

**IMPACT OF AUTOMATION ON
AGRICULTURAL INFORMATION SERVICES
AT THE NATIONAL AGRICULTURAL
RESEARCH ORGANISATION (NARO),
UGANDA.**

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**A DISSERTATION SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE
AWARD OF THE DEGREE OF BACHELOR OF
LIBRARY AND INFORMATION SCIENCE (BLIS) OF
MAKERERE UNIVERSITY.**

JULY 2001

DEDICATION

TO MY PARENTS:

**MY FATHER, MR. SSERULYO IGNATIUS
AND
MY MOTHER, DR. NAKABIITO CLEMENSIA**

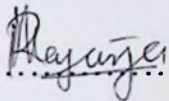
who have greatly encouraged and supported me in my education.

TO MY SIBLINGS:

who have made my life comfortable.

DECLARATION

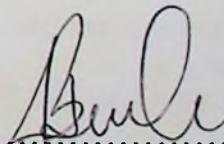
I, Mayanja Richard, do hereby declare this dissertation as my original work and has never been submitted for any award of a degree in any institution of higher learning.

Signed:

Date: 6th JULY, 2001

MAYANJA RICHARD
CANDIDATE

I certify that this research is the original work of the above named candidate and has been done under my supervision. The work has never been submitted for any award of a degree in any institution of higher learning.

Signed:

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ACKNOWLEDGEMENTS

Success in life is never attained single handedly. It is on this note that I express my heartfelt gratitude to God for the strength and wisdom; and to various people who have assisted me in various ways to accomplish this dissertation.

My sincere appreciation goes to the E.A.S.L.I.S. staff, more especially so to my supervisor, Mrs. Joyce Nyumba, without whose help this work would not be as it appears.

I also extend my gratitude to the library staff of ARIS, KARI and NAARI who made it conducive for me to exhaustively gather research findings.

I thank my parents for the financial and moral support rendered to me not only in the preparation of this dissertation but also the whole of my life.

Last but not least, I acknowledge my friends: Peter Mulisa, Jeff Isingoma, Robert Baguma, Matthew Luubulwa, Erisania Kibaya, Joseph Balikuddembe, Geoffrey Magimbi (EASLIS Custodian), Caroline Namukhula, Rosette Nalugonda, Sadres Twinomugisha, Naomi Logose, and Caroline Tuhwezeine for having made my academic and social life comfortable at Makerere University.

MAY GOD BLESS YOU ABUNDANTLY

ACRONYMS

- AGRIN:** National Information System for the Agricultural Science and Technology
- AGRIS:** Agricultural Information system
- ARIS:** Agricultural Research Information System
- CARIN:** National Current Agricultural Research Information system
- CARIS:** Current Agricultural Research Information System
- CCF:** Common Communication Format
- CD:** Compact Disc
- CD-ROM:** Compact Disc - Read Only Memory
- CDS/ISIS:** Computerised Documentation system - Integrated Set of Information System
- DBMS:** Data Base Management System
- EAC:** East African Community
- EASLIS:** East African School of Library and Information Science
- INFORM:** Information For Research Managers
- IT:** Information Technology
- KARI:** Kawanda Agricultural Research Institute
- NAARI:** Namulonge Agricultural Research Institute
- NARO:** National Agricultural Research Organisation
- OPAC:** On-line Public Access Catalogue
- OPAC:** On-line Public Access Catalogue
- QAS:** Question and Answer Service
- TEEAL:** The Essential Electronic Agricultural Library
- WINISIS:** CDS/ISIS bibliographic record management system for Windows

❖ **NB:** Acronyms for NARO's collaborative organisations are on **Appendix C**

DEFINITION OF TERMS

Acquisition - The process of acquiring information materials for a library.

Archive - A place where less actively or inactively used information materials are kept and preserved for historic reasons, which can be referred to whenever a need arises.

Cataloguing - Processes involved in constructing a catalogue; describing documents so as to identify and characterise them; providing entry points peculiar to the document, e.g. author heading, title headings; and providing for subject and format information.

Compact Disc - A storage device which uses optical laser storage techniques and thereby providing robustness, ease of handling and greatly enhanced storage capacity.

Computer - An automatic electronic data processing machine; it can input and store data, operate a program and output results to the user or control a process.

Databases - An organisation of data files having information or reference material on a particular subject, or subjects. It is typically structured so that headings or keywords can be referenced easily, which permits efficient and simple access to - and retrieval - of records. The individual files are further structured into hierarchy of records and fields.

DBMS - In computing, a set of programs which facilitates the creation and maintenance of a database and the execution of programs using the database.

Document - Generic term for the information bearing media - books, serials, sound recordings, films, illustrations.

E-mail - Messages which are sent by one user and retrieved by another through an electronic service system, usually through telephone lines.

Information dissemination - Distributing and sending information to a group of users or potential users.

Information services - Storing, accessing, delivering information to meet the needs of specific users.

Information system - Organised procedure for collecting, processing, storing and retrieval of information to meet users' needs.

Internet - A network of computer networks.

Library automation - The use of computer and networking technologies in a library.

Literature search - Search through a number of documents to find those that can satisfy an enquiry.

Network - Group of physically dispersed computers linked to each other by communication lines to share information resources.

Online - Direct real-time communication with the central processor of a computer via a terminal or separate computer.

Preservation - Processes which aim at maintaining archival or library material in their original form or in some other usable form.

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ABSTRACT

This study aimed at measuring the impact of automation on agricultural information services in the National Agricultural Research Organisation (NARO) with a view to identify problems and make recommendations for the improvement of automated information services. The objectives of the study were: to establish the means through which NARO staff offer their information services by way of automation, to establish clients' attitudes towards the way they receive automated information services, to identify problems related to automated information services, and to suggest possible recommendations for overcoming problems related to automated information services. To achieve the above, personal interviews, observations and discussions were conducted to collect data from Kawanda and Namulonge. The findings of the study indicated that librarians carried out most of their library routines with the aid of computers. The librarians further expressed the need for a better or modernised automated information service system. Agricultural researchers wanted current and updated agricultural information of which most of it was meant by electronic resources, especially CDs. Most problems faced by NARO's information service system were due to lack of enough funds. Conclusions and recommendations summed up the study with an illustration that shows a proposed automated agricultural information system for NARO.

CHAPTER ONE

1.0 INTRODUCTION

This chapter consists of information on the background of libraries and automation, agricultural research in Uganda, an introduction to NARO and the state of library automation in NARO. The statement of the problem, aim, objectives justification, scope and limitations of the study on the impact of automation on agricultural information services are presented.

The chapter ends with a summary of the five chapters of this dissertation.

1.1 Background of the Study

The interest in library automation originated from the researcher's general observation of the frustrations experienced by library staff and clients in locating information and documents even when the library had a semi-automated library and information system. This interest was focused on Uganda's agricultural sector because provision of right and timely information is one of the vital means to the development of Uganda's backbone economy - agriculture.

1.1.1 Libraries and Automation

The basic aim of librarianship is to bring the right user in contact with the right document or information in the right time. In other words, a librarian or an information worker is concerned with ensuring that there is an effective and efficient provision of documents or information to clients.

On account of information and knowledge explosion, it has become essential for librarians to provide a master key to this repository of knowledge. To make the

maximum use of this tremendous upsurge of knowledge in the service of humanity, the librarians started mechanising activities of libraries and research institutions through various gadgets.

Over a period of thirty years, goals for library automation have shifted from an emphasis on local concerns to an emphasis on global concerns. These goals evolved through three incremental phases - efficiency of internal operations, access to local resources, and access to resources outside the library - before reaching the present stage of addressing interoperability among systems and services.

The challenge facing libraries today is how to act locally - to implement systems that ensure internal efficiencies and high levels of service to the community - while thinking globally, assuring the local systems are able to exchange data with other systems around the world. This challenge is more pronounced in developing countries like Uganda.

According to **Lam (2000)**, the areas of library automation at the present moment include:

- Automation of library functions (Acquisition, cataloguing, serials control, circulation, OPAC, reporting)
- Use of electronic resources within the library (e.g. CD-ROMs)
- Accessing remote electronic resources (e.g. Internet)
- Office automation (e.g. Word-processing, Spreadsheets, Databases, etc.)
- Client services (e.g. Computer laboratory, multimedia center)

Lam (2000) provides an illustration of the components that are involved in the automation of library functions. **Figure 1.1** shows the illustration.

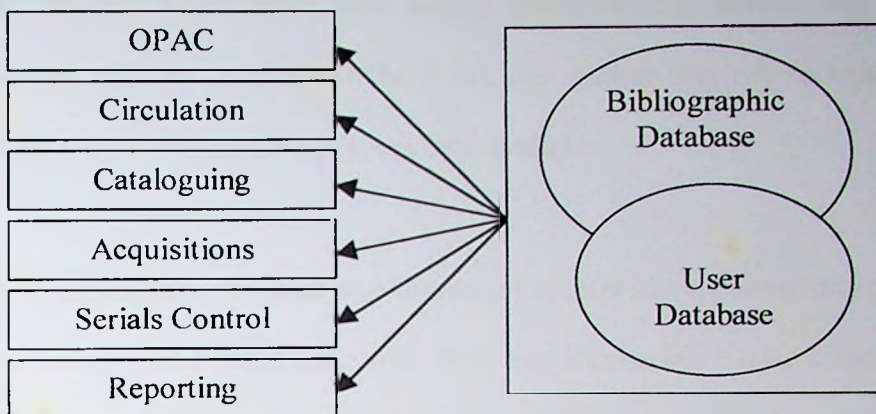


Figure 1.1: Automated library functions

1.1.2 Agricultural Research in Uganda

This subsection provides information on the inception of agricultural research in Uganda and how it developed till 1992, when NARO was created. This information has been documented from <http://www.naro.go.ug/>.

