programmes, any other sources
Information services	Needs of information services according to priority-. document loan, reprographic service, current awareness service, reference services, selective dissemination.

	indexing and abstracting computer literature, inter library loan services, bibliographical verification, audio visual materials, citation services
Ranking of services	Parameters of ranking the level of satisfaction and dissatisfaction –fully satisfied, marginally satisfied, fully dissatisfied and no comment; all NARS Information services.
Users awareness	Techniques of awareness about the new arrivals of the library-through friends, through library staff, through professionals, through technical meetings and others.
Problems identified	Insufficient reading resources, lack of proper information services, insufficient infrastructure, inconvenient working hours, resources arrangement problems, staff behavior, insufficient IT facilities, lack of awareness of the authorities, lack of updated information.

1.5.6 Data Processing and Analysis

The data collected from two sets of questionnaires of this study were duly edited to verify and analyzed to fulfill the stated objectives. All the questionnaires were duly coded after editing for computer input. The steps followed in the process of data input are:

- Conducting validation checks to ensure that data have been correctly entered into the computer
- Preparation of output tables
- The statistical package was used to enter, edit, analyze and interpret the data.

1.5.7 Statistical Method

In the study pie charts and bar diagrams are used to represent the data. The objectives of statistical presentation of data are to summarize clearly (with considerable visual impact) the facts and inferences drawn from the data.

1.5.8 Formulation of Hypotheses

The following hypotheses are formulated:

(i) The existing information services available in the NARS Institutes libraries and information centres in Bangladesh are not sufficient to fulfill the requirements of the agricultural scientists and resources.

(ii) The agricultural scientists and researchers of Bangladesh are in need of modern and computerized/automated agricultural information system for accessing, updating and upgrading their knowledge.

(iii) The resource sharing of agricultural information source among the NARS Institutes are not up to the satisfaction of the agricultural scientists and researches.

(iv) There is an urgent need for networking of agricultural information system in Bangladesh NARS for effective and necessary information supply to the agricultural scientist and researchers in Bangladesh and for this an uniformed Database should be maintained.

1.6 Organization of the Study

The text of the dissertation has been organized in a logical progression in the following eight major chapters including preliminaries and appendices.

Chapter 1: Introduction & Methodology

(1.1) Preamble, (1.2) Statement of the Problem, (1.3) Objective of the Study, (1.4) Scope of the Study, (1.5) Methodology of the Study, (1.5.1) Nature of the Study, (1.5.2) Design of the Study, (1.5.3) Sample Design, (1.5.4) Data Collection Instrument, (1.5.4.1) Literature Search and Analysis, (1.5.4.2) Visit the NARS Institutes, (1.5.4.3) Questionnaire Method, (1.5.5) Variables of the study, (1.5.6) Data processing and Analysis, (1.6.7) Statistical Method, (1.6.8) Formulation of Hypotheses, (1.7) Organization of Study and (1.8) Implementation.

Chapter 2: Literature Review

Chapter 3: Agricultural Information Systems and Services

(3.1) Introduction, (3.2) Information: Meaning and Definition, (3.3) Types of Information, (3.4) Characteristics of Information, (3.5) Information Architecture, (3.6) Components of Information Architecture, (3.6.1) Information Usage Patterns, (3.6.2) Information Access Points, (3.6.3) Taxonomy, (3.6.4) Administration Structure, (3.6.5) Information Flow, (3.6.6) Standards and Guidelines, (3.6.7) Taxonomic structure,(3.6.8) Taxonomy of Information, (3.7) Agricultural Information, (3.8) Categories of Agricultural Information, (3.8.1) Technical/Scientific, (3.8.2) Commercial, (3.8.3) Social, (3.8.4) Legal, (3.9) Agricultural Information System, (3.10) Characteristics of Information Systems, (3.10.1) Passive Information Systems, (3.10.2) Interactive Information Systems, (3.11) History of Information Services, (3.12) Information Services: Definition and Growth,(3.13) Agricultural Information Services, (3.14) Features of Agricultural Services, (3.14.1) Technical Aspects, (3.14.2) Economic Characteristics of Agricultural Services, (3.14.3) Quality of Agricultural Services, (14.4) Effects of Agricultural Services, (3.15) Importance of Agricultural Information System and Services: Bangladesh Perspective and (3.15) Conclusion.

Chapter 4: NARS: A brief Account

(4.1) Background of Agriculture in Bangladesh, (4.2) Performance of Agriculture Sector, (4.3) Challenges in Agriculture, (4.3.1) Population Growth, (4.3.2) Loss of Cultivated Land, (4.3.3) Dwindling Water Resources, (4.3.4) Climate Change, (4.3.5) Loss of Biodiversity, (4.4) Agricultural Research System in Bangladesh, (4.4.1) Historical Highlight, (4.4.2) National Agricultural Research System, (4.4.3) NARS Institutes, (4.4.3.1) Bangladesh Agricultural Research Institute (BARI), (4.4.3.2) Bangladesh Rice Research Institute (BRRI), (4.4.3.3) Bangladesh Jute Research Institute (BJRI), (4.4.3.4) Bangladesh Sugarcane Research Institute (BSRI), (4.4.3.5) Bangladesh Tea Research Institute (BTRI), (4.4.3.6) Bangladesh Institute of Nuclear Agriculture (BINA), (4.4.3.7) Bangladesh Fisheries Research Institute (BFRI), (4.4.3.8) Bangladesh Livestock Research Institute (BLRI), (4.4.3.9) Bangladesh Forest Research Institute (BFRI), (4.4.3.10) Soil Resource Development Institute (SRDI), (4.4.3.11) Research and Development by NGO's, Universities and Some Private Sector Agencies, (4.4.3.12) Bangladesh Agricultural University Research System (BAURES) and (4.5) Conclusion.

Chapter 5: Existing Information Systems and Services of NARS

(5.1) Introduction, (5.2) Information Needs of the Agricultural Scientists and Researchers, (5.3) Development of Agricultural Information Services in Bangladesh, (5.4) The Existing Information Services in NARS Institutes, (5.4.1) Agricultural Information Center Library (BARC), (5.4.2) Bangladesh Agriculture Research Institute Library, (5.4.3) Bangladesh Rice Research Institute Library, (5.4.4) Bangladesh Institute of Nuclear Agricultural Library, (5.4.5) Soil Resource Development Institute Library,(5.4.6) Bangladesh Jute Research Institute Library,(5.4.7) Bangladesh Sugarcane Research Institute Library, (5.4.8) Bangladesh Livestock Research Institute Library, (5.4.9) Bangladesh Forest Research Institute Library, (5.4.10) Fisheries Research Institute Library Documentation Center, (5.4.11) Bangladesh Tea Research Institute Library and (5.5) Conclusion.

Chapter 6: Findings of the Survey and Discussion

Chapter 7: A Model of Information System Development for NARS

7.1. Introduction, (7.2) Existing Status of Information System in NARS, (7.3) The needs of the Improvement of the Existing Information Systems and Services in NARS, (7.4) The Proposed Model Plan: Agricultural Research Information System (ARIS), (7.5) The Definition and Goal of ARIS, (7.6) The Ways of ARIS Implementation (7.6.1) A Framework for ARIS, (7.6.2) ARIS Cells, (7.6.3) Strengthening Agricultural Information Center and Computer Center at BARC, (7.6.4) Creation of Web Site and Home Page, (7.6.5) Strengthening of Connectivity, (7.6.6) Databases and Application Software, (7.6.7) Development of Application Software, (7.6.8) Agricultural Research Library Information System (ARLIS), (7.6.9) Human Resource Development and (7.7) Conclusion.

Chapter 8: Recommendations and Conclusion

1.7 Implementation

The study was implemented in four steps:

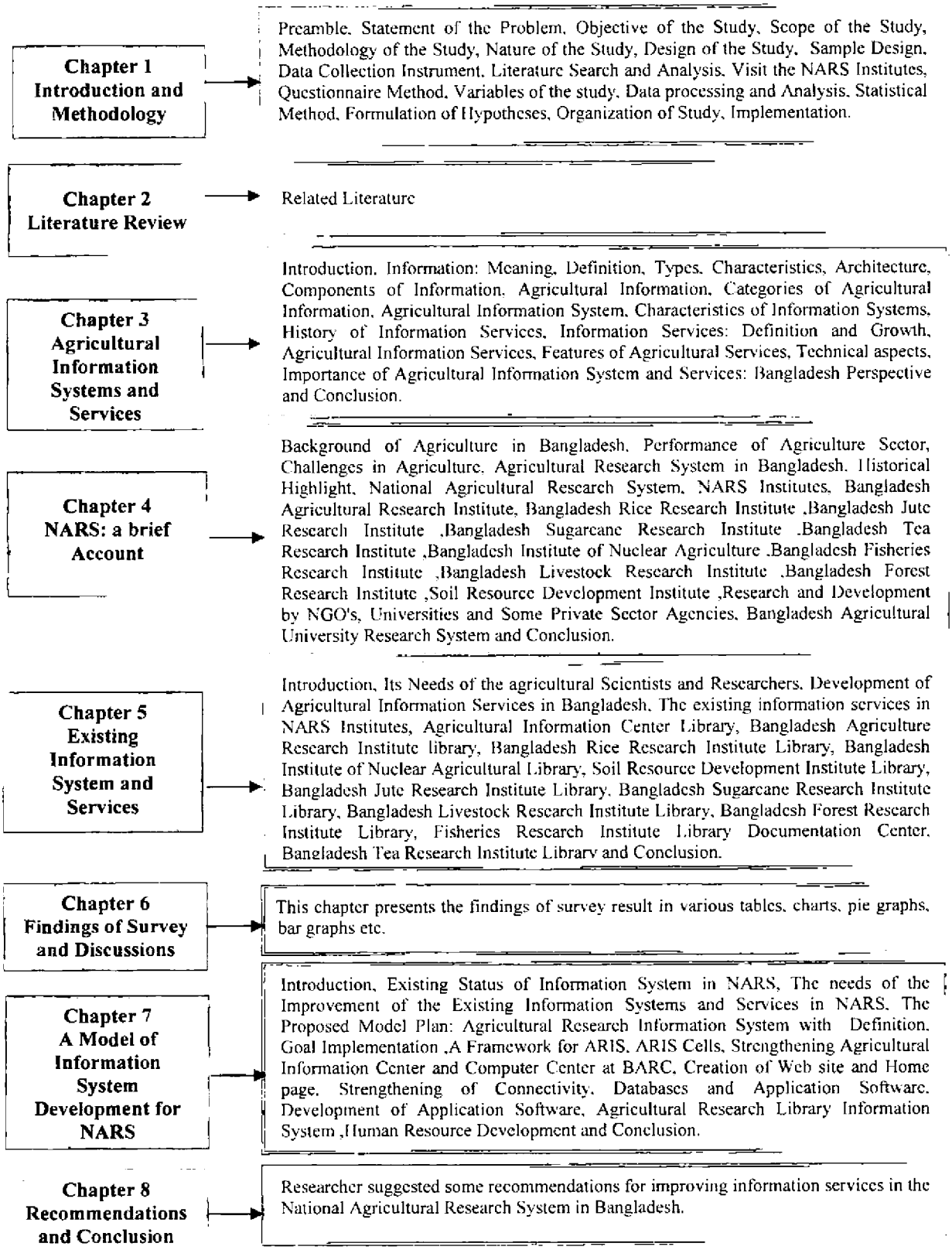
Step-I : Reviewing of all relevant literatures preparation of reading list

Step-II : Designing and testing of questionnaires, sample design, data collection, data analysis and presentation

Step-III : Presenting the existing status of the information services in the National Agricultural Research System

Step-IV : Preparing/developing a model plan for improving the existing information services in the National Agricultural Research System

Figure- 1.2 Diagram of Organization of Thesis



CHAPTER 2

LITERATURE REVIEW

Chapter 2

Literature Review

Introduction

Information collecting and transmitting could have been the first profession of the world when a cave man took the job interview of a painter for the first time. Since then information has been used in every sphere of life in our society.

Literature search is itself information by nature. Every research work requires hard studies to get information related to literature as it is an essential for any investigation to identify the new problems and gaps in the area of research. It also helps to frame the study and intervention of the search findings. The present titled problem is modern in nature as it is related with the agricultural scientists of Bangladesh. Research work on the improvement of the information services and their characters in national agricultural research systems in Bangladesh is very rare. Most of the literature on the topic in Europe, America and Africa are not available libraries and information centers in Bangladesh. Some works on the same topic are found in India. In this particular study, the following literature has been reviewed chronologically:

Hunter (1970) worked on the current mechanism of taking information from its point of origin of the farm where the actual application takes place. He pointed out that process was needed to involve designated extension workers prominently. He emphasized on the area where information needs for the extension workers.

Lionberger and Chang (1970) realized that the flow of farm information was very essential for modernizing agriculture. They did their work where farmers' information needs were analyzed. He felt necessity to solve the information problems that were really essential for the development of agriculture and for the improvement of agricultural research.

Ayepeaku (1983) defined the scope of the information needs of civil servants in a manner that would reinforce the concept of development need to resolve around the activities carried out by civil servants. These activities include finding facts, assessing trends,

diagnosing solution programmers and projects, grating of action, evaluating successes and failure.

Agra et. al. (1984) confirmed that respondents rely heavily on personal contracts with other advisors, specialists and farmers as that was a convenient way of obtaining information. They defined information, categorized it and characterized it in detail for the better improvement of the information use for the researchers and scientists.

Nielson (1984) reported that in order to improve the information flow from agricultural research to extension in most instances it was necessary to do some re-packaging of the research results before they could be used by the farmers.

Aina (1986) examined the basic information component of extension services in Nigeria for the better services of the farmers with a view to bumper crops to meet up the food demand of the country. He revealed what kind of information is really required by the agricultural extension services of Ibadan area.

Lupange (1986) identified the linkage of research and extension and major communication behaviors of researchers and extension workers. He bound an information tie between extension workers and farmers at grass roof level for the improvement of the agricultural services and development of agricultural sector.

Prasad (1987) insisted that agricultural university should serve as one of the primary sources of agricultural information and assume its role in development of effective communication media including film production and the development of prototype instruments and appliances. In the field of research, the university should primarily confine itself to the knowledge of input but every research scientist in the university should have contact with the field.

Reddy (1987) stressed the importance of transfer of technology in increasing the agricultural production. He said that the transfer process consists of four important inter linked and interdependent operations namely the development of information, documentation of information, dissemination of information and diffusion of information

Gupta (1988) found information as an important matter in daily affairs. He stated that information is in fact needed by policy makers, politicians, executives and people from all walks of life. To him without information even people at grass root level can't live.

Aiyepeku (1989) felt necessities of the sources of the information needs that include newspaper, magazine, learned journal, books, monographs, in-house memoranda (files), indexes, abstracts, government publications, consultancy report and feasibility reports without which no organization can function smoothly.

Ojiambo (1989) investigated communication of agricultural information among research scientists, extension personnel and farmers in Kenya. He made it easy for the people related to agriculture to disseminate, collect and reserve information for the improvement of the agricultural services.

Beverlee (1990) depicted agricultural scientist information needs and behavior. He reviewed the trend in agriculture and information delivery and implications of these treads for users and for the relationship between information personnel and user. It is important to think of the behavior input and agricultural output.

Dikle (1990) dealt with information quality aspects like reliability on credibility. He gave importance on information on media like radio, television as the subjects of study. Even he pivoted on the role of newspaper in communication of agricultural information. His work was praise worthy as it is still the milestone for the guideline of information specialists.

Paskoff (1990) discovered that at the earliest use of agricultural libraries were created to serve state and national government agencies. He provided the real history of agricultural libraries and analyzed the different characteristics of those libraries. It came to believe that a country development depends on the proper information services provided by different organizations like libraries.

Thompson (1990) believed that communications could improve the existing systems of a country. He understood that the role of information as a resource could facilitate the solution of problems of development and new types of information systems were being developed to meet the needs of developing countries. He saw that information systems

were usually developed in response to a felt need for new knowledge or its application; thus, as global, regional and national priorities on issues related to agricultural research evolve, and as ways in which new information technologies could be effectively applied to manipulate data develop, information systems and services could be expected to reflect these developments. He also believed that recent information systems and services now involve new users, new subjects, and new formats.

Aina (1991) described the importance of agriculture in Africa and outlines the information needs of farmers. Those needs were transmitted to research scientists by agricultural extension workers. The findings of research were transmitted through research libraries to public libraries and then to the agricultural extension workers.

Tiamiyu (1991) looked at information needs by identifying work activities important for the civil service. These work activities include evaluating project proposal, communicating with other ministries publishing information on projects, implementing and inspecting projects writing reports on public policy issue, summarizing reports, gathering statistical information / data, evaluating reports complied by others, carrying out general administrative duties and providing direct public services among others. Tiamiya further stated that civil servants need statistical information, directory information, procedural information, tax administration and general administrative information.

Van Niekerk (1992) focused on the role of the library in the provision of information in South African agriculture. She measured the various roles of libraries in the development of agriculture in South Africa. Her investigation was a leading discovery for the improvement of agricultural services and the development of agricultural sector in the country.

Meah (1994) delineated a superb picture of four agricultural libraries, their shortcomings, services and various systems followed by the libraries. He proposed some suggestions for the further development of the agricultural libraries in Gazipur district in Bangladesh. The suggestions made by him were really beneficial to the information personnel home and abroad.

Kaur (1995) analyzed the concept and described the growth of information services. He also discussed development of agricultural information services in India. He also depicted the present status of the information services in the libraries of agricultural universities and research institutes. Some pragmatic suggestions were made to improve the situation.

Ramkumar (1995) analyzed the information systems of dairy farmers in two villages of India and found that each farmer's information system was unique. He also realized that there was little linkage between farmers and non-farmers in and outside the villages. He felt the printed media and the dairy extension workers were rarely used as information sources, but the private veterinarian and the secretary of the milk cooperative were widely used. The farmers functioned as both disseminators and users of information. Decision-making by the farmers was made more complex by inappropriate and inefficient information transfer from research and extension services. He compelled the farmers to capitalize on their working knowledge to find suitable solutions.

Wahab (1995) highlighted the information needs of the teachers of the Bangladesh Agricultural University (BAU). He identified the areas of satisfaction of the teachers and mentioned some problems, which made obstacles to provide better services to the teachers. At the end, he further recommended some suggestions for improvement of the library facilities to cater better services to the teachers of the university.

Akhidime (1996) identified some problems in the government sections. Those problems are poor man power, inadequate materials, and lack of awareness, poor funding and lack of equipment. He ensured that the success information needs largely depends on success of success. These factors really affect access to information needs to government establishment.

Ajegbeleye (1996) added some problems of information needs. The factors that affect government and public officers are collecting and recording government documents, inadequate file classification, quality of paper and file, mutilation and theft of government document, storage problem, absence of training for librarian and poor working condition in libraries.

Garforth & Usher (1996) reviewed various models of information system processes such as development and transfer. They stressed that these processes showed that information does not simply flow, but is continually being transformed and adapted through communication. They also stated that systems models allowed the researchers to move away from unilateral conceptions of information and technology development and dealt more effectively with the diversity of information sources available to potential users.

Nair and Francis (1996) reviewed how far the existing information systems can meet the research, education and extension needs in Agricultural sector in India. They pointed out the wrong concepts about information systems and services, put forward suggestions for improvement and recommended the establishment of a central agency to monitor the utilization of resources allotted for agricultural information services.

Sam (1996) explored that in order to satisfy the diverse information needs and interests of agricultural policy makers and managers, the library collection must be adequate in terms of quantity, quality and currency. The collection must be accessible to the users. He further identified that policy makers and managers need adequate up-to-date information as a precondition to effective decision-making and good governance.

Ortiz (1997) analyzed an agricultural knowledge and information system and researched the dissemination of integrated pest management related information among research, extension and potato producers in Peru. He found that potato-related pest management is a kind of technology which demanded from farmers the management of more complex types of information and knowledge that created for farmers the need to understand the technological principles of integrated pest management. He concluded that information dissemination required to be included within a learning system so that farmers could acquire appropriate knowledge and used it to make decisions in a more flexible way. In addition, the system formation was facilitated by personal and organizational sources with internal and external pressures and between demand for, and supply of, integrated pest management information.

Vedpathak et. al. (1997) evaluated the impact of the training and visit of carrying information to farmers. They also studied the problems of information needs of research workers in the area of agriculture with a view to tackling the problems of farmers, extension workers and research workers simultaneously with regard to information needs.

Islam (1998) explored library, documentation, publication and also audio-visuals. He explained various types of agricultural information service provided by the agricultural libraries in Bangladesh. He also collected up-to-date information for quality research for the overall development of not only agricultural sector but also other sectors of Bangladesh Government.

Maji et. al. (1998) explored the use of geographical information system in agriculture. They did an important work that through the techniques of crop acreage estimation, soil resource identification etc are developed but they are not readily available on any information network for ready use of farmers and planners.

Rolls et al. (1999) analyzed the information systems in Czech agriculture. They thought that the information systems appeared to be the construct of the personal characteristics of the farmers and the farmers appeared to regard information as a social good to be exchanged and discussed within social networks. They found that printed materials, agricultural shows, and demonstrations were strong sources of agricultural information, and consultants also gained recognition as valued components of the information system.

Demiryurek (2000) used agricultural information system theory to analyze the current information systems used by organic and non-organic hazelnut producers and found that the information systems for the two groups of farmers were largely separate. He called for the conversion to organic production clearly demanded changes in the information system to allow producers to acquire the appropriate new knowledge and skills. He examined that the organic producers had used more information sources more frequently and more actively than non-organic producers.

Majid et. al. (2000) realized that knowledge about the information needs and seeking behavior of scientists could play a vital role in meeting their collections and facilities to them to attune the needs of scientific community. They explored information needs and seeking behavior of Malaysian agricultural scientists. They also revealed that scientists preferred using primary sources of information particularly journal and review articles. They recommended that science and technology libraries information needs of their users, assessed their collections and facilities, and strengthened their promotional activities.

Naidoo and Rolls (2000) investigated agricultural information use by small-scale cattle farmers in Mauritius and found that the farmers managed information as a production resource. They stressed that the personal characteristics and cattle husbandry practices of the farmers were major influences on their management of information. The practices were mainly learnt from family elders. To them extension advice was only partly remembered, or rejected as the information from this source was sometimes not useful.

Uddin (2000) evaluated the services offered by the agricultural libraries in Mymensingh. It was found that substantive improvements in library administration, organization and personnel were required for offering better services to the library users. In this regard, he proposed some suggestions for further development of the agricultural libraries in Mymensingh (Bangladesh)

Rosaiah and Palanisamy (2001) found out some instances of connection farmers, extension workers and researchers through networked community tele-services. They described a good account of Panela Net of Columbia, Farming and Rural Expertise and Dissemination Services of Greece.

Sreenvaulu (2001) provided an overview on the networking of the agricultural information systems and services in India. He explored ARIS, APPIS, ARFIS, ARILIS and ARMIS in order to get a total solution of networking system and services to combat with modern world. He made it possible to solve agricultural problem with the touch of modern technology and networking systems.

Sreenivasulu and Nandwana (2001) explored Networking agricultural information systems and services in India. He discussed in detail the Agricultural Research Information System Network (ARISNET) for India and its modules consists of Agricultural Research Personnel Information System (ARPIS), Agricultural Research Financial Information System (ARFIS), Agricultural Research Library Information System (ARLIS), and Agricultural Research Management Information System (ARMIS) and ARISNET management. He reviewed the strength and development of Agricultural Libraries in India including institutional system of ICAR, State Agricultural Universities, and ICAR Institute Libraries. He also emphasized on information technology applications in agricultural libraries and information technology infrastructure in the Agricultural Libraries in India.

Vernon (2001) provided agricultural research managers at all levels and information specialists within agricultural research organizations with a source of ideas, concepts, methodologies, explanations, and guidance in managing information. Agricultural research successfully identified new technologies for farmers long before computers were introduced.

Uddin (2002) depicted the present status of information services in the libraries of agricultural scientists and research organizations. He showed agricultural scientists and researchers the actual source of information needs. He reflected the agricultural information systems in Bangladesh. The climate, land, population, economy, a historical overview of Bangladesh agriculture, agricultural education, research and extension system of Bangladesh and role of NGO's in agriculture are stated. His aim was to deal with linkage of Bangladesh with international agricultural information systems and services and their roles in agricultural development of Bangladesh. He proposed a network of agricultural information system in Bangladesh. His suggestion for necessary development of agriculture in Bangladesh has come to use to great extent. His work on agricultural information helped concerned people a lot to bind the scientist and the farmers of Bangladesh.

Veeranyaneyulu and Romesh (2002) stated that the present rate of agricultural production could be doubled if the available technologies are brought to bear with the production process and programmers. They focussed more and more on transferring new technologies away from the confines of laboratories and research institutes making them more result and work oriented, which is the need of day. They felt necessity of the progress of research in agricultural fields and improvement of production which essentially require timely supply of information to the agricultural scientists.

Jensen and Thysen (2003) described up-to-date and local agricultural information communicated by SMS. The system has two types of warnings: Push-type warnings are sent regularly or when certain criteria are met, as specified by the user, while pull-type warnings are sent on the user's request by SMS. A web-based DSS, which require data updated frequently by the user, has been enabled for operation by SMS. Applying widely distributed and well-known technology, the SMS systems make information and decision support available to the farmer whenever he needs it and wherever he is.

Omekwu (2003) reviewed the state of agricultural literature control in Nigeria. The problems of data inconsistencies, scarcity of relevant information and dilemmas faced by policy makers, planners and agriculturists are described. He reveals that foreign-based bibliographical services do not adequately cover literature emanate from the country. A conceptual framework for the evolution of a national agricultural information management system will involve a functional integration of all agencies and individuals involved in the production, processing, provision, and utilization of agricultural information. Critical decisions and actions that will enhance the evolution process include a commissioned inventorization of all grey literature and agricultural information resources at both Federal and State Agriculture Ministries, a systematic documentation of resources in the research and academic institutions.

Opera (2003) saw information as capable of promoting action or inaction in a recipient. He entered deep into the nature of information revealing some concerns for information management.

Rolls and Slavik (2003) investigated changes in information systems in Czech agriculture over time. They stressed that printed media remained most important, social sources decreased in importance, and professional sources, such as consultants, research and university sources, increased. They also opined that horizontal transfer of information between similar farms remained very important. They suggest that new information sources were needed relate to agricultural information and predicted that computerised databases will be increasingly used in the future.

Chisenga and Brakel (2005) guided for developing agricultural information portals in the Southern African Development Community Region (SADC). They highlighted the internet and the web to become a source of agricultural information for many people, including researchers working in agricultural research organizations. The relatively small investment required to set up a Website enables a great many institutions to become instant information providers. The current system of agricultural information services is at times rather incoherent, and those in search of high quality information often have difficulty separating the wheat from the chaff. There are a great number of services, but potential users often have problems finding and accessing relevant information in usable formats.

Daniel (2006) identified that agriculture sector is the need for an effective agriculture research and extension system. Throughout the world, and in Afghanistan, agriculture research and extension is in transition – influenced by trends towards reduced government intervention in the economy, growth of the private sector and civil society, and globalization. These changes and a range of other pressures are forcing a reexamination of public research and extension systems.

Demiryurek (2006) stated that agricultural information can be transferred to large numbers of farmers through mass media simultaneously and at a lower cost per farmer than other extension methods. He also assured that the availability of these sources limits the farmers' access, and hence their usefulness. He evaluated that the mass media has weaker feedback potential than other conventional extension methods and the capacity of these sources at the stage of adoption of agricultural innovations is limited.

Mangstl (2006) worked on information and knowledge management as well as agronomy. He included capacity building and partnership initiatives which promote best practices in information management, sharing information management systems and tools, e-learning modules for capacity building through the Information Management Resource Kit (IMARK) initiative and proactively participating in FAOs interdepartmental WAICENT Committee.

Raman Nair (2006) evaluated farmer oriented information resources available in agricultural sector and outside as well as awareness about them among farmers and public, their accessibility, aptness, relevance and services. He conducted a survey among the institutions as well the expected user community representing various spheres of activity interested in small scale agriculture. He also revealed that information resources and services in agricultural sector are mostly restricted to scientists. He provided information that farmers deal with the situations and crops of the region. Psychological barriers are absent among farmers in approaching village libraries. Their timings and location were also convenient to the farming community.

Rokade and Rajyalakshmi (2006) showed that electronic information services are the keys to the development of agriculture, agriculture education, research and agricultural extension education in India. They understood that one of the main objectives of agricultural university libraries in India is to process, organize and disseminate the much-needed agricultural information to the users. They suggested that the agricultural information services rendered by the four agricultural university libraries in Maharashtra are important for the agricultural scientists, academic staff, students and other agricultural users. They found that in changing agricultural scenario and rapid development of agriculture science and technology, the importance of agricultural information service is vital to the progress of agriculture. They considered the importance of electronic information services for development of agriculture. He evaluated electronic information services, INFLIBNET services, and use of electronic services in agricultural university libraries in Maharashtra.

Singh (2006) explored the current state of telecommunication policy for rural and agricultural development, diverse applications of new ICT in rural farming areas of selected Asia-Pacific countries and identifies different models of such applications by

analyzing the context of local situations. He also assesses the potential impact of ICT in agricultural development by describing two successful cases – one from South Korea and the other from India – where the potential of ICT is harnessed for the benefit of small farmers. He stated that the South Korea case is a NARS initiative to provide agricultural information services using state-of-the-art ICT to more than 100,000 farmers and extension agents per month. He succeeds in certain common elements such as the recognition of information and decision-making needs of farmers, capacity building support to farmers to enable them master the new ICT, and a user-friendly ICT-enabled agricultural information system.

Malhan and Rao (2007) said that agriculture has been a part of human life since the beginning of the human race and the need for agricultural information is probably almost as old as agriculture itself. They ensured that Babylonian clay tablets have been found something that contains agricultural information. They also found that throughout history, in many civilizations, there have been libraries that have included agricultural information, and separate agricultural libraries were established in Europe in the mid-eighteenth century. They explored that the Indian Council of Agricultural Research (ICAR) acts as a repository of information and provides consultancy on agriculture, horticulture, resource management, animal sciences, agricultural engineering, fisheries, agricultural extension, agricultural education, home science, and agricultural communication.

Singh and Satija (2007) conducted research study on information seeking behaviour of agricultural scientists working in the ICAR institutions of Delhi and Punjab Agricultural University, Ludhiana. They collected the structured questionnaire and analyzed with the help of latest version of MS-Excel for appropriate statistical procedures for the description. They found various strategies and procedures adopted by the agriculture scientists in meeting their information requirements showing that agriculture scientists have expressed great dependence in meeting their information requirements on their institutional library information.

Aboh (2008) declared that in recent times, information and communication technology (ICT) has become relevant in the Nigerian agricultural sector. He stated that the extension service requires ICT for effective information delivery. He examined the frequency of ICT tools usage by agricultural extension agents in Imo State, Nigeria. He revealed that only mobile phone and computer were frequently used by respondents. He suggested that ICT tools were not frequently used for extension services and this has grave implications for agricultural development.

Ahmed and Musa (2008) investigated the vast agricultural and pastoral area of Sudan with a rich cultural diversity. The agricultural research in Sudan and GDP and ARC of the country are also measured by them. They found some measures of improved agricultural tools of employment opportunities.

Asadi, Rezaei and Ahmad (2008) described the MIS improvement mechanisms in Iran's Agricultural Extension Organization. They addressed to evaluating managers' responses regarding to MIS improvement mechanisms. All mechanisms had mean score greater than five as perceived by managers which implied that most mechanisms are moderately important in the present time. According to factor analysis the improvement mechanisms were categorized into three groups consisting: the internal effectiveness, business relationship and technology infrastructure that those factors explained 69.47% of the total variance of the research variables.

Ceesay (2008) studied to identify potential strategic partners for CTA to work with and to improve the availability and effectiveness of their information and services to beneficiaries in the country. He aimed to examine some roles and unique characteristics of information and supports the theory that information can be treated as wealth creator due to its vital impacts.

Demiryurek et. al. (2008) analyzed that the agricultural information systems and communication network used by members and non-members of the Dairy Cattle Breeders' Association provide a framework to identify the strength and weaknesses of the current systems and led to recommendations to improve their performance method. They used structured interviews to collect data from a randomly selected forty-three members and sixty-five non-members of the Association.

Gopalakrishnan, Babu and Gopalakrishnan (2008) stated that information explosion paves the way to seek information is an increasing variety and diversity at different levels, frequency, volume and use. They emphasized as the information use pattern and information needs. The task of effective retrieval without assessing their specific needs was approved by three scholars.

Islam and Islam (2008) explained how the community needs information to make the best use of resources available to them and get direct on indirect help in solving their day to day problems. They also advocated to make a sound coordination with CIC and rural libraries and suggested some effective measures for the improvement of community information services in Bangladesh. The development of a society largely depends on the access to information - a power and a national resource which is a common property resulting in an increased usage of information.

Kanaujia and Walia (2008) explored the basic functions of public libraries with problems and suggestions. They gave the view of user needs and pattern of use of public libraries in advanced countries. They emphasized on information gathering habits. They ensured suggestive measures for the important of public libraries in terms of collection, services and facilities.

Khongtim and Marbaniang (2008) found the information needs and search strategies of the co-educollege student in Shillong. They also indicated different sources of information and the problems during the search attempt for information. They agreed to use the library as one of the main sources of information because they considered library as the heart of any Institution or organization.

Shukla and Gautam (2008) found the critical problems of India such as lack of information communication. They stated that the present world should emphasize on information communication. They made suggestion to improve rural India through technology transfer based on ICT. They saw development as a catalyst for their Socio-Economic transformation. They gave importance to the development applications of a ICT need to understand and bind on the palters of communication behavior.

Shatberashvili and Maru (2008) explored the status of access to agricultural information and information exchange; the status of telecommunications; status of Radio and TV; organization and management of scientific and technical information systems and services in agriculture; use of information and communication technology for scientific and technical information purposes; research to- farmer information transfer; problems in using ICT for information services in agricultural research and development were studied in all the eight countries of the region. They also measured the status of FAO Depository Libraries, other agricultural libraries, agricultural collections of National Libraries and of other ST libraries. They examined availability of electronic information resources. They discussed that functions and services relating to access to resources as well as to development of national and regional resources and the possible solutions to the problems in information management. They evaluated that use of the National and local TV and Radio for agro information dissemination in the CAC region. They also discussed that finally awareness of the main stakeholders of the available services and their development. They presented possible policies of the agro information development in the CAC region.

Tamoutsidou and Tseles (2008) tried to identify farmers' needs and problems, secondly to investigate information accessibility via Agricultural Integrated Information System (A.I.I.S.) based on e-learning and provided by the academic institution of tertiary education located in Florina, Greece. They showed that with the aid of a well known e-learning system, installed in institution's services, the educational/training course content, in digital form, was managed dynamically, shared by the farmers freely and formed the basis for a better agricultural development and productivity. They suggested that finally, with the design of such an electronic system, that could provide fast, easy and up-to-date agricultural information in several ways; enable farmers to keep up-to-date with new productivity and sustainable innovations in Greek agriculture.

Anyarwu, Enyinna and Desmond (2009) identified the work activities and information needs of the policy makers and evaluated the resources of government libraries. It was discovered that the government libraries are not adequate in all aspects. They are not well funded. The sources of information and factor affecting access to information needs were identified. Recommendations were made for the better provision and use of information in ICT.

Salam and Aderibigbe (2010) examined the awareness and utilization of the Essential Electronic Agricultural Library (TEEAL) database resources by the academic staff at the University of Agriculture, Abeokuta, Nigeria. A questionnaire was distributed to two hundred academic staff members that were randomly selected for the study. The findings show that 57.8% of the respondents were aware of TEEAL and that 33% used it when necessary. He also identified electricity problem and poor internet facility as hindrances to their utilization of this electric resource.

Gues (2010) carried out some suggestion which reveal how mind works, how it can be used to think about business and improvement of business performance through better information management practices. He emphasized on information overload as an essential road map to seeking and finding information.

Bwalya (2010) assessed the efforts that Zambia has made to build an information society by the year 2015. He revealed that the majority of Zambians are not connected to the internet. Currently, Zambia is estimated to have 16, 464 internet subscribers and 700,000 internet users, which account for only 5.9% of the population. The internet in Zambia is still too expensive for many people. This is partly due to the fact that computers and other accessories needed to connect to the internet are still not affordable.