Uganda has enjoyed a long research tradition, starting with the early colonial period when reputable and outstanding research stations at Kawanda, Namulonge, Serere and Entebbe were developed. A series of improved plant and animal materials and technologies flowed from these stations and helped make Uganda one of the foremost East African countries in the production of food and export commodities from the 1950s until the early 1970s.

The faculty of Agriculture and Forestry of Makerere University commenced research in agriculture in 1957. It is the oldest institution of higher learning in agriculture in Africa, offering many research programmes. Uganda also served as the host country for the East African Community (EAC) research institutes for trypanosomiasis and tsetse control and for fisheries research, and established research stations with major responsibilities for

sorghum, millet, sugar cane and cotton improvement within the EAC. After Independence and the breakup of the EAC, the system was not rationalized to meet national objectives within the resources then available.

Until 1992, agricultural research was organized strictly along commodity groups (crops, livestock, forestry and fisheries) under four line ministries. These commodity groups operated independently of one another and hardly shared facilities. Given Uganda's economic constraints, and urgent need to strengthen agricultural research was identified and a working group charged with a task of formulating proposals for cost-effective implementation of research through appropriate use and consolidation of the available research infrastructure was formed. The working group recommended the creation of a National Agricultural Research Organization which would encompass all agricultural research in the country so as to create a productive research network.

1.1.3 Introduction to NARO

This subsection provides information, on NARO's vision and the major goals of NARO's Information Management System (IMS), which has been documented from <http://www.naro.go.ug/>.

NARO was created by statute in 1992 with a clear vision *"to be a centre of excellence spearheading the development and enhancing the flow of improved and appropriate technologies with its partners and clients, to the farming communities by establishing and operating lean, efficient and cost effective mechanisms and an enabling environment for agricultural research and sustained agricultural development, through a system of management devolution and delegation of authority."*

In the context of changed internal and external environments, NARO sees its vision as *"transforming into a more dynamic and better equipped institution with capacity to effectively respond to the changing needs and demands for agricultural technology, knowledge and information, and contributing to meeting the emerging agricultural development challenges of ensuring food security, alleviating hunger and eradicating poverty."*

Recognizing that information is a vital component of research and economic development; considering that information is a national resource required by policymakers, managers, administrators, researchers and other clients essential for socio-economic development if optimally utilized:

The major goals of the Information Management System (IMS) for NARO are:

- An effective, efficient, systematic, up-to-date, well-managed and easily accessible system of gathering, processing, storing and disseminating of agricultural research information;
- Well-informed agricultural research policymakers, managers, scientists and technology clients.

1.1.4 The State of Library Automation in NARO

The Agricultural Research Information Service (ARIS) is one of the support service units of NARO. ARIS is charged with the responsibility of coordinating information and library activities within NARO and enhancing access to national and international agricultural research knowledge. ARIS has very extensive linkages with both local and international organisations involved in the provision of agricultural information. See **Appendix C** for the examples of the organisations that collaborate with NARO.

ARIS coordinates a number of institute libraries of which the following had an automated catalogue based on CDS/ISIS:

- Fisheries Research Institute (FIRI) Library, Jinja
- Forestry Research Institute (FORI) Library, Kampala
- Kawanda Agricultural Research Institute (KARI) Library, Kampala
- Livestock Health Research Institute (LIRI) Library, Tororo

The other libraries which had no automated catalogue included:

- Namulonge Agricultural and Animal Production Research Institute (NAARI) Library, Kampala
- Agricultural Engineering and Appropriate Technology Research Institute, (AEATRI)
- Coffee Research Centre, (COREC)
- Food Science and Technology Research Institute, Kampala (FOSRI)
- Serere Agricultural and Animal Production Research Institute (SAARI)

ARIS offers a range of electronic information products which included:

- ◆ CD ROM DATABASES. Examples include Animal production and Dairy Technology Information (BEASTCD), Current Agricultural Research Information system (CARIS), International Information System for the Agricultural Sciences and Technology (AGRIS), Worldwide Forestry Information (TREECD), African Highland Initiative (AHI), among others. A full list of CDs that were possessed by ARIS is on **Appendix D**.
- ◆ IN-HOUSE DATABASES. Examples include National Information System for the Agricultural Science and Technology (AGRIN), National Current

Agricultural Research Information System (CARIN), Information for Research Managers (INFORM), and Question and Answer Service (QAS) database.

- ♦ NARO HOME PAGE accessible through <http://www.naro.go.ug/>.

With the support of the Technical Centre for Agricultural and Rural Cooperation (CTA), ARIS offers Selective Dissemination of information (SDI) and Question and Answer Service (QAS) which are handled with the aid of computer and telecommunication technologies.

The QAS (see **Appendix E** and **Appendix F**) was put in place to provide information services on demand. Requests for scientific and technical information are answered using ARIS library facilities e.g. the Internet, The Essential Electronic Agricultural Library (TEEAL, see **Appendix G**) containing over 100 journals on CD-ROM and other online databases, as well as its collection of periodicals, pamphlets and other materials. Experts in particular fields are consulted, especially where resources are insufficient for a comprehensive answer.

Requests are made and answered through e-mail, post office, telephone and fax. The requests are indexed in a database to make future re-use easier.

1.2 Statement of the Problem

The statement of the problem was depicted from the principal function of an information centre - to provide right and timely information to clients. Although NARO embraced the use of an automated catalogue, CD-ROM and Internet in offering automated

information services to agricultural researchers, there was a problem of failure to efficiently and effectively access full (detailed and current) information.

1.3 Aim of the Study

The overall aim of this study was to measure the impact of automation on agricultural information services in NARO with a view of identifying problems and making recommendations for the improvement of automated information services.

1.4 Objectives of the Study

The objectives of this study were to:

1. To establish the means through which NARO's librarians offered their information services by way of automation.
2. To establish clients' (NARO's agricultural researchers') attitudes towards the way they received automated information services.
3. To identify problems related to automated information services.
4. To suggest possible recommendations for overcoming problems related to automated information services.

1.5 Justification of the Study

This study focused on the evaluation of the use of an automated library and information system in the provision of agricultural information services. This indicates that the immediate beneficiaries of this study are involved in aspects of a specialized field of knowledge, that is, agriculture. This goes a long way to realise that the significance of carrying out this study was to build up ideas that will generally enable managers and

librarians in planning for the organisation and provision of information materials and services to a specialised group of users with the aid of the automated system. For instance, the provision of medical and health information services by a medical information centre or library.

1.6 Scope and Limitations of the Study

The study was intended to cover a full range of facts related to the automation of the library system in NARO. This involved making a study on the electronic facilities possessed by ARIS and the institute libraries it coordinates. These facilities included automated catalogues, CD-ROM databases, in-house databases, e-mails and the Internet.

The study was limited in the time and cost required to cover all the opinions of NARO's librarians and clients who are scattered all over Uganda. For instance, Livestock Health Research Institute (LIRI) library which is part of NARO's agricultural information system is found in Tororo. The library in Tororo was far away for the researcher to get in touch with. Therefore the study was limited to ARIS, KARI and NAARI which were within easy reach.

1.7 Summary

This dissertation consists of five chapters that cover the study on the impact of automation on agricultural information services at the National Agricultural Research Organisation (NARO), Uganda.

Chapter one is an introduction to the study that attempts to account for the factors that sparked off the interest in the study. The chapter gives the background of NARO,

presents the problem statement, and spells out the aim and specific objectives of the study. The purpose of the study is to come up with possible ways of fully satisfying information needs of specialised users (agricultural researchers) by automation means.

Chapter two is devoted to literature review. This presents some of the related information that has been documented by previous researchers in the area of automated library and information services. Literature is reviewed under three main sections: library automation, information services and impact of library automation on information services. The chapter ends with a summary that points out the intention for carrying on the study.

Chapter three presents the methodology that was adopted in carrying out the study. This chapter focuses on the study areas, study population, the type and size of sample and the methods that were used to obtain study findings. The methods included interviews, observations, informal discussions and literature survey. The chapter ends with a research procedure that gives a brief description of how the findings were collected, presented, analysed, discussed and documented.

In chapter four, the study findings were presented, analysed and discussed as per each objective of the study. Each objective of the study had a particular number of corresponding questions derived from the interviews that were conducted. The librarians carried out most of their library routines with the aid of computers. The librarians further expressed the need for a better or modernised automated information service system. The agricultural researchers expressed the need for current and updated agricultural information of which most of it was meant by electronic resources, especially CDs. The

problems of NARO's information service system were mainly due to lack of adequate funds.

Chapter five gives conclusions and recommendations of the study. The conclusions were based on the study objectives. The recommendations were derived from the findings of the study as well as from the researcher's opinions and the literature that was reviewed. The study ends with an illustration that shows a proposed automated agricultural information system for NARO.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter gives a critical examination of published studies that have been carried out in the areas of library automation, information services, and the impact of library automation on information services. The purpose of this chapter is to show an association of this study and the other previously carried out related studies.

The chapter ends with a summary that reveals the intention of carrying on the study. The intention is described under four research questions.

2.2 Library Automation

Gallimore (1996) argues that public libraries need to give priority to information technology (IT) if they are to continue as the main point of access for the general public seeking information:

"Library services are making more and more use of IT as part of their direct delivery of services to users and this trend will continue in the future. The trend is towards end-user access to IT systems in public libraries. There are pressures from all sections of society for public libraries to increase their IT facilities and new IT-based media are appearing all the time. Multimedia and bibliographic CD-ROMS, shareware, internet access, computer-based open learning, etc are all placing new demands upon resources."

In other words, **Gallimore (1996)** clearly pointed out that in this era of IT, public libraries should possess self-issuing terminals that provide Online Public Access

Catalogue (OPAC), access to the Internet and World Wide Web (WWW) to library users.

Gallimore (1996) makes a conclusion by saying that *"Electronic services are not intended to replace traditional media but to complement them. By providing such services public libraries will continue to play a vital role in the provision of information services."*

Ford (1991) covered the application of information and communication technology in the management of knowledge right from its creation to its use. He pointed out that 'intelligent' computer systems add to the range of knowledge resources at our disposal. He covered two examples of 'intelligent' computer systems: (i) TIS (Topic Identification System) (ii) AIR (Adaptive Information Retrieval); and how these systems are being applied in information work. How do they work? What benefits can they bring? What is 'knowledge management', and how does the development of intelligent computer systems have potentially dramatic implications for information professionals?

Ford (1991) attempted to respond to three questions:

- (i) What applications of Artificial Intelligence (AI) are relevant to the existing and developing role of information professionals?
- (ii) What concepts and techniques does the reader need to know about in order to gain a good understanding of these applications, and to be able to follow future developments?

- (iii) How can these concepts, techniques and applications be presented to the reader in an accessible way demanding no prior knowledge or experience of computing on his/her part?

In other words, **Ford (1991)** addressed the relevance of intelligent computer systems to library and information professions in that the systems can help:

- (i) develop our professional role (from information to knowledge management).
- (ii) offer clients new types of knowledge resource
- (iii) achieve 'traditional' LIS (Library and Information Service(s)) in-house objectives more cost effectively

2.3 Information Services

Sturges (1996) made a report on the provision of information in the villages of Malawi.

The specific objectives of the project were to examine the chain of communication between providers of information (chiefly government ministries and agencies) and the ordinary citizens in the rural communities who are the intended users of this information. This was done at three points: in the agencies which create information packages for dissemination; amongst the intermediaries who actually do the dissemination; and the inhabitants of the villages, whose needs the packages are intended to serve.

Sturges (1996) simply made a clarification on the importance of information services in providing means for the flow or transfer of information from information sources to information seekers. The results were a contribution towards understanding an

information environment which presents unusual degrees of challenge for both the information seeker and the information worker.

2.4 Impact of Library Automation

✓ **Orambo (1996)** lays emphasis on the role of a computer as a modest tool in the management of information. The findings obtained from her study revealed that computerized information services were managed effectively and efficiently better than manual services:

"Computers enhance information management and handling by provision of easy processing, compact storage and fast retrieval thus quickening decision making and planning processes. Use of networks has also led to quick information provision. Computers have eased the work of employees by reducing the burdens of handling bulky paper files."

In addition to having computers to manage information, **Orambo (1996)** addressed a paramount importance of having a team of well trained competent staff who are able to handle both the information and the computers.

Michael (1989) made comments on the impact of automation on the library organisational structures. He maintained that automaton basically changes the conditions of structural development. This was reviewed through a great number of published studies that dealt with the new information technology and its impact on organizations and organizational structure:

"One issue which has been debated for a long period is whether the organisation, as Thomas Whisler predicted in 1970, will become flatter

as a result of the introduction of information technology. Having studied a number of cases Arthur Francis concludes that there is no consistent pattern of flatter structures (FRANCIS 1986). However, Peter Drucker in a recent article on The Coming of the New Organization maintains that when companies shift from using computers for processing data to producing information, then organizational structure will change and the number of managerial levels will be sharply reduced (DRUCKER 1988)."

Michael (1989) pointed out that automation leads to a great possibility of merging library functions, such as the merging of acquisitions and cataloguing functions, hence having an impact on the structure of a library.

Nakku (2000) made an assessment of how IT can bring about an improvement in the services of public libraries in Uganda. She commented that, *"The provision of timely and appropriate information should now be accepted as an important ingredient in the development process because it guides people in choosing the best course for their development and the country at large."*

Nakku (2000) maintained the fact that the use of manual systems leads to the slow capture, processing, storage and communication of bulky information. On that note, she calls for the use of IT in Uganda's public libraries so as to pave a way for the quick development of the country.

In her concluding remarks, Nakku (2000) clearly points out that IT is merely a tool which can easily be mismanaged or mishandled; and therefore, having a well trained competent staff in an information system is of paramount importance.

Nkuutu (1996) studied the need and possibility of improving on an information service system for the clearing and forwarding industry in Uganda through automation means. He reported that, *"Manual information service systems are cumbersome in the collection, organisation, storage, retrieval, dissemination, preservation and maintenance of information. This is so because the manual system is slow, inaccurate, inefficient, and consumes a lot of office space."*

Nkuutu's (2000) investigation was more of a comparative study between a manual information system and an automated information system. He concluded by recommending for an automated information service system because its implementation is more flexible.

2.5 Summary

The literature examined in this chapter made it clear that computer systems are just tools that are designed to support or facilitate an information system of an organisation. On that note, most reviewed literature revealed that librarians or information workers have to be well trained and competent in handling both information systems and computer systems so as to ensure that information services are well rendered to information seekers, thereby meeting users' information needs.

In relation to automated information services, the intention of carrying on this study was done so as to deal with the following research questions:

1. What are the attitudes possessed by NARO's librarians towards the use of automation in offering agricultural information services?
2. To what extent has library automation contributed to the satisfaction of NARO's agricultural researchers' information needs?
3. What are the problems faced by NARO's information service system?
4. What are the possible solutions to the problems faced by NARO's information service system?

CHAPTER THREE

3.0 RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter briefly describes the procedures that were undertaken in accomplishing this study. This involved describing the study areas and study population under investigation, the type and size of the sample, and the methods that were used to obtain study findings. According to **Busha (1980)**, *"In methodology, only relevant actions and information which directly contribute to the results presented should be given."*

The chapter ends with a research procedure that gives a brief description of how the findings were collected, presented, analysed, discussed and documented.

3.2 Research Design

The study was based on both quantitative data and qualitative data. Quantitative data was obtained by collecting data on the use or non-use of libraries and the various ways in which information was disseminated in the institute libraries. Qualitative data was got by collecting data on the use of computers in information services; problems and solutions of automated information services; and from literature reviews.

3.3 Research Method

A survey research was developed to provide information on the factors of acceptance or resistance among agricultural researchers and librarians of NARO towards the use of automation in agricultural information services. According to **Busha (1980)**, *"Survey research is characterised by the selection of random samples from large and small populations to obtain empirical knowledge of a contemporary nature. This knowledge*

allows generalisation to be made about characteristics, options, beliefs, attitudes, and so on, of the entire population being studied."

Survey research was used to accomplish this study because it saves time and money, without sacrificing efficiency, accuracy, and information adequacy in the research process.

The independent variable was the level of automation while the dependent variable is the level of productivity in agricultural information services. The level of productivity was measured in accordance to two factors:

- (i) Librarians' attitudes towards the use of computers in offering information services (skills and level of flexibility in accessing and disseminating agricultural information)
- (ii) Agricultural researchers' degree of satisfaction (accuracy or content of received information and the time saved)

3.4 Description of Study Areas

The study covered NARO. However, the study was limited to two geographical areas: Kawanda and Namulonge.

Kawanda had two information centres which were ARIS and KARI library while Namulonge had only one which was NAARI library.

There were seven agricultural research programmes in Kawanda while there were 8 agricultural research programmes in Namulonge. **Table 3.4** contains the lists of the research programmes in Kawanda and Namulonge.

4.5 Population of the Study

The study population included all NARO's agricultural researchers and librarians who were attached to various agricultural research institutes managed by NARO.

However, the target population only covered agricultural researchers and librarians in Kawanda and Namulonge.

Kawanda had 50 agricultural researchers who were distributed among 7 agricultural research programmes while Namulonge had 45 agricultural researchers who were distributed among 8 agricultural research programmes.

Table 3.5 shows the distribution of the agricultural researchers among the agricultural research programmes in Kawanda and Namulonge.

AREA OF STUDY	
KAWANDA	NAMULONGE
1. Banana improvement programme ...(05)	1. Animal production programme(07)
2. Horticulture research programme ...(08)	2. Cassava programme(06)
3. Post-harvest research programme ...(09)	3. Biological control(04)
4. Soil and soil fertility management programme(08)	4. Potato programme(05)
5. Tissue culture unit(05)	5. Agrometeorology unit(04)
6. Seed programme(11)	6. Beans programme(06)
7. Kiige citrus scheme(04)	7. Cereals improvement programme(07)
	8. Meteology unit(06)
Total agricultural researchers(50)	Total agricultural researchers(45)

Table 3.5: Distribution of agricultural researchers among agricultural research programmes in Kawanda and Namulonge

3.6 Sampling Procedure and Sample

3.6.1 Sampling Procedure

All librarians from Kawanda and Namulonge were selected to make a sample of 6 librarians.