Pan and Hovde (2010) assessed professional development (PD) as a lifetime learning process, which is both universal and individualized. He felt a universal requirement of all librarians in order to keep up with the rapid changes in the library field and maintain professionalism. At the same time, it is an individualized experience that varies with the needs of specific work duties as well as resources available around one's working, social, and academic environment. He discusses the needs (i.e., expansion and diversification of one's functionality) and resources (local and beyond) for PD. Examples of successful PD are drawn from some academic libraries. Administrative support, a very important PD related topic, is also discussed.

Okorie (2010) described that the use of automated electronic information services by patrons has influenced the services at a university library. He also identified the major constraints for the utilization of automated Information services. The importance of electronic agricultural library was given by M.O and N.A (2010) titled awareness and utilization of the Essential Electronic Agricultural Library by Academic staff.

Oduwole and Okorie (2010) explored the millennium development goals (MDGs). The MDGs are international objectives on poverty reduction adopted by the world community in 2000. He examined provision of agricultural information to rural dwellers/farmers in meeting the MDG 1: eradicating poverty and hunger in the world. The paper is drawn from the authors' interaction /interviews with a group of farmers in Abeokuta, OgunState. Methods of disseminating information to farmers identified include the use of electronic and print media, village square meetings, church and mosques as well as market places. Study recommends the support of pro-poor policies by the developed countries as this will allow people living in the developing world to break out of the poverty, hunger and malnutrition trap in which they find themselves. Agricultural information required by farmers, among others, includes pest and disease control and management, services available from government/private organizations and information on high yielding varieties of crops and animals.

Conclusion

Literature of any research work determines how many books, journals, publications, articles, reports etc. a researcher exerts to seek the result related to his/ her thesis. A researcher is a good seer, a keen investigator, a witty reader and a great writer. But above all a researcher is to be a studious man for 'studies serve for delight, for ornament, and for ability' (Bacon, 1561). Review of literature has been done on many topics such as information systems, information services, research, information needs, technology transfer, and problems of information systems, services and their characteristics, improvement of information systems and services in the field of agricultural research and development. Besides, the researcher worked on the major communication behaviors of researchers and extension workers of different countries. The investigator searched the writings of the eminent writers of many developed countries of the world in the ground of agricultural information systems and services. The researcher explored the different functions and services of modern libraries such as current awareness service, online services, electronic cataloguing etc. through the internal publications, journals and books. Literature done above has made the researcher easy to have superb findings along with a good model of NARS with the help of the result of the questionnaire and its discussion.

CHAPTER 3

AGRICULTURAL INFORMATION SYSTEMS AND SERVICES

Chapter 3

Agricultural Information Systems and Services

3.1 Introduction

Agriculture has been a part of human life since the beginning of the human race and the need for agricultural information is probably almost as old as agriculture itself (Malhan and Rao, 2007).The present age is called the digitalized age. The first and foremost condition of being digitalized is information. Information is the medium of communication of ideas and resources for research and development (Uddin, 2002). It is the basic root of learning a thing. It is the fundamental step of the advancement of human civilization. So information is the prime resource for the development of all human activities. We live in the global information society where research and education are at the core of development of any sector. Research is the activity the information is generated for the whole of the agricultural information society. Actually information that we at this moment mean is the outcome of brainstorming. And that becomes information of a new thing. It is the key to the increased production for the agriculture.

Information is seen as a facilitator of change, a distributor of traditional relationships and alignments and as the future basis of financial, political and social power. Information has been called a commodity, a public good one of the few things that does not diminish in value in proportion to the number of people who use it (Satyanarayana and Satyanarayana, 1996).

3.2 Information: Meaning and Definition

Information may be defined as the characteristics of the output of a process, these being informative about the process and the input. This discipline independent definition may be applied to all domains, from physics to epistemology. Hierarchies of processes, linked together, provide a communication channel between each of the corresponding functions and layers in the hierarchies. Models of communication perception, observation, belief, and knowledge are suggested that are consistent with this conceptual framework of information as the value of the output of any process in a hierarchy of processes. Topics or definitions (provided) include information, value, function, argument, process, informative, reversibility, message, channel, inverse functions, representation, perception,

belief, knowledge, information loss, perfect information, incomplete information, and misinformation (Losee, 1999).

The term 'Information' has driven from two Latin words i e ' formatio' and 'forma' mean giving shape to something and forming a pattern respectively (Devarajan, 1995). The term 'Information' has been defined in many ways. In general usage it may mean a 'message' the basic element with which a human being communicates from time immemorial. The definition of information has gradually become complex as specialists and scholars interpreted it in different way in different contexts. So we see that information is one of the vital resources indispensable for every kind of development of the civilized society. According to "Wikipedia" information, in its most restricted technical sense, is an ordered sequence of symbols. As a concept, however, information has many meanings. Moreover, the concept of information is closely related to notions of constraint, communication, control, data, form, instruction, knowledge, meaning, mental stimulus, pattern, perception, and representation"(www.thefreedictionary.com/information).

G. B Davis, an eminent information scientist gave his opinion regarding information in the following way. Information is "Data that has been processed into a form that is meaningful to recipient and is of real perceived value in current as prospective decisions." He further observed that information is processed data and it has a meaning to its recipient (Davis, 1977).

According to ALA Encyclopedia of library and information services, "Information is a property of data resulting from or produced by process that produced the data transmission (in which case the definition and measures used in communication theory are applicable) it may be data organization, it may be data analysis" (ALA World Encyclopedia Library & Information Service, 1986).

J. Martin defined information as the staple diet for readers of newspaper and mass audiences of the broad casting media and the cinema. It is directed ceaselessly at those millions of consumers so relentlessly targeted by the advertising industry and is dispensed around the clock from any number of inquiry desks at railway stations and airports, libraries and similar public or private service institution (Martin, 1989).

E. Ploman has given his ideas regarding information in a different way. Information is fundamental of all resources in the sense that all other resources depend on information and knowledge: it is the perception of and evaluation of resources which makes their use possible (Ploman, 1986).

The Danish Dictionary of Information Terms argues that information only provides an answer to a posed question. Whether the answer provides knowledge depends on the informed person. So a generalized definition of the concept should be: "Information" = An answer to a specific question (www.thefreedictionary.com/Danish).

3.3 Types of Information

There are three types of information-Primary, Secondary and Tertiary

Primary Information means the original materials that has not been interpreted or analyzed. The examples of primary information are statistics, research articles, blogs, websites etc.

The secondary information means material created from primary material, interpreting original one.

Most information is generally divided into three main categories: The examples of secondary information are textbooks, review articles etc.

The tertiary information acts as a tool in understanding and locating information. The examples of tertiary information are databases, subject gateways, dictionaries, bibliographies.

3.4 Characteristics of Information

Information comes in all shapes and sizes. Knowing some of its characteristics will help us better identify of information need and evaluate what we are receiving (www.lib.odu.edu/genedinfolit/1infobas, 2010).

Relevance

Information is relevant if it is needed for a practical situation. The information that a person uses must be relevant to the current problem at hand. If the information is not relevant it would not help to solve the problem at all.

Completeness

Complete information provides the user with all that needs to be known about a particular situation. The information must be complete. If the information is not complete and only partial information is received, it may lead to wrong decisions being made as only half of an entirety of the information is known.

Accuracy

The 3rd characteristic is Accuracy. The information must be accurate as inaccurate information would lead to many different major problems as inaccurate information for example, may lead to people playing the stock market to lose a lot of money.

Current

The 4th characteristic is Current. The information must be current as a fact of yesterday may not be a fact of today. For example, a criminal on the loose the day before would not be a criminal on the loose anymore if he gets caught today. As the stock market is ever changing, current information is really a must.

Economical

The 5th characteristic is Economical. The information used must be of economical use to companies that use them. Companies are built to make profit if the information used is not economical it would result in companies making losses and get shut down. That is why economical information is important.

We pay attention to information that has some meaning versus our subjects of interests. The impact of information on a system depends upon the meaning it generates in the system. The important thing for the system is the meaning generated by the incident information (http://wasaa.wordpress.com; June1, 2008).

3.5 Information Architecture

Information architecture is the term used to describe the structure of a system, i.e. the way information is grouped, the navigation methods and terminology used within the system. An effective information architecture enables people to step logically through a system confident they are getting closer to the information they require.

Information architecture is most commonly associated with websites and intranets, but it can be used in the context of any information structures or computer systems (Barker, 2005).

The term "information architecture" was first coined by Richard Saul Wurman in 1975. Wurman was trained as an architect, but became interested in the way information is gathered, organised and presented to convey meaning. Wurman's initial definition of information architecture was "organising the patterns in data, making the complex clear".

Information architecture, in the broadest sense, is simply a set of aids that match information needs with information resources. A well-implemented architectural design structures information in an organization through specific formats, categories, and relationships (Davenport and Prusak, 2003).

3.6 Components of Information Architecture

Information architecture consists of six components, as shown in Figure 1.3. Here there are in detail:

3.6.1 Information Usage Patterns

.Information is utilized and flows within an organization, as typically illustrated through use cases. Information usage patterns may vary by user profile. For example, the information usage pattern for a Chief Information Officer (CIO) may be different from the usage pattern for a Web developer in terms of subjects, level of details, content coverage, etc.

3.6.2 Information Access Points

These provide various channels through which an information seeker can locate and retrieve the information needed. Examples include breaking news, site maps, search utilities, popular links, and directory listings of categories.

3.6.3 Taxonomy

It is the core component of information architecture. As illustrated in the diagram, taxonomy interrelates with all of the other components of information architecture. Derived from analysis of usage patterns and information flow, taxonomy guides the visual design of information navigation and administration in compliance with standards and guidelines. There are two aspects of taxonomy: view and structure.

3.6.4 Administration Structure

It provides the visual design for internal users who are responsible for creating and maintaining information, such as taxonomy categories made available through the content management flow.

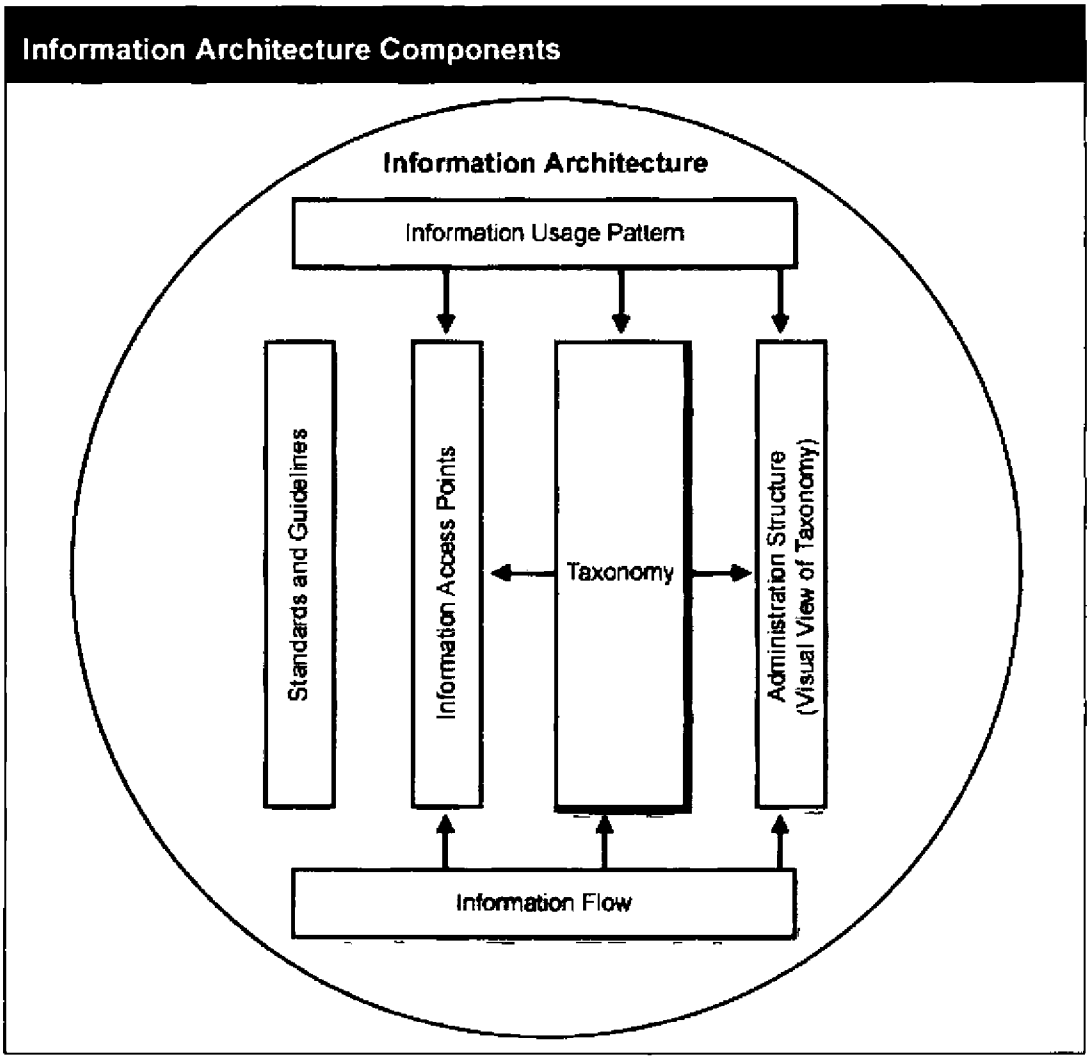
3.6.5 Information Flow

Information flow is such a thing that describes how information flows within an organization.

3.6.6 Standards and Guidelines

They governals the components listed above, dictating how new information should be tagged and cataloged.

Figure-3.1 Taxonomy of Information Architecture



(Source: http://www.techrepublic.com/article/understan).

3.6.7 Taxonomic structure

Taxonomy structure is similar to classification systems used in the life sciences field and the library community, such as the National Center for Biotechnology Information (NCBI) taxonomy and the Library of Congress subject classification system

Taxonomy structure has the following key characteristics:

- Taxonomy structure is multi level, representing hierarchical relationships between concepts within a defined scope and context.

- It is used to categorize information. Taxonomy structure for an organization is used to categorize enterprise wide information.
- It is an integral part of a content management system. Taxonomy structure should be made available within the content management workflow (Davenport and Prusak, 2003).

3.6.8 Taxonomy of Information

Information itself is of a bewildering category. It can be categorized using different characteristics depending upon the purpose:

There are three kinds of information:

i) Semantic information (as a message)

ii) Semantic information (as a process)

iii) Documented information

While semantic information as a message is used for transmission of knowledge, the same as a process is used to store and disseminate on a permanent basis. On the other hand, documented information having the characteristics of analytical and synthetic nature is full of facts, statistics or statements supported by evidences (Mohalik, 1998).

Information has been divided under two broad groups:

(a) Discursive information

(b) Non-discursive information

Discursive information is the message conveyed by a systematized body of ideas or its accepted or acceptable substitutes, having one or more of the following attributes:

i. Ranging over a wide field

ii. Proceeding logically or coherently from topic to topic and

iii. Reasoning from premises to conclusion or proceeding from particular to general utilizing analytical reasoning or proceeding from logical abstraction to logical interaction.

Non-discursive information, on the other hand, is a unit of facts conveyed by a systematized body or its accepted or acceptable substitutes. Non-discursive information is subdivided into two types: (i) Qualitative and (ii) Quantitative (Bhattacharya, 1978).

On the basis of the use and purpose of information has been categorized information into six types as follows:

i. Conceptual information
ii. Empirical information
iii. Procedural information
iv. Stimulatory information
v. Policy information
vi. Directive information (Shera, 1972).

Types of information have been judged from different angles taking into account the following four broad dimensions:
(a) Relating to behaviour, (b) organizational penetration, (c) item content and (d) technological fit.

From behavioral patterns, however, information can be of only two types. They are:

(a) general, which is more of relating to purpose and
(b) specific, that relates to the psychological mechanism involved

On the basis of organizational penetration, three fundamental types of information can be identified. These are:

(i) Material information
(ii) System information and
(iii) Product information

An organization requires the above three types of information to produce informative materials, viz. document either in printed or non- printed form. Here it can be ascribed that, the types of information distinguished above are primarily concerned with the organizational effectiveness for production and consumption of documents (Christie, 1981).

In respect to item content, information can be divided into two types: (a) Data information (b) programme information. While data information refers to statistical numbers, symbols, etc. that are used in specific purposes, programme information on the other hand, is manipulated to show how former is utilized. The fourth key type under these dimensions, i.e. technological fit, is less significant due to the introduction of electronic system that handles a wider spectrum of information (Aino, 1986).

3.7 Agricultural Information

Agriculture is the oldest and most important avocation of the world (Metkewar and Acharya, 2006). Agricultural information can be seen as an important factor which interacts with the other production factors such as land, labour, capital and managerial ability. The productivity of these other factors can arguably be improved by the relevant, reliable and useful information and knowledge. Hence, the information supply from extension, research, education and others has become managed by agricultural organizations, and especially disseminated to farmers so that they can make better decisions to take advantage of market opportunities and to manage continuous changes in their production systems (Demiryurek, 2008).

Agricultural information can be transferred to large numbers of farmers through mass media simultaneously and at a lower cost per farmer than other extension methods (group or individual). However, the availability of these sources limits the farmers' access, and hence their usefulness. In addition, the mass media has weaker feedback potential than other conventional extension methods and the capacity of these sources at the stage of adoption of agricultural innovations is limited (Demiryurek, 2006).

Bangladesh has potential land despite its limitation. The approximately uncontrolled population can hardly cope with the present rate of food production. The only way to solve their problem is to accelerate the food production with the help of modern technology. For making the research on agriculture with a view to increasing food production we need a process and smooth supply of information. For this agriculture information is needed. It is that kind of information which is used in the development of agricultural research, extension and education. Without this type of information no country can prosper in the field of agriculture.

Now-a-days information strategies for agriculture have been the concern of all like farmers, researchers, planners, administrators and agricultural marketing people also. Information is now widely accepted as valuable and inexhaustible commodity and as an important resource, which can be acquired, stored, processed, systemized and properly monitored to achieve the set goals in the realms of accelerated agricultural development. So the essence of the modern technology based on information can not be ignored in the question of the development of agriculture in Bangladesh.

3.8 Categories of Agricultural Information

Agriculture information is that kind of information which is needed in the development of agricultural research extension and education (Uddin, 2002).

There are four main categories of agricultural information :

3.8.1 Technical/Scientific

This type of agricultural information arises from research and development work aimed at increasing agricultural production by proving high yielding crop varieties, controlling major pests and diseases, developing new methods of crops production and so on.

3.8.2 Commercial

Farmers, who are involved in export crops need commercial information too to maximize their profits. This includes information relating to agricultural credits and co-operatives, national prices for export commodities and information on agro based products.

3.8.3 Social

This includes information on traditional agricultural practices, local, cultures, background information on local communities and availability of labor.

3.8.4 Legal

Farmers require legislation relating to ownership of and distribution of land, sale of agricultural production and etc. Favorable laws will help them maximize their production (Aina, 1996).

3.9 Agricultural Information System

An information system is any combination of information technology and people's activities using that technology to support operations, management, and decision-making. In a very broad sense, the term information system is frequently used to refer to the interaction between people, algorithmic processes, data and technology. In this sense, the term is used to refer not only to the Information and Communication Technology but also to the way in which people interact with this technology in support of business processes.

There is a clear distinction between information systems, and computer systems ICT, and business processes. Information systems are distinct from information technology in that an information system is typically seen as having an ICT component. Information systems are also different from business processes. Information systems help to control the performance of business processes (en.wikipedia.org/wiki/Information_system).

The meaning of "information systems" has been growing in diversity and complexity. Several authors have pointed out this fact, described the phenomena and tried to bring some order to the perceived chaos in the field. For example, after describing the attacks on the information systems field, for "its lack of tradition and focus" and the "misunderstandings of the nature of information systems," examines "the limitations of existing frameworks for defining information systems" and re-conceptualizes information systems and tries "to demonstrate that it has evolved to be part on an emerging discipline of fields, Informing Science" (Cohen, 2000).

An agricultural knowledge and information system is useful in such a way that it contributes as much as possible to generation, dissemination, transformation utilization, storage and retrieval of knowledge and information which is useful for agricultural development (Roling, 1988).

The agricultural information system does not function without a functional information support (research and extension) subsystem. It consists of components (subsystems), information related processes (generation, transformation, storage, retrieval, integration, diffusion and utilisation), system mechanisms (interfaces and networks) and system operations (control and management). In addition, the analysis of the agricultural information system in a specific farming system may provide the identification of basic components and structure of the system, the different sources of information used by different components in the system, the understanding of how successfully the system works and how to improve system performance (Demiryurek, 2000).

3.10 Characteristics of Information Systems

Information systems are the means by which people and organizations, utilizing technologies, gather, process, store, use and disseminate information (www.turningcourse.com/ukais/isdefn.pdf). The development of databases and the information systems relating to these would require inputs from various sources, and their processing and timely dissemination, will be useful for the planners, policy makers, development practitioners, research, administration and other co-coordinating agencies (Hand Book of Agriculture, 2006).

3.10.1 Passive Information Systems

Passive information systems are systems that will answer queries based on the data that is held within them, but the data is not altered. A simple example would be an electronic encyclopedia where queries can be used to search for data and much valuable information can be learned, but the user is not allowed to alter the data. Another example would be the student file in a school that can be accessed by members of the teaching staff to find out where a student is at a particular time of day, or to look up their telephone number in order to contact the parents. The database of information is a valuable resource but it is not possible for an ordinary teacher to alter it.

3.10.2 Interactive Information Systems

An interactive system is one that data can be entered for processing which may alter the contents of the database. An example would be the school secretary updating the attendance record of a pupil in the pupil file. In commerce, a stock control system in a supermarket is an interactive information system because it not only gives information like the price and the description of the goods for the till receipt (passive), but also updates the number in stock immediately (interactive) so that when the next item is sold the number in stock has already been altered (www.infocheese.com/characteristicsofi).

3.11 History of Information Services

Uptil the mid nineteenth century, the library did not play a significant role in the dissemination of information for the simple reason that the subject matter of books was limited then and library collections were smaller. The limited library collection did not pose much problem either for the scholars in gathering information or for the librarian in supplying the required material to the users; but because of great upsurge in the

publications and literacy since then the ancillary skill of knowing where to find the information began to elude the grasp of those who need it for their study and research. It was in 1876 that Samuel Swett Green made the first serious proposal for a programme of personal assistance to the readers at the Philadelphia library Conference. With the passage of time, his ideas gained acceptance and many of the academic and public libraries started providing assistance (i.e. reference service) to the readers (Kaur, 1995).

Legal electronic resources became available in the mid-1970s when Lexis and then Westlaw were introduced. However, scientific and business literature did not begin to become universally available in electronic format, particularly full-text articles with graphics, until the advent of the World Wide Web (WWW) in 1991 (Carroll and Chandler, 2004).

Print resources continue to be an important piece of a law firm's information resources though there is a move to e-content, especially for non-legal resources. This change is being driven, in part, by the increasingly smaller space devoted to the law library (Carroll and Chandler, 2004).

Work on valuing Library services has continued, but little work has been done since the early 1990's on the characteristics of information environments that support organizational productivity. The rise of knowledge management and the World Wide Web has produced research on information portals, but again, there is little research on the total information environment managed by information professionals, particularly in the legal community.

The introduction of the internet and intranet as collaborative platforms for knowledge sharing has produced a significant shift in emphasis to knowledge management. Productivity has tagged along as an incidental outcome of an effective knowledge management program rather than continuing to serve as the desired primary outcome. This shift is a direct result of the need to manage all of an organization's information assets, e.g., aggregating externally and internally generated information (Carroll and Chandler, 2004).

The Internet and the Web have become a source of agricultural information for many people including researchers working in agricultural research organizations. The Web has changed the information landscape in the field of agriculture and natural resources (Besemer, Addison and Ferguson, 2003). The relatively small investment required to set up a Website enables a great many institutions to become instant information providers.

3.12 Information Services: Definition and Growth

Information services may be defined as services provided by, or for, a library which draw attention to the information possessed in the library or in any other library in the system in anticipation or on demand. The main objective of information service is to provide information specifically, thoroughly, expeditiously and present it in a manner most convenient to the user with a view to ensure the best use of there sources of the library (Kaur, 1995).

Information service has two aspects: (i) provision of information in anticipation; (ii) provision of information on demand. The first aspect "aims to keep the users well informed and up-to-date in their field of specialization and also in the related subjects" though such means as current awareness service, selective disseminations of information, bibliographic service, literature searching, indexing, abstracting, database service, reprographic service, inter library loan service, bibliographic instructions etc. The second aspect aims to find a specific document/information in response to a specific query.

3.13 Agricultural Information Services

Information needs of farmers center around the problems such as seeds, soil fertility, soil erosion, climatic conditions, fertilizers, pest hazards, weed control, water management, farm credit, post-harvesting, transportation, marketing and so forth. Timely provision of information is essential in solving these problems. However, the impact of agricultural research and innovations on farmers is not much either because they have no access to such vital information or it is poorly disseminated. Information provided is mainly focused on policy makers and researchers with little attention paid to the information needs of farmers. It is more so in developing countries like Bangladesh and particularly small-scale farmers (http://www.ifla.org/calls-for-papers/1852). So agricultural information services are crucially important to be catered by the scientists and researchers for the betterment of the farmers.

Services to the agricultural sector are extraordinarily heterogeneous, ranging from agricultural extension to legal counselling on land tenure issues. It is therefore hardly surprising that there no general consensus exists on the precise definition of the term "services", in particular agricultural services (Bruhn, 1997). In the past, services to agriculture were often analysed and described from a technical perspective based on an enumerative definition. Typical services of the agricultural sector are agricultural research, agricultural extension and information services, education and training, rural financing (e.g. saving, credit) and insurance, marketing of agricultural products and market promotion, input delivery services for plant production (e.g. seed, fertiliser, pesticides, irrigation etc.)

3.14 Features of Agricultural Services

An array of possibilities exists on how to categorise services to the agricultural sector. According to the definitions in the literature, the following four broad categories are often used to categorise services: activity, potential, process, and output. The key features of agricultural information services are: technical aspects, economic characteristics, quality aspects and effects (Bruhn, 1997).

3.14.1 Technical Aspects

Typical services are immaterial in nature. Typical product-oriented services include the provision of agricultural inputs such as seed fertilisers, insecticides, veterinary products, etc. Pure services, by contrast, are intangible products which are not actually expressed in terms of a product. These services include agricultural extension and 'pure' services such as management consultancy with knowledge transfer.

3.14.2 Economic Characteristics of Agricultural Services

The provision of timely and accurate information is essential for good farm management, but this seems to pose particular problems at both the conceptual and operational levels. The case has often been made that, to use the language of economists, information is a public good. As the information embodied in an agricultural support service becomes more time and location-specific, it also becomes a private good that the private sector is willing to supply, as the increasing sophistication of agricultural support services demonstrates. Developments in information technology have on one hand made it easier to

exclude non-payers from receiving benefits, but have on the other hand made widespread dissemination cheap and easy.

3.14.3 Quality of Agricultural Services

The quality features of agricultural information service are relevant for professional service management. The technical characteristics of those services must be taken into account if a full understanding of service quality. These technical aspects affect how services are valuated in terms of quality.

3.14.4 Effects of Agricultural Services

The effects of agricultural information services embrace positive and negative consequences for the provider and the user/beneficiary of an individual service (Kleemann, 1999). An assessment of the effects of those services includes -direction of the effects, chances in occurrence of the expected effects, duration and sustainability of the effects, number and type of affected persons, ways of measuring the effects and their use in a monitoring and evaluation system etc.

3.15 Importance of Agricultural Information System and Services: Bangladesh Perspective

Information service is an important factor in the field of agricultural research and development in Bangladesh. The Agriculture Information Service disseminates information primarily to extension workers and then to farmers by way of package information through different media with particular emphasis on modern technologies; production of educational and information materials; dissemination of information through farm broadcasting programmes (www.banglapedia.org/httpdocs/HT/A_007).

Modern agriculture is a knowledge agricultural industry, which is produced under the high scientific and technological means such as biology technology and information technology in agriculture (www.casb.org.cn/EN/abstract/abstract1).

The accurateness and effectiveness of the performance of all human activities depend to a great extent upon the availability of information at the right time in adequate manner. Actually every exertion results in information which is the input of another work. The smooth flow of information depends on the system.

Information is regarded as a catalyst of change. It can change the society, influence on culture. It is the future basis of financial, political and social power. This it has been called a commodity a public good, one of the few things that do not diminish as value in proportion to the number of people who use it.

Agriculture plays a vital role in Bangladesh as it provides food for the entire population and work for much of the population. The provision of agricultural information to relevant users is very strategic in the overall increase of food production in Bangladesh. It is the key industry which controls the base of nation's economy and draws the attention of a large section of the population. Agriculture is the sector which determines the standard of living. It dominates the development of our country. Our country is rich in soil though dominated by small land holdings. Much development did not come to this sector due to a gap of information between farmers and researchers and scientists along with natural calamities, finance and resource constraints (Uddin, 2000). Besides a wide gap exists between the technological information generated in the laboratories and the grass-root level users i.e. agricultural workers mainly due to lack of communication, lack of willingness to transfer of needed information to the end users etc.

Similar gap also exists amongst the agricultural scientists/researchers associated with different agricultural research organization in Bangladesh due to lack of coordination and cooperation. So we need to pass useful information from laboratories to field workers from proper application for wider field testing and from laboratory to laboratory for a more improved and innovative methodology. Information system is omni present. It is only the architect and tool which have changed over time period. So creation of information and exchange of information must have been taking place all along with evaluation of agriculture.

In order to help the farmers produce bumper crops the traditional systems of farming should be replaced by modern system. Government & non-government agencies should be equipped to disseminate information through proper documents. These documents are of two kinds- the published literature and electronic media. The published literature on agriculture and allied science are scattered and limited enough to supply the users. This scattered information has to be utilized collecting, processing, preserving from the agricultural libraries to disseminate among the scientists and researchers. Moreover, the cluster of the users of the agricultural information scientists of heterogeneous mixture of

students, academicians, researchers, extension workers, policy workers, agro-industrialists and also the farming communities (Ojha,1995).

Besides printed books and publications, radio, television, internet, email etc. are very helpful in the recent times to collect information worldwide. There are some basic web-sides especially for agricultural services which help to download information related documents important for scientist and stakeholders. Proper supply of agricultural information can play a significant role in every sphere of agricultural sector of the country (Nasir & Francis, 1996).

3.15 Conclusion

Information is a type of pattern that influences the formation of other patterns. So the frame work of agricultural research depends on proper information and its source. It also provides an answer to a posed question of researchers. In this context proper information through proper channels is the right key to help the agricultural scientists and researchers. Information systems and services are to be developed in NARS institutes in line with modern world of science and technology.

CHAPTER 4

NARS: A BRIEF ACCOUNT

Chapter 4

NARS: A brief Account

4.1 Background of Agriculture in Bangladesh

Bangladesh is located between 20^0 34′ and 26^0 38′, north latitudes and 88^0 01′ and 92^0 41′ east longitudes with an area of 147,570 square kilometers and a population of more than 150 million (BBS, 2010). It is a delta and sloping land lying in the lap of the Bay of Bengal. The Himalayas are to the north and the hilly lands of Asam and Tripura are to the east. Lower plains of the west Bengal are to the west. Most of the rivers originate from their own mountains and hilly areas and fall into the Bay of Bengal. Most of the inlands of Bangladesh are plain. This geographical diversity has led our country to ample flourishment of agriculture. So Bangladesh is called an agricultural country.

The soil, the climate and the water resources have ever favoured the cultivators to grow wide range of cropping to run their farms. Wide network of research and development helped the farmers to adapt newer crops with high yielding qualities. However, recent threat of climate change associated with climatic extreme events like tidal surge, salinity, drought, flash flood etc poses great challenges to the total production system led to food insecurity. Too much dependence on rice being staple, reduced the production of diversified food commodities like vegetables, pulses, oilseeds and spices. This led the country to import diversified food commodities from abroad.

Bangladesh possesses in the tropical and sub tropical climate and even in tempered zone because of the tropic of cancer. There are six seasons in Bangladesh, namely, the summer, the winter, the autumn, the late autumn, the rainy and the spring. But mainly the summer of the rainy and dry winter season is widely felt. The cropping season is dominated by dry winter, Pre-kharif and kharif (monsoon). A hot summer season with high humidity from March to June (pre-kharif) suits to cultivating rice, vegetables, pulses and oilseeds. A hot and humid monsoon season (Kharif) with heavy rain fall from June to October suits cultivating rice, Jute, and a relatively cool and dry winter season from November to March suits irrigated HYV rice, wheat, maize, and plenty of winter vegetables.

Bangladesh lies across the delta of three major rivers, the Ganga-Padma, the Brahmaputra-Jumuna, and the Meghna. These rivers and their tributes flow from the hilly areas and fall into the Bay of Bengal creating a great source of water all over the country plain land. Besides these rivers other surface water bodies such as haors, hills lakes and ponds all make a major contribution to the agriculture in general.

The rainfall, soils, temperature water availability of Bangladesh make it ideal for agricultural production which has been practiced for thousands of years and it has supported major civilizations.

Bangladesh is one of the poorest and densely populated countries in the world. Agriculture is the key sector of her economy; the living standard of the people depends on agricultural development.

At current prices, agricultures' contribution to GDP is 21% in FY 2007-08 and about 48 percent of total forces are engaged agriculture (Economic Review, 2010) and accounts for roughly 32 % of export earnings. The crop sector alone accounts for 73 % share of agricultural output followed by fisheries (9.9%), livestock (9.6%) and forestry (7.4%).

Table 4.1 Statistics of Bangladesh Agriculture

Total cultivable land	9.1 Million hectare
Population	150 Million
Density	980 per sq. km
Net cropped area	8.03 M hectare
Total cropped area	13.0 M hectare
Cropping intensity	180 %
Per capita land	0.05 hectare
Average farm size	0.6 hectare
Per capita income	675 US $
Total area under irrigation (minor and major)	4.85 Million hectares
Total food grain production (Rice & wheat)	32.16 Million tons (wheat 9 lakh ton)
Other major crops grown	Wheat, maize, Jute, Sugarcane, Potato, Sweet potato, Oilseed, Pulses, fruits, vegetables, Spices, Tobacco, etc.
Area occupies by rice	75 %
Rice yield (cleaned)	National average 2.9 t/ha (irrigated boro 4.0 t/ha)

(Source: Bangladesh Bureau of Statistics, 2010).

There has been rapid change in the agricultural scenario of the country over the past 25 years. Rice production has been nearly tripled from 10 in 1970s to 32 million tons recently bringing the country on the verge of achieving self-sufficiency in food grains. This achievement has been based on a substantial intensification of farming: modern rice varieties (MVs) which now account for 75% of the harvested rice area; the cropping intensity rose from 143% to 180% (BBS 2010). The national indicators on health, literacy and life expectancy at birth have all improved and the proportion of people living in poverty has declined.

Obviously the challenges facing Bangladesh Agriculture in the 21st century would be grounded in meeting the basic twin challenge of increasing agricultural production and sustaining the natural resource base supporting agricultural production. This would have to be done taking into account new opportunities and constraints that would increasingly affect agricultural scenario worldwide - liberalization of trade and greater integration of local markets with world market, intellectual property rights, global climate change etc.

4.2 Performance of Agriculture Sector

Agricultural revolution has taken place which is still evolving in response to natural calamities, socio-economic changes, population growth, urbanization, new technology in agriculture and new opportunities in rural non-farm sector, commercialization and changes in macro policy and sector policy reforms including market and trade liberalization and substantial reduction in public sector intervention in agriculture. From largely a peasant based subsistence activity, agriculture today is more of a commercial entrepreneurial activity than ever before.

However, crop sub-sector growth has been highly unstable varying from – 3.4% in 1994-95 to 4.27% in 2003-04 (Table 1.5). The highest growth rate of 8.1 percent was registered in 1999-00, followed by 6.4 percent in 1996-97 and 6.2 percent in 2000-01. This shows that it is possible to enhance growth of crop agriculture with appropriate use of production inputs under favorable climatic conditions. On the other hand, growth instability in certain years indicates that crop agriculture is highly vulnerable to natural disasters and unpredictable climate behavior. Growth potential is high in livestock sub-sector. The livestock growth rate in 2003-04 was the highest of any sub-sector; it was 4.98% compared to 4.27% for crops and 3.09% for fisheries sub-sector. Fisheries registered a rapid growth in the first half of the decade; in the second half, the growth

has slowed and dropped to 3.09% in 2003-04 from 10% in 1998-99. Growth of non-cereals, mostly horticultural products accelerated from 1.01% over 1990-1996 to 3.21% over 1996-2000 period (Mujeri, 2002). Vegetable production increased by 84% between 1992-93 and 2000-01.