The sampling technique that was used in selecting agricultural researchers was 'convenient' technique. The 'convenient' technique meant that the researcher interviewed any 2 easily approachable agricultural researchers from each of the agricultural programmes to make a total of 30 agricultural researchers. The sampling technique that was adopted and the decision to select only 2 agricultural researchers per agricultural research programme were done to save on time and cost of carrying out the study since most agricultural researchers were either too busy to attend to the researcher or they

were hardly around the research institutes during the days the interviews were carried out.

3.6.2 Sample Description

All the 6 librarians in Kawanda and Namulonge were selected.

Basing on the selection criteria mentioned in subsection 3.5.1, there were 7 programmes in Kawanda and so 14 agricultural researchers were selected; while in Namulonge there were 8 programmes from which 16 agricultural researchers were selected.

Table 3.6 shows the sample of the study. The table indicates the distribution of NARO's library staff and agricultural researchers that were selected by the researcher.

AREA OF STUDY		LIBRARY STAFF	AGRICULTURAL RESEARCHERS
Kawanda	ARIS	3	14
	KARI	2	
Namulonge	NAARI	1	16
TOTAL		6	30

Table 3.6: Sample description

The sample was primarily used for the collection and representation of data; and in the analysis and discussion of the findings made in this study.

3.7 Data Collection Methods

A combination of data gathering methods were used in the collection of study findings. These included the following: interviews, observations, informal discussions and literature survey.

3.7.1 Interviews

Data from librarians and agricultural researchers was solicited verbally and individually. An interview schedule (see **Appendix A**) was used in collecting data from the librarians while and interview guide (see **Appendix B**) was used in collecting data from agricultural researchers.

The interview schedule contained structured questions while the interview guide contained unstructured questions.

An interview schedule was an ideal tool for collecting data from the librarians because it easily facilitated in capturing precise answers that easy to analyse qualitatively.

An interview guide was an ideal tool for collecting data from the agricultural researchers because it enabled the researcher to make clarifications on library automation and information service concepts that were not clear to the agricultural researchers.

3.7.2 Observations

The researcher inspected and took note of the various automated library facilities, products and services offered. This involved:

- (i) How library users' requests were recorded and answered especially in the provision of Question and Answer Services (QAS).
- (ii) Testing librarians on the information retrieval of specific records from CDS/ISIS, TEEAL CDs and Internet.
- (iii) Inspecting the arrangement of printed documents and CDs. This is important because a systematic arrangement ensures easy access to documents and information.

3.7.3 Informal Discussions

Informal discussions were held with the all librarians. Talking with and sharing ideas and opinions with the staff was helpful in understanding NARO's information service system. Such discussions helped to confirm or disprove data collected using other techniques. It was also a means of gathering more data that might have been left out.

3.7.4 Review of Survey Literature

This constituted reading published materials (both electronic and printed) concerning the study. This assisted the researcher on getting information on what has already been done in relation to the research topic and other aspects such as the historical background of agricultural research in Uganda.

Information sources included books, journals, reports, brochures, dictionaries, encyclopaedias and the Internet.

3.8 Presentation, Analysis and Discussion of Findings

The study findings were presented in tabular form, and where applicable, totals and percentages were included so as to facilitate analysis. The presentation of findings were done by grouping or categorising the findings while data analysis was done by making comparisons between or among the categories.

For each presentation, an objective of the study was quoted, corresponding interview questions were outlined, and an analysis and discussion of findings were made.

3.9 Research Procedure

First, an introduction letter (see **Appendix I**) was acquired from East African School of Library and Information Science (EASLIS) administration which introduced the

researcher to the areas of study. While soliciting for information, total privacy and confidentiality were assured to the respondents. After collecting all the necessary data, the presentation, analysis and discussion of study findings were carried out. After completing the study, it was documented into this research report (dissertation).

Appendix H shows the work plan that was used by the researcher to accomplish and write the dissertation on this study.

CHAPTER FOUR

4.0 PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter addresses the objectives of the study with a purpose of identifying reasons for explaining the research problem - *"Although NARO embraced the use of an automated catalogue, CD-ROM and Internet in offering automated information services to agricultural researchers, there was a problem of failure to efficiently and effectively access full (detailed and current) information."*

The study findings are presented, analysed and discussed as per each objective of the study. Each objective of the study had a particular number of corresponding questions derived from the interviews that were conducted.

4.2 Description of Respondents

This section focuses on describing the types of all respondents that were interviewed by the researcher, which has been made by addressing two research questions derived from the interview schedule:

- (i) What position do you hold in NARO?
- (ii) What are your major responsibilities or duties in the library/information centre?

The respondents that were interviewed represented 100% of the study sample.

Table 4.2 shows the distribution of the respondents of NARO's library staff and agricultural researchers.

AREA OF STUDY		LIBRARY STAFF	AGRICULTURAL RESEARCHERS
Kawanda	ARIS	3	14
	KARI	2	
Namulonge	NAARI	1	16
	TOTAL	6	30

Table 4.2: Distribution of Respondents

The study was carried out in ARIS and KARI which were found in Kawanda; and in NAARI which was found in Namulonge. From the research findings, there was only 1 librarian in NAARI, with about 45 agricultural researchers of which 16 were interviewed. There were 5 librarians in Kawanda of which 2 are in KARI and 3 are in ARIS. There were 50 agricultural researchers in Kawanda of which 14 were interviewed.

Among the 3 librarians in ARIS, one was a librarian and the other two were assistant librarians; in KARI, one was a librarian and the other was an assistant librarian while in NAARI there was only one librarian.

All the librarians performed or got engaged in a variety of library technical and users' services that facilitated the linkage between documents or information and library users. Such library operations included accessioning, cataloguing, and processing of information sources; and offering of reference and information (QAS) services.

From the above findings, it was noticed that the librarians had work overload especially in NAARI library. Considering that the librarian in NAARI was solely responsible for

managing the library and performing library routines, it became very difficult for him to effectively and efficiently perform all tasks including the provision of automated information services to the agricultural researchers.

The work overload was probably due to lack of enough library staff or lack of an appropriate automated information system that would facilitate the execution of library routines.

4.3 Library Use or Nonuse

In this section, the factors that affected the use or nonuse of the libraries in Kawanda and Namulonge are evaluated with a purpose of measuring the extent library automation has contributed to the satisfaction of the agricultural researchers' information needs. In other words, this section focuses on one of the objectives of the study, which was, *"To establish clients' (NARO's agricultural researchers') attitudes towards the way they received automated information services."*

This section is so diverse, in that, it addresses many of the interview questions that were used in the interview schedule (first question below) and the interview guide:

- (i) How often have you received complaints from users for having failed to get adequate information in the right time?
- (ii) Do you normally refer to for your institute library for agricultural information needs?
- (iii) Are there any other places that you refer to for agricultural information?
- (iv) To what extent have your agricultural information needs been met by your institute library?

- (v) From what form of sources (that is, print or CD-ROM or Internet) are your agricultural information needs got?
- (vi) Have you ever used Internet or CD-ROM in accessing agricultural information in your institute library?
- (vii) Do you receive library staff assistance in searching for any agricultural information on the Internet or CD-ROM?

Having noted that this section is so diverse, the researcher divided it up into subsections which are:

1. Measuring agricultural researchers' level of satisfaction
2. Factors that affected level of satisfaction
3. Accounting for libraries nonuse
4. General overview

4.3.1 Measuring agricultural researchers' level of satisfaction

Table 4.3A shows the distribution of NARO's agricultural researchers in terms of the extent to which the institute libraries successfully met the information needs of the agricultural researchers.

AREA OF STUDY	USERS		NONUSERS (DUE TO POOR SATISFACTION)	TOTAL
	SATISFIED	FAIRLY SATISFIED		
Kawanda	6	6	2	14
Namulonge	3	8	5	16
TOTAL	9 (30%)	14 (47%)	7 (23%)	30 (100%)

Table 4.3A: Level of satisfaction (indicated by agricultural researchers)

In general, as indicated in the **table 4.3A**, 30% of agricultural researchers in NARO are satisfied with the information they seek for in the institute libraries, while 47% are fairly satisfied and 23% do not use the institute libraries at all.

The presentation of the findings in **table 4.3A** as indicated by the agricultural researchers is to a great extent comparable to the findings presented in **table 4.3B** as indicated by the librarians when they were asked, *"How often have you received complaints from users for having failed to get adequate information in the right time?"*

AREA OF STUDY	VERY OFTEN (100%)	OFTEN (75%)	SOMETIMES (50%)	RARELY (25%)	NEVER (0%)
Kawanda	—	—	1	4	—
Namulonge	—	—	1	—	—
TOTAL	—	—	2	4	—

Table 4.3B: Rate of complaints received from users (indicated by librarians)

Among the 6 librarians, 4 indicated that they rarely received complaints from users while the other 2 indicated that they sometimes received complaints from users.

Each of the options in **table 4.3B** was given a percentage score in which 'very often' was given a score of 100% while 'never' was given a score of 0%.

The two librarians who answered 'sometimes' produced a score of 100% (2 times 50%) while the four librarians who answered 'rarely' also produced a score of 100% (4 times 25%). This implies that the average score is:

$$\frac{(2 \times 50\%) + (4 \times 25\%)}{6} = \frac{200\%}{6} = 33.3\%$$

Therefore 33.3% of the responses received by librarians from the users are complaints

The average percentage score of 33.3% derived from **table 4.3B** implies that 67.3% (100 - 33.3) of the agricultural researchers are either satisfied or fairly satisfied. In comparison with results from **table 4.3A**, 77% (30 + 47) of agricultural researchers are either satisfied or fairly satisfied.

In general, the overall approximate level of satisfaction derived from both **table 4.3A** and **table 4.3B** was got by calculating the weighted percentage score:

$$\frac{(6 \times 67.3\%) + (30 \times 77\%)}{36} = \frac{2713.8\%}{36} = 75.4\%$$

Therefore the level of user satisfaction got from the institute libraries is approximately 75.4%.

→ This result got above gives an impression that most of the information needs are met but it should be **noted that most of the needs were just fairly satisfied**. The level of satisfaction is attributed to various factors which are discussed in the next subsection, **4.3.2**.

4.3.2 Factors that affected level of satisfaction

After a careful study of the responses made by NARO's agricultural researchers, it was learnt that the following factors affected the use or nonuse of the institute libraries:

- (i) First and foremost, the lack of required information. One of the agricultural researchers said that, *"Some documents we (agricultural researchers) recommend to the institute libraries are not acquired at all by the libraries."*
- (ii) Secondly, the depth or level of information sought. Agricultural researchers are interested in a very detailed level of agricultural information, which is not always accessible from the institute libraries.
- (iii) Thirdly, the type of information (either current or old). Agricultural researchers are more interested in current agricultural information yet the institute libraries possess old documents especially NAARI library.
- (iv) Fourthly, the form of information sources (documents, CD-ROM, or Internet). Agricultural researchers referred to all the three forms of information sources although CD-ROM was mostly referred to, followed by documents and Internet respectively.

In respect to the form of information sources, all the librarians in ARIS and NAARI agreed as well that most library users get their information needs met through the use of CD-ROM followed by documents and Internet respectively.

CD-ROM was most preferred because most full text information requests are answered with the use of TEEAL CDs (see **Appendix G**).

Documents followed CDs in terms of preference probably because they contain information that can be directly read without the aid of computer systems and they were the only form of information source that could be lent out to the agricultural researchers.

Although Internet offered current information, it was least preferred because some of its sources were not easily accessible due to information explosion; and it provided mainly abstract agricultural information which is a means to an end. Nevertheless, Internet was used to facilitate in the selection of documents. By reading through the abstracts got from Internet, the agricultural researchers were able to recommend for the acquisition of appropriate documents.

4.3.3 Accounting for libraries' nonuse

Table 4.3A indicates that 23% of the agricultural researchers never used the institute libraries at all. When the agricultural researchers were asked, *"Do you normally refer to for your institute library for agricultural information needs?"*, 7 (23%) of them said they completely do not refer to their institute libraries. One of the researchers said that, *"I don't use the library because I am satisfied by the stock of documents that I possess in my office, and by the way, these documents are not accessible anywhere else in Uganda."*

Most of these agricultural researchers (the 23%) made their own individual efforts to acquire such documents through donations, and sometimes they acquired them as gifts from fellow international agricultural researchers from France, USA, Netherlands, Canada, South Africa and Egypt.

When the agricultural researchers were asked, *"Are there any other places that you refer to for agricultural information?"*, 20 (67%) of them said 'yes' whereas 10 (33%) of the agricultural researchers said 'no'. The 20 agricultural researchers who said 'yes' refer to other places or organisations such as Makerere, Nakawa and NEMA. In response to the

question, one of the agricultural researchers said that, *"ARIS does not possess all the information that I need. So, sometimes, I refer to Makerere."*

The other 10 (33%) agricultural researchers who said 'no' to the above question depended on only the information resources within their research institutes. These resources included the NARO institute libraries, other agricultural researchers within the institutes and documents kept within their own offices.

In the researcher's view, libraries' nonuse is probably attributed to the fact that the acquisition of relevant agricultural documents or information is very slow due to lack of adequate funds to support:

- (i) the acquisition process for acquiring recommended documents
- (ii) an appropriate automated system that would facilitate the sharing and transfer of agricultural information.

4.3.4 General Overview

In the above findings on the level of satisfaction, it was generally concluded that the agricultural research institute libraries approximately satisfied 75.4% of the agricultural researchers' information needs.

However, it was noted that most of the needs were just fairly satisfied, and most agricultural researchers used the library to seek for information which was mostly got from electronic resources, especially CDs (see **Appendix D**)

Also, **table 4.3A** indicates that that agricultural researchers in Kawanda were more satisfied than the agricultural researchers in Namulonge. This was probably attributed to by the following factors:

- ARIS and KARI had newer documents as compared to NAARI.
- NAARI has no automated catalogue (neither manual catalogue) to enable an easier access to library stock whereas, KARI had an automated catalogue based on CDS/ISIS.
- ARIS was more resourceful in CDs (see **Appendix D**) that possessed abstract and full text information. ARIS receives TEEAL CDs (see **Appendix G**) that contain full text current information that is mostly accessible and searched by agricultural researchers in Kawanda.

However, one of the agricultural researchers in Kawanda expressed concern by being worried over the shift of ARIS to Entebbe. He said, *"If ARIS is to be relocated in Entebbe, as the roamers hold it, then how will the agricultural researchers in Kawanda benefit from TEEAL since KARI does not have the CDs."* Such a comment from the agricultural researcher meant that the information contained in TEEAL CDs is not easily accessible by other NARO agricultural researchers who are not within Kawanda. In other words, the presence of ARIS in Kawanda played a big role in the higher level of user satisfaction in Kawanda as compared to Namulonge.

† 4.4 Computer Use and Training

This section is important in evaluating the extent to which library automation was achieved as a tool in facilitating the day-to-day library operations in Kawanda and Namulonge. The section focuses on one of the objectives of the study, which was, *"To*

establish the means through which NARO's librarians offered their information services by way of automation." In other words, this section is meant to establish librarians' attitudes towards automation.

In order to accomplish the above objective, the following questions derived from the interview schedule were addressed:

- (i) What type of information formats are commonly used as sources of information?
- (ii) In your daily tasks, do you use a computer in offering information services to users?
- (iii) How often do you use an automated catalogue in accessing information sources?
- (iv) To what extent have you succeeded in using the computer in retrieving right information within the shortest time possible?
- (v) Do you undertake any computer software training so as to improve your skills in handling database programs?

Table 4.4 illustrates the information services in which computers were used in Kawanda and Namulonge.

AREA OF STUDY		COMPUTERISED INFORMATION SERVICES				
		CATALOGUE	DBMS	CD-ROM	E-MAIL	INTERNET
Kawanda	ARIS	X	√	√	√	√
	KARI	√	X	X	X	X
Namulonge	NAARI	X	X	√	√	√

X: Absent ; √: Present

4.4: Use of computerised information services in libraries

Table 4.4 indicates that ARIS and NAARI library primarily used the computers for e-mail, Internet and CD-ROM searching while KARI library used the computers only for the maintenance of a catalogue. The table also indicates that it is only ARIS that handles DBMS.

As defined in this study, library automation is the use of computer and networking technologies in a library. However, the level of library automation in NARO was concentrated only on the use of computers. In other words, NARO had no networking technologies among its research institutes

One of the extreme factors identified in table 4.4, is that KARI library was the only one with an automated catalogue; and at the same time, KARI library used its two computers for maintaining only an automated catalogue based on CDS/ISIS software.

NARO was reluctant in setting up the other computerised information services in KARI library because KARI library was just adjacent to ARIS. In other words KARI library worked hand in hand with ARIS to implement the other computerised information services.

This section is divided into 6 subsections: (i) Catalogue, (ii) DBMS, (iii) CD-ROM, (iv) E-mail (v) Internet, (vi) General overview.

4.4.1 Catalogue

Among, the libraries visited in the study areas, KARI library was the only one with an automated catalogue and at the same time it was the only automated library facility it possessed.

The two librarians in KARI library used CDS/ISIS for entering, modifying, searching, retrieval and display of bibliographic data into the automated catalogue. When the researcher asked the two librarians, *"How often do you use an automated catalogue in accessing information sources?"*, they all said 'very often'. The librarians appreciated the usefulness of CDS/ISIS because it assisted them in storing a very big number of bibliographic records (6082 records) and in the retrieval of right records within a very short time.

When the researcher tested the two librarians individually by asking each of them to avail him with documents containing information on "diseases of passion fruits" and "soil requirements for Arabic coffee", the librarians managed to handle the requests effectively and efficiently with the aid of CDS/ISIS.

It was also noticed that CDS/ISIS would not be of help if the documents themselves were not arranged systematically on the shelves. Therefore, to render the automated catalogue useful, the librarians always ensured that documents were never reshelfed by users, and shelf reading was done at a regular interval of 2 weeks.

4.4.2 DBMS

There were 4 electronic in-house databases that were managed by ARIS which included CARIN, AGRIN, INFORM and QAS. However, these databases were not handled by the 3 librarians in ARIS; the databases were handled by 2 documentation officers in ARIS.