Table 4.2 Growth Rate of Agriculture and its Sub-sectors

Sector/Sub-sector	94-95	95-96	96-97	97-98	98-99	99-00	00-01	01-02	02-03	03-04
GDP Growth	**4.93**	**4.62**	**5.39**	**5.23**	**4.87**	**5.94**	**5.27**	**4.42**	**5.26**	**6.27**
Agriculture	- 1.9	2.0	5.6	1.6	3.2	6.9	5.5	- 0.6	3.29	4.38
Crops	- 3.4	1.7	6.4	1.1	3.1	8.1	6.2	- 2.4	2.88	4.27
Livestock	2.5	2.5	2.6	2.6	2.7	2.7	2.8	4.7	4.51	4.98
Fisheries	6.8	7.4	7.6	9.0	10.0	8.9	- 4.5	2.2	2.33	3.09
Forestry	2.8	3.5	4.0	4.5	5.2	4.9	4.9	4.9	4.43	4.18

(Source: Statistical Yearbook of Bangladesh 2001, Table 4.61).

Total rice production in 1971 was 10 million tons; in 2008-2009, it was 32 million tons. In other words, rice production during the last three decades increased by 3 times. Rice yield increased from 1.22 metric tons per hectare in 1975-1976 to 2.9 metric tons per hectare in 2008-2009; HYV boro from 2.54 metric tons per hectare to 4.0 metric tons per hectare. Over the same period, fertilizer use increased from 48 kg per hectare to 190 kg per hectare (Ahmed, 2001).

Fertilizer use became popular across all groups of farmers. HYV occupied 75 % of rice area in 2009 compared to 13% in mid 1970s. Wheat production increased from 1.25 million tons in 1994-95 to 1.91 million tons in 1998-99, which has started declining and the production has come down to 0.97 million tons (estimated) in 2004-05. Pulses and oilseed production is also steadily declining. Production of vegetables and fruits has increased, but at a slow pace from 1.21 and 1.41 million tons in 1994-95 to 1.61 and 1.55 million tons in 2002-03 respectively.

However, the production of vegetables jumped to 6.13 million tons in 2003-04 and 7.28 million tons in 2004-05 (Table 1.6). Fruit production has also jumped from 1.4 million tons in 1994-95 to 4.60 million tons in 2004-05. Potato production has made a quantum jump from 1.47 million tons in 1994-95 to 9.2 million tons in 2008-09. Production of

non-cereals such as pulses, oilseeds, vegetables and fruits still remains far below the actual requirements. According to BARC estimate, the current deficit (2004-05) of pulses and oilseeds are 1.12 million tons and 2.26 million tons respectively. Similarly, shortage of vegetables and fruits is estimated as 2.24 million tons and 2.70 million tons respectively.

Irrigation development was a major factor behind spread of HYV and consequent yield increase. From an initial focus on surface water, irrigation emphasis shifted to development of ground water (69% of all irrigation in 2002-2003) with the advent of shallow tube well promoted by market liberalization. Irrigated area increased by 5.5% annually from 1975-1976 to 1996-1997, with ground water based irrigation by a phenomenal 18.6%. Other concurrent developments include increasing mechanization of agricultural operations, including power tillers for cultivation, pumps for irrigation and threshers and rice mills for converting paddy into rice. In some regions, power tiller use has reached 60% of the area cultivated; up from 28% reported in 1996 agricultural census in response to shortage of human and animal labor raising the cost of both.

Table 4.3 Trend of Agricultural Production (1994-95 to 2004-05 & 2008-09) ('000 MT)

Year	Food grain		Potato	Pulses	Oilseeds	Vegetables	Fruits
	Rice	wheat					
1994-95	16833	1245	1468	535	480	1214	1414
1995-96	17687	1369	1492	524	471	1254	1431
1996-97	18880	1454	1508	525	478	1290	1418
1997-98	18862	1803	1553	518	482	1306	1403
1998-99	19905	1908	2762	499	476	1526	1359
1999-00	23067	1840	2933	394	406	1529	1357
2000-01	25085	1673	3216	377	394	1472	1406
2001-02	24300	1606	2994	355	392	1599	1467
2002-03	25190	1507	3386	345	369	1605	1547
2003-04	26189	1253	4855	332	286	6133	1619
2004-05	25157	976	5948	527	566	7278	1700
2008-09	31975	956	92.37	584	840	10322	4000

(Source: BBS, DAE, 2010).

Fish production increased significantly from 1.17 million tons in 1994-95 to 2.10 million tons in 2003-04 (Table 1.7). Substantial increase in meat, milk and egg production has been recorded over the last ten years. But the shortage is still large and the gaps between production and requirements are wide. For example, domestic milk production accounts for only 14% of the minimum requirement (Department of Livestock Services, 1999). Milk availability, including imported powder milk, per caput is approximately 30 ml per day against the FAO recommendation of 250 ml. The national deficit of milk and meat is 10.38 million tons and 4.95 million tons respectively, and of egg is 8645 million (Department of Livestock Services, 2005).

The present national requirement of fish is estimated at 2.30 million tons, showing a deficit of 0.20 million tons (Department of Fisheries, 2005).

Table 4.4 Trend of Fish, Meat, Milk and Egg Production (1994-2005)

Year	Fish (MnT)	Meat (MnT)	Milk (MnT)	Egg (Million)
1994-95	1.17	0.48	1.52	2400
1995-96	1.26	0.54	1.57	2830
1996-97	1.36	0.58	1.58	3020
1997-98	1.46	0.62	1.62	3250
1998-99	1.55	0.66	1.66	3510
1999-00	1.66	0.70	1.70	3990
2000-01	1.78	0.75	1.74	4097
2001-02	1.89	0.78	1.78	4424
2002-03	1.99	o.83	1.82	4777
2003-04	2.10	0.91	1.99	4780
2004-05	-	1.06 (est.)	2.14 (est.)	5625 (est.)

(Source: Memento, National Fish Week, 2005; Department of Livestock Services).

According to the projected level of requirements and production of important food crops estimated by BARC for the target year 2015 to meet the millennium development goals (Table 1.8), there will be a marginal surplus of 1.20 million tons of food grains and 2.03 million tons of potato. The projected requirement of cereals was estimated on the basis of 156 million people in 2015 by using the current consumption rate of 487 gm/capita/day. If the rate of consumption varies in the future, which is likely with the change of population growth rate, income level, food habit and consumption pattern, the requirement will also vary. However, deficit will continue to persist in pulses, oilseeds, fruits and vegetables. Food availability at the national level in terms of cereals

has certainly increased to keep pace with the population growth in recent times. But considering the highly volatile nature of cereal production, caused due to disastrous flood and drought, one cannot predict with any amount of certainty increasing growth in cereal production in the future to feed the population which is growing at the rate of 1.6 percent per year. Although cropping intensity has increased from 148 percent in 1976 to nearly 177 percent in 2001-02 and diversification of agriculture is taking place at a rate slower than desired, major efforts will be needed to boost production of food grains to the projected level and to even out the deficit in other food crops to meet the millennium development goals.

The national requirements of meat and milk as estimated by DLS for the year 2015 are 6.86 million tons and 14.29 million tons respectively, and of eggs are 16297 million. The deficit is large: 4.41 million tons for meat, 9.75 million tons for milk and 5245 million for egg. This is a huge gap. The total requirement of fish in 2015 will be 2.57 million tons, with a deficit of 0.47 million tons from the current level of production.

The Agriculture Sector Review and PRSP indicated that to achieve the critical MDG goals, Bangladesh has to attain an annual economic growth of 6-7 percent, which will be possible only if the broadly defined agriculture (crops, livestock, fisheries and forestry) grows by at least 4 percent per year. The current growth rate, on average, is less than 3 percent. The annual growth rate of 4 percent has to be achieved against the shrinking land and ground water resources, declining soil productivity and competing demand for land by other sectors.

Table 4.5 Projected Requirements and Production of Major Food Items in 2015

Food Items	Food Production in 2008-09 (mT), (less 11.58%)	Requirements in 2015 (mT) (less 11.58%)
Rice & Wheat	32.13	35.85
Pulses	0.58	1.85
Oilseeds	0.84	3.17
Vegetables	10.32	10.72
Fruits	4.60	8.22
Potato	5.95	5.56
Fish	2.50	2.57
Meat	0.91	6.86
Milk	1.99	14.29
Egg (million)	4780	16297

(Source: BARC, 2006).

During the past two decades, the total production of food cereals increased steadily at a growth rate of 2.89% per annum. The major source of rice production growth came from the shift of area from local rice varieties to MVs or expansion of MV rice onto newer areas.

There was a dramatic increase in production of wheat that emerged as the second most important cereal. Productivity of pulses and oilseed crops remained stagnant.

Contribution of Livestock to agricultural GDP as a conventional source of meat, milk, eggs, hides and skin stands at around 10%. Surprisingly, Bangladesh has one of the highest cattle densities: 145 large ruminants/km^2. Most cattle trace their origin to poor genetic bases. Their productivity in terms of milk, dairy products, meat, and farm power are insignificant. There has not been any organized cattle breeding, in general. The breeds which exist are either indigenous or introduced. The same applies to poultry. Nutrient deficiency in livestock is widespread. The small areas of rough pasture are generally overgrazed. Future research will, therefore, have to be focused on finding a niche for fodder grasses and legume species in the existing food production system that will not call for a major restructuring of food crop-based cropping sequences.

Fisheries now rank next to crops in its share in agricultural GDP contributing 22.23% (Department of Fisheries,2010). Its share in total export earnings is about 9.1% representing the third position after ready made garments and jute. Fish catches from open water capture

fisheries consistently declined. The new management technologies developed recently have demonstrated the potential to increase fish production substantially. Technologies for the production of fish seed for most cultivable species are available, but there is need for further research in brood management. Shrimp culture has experienced rapid expansion in recent years, but further growth in the future will largely depend upon the supply of hatchery-bred shrimp seed, improvement in culture techniques, as well as farm and environmental management practices.

The share of forestry in agricultural GDP stands at around 10%. The share of forest area comes to just 5-6% of total land area. By any standard this ratio is grossly inadequate to provide a basis for longer-term ecological security. The single major use of forest products in the country is as fuel. About 83% of all energy consumption in the country comes from traditional biomass source of which fuel wood constitutes about 14.5%. The current state of extracting benefits from forest resources is purely exploitative which is evident from high, and increasing, rate of deforestation now approaching 30% annually.

Forestry research in the past focused on the management of tree plantations and industrial utilization of wood and wood products. The present emphasis is on developing plantation techniques for various fast-growing exotic species for meeting the demand for fuel wood.

Table 4.6 Contribution of Agriculture to GDP (%)

Sector/ Sub-sector	94-95	95-96	96-97	97-98	98-99	99-00	00-01	01-02	02-03	03-04
Agriculture	26.0	25.6	25.8	25.3	25.2	25.58	25.0	23.99	23.4	23.08
Crops	15.4	15.0	15.2	14.5	14.3	14.59	14.70	13.75	13.43	13.23
Livestock	3.42	3.36	3.27	3.19	3.12	3.02	2.95	2.96	2.93	2.91
Fisheries	5.21	5.36	5.48	5.67	5.93	6.09	5.51	5.40	5.25	5.11
Forestry	1.95	1.93	1.91	1.89	1.90	1.88	1.87	1.88	1.86	1.83

(Source: Bangladesh Economic Review, 2005).

4.3 Challenges in Agriculture

The present agriculture is facing various challenges despite the achievements. Bangladesh agriculture is constrained by few crucial factors inhibiting its proper growth. Knowledge gaps, production hazards, and environmental vulnerabilities, low productivity, imperfect markets, poor access to credit and inadequate technologies are

on the lists of constraining factors responsible for sub optimal production in all sub sectors of agriculture.

Use of continuous high yielding varieties and chemical fertilizers, reduction of organic matters of the soil, nutrient deficiency, decrease productivity, water logging, salinity, etc. resulted in a number of problems. Report of a Task Force of MoA shows the decrease of rice production and stagnancy of yield in other crops during the last decade. National average of rice production stagnated at 2.5 Mt whereas at the same time the use of fertilizer increased up to 3 times. Wheat, potato, oilseeds, jute, sugarcane, etc. production rate has been stranded. Moreover, although the supply of grain crops is satisfactory, there exists a considerable shortfall of pulses, oilseeds and fruit production. To reduce the shortfall research and extension activities should be strengthened. The following elements posed serious threat to the production system in Bangladesh.

4.3.1 Population Growth

The country has made commendable success in curbing population growth to 1.48% from 3% in the 70s. Even at this modest growth, the size of the population is expected to climb 170 million by 2020. The demand for food for the increased population will be a challenge for the NARS system.

4.3.2 Loss of Cultivated Land

Land area under cultivation in Bangladesh is decreasing alarmingly, one percent per annum. Urbanization, river erosion are the main factors responsible for the loss of productive agricultural land. Whatever Bangladesh farmers grow, it has to be within its land resource 8.2 million hectare of cultivated area. Fallow land as a proportion of the total land area is less than 3 percent.

Compared to the 1983-84 per capita availability of arable land has decreased from 0.11 ha to 0.07 ha. There had been significant structural change of the farm holdings in the country. Total number of holdings increased by 29 percent and number of non-farm holdings by 59.8 percent over the same period while number of farm holdings increased by 17.5 percent. The proportion of medium and large farms decreased while that of small and marginal farms increased by 33 percent. Average farm size also decreased from 0.81 to 0.61 ha.

The soils of Bangladesh have been poorly managed for many generations. Land degradation is a complex process in Bangladesh in which several factors can be recognized to a loss of productivity. This adds to the problem of land shortage, land tenure, economic pressure and thus increase poverty. In Bangladesh, active land degradation processes are water erosion, loss of fertility due to physical, chemical or biological degradation of soils. Water logging, acidity, nutrient deficiency, salinity, land sliding, river bank erosion are the process responsible for the degradation. Depletion of soil organic matter is becoming serious threat to our agricultural land. Depletion of organic matter is associated with less addition of crop residue, high cropping pattern. About 4.05 million hectares of agricultural land in Bangladesh has organic matter content at less than critical level of less than 1 percent.

In Bangladesh over 30 percent of the net cultivated area is in the coast. Out of 2.85 million hectares of the coastal and off shore areas about 0.833 million hectares of the arable lands is affected by varying degrees of soil salinity constraining intensification of cropping. Drought is a common phenomenon in the country.

4.3.3 Dwindling Water Resources

Agriculture in Bangladesh is constrained by too much of water during the wet season and too little during the dry season. Presently total irrigated area is 4.8 million ha (Agricultural Dairy, AIS, 2011) which is more than 55 percent of the potentially irrigable area of 7.12 ha cultivated area. This area is being irrigated through surface and ground water resource. Irrigation coverage through Shallow tubewells (STWs) during dry period is growing very fast following the recent wave of privatization. The groundwater table in Bangladesh is declining at an alarming rate causing STWs non-operating in many parts of the country during dry period. Lack of surface water during the dry season limits the function of Low Lift Pumps. Recent outbreak of hazard due to arsenic from groundwater source created enough toll to our health.

4.3.4 Climate Change

The climate change and sea level rise due to global warming in the next decades will be particularly hard felt in the delta areas like Bangladesh. According to one estimate Inter governmental panel on climate change (IPCC), sea levels will probably rise by about 20 cm by 2030. A simulation model study was conducted to assess the vulnerability of foodgrain production in Bangladesh to potential climate change. Simulation runs were

made for high yield varieties of Aus, Aman and Boro rice and wheat. Higher temperature reduced the yields in almost all study locations and all seasons and it was particularly pronounced with a 4 ° C increase. The detrimental effect of temperature rise was observed even with increased CO_2 levels.

4.3.5 Loss of Biodiversity

Loss of biodiversity is a serious concern of Bangladesh agriculture. The country is known to be rich for its biodiversity. About 60 percent land races of rice have disappeared so far from our land. Many lower plants are already in extinction. Wild species of rice, rose, solanum and many cucurbits, ground orchids, and root parasites of sal trees are believed to be burnt out. As many as 25 vascular plants are listed as threatened and 14 species of wet land fauna are already in extinction whereas 18 species of wetland fauna are in the list as endangered.

4.4 Agricultural Research System in Bangladesh

4.4.1 Historical Highlight

Agricultural research in Bangladesh has a long history. Formal agricultural research in Bangladesh had its beginning a decade even before the 20th Century in 1880. On the recommendation of the famine commission, a department of agriculture was established under the Department of Land Records in British Bengal. Systematic research on Jute was started by the provincial government at the turn of the Century. Planters, the tea traders and several governmental estates began tea research about the some time.

The Indian Department of Agriculture was established in 1905. Lord Curzon, the Viceroy of India, granted separate status to the Bengal department of Agriculture in the following Year. Rice research was started by the Department two years later (Agricultural Research in Bangladesh in the 20th Century, 2001).

A nucleus agricultural research laboratory was established at Tejgaon in 1908 to serve the Provinces of Bengal and Assam.

Another important step was the formation of the Imperial Council of Agricultural Research (ICAR) in 1929 in undivided India and 'Pusa' Institute in Pusa (Bihar) in 1929.

Education is an important element of the agricultural research process. Bangladesh had benefited from early and strong educational resources, beginning with the founding in 1938 of the Bengal Agricultural Institute (BAI). At the time, it was the only school for higher education in agriculture in the province. This was subsequently affiliated with the Bangladesh Agricultural University (BAU) but administered by Bangladesh Agricultural Research Institute (BARI). Recently, the institute has been converted as Shere Bangla Agricultural University.

The worldwide economic depression severely reduced the resources available for agricultural research in the Mid1930s, greatly restricting experimental work. Tea research was nearly stopped. Nevertheless, by the end of 1939, the research system had successfully developed and introduced improved varieties of rice, sugarcane and jute. The research effort nearly stopped again during 1942 and 1943 when the Japanese threatened to invade India through Bengal.

The end of the British Colonial period in 1947 caused the division of the ICAR into the Indian Council of Agricultural Research and the Food and Agricultural Council of Pakistan (FADCP). Both Councils had similar purposes to undertake aid, promote and coordinate agricultural research in their respective countries.

Research institutes for jute, tea and sugarcane were lost to India at the time of partition of India. Many scientists left the country in this period.

New research agencies devoted to jute and sugarcane were established in1951. The Sugarcane Research System was re-organized as the Sugarcane Research and Training institute in 1973.

The Bangladesh Forest Research Institute was established in 1955. Another series of reorganizations took place in the mid-1950s. These led to the establishment in 1957 of the Agriculture Research Institute (ARI) under the Directorate of Agriculture (Research and Education) of the then East Pakistan.

The Bangladesh Tea Research Institute (TRI) was founded in 1958 to replace scientific facilities that were lost to the country at the time of partition of India.

However, 1962 was also a year of major disruption for agricultural research in the province. The experiment station lands at Dacca Farms were taken over by the

Government to become the site of the second capital, and area today called Shar-e-Bangla Nagar. The action was a severe blow to progress in agricultural research for the 600 acres of Dacca Farms were the principal research facility. Rice germplasm collection was lost that was 50 years in assembling. The loss of the Dacca Farms was all the more serious as during this period the province lacked a strong institutional base for its agricultural research. It was nearly a decade before the scientists again had adequate lands for conducting their field experiments.

In 1964 there was a further reorganization in the national coordination of research when the Pakistan Agricultural Research Council was formed from the Food and Agriculture Council.

Active cooperation with the newly-created international research centers began in the mid-1960s. One of the earliest efforts came in 1965 when the first high yielding varieties (HYV) of rice were introduced into the country by the International Rice Research Institute (IRRI). Sugarcane varieties were imported for testing on mill farms. And during this time, Virginia tobacco was imported and quickly became dominate in this crop.

It was about this same time that ARI scientists were able to start temporary crop breeding work in rice on lands of the Savar Dairy Farm.

The government purchased 650 acres of land near Joydebpur in 1966 as a replacement for the Dacca Farms, and planning began to erect a modern agricultural research centre. It took more than a decade to accomplish this goal.

In 1970 the East Pakistan Accelerated Rice Research Institute was established with major support by IRRI. About 165 acres of the Joydebpur site were designated for this new center. Not many months later this became the Bangladesh Rice Research Institute (BRRI).

The months of the war of liberation were a difficult period for agricultural scientists. Not only were there many disturbances in their personal lives, but there was a great loss of scientific and agricultural equipment caused by the fighting. Of course, with independence came opportunities for a new start as nationhood and major reorganization for the research system. Several key decisions were implemented in 1973. The former provincial research organizations took up national responsibilities.

One of the most important developments of the organizations took up national responsibilities. One of the most important developments of the organizations took up national responsibilities. One of the most important developments of the year was presidential Order No.32, issued on April 5, 1973, which established the Bangladesh Agricultural Research Council (BARC) as the national agency to coordinate agricultural research. The 1996 Act has given wider responsibility to BARC to coordinate, review and monitor agricultural research in ten agricultural research intuitions.

4.4.2 National Agricultural Research System

Undoubtedly, the achievements of Bangladesh NARS had a crucial role to play in generating farm technology that acted as engine of growth in agriculture. Modern production technologies, both variety-and management-based were transferred to DAE and other extension organizations for their dissemination to farmers. There have been about 600 improved varieties of different crops developed by the NARS so far. Among the varieties developed so far by NARS include 60 for rice, 26 for wheat, 36 for jute, 40 for sugarcane, 20 for tea, 38 for oilseed, 27 for pulses etc. BARI researchers were successful in developing short duration varieties of wheat suitable for late planting.

Table 4.7 Varieties/technologies (number) released by and in the pipeline of different research institutes

Institute	Crops	Varieties released	Varieties in pipeline
BRRI	Rice	53	4
	Agricultural machinery	11	
BARI	Wheat	26	10
	Potato	32	4
	Vegetables	72	36
	Fruits	52	5
	Flower	9	5
	Pulses	27	4
	Oilseeds	38	8
	Spices	17	5
	Agricultural machinery	11	

BINA	Rice	6	2
	Pulses	13	0
	Oilseeds	10	6
	Jute	2	4
	Tomato	3	2
BJRI	Jute	36	3
BSRI	Sugarcane	40	4
BLRI	Poultry, cattle production package	52	

(Source: Personal communication).

Among the management technologies developed are determination of optimum fertilizer requirement of different crops for different AEZs, detection of deficiencies of micronutrients like zinc, sulphur, boron, etc. in certain lands and application of micronutrient fertilizers for increased crop yield, development of profitable cropping patterns for different land types, integrated nutrient management techniques, minimum/zero tillage for early establishment of rainfed crops, supplemental irrigation and rainwater harvesting technologies, spaced transplanting technique of sugarcane growing, homestead-based vegetable production technology, etc. Apart from variety-based technologies farmers had different levels of adoption of these management-based technologies.

Ten agricultural research institutes makeup the national agricultural research and network in Bangladesh known as National Agricultural Research System (NARS). Bangladesh Agricultural Research Council as a pivotal position coordinates the research activities within the NARS. Through its research, NARS seeks to promote sustainable agricultural for food security in Bangladesh. The NARS has total 1500 scientists having higher degrees and training. The institutes are of different categories in terms of their governance and they belong to different ministries (Ministry of Agriculture, Ministry of Fisheries & Livestock, Ministry of Environment & Forest etc). The institutes involved within the NARS network are:

1. Bangladesh Agricultural Research Institute
2. Bangladesh Rice Research Institute
3. Bangladesh Jute Research Institute
4. Bangladesh Livestock Research Institute

5. Bangladesh Fisheries Research Institute
6. Bangladesh Forest Research Institute
7. Bangladesh Sugarcane Research Institute
8. Bangladesh Tea Research Institute
9. Bangladesh Institute of Nuclear Agriculture
10. Soil Resource Research Institute

Bangladesh Sericulture Research and Training Institute, is being included in the NARS, in which case total number institute will be 11 under the coordination of BARC.

Not only national institutes those are public sector agencies constitutes-NARS. There are increase partnership with NGOs, universities who are very much within the periphery of NARS and contributing towards research and developments of Agriculture. BARC works as an apex agency leads the NARS in terms of planning and fixing priority of future research agenda, monitoring of existing research programme and feed back evaluation of the program, coordination among various programs and activities.

BARC is fully aware that research efforts in agriculture and natural resources must relate and contribute to the achievement to national goals. Over the last 25 years Bangladesh Agricultural Research Council played an important role in sharing its technologies and information with the rest of the world and also benefited from the inflow of technologies, scientific information and germplasm for promoting agricultural development. Moreover, international cooperation, encompassing exchanges of ideas, know-how, personnel and materials, has been systematized during the last 10 years. BARC has been partner with the research centers of the Consultative Group of International Agricultural Research (CGIAR) centres and research coordination bodies of the various countries. Developments pertaining to rice, wheat, vegetables, potato and pulses are excellent examples of international cooperation. In this connection, Memoranda of Understanding (MOU)/Agreement have been signed with many international organizations.

At present, BARC maintains working relations with a large number of national and international research organizations. Some of them are:

Consultative Group of International Agricultural Research Centers (CGIAR):

- International Rice Research Institute (IRRI), Los Banos, Philippines
- International Maize and Wheat Improvement Centre (CIMMYT), El Batan, Mexico
- International Institute of Tropical Agricultural (IITA), Ibadan, Nigeria
- International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, India.
- International Plant Genetic Resources Institute (IPGRI), Rome
- International Potato Centre (CIP), Lima, Peru
- International Food Policy Research Institute (IFPRI), Washington D.C., USA
- International Water Management Institute (IWMI), Sri Lanka
- International Centre for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria
- Center for International Forestry Research (CIFOR), Indonesia
- International Center for Tropical Agriculture (CIAT), Colombia
- World Fish Center, Penang, Malaysia
- International Center for Research in Agroforestry, (ICRAF), Nairobi, Kenya
- International Livestock Research Institute (ILRI), Nairobi
- West Africa Rice Development Association (WARDA), Cote d' Ivory

Regional/International Organizations:

- Indian Council of Agricultural Research (ICAR), New Delhi, India
- Pakistan Agricultural Research Council (PARC), Islamabad, Pakistan
- Sri Lankan Council for Agricultural Research Policy (CARP), Sri Lanka
- Nepal Agricultural Research Council, Kathmandu
- Centre for Agricultural Research and Development (CARD), Bhutan
- Malaysian Agricultural Research and Development Institute, Malaysia
- Japan International Research Centre for Agricultural Sciences (JIRCAS), Japan
- Rural Development Administration (RDA), Korea
- Australian Centre for International Agricultural Research (ACIAR), Canberra
- Philippines Council for Agricultural and Resources Research and Development (PCARRD), Philippines
- International Institute of Education (IIE), USA
- Asian Vegetable Research and Development Centre (AVRDC), Thailand

- International Soybean Programme (INTSOY), USA
- South-East Asian Regional Centre for Graduate Study and Research in Agriculture (SEARCA), Philippines
- Asia Pacific Association of Agricultural Research Institute (APAARI), Bangkok, Thailand
- Council for partnership on rice Research in Asia (CORRA), Philippines
- Centre for Agriculture and Biosciences International (CABI), U.K.
- International Information System for the Agricultural Sciences and Technology (AGRIS), FAO, Rome, Italy
- Center for Integrated Rural Development for Asia and the Pacific, Dhaka
- SAARC Agricultural Information Centre (SAIC) of the South Asia Association for Regional Cooperation (SAARC), Dhaka.

BARC will continue to expand its international linkages to include as many national and international institutions as possible. These linkages are significant because they provide access to new materials, technology and training.

Size of the researchers in the NARS and elsewhere in the country

The number of positions for scientists in the system is about 1900. Among the total number of researchers, about 200 are Ph.D. (20%), and 1000 masters in major fields of agriculture (agronomy, breeding, entomology, horticulture, soil, water management, livestock, fisheries, forestry etc.). The public universities (Agricultural) have also about 500 researchers/teachers.

Scientific expertise of the NGOs and private sector in the field of agriculture is growing though slow. However, very few private research entities are emerging now with specific focus on development of crop varieties.

Recent trend of the scientists of leaving the institutes is a serious concern for NARS; more than 400 well trained scientists left the country for higher opportunity elsewhere during last several years.

4.4.3 NARS Institutes

4.4.3.1 Bangladesh Agricultural Research Institute (BARI)

Bangladesh Agricultural Research Institute is the largest research institute of the country. It does research on all crops other than those covered by specialized institutes (rice, sugarcane, cotton, jute and tea). The institute is run by Board of Management and

Director General chairs the board and represented by two outside scientists, farmers, NGOs, BARC and ministry of agriculture and finance. The institute has strength of 700 scientists with six regional stations and a number of substations.

BARI developed not only number of varieties but also a number of improved management technologies, pest control methods, post harvest technologies, development improved machines and devices, standardization of fertilizer and irrigation application etc. in the tune of different agro-ecological zones of the country.

Today, more than 80 % wheat area is covered by BARI varieties and achievements in wheat research which now second important cereal crop in Bangladesh came through BARI. BARI has released 26 high yielding varieties of wheat. Of these Kanchan occupies the major share followed by Akbar, Barkat, Bijoy and Agrani considering the area under wheat. The institute has developed four improved varieties of maize, of which Barnali with higher carotene is mostly popular. The major breakthrough of BARI oilseed breeders has been the development of B*rassica napus* lines for tropical climate of Bangladesh. The yield potential is as much as 2 t/ha which is more than twice the yield of local mustard varieties. Improved varieties of mustard with higher oil content and tolerant to water logging have been developed. Improved varieties of Ground nut, sunflower, Til, Soybean, Tisi also were released. These are characterized by short duration, suitable for inter-cropping and tolerant to drought and salinity. Varieties of mungbean and chickpea have been released with higher yield and drought resistance.

In potato, high yielding varieties have been developed which are being widely cultivated among the growers and those that acted as a booster of production jump are Cardinal, Multa, BARI TPS-1 and TPS-2. Besides, Considerable success has been achieved in research on growing potatoes from true potato seed (TPS) which is considered as a cost effective production technology. Among other tubers, varieties developed are sweet potato, aroids.

The Horticulture Research Center of the institute developed several leafy vegetables which mature early and farmers can harvest several times from a single plant. Other release includes varieties of radish and cabbage, gourd, cauliflower, beans etc.

The institute released 53 varieties of several major and minor fruits. Improved varieties are mango, litchi, guava, papaya, coconut and in citrus crops like lemon and orange.

Besides the variety development, the institute made success in developing production and management technologies.

The institute has developed cost effective chips making method of potato. Fruit conservation, drying and processing technique have been evolved. Among them is the pulp making technique with mango, jackfruits and pineapple.

4.4.3.2 Bangladesh Rice Research Institute (BRRI)

BRRI is under the ministry of agriculture and run by the Board of Management. Director General chairs the board and represented by two outside scientists, farmers and NGOs. The institute has 230 scientists and nine regional stations.

Since its establishment in 1970, BRRI has released 60 Modern Varieties of rice. The institute tries to put its endeavor to tailor rice plant varieties to accommodate short field duration, higher yield, disease and pest resistant, drought, flood and salt tolerant to meet the socioeconomic demand of the farmers. Of these, eleven of these are suitable for cultivation in both the boro and aus seasons, eight in the boro season only, five in the aus season only and twelve in the transplanted aman season only. These are not only high yielding but also tolerant to wider unfavourable situations like drought, cold and insect pest and are suitable for varying ecosystems with wide range of disease and insect resistance. Not only in Bangladesh, a few BRRI MV rice are now widely grown in other countries like India, Nepal, Bhutan, Myanmar, Vietnam and west Africa.

The MV rices and production technologies developed by BRRI contributed tremendously to the national food production in Bangladesh. Since the establishment of BRRI in 1970-71, the overall adoption of all MV rices rose from 4.64 % of the total rice area to about 75% until 2009. It is evident that the share of MV rices had been increasing gradually. BRRI developed modern varieties presently covers 94 % of the boro, 32% of the aus and 48 % of the T.aman areas of Bangladesh. These varieties together cover 62 % of the total rice area and account for about 77 % of the total annual rice production of the country.

Management technologies for crop, soil, fertilizer and pest and rice-based cropping patterns for the cultivation of MV rice varieties in various agroecological regions of the country have been developed. These include the integrated nutrient management techniques using both chemical fertilizers and organic materials for the improvement of

soil health and crop productivity, research on water management and agronomic practices, pest management in terms of identification of number of species of insect pests, parasites and predators. Ten techniques based on the integrated pest management approach have been developed to control rice insects. Forty insecticides that are effective against different insects have been identified. BRRI plant pathologists have identified 31 diseases caused by viruses, mycoplasma, bacteria, fungi and nematodes that affect rice production, ten of these are of major economic importance.

The institute has developed successfully the rice-fish farming systems for the deep water areas, appropriate timing of crop establishment and suitable varieties and management practices for the rice-wheat cropping system and cropping system for incorporating short duration pulses and oilseeds in between two MV rice crops for diversified farming.

Participatory research in rice farming system gained significant achievements in developing improved cropping systems to increase farmers income through site specific research with the participation of farmers and extension agents.

BRRI with active support from International Rice Research Institute (IRRI) initiated research on hybrid rice in 1993. Intensive investigations into CMS (Cytoplasmic male sterility) lines resulted in the identification of two stable CMS lines namely, IR58025A and IR62829A. Some F1 rice hybrids derived from these lines showed higher yield potential than the comparable inbred HYV. Collaboration from CG center, IRRI has been active in BRRI research.

4.4.3.3 Bangladesh Jute Research Institute (BJRI)

BJRI is under the ministry of agriculture and run by Board of Management. Director-General (chief executive) chairs the Board of Management and represented by one eminent technologist, member from Federation of Chamber of Commerce and Industries, Jute mills Corporation, crop extension agency, Ministry of Agriculture, farmer, and NGO. The institute has eight sub-stations and about 200 scientists.

Achievements have been to develop improved varieties of jute, which are in wide use in Bangladesh; to develop better tossa varieties with shorter field duration and photosensitivity, and greater disease resistance; to insert jute into multiple cropping

systems with rice through improved cropping practices; to recommend improved fertilizer management and better retting practices.

So far BJRI developed 36 improved varieties of jute including white, mesta, tossa and kenaf.

Technologies on production packages has been developed which include improved cultivation practices to reduce cost of production as well as financial gain of the farmers. Many jute based cropping patterns have been identified to be profitable.

The quality of fiber is greatly determined by the retting process. Improved retting method to improve the fiber quality of jute has been evolved. Ribon retting, an innovative technology for jute retting which involves the process with limited water, devised by the institute. The research success also came in terms of solving problems of industrial and commercial use of jute.

4.4.3.4 Bangladesh Sugarcane Research Institute (BSRI)

The institute is under the Ministry of Agriculture and run by Board of Management. Minister for Agriculture chairs the Board. The institute has 75 scientists and four sub-stations.

Bangladesh Sugarcane Research Institute was established in 1973 to cater to the technical and research support to the Sugar and Food Industries Corporation. Sugarcane is the county's second most important agro-industrial crop. The research effort led by the institute is devoted to produce more cane per hectare as well as through greater cropping intensity. Some notably higher yielding varieties have been developed over the years. So far, BSRI released 40 high yielding, disease and drought resistant varieties with higher sugar recovery rates. Many of them can withstand flood and submergence. Varieties Ishurdi-20, Ishurdi-21, Ishurdi-22, Ishurdi-24, Ishurdi-26, Ishurdi-27 and Ishurdi-28 are tolerant to water stagnation in different degrees.

In addition, associate technologies and improved production packages have been developed to fit sugarcane into financially attractive cropping pattern. Inter cropping with other crop, integrated pest management, fertilizer recommendation for different agro-ecological zones, mechanization for the sowing, tillering, harvesting are among the successes. Spaced transplanting technique of sugarcane growing has been recent

breakthrough in sugarcane cultivation which allows the farmers to reduce the cost of transplanting considerably without sacrificing yield.

4.4.3.5 Bangladesh Tea Research Institute (BTRI)

The institute is a constituent part of Bangladesh Tea Board under Ministry of Commerce. Cess from sale of commodities (Tea) provides resource for research. Entire operation cost is met by the cess.

BTRI was established in 1957. The research program is mainly applied and is planned in conformity with the needs of the tea industry. Ten clones of such standard have been released to the tea industries. Twelve clones of desired standard and suitable for commercial plantation were released to the estates through clonal selection from cultivated seed population. They are now under cultivation.