- (i) AGRIN which is based on CD/ISIS is a National Bibliographic Information system for Agriculture Sciences and Technology database of Uganda. NARO sends inputs of this database to Food and Agriculture Organisation (FAO) Central inputting centre in Vienna for incorporation into AGRIS.
- (ii) CARIN which is based on MS Access is a directory of agricultural research projects in Uganda. The records of this database are important in revealing the agricultural researches that were carried out in particular agricultural specialties at a particular period of time. In other words, CARIN creates awareness about research projects that are being carried out so as to enable agricultural researcher avoid making duplications.
- (iii) INFORM contains records on researchers and the research projects they have carried out. This database is vital in identifying experts in particular agricultural specialties.
- (iv) QAS which is based on MS Access contains records of agricultural information requests that were filled in a QAS form by users who inquired for information in ARIS. The database served the purpose of storing and evaluating users' information needs.

4.4.3 CD-ROM

Although both ARIS and NAARI library offer CD-ROM services, it was ARIS which had a variety of CDs and in very big numbers. **Appendix D** shows a full list of CDs that were found in ARIS.

Some CDs contained abstract information while the rest contained full text information. The CDs had indexes that facilitated searching of information that was done by the use of keywords.

One of the librarians in ARIS demonstrated literature searching on CD-ROM for the researcher. As the librarian was making the demonstration, the researcher observed that it was very easy to access full text information on almost all information requests that were thought of. This explains why CDs were the most used form of information source in NARO.

The CDs were supposed to be shared among NARO institutes but this was hardly done. However, information request from CDs were sometimes answered by e-mail in order to cater for the information needs made by other NARO agricultural research institutes.

TEEAL (see **Appendix G**) is the most used full text information CD in answering users' information requests in ARIS.

4.4.4 E-mail

This facility was used in keeping in touch with local and international agricultural researchers and organisations in terms of agricultural information requests and answers. In other words, the e-mail facility was sometimes used for answering users' agricultural information requests.

However, the e-mail facility was not fully used in the dissemination of agricultural information probably because:

- (i) most users don't have their own e-mail accounts,
- (ii) users find it better to visit the library instead of using e-mails since e-mailing does not easily permit an immediate continuous dialogue between a sender and a receiver.

4.4.5 Internet

Internet was used for two main purposes:

- (i) For logging online to international agricultural databases which were maintained by organisations that were in collaboration with NARO. Some of these organisations (see **Appendix C**) included FAO, CTA, KIT, CAB, ICRAF, ILRI CGIAR.
- (ii) Making literature searches on issues pertaining to agriculture. Internet is a very resourceful source of abstracts in agricultural information. By reading through the abstracts, the agricultural researchers are able to recommend for the acquisition of appropriate documents.

However, Internet is not mostly referred to as compared with CD-ROM and printed documents. This was attributed to two factors:

- Information explosion, making it difficult to retrieve required information.
- Most information on the Internet was so shallow to satisfy the agricultural researchers.

4.4.6 General overview

- ❖ *"In your daily tasks, do you use a computer in offering information services to users?"*

All librarians in Kawanda and Namulonge, apart from one who was found at the issue desk of ARIS, agreed that they used computers so frequently in the course of performing their library routines. The librarians used the computers so frequently because most of their duties were involved in performing literature searches with the use of either CDS/ISIS, or DBMS (CARIN, AGRIN, QAS), or CDs (especially TEEAL CDs), or the Internet.

The librarian at the issue desk of ARIS had no computer at his desk to manage an easier retrieval of documents; and he welcomed and recommended for the establishment of an automated catalogue. This implied that he does not use a computer in offering information services to users.

- ❖ *"To what extent have you succeeded in using the computer in retrieving right information within the shortest time possible?"*

Of the 5 librarians who offer computerised information services, 2 librarians answered 'very successful' while 3 librarians answered 'successful'.

The success in computerised information is mainly due to the fact that the databases (either on CD, or Internet, or CDS/ISIS, or in-house DBMS) facilitated easy searching with the use of keywords. Whenever the librarians were told to demonstrate how they carry out literature searching, the researcher observed that they all used keywords in retrieving information.

- ❖ *"Do you undertake any computer software training so as to improve your skills in handling database programs?"*

The 5 librarians who render computerised information services basically depended on on-job self-training in order to improve on their computer skills. In cases where they got stuck on the use of the computerised information services, they consulted among themselves and also used manuals.

NARO did not take the initiative to develop or modernise the skills of its librarians probably because it lacked adequate funds.

- ❖ To sum up the findings made on computer use and training, the researcher noted that, library automation was appreciated and welcomed by all the 6 librarians because it enables the storage, effective retrieval and transfer of a lot of information from one place to another within a short time; also, the librarians are capable of handling the technology applied in the information services.

A proposal was made by NARO to automate the catalogues of all its institute libraries. A further step would be taken to interlink all the institute libraries so that bibliographic information is shared among the institute libraries using a Common Communication Format (CCF). Probably this kind of automated system will be in place by the end of this year, 2001.

4.5 Information Urgency and Dissemination

This section is important in evaluating the rate/speed and the ways in which information is transferred between information seekers (agricultural researchers) and information workers (NARO librarians).

In other words, this section focuses mainly on the type of channels that affect the transmission of information in terms of speed and volume of data. This section is of great consideration because it affects the type of network (manual or computerised, or both) that should be implemented in NARO's agricultural information service system.

In answering the question referring to information urgency, most researchers said that the majority of the requests they made were not so urgent.

There are 5 ways (channels) in which information flows between and among NARO's librarians and users. The channel that was most highly ranked was given a score of 25 while a channel that was least highly ranked was given a score of 5. **Table 4.5** shows how the 6 librarians in Kawanda and Namulonge ranked the 5 ways of information dissemination.

WAY	SCORES FROM LIBRARIANS						TOTAL SCORE
	ARIS			KARI		NAARI	
Personal Contact	25	25	25	25	25	25	150 (34.5%)
Post Office	20	20	20	20	15	15	110 (25.3%)
Personal Delivery	15	15	15	15	20	10	90 (20.7%)
E-mail	10	10	10	10	10	20	70 (16.1%)
Fax	5	5	5	5	5	X	15 (03.4%)
X: Absent						TOTAL	435 (100%)

Table 4.5: Ranking of information dissemination ways (channels)

Personal contact between librarians and users was mostly preferred probably because most users prefer conducting a dialogue with the librarian until their information needs are met.

After personal contact, post office and personal delivery followed respectively. Post office and personal delivery were used in cases where documents were to be transferred or distributed from one agricultural institute to another. Post office means were normally used when the destination of the documents was far away whereas personal delivery was used in cases where the destination of the documents was quite near.

E-mail and fax facilities fall at the bottom of the table probably because end-users do not possess the facilities themselves. However, e-mail is used more than fax probably because e-mail was more common than fax.

Generally, information dissemination is mainly done through manual methods as presented above probably because NARO's technology was old-fashioned and facilities were equally lacking due to low priority in funding.

4.6 Problems of Automated Information Services

The study was also intended to identify the problems faced by NARO's librarians and agricultural researchers in the offering of automated information services. In other words, this section focuses on one of the objectives of this study, which was, *"To identify problems related to automated information services."*

To achieve the objective, an interview schedule, an interview guide and observations had to be applied. The problems got from the librarians were obtained by asking, *"What problems have you faced in using the computer to carry out your tasks?"* while the problems got from the agricultural researchers were obtained by asking, *"What problems have you faced in accessing agricultural information from your institute library?"*

The following problems were obtained.

1. Lack of enough staff

There was lack of enough library staff, especially in Namulonge. This problem is further compounded by the high staff turnover. This was attributed to the fact that the librarians leave for greener pastures. One of the librarians commented that the cause of this is due to the fact that, *"NARO considers them as merely support staff who are given a small salary and hardly any training."*

Due to the above factors, the librarians are not boosted to efficiently carry out the roles that are supposed to be done by an information worker of this present century, especially automated information services.

2. Poor access to electronic information sources

This was more so for Namulonge which had few CDs. Nevertheless, poor access to electronic information resources was due to the lack of a network among the research institutes. In other words, dissemination of information was done within individual research institutes.

3. Lack of adequate funds

Progress in NARO's automated information service system was mainly hindered by lack of adequate funds.

4. Lack of library staff motivation

This was mainly contributed to the fact that decision-makers in NARO did not recognise the role and status of the librarians. NARO's librarians were considered as support staff.

5. Computer related problems

These included computer **hardware breakdowns**, **low versions of software packages**, and **electricity power failures**. One of the librarians expressed the need to upgrade the automated catalogue in KARI library from CDS/ISIS to WINISIS so as to keep on the same footing with the latest technology.

6. Old information materials

The libraries visited have old information materials that are rarely used. This is more especially so in Namulonge. These materials consume a lot of library space making it difficult to incorporate newly acquired information materials.

7. Lack of comprehensive information

Most of the information materials, especially books, contained very shallow agricultural information that could not serve the information needs of the agricultural researchers.

4.7 Possible Solutions to the Problems

Another objective of the study was to identify all the possible solutions to the problems faced in offering automated information services. To achieve this, literature search, interviews and observations were used. **Table 4.7** outlines problems and their corresponding possible solutions to NARO's information service system.