Improved cultural and management practices for tea cultivation have been developed. These include, planting time, planting system, lifting method from nursery, spacing requirement, post planting care, soil, nutrient and pest management. The biochemistry division has developed a carbonated tea beverage and registered.

4.4.3.6 Bangladesh Institute of Nuclear Agriculture (BINA)

The institute is run by Board of Management. The Board is constituted by the members from atomic energy commission, agricultural university, department of agricultural extension, farmers, NGO and representative from Ministry of Agriculture and Finance.

Bangladesh Institute of Nuclear Agriculture was established in 1972 as a component of Bangladesh Atomic Energy Commission. Its research efforts are directed towards crop agriculture using nuclear techniques. Using mutation breeding techniques BINA has been successful in releasing 35 modern varieties of different crops like rice, jute, mustard, chikpea, mungbean, blackgram and tomato with total production packages. Recent development that came up in BINA Dhan-6 & 8 which deserves attention. Mutagenes are being used in changing the genetic make up of characters. In addition, cross breeding, tissue culture, anther culture techniques are used side by side to develop suitable crop varieties.

Using the various kinds of isotopes the institute has been able to study soil related problems of the country including dynamics and behavior of the phosphorous and potassium on different soils, efficient use of fertilizers for sustained productivity, fate

of applied nitrogen in the soils, dynamics of soil micro-nutrients and physical aspects of soil and water management practices.

High yielding rice varieties, developed by irradiation are capable of performing well in terms of early maturity, late transplanting, disease resistance and grain quality. Jute varieties developed have improved fibre quality, yield and resistance to wide range of insect pest.

Besides the improved varieties, the institute has been successful in developing biofertilizer for lentil, groundnut, chickpea, mungbean, cowpea, dhaincha and soybean.

The institute achieved success in developing appropriate technologies and information packages in different aspect of crop agriculture.

4.4.3.7 Bangladesh Fisheries Research Institute (BFRI)

The institute is run by a Board of Management. Minister for Livestock and Fisheries chairs the board and represented by the Secretary of the Ministry, BARC, University, Fisheries department, member engage in fisheries research outside of the institute. The institute is operated by 65 scientists.

BFRI established in 1984, focuses research in four main areas: a) Fresh water research b) Riverine research c) Marine fisheries and d) Brackish water research. Research has achieved results on genetic improvement of carp, surveys of fish diseases, culture techniques for fry and fingerlings, seasonal pond management practices, fish poly culture in inland culture fisheries and improved methods of fish nutrition.

Research success came from number of areas which include induced breeding of carp, transportation of fish fry, aquaculture of curp, feed and ferilization, fish disease, aquatic weed control, water pollution and resources survey.

FRI has generated appropriate technologies for improved breeding and nursery management of carps, fish culture in seasonal and perennial ponds, fish culture in pens, integrated poultry-fish/duck-fish/rice-fish farming. Research on poly culture of carps adopting low input management practices, resulted in fish production of over 5 t/ha, using agricultural wastes and by products as inputs. Induced spawning of Indian and Chinese major carps, common carp, and silver carp using various dosages of hormone has resulted in development of a low cost hatchery management system. Multiple spawning

of same carp fish for 2-3 times in one season has been achieved resulting in optimum utilization of hatchery space and maximization of benefits. Genetical improvement of carp and tilapia by chromosome manipulation has been undertaken with a view to develop triploids. Triploidy was being induced in rohu and mrigal using heat shock. Techniques have been developed for breeding and increasing survival of native catfish fry. Research on nursery pond management practices has resulted in developing a system whereby over 70% survival of fry could be obtained at stocking densities as high as 10 million per hectare.

Survey of potential fish feed ingredients of Bangladesh and estimation of biochemical composition have been completed with a view to develop cheap and high quality fish prawn feeds from indigenous raw materials. There has been some progress in developing low cost feed formulation and cheaper fertilization procedure for a number of fish species including carps and shrimps.

The riverine station is undertaking research on inland openwater fisheries management and development of production systems for riverine species. Natural spawning grounds of Indian major carps have located through surveys with a view to protect and conserve the breeding grounds which are being presently threatened due to environmental degradation. The station is also undertaking research on culture of carps in pens in irrigation canals.

Techniques for the breeding of Pangas sutchi have been successfully developed for the first time in the country and efforts are in progress for breeding of P. pangasium. Polyculture of pangas with carps have been developed.

4.4.3.8 Bangladesh Livestock Research Institute (BLRI)

The institute is under the Ministry of Livestock and Fisheries. Run by Board of Management where Minister chairs the board and represented by Secretary of the Ministry, vice-chancellor of the Agricultural University, two members from outside concerned with the matter. The institute has 35 scientists and 3 substations.

BLRI was established in 1984 with the main objectives of raising the productivity of indigenous ruminants and non-ruminants. It has so far developed 32 technologies and 9 production packages. The research mainly centered on feed and fodder development and management and disease management including vaccines.

In view of limited land resource and top priority assigned to production of food grain crops, it is highly unlikely that farmers will redirect any significant amount of land from human-consumption crops to fodder crops for livestock. A unique feed technology for ruminants called Urea-Molasses-Straw is widely practiced. It has been found to promote better growth response in calves and increased meat production in bull/bullocks and milk production in dairy cows. A simple storing technology of rice straw under wet condition has been developed and adopted largely. In a situation where green grass is not available, Algea as feed for ruminants developed, is gaining importance.

Information on the prevalence and distribution of major infectious diseases and disease monitoring for critical control has been undertaken. Besides, BLRI also developed Salmonella antigen, Serum antibiotic combined treatment of PPR, Rinderpest competitive ELISA technique, and ELISA based techniques for the control of Foot and Mouth Disease, all of which have immense economic benefit to the farmers. A model has been developed for controlling parasites through deworming of animals to have animals free from harmful parasites like fasciola.

Investigations on parasitic diseases revealed the presence of different species of nematodes, tremadotes and cestodes. The general incidence of infestations by these parasites is very high. Protozoa parasites and arthropod vectors of diseases have also been recorded.

Many other livestock production packages have been developed by the institute. These are cultivation of Dal grass, Goat rearing under stall fed condition, estimation of liveweight for cattle at farm level and rearing cross bred layers in semi-scavenging systems for poverty alleviation.

Cross bred chickens over the years recorded better performance in semi-intensive and scavenging system with supplemental of ration and proper vaccination against New Castle disease. Khaki Cambell duck is performing well in regard to egg production. This has prompted a large number of farmers to rear this exotic breed. Besides, Quail has been found to thrive well in local condition.

4.4.3.9 Bangladesh Forest Research Institute (BFRI)

The institute is a government department under Ministry of Environment and Forest. The institute has about 100 scientists and 25 substations or plantation units.

BFRI was established in 1955 with exclusive responsibility to undertake forestry research. Forestry research focused on management of tree plantations and industrial utilization of wood and wood products. Appropriate tree species have been identified for planting based on the soil characteristics. Accordingly a map has been prepared for selecting site specific forest tree species. Physiological research on germination, flowering, fruiting, and seed maturity of several mangrove species were conducted for raising nursery stock. Technologies for rapid propagation of bamboo have been developed.

In the area of forest product utilization, research focused on treating inexpensive but less durable wood like Mango and Civit that can be used in making furniture. Technology has been developed for making furniture with plywood and hollow-core panels. Designs and techniques have been developed for processing and fabrication of novelty products. Indigenous tree species are now being used in the manufacture of sports goods the bulk of which was imported earlier.

Vegetative propagation technique of ten domestic forest tree species and tissue culture technique for propagation of three bamboo species have been made. Preservation techniques for wood, bamboo, sungrass and straw as major construction materials have been formulated which enhanced the durability the materials three to four fold.

4.4.3.10 Soil Resource Development Institute (SRDI)

SRDI is a government department under Ministry of Agriculture. The institute has 454 scientists and has substations in most of the regions.

The institute has been established to assess of potentials of the country's land resources through soil survey. It assists the government and other beneficiary agencies in land development planning for agriculture, afforestation, soil conservation and reclamation, land settlements, irrigation and drainage, flood protection, etc. by providing basic soil data and information; advisory services to farmers.

The institute has made considerable success in generating soil and water related information to support increased agricultural production. It has been able to prepare land and soil resources utilization guide of most of the thanas (smallest administrative unit), updated reconnaissance and resources inventory data, completed special surveys to identify, characterize, and delineate problem soils and pilot studies for their amelioration. The institute is monitoring of soil fertility, salinity and soil erosion and

has been able to provide farmers' in-field soil analytical and advisory services on fertilizer dosage and irrigation requirements.

With the Geographical Information System (GIS) facilities at the institute, location specific crop suitability maps, micro level data base on land and soil have been made. At present the institute has been carrying out soil moisture characterization of major soils of the country, soil conservation and watershed management studies, soil mineralogical studies, soil micro biological studies and development of computer storage and retrieval facilities for all land resources data.

4.4.3.11 Research and Development by NGO's, Universities and Some Private Sector Agencies

Universities of Bangladesh mostly the agricultural universities contributed significantly in technology generation and transfer of the same through outreach program. There are two national agricultural universities in the country. Besides, few agricultural colleges perform agricultural research in the graduate studies. As a partner of the NARS, the universities take part in the contract research scheme of BARC in agricultural research. Research and development program of the universities is mainly on crop management, varietal development, fertility management, animal feed and fodder development, fisheries, fisheries management, technology transfer, socio-economic studies of crop production, agricultural mechanization and management, farming system research etc. Research Funding mainly comes from University Grants Commission, donor supported projects and BARC.

4.4.3.12 Bangladesh Agricultural University Research System (BAURES)

It undertakes research in most of the specialized disciplines of Agricultural Sciences including Crop Sciences, Animal Husbandry, Agricultural extension, Socio-economics, Veterinary Sciences, Agricultural Engineering and Fisheries. The BAU research projects are determined, managed and coordinated by various Technical Committees formed by the BAU Research System. Current research programs of BAURES are:

- Soil fertility and plant nutrition studies and production technology of different crops.
- Pest Management and Entomological Studies:
- Varietal Improvement and Genetic Studies:
- Socio-Economics and Extension Studies:
- Animal husbandry
- Poultry Production, management and performance of breeds, feed and nutrition.
- Cattle production, selective breeding of buffaloes, sheep and goat nutrition, feed evaluation, milk production, endocrinology.
- Veterinary science

4.5 Conclusion

Agriculture in Bangladesh is facing number of challenges. Meeting food demand for increasing population in decreasing land is the major challenge. However Bangladesh has good network of agricultural research and extension with skilled scientific manpower. Total agricultural research and extension services should be supported with enhanced knowledge and information system. The advancement of present global and national information management skill may further make the research system more efficient.

CHAPTER 5

EXISTING INFORMATION SYSTEMS AND SERVICES OF NARS

Chapter 5

Existing Information Systems and Services of NARS

5.1 Introduction

Agriculture in the 21st Century faces important environmental, social, agronomic, and philosophical challenges. These challenges are interconnected and can best be addressed using an interdisciplinary approach. Information is one of the basic inputs that can be addressed for those challenges in the field of agricultural development. Scientists and agriculturists want to get new information in their fields. It acts like driving forces and stimulates the professionals to discover and invent what people need to meet their professional accomplishment. Agriculture is a vast sector in Bangladesh. The research undertaking in agriculture largely depends on information based on which new knowledge is developed (www.sust.ag.iastate.edu/gpsa/qanda.html).

Information is very useful to us in many ways. It is the time winning element of modern science. It is so important that there is no sphere where it is not needed. In research, development, business, industry, government affairs, education, training information is to be acquired, processed, retrieved and disseminated for communication.

Improved information can help develop agricultural research in many folds. Information is important resource, valuable input and power for societal development. The present information age is characterized by society, which is conscious of the value of information and its use. The information revolution is the third major force following agricultural and industrial revolutions that is shaping the way of living in the civilized world. It is a fact of significance that a country which is rich in information is rich in economic spheres too (Devarazan, 1996).

Information may be understood as the value attached or instantiated to a characteristic or variable returned by a function or produced by a process. The information hierarchy provides a satisfactory link between physical processes and consistent ideas about information and higher level mental functions discussed by psychologists and

philosophers. This allows information scientists and others to examine information in a uniform way across the breadth of information phenomena, providing a level of precision to some interdisciplinary discussions of information, and serving as a base to which additional limiting assumptions may be added within specific disciplines, such as the concept of 'value' for economic studies of information (Losee,1997).

5.2 Information Needs of the Agricultural Scientists and Researchers

Technology has an enormous prospective for providing needed support to the agriculture in achieving sustainable production by way of timely dissemination of agricultural technology needed by the farmers. These technologies have in fact converged to information and communication technology which is defined as the technologies involved in collecting data, processing of data, storing of data, retrieving, disseminating and implementing data and information using microelectronics, optics, telecommunications and computers (www.tutorvista.com/chemistry/agricult).

Information is the pivot of which the survival of any society rests. It remains the major ingredient in taking decision; and assist in reading the degree of uncertainty. Information and its use are as old as a man. Indeed, without information there can't be communication. The technology embrace has led to the proliferation of electronically available information resources. These resources include CD – ROM databases, electronic mails. Online Public Access Catalogues (OPAC) and internet browsing (Oduwole et. al., 2003). The internet which is the most prominent of this source has made possible access to electronic books and journals; various databases and search engines. All these resources constitute Electronic Information Sources (Oduwole & Akpati, 2003).

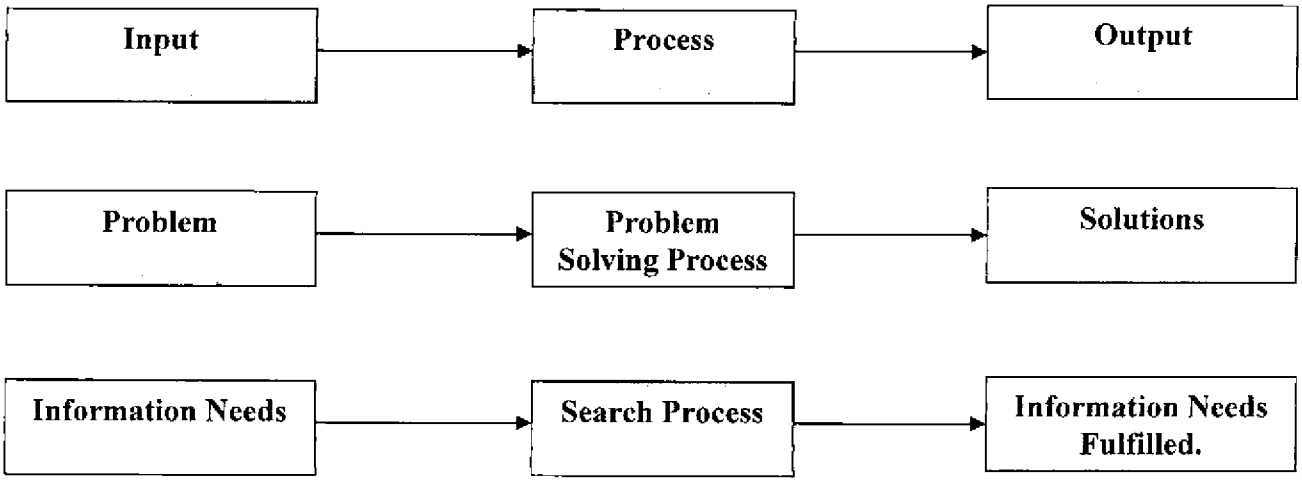
The information need (need for information) is a factual situation in which there exists an inseparable inter connection with 'information' and 'need'. Information originates and is generated because there exists a need or an interest (Uddin, 2002).

The progress of research in agriculture fields and improvement of production, essentially require timely supply of information to agriculture scientist. It is not possible to achieve self-sufficiency in food production without adequate information supply to agriculture scientist.

The concentration of effort is probably efficacious in information agriculture scientist of improved method in agriculture. It also indicates an unfortunate parochialism affecting both the agriculture scientist and the information handling industry. To promote an effective working relationship between research workers, who generate new agricultural knowledge, and the information and industry, information systems act as middlemen in a position to deliver such knowledge to the required points of distribution. The sources of agricultural information are varied in kind and widely scattered in location with an equally widespread distribution. In the same way agricultural information users are also equally scattered. To bridge these two, we need agricultural information networks (Veeranjaneyulu & Ramesh, 2000).

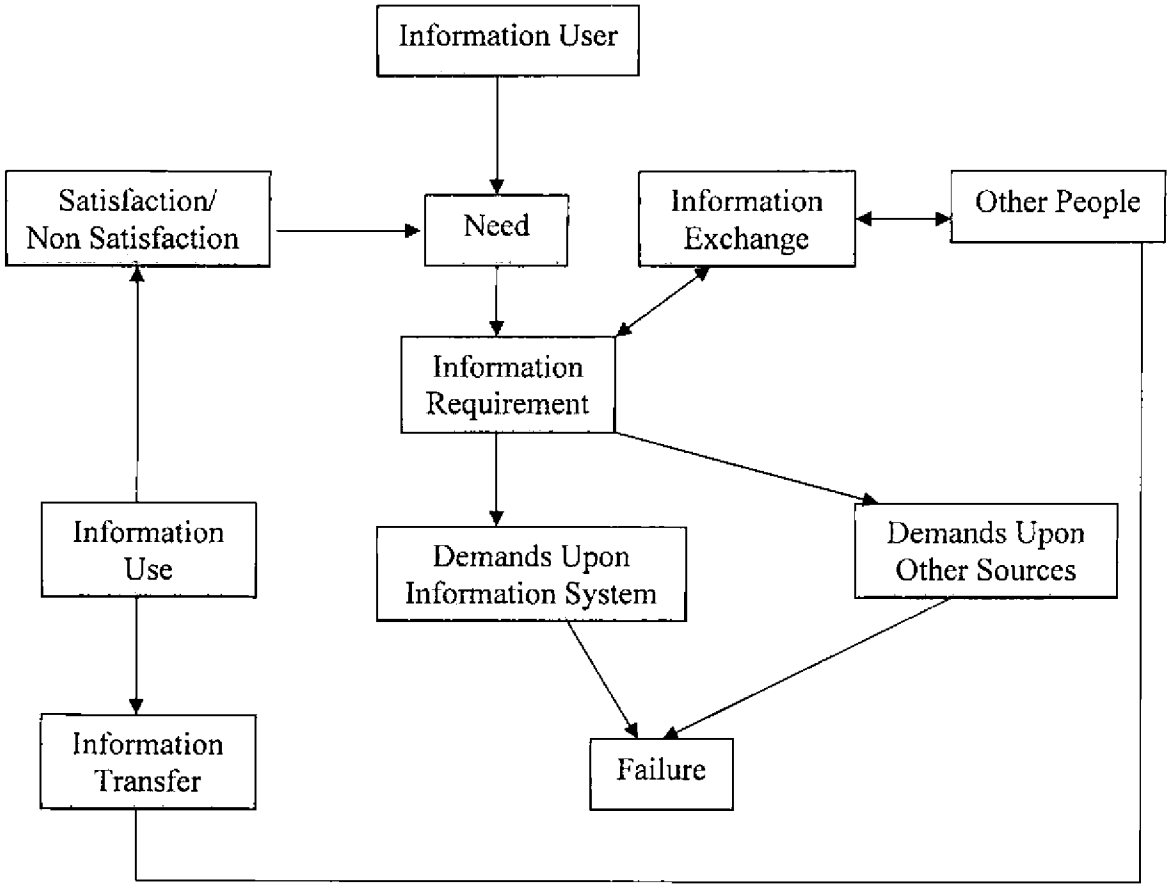
The information need may be expressed as input-process-output model. The basic components of the system are: (a) problem (b) Problem solving process and (c) Solution. The problem is analyzed to determine information needs. Solution results in resolving of the situation by filling the gap in the knowledge (Kumer, 1990). The model se-forth by him can be illustrated as below:

Figure-5.1 Se-forth Model



Information need is not a psychological state of mind, rather it is an objective need oriented towards particular tasks, problem etc (Paisely, 1986). User information needs has different areas. The inter relationships among the areas are shown by Wilson.

Figure-5.2 The Inter-relationship among the areas usually covered in users' information needs (Wilson, 1981).



In the categories of the users of agricultural information, the active scientists and researchers in research work normally top the list of user groups. (Lancaster,1979).They are attached to the agricultural universities, colleges and research organizations scattered all over Bangladesh.

The administrators, policy makers, legislators, district agriculture officers, subject matter officers and professional staff of the agriculture related institutions are always in need of information in order to manage the affairs and responsibilities comfortably, efficiently, efficiently and adequately (SAIC, 1997). Teachers use libraries for updating their knowledge and also for improving their professional competence.

The various categories of information needs of the agricultural scientists and researchers may be classified in the following ways:

(a) Ephemeral

(i) Newspapers (ii) Agricultural news and press release (iii) Market reports (iv) Weather reports, forecasts.

(b) Enduring non-scientific

(i) Parliamentary publications, official reports (ii) Publication from agricultural associations (iii) Popular articles, reports, reviews (iv) Advisory publication such as technical news letters, farming notes, bulletins, monograph, agriculture in brief, agriculture at a glance etc.

(c) Enduring scientific primary

(i) Scientific journals, technical notes (ii) Patents, specifications (iii) Theses, (ii) dissertations (iv) Research reports bulletin (v) Conference proceedings etc.

(d) Enduring scientific secondary

(iii)Text books (ii) Reviews and monographs (iii) Reference books, hand books, manuals etc. (iv) Bibliographies, indices, abstracts (SAIC 1997).

(iv)The agricultural science has large volume of non-scientific information including popular literature also. Despite the importance of this kind of literature, much of it presents great difficulty to the users wishing to keep informed of the available publications and obtain those relevant to his interest (SAIC 1997).

5.3 Development of Agricultural Information Services in Bangladesh

After independence the govt. of Bangladesh has been trying to gear up the modernization processes for increased production of crops for attaining self-sufficiency with intensification of development programmes. With the increasing use of modern technologies like chemical fertilizers, modern varieties of crops, irrigation and pesticides along with the credit and infrastructural facilities, crop production has been increased since 1970. The education, research, extension and input distributing agencies, financial institutions and other nation building organizations have been established or reorganized

to accelerate the process of agricultural development for raising the living condition of the farming community and the nation as a whole.

During Bangladesh period the Bangladesh Agricultural Research Institutes like BARI, BRRI, BJRI, BINA, BFRI, BLRI, BSRI and FRI began to identify and solve problems of the farming community through technology generation and utilization. The research activities of the above institutes have been made interdisciplinary and the research capabilities of the individual institutions have been strengthened through increased investment, improvement of technical support services, training of scientific personnel and provision of more operational autonomy to the institutes.

5.4 The Existing Information Services in NARS Institutes

Most agricultural research takes place within traditional academic boundaries. Innovative mechanisms can build bridges among fields of knowledge and people while developing practical solutions to sustainability problems in agriculture. A broad perspective can help increase traditional product (www.sust.ag.iastate.edu/gpsa/qanda.html).

The opportunity brought about by electronic information sources has in recent years exerted pressure on the educational intuitions and their libraries. The pressure on the institutions is the provision of the necessary infrastructure and the actual access to these sources. The pressure on the library and information centers is in the sourcing, acquisition and repackaging of these sources; as well as the provision of necessary guidance to end user. Academic libraries work together with other members of their institutions by teaching core competencies of information literacy – abilities involved in identifying need, accessing needed information, evaluating, managing and applying information, and understanding the legal, social, and ethical aspects of information use (Oduwole&Akpati, 2003).

Bangladesh Agricultural Research Council (BARC) was established in 1973 with the aim of co-coordinating systematic agricultural research in the country under an presidential ordinance. Later it has been amended several times to reshape BARC. By the Act 1996 BARC was given wider responsibilities of human resource development and planning,

priority setting, coordination, monitoring, reviewing and evaluation of research programs of the National Agricultural Research System (NARS). The vision of BARC is to develop an efficient, effective and sustainable system of agricultural research promoting to increase standard of living, which would be adequate for well being of the people of Bangladesh. The mission of BARC is to strengthen and mobilize research capabilities of the institutes of the NARS, universities, public sectors and other stakeholders and partnership in the generation of appropriate technologies and information for the development of agriculture sector.

The mission and the vision of BARC is in the alignment of the goal of Bangladesh Government. To implement this BARC has been organized into several divisions. Agricultural Information Center (AIC) is one of them and its function is to provide information support and services of BARC and other stakeholders engaged in agricultural research (BARC, 2008).

5.4.1 Agricultural Information Center Library (BARC)

Agricultural Information Centre is the typical representative of BARC to the national and international media. It is called the resource centre of Bangladesh Agricultural Research Council. AIC makes information available to the scientists, policy makers, teachers and research students in agriculture.

AIC performs different kinds of activities not only for BARC but also caters the need of NARS institutes. It works on literature search through CD ROM. AIC records new technologies of crops, livestock, fisheries and forestry into documents. It publishes and quarterly news letter, Newspaper indexing. It published the organization's journal, (Bangladesh Journal of Agriculture), technical reports, books and annual reports. It arranges training programmes on the improvement of computerized information, processing, technical writing, editing for NARS personnel. It ensures the participation of experts for various activities in the regional and international Agricultural Information System like AGRIS, APAARI. AIC performs Document Supply Services, Indexing Services, Audio-visual Services, SDI Services and CD Rom Search Services.

AIC library is rich in collection of 12,000 books, 3,000 reports, 200 thesis papers, 1000 workshop proceedings 1000 manuscripts, 500 and others periodicals are 1000 with title and full text CD based database-1 (contains about 150 world's re-round journals). It has also their database like NAIS (A database of National Agricultural Information), LIB (A database of library holding) and PER, (A database of periodicals). It has internet facilities with broad band connectivity open for all in office hour. But internet operation is not smooth due to interruption of the line, expert hand and insufficient computers.

5.4.2 Bangladesh Agriculture Research Institute Library

From the inception it tried to serve the agricultural information services through BARI library. BARI library was established in 1976. The library is 2000 sq. ft. It serves for its user from 9a.m to 5p.m.

BARIL is one of the most important agricultural libraries in Bangladesh. About 900 scientists and researches use this library for their daily research activities.

BARIL is usually considered a special library. It provides the scientists with many services such as Circular Services, Reprographic Services, Indexing Services Current Awareness Services Abstracting and Bibliographic Services and Periodical Indexing Services. The library has no SDI services. It works on Decimal Classification (DDC) in classifying library materials complying subject bibliographic. The library lacks computerization. It is a vital point to mark that in the digital information era the library can't be put to the best usages and services without computerization. For this it does not cater the readers to the prompt services with soft information. However the library was established with a view to providing the procurement of books, journals, various publications and allied materials related to agriculture from national and international levels.

The library was thought to disseminate up-to-date information research reports, proceedings etc. to the scientists and researches of the institute rendering effective information services with the help of information technology. Despite rich collections of 33,343 books, monographs, 575 with title periodical and reference material the library

has 9,145 reports, 604 thesis papers, 1099 workshop proceedings, newsletters, bulletins, archival material etc.

5.4.3 Bangladesh Rice Research Institute Library

Bangladesh Rice Research Institute (BRRI) library was established it in the campus since its establishment. The library is one of the important mono-crop libraries in Bangladesh playing a vital role in rice production in Bangladesh. The objectives of the library have to procure of books, journals and allied materials for the scientists. It collects research publications related to rice from national and international agencies. The library aims at disseminating up-to-date information research reports, proceedings etc to the scientists and researchers of the institute. It renders much more effective and efficient information to the rice scientists and researchers by the help of information technology compiling organizational reports. This library like other libraries gives important services like Reference Services, Circulation services, Reprographic services, Current Awareness Services, Bibliographic Services and Periodical Indexing Services.

Research in the field of rice is much more essential than that of other crops in Bangladesh as rice is the staple food for Bangladesh. So this library is to play a vigorous role in research field. The librarian is a trained professional and has enriched the library with the help of authority. So it does an active role in the development of rice production. The library little more modernized than other libraries in the research fields. Yet more attention with sufficient allocation of budget should be given so that it can render more effective services to the scientists and researchers.

5.4.4 Bangladesh Institute of Nuclear Agricultural Library

The library of Bangladesh Institute of Nuclear Agricultural was established just after the foundation of the institute with an aim to assist the scientists with sufficient up-to-date information research reports, proceedings. Procurement of materials involves of Nuclear Agriculture related books, journals and allied materials with various publications from national and international levels. The library wanted to serve the agri-scientists, engineers and researchers by rendering more information services.

The library does many services such as References Services, Circulation Services, Current Awareness Services, Reprographic Services and SDI Services. So it plays a vital role in the field of various subjects of agriculture as it develops agricultural economics agricultural engineering, biotechnology, crops, extension, farming, food sciences, horticulture plant pathology, soil and water resources.

The library is very important in the service of spreading nuclear techniques of agriculture but it has not been computerized. The library has close contact with allied national and international institutes. It keeps several linkages with national institutions to avoid duplication of research. Maintaining standard collaborations with FAO/IAEA, ICARDA, AVRDC, NIFTAL, PPIC etc. are mentionable. But the library lacks computerization and internet facility for which the scientists and researchers suffer most

5.4.5 Soil Resource Development Institute Library

The Soil Resource Development Institute was established in 1962 at Farmgate by renaming the then Department of Soil Survey with an object to develop soil of Bangladesh. It is now prepared to face the challenge of future to make a break through in crop production through improved soil management in Bangladesh. The library of SRDI was established in 1962 in the main building.

There are many objectives with which the library was established. The library fulfills the need and demand of the scientists by catering the necessary latest information, references materials, related to soil resource research The library collects the recent publications and references related to soil survey, fertility management research and development. The library improves the procurement of books, journals, periodicals, other printed and non-printed materials. It also compiles a compressive bibliography with full detail to enable the users to study the required materials. The library has to preserve and protect collected books, journals periodicals, reports; research findings and other printed materials as well as the regular, periodic and special publications of SRDI. The library can't but develop and employ suitable system of classifications filing indexing and other technical services related to SRDI publications.

With huge amount of books the library not only caters 14100 Thana Nirdeshika (guide) but also renders many services such as Readers Advisory Services (RAS), Information services to the divisional scientific officers, References and Circulation Services.

Though the library is the only specialized library and one of the oldest libraries in Bangladesh, the facilities in the library are very scanty. There are only a table and some chairs in the reading room. No library catalogue is maintained in the library, books and journals in the library are outdated. There is no computer let alone instruments of information technology in the library. No reading materials are collected due to lack of fund and disinterest of the higher authority. The services and the environment of the library do not attract the scientists as well as the researchers. Despite the location of the library being Dhaka, the library seems to be a poor garden in the institution.

5.4.6 Bangladesh Jute Research Institute Library

After the parliamentary Act of 1973 Bangladesh Jute Research Institute became autonomous. This institute has established with a view to controlling and promoting technological and economical aspects of agricultural research on jute and allied fibers, and to ensure required quality of Jute in Bangladesh and abroad. BJRI is a specialized research organization in agricultural field for Agro-industrial sector with autonomous status. There are twelve divisions in the institute.

The status of information services

Bangladesh Jute Research Institute Library is a special library. In order to meet the needs of Jute researchers at national level, the library has the following objectives:

a) To improve the procurement of jute related books, journals, periodicals and other publications and allied materials
b) To collect /gather the important publications from various regional and international agencies
c) To preserve and dissemination up-to date information, research reports, proceedings etc.
d) To circulate the important findings of researchers on High Yielding varieties (HYV)
e) To deliver up more effective information services to the scientists and researchers.

Important Services are:

1) Readers advisory services
2) Reference services
3) Reprographic services
4) Indexing and abstracting services BJRI library is the primary unique library in the field of jute related matters

Limitations

The characteristic of a special library is rendering every important service to the scientists and researchers. But BJRI Library does not have enough facilities for rendering services. It is yet to provide SDI, Inter loan and computerized library services. There is no automation service. It serves services manually. For this scientists are losing their interest to consult the library.

5.4.7 Bangladesh Sugarcane Research Institute Library

The sugarcane research station was renamed as Bangladesh Sugarcane Research Institute after the liberation of Bangladesh. It established a library in 1957 but later the library was upgraded in 1974. The library had several objectives like other research libraries. The library is rich in the collection of books, periodicals and other library materials maintaining special subject reference, files and indices, disseminating currently published information through journals, annual reports, technical reports and reference services, compiling organizational reports as well as processing required publications from abroad.

There are many important services the library renders to the users such as: Reference Services, Current Awareness Services, Reprographic Services, and Lending Services. The library is a special library but its services are not mentionable.

The library does not provide SDI services, Inter Library Loan, Indexing and Abstracting and computerized library services to the scientists. The library operations are manual. The scientists can't adequate information with the traditional journals and books. There is no good procurement and internet facility.

5.4.8 Bangladesh Livestock Research Institute Library

The library of Bangladesh Livestock Research Institute was established in 1986 and started functioning with a small collection of books and journals in the same year. But now the library has become one of the richest and biggest libraries in the country for the services.

The objectives with which library was established are (1) to serve as a livestock information centre, (2) to collect and preserve the livestock publications within and outside the country and to keep the scientists and researchers aware of the latest information in the field of livestock and (3) to provide CAS and SDL services to scientists.

The main services of the library are a) Readers Services b) Reprographic service c) Current awareness Services d) Selective Dissemination of Information Services e) Indexing and Abstracting Services.

In the field of livestock this library plays an important role catering the needs and demands of the scientists and researchers with books, journals, periodicals. It has been preserving indigenous and foreign journals. The lack of the library is not less. It does not render loan services and computerized library services. There is a shortage of manpower. The development of the library is very slow though the latest livestock information is the key to the development of this sector. The library should be automated as soon as possible.

5.4.9 Bangladesh Forest Research Institute Library

The library of Bangladesh Forest Research Institute established in 1955 in Chittagong started its functioning after the inception of the institute. The library has been maintaining collaboration with national and international forestry research organizations and networks. The objectives of the library are to improve the procurement of the books, journals and other allied materials related to forest, collecting the important publications from various regional and international agencies. It aims at disseminating up-to-date information research report, proceedings etc. to the scientists. It also renders more effective information services to the scientists and researchers. The library is rich with

special reference materials like AGRIS, AGRINDEX, and AGRICOLA etc. It has so far imparted training to over 50,000 individuals (foresters, extension works, NARS researchers, farmers, and users).

Being mandated as the only public research organization to conduct forest management and forest utilization research. The library is rich enough to cater to the current information needs of nation with the database it has created and the technologies generated. The important services the library gives the readers are Reference Services Current Awareness Services, Selective Dissemination of Information Services Circulation Services and Reprographic Services.

The library suffers from trained manpower, adequate finance and modern equipment. The library does not render inter-library loan, indexing and abstracting services to the scientist and researchers. The library follows a manual operation. There is no use of computer at all though it should be a special library with special opportunities for the users. It is high time for the authority to introduced modern electronic devices to render effective and efficient information services to the scientists and researchers. To make the library digital in service systems it should be computerized with internet facilities.

5.4.10 Fisheries Research Institute Library Documentation Center

The Fisheries Research Institute was established in 1984 which was subsequently renamed as Bangladesh Fisheries Research Institute by an Act.

The library and documentation centre of fisheries research institute was established in 1984. It is a specialized library and the largest one in the field of fisheries research. It is rich in books, journals, reports and proceedings.

The library collects important publications in fisheries, agriculture and shrimp culture from various national and international organizations. It does improve the procurement system of books, journals and allied materials related to fish. It also disseminates up-to-date information to the fisheries, scientists and researchers.

5.4.11 Bangladesh Tea Research Institute Library

Like other research institutes BTRI has also a library. After the birth of Bangladesh with the change of the institute's name, the library was named BTRIL having sufficient space. The library was established with the keen objectives like improving the procurement system of books, journals and allied materials related to tea collecting various tea related publications from the country and abroad. The library aims at providing up-to-date information, research, reports, proceedings etc. for the scientists and researchers. It does compile organizational journals and reports of various levels.

BTRIL like other NARS institutes library is considered a research library without which research work is quite impossible. It provides not only important information through books, journals, reports proceedings etc. published from the library but also some other special services such as Reference Services Current Awareness Services, Selective Dissemination of Information Services, Indexing and Abstracting Services, Reprographic Services. The library collects foreign tea journals too. The scientists and researches are much more benefited by the library journal, research reports. Despite being old the library has not much been developed. The library is not run systematically for the lack of proper supervision and attention from the authority. It lacks appropriate mechanisms to review the library activities. The library personnel are not properly trained up. It should be automated with modern technology to run with the modern concept.

5.5 Conclusion

To save the poor people from hunger and malnutrition, we must raise agricultural production and to raise food production we need to develop modern technology for efficient farming. So research in agriculture is utmost important to generate appropriate technology and knowledge. Research without information is unthinkable. So information services will have to be improved to cater need of the scientists, academicians and other professionals so that they can do better in their own fields utilizing information and communication technology especially in the field of dissemination of information. Libraries and information centers can hardly function today without computers and information technologies. The library and information profession has to change and adopt itself to the developments taking place in information technology. For the purpose of

information services may be provided response to the specific requirement of the intended users namely policy makers, scientists, researchers, farmers etc. Farmers are the main representative agents of agricultural development. They are much benefited by increasing their production with the help of information on new knowledge and technologies recommended by researchers. So it is essential to improve information services of Bangladesh National Agricultural Research System through effective utilization of Information and communication technology that will minimize the time.

CHAPTER 6

FINDINGS OF THE SURVEY AND DISCUSSION

Chapter 6

Findings of the Survey and Discussion

The authenticity and cogency of the research depends upon the validity of research data. Hence, it is imperative to provide the reader with details of data collection and generation, analysis method of the problems, with their solutions or effects of the researched data. This section gives a good indication of what is expected to get out of the research. The investigator has attempted the data analysis and possible outcomes to the theory and questions that the users have raised. This chapter is a good place to summarize the significance of the work. The researcher has tried to find out the existing information systems and services of NARS, available infrastructural facilities, modern library facilities, library professional's ability, some of the basic and general information of the libraries and the details about materials processing etc.

Table 6.1 : Basic Facts of Library in the NARS Institutes in Bangladesh

Name of the Institute/(Type)	Name of the Library/ Information Centre	Year of Establishment	Address of the Library	In separate building (Y/N)	Area of the Libray (Sq. ft)
1. BARC (Autonomous)	Agricultural Information Centre	1973	BARC, Farmgate Dhaka 1215 Tel. +880 2 913 2415; Fax.+880 2 913 2415 e-mail.barc@net.bd	Yes	12,500 sq ft
2. BARI (Autonomous)	BARI Library	1970	BARI, Joydebpur Gazipur 1701 Tel. +880 2 926 1415; Fax.+880 2 926 1415 e-mail.dg.bari@bari.gov.bd	Yes	10,386 sq ft
3. BRRI (Autonomous)	BRRI Library	1970	BRRI, Joydebpur Gazipur 1701 Tel. +880 2 924 7401-5/476; Fax.+880 2 926 1110 e-mail.head.lib@brri.gov.bd; saleha60@yahoo.com	No	2,200 sq ft

4. BJRI (Autonomous)	BJRI Library	1951	BJRI, Manik Mia Avenue, Dhaka Tel. +880 2 812 1931 Fax, +880 2 911 8415 e-mail. info@bjri.gov.bd	Yes	3,000 sq ft
5. BINA (Autonomous)	BINA Library	1973	BINA, BAU Campus, Mymensingh 2202 Tel. +880 91 67601-2/147,173 Fax. +880 91 67842 e-mail. dg@bina.gov.bd	No	1,600 sq ft
6. SRDI (Government)	SRDI Library	1962	SRDI, Krishi Khamar Sarak, Farmgate, Dhaka 1215 Tel. +880 2 815 3618; Fax.+880 2 911 0844 e-mail.kshoq-lib@yahoo.com	No	1000 sq ft
7. BSRI (Government)	BSRI Library	1974	BSRI, Ishurdi, Pabna Tel. +880 7326 63414 250 Fax. +880 7326 63888 e-mail. bsri2bsri.gov.bd	No	3600 sq ft
8. BLRI (Autonomous)	BLRI Library	1986	BLRI, Savar, Dhaka 1341 Tel. +880 2 779 1683; Fax.+880 2 779 1675, e-mail.libblri@bangla.net	No	No response
9. BFRI (Forestry) (Government)	BFRI Library	1955	P.O. Box # 273, Sholoshahar, Chittagong Tel. +880 31 258 1207; Fax.+880 31 681 566 e- mail.bhuian_bfri@yahoo.com	Yes	8000 sq ft
10. BFRI (Fisheries) (Autonomous)	BFRI Library & Documenta-tion Centre	1987	BFRI, Mymensingh 2201 Tel. +88 091 65874 Fax. +88 091 55259 e-mail. srlibrarianfri@gmail.com	No	3540 sq ft
11. BTRI (Autonomous)	BTRI Library	1957	BTRI, Srimongal 3210, Moulavibazar. Tel. +08626 71225 Fax. +880 8626 71930 e-mail- director_btri@yahoo.com	No	660 sq ft

(Source: Survey Data, 2011).

Table 6.1 reveals that all the NARS libraries and one information center for the current study were established during 1951-1987. The eight institutes under NARS are autonomous and rest three are government departments. Among the libraries of the NARS, BARC has the highest space (12500 sq ft) for library and information service while BARI has the second highest area space (10, 386 sq ft). BTRI has the lowest space (660 sq ft). Four libraries are located in Dhaka, two in Gazipur, two in Mymensingh, one in Srimongal, Moulavibazar, one in Ishurdi, Pabna and the rest one in Chittagong.

Table 6.2 : Institutional Information of NARS Library / Information Centres in Bangladesh

Name of the Institute/(Type)	Name of the Library/ Information Centre	Website	Type of Library	Working hours/day	In separate building (Y/N)
1. BARC (Autonomous)	Agricultural Information Centre	www.barc.gov.bd	Special	09:00 a.m. to 05:00 p.m.	Yes
2. BARI (Autonomous)	BARI Library	www.bari.gov.bd	Research	09:00 a.m. to 05:00 p.m.	Yes
3. BRRI (Autonomous)	BRRI Library	www.brri.gov.bd	Research	09:00 a.m. to 05:00 p.m.	No
4. BJRI (Autonomous)	BJRI Library	www.bjri.gov.bd	Special	09:00 a.m. to 05:00 p.m.	Yes
5. BINA (Autonomous)	BJNA Library	www.bina.gov.bd	Special	09:00 a.m. to 05:00 p.m.	No
6. SRDI (Government)	SRDI Library	www.srdi.gov.bd	Special	09:00 a.m. to 05:00 p.m.	No
7. BSRI (Government)	BSRI Library	www.bsri.gov.bd	Special	09:00 a.m. to 05:00 p.m.	No
8. BLRI (Autonomous)	BLRI Library	www.barc.gov.bd	Special	09:00 a.m. to 05:00 p.m.	No
9. BFRI (Forestry) (Government)	BFRI Library	www.bfri.gov.bd	Special	09:00 a.m. to 05:00 p.m.	Yes
10. BFRI (Fisheries) (Autonomous)	BFRI Library & Documenta-tion Centre	www.bfri.gov.bd	Special	09:00 a.m. to 05:00 p.m.	No
11. BTRI (Autonomous)	BTRI Library	www.btri.gov.bd	Special	09:00 a.m. to 05:00 p.m.	No

(Source: Survey Data, 2011).

Table 6.2 shows that some are in the same building while others are in separate building within the same premise. Among 11, only 4 libraries are located in separate building and rest seven libraries are located within the same building of the institute. All libraries operate within the official hours, that is, 09 AM to 05:00 PM. This shows that the scientists do not get service of the information beyond office hours. Among eleven surveyed libraries nine are special and the rest two are research ones. All the sample libraries have communication facilities like telephone, fax and e-mail. All surveyed institutes have their individual websites.

Table 6.3 : Management Information of NARS Library / Information Centres in Bangladesh

Name of the Institute/ (Type)	Name of the Librarian	Qualification	Management of Library	Existence of review mechanism (Y/N)	Maintaining Library Inventory of equipment (Y/N)
1. BARC	Md.Rafique Mostafa Kamal (5th grade)	MS in Documentation & Information Sciences	Other	No response	yes
2. BARI	Senior Librarian (6th grade)	MS in Library Sciences	Committee	Yes	Yes
3. BRRI	Ms. Saleha Khatoon, Senior Librarian (6th grade)	MA in Information Sciences & Library Management	Committee	Yes	Yes
4. BJRI	Ms. Sanjida Sharmin	M.A	Other	No	No
5. BINA	Mohammad Faroque Hossain	MA in Library & Information Sciences	Other	Yes	Yes
6. SRDI	Kh. Shamsul Hoque (10th grade)	MA in Library & Information Sciences	Other	No	No

7. BSRI	AZM Rajiul Ansary (Grade 9)	MSS (Library Science)	Other	Yes	Yes
8. BLRI	S.M. Ekthairuddin Librarian, (5th grade)	MA in Library Sciences	Other	Yes	Yes
9. BFRI (Forest)	Md. Manik Hossain Bhuian (Assistant Librarian)	MSS in Library & Information Sciences	Other	Yes	Yes
10. BFRI (Fisheries)	Ms. Rizia Begum	MA in Library Sciences	Committee	Yes	Yes
11. BTRI	Mohammad Kamal Uddin	MSc in Library Management & Information Sciences	Other	No	No

(Source: Survey Data, 2011).

Table 6.3 indicates that the quality of staff involved in information management varies with the institutes. However, the librarians in most of the libraries have master's degree in information science. The management of the libraries of the NARS also varies among the institutes. Only three institutes (BARI, BRRI and BFRI (Fisheries)) operate their libraries through committee while rest eight libraries are managed by set rules of the institutes. Eight libraries of NARS maintain inventory of equipments while three do not.

Table 6.4 : Institute Wise Respondents

Institutes	Respondents	Total number of Scientists
1. BARC	30	51
2. BARI	40	700
3. BRRI	40	230
4. BJRI	10	200
5. BINA	10	100
6. SRDI	10	450
7. BSRI	20	75
8. BLRI	10	35
9. BFRI (Forestry)	10	100
10. BFRI (Fisheries)	10	65
11. BTRI	10	30
Total	200	2036

(Source: Survey Data, 2011).

There were eleven (11) respondents in the questionnaire on the library service providers (Librarians) of eleven NARS institutes of Bangladesh and 200 respondents from the NARS institutes of which all of them were research scientists of different designation and academic qualifications.

From BARC 30% respondent out of 51 participated in the survey. From BARI and BRRI each 40 respondents took part in the questionnaire. The highest number of the respondent comes from BARC. The respondents are all scientists from entry level to the top. Out of 2036 scientists and academicians the researcher took data from 200 personnel. But BARC scores 58.82% response where as SRDI response is the lowest one.

Table 6.5: Strength of Library staff & information provider and catalogue system of NARS Library/Information Centres in Bangladesh

Name of the Institute	Strength of Library Staff (No.)			Strength of Information Provider (No.)		
	Professional	Semi-professional	Non-professional	Professional	Semi-professional	Non-professional
1. BARC	2	0	2	4	0	0
2. BARI	4	0	3	0	0	2
3. BRRI	3	1	4	3	1	1
4. BJRI	2	1	3	1	1	2
5. BINA	3	0	2	1	0	0
6. SRDI	1	1	1	1	0	9
7. BSRI	3	1	1	2	0	0
8. BLRI	1	0	1	1	0	0
9. BFRI (Forest)	2	0	6	2	6	0
10. BFRI (Fisheries)	3	2	2	2	1	0
11. BTRI	1	0	3	0	0	0

(Source: Survey Data, 2011).

Table 6.5 represents the strength of staff of the NARS libraries and information provider. BFRI (Forest) has the highest number (16) of total staff involved in library and information providing service next to BRRI (13). The lowest number of staff is in the BLRI (3). In terms of quality of staff, BARI has the highest number of professional staff in library.

Table 6. 6 : Institutional Information of NARS Library/Information Centres in Bangladesh

Name of the Institute	Catalogue	Maintaining Library Statistics (Y/N)
1. BARC	Automated	Yes
2. BARI	Card form	Yes
3. BRRI	Card form	Yes
4. BJRI	Card form	No
5. BINA	Card form	Yes
6. SRDI	Both Automated & Card form	No
7. BSRI	Card form	Yes
8. BLRI	Card form	Yes
9. BFRI (Forest)	Card form	Yes
10. BFRI (Fisheries)	Card form	Yes
11. BTRI	Card form	No

(Source: Survey Data, 2011).

Table 6.6 represents the status of library service delivery. Only BARC and SRDI maintain automation in cataloguing and rest 09 libraries have card form which is old system. It shows that the system needs to be changed with the experience of BARC and SRDI. The statistics of the information materials are maintained in most of the libraries while three libraries do not maintain statistics. The libraries that do not maintain statistics are BJRI, SRDI and BTRI. For the sake of better service and discipline the three libraries should start statistics of library.

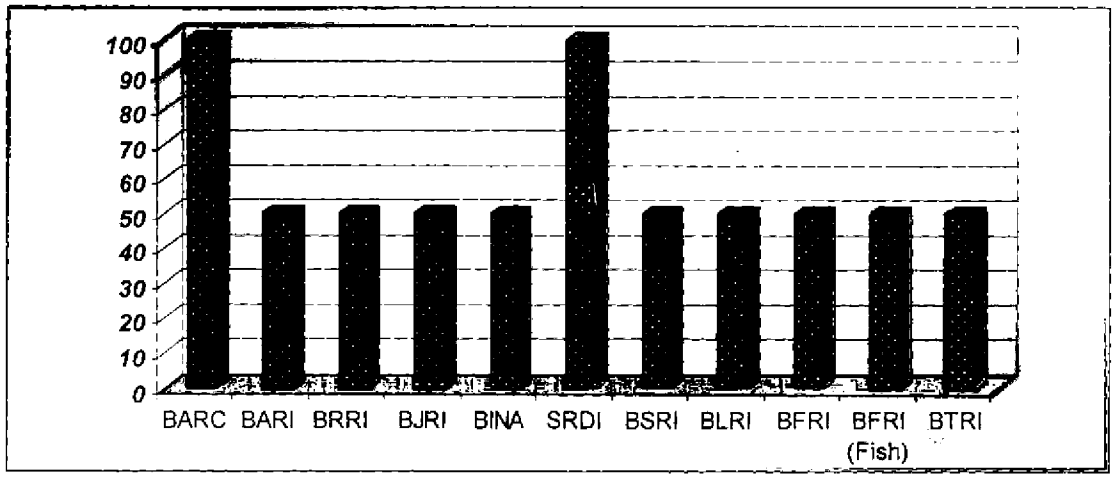


Figure - 6.1 Libraries in NARS Using Card (50 Unit) Form or Automation (100 Unit)

Table 6.7 : Staff Position Situation to run The Library Smoothly With Reason & Justification of NARS Library/Information Centres in Bangladesh

Name of the Institute/	Sufficient/ Insufficient	Reasons for Insufficiency	Justification
1. BARC	Insufficient	Having good number of collection & various type of users	a)The organization is the apex body of NARS under which 10 organization are associated, b) The collection is diversified in nature & therefore, the users are also diversified, c) There are projects within the organization, demand from them also need to be fulfilled, d) Serving from full text database requires much afford and time, e) Head of the library engaged in other than the library activities.
2. BARI	Insufficient	No response	a) Smooth running and management of the library, b) Provide improved library services to the researchers, c) Library databases and making input to it, d) Strengthening exchange and complementary programme, e) Documentation works with accessioning, catalogue and classification etc. of the documents received so far & to be received during this time.
3. BRRI	sufficient	Not Applicable	Not Applicable
4. BJRI	Insufficient	Lack of manpower	No response

5. BINA	Insufficient	Lack of manpower	No response
6. SRDI	Insufficient	Existing number of staff do not cover the total service of library	a) Cataloguer – 01, b) Book sorter – 01 & c) Book binder – 01 are needed for smooth running of the library
7. BSRI	Insufficient	Lack of manpower	No response
8. BLRI	Insufficient	Insufficient manpower	a) There are needs of at least three professional manpower to run the library smoothly.
9. BFRI (Forest)	Insufficient	No response	No response
10. BFRI (Fisheries)	Insufficient	Lack of manpower & inadequate financial support	No response
11. BTRI	Insufficient	Not Applicable	No response

(Source: Survey Data, 2011).

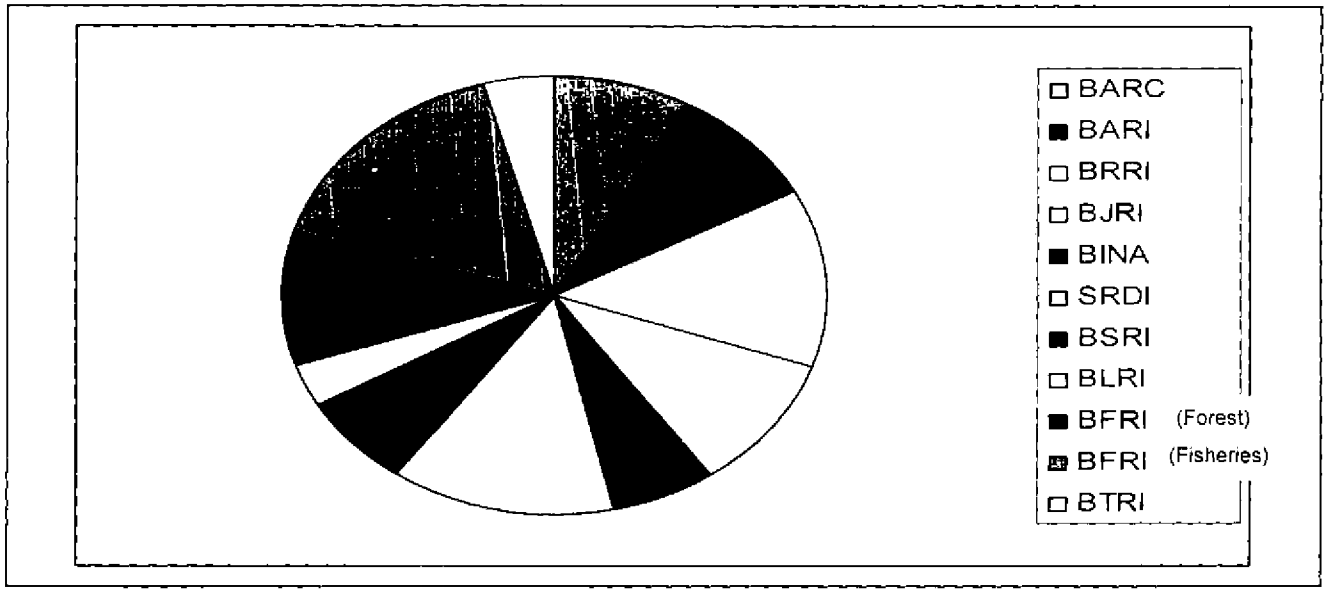


Figure - 6.2 Staff Position Situation NARS Library / Information Centres in Bangladesh

Table 6.7 shows qualitative description of the library service of the NARS. Surprisingly, only BRRI library stated as sufficient in terms of staff position in the library while rest of the NARS institutes stated as in-sufficient. In lack of manpower has been cited as the

major reason for insufficient service of the library. However, in adequate financial allocation has been cited also as reason.

Table 6.8 : Information About the Library Staff of the NARS Institutes in Bangladesh

Name of the Institute/ (Type)	Designation	Qualification	Salary scale	Work allotted
1. BARC	Principal Librarian	MS	22,500 -	Library administration and management. Also provide services
	Other Professional staff	MA	No response	Classification, cataloguing, providing service & secretarial works
2. BARI	Senior Librarian	M.A in Lib. Sc.	18500 – 29700	No response
	Librarian	M.A in Lib. Sc.	11000 – 20370	No response
	Cataloguer	B.Sc , Dip. in Lib Sc.	5200 – 11235	No response
	Non-professional	HSC	4700 – 9745	No response
		Class VIII	4250 – 8140	No response
3. BRRI	Senior Librarian	M.A.	18500 - 29700	Whole management of the library
	Librarian	M.A.	11000 – 20370	No response
	Assistant Librarian	M.A.	5500 – 12095	No response
	Semi-professional	SSC	5500 – 12095	No response
	Non-professional	Class VIII	4100 – 7740	No response
4. BJRI	Librarian	M.A.	11000 – 20370	No response
	Semi-professional	SSC	5500 – 12095	No response
	Non-professional	Class VIII	4100 – 7740	No response
5. BINA	Librarian	M.A.	11000 – 20370	Perform all functions of library management & administration
	Assistant Librarian	B.A. & PGDLIS	No response	Make the call no, & reader service
	Other Professional staff	B.Com. & PGDLIS	No response	Book lending & borrowing activities
	Non-professional	Class VIII	No response	No response
6. SRDI	Librarian	M.A in Lib. Sc.	8000 – 11150	Whole work of the library
	Other Professional staff	SSC	4250 – 8140	Daftari
	Non-professional	Class VIII	4100 – 7740	MLSS
7. BSRI	Librarian	MSS (L&ISc)	No response	No response
	Assistant Librarian	MA (L&ISc)	No response	No response
	Other Professional staff	MSS (L&ISc) & Certificate course	No response	No response
	Non-professional	SSC		No response
8. BLRI	Librarian	M.A in Lib. Sc.	22250 – 31250	No response
9. BFRI (Forest)	Assistant Librarian	MA (L&ISc)	15700	No response
	Other Professional staff	Certificate course in L.Sc.	No response	No response

	Non-professional	BA (Pass) SSC	No response	No response
10. BFRI (Fisheries)	Senior Librarian	MA (Info. Sc. & Lib. Mgt)	18500	No response
	Assistant Librarian	MA	11500	
	Other Professional staff	Diploma	8000	No response
11. BTRI	Librarian	M.Sc in LImSc.	8000	No response

(Source: Survey Data, 2011).

Table 6.8 describes the status and salary structure of the library staff of NARS. Though all the librarians are masters in Library and Information Science but the salary structure varies among the librarians.

Table 6.9 : Frequency of Library Visit by the Respondents of NARS Personnel in Percentage

Name of the Institute	Frequency of Library visit (%)			
	Daily	Twice a week	Once a week	Occasionally
01. BARC	6.67	16.67	23.33	53.33
02. BARI	15.00	20.00	35.00	30.00
03. BRRI	25.00	17.50	25.00	32.50
04. BJRI	20.00	40.00	20.00	20.00
05. BINA	10.00	40.00	30.00	20.00
06. BSRI	25.00	15.00	40.00	20.00
07. SRDI	10.00	20.00	30.00	40.00
08. BLRI	10.00	20.00	50.00	20.00
09. BFRI (Forestry)	20.00	30.00	20.00	30.00
10. BFRI (Fisheries)	10.00	30.00	40.00	20.00
11. BTRI	10.00	20.00	20.00	50.00
Average	14.70	24.47	30.30	30.53

(Source: Survey Data, 2011).

Table 6.9 shows the picture of library users by the scientists, students and others. It shows that BARC library is used more than any other libraries. This is because the library is located in the heart of the city and near the Shere Bangla agricultural university. The library used to the lesser extent is the BTRI. It may be mentioned that BTRI is the smallest research institute in terms of number of scientists which located in the Upazilla of Maulivibazar. Table and figure also show the library use by the respondents taken from the NARS librarians. BARC library is used more frequently by average 62 persons per day. BTRI library is used less by the users (Fig. 6.3).

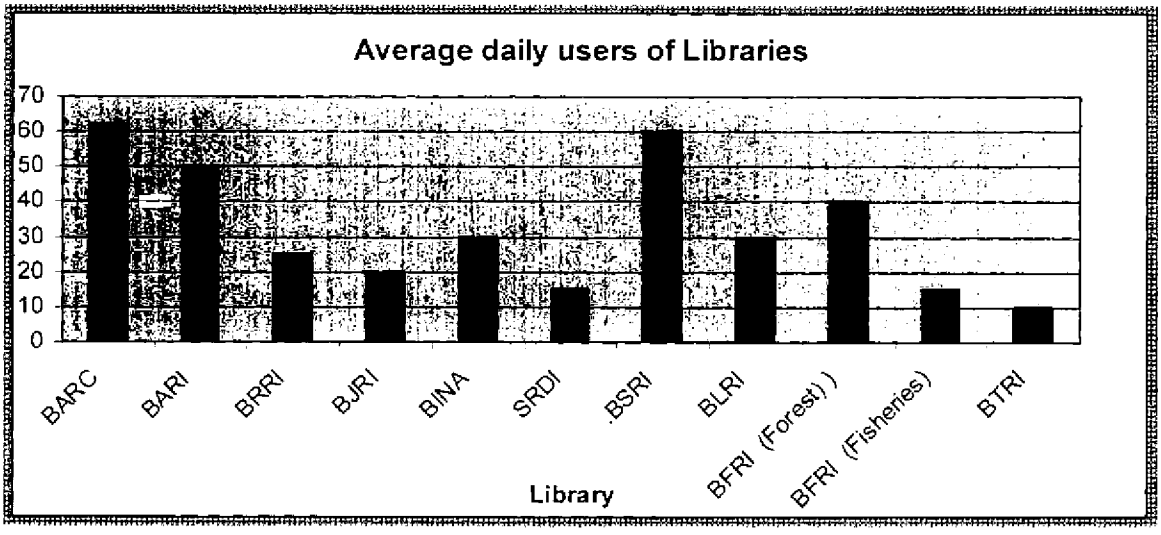


Figure - 6.3 Average Number of Users of Libraries.

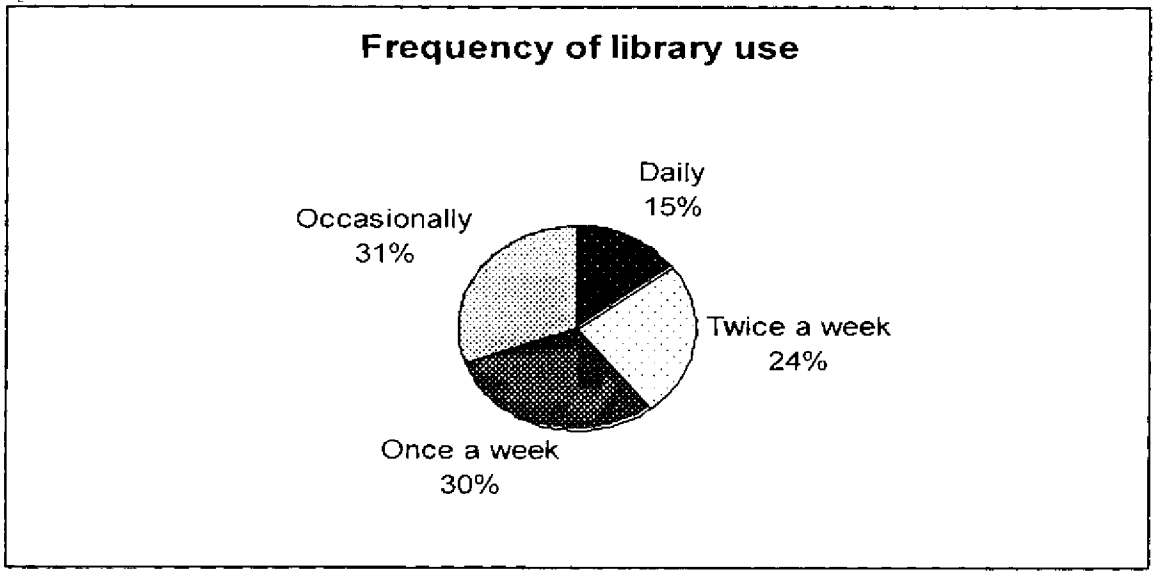


Figure - 6.4 Frequency of Library Use of NARS by the Respondents

Table 6.9 states the frequency of library visit by the respondents of NARS personnel in percentage. It says that the NARS libraries are most frequently used by the respondents taken from the NARS scientists mainly occasionally (31%) than daily (30%). Only 15% respondent scientists use the libraries daily. BRRI and BSRI libraries are used daily by the respondent scientists while BARC library is used less frequently by the respondents.

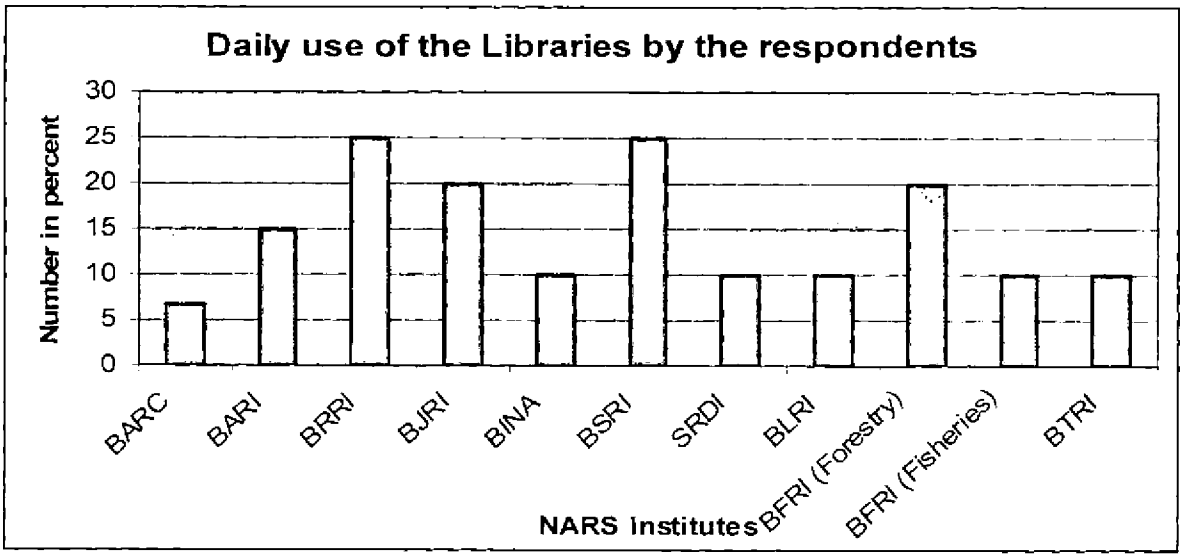


Figure- 6.5 Daily Use of the Libraries by the Respondents.

Table 6.10 : Opinion of the Respondents of NARS about the Stocks of Books for Research Work in Percentage

Name of the Institute	Inadequate	Adequate	Fairly Adequate
01. BARC	56.67	26.67	16.67
02. BARI	29.27	39.02	31.71
03. BRRI	20.00	67.50	12.50
04. BJRI	40.00	20.00	40.00
05. BINA	30.00	10.00	60.00
06. BSRI	20.00	70.00	10.00
07. SRDI	70.00	10.00	20.00
08. BLRI	40.00	20.00	40.00
09. BFRI (Forestry)	30.00	20.00	50.00
09. BFRI (Fisheries)	50.00	10.00	40.00
11. BTRI	20.00	10.00	70.00
Average	**36.90**	**27.56**	**35.53**

(Source: Survey Data, 2011).

Table 6.10 represents opinion of the respondents of NARS about the stocks of books for research work in percentage. About 37% of the total respondents have opined that the stock of books is not adequate to meet the demand of the respondents while 28% opined adequate. However institute wise picture is different. BRRI respondents opined satisfaction as adequate (68%) while respondents of SRDI opined as inadequate.

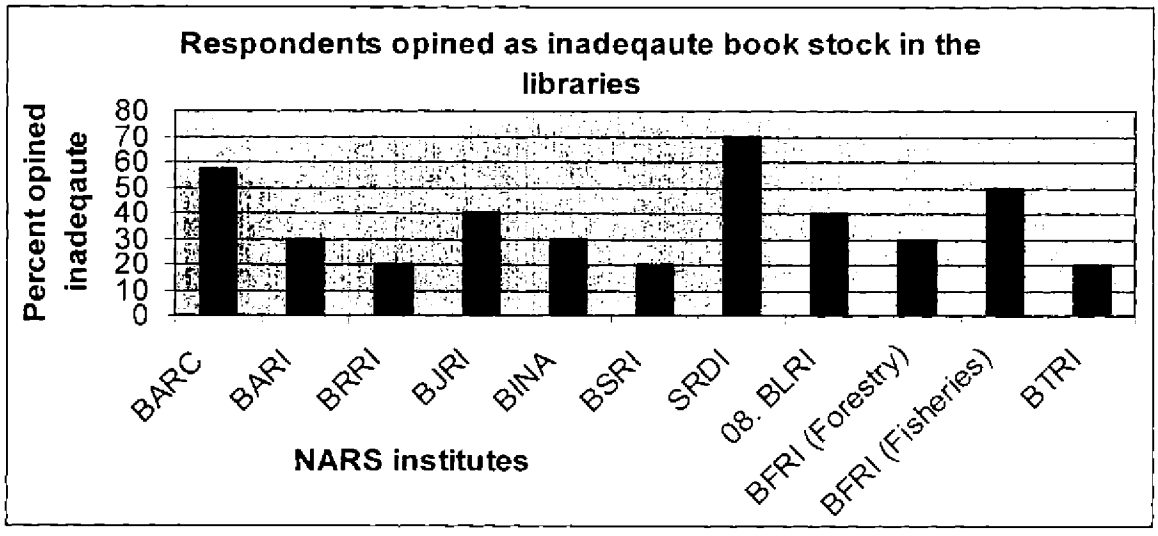


Figure – 6.6 Respondents Opined as Inadequate Book Stock in the Libraries

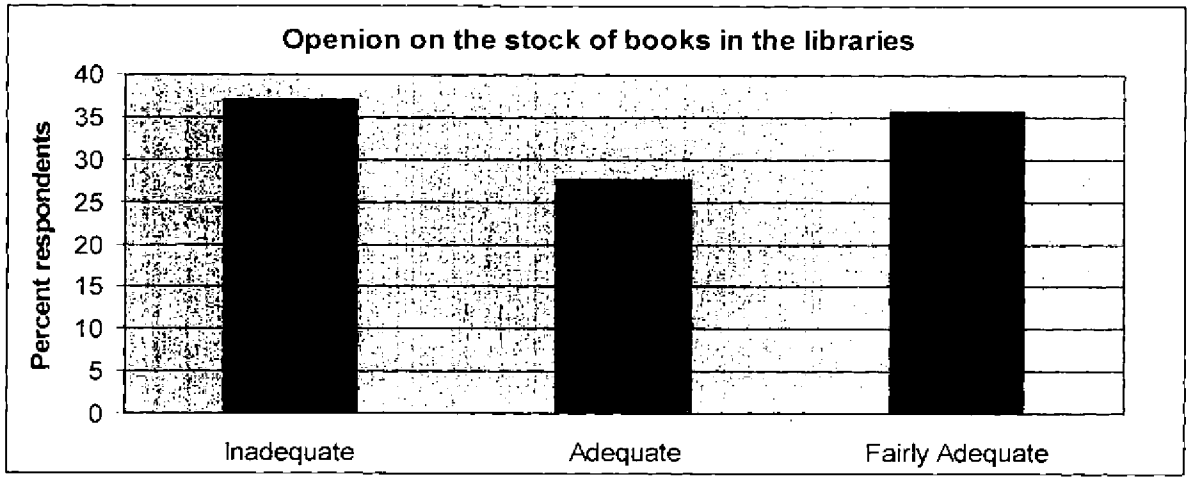


Figure – 6.7 Average Opinion of the Respondents of NARS about the Stocks of Books for Research Work in Percentage

Figure represents opinion of the respondents of NARS about the books for research work in percentage. About 37% respondents on average opined inadequacy of books and 27% opined adequate. Institution wise, BRRI respondents opined adequacy of books (68%) while 70% respondents of BSRI opined inadequacy of periodicals in the library.

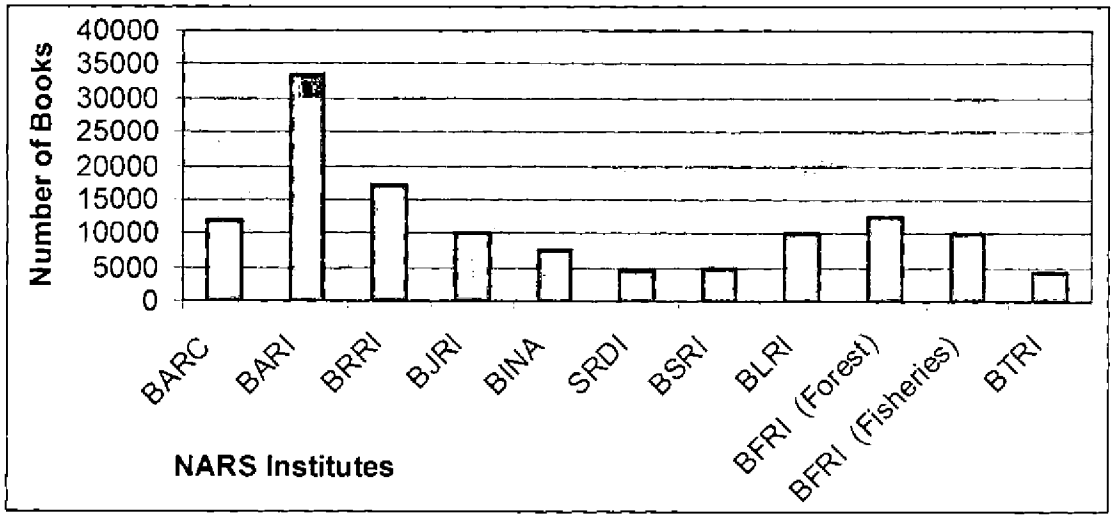


Figure - 6.8 Number of Books in the Libraries of NARS Institutes

Figure 6.8 Shows that BARI has the highest number of books i.e about 33000 books while SRDI, BSRI and BTRI have the lowest number of books i.e less than 5000.