PROBLEM	POSSIBLE SOLUTIONS
1. Lack of enough staff	– Strengthen staff recruitment and retention – Increase staff salaries
2. Poor access to electronic information resources	– Networking all the institutes through Local Area Networks (LANs) – Linkages with other national and international electronic resources through Wide Area Network (WAN)
3. Lack of adequate funds	– Seek for financial aid through a coordination of donor support – Resource sharing so as to minimize expenditure
4. Lack of library staff motivation	– Increase staff recognition – Staff remuneration – Staff development (training)
5. Power failures	– Acquiring of generators
6. Computer breakdowns	– Technician in computer hardware maintenance should be recruited
7. Low versions of computer software Packages	– Upgrading should be done with the assistance of a computer software engineer and analyst
8. Outdated information materials	– An archive should be put in place
9. Lack of comprehensive information.	– Evaluation of information materials

Table 4.7: Possible solutions to problems

From **table 4.7**, it was noted that many of the problems facing NARO's automated information service system would be solved if the mobilisation for adequate funds is made. This is because with adequate funds, there should be adequate staffing, staff development and the implementation of networking technologies would be achieved.

To counteract most of the above problems, NARO was found receiving a wide range of assistance from national and international institutions (see **Appendix C**). The assistance involved: technical assistance (personnel), funds, equipment, documents, publications, catalogues, databases, training, library searches, etc., from several international information agencies and institutions, including FAO, CTA, ICRAF, ISNAR, ILCA, CIAT, UNESCO, ICRISAT, IITA, INIBAP, CIP, IRRI, USAID, IDRC, ICIPE, CABI and NUFFIC to mention a few. At the same time NARO is also collaborating with local institutions in various ways, including resource sharing, training, networking, exchange of publications, consultations. Three of these institutions include Makerere University, the Ministry of Finance and Economic Planning and the Bank of Uganda.

4.8 Summary

The study objectives guided the researcher in producing this chapter - presentation, analysis and discussion of findings. The study findings were presented, analysed and discussed as per each objective of the study. Each objective of the study had a particular number of corresponding questions derived from the interviews that were conducted.

This chapter enabled the researcher to come up with conclusions and recommendations that are dealt with in chapter five.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The aim of the research study was to measure the impact of automation on agricultural information services in NARO with a view of identifying problems and making recommendations for the improvement of automated information services. The objectives of the study were: to establish the means through which NARO staff offer their information services by way of automation, to establish clients' attitudes towards the way they receive automated information services, to identify problems related to automated information services, and to suggest suitable recommendations for overcoming problems related to automated information services. The study used an interview schedule, an interview guide, observations and literature search in the collection of data from Kawanda and Namulonge.

This chapter presents conclusions and recommendations for the study. The conclusions were based on the study objectives. The recommendations were derived from the findings of the study as well as from the researcher's opinions and the literature that was reviewed.

The study ends with an illustration that shows a proposed automated agricultural information system for NARO. If the proposed automated information system is implemented, it would possibly solve the problem of the study which was, "failure to effectively and efficiently access full (detailed and current) information."

5.2 Conclusions

❖ There was a low level of library automation in NARO that was attributed to:

- (i) computer technology was not fully incorporated into NARO's library functions,
- (ii) lack of an advanced computer network among NARO research institute libraries.

❖ NARO's librarians showed a high response towards automated agricultural information services. In other words, the librarians appreciated the importance of the automated agricultural information services because:

- (i) they used computers so frequently in the course of performing their library routines,
- (ii) they were willing and ready to take on or perform any advanced automated library functions.

❖ Library automation greatly contributed to the satisfaction of NARO's agricultural researchers' information needs. However, most of the satisfaction was meant through the use of the CD-ROM technology which is part and parcel of the computer technology.

❖ The compound problems hindering NARO's information service system is the lack of adequate funds and lack of library staff motivation.

❖ The main solutions to the problems faced by NARO's information service system would be:

- (i) to revise NARO's financial structure and to lobby for more financial resources
- (ii) to strengthen library staff recognition, recruitment and retention by increasing their recognition, remuneration and development (training).

5.3 Recommendations

After analysing the findings of the study, the study was to provide possible means NARO can adopt to improve its automated information services and the following recommendations were given.

1. **Provision of electronic Current Awareness Services (CAS):** ARIS should actively create awareness among agricultural researchers of the new information products received. This would be easily facilitated through the use e-mails. This can be well implemented if each agricultural researcher gets his/her own e-mail account. For instance, if a new set of TEEAL CDs is acquired, ARIS should inform all NARO agricultural researchers about it through the use of e-mail.
2. **Computer networking:** This can be a Wide Area Network (WAN) covering all the institute libraries so as to facilitate information sharing and transfer. This will enable librarians and agricultural researchers to save time used in retrieving and transferring information from one institute library to another.
3. **Staff remuneration and development:** This will help in the motivation of the librarians and in the acquisition of the latest skills in information technology and management. Well-trained motivated staff will greatly contribute to the efficiency and effectiveness of meeting users information needs.
4. **Computer maintenance:** This is important in rectifying any computer problems encountered in both hardware and software. This will involve recruiting technical support staff or recruiting librarians who have the technical skills of maintaining the computer systems.
5. **Selective Dissemination of Information (SDI) in abstract form:** This will enable agricultural researchers to be updated in their specialties. Abstracts should be

distributed to the researchers to guide them in making recommendations for the acquisition of relevant up-to-date information materials.

For agricultural information and knowledge to be effectively and efficiently shared among NARO's agricultural researchers, ARIS has to set up an automated (computer and networking technologies) information system among all NARO's institute libraries. The automated information system should also have electronic links to international agricultural information resources. In short, an Intranet should be an ideal system to be established among all the institute libraries, which is further linked to international agricultural information resources.

However, automation is simply a tool that facilitates easy storage, retrieval and transfer of information in an information system. Therefore the researcher realised that, in addition to automation, the following aspects are of great importance in achieving a coordinated information service system:

- Agricultural researchers who are regularly informed of the new information resources acquired by the institute libraries.
- Well trained, competent and motivated library staff who are able to handle both information and computer systems.
- Agricultural researchers who have a spirit of cooperation amongst themselves.

Figure 5.2 illustrates the role of ARIS with a proposed automated information system.

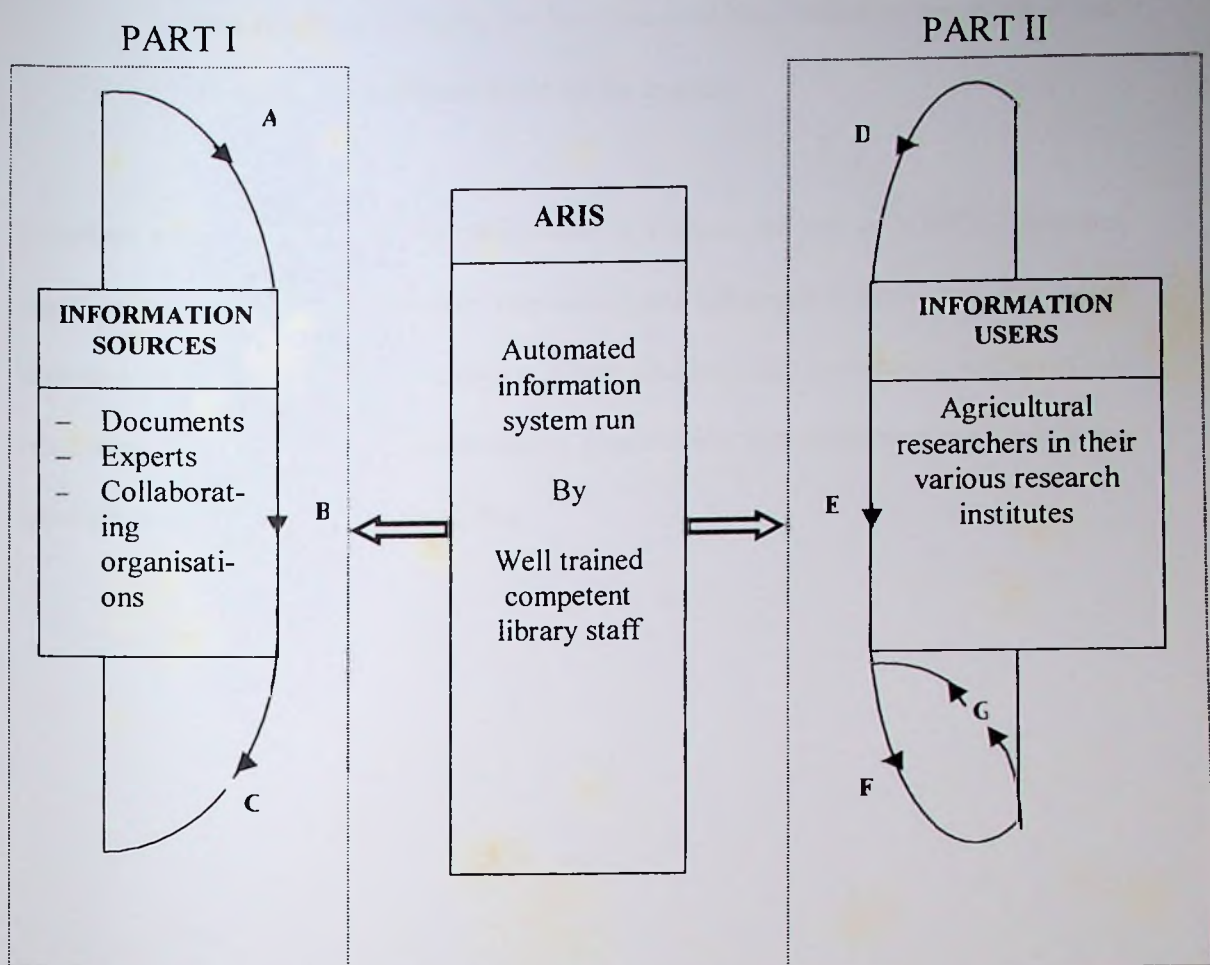


Figure 5.2: Proposed automated information system for ARIS

Figure 5.2 shows that the automated information system for ARIS should coordinate and close the gap between two parts. The two parts are:

- (i) **Part I - Technical Services** having 3 major sequential processes which are A, B and C. A stands for collection of information sources; B stands for organisation of information sources; and C stands for preservation of information sources.
- (ii) **Part II - Question and Answer Services** having 4 major sequential processes which are D, E, F and G. D stands for reception and recording of an inquiry from an information user; E stands for information search

and retrieval; F stands for distribution of information to the inquirer and;

G stands for feedback made by the inquirer.