Table 6.11 : Opinion about the Stocks of Periodicals for Research Work

Name of the Institute	Inadequate	Adequate	Fairly Adequate
01. BARC	70.00	20.00	10.00
02. BARI	12.50	25.00	62.50
03. BRRI	10.00	70.00	20.00
04. BJRI	50.00	20.00	30.00
05. BINA	20.00	10.00	70.00
06. BSRI	75.00	10.00	15.00
07. SRDI	70.00	10.00	20.00
08. BLRI	30.00	10.00	60.00
09. BFRI (Forestry)	30.00	30.00	40.00
10. BFRI (Fisheries)	30.00	20.00	50.00
11. BTRI	40.00	10.00	50.00
Average	39.77	21.36	38.86

(Source: Survey Data, 2011).

Table 6.11 represents opinion of the respondents of NARS about the stocks of periodical for research work in percentage. About 40% of the total respondents have opined that the stock of books is not adequate to meet the demand of the respondents while 35 opined adequate. However institute wise picture is different. BRRI respondents opined satisfaction as adequate (70%) while respondents of BINA, BSRI, SRDI, BLRI and BTRI opined as inadequate.

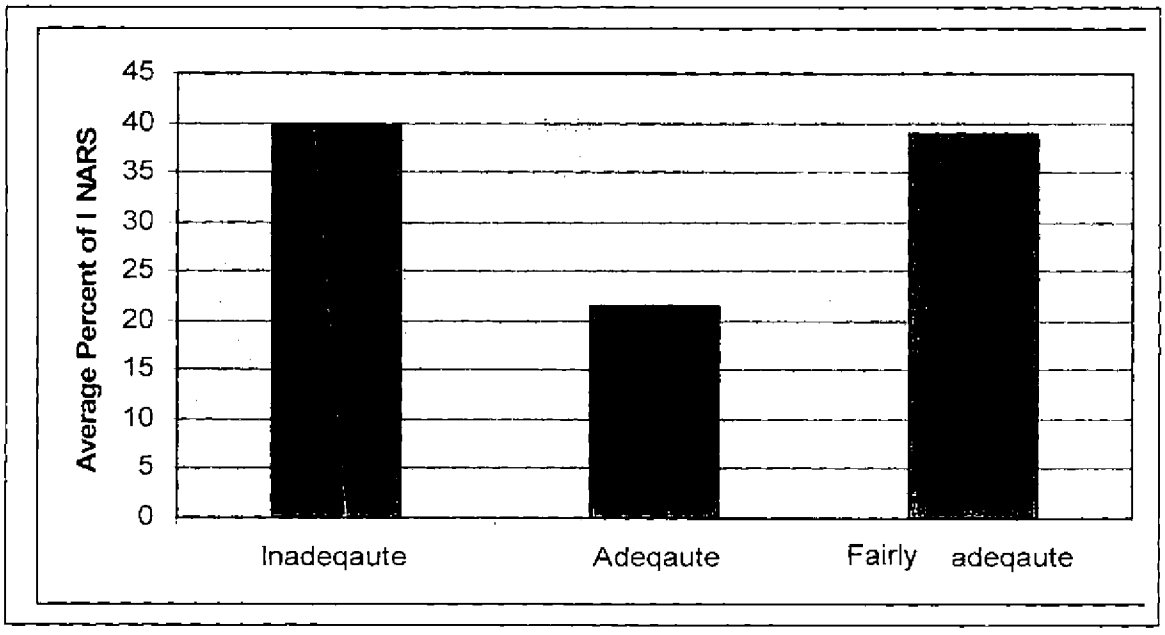


Figure - 6.9 Average Opinion of the Respondents of NARS about the Periodicals in Percentage

Figure 6.9 represents opinion of the respondents of NARS about the periodicals for research work in percentage. About 40% respondents on average opined inadequacy of periodicals and 22% opined adequate. Institution wise, BRRI respondents opined adequacy of periodicals 70% while 75% respondents of BSRI opined inadequacy of periodicals in the library.

Table 6.12 : Opinion of the Respondent about the Percent of Fulfilling the Service Requirement by them

Name of the Institute	0-20 %	20-40%	40-60%	60-80%	80-100%
01. BARC	13.33	20.00	56.67	6.67	3.33
02. BARI	2.50	5.00	25.00	65.00	2.50
03. BRRI	15.00	45.00	30.00	5.00	5.00
04. BJRI	10.00	10.00	60.00	10.00	10.00
05. BSRI	10.00	30.00	45.00	10.00	5.00
06. BINA	0.00	20.00	70.00	10.00	0.00
07. BFRI (Fisheries)	10.00	30.00	50.00	10.00	0.00
08. BLRI	0.00	60.00	30.00	10.00	0.00
09. BFRI (Forestry)	0.00	50.00	20.00	30.00	0.00
10. SRDI	10.00	60.00	10.00	20.00	0.00
11. BTRI	10.00	50.00	30.00	10.00	0.00
Average	7.35	34.55	38.79	16.97	2.35

(Source: Survey Data, 2011).

Regarding satisfaction of the respondents on the service of the libraries, average 39% opined that the 40-60% of the demand is being satisfied by the libraries. On an average 7% opined that 0-20% demand is fulfilled by the libraries and only 2.3 % opined that 80-100% of fulfillment of service (table 6.12) Institute wise, highest 65% of BARI respondents replied that 60-80% demand is fulfilled by the service.

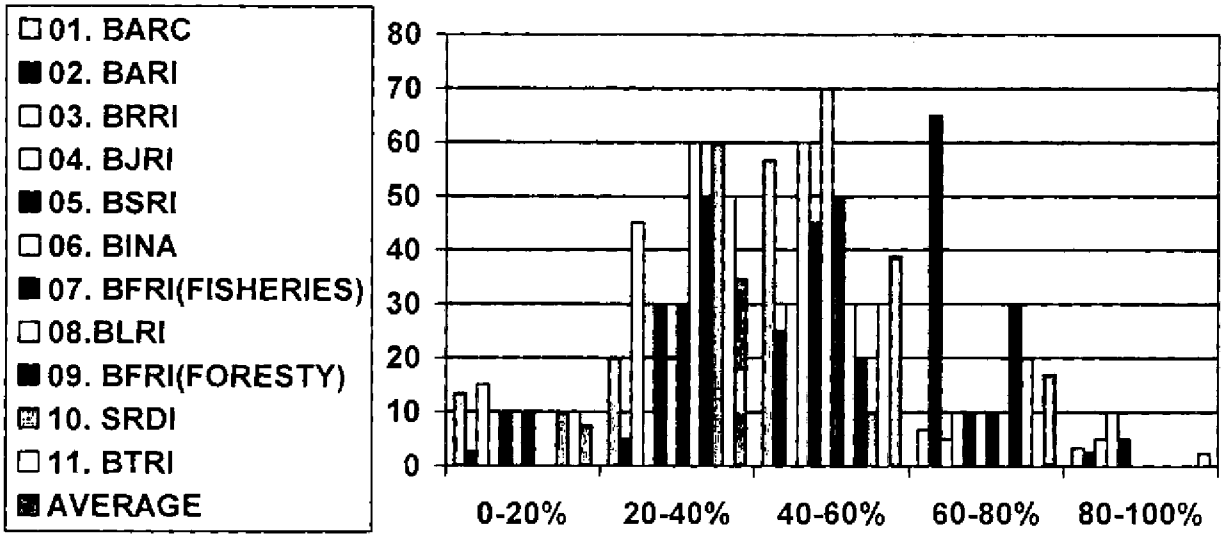


Figure- 6.10 Opinion of the Respondent about the Percent of Fulfilling the Service Requirement by them

Table 6.13 : Response on Using other Libraries

Name of the Institute/(Type)	Visiting other Library		Respondent	Visiting other Library		Name of other library
	Yes	No		Yes	No	
01. BARC	25	5	30	83.33	16.67	BAU, BSMRAU, BARI & BRRI
02. BARI	30	10	40	75.00	25.00	BAU, BSMRAU, BARC & BRRI
03. BRRI	36	4	40	90.00	10.00	BAU, BSMRAU, BARC &BARI Libraries
04. BJRI	6	4	10	60.00	40.00	BANSDOC, IJSG, BIDS, BARC
05. BSRI	9	1	10	90.00	10.00	BARC, BAU & BARI

06. BINA	10	0	10	100.00	0.00	BAU & BSMRAU
07. BFRI (Fish)	8	2	10	80.00	20.00	BAU
08. BLRI	7	3	10	70.00	30.00	BAU, BARC
09.BFRI (Forestry)	8	2	10	80.00	20.00	CU
10. SRDI	3	7	10	30.00	70.00	BARC, SPARSO
11. BTRI	7	3	10	70.00	30.00	BAU & BARC

(Source: Survey Data, 2011).

Table 6.13 represents that they are using other library for their professional jobs. One hundred percent respondents of BINA use other library (Bangladesh Agricultural University library, in the same campus). 90% respondent scientists of BRRI use BSMRAU (nearby), BARC and BARI library for professional jobs and 75% of BARI uses BAU, BSMRAU library.

Table 6.14 : Opinion of the Respondent of Different NARS Institute about the Purpose of the Use of Library

Name of the Institute	Respondent	Teaching	Research	Scholarly writings	Self Knowledge	Prescribed Course	Recreation	Respondent
01. BARC	30	6.67	53.33	20.00	3.33	10.00	6.67	100
02. BARI	40	17.50	60.00	10.00	5.00	5.00	2.50	100
03. BRRI	40	12.50	47.50	12.50	12.50	12.50	2.50	100
04. BJRI	10	0.00	70.00	30.00	0.00	0.00	0.00	100
05. BSRI	20	0.00	80.00	20.00	0.00	0.00	0.00	100
06. BINA	10	10.00	60.00	20.00	10.00	0.00	0.00	100
07. BFRI	10	10.00	70.00	10.00	10.00	0.00	0.00	100
08. BLRI	10	0.00	60.00	30.00	10.00	0.00	0.00	100

09. BFRI (Forestry)	10	0.00	50.00	40.00	10.00	0.00	0.00	100
10. SRDI	10	0.00	70.00	20.00	10.00	0.00	0.00	100
11. BTRI	10	0.00	60.00	20.00	10.00	10.00	0.00	100
	%	5.15	61.89	21.14	7.35	3.41	1.06	100.00

(Source: Survey Data, 2011).

Table 6.14 shows about the purpose of the library use. The percentage of the purposes of library use is teaching 5.15%, research 61.89%, scholarly writing 21.14%, self-knowledge 7.35%, prescribed course 3.41% and recreation 1.06%. Thus most libraries are used mostly for research purpose. BSRI library is used at the highest level for this purpose whereas BRRI library is used at the lowest level. BFRI (Forestry) library is used most for scholarly writing whereas BFRI library is at the lowest rate. BARI library is used for self knowledge and BJRI and BSRI libraries are counted at 0% level. For Prescribed Course BARI library is used mostly but many NARS institutes libraries are not used for this purpose. For Recreation BARC information center is used more than any other surveyed library.

Table 6.15 : Library users Information of the NARS Institutes in Bangladesh

Name of the Institute	No. of Daily users (Avg)	Library users						Type of Users frequently use the library				
		Teachers	Students	Administrators	Scientists	Researchers	Others, Specify	Institute Scientists	Scientists from other Institute / University	Students	Institute Staff	Others, Specify
1. BARC	62	-	√	-	√	-	√	√	√	√	-	NGO
2. BARI	50	√	√	√	√	√	√	√	√	√	-	-
3. BRRI	25	√	√	√	√	√	-	√	-	-	-	-
4. BJRI	20	-	√	-	√	√	-	√	√	√	√	-
5. BINA	30	√	√	√	√	√	√	√	√	√	√	√
6. SRDI	15	√	√	-	√	√	-	√	√	√	-	-
7.BSRI	60	√	√	√	√	√	√	√	√	√	√	√
8. BLRI	30	√	√	√	√	√	√	√	√	-	√	-
9. BFRI (Forest))	40	√	√	√	√	√	√	√	√	√	√	√
10. BFRI (Fisheries)	15	√	√	√	√	√	√	√	√	√	√	√
11. BTRI	10	√	√	√	√	√	-	√	√	√	√	-

(Source: Survey Data, 2011).

Table 6.15 shows what type of users use the library or information centre. BARC and BJRI are not visited by teacher, administrator, researchers and institute staff at all where as students, institutes scientists use all the library and information centre more or less. BARI is not used for reading by institute staff or NGoS. Scientists from other institutes, students and institutes staff do not visit BRRI for library information or data collection. All types of users mentioned by the researcher visit BFRI both (Fisheries & forest), BSRI, BTRI and BINA .

Table 6.16 : Information about Collection of Different Library Materials by the NARS Institutes in Bangladesh

Name of the Institution	Number							
	Books	Reports	Thesis	Proceedings	Manuscripts	Periodicals	Audio-visual Materials	Others
1. BARC	12000	3000	200	1000	500	1000	Full text CD based database which included 150 world's renowned journals	-
2. BARI	33343	9145	604	1099	-	575	25	3800
3. BRRI	17117	√	360	√	√	379	-	-
4. BJRI	10200	500	50	590	14	4790	5	-
5. BINA	7504	-	120	-	-	2807	-	-
6. SRDI	4495	1055	6	-	-	100	-	-
7.BSRI	5000	40	60	50	20	100	50	-
8. BLRI	10000	200	31	200	-	250	-	-
9. BFRI (Forest)	12500	300	28	800	-	590	√	-
10. BFRI (Fisheries)	10000	2000	500	150	250	400	100	-
11. BTRI	4487	15	10	68	-	240	60	8538

(Source: Survey Data, 2011).

Table 6.16 indicates that BARI has the highest quantity of books and BTRI the lowest. BARI holds most reports and BRRI has none of this category. In respect of thesis, BARI is the highest and SRDI, the lowest. BARI contains more proceedings than any other NARS Institutes. BINA and SRDI do not contain any proceedings. It is BARC and BFRI (Fisheries) which contains 500 manuscripts respectively where as BARI, BINA, SRDI, BLRI and BFRI (Forest) contain no manuscripts. BJRI contains about five thousand periodicals and SRDI and BSRI contain only one hundred periodicals. BARC has 150 CD based international journals and many other NARS institutes do not hold anyone.

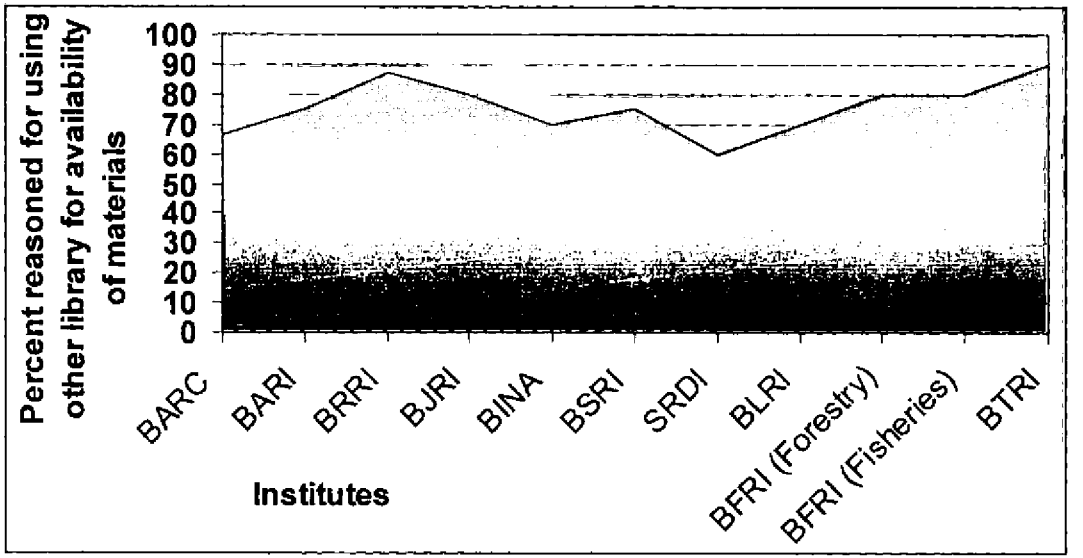


Figure- 6.11 Percent Reasoned for Using other Library for Availability of Materials.

Table 6.17 :Major Five Areas of Collection, Adequacy and Number of Volume Added During Last Five Years by the NARS Institutes in Bangladesh

Name of the NARS Institute	Major five areas								Rating Adeq / inadeq / poor	Volume added during				
	Crop Science	Agro-Processing	Fisheries	Livestock	Natural Resources	Agri-business	ICT	Others		09-10	08-09	07-08	06-07	05-06
1. BARC	√	-	√	√	√	-	√	-	**Adequate**	1000	850	1200	2000	1200
2. BARI	√	√	-	-	√	√	√	-	Adequate	1741	1415	2361	1875	988
3. BRRI	√	√	√	-	√	√	-	-	**Inadequate**	322	106	275	375	285
4. BJRI	√	-	-	-	√	√	√	-	Inadequate	150	350	150	100	188
5. BINA	√	√	-	-	√	-	√	Nuclear	**Inadequate**	40	40	35	36	35
6. SRDI	√	√	-	-	√	-	√	Soil Science	Inadequate	186	-	-	57	5
7.BSRI	√	√	-	-	√	√	√	-	**Inadequate**	450	500	400	280	350
8. BLRI	√	√	-	√	√	√	-	-	Adequate	80	3	48	50	38
9. BFRI (Forest)	√	√	-	-	√	√	-	Forest sci, & Forestry	Adequate	400	350	320	-	
10. BFRI (Fisheries)	√	√	√	-	√	√	-	-	Inadequate	15	18	20	14	25
11. BTRI	√	√	-	-	√	√	-	Tea Science	Inadequate	45	78	45	50	15

(Source: Survey Data, 2011).

Table 6.17 shows that all the NARS institutes have collection of crop science volume. All the institutes except BARC and BJRI have agro- processing volume. Only three institutes namely BARC, BRRI and BFRI have the collection about fisheries. It is notable that all the NARS institutes have the large collection about the National Resources whereas all the institutes except BINA and SRDI have the collection about agri- business.

Table 6.18 : Information about the Collection of Materials in Ascending Order with Subject, Possession of Special Materials (AGRIS, AGRI Index, AGRICOLA, CABI) and Perception by the NARS Institutes in Bangladesh

Name of the NARS Institute	Collection of materials in ascending order with subject										Possession of Special Material (Y/N)	Collection Should up-to-date
	1	2	3	4	5	6	7	8	9	10		
1. BARC	Crop Science	Soil Science	Fisheries	Livestock	Forestry	Agricultural Engineering	Social Science	Statistics	ICT	IPM	Yes	Yes
2. BARI	Library science	Agril. Economics	Science	Agro-nomy	Agril. Engin.	Entomo-logy	Food science	Horti-culture	Plant Patho-logy	Soil Science	Yes	Yes
3. BRRI	Agri-culture	Bio-chemistry	Crops	Diseases	Ecology	Farm Mgt / Food	Gene-tics	Herbi-cides	Immuno-logy	Jute Re-search	Yes	Yes
4. BJRI	Agri-culture	Soil Science	Physio-logy	Agri-business	Patho-logy	Entomo-logy	Econo-mics	Compu-ter	IPM	Science	Yes	Yes
5. BINA	Agri-culture	Soil science	Patho-logy	Agril. Eng.	Entomo-logy	Adminis-tration	Electro-nics	Compu-ter	Religion	Physio-logy	Yes	Yes
6. SRDI	Soil Science	Agricultural Sciences	BBS Publi-cations	Govt. Publi-cations	Free-dom Fight	-	-	-	-	-	No	Yes
7.BSRI	Compu-ter	Library science	Philo-sophy	Social science	Statis-tics	Economics	Mathe-matics	Physics	Chemis-try	Botany	Yes	Yes
8. BLRI	Live-stock	Animal Science	Poultry Science	Sheep & Goats	Disease of Animal	Veterinary Science	Animal Feeds & feeding	Animal Genetics	Bio-techno-logy	Agril. Econo-mics	Yes	Yes
9. BFRI (Forest)	Forest Sci. & Forestry	Environ-ment	Botany	Entomo-logy	Bio-diver-sity	Ecology	Wild life	Genetic Engin.	Bio-informa-tics	Pure Sciences	No	Yes
10. BFRI (Fisheries)	Fish culture	Fish Breeding	Shrimp culture	Fish Disease	Fisheries economics	Fisheries Magt.	Marine Fisheries	Brakish water Fisheries	Fresh water Fisheries	Lake & Rivarian Fisheries	Yes	Yes
11. BTRI	General Sciences	Botany	Plant Disease	Agri business	Bio-technology	Agril Economis	IPM	Tea Processing	Crop Physio-logy	Tea Science	No	Yes

(Source: Survey Data, 2011).

Table 6.18 states that the collection of various material maintained by the NARS Institutes fluctuates. BARC collects the crop materials most; BARI collects library science; BRRI, BJRI and BINA contain the largest collection about agriculture ; SRDI Soil Science; BSRI computer; BLRI livestock; BFRI Forest Science & Forestry; BFRI fish culture and BTRI holds the highest collections of general science. From the ten items, BARC contains the least amount about IPM; BARI; Soil Science, BINA, physiology ; SRDI, Freedom fight, BSRI, Botany; BLRI, AgriEconomics, BFRI(Forestry), pure science, BFRI (Fisheries), Lake and Riverine fisheries and BTRI holds the collection of tea science. All the NARS Institutes replied in the affirmative that they have possession of special materials and up to date collection. Nine NARS Institutes have average ten items but SRDI has five items in store of their collection.

Table 6.19 : Opinion on Computerization of NARS Libraries (%)

Name of the Institute/(Type)	Library Should be computerized		Library Should have Internet		Browsing Internet	
	Yes	No	Yes	No	Yes	No
01. BARC (Autonomous)	93.33	6.67	93.33	6.67	86.67	13.33
02. BARI (Autonomous)	87.50	12.50	87.50	12.50	77.50	22.50
03. BRRI (Autonomous)	90.00	10.00	90.00	10.00	70.00	30.00
04. BJRI (Autonomous)	70.00	30.00	70.00	30.00	50.00	50.00
06. BINA (Autonomous)	80.00	20.00	80.00	20.00	60.00	40.00
05. BSRI (Autonomous)	85.00	15.00	85.00	15.00	70.00	30.00
10. SRDI (Government)	90.00	10.00	90.00	10.00	60.00	40.00
08. BLRI (Autonomous)	80.00	20.00	80.00	20.00	70.00	30.00
09. BFRI (Forestry) (Government)	90.00	10.00	90.00	10.00	50.00	50.00
07. BFRI (Fisheries) (Autonomous)	70.00	30.00	70.00	30.00	50.00	50.00
11. BTRI (Government)	70.00	30.00	70.00	30.00	60.00	40.00
Average	85.5	14.5	85.5	14.5	69.5	30.5

(Source: Survey Data, 2011).

Table 6.19 shows that three NARS institutes are run by the government and the rest are autonomous. All the libraries have replied positively in the field of computerization and using interest. A healthy amount of response is collected about the materialization of the library computerization process. Only 14.5% have opposed the idea. All the libraries should have internet facilities. Only few respondents voted negatively. Their percentage is only 14.5%. In the field of browsing facilities about 70% respondents have nodded by 'yes' and 30% by 'no'.

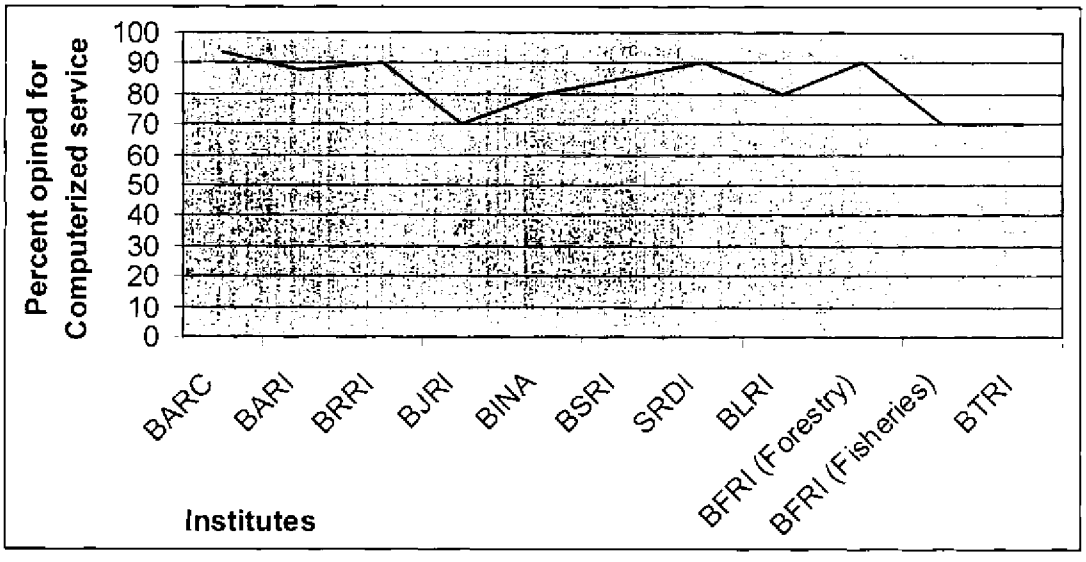


Figure - 6.12 Percent Responded for Computerized Library Services

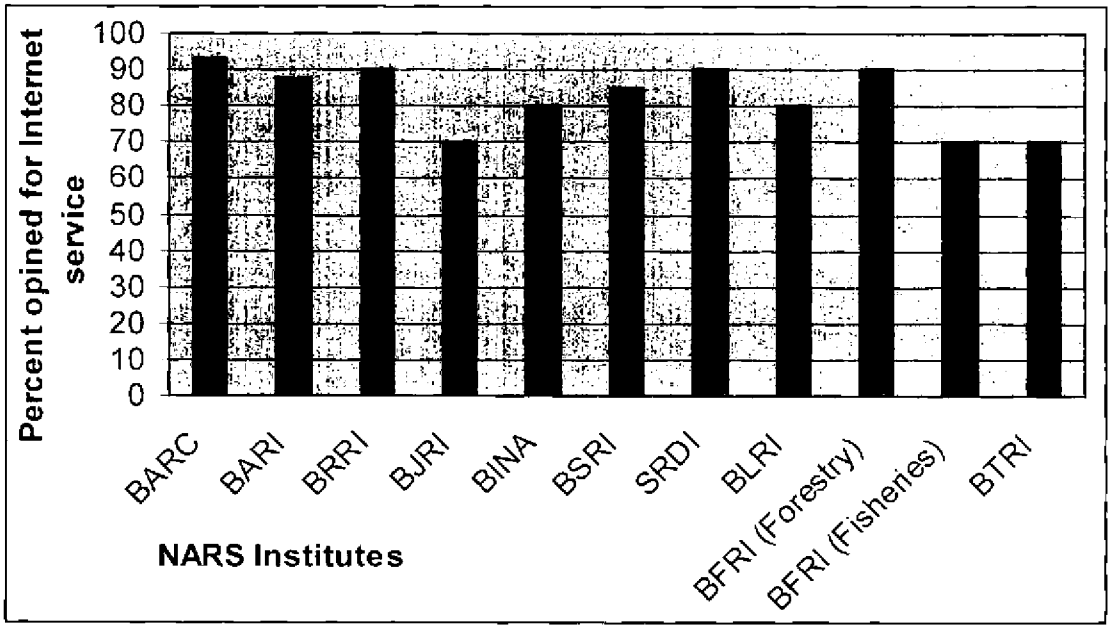


Figure- 6.13 Percent Responded for Internet Services in Library

Table 6.20 : Opinion about NAIS

Name of the Institute/(Type)	Aware about NAIS in other Countries		Is there any such NAIS in Bangladesh		If, yes name of the Centre
	Yes	No	Yes	No	
01. BARC (Autonomous)	60.00	40.00	50.00	50.00	AIC, SAIC
02. BARI (Autonomous)	57.50	42.50	50.00	50.00	AIC, SAIC
03. BRRI (Autonomous)	62.50	37.50	55.00	45.00	AIC, SAIC
04. BJRI (Autonomous)	40.00	60.00	30.00	70.00	AIC, SAIC
06. BINA (Autonomous)	60.00	40.00	50.00	50.00	AIC, SAIC
05. BSRI (Autonomous)	60.00	40.00	50.00	50.00	AIC, SAIC
10. SRDI (Government)	60.00	40.00	50.00	50.00	AIC, SAIC
08. BLRI (Autonomous)	50.00	50.00	40.00	60.00	AIC, SAIC
09. BFRI (Forestry) (Government)	40.00	60.00	30.00	70.00	AIC, SAIC
07. BFRI (Fisheries) (Autonomous)	40.00	60.00	40.00	60.00	AIC, SAIC
11. BTRI (Government)	50.00	50.00	30.00	70.00	AIC, SAIC
Average	56.00	44.00	47.00	53.00	

(Source: Survey Data, 2011).

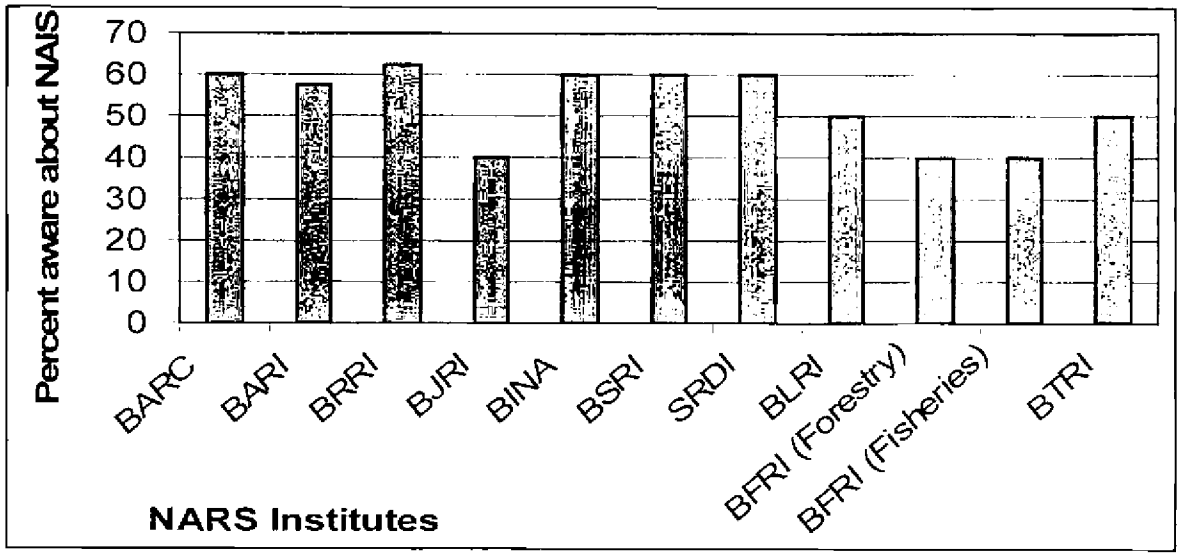


Figure - 6.14 Percent Awareness about NAIS

Table 6.20 states about NAIS. On average 56% respondents are aware of the NAIS in other countries and 47% in Bangladesh. The rest are in the opposite side. About the question of the existence of NAIS in Bangladesh 47% respondents are in the affirmative answer and 53% in the negative answer. Those who believe that there is existence of NAIS in Bangladesh want to say that AIC and SAC are two mother centers where it is found.

Table 6.21 : Linkage with FAO and keeping abstract of NARS

Name of the Institute/(Type)	Libraries should keep link with FAO /UNO library		Keeping abstract of Information generated by the NARS/University	
	Yes	No	Yes	No
01. BARC (Autonomous)	90.00	10.00	83.33	16.67
02. BARI (Autonomous)	82.50	17.50	80.00	20.00
03. BRRI (Autonomous)	90.00	10.00	75.00	25.00
04. BJRI (Autonomous)	70.00	30.00	60.00	40.00
06. BINA (Autonomous)	80.00	20.00	70.00	30.00
05. BSRI (Autonomous)	75.00	25.00	75.00	25.00
10. SRDI (Government)	60.00	40.00	50.00	50.00
08. BLRI (Autonomous)	80.00	20.00	70.00	30.00
09. BFRI (Forestry) (Government)	90.00	10.00	80.00	20.00

07. BFRI (Fisheries) (Autonomous)	80.00	20.00	70.00	30.00
11. BTRI (Government)	70.00	30.00	60.00	40.00
Average	82	18	74	26

(Source: Survey Data, 2011).

Table 6.21 shows the opinion about the linkage with FAO and keeping abstract of NAIRS. 82% respondents have opined in the favour of the linkage with FAO/ UNO library where only 18% are in the opposition. 74% respondents want to keep abstract of information generated by the NARS/ University but 36% do not want that.

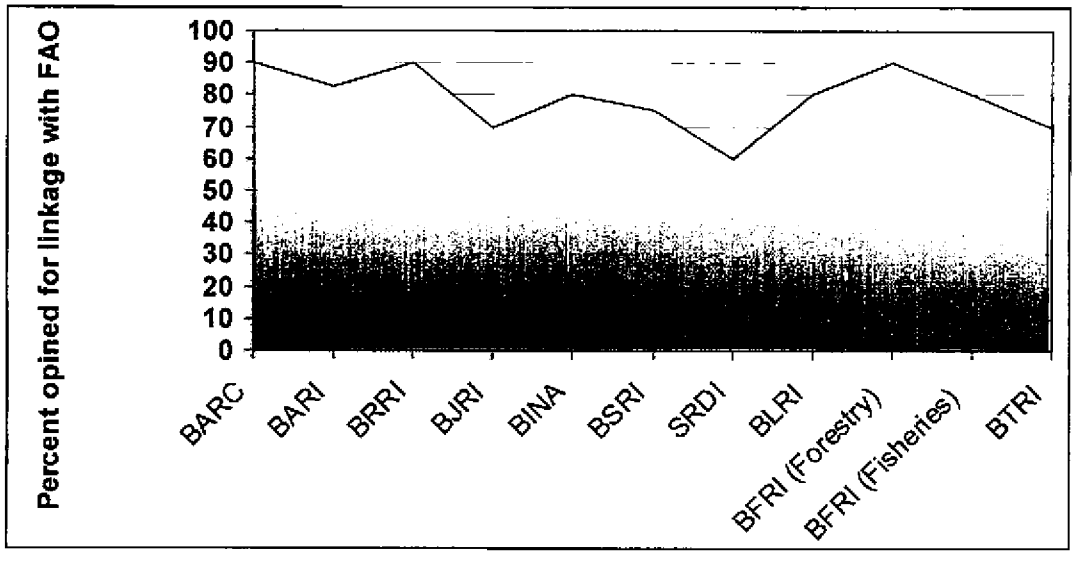


Figure- 6.15 Percent Responded for Linkages with FAO

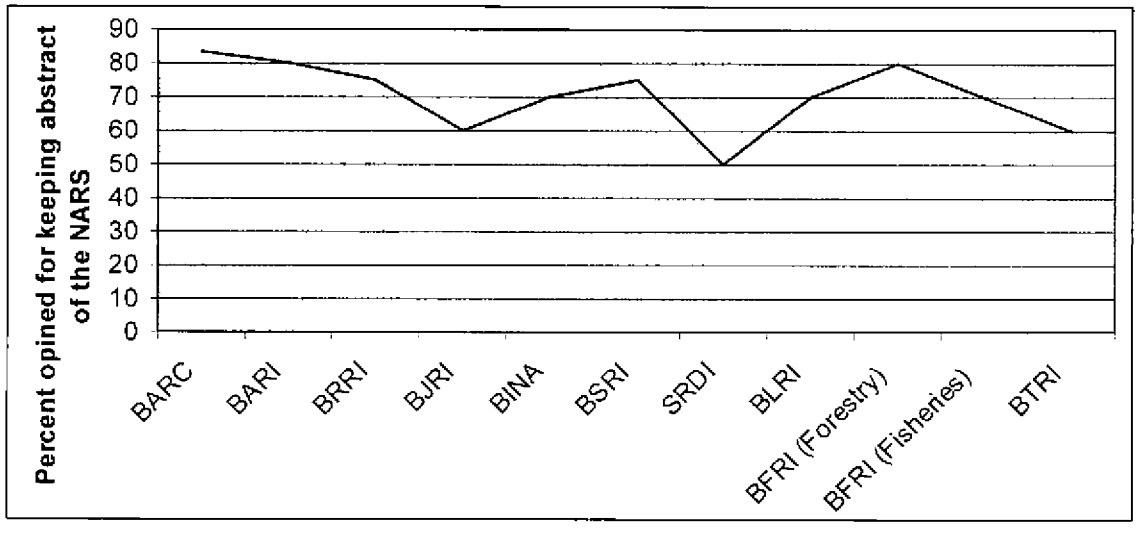


Figure- 6.16 Percent Responded for Keeping Abstract of NARS in the Library

Table 6.22 : Opinion of Respondents on Adequacy of Information Materials (%)

Name of the Institute/(Type)	Sufficiency of Existing Available Agril. Information Sources for professional work			Meeting Information Need from Professional Colleagues		
	Sufficient	Mod. Sufficient	Insufficient	Home	Abroad	Both
01. BARC	6.67	33.33	60.00	60.00	16.67	23.33
02. BARI	10.00	47.50	42.50	52.50	25.00	22.50
03. BRRI	12.50	42.50	45.00	57.50	30.00	12.50
04. BJRI	30.00	40.00	30.00	20.00	40.00	40.00
05. BSRI	20.00	50.00	30.00	20.00	50.00	30.00
06. BINA	5.00	35.00	60.00	30.00	60.00	10.00
07. BFRI	10.00	30.00	60.00	20.00	50.00	30.00
08. BLRI	20.00	60.00	20.00	60.00	20.00	20.00
09. BFRI	10.00	80.00	10.00	70.00	10.00	20.00
10. SRDI	10.00	30.00	60.00	40.00	30.00	30.00
11. BTRI	20.00	10.00	70.00	30.00	40.00	30.00
Average	12	41.5	46.5	47.00	31.50	21.50

(Source: Survey Data, 2011).