Therefore, with an automated information system in place, the role of NARO's librarians should be to close the gap between information and information users with the aid of computer and networking technologies which facilitate the collection, organisation, processing, storage, retrieval, dissemination, preservation and maintenance of very large amounts of data within a very short time.

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APPENDIX A: Interview Schedule
Makerere University
East African School of Library and Information Science

INTERVIEW SCHEDULE
ON THE IMPACT OF AUTOMATION ON AGRICULTURAL INFORMATION
SERVICES AT THE NATIONAL AGRICULTURAL RESEARCH
ORGANISATION (NARO),UGANDA.

FOR INFORMATION WORKERS OR LIBRARIANS

DEFINITION: Library Automation is the use of computer and networking technologies in a library.

Dear Sir/Madam:

The intention of this interview is to seek your opinions or experience of the automation of library functions such as acquisition, cataloguing, and the dissemination of information. Your responses will provide important information on the attitudes of library staff and clients about library automation. Please take a few minutes to respond to the following questions. All efforts will be made to maintain confidentiality of responses.

1. What position do you hold in NARO? [e.g. **assistant librarian at Fisheries Research Institute Library, Jinja**]

.....
2. What are your major responsibilities or duties in the library/information centre?

.....
3. How urgently do users request for information?

- ☐ Very urgently
☐ Urgently
☐ Not so urgent

4. How often have you received complaints from users for having failed to get adequate information in the right time?

- ☐ Very often ☐ Often ☐ Sometimes ☐ Rarely ☐ Never

5. What type of information formats are commonly used as sources of information?

☐ Documents (printed text)

☐ CD-ROM

☐ Online databases

☐ Internet

☐ Microfiche

Others (Specify):

.....
Rank the list above by assigning 1 to the highest.

6. What are the regular ways of disseminating information in your organisation?

☐ E-mail

☐ Internet

☐ Post office

☐ Fax

☐ Personal delivery

☐ Personal contact between staff and user at the library premises

Others (Specify):

.....
Rank the list above by assigning 1 to the highest.

7. In your daily tasks, do you use a computer in offering information services to users?

[Answer either (a) or (b)]

(a) If yes, how often do you use the computer in carrying out your tasks?

☐ Very often

☐ Often

☐ Sometimes

☐ Rarely

☐ Never

(b) If no, would you recommend for your tasks to be computerised?

☐ Yes

☐ No

If yes, mention the tasks you would wish to automate/computerise.

.....

If no, why?

.....

.....

8. How often do you use an automated catalogue in accessing information sources?

☐ Very often ☐ Often ☐ Sometimes ☐ Rarely ☐ Never

9. To what extent have you succeeded in using the computer in retrieving right information within the shortest time possible?

☐ Very successful

☐ Successful

☐ Somehow successful

☐ Rarely successful

☐ Never successful

10. Do you undertake any computer software training so as to improve your skills in handling database programs?

☐ Yes

☐ No

If yes, mention the type of training you have received?

.....

.....

If no, why?

.....

.....

11. What problems have you faced in using the computer to carry out your tasks?

.....

.....

.....

.....

12. Please suggest any recommendations for improving the computerised information services?

.....

.....

.....

.....

.....

Thank you for your co-operation

APPENDIX B: Interview Guide
Makerere University
East African School of Library and Information Science

INTERVIEW GUIDE
ON THE IMPACT OF AUTOMATION ON AGRICULTURAL
INFORMATION SERVICES AT THE NATIONAL AGRICULTURAL
RESEARCH ORGANISATION (NARO),UGANDA.

FOR LIBRARY CLIENTS (NARO RESEARCHERS)

Procedure:

The interviewer should give an explanation to the respondent about the intention of the interview before proceeding to the questions below.

Definition:

Library Automation is the use of computer and networking technologies in a library.

Questions:

- 1. Do you normally refer to for your institute library for agricultural information needs?
2. Are there any other places that you refer to for agricultural information? If yes, mention them.
3. How urgently do you request for agricultural information?
4. To what extent have your agricultural information needs been met by your institute library?
5. From what form of sources (that is, print or CD-ROM or Internet) are your agricultural information needs got?
6. Have you ever used Internet or CD-ROM in accessing agricultural information in your institute library?
7. Do you receive library staff assistance in searching for any agricultural information on the Internet or CD-ROM?
- 8. What problems have you faced in accessing agricultural information from your institute library?
- 9. Could you please suggest any recommendations for solving such problems?

Thank you for your co-operation

APPENDIX C: NARO's Collaborative Organisations

The following are some of the organisations NARO collaborates with:

BoU: Bank of Uganda

CABI: CAB International

CGIAR: Consultative Group on International Agricultural Research

CIAT: International Centre for Tropical Agriculture

CTA: Technical Centre for Agricultural and Rural Cooperation

FAO: Food and Agriculture Organisation

ICRAF: International Centre for Research in Agroforestry

ICRISAT: International Crops Research Institute for the Semi-Arid Tropics

IDRC: International Development Research Centre

IITA: International Institute for Tropical Agriculture

ILRI: International Livestock Research Institute

INIBAP: International Network for the Improvement of Banana and Plantain

IRRI: International Rice Research Institute

ISNAR: International Service for National Agricultural Research

KIT: Royal Tropical Institute

MUK: Makerere University, Kampala

NUFFI: Netherlands Universities Foundation for International Cooperation

UNESCO: United Nations Educational Scientific and Cultural Organisation

USAID: United States Agency for International Development

APPENDIX D: CDs Possessed by ARIS



NATIONAL AGRICULTURAL RESEARCH ORGANISATION (NARO) AGRICULTURAL RESEARCH INFORMATION SERVICES DATA BASE CATALOGUE

NARO 2000

COMPREHENSIVE BIOGRAPHY OF COMMON RESOURCES

ECO AND ENVIRONMENTAL SCIENCES

AGRICULTURAL RESEARCH PRIORITY SETTING

IS

IS - FISHERIES

IS - Human Food and Nutrition(FHN)

FOREST DATABASE

PROVOC: MULTILINGUAL THESAURUS

ASTO

IS: ABSTRACTS

IS

IS - SIS

CLASSIFICATION AND REGRESSION TREES

COMPAQ

COMPUERVE: FOR WINDOWS AND MACINTOSH OPERATIONS SYS

CURRENT CONTENTS

EUROPEAN INFORMATION SYSTEM ON AGRIC RESEARCH FOR DEVELOPMENT

FAO DOC

FAO ON THE INTERNET

FARM ANIMAL GENETIC RESOURCES

FINANCIAL MANAGEMENT IN RESEARCH ON AGRICULTURE AND NRM

GEO- INFORMATION FOR SUSTAINABLE LAND DEVELOPMENT

GLOBAL PLANTS & PEST INFORMATION SYSTEM

GREEN HOUSE TECHNOLOGY INFORMATION: EXCHANGE DIRECTORY

HUMANITY DEVELOPMENT LIBRARY: For Development and Basic Needs

INFORMATION NETWORK ON POSTHARVEST OPERATIONS

INTEGRATED PLANNING FOR SUSTAINABLE MANAGEMENT OF LAND RESOURCES

INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE ON A DISC

MANAGEMENT OF AGRICULTURAL RESEARCH

MUSA DOC

OPEN PAGE

REMOTE SENSING & WATER RESOURCES: Water report 16

RESEARCH PROGRAM FORMATION

RESEARCH PROJECT MANAGEMENT CYCLE PLANNING, MONITORING & EVALUAT

STRENGTHENING POLICY ANALYSIS: ECONOMETRIC TESTS

TREAL: 1993 - 1997

THE STATE OF THE WORLD'S PLANT GENETIC RESOURCES

TOEFL SAMPLE: AN INTRO TO TAKING TOEFL TEST ON COMPUTER

TOOLKIT ON GENDER IN AGRICULTURE

TREED1

UGANDA'S AGRO ECOLOGICAL ZONES DATABASE

VETCD

WORLD FOOD SUMMIT

WORLD SOIL RESOURCES REPORT(87)TA

ZOOM