Table 6.22 shows that average 42% respondents think existing available agricultural information services for profession work sufficient and 46% insufficient. To meet information needs from professional colleagues 47% come from home, 31.5% abroad and 21.5% from the both.

Table 6.23 : Awareness of International Information Database

Name of the Institute/(Type)	Awareness about the following agricultural information sources (%)						
	AGRIS	AGRIINDEX	AGRICOLA	CABI	TEEAL	AGORA	INASPER
01. BARC (Autonomous)	26.67	10.00	26.67	93.33	66.67	16.67	10.0
02. BARI (Autonomous)	22.50	17.50	20.00	87.50	37.50	20.00	17.5
03. BRRI (Autonomous)	22.50	30.00	20.00	75.00	30.00	20.00	17.5
04. BJRI (Autonomous)	30.00	70.00	40.00	50.00	20.00	50.00	20.0
05. BSRI (Autonomous)	40.00	90.00	70.00	40.00	120.00	30.00	20.0
06. BINA (Autonomous)	30.00	20.00	40.00	10.00	20.00	25.00	10.0
07. BFRI (Fisheries) (Autonomous)	50.00	30.00	50.00	30.00	40.00	20.00	30.0
08. BLRI (Autonomous)	10.00	30.00	40.00	80.00	30.00	10.00	30.0
09. BFRI (Forestry) (Government)	20.00	30.00	60.00	30.00	50.00	30.00	20.0
10. SRDI (Government)	20.00	10.00	10.00	80.00	30.00	50.00	20.0
11. BTRI (Government)	10.00	20.00	50.00	90.00	10.00	10.00	20.0
Average	25	27	32	67.5	40.5	23	17.

(Source: Survey Data, 2011).

Table 6.23 shows about awareness of international information database. All the libraries use on average AGRIS 25%, AGRIIDEX 27%, AGRICOLA 32%, CABI 67.5%, TEEAL 41.5%, AGORA 23% and INASPERI 17.5%. BARC, BARI, BRRI, BJRI, BLRI, SRDI and BTRI use CABI international database most whereas BINA and BFRI (Forestry) use AGRICOLA international database most. BSRI uses TEEAL most BFRI (Fisheries) uses both AGRIS and AGRICOLA most.

Table 6.24 : Opinion on Inter-library Loan Service (%)

Name of the Institute/(Type)	Provision of Inter libraries Loan		If no, do you feel necessity		Library should provide SDI service	
	Yes	No	Yes	No	Yes	No
01. BARC (Autonomous)	66.67	33.33	16.67	16.67	96.67	3.33
02. BARI (Autonomous)	87.50	12.50	5.00	7.50	95.00	5.00
03. BRRI (Autonomous)	62.50	37.50	30.00	7.50	92.50	7.50
04. BJRI (Autonomous)	60.00	40.00	30.00	10.00	90.00	10.00
05. BINA (Autonomous)	70.00	30.00	20.00	10.00	80.00	20.00
06. BSRI (Autonomous)	85.00	15.00	15.00	0.00	90.00	10.00
07. SRDI (Government)	60.00	40.00	40.00	0.00	80.00	20.00
08. BLRI (Autonomous)	50.00	50.00	30.00	20.00	70.00	30.00
09. BFRI (Forestry) (Government)	70.00	30.00	20.00	10.00	60.00	40.00
10. BFRI (Fisheries) (Autonomous)	50.00	50.00	20.00	30.00	80.00	20.00
11. BTRI (Government)	70.00	30.00	20.00	10.00	90.00	10.00
Average	70	30	66.67	33.33	88.5	11.5

(Source: Survey Data, 2011).

Table 6.24 indicates inter-library loan. All the libraries have average 70% provision of inter libraries loan. 30% libraries do not have any provision of inter-library loan. On average about 70% libraries feel the necessity of that kind of provision. 85.5% of the libraries want SDI service but only 11.5% do not want.

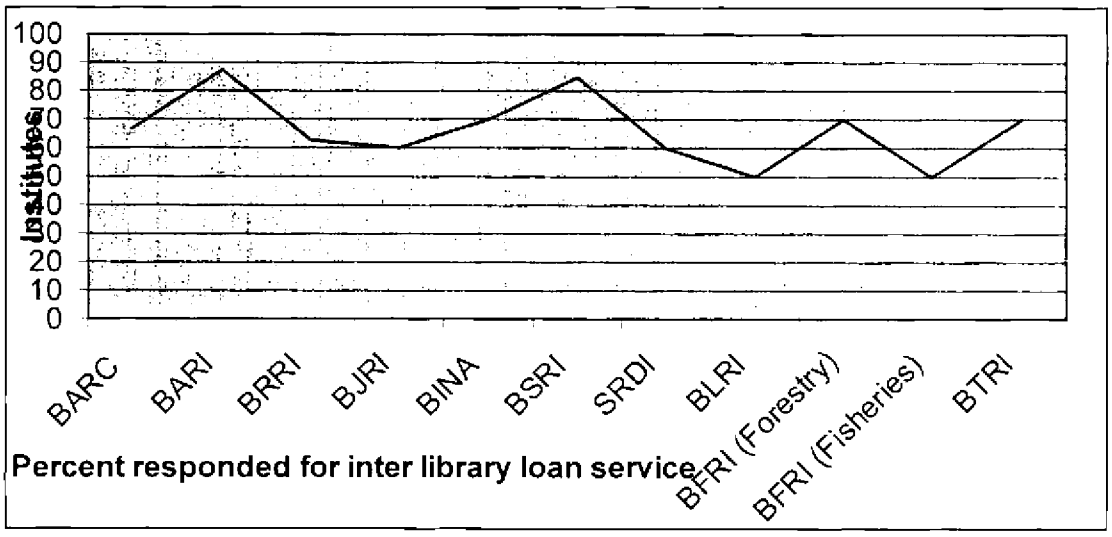


Figure- 6.17 Percent Responded for Inter-library Service

Table 6.25 : Factors Influencing Creation of Awareness on Current Publications (%)

Name of the Institute/(Type)	Aware about the current publications through					
	Friends	Library Staff	Display board	Experienced Professionals	Technical Meeting	Internet
01. BARC (Autonomous)	6.67	0.00	3.33	0.00	6.67	83.33
02. BARI (Autonomous)	7.50	2.50	7.50	7.50	20.00	55.00
03. BRRI (Autonomous)	5.00	0.00	0.00	15.00	30.00	50.00
04. BJRI (Autonomous)	10.00	10.00	10.00	30.00	20.00	20.00
05. BINA (Autonomous)	20.00	10.00	10.00	20.00	30.00	10.00
06. BSRI (Autonomous)	10.00	10.00	5.00	15.00	20.00	40.00
07. SRDI (Government)	20.00	0.00	10.00	10.00	40.00	20.00
08. BLRI (Autonomous)	10.00	0.00	0.00	10.00	20.00	60.00
09. BFRI (Forestry) (Government)	0.00	10.00	10.00	40.00	30.00	10.00
10. BFRI (Fisheries) (Autonomous)	10.00	0.00	10.00	20.00	30.00	30.00
11. BTRI (Government)	20.00	30.00	10.00	10.00	20.00	10.00
Average	9	4.5	5.5	13	22.5	45.5

(Source: Survey Data, 2011).

Table 6.25 shows that 45.5% respondents can be aware of the current publication through internet and 9% through friends. At present people use the traditional systems like library staff and display board less than the modern means like internet, technical meeting etc. Thus inward advertising influences the users more than outward means of awareness.

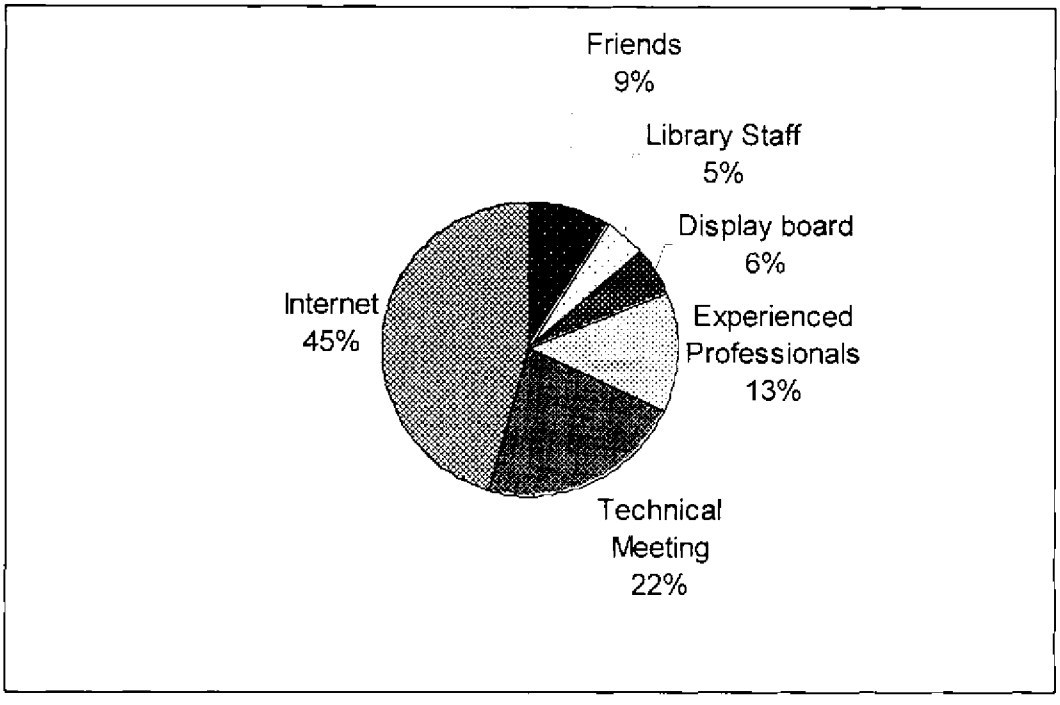


Figure - 6.18 Factors influencing creation of awareness on current publications (%) among the NARS institutes

Table 6.26 : Opinion on Scanning of Abstracts and Updating (%)

Name of the Institute/(Type)	Continuously scan the abstracting & indexing		Updated with the latest literature	
	Yes	No	Yes	No
01. BARC (Autonomous)	80.00	20.00	86.67	13.33
02. BARI (Autonomous)	85.00	15.00	80.00	20.00
03. BRRI (Autonomous)	92.50	7.50	85.00	15.00
04. BJRI (Autonomous)	60.00	40.00	50.00	50.00

05. BINA (Autonomous)	70.00	30.00	80.00	20.00
06. BSRI (Autonomous)	75.00	25.00	90.00	10.00
07. SRDI (Government)	60.00	40.00	70.00	30.00
08. BLRI (Autonomous)	70.00	30.00	60.00	40.00
09. BFRI (Forestry) (Government)	60.00	40.00	50.00	50.00
10. BFRI (Fisheries) (Autonomous)	70.00	30.00	80.00	20.00
11. BTRI (Government)	80.00	20.00	60.00	40.00
Average	78.5	21.5	77.5	22.5

(Source: Survey Data, 2011).

Table 6.26 shows that almost 78% libraries have opined the positive side of continuously scanning the abstracting and indexing and only 21.5 % are in the negative. About 78% of the libraries are updated with latest literature but only 22.5% are still backdated in the field.

Table 6.27 : Percent of the Respondent of NARS Institute Visiting Other Libraries and Factors Which Motivated them

Name of the Institute/(Type)	Visiting other Library		Name of the Library	Factors for visiting		
	Yes	No		Availability of Current periodicals	Good Study Environment & Physical Facilities	Prompt Services
01. BARC (Autonomous)	83.33	16.67	BAU, BSMRAU, BARC & BRRI	66.67	16.67	16.67
02. BARI (Autonomous)	75.00	25.00	BAU, BSMRAU, BARI & BRRI	75.00	20.00	5.00
03. BRRI (Autonomous)	90.00	10.00	BAU, BSMRAU, BARC & BRRI	87.50	12.50	0.00
04. BJRI (Autonomous)	60.00	40.00	BANSDOC, IJSG, BIDS, BARC	80.00	20.00	0.00

05. BINA (Autonomous)	90.00	10.00	BAU & BSMRAU	70.00	20.00	10.00
06. BSRI (Autonomous)	90.00	10.00	BARC, BAU & BARi	75.00	20.00	5.00
07. SRDI (Government)	30.00	70.00	BARC, SPARSO	60.00	20.00	20.00
08. BLRI (Autonomous)	70.00	30.00	BAU, BARC	70.00	20.00	10.00
09. BFRI (Forestry) (Government)	80.00	20.00	CU	80.00	20.00	0.00
10. BFRI (Fisheries) (Autonomous)	80.00	20.00	BAU	80.00	10.00	10.00
11. BTRI (Government)	70.00	30.00	BAU & BARC	90.00	10.00	0.00
Average	78.5	21.5		76.5	17	6.5

(Source: Survey Data, 2011).

Table 6.27 shows 78.5% personnel of NARS Institutes visit libraries of other NARS institutes and organizations namely BAU & BSMRAU and 21.5% don't. The factors are availability of current periodicals (76%), good study environment & physical facilities (17%) and prompt services (6.5%).

Table 6.28 : Opinion of the Respondent of Different NARS Institute about the Acquiring New Publication by their Library (%)

Name of the Institute/(Type)	Display in the Library	List of Addition	Library Catalogue	Informally through other student/ researcher	Informally through the Librarian/ library staff	Others
01. BARC	43.33	20.00	26.67	6.67	3.33	0.00
02. BARI	30.00	37.50	32.50	0.00	0.00	0.00
03. BRRI	22.50	45.00	25.00	2.50	5.00	0.00
04. BJRI	50.00	30.00	20.00	0.00	0.00	0.00

05. BSRI	40.00	10.00	10.00	40.00	0.00	0.00
06. BINA	60.00	10.00	30.00	0.00	0.00	0.00
07. BFRI	70.00	10.00	20.00	0.00	0.00	0.00
08. BLRI	50.00	20.00	20.00	10.00	0.00	0.00
09. BFRI	60.00	10.00	30.00	0.00	0.00	0.00
10. SRDI	60.00	20.00	10.00	0.00	10.00	0.00
11. BTRI	50.00	20.00	20.00	10.00	0.00	0.00
Average	41.00	26.50	24.00	6.50	2.00	0.00

(Source: Survey Data, 2011).

Table 6.28 states that acquiring new publication through the display in the library is about 41%, 26.5% through the list of addition, 24% through the library catalogue and the rest through other students / researcher or librarian/ library staff. In this context BFRI (Fisheries) does 70% through the display in library, BRRI 40% through the list of addition, BRRI 32.5% through the library catalogue and BSRI 40% through other students / researcher or librarian/ library staff.

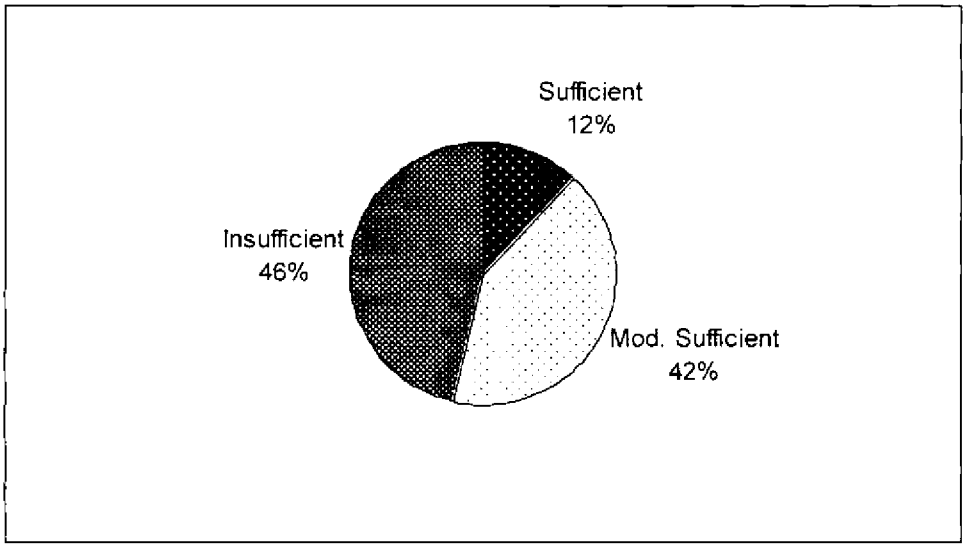


Figure – 6.19 Average Rating of the Sufficiency of Information Materials in the Libraries of NARS

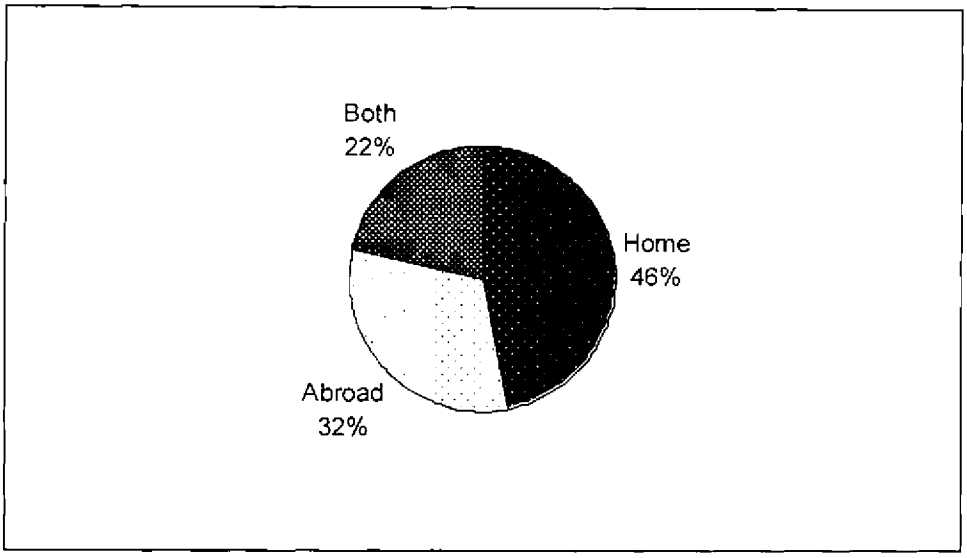


Figure – 6.20 Meeting Information Need from Professional Colleagues at Home, Abroad and Both

Table 6.29 : Opinion on Agricultural Information Network for Efficiency (%)

Name of the Institute	AIN creates more efficiency in res/study & teaching		Present Manpower of the Library		If inadequate, factors behind that		
	Yes	No.	Adequate	Inadequate	Negligence of the authority	Lack of Financial .support	Others
01. BARC	73.33	26.67	20.00	80.00	4.17	62.50	33.33
02. BARI	85.00	15.00	25.00	75.00	6.67	83.33	10.00
03. BRRI	80.00	20.00	30.00	70.00	7.14	85.71	7.14
04. BJRI	60.00	40.00	50.00	50.00	20.00	80.00	0.00
05. BSRI	70.00	30.00	60.00	40.00	0.00	75.00	25.00
06. BINA	75.00	25.00	60.00	40.00	12.50	75.00	12.50
07. BFRI	60.00	40.00	50.00	50.00	0.00	100.00	0.00
08. BLRI	70.00	30.00	60.00	40.00	25.00	50.00	25.00
09. BFRI	80.00	20.00	50.00	50.00	0.00	60.00	40.00
10. SRDI	70.00	30.00	60.00	40.00	0.00	75.00	25.00
11. BTRI	80.00	20.00	70.00	30.00	33.33	66.67	0.00
Average	76	24	40	60	7.5	76.67	15.83

(Source: Survey Data, 2011).

Table 6.29 indicates that on average all the libraries think 76% on agricultural information network for efficiency. 40% of them think manpower of the library is adequate and 60% inadequate. They have mentioned reasons behind this inadequacy on negligence of the authority 7.5%, lack of financial support 76.67% and others 15.83%.

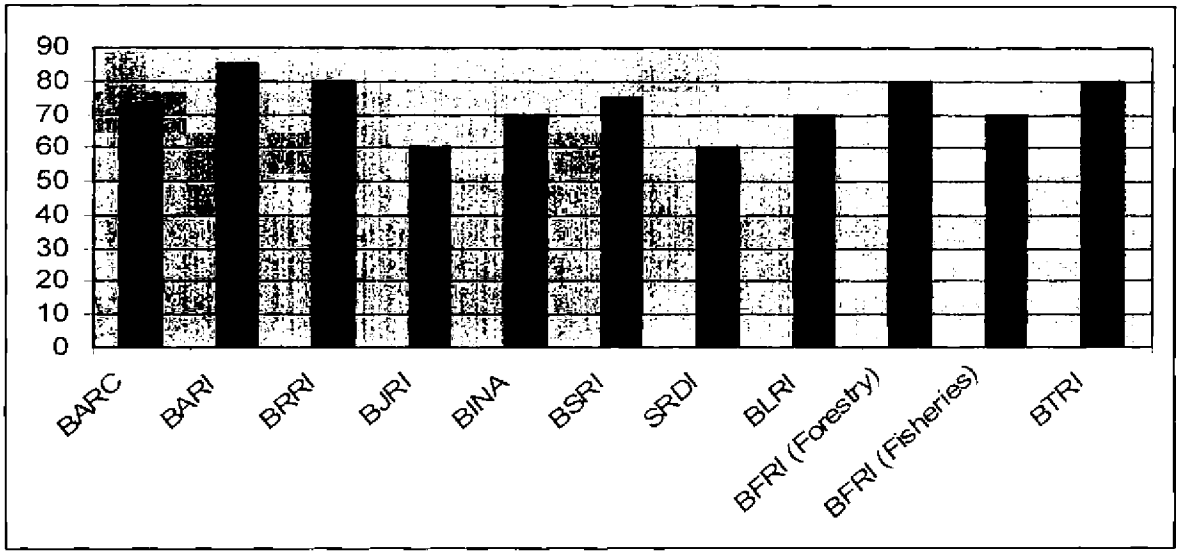


Figure –6.21 Percent Responded in the NARS on AIN Creates more Efficiency in Research

CHAPTER 7

A MODEL OF INFORMATION SYSTEM DEVELOPMENT FOR NARS

Chapter 7

A Model of Information System Development for NARS

7.1. Introduction

It is important to bring necessary reforms in technology generation, assessment and dissemination through institutionalization of new approach of ICT as well as upgrading the skills of the scientists and extension workers added with hard ware and software support. The planning process being followed is 'bottom up' and consequently envisages strong linkages between institutions, disciplines, research and extension agencies. The major objectives should be to increase efficiency and effectiveness of Agricultural Technology Generating/Developing System. One strategy to achieve the objectives is the improvement of agricultural research information system and providing improved access to IT tools to research scientists both for knowledge management and communication development. Strong information management system targeting scientists for their knowledge upgradation should be the prime focus of the day. It is believed that improved information leads to better strength of the scientists to develop good scientific output which leads to better technology dissemination to the end users.

The advent of the computer as a product of information technology has made it easy to automate library operations, thereby facilitating students and researchers in Agricultural Universities in searching information and carrying out research in their respective fields. The application of information technology has made the library a new information services unit, providing electronic acquisition, electronic cataloguing, electronic Online Public Access Catalogue (OPAC), and serials control, electronic interlibrary loan, and electronic circulation functions (Raseroka, 1999).

7.2 Existing Status of Information System in National Agriculture Research System (NARS)

Bangladesh started ICT application to Agricultural Research and Development in twentieth century. An attempt was made in early nineties to formalize a National Agricultural Information System in Bangladesh with a goal to maintain a national cooperative communication network and information collection exchange system in

support of the NARS in order to assist in the advancement of all areas of agricultural research and development. But due to lack of resources the project could not be implemented. During late nineties, most of the NARS institutes received IT tools like computers, printers, ups, projector and other accessories and LAN server to a few Institutes with support from external support. However, these were procured within last 6-8 years before and by now; many of the equipments became obsolete and need up gradation, modification and expansion to many more scientists at the research station in the rural areas. Although e-mail facilities have been extended to all NARS institutes, intra and inter institutional linkages could not be established. Moreover, linkages with the regional research stations and research centers are poor. Web sites of Bangladesh Agriculture Research Council (BARC) and NARS institutions have been established. SAARC Agriculture Center (SAC) is located at BARC campus, Dhaka having web based information sharing became source for the member states. The contribution of this center to the agricultural research and development is expanding. In extension activities, although all district offices and many Upazila offices are having computer facilities, but these should be upgraded for the use of enhanced connectivity.

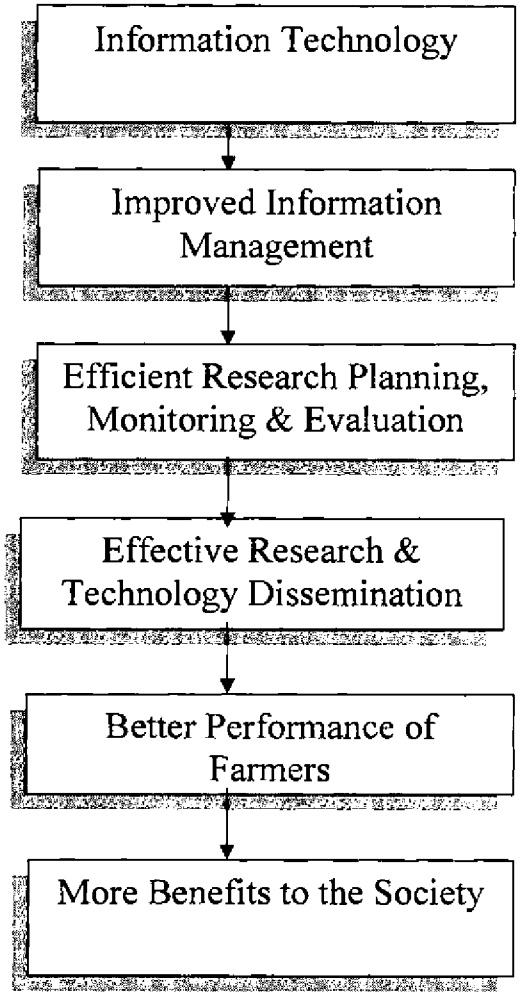
However, the objective of the facilities available in one institute should be extended for intra, inter institutional linkages in order to reach the benefit of modern information technology to the doorstep of all scientists. Therefore, BARC, NARS institutes and research centers including regional research stations will be able to come under one umbrella of a strong research information system. Electronic linkages with the regional research stations and research centers in remote areas of the country would be able to disseminate agricultural technologies much quicker than at present.

7.3 The Needs of the Improvement of the Existing Information Systems and Services in NARS

Bangladesh is a small agro-based country with heavy burden of large population. The country needs to improve existing production systems to enhance crop productivity in limited land, energy and natural resources to meet the diversified demand of increasing population. On the other hand the better understanding of the natural resources particularly under climate change will remain a challenge to develop appropriate crop and cropping pattern.

All agricultural scientists and technologists have to work in the direction of information technology for doubling the productivity of the available land despite the ever decreasing land for cultivation. The following Diagram presents the importance of improved information technology.

Figure -7. 1 Flow Diagram of Information System Utility



In order to achieve this, the institutes under NARS must develop its information services responsive and more accountable system to the global and regional standards. Because NARS is responsible for addressing the research and the scientific community to maintain its capacity to exploit recent advances in agricultural research which can be implemented through applying modern information services. So it is very vital for transmitting information through libraries of NARS where the information of total Agricultural sector is disseminated. In this regard the information personnel also have to adapt themselves to the modern techniques of information services.

Most of the techniques of information services of NARS institutes still keep the traditional services of information but its need gradually adding new modern elements for disseminating information like online public access whenever they want.

In order to emerge as a proper information service NARS has to introduce new tools and techniques for enchaining access to information.

To cast the proper light on the relationship between information and its user, two particular facets should be referred to. First our gathering, processing and diffusing practices of information aim at effective use of information in differing contexts layers of community, which results in enabling the users to get most privilege out of their work.

Secondly information professionals should be aware of the potentials of the users, the techniques they adopt to get more relevant information and to devise some new mechanisms to improve access to information.

We need to take following measures for improving the existing information services to meet up the demand of the users.

Firstly, it is very important to gather NARS in a one umbrella with a unique networking system to be established which can help for rapid transfer of information;

- formulates strategies based on information needs
- identifies (fight) and relevant networked information resources and
- improves information seeking behaviors through information networks.

So, we have to get acquainted with the ways and meaning of information system into networking for connecting, searching and obtaining information from the informants," otherwise we would not have access to our needed information.

The other major point regarding information networks is to get relevant and correct information. Today the world has got new sphere which is networked with connectivity of information system, so the development of various scopes has had a profound influence on seeking, accessing and using information. So information networks are useful tools for access to exchange of information. For implementing this information networks it is necessary to establish an unified database for all NARS Institutes because database can fulfill the prime objective NARS of making available and accessible of information especially in the light of realities of scattered resources. An unified database can promote and provide a unique framework for the national research needs which can be shown following diagram:

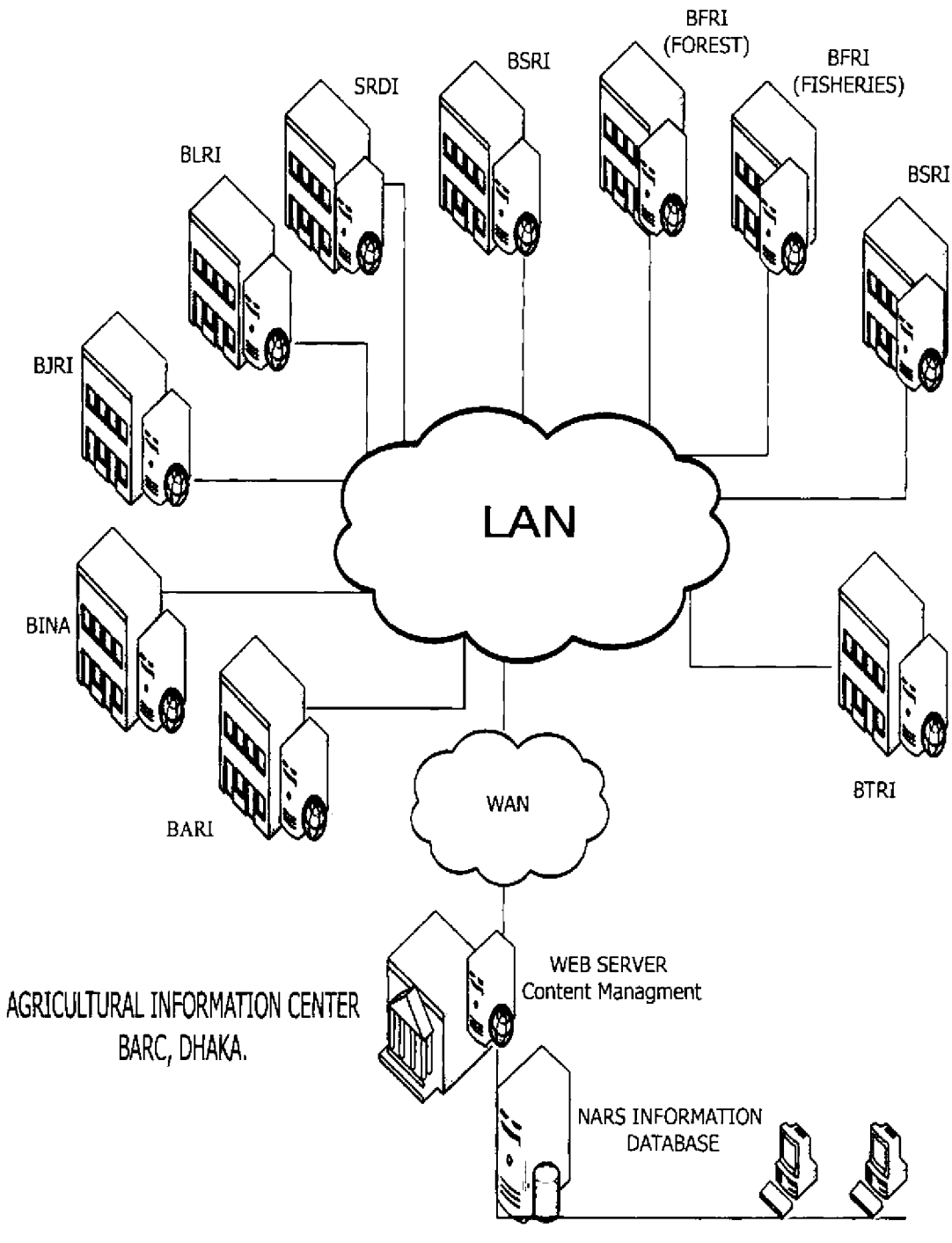


Figure – 7.2
NARS Information Network System Diagram

The application of Computer, Internet, E-mail and Fax is noticeably essential but the computer literacy is too low for this sector to function smoothly. But the NARS libraries or information centers are to be assigned to train the scientists and researchers on computer application as well as Information Technology (IT) by the expert and technical staff. So IT support instruments are very essential for communicating not only between NARS institutes but also achieving global research advancement. The usage of internet has reduced the telephone use as it is an easy medium of data transfer and it is more secured than telephone. So a strong and speedy internet infrastructure is very essential for information service. The development of research is completely related to the essence of information services today. We can provide useful and accurate information to the researchers as well as the highly advanced professional groups through proper information services. The problem is not the lack of information but the proper techniques of serving that information and build up an organizational structure with appropriate information services to deliver information.

Information system development for BARC and NARS institutes is strategically important for the development of technology generation and dissemination system. Making full use of the opportunities provided by the modern information technology is of immense importance to facilitate agricultural research and dissemination of agricultural technology to the farmers, so that research system can face challenges of sustainable growth of agriculture. The broad aim of Information System Development (ISD) is to strengthen the information management within BARC and NARS institutes by developing electronic linkages between and amongst BARC, NARS institutes, research centers, research stations, agricultural universities and agricultural extension (crop, livestock and fisheries). This information network would provide access to internet, national and international scientific literature and database and CD-ROM libraries. It includes Agricultural Research Information System (ARIS) including improvement of library automation. Information Technology ultimately leads to social benefit through efficient research, extension and farmers' performance.

7.4 The Proposed Model Plan: Agricultural Research Information System (ARIS)

Many developing countries in the world are in line with introducing and implementing ARIS for the overall development in the agricultural sector. The proposed information systems are expected to provide an organizational backbone to support information flow among the national agricultural research institutions. An ARIS aims to integrate and coordinate information flows and access in a country's agricultural research system so as to benefit its stakeholders through informed research and development activities. There are several reasons why a country's agricultural research system may want a common information system. So ARIS is needed to improve research through sharing of data, information and knowledge among scientists, to improve management and coordination of research and development activities, to improve global access to information available in the NARS and hence protect intellectual property rights and to enable to restructure the agricultural research system to make it more effective in its objectives (Maru, 1999).

7.5 The Definition and Goal of ARIS

An ARIS can be defined "as a system that enables digital connectivity among institutions and stakeholders engaged in agricultural research within countries for sharing scientific, technical and research management information; and supports, in full or part, the infrastructure and services for electronic messaging and communication among participating institutions."(Maru, 1999).

The goal of the ARIS is to strengthen Information Management Culture using modern tools within Bangladesh NARS, so that agriculture research becomes more efficient and effective. The major objectives are to,

- put information close to the scientists through electronic connectivity
- enhance capacity of researchers and the institute as a whole to organize, store, and use the relevant information for research program development, execution and dissemination
- enable agriculture research to provide relevant information as technological support to rural stakeholders to improve their livelihoods
- institutionalize mechanisms to share information over NARS
- Improve the capacity to plan, execute, monitor and evaluate research programs, and
- Strengthen libraries and library network in the electronic access

7.6 The Ways of ARIS Implementation

Strategies to achieve above objectives include following activities:

(a) Creation of Local Area Networks (LAN) at BARC and NARS institutes head quarters as well as major regional research stations in different Agricultural Ecological Zones

(b) System integration of LAN and WAN servers

(c) Expansion of infrastructure for electronic connectivity at NARS institutes to provide access to majority scientists

(d) Training to Scientific, Technical and Office staff in the areas of computer applications, system management and office automation etc.

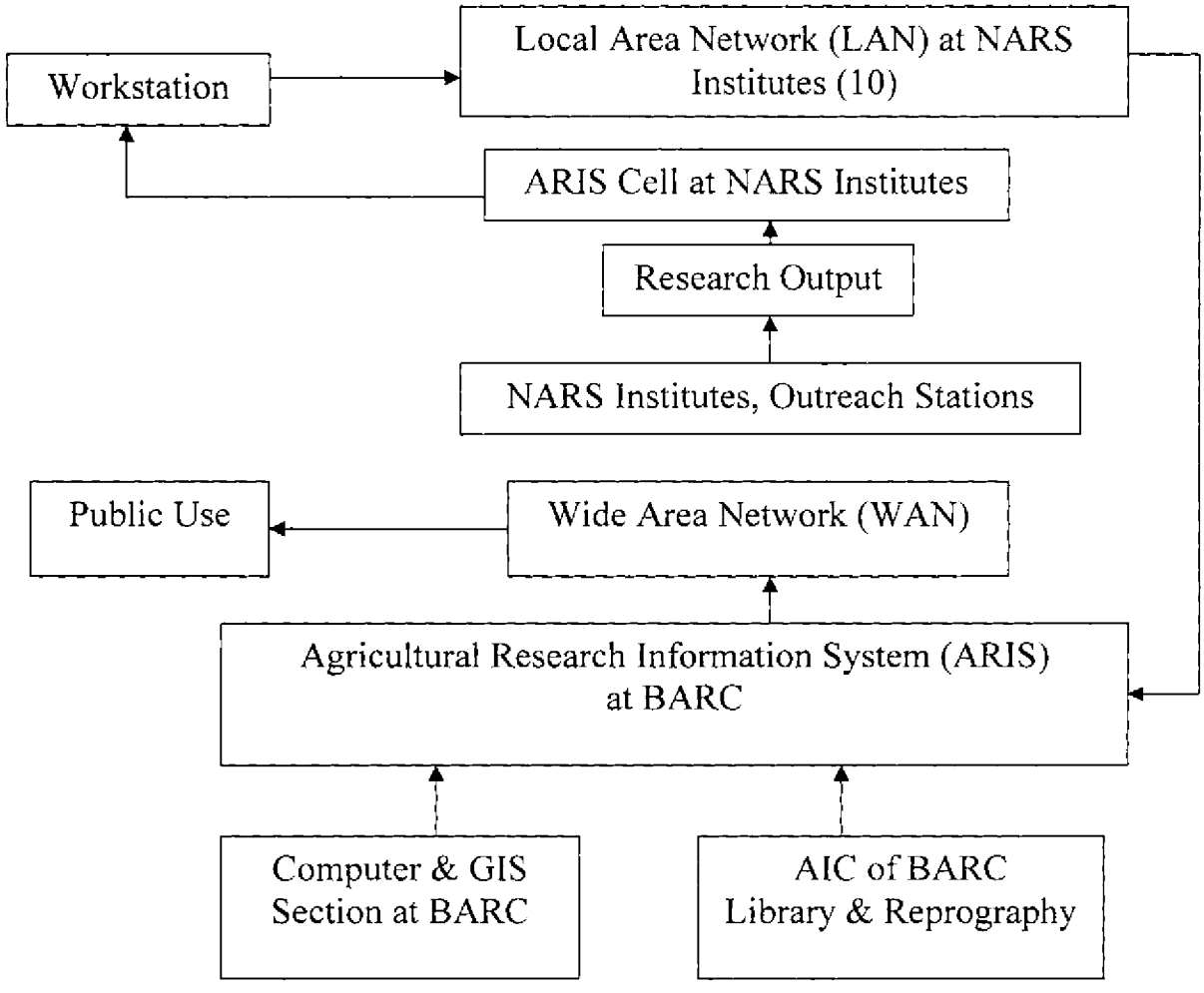
(e) Development of various databases and converting the databases of research, development and value-chain to multiple users

(f) Improvement of Agricultural Information Center and computer center at BARC including its existing library to develop a National library in agricultural research discipline

(g) Establishment of electronic linkages with Agricultural Information Service at Extension Agencies and other national libraries

(h) Training of librarians and other staff associated with library automation

Figure – 7.3 Agricultural Research Information System (ARIS) at BARC



7.6.1 A Framework for ARIS

It will be necessary that BARC and all research institutes under NARS to expand the electronic connectivity of the ARIS. The process was initiated during the previous project approach in late nineties. Through that project, hardware and software were supplied to many NARS institutes. But at that time, ARIS was not institutionalized and the electronic connectivity among different institutes was not established. In the present approach, ARIS cell will be established at each institute and providing the facilities down to the research divisional level in the head quarters and regional research stations as well as research centers of each research institute in the remote area. All the researchers are expected to have access to the World Wide Web, interlinked between in-country and foreign data

source and will get on-line library facilities. Thus, BARC and ten different NARS institutes with their more than hundreds of regional/sub research stations and research centers will get these facilities. In the present project, public sector extension agencies of crop, livestock and fisheries will be electronically linked through their existing infrastructures and facilities. No additional fund from the project is provided to the extension agencies and agricultural universities. However, in future, when universities will be able to develop WAN and LAN facilities, electronic linkage of NARS institutes with the universities will be more.

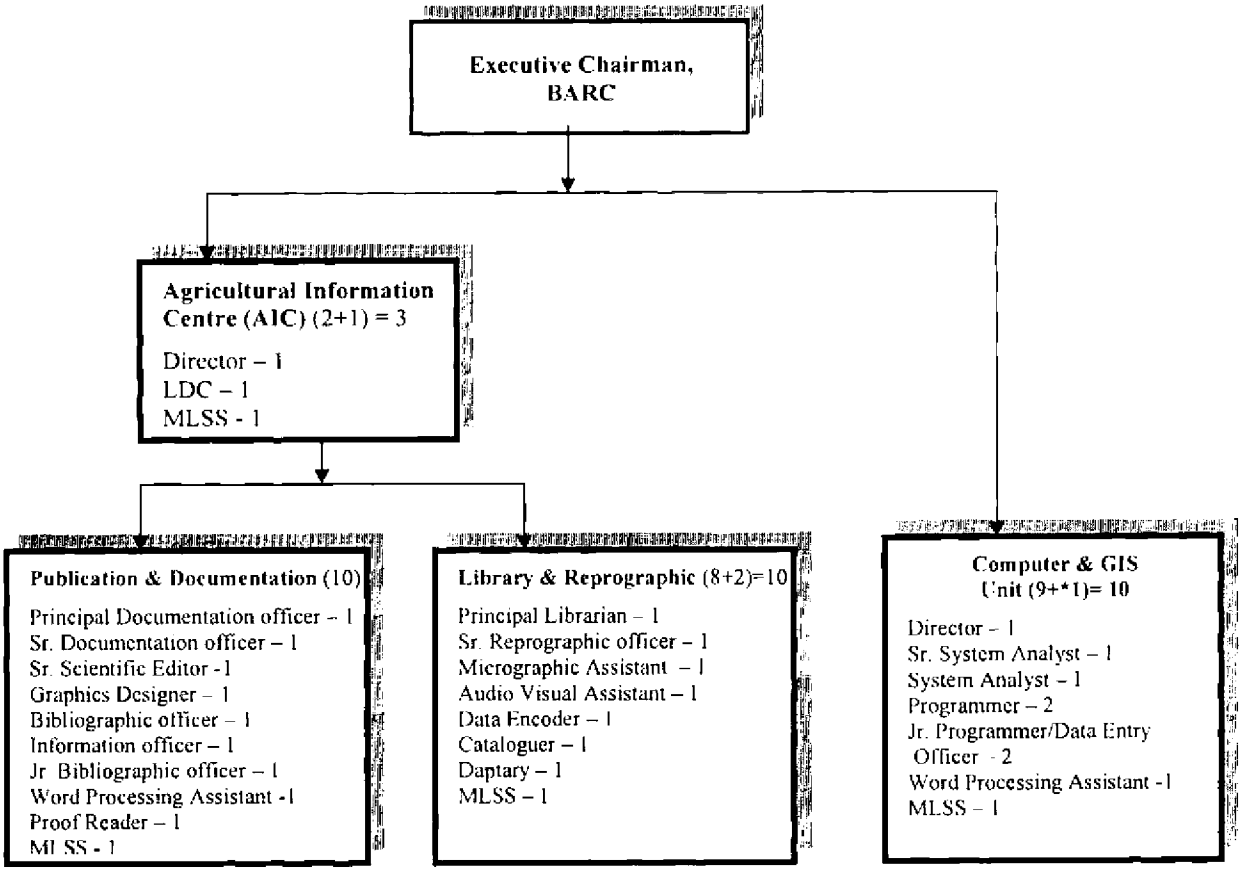
7.6.2 ARIS Cells

For this purpose, ARIS cells have to be established at BARC and all NARS institutes. At present, each institute has a small division or department dealing with communication. Each institute has a small committee for ICT development. However, for the effective utilization of the facilities, communication cell at each institute needs to be strengthened and equipped with trained manpower and facilities. This cell will have to take the responsibility of all network development and maintenance for the institute.

7.6.3 Strengthening Agricultural Information Center and Computer Center at BARC

Agricultural Information Center (AIC) at BARC will act as hub of the collaborative system. At present, this center has two wings -one is with the responsibility of publication and documentation, while other wing is the library and reprography. The Director of AIC directly responsible to the Executive Chairman of BARC coordinates the wings. The center has 23 manpower including support staff. Many positions remain vacant and quality be upgraded. The Computer Center at BARC is responsible for GIS development and providing computer facilities to the scientists. The computer center headed by one Director and the two centers can be effectively utilized for information management of the NARS.

Figure – 7.4 Organogram of Agricultural Information Center and Computer Center of BARC



Both AIC and Computer Center of BARC will have to take the responsibility of oversight and backstopping of this expansion of electronic connectivity through connectivity to BARC and all NARS institutes. AIC will be responsible for gathering databases from all institutes and other sources. It will have electronic linkage with all NARS institutes, research centers, regional research stations and with information centers of public extension agencies through WAN connectivity. It will act as national repository of all agricultural research works including databases and publish research results/reports, important news etc. in the web. Provisions of databases facilities and WAN/LAN for BARC will be located and managed by this center. Computer Center will be responsible for software development and providing services to the NARS institutes. To facilitate the function, the existing vacant positions of AIC and BARC and Computer Center need to be re-designated and redistribute using the existing workspace.

7.6.4 Creation of Web Site and Home page

With a rapid growth in information technology and internet culture, having a web site and home page is an essential need. BARC needs to expand its homepage to provide quick and less costly information about all NARS institutes.

7.6.5 Strengthening of Connectivity

Electronic connectivity should be strengthened to individual scientist in all research institutes, regional research stations and major research centers under NARS and connecting them through Local Area Networks (LAN). WAN will be established at BARC. Through WAN at BARC and LAN in other institutes, all the research institutes including regional stations and research centers will get access to national and international research organizations.

Wide Area Network (WAN)

Connectivity with cluster server is proposed to be established at BARC, the apex institute of the NARS. With this facility at BARC, all research institutes can be linked with BARC as well as with each other through LAN server. For this, one cluster server with necessary accessories will be provided to BARC.

Local Area Network (LAN)

Strengthening the existing LAN connectivity as well as providing new LAN connection to other NARS institutes will require LAN servers in about 49 locations of different regional research stations and research centers of ten different NARS institutes having 500 nodes under LAN set up. BARI is the largest research institute where researches on high value crops are being carried out. Expansion of LAN servers in its head quarters and establishment of new LAN servers in its regional research stations and research centers will require LAN set up in 18 locations. Similarly, in all other nine research institutes and their regional research stations are planned to have LAN connectivity.

7.6.6 Databases and Application Software

Databases

There is an urgent need to develop national databases on scientific and technical information, crops, fishery, livestock, projects, finance, resources and abstracts of Journals. In addition, each NARS institute needs to maintain databases on research results, abstracts from Journals, finance, personnel and physical resources.

In addition, each NARS institute will maintain databases on the followings;

- Research results databases (including experimental design, data and the results)
- Databases on abstracts of Journals relevant to its mandate
- Databases on financial, personnel and physical resources.

7.6.7 Development of Application Software

To create, maintain and update databases regularly, it is necessary to develop application software.

7.6.8 Agricultural Research Library Information System (ARLIS)

For automation of library facilities, a software package needs to be developed. With the assistance of the software, all scientists should have on-line access to the (a) international databases and scientific literature; (b) new databases created under the program and (c) external databases accessible through the worldwide web.

7.6.9 Human Resource Development

In the NARS institutes, computer professionals with requisite qualifications for handling the huge databases are not available. Training programs, both in country and abroad are proposed to develop trained manpower in computer application in agriculture and training programs on use of computers and application software packages. Moreover, sufficient people from each institute need to be trained in managing various information servers and on-line databases, and administration of LAN and WAN networks.

7.7 Conclusion

In fine the proposed model of ARIS will have to consider some clusters of issues related to information management in NARS. It will accelerate national policies, NARS mandates and strategies for information management and flow. ARIS will help to develop a National Agricultural Information Contents Base. The system will tend to boost national capacity to collate access, share and use agricultural information. ARIS will assist to govern and regulate information flow and use to protect national interests related to development and intellectual property. Designing and implementing a next generation ARIS will integrate and coordinate information flows and access in a country's agricultural research system so as to benefit its stakeholders through informed research and development activities.

CHAPTER 8

RECOMMENDATIONS AND CONCLUSION

Chapter 8

Recommendations and Conclusion

The present world is running on the wheels of information and knowledge. This study aims at creating some more information and knowledge for accelerating the research work of agriculture subjects. The build-up of a well equipped and well organized agricultural information system to meet up the agricultural development is the needs of the scientists engaged in agricultural research shown in the present survey.

The scope of knowledge has amply been increased with the scientific instruments. The agricultural scientists and researches find it difficult to keep themselves abreast of new developments within their area of specialization. The current agricultural information system is developed but yet many NARS institutes have not applied instrumental system. So many scientists hardly have timely access to reliable information is agricultural filed. The agricultural environment in Bangladesh in relation to availably of agricultural information sources is confined to agricultural libraries at research stations and national and international agricultural databases. Almost all libraries and centres are needed to be computerized.

In the present study the following important points were found out:

1. Various types of information needs for the NARS scientists and researcher of Bangladesh.
2. The same opinion has been expressed about the automation and computerization of agricultural libraries of NARS institutes.
3. Different attitudes of agricultural scientists and researchers in favour of introducing LAN, WAN and other equipments of internet facilities.
4. Various information sources available with NARS libraries need to be bringing under one networking system.
5. Existing agricultural information resources should be adequately shared among the various NARS libraries of Bangladesh.

6. Most of the techniques of information sequence of NARS institutes are still keeping the traditional services of information.

The following hypotheses are proved:

1. The existing agricultural information services in most NARS institutes are not adequate to meet the information needs of agricultural scientists and researchers.
2. Equal opportunities of all small and big libraries in the NARS institutes should be introduced.
3. The agricultural scientists and researchers are in need of one networking system for accessing, updating and upgrading their knowledge and information for their research.
4. The agricultural information resource sharing among the NARS libraries are not upto the satisfaction.

The following recommendations are made by the researchers:

1. The NARS libraries should use effective software of networking system so that all the scientists and researchers concerned can work under the same umbrella to get the latest information of their invention just with click of their computer mouse.

2. The Government of Bangladesh should lay down a clear National Information policy in the agricultural sciences and make it obligatory on the part of national agricultural research institutes to provide free flow of information to the agricultural scientists and researchers.

3. BARC should undertake the responsibility for planning National Agricultural Information Network System for all agricultural libraries in Bangladesh to provide agricultural information to the agricultural scientists and researchers even beyond NARS. BARC should also take the responsibility of supplying hard and soft copies of the journals and books to the agricultural scientists and researchers in Bangladesh.

4. The collection of standard computer, books, research journals, reports etc. should be increased in the agricultural libraries of Bangladesh in order to meet the information needs of the agricultural scientists and researchers.

5. One of the essential prerequisites for the creation and development of indigenous database is the availability of a large number of trained information professionals such as system analyst, database manager, computer hardware/software specialists, information scientists, Abstracters, Indexers and subject specialists. It is therefore, necessary to organize intensive practical training programmes for the information personnel.

6. Bangladesh arranges a co-operative venture in several International databases like UNESCO, UNFP, UNDP, AGRIS, CARIS, CABI and etc. The national centres of excellence in agricultural sciences should develop capabilities for the continuously augmenting the database creation in various fields of research activity in agricultural sciences.

7. Development of software programmes for creation of indigenous vocabulary control devices should be necessary. CDS/ISIS, MINISIS and LYBSIS can be used for this purpose, we can also use commercially developed customized library automation for house keeping operations such as LYBSIS etc.

8. DVD ROM technology should be used in the creation of agricultural database and made available for the scientists.

9. There is a need for wider circulation of agricultural publications and also wider circulation of information about new arrivals. This has to be done by a central agricultural information supply agency as hub, incorporating all materials at one place and this catalogue should be made available to agricultural scientists and researchers, extension workers, planners and agricultural policy makers etc.

10. Indexing and abstracting services for all agricultural information are necessary for ensuring their easy and speedy access to the agricultural scientists and researchers.

11. It is suggested that reference service should be provided not only to the agricultural scientists and researchers but also to the farmers in order to utilize the agricultural information to the maximum extent possible.

12. The BARC should conduct small courses to enable agricultural scientists and researchers to be aware of the generation of nascent information by National, Regional and International Agricultural Research Institutes.

13. Agricultural information materials available in all libraries of agricultural universities, agricultural colleges, agricultural research institutes and department of agricultural extension should be available to all the agricultural scientists and researchers in Bangladesh irrespective of their belonging to any particular institute.

14. The agricultural librarians with the help of Library Association of Bangladesh (LAB) and Bangladesh Association of Librarians, Information Scientists and Documentalists (BALID) have to take initiative for preparing agricultural library standards.

15. The Government of Bangladesh should make the NARS Libraries E-library and all the journals E-journal very soon just to provide the scientists with quick information for the acceleration of their research work.

16. The NARS libraries must keep the informational standard database with the help of national and international agencies and organizations. For this task both the standards for database should be examined.

17. Every library of NARS should have online access for the staff as well as for the outside users. For this purpose the sufficient number of computer would be installed.

18. The MOA should budget enough for NARS institutes for provide more facilities for applying modern scientific equipment of information services.

19. The NARS institute should work under an umbrella of a unique networking system for rapid transfer of information so that they can formulate strategies based on information needs, identify first and relevant networked, information resources, develop successful research strategies categorizing networked information resources by their contact, format functionality and improve information seeking behaviour through information network.

20. NARS have no other way except for becoming a network literate. NARS have to be acquainted with the ways of connecting, searching and obtaining an access to our needed information.

21. The BARC authority should strengthen a networked information sphere so that the researchers and scientists can develop various scopes having a profound influence on seeking, accessing and using information network. It is impossible without the implementation of information network.

22. All NARS libraries should apply a unified database to promote and provide a unique framework for the national research needs.

23. The librarians and information centre head are related to public relation activities. They should have training on user care motivation. For this they must change their attitude towards better usage of their skill.

24. The Bangladesh Agricultural Research Council (BARC) should establish agricultural resource centre in specialized discipline to meet the individual information needs of the agricultural scientists and researchers.

25. The NARS libraries should develop the collection of non-book material e.g. tapes, videocassettes, audio-visual material and DVD-ROMS along with other necessary documents.

26. The NARS libraries should organize user orientation programs on the use of libraries especially in using the computerized information services.

27. The National Agricultural Research System institutes should mobilize their own financial resources either by marketing information or information consultation services to overcome their financial crisis.

28. More local journals in agriculture sciences and related disciplines should be published as Bangladeshi scientists and researchers find it difficult to publish their research findings in overseas journals.

29. Acquisition policy should be developed for each agricultural research library to enable it acquire only those publications that are relevant to the research work of its parent organization. Such a policy should also include the exchange of publications with selected organizations and institutes locally and abroad

30. International sources of information database like AGRIS should be available for the NARS Scientists for their research use.

Conclusion

Identifying the existing information systems and services of the National Agricultural Research System (NARS) and recommendations suggested for the future development regarding the information systems and services will play a significant role in the agricultural field. This also will increase the potential of exploiting information which can gain so many benefits for the citizens of the information society .The proposed model will help the agriculturists to manage more knowledge to create an organized flow of information in the ground of national agricultural research system. Information as a non - material product can increase agricultural product if it up to date. This is the key matter reflected in the present study. The survey result and analysis of course will help the scientists, students, research managers, teachers and information specialists in the agricultural field.

APPENDIX- 1

Appendix - 1

Survey on the Information Service Delivery of the NARS libraries and Information Centres in Bangladesh

(Please Tick (√) marks where necessary)

Confidential

1. Institutional Information :

   a) Name of the Institute

   Government/Autonomous

   b) Name of the library/information :

   c) Address of the library :

   d) Type of library :

   e) Name of the librarian/information designation (service grade) :

   f) Highest qualification of the librarian/information scientist :

   g) Working hours of the library :

   h) Telephone Number :

   i) Fax : : E-mail:

2. Is the library situated in a separate building? Yes ☐ No ☐

3. Area of the library (in sq.ft) :

4. Management of library, Through Committee ☐ other ☐

5. Is there any mechanism to review the library activities and services for improvement?

   Yes ☐ No ☐

6. Does your library maintain any library statistics? ☐ ☐

7. Does your library maintain library inventory of equipments? Yes ☐ No ☐

8. Total strength of library Staff :
   a. Professional :
   b. Semi-professional :
   c. Non-professional :

9. Total strength of information provider (CD search, networking etc)
   a. Professional :
   b. Semi professional :
   c. Non-professional

10. Catalogue (a) Online/automated
    (b) Card form

11. Is the present position of the staff is sufficient to run the library smoothly?
    Yes ☐ No ☐

    If no, explain the reason? .....

    Please justify your demand with reasons

    (i)
    (ii)
    (iii)
    (iv)
    (v)

12. Please provide the following informations:

Designation	Qualification	Salary scale	Work allotted

a. Librarian
b. Deputy Librarian
c. Assistant Librarian
d. Other professional staff
e. Non-professional

II. Library users

a. Teachers :

b. Students :

c. Administrators :

d. Scientists :

e. Researchers :

f. Others (Pl. specify):

13. Average number of users use the library daily:

14. Which types of users use the library more frequently?

a) Institute scientists
b) Scientists of other institutes/university
c) Students
d) Institute staff
e) others

III. Library collection :

15. Total collection of the library

a. Books :

b. Reports :

c. Thesis :

d. Conference/ workshop proceedings

e. Manuscripts :

f. Periodicals, :

f. Reports :

g. Audio-visual materials, (video, digital text, other):

h. others :

16. Mention five major areas of collection

1. Crop science,
2. Agro-processing,
3. fisheries,
4. livestock,

5. Natural resources
6. Agro-business,
7. ICT,
8. other :

17. How do you rate your present collection?

Adequate ☐ inadequate ☐ poor ☐

18. Volumes added during last year (5 years)

Year:	Volume:
2008-09	
2007-08	
2007-08	
2006-07	
2005-06	

19. Mention the ascending order of the collection with subject:

a. f.
b. g.
c. h.
d. i.
e. j.

20. Does your library possess any special materials like AGRIS, AGRI index, AGRICOLA, CABI ? Yes ☐ No ☐

21. Do you think that your library collection should up-to-date Yes ☐ No ☐

IV. Library Finance

22. Please give details of the library expenditure for the 5 years.

Year	Books	Periodicals	Indexing	Others	Total
2009-10					
2008-09					
2007-08					
2006-07					
2005-06					

23. Sources of library collection:

a) Purchase

b) Exchange

c) Gift

d) Own publication

24. Mention the sources of finance for the library

a. Internal/outside Bangladesh ( )

b. Government ( )

c. BARC ( )

d. UGC ( )

e. FAO ( )

f. Others specify ( )

25. Are the finances adequate for collection/development and service?

Yes ☐ No ☐

If no please suggest the methods of improving the finance & services

a. Ask for more finance from Government and other sources ( )

b. Join the network for exploiting resources of other libraries ( )

c. Strengthen resource sharing among the libraries ( )

d. Both a & b ( )

26. Indicate the methods for the allocation of Budget?

V. Service of the Library/information centre

27. Service rendered by your library/information centre (Please √)

a. Reference services ☐
b. CAS (Current Awareness Service) ☐
c. SDI (Selective Dissemination of Information) ☐
d. Inter-library loan services ☐
e. Indexing and abstracting services ☐
f. Reprographic services ☐
g. Internet services ☐
h. CD ROM services ☐
i. Online library services ☐
j. Others (Please specify) ☐

28. Are the services adequately utilized ? Yes ☐ No ☐

29. The library operations are:

a. Manual and conventional ☐
b. Partly computer based ☐
c. Automated ☐
d. Digitized ☐

VI. Acquisition (Methods of book purchase)

30. a. By inviting quotations ☐
b. Appointing vendors ☐
c. From local book market ☐
d. Others specify

31. Methods of subscribing periodicals

(i) Local
a. Through agents ☐

(ii) Foreign
a. Through agents ☐

b. Direct from publishers ☐ b. Direct from publishers ☐

e. Others (Pl. specify) ☐ e. Others (Pl. specify) ☐

VII. Processing

32. Use of classification schemes for arranging library materials

a. Dewey Decimal Classification ☐

b. Colon Classification ☐

c. Universal Decimal Classification ☐

d. Others (Pl. specify) ☐

33. Type & format of catalogue maintained

a. Dictionary ☐ b. Classified ☐ c. None ☐

34. Catalogue code followed for processing

a. ALA ☐ b. C.C.C. c. AACR-2 ☐ d. Other ☐

VIII. Circulation

35. Method followed for issue of library

a. Register ☐

b. Brown system ☐

c. Newark system ☐

d. Other (Pl. specify) ☐

36. Number of books issued by the user at a time.

37. For how long days, books are issued to a user?

IX. Inter-library loan services

38. Period of loan of books or other materials

One week ☐

Two weeks ☐

One month ☐

39. Do you think that your library should be linked-up with other agricultural libraries of Bangladesh? Yes ☐ No ☐

40. How do you get the information for your users when they need?

a. By sending persons ( )

b. By writing letters ( )

c. By telephone ( )

d. By e-mail ( )

e. By all means ( )

41. Are your readers interested to get agricultural information available in NARS libraries?

Yes ☐ No ☐

If yes, what type of information actually they need

a. Periodicals ☐

b. Non-book materials ☐

c. Reference materials ☐

d. Books ☐

e. Others materials, if any ☐

42. Please mention what types of communication problem you face in getting information from other libraries? ☐ Yes ☐ No

If yes, please specify the problems.

X. Computer facilities

43. Have you initiated computerization? Yes ☐ No ☐

44. Do you use computer? Yes ☐ No ☐

If yes, for what purpose are you using the computer?

a. Data entry ( )

b. Data Processing ( )

c. Retrieval

d. Circulation

e. Clerical and administrative work ( )

d. Others (Pl. specify)

45. Does your library have any database (please mention)?

46. Do you think the NARS Institutes should have the unified database

Yes ☐ No ☐

47.If yes, mention the most appropriate one----------

XI. Library network.

48. Are you interested in joining network of Agricultural information system in Bangladesh? Yes ☐ No ☐

49. Do you have local Area network (LAN) facility? Yes ☐ No ☐

50. Existing hardware

no of computer, -------- no of printer,--------- scanner ------- and other equipments---

51. Are you participating in a wide Area Network (WAN) or taking its benefit?

Yes ☐ No ☐

52. What specific tools, do you use for rendering agricultural information services (Please mention)?

53. State your opinion and role in improving Information services in NARS

54. Does your library have any publication (Please mention).

55. Please mention in brief to what extent the existing information services rendered by NARS libraries and information centres can meet the demand of the agricultural scientists and researchers for the betterment of agricultural development in Bangladesh as well as in the world.

Questionnaire filled by:
Signature & date:
Address:

APPENDIX- 2

Appendix - 2

Survey on the Information Service Delivery of the Agricultural Scientists and Researchers of Bangladesh
(Please Tick (↗) marks where necessary)

Confidential

1. Name :

2. Sex : 1. Male ☐ 2. Female ☐ 3. Age ☐

3. Name of the Institute to which he/she is attached:

4. Qualification : ☐
   a. Graduate : ☐
   b. Master's degree : ☐
   c. Doctorate degree : ☐
   d. Others (Pl.specify): ☐

5. Status
   a. Researcher ☐ d. Scientist ☐
   b. Teacher ☐ e. Administrator ☐
   c. Ph.D. Scholar ☐ f. Other (Pl. specify) ☐

6. Specialization (Pl.specify):

7. For how long you have been using BARC/BARI/BRRI/ BSRI/.....institute library:

8. How often do you visit the library?
   a. Daily ☐ b. Twice a week ☐
   c. Once a week ☐ d. Occasionally ☐

9. How do you generally select your area (topic) of research?

   a. Section based on thirsted areas in agriculture ☐
   b. Consultation with senior colleagues ☐
   c. On your own idea ☐
   f. If any other ☐

10. The way you get the information concerning your research topic?

   a. By scanning abstracting and indexing periodicals ☐
   b. By sharing with colleagues ☐
   c. By attending technical programmes ☐
   d. Any other sources ☐

11. In your opinion stock of books for your research work is

   a. Inadequate ☐ b. Adequate ☐ c. Fairly adequate ☐

12. In your opinion stock of periodicals for your research work is

a. Inadequate ☐ b. Adequate ☐ c. Fairly adequate ☐

13. In total to what extent the library is meeting your information needs for your research work?

   a. 0-20% ☐ b. 20-40% ☐ c. 40-60% ☐
   d. 60-80% ☐ e. 40-100% ☐

14. Please indicate your needs of information services (According to priority viz 1,2,3,4,5,6,7 etc)

   a. Document loan ☐ b. Reprographic Service ☐
   c. Current Awareness service ☐ d. Reference Services ☐
   e. Selective Dissemination of Information services ☐ f. Indexing and abstracting Services ☐
   g. Computer Literature Searches ☐ h. Inter Library Loan Services ☐
   i. Bibliographical verification of Citation ☐ j. Audio Visual Materials Services ☐

15. Please mention the way of the library acquiring new publications?

a. Display in the library ☐
b. List of Additions ☐
c. Library Catalogue ☐
d. Informally through other students/researchers etc. ☐
e. Informally through the librarian/library staff ☐
f. Any other sources (Pl. specify) ☐

16. You use the library for the purpose of

a. Teaching ☐
b. Research ☐
c. Scholarly writings ☐
d. Self knowledge ☐
e. Prescribed Course ☐
f. Recreation ☐

17. Do you visit any other library for your research work? Yes ☐ No ☐

If yes, what are the other libraries you visited during the last one year for your research work?

Sl. No.	Name of the Library	Period of visit	Nature of Inf. Collected	Other (If any)

18. What motivated you to become a member of the other libraries?

a. Availability of Current periodicals ☐
b. Good study environment and physical facilities ☐
d. Prompt services ☐
e. Other (if any) ☐

19. What type of publications such as books, periodicals, maps, reference books, proceedings etc. do you use for your research work in order of priority

1. 4.
2. 5.
3. 6.

20. Do you continuously scan the abstracting and indexing periodicals in order to know the latest articles published in your research work?

Yes ☐ No ☐

21. Are you able to keep updated with the latest literature in your field?

Yes ☐ No ☐

22. How do you come to know about current publications in your field?

a. Through friends c. Through experienced professionals
b. Through library staff d. Through technical meeting
e. Through display board of library f. Through internet
g. Others (please specify)

23. Does your library provide documents through inter library loan (i.e. procuring books which are not available in your library from other libraries)?

24. If no, do you feel that his service is necessary to fulfill your information needs?

25. Do you think that the library should provide SDI service (i.e.) continuously informing the scientists and individually about the latest information published in various sources? Yes ☐ No ☐

26. Are you aware of the following agricultural information sources available in your field?

a.	AGRIS	Yes	☐	No	☐
b.	AGRIINDEX	Yes	☐	No	☐
c.	AGRICOLA	Yes	☐	No	☐
d.	CABI	Yes	☐	No	☐
e.	TEEAL	Yes	☐	No	☐
f.	AGORA	Yes	☐	No	☐
g.	INASPERI	Yes	☐	No	☐

27. Do you think that all the agricultural libraries of Bangladesh should be computerized as soon as possible? Yes ☐ No ☐

28. Do you think that computerized Agricultural Information Services are very much essential for your research work? Yes ☐ No ☐

29. Do you feel that all the agricultural libraries of Bangladesh should have internet connection with other agricultural libraries of the world?

Yes ☐ No ☐

30. Do you browse internet to meet up your agricultural information needs?

Yes ☐ No ☐

31. Are you aware of National Agricultural Information Systems/Services in other countries? Yes ☐ No ☐

a. Is there any such national agricultural information centres/services in Bangladesh? Yes ☐ No ☐

b. If yes, please name the centre/services

32. Do you think that all the libraries should keep link with the FAO library and other international Agricultural Information Centre library (UNO)?

Yes ☐ No ☐

33. Are you keeping abstract of information generated by the organizations like BARC, BARI, BRRI, BAU, etc. ☐

If yes, please state how you are acquiring that information

34. Do you feel that existing available agricultural information sources of your area are sufficient for your professional work?

a. Sufficient ☐ b. Moderately sufficient ☐

c. Insufficient ☐

35. To meet your information, are you getting help from professional colleagues?

Professional colleagues in the country

Professional colleagues out side the country

36. Do you feel that there is an urgent need for computerized agricultural information services in Bangladesh? Yes ☐ No ☐

If yes, please state whether there is any need for agricultural information:-

a. Local ☐

b. National ☐

c. International ☐

37. Do you have knowledge in computer operations?

a. Preliminary knowledge ☐

b. Operational knowledge ☐

c. Manipulation of package ☐

d. Production of software ☐

38. Please record your opinion on computerization of your library facilities

40. State your opinion and role in network of Agricultural information system in Bangladesh

41. Introduction of Agricultural Information Networks to your subject creates more efficiency in research/study and teaching Yes ☐ No ☐

42. Do you think the present manpower position of the agricultural libraries and information centres of Bangladesh is inadequate.

Yes ☐ No ☐

If not, do you think that the following factors are responsible for inadequacy?

a. Negligence of the authorities ☐

b. Lack of adequate financial support ☐

c. Any other (please mention) ☐

43. What is/are your opinion/recommendations or suggestions for improving information services of NARS to meet up the demand of NARS scientists and researchers of Bangladesh for the betterment of Agriculture in Bangladesh? (Please mention in brief).

Questionnaire filled by:

Signature & date:

Name :

Designation:

Address:

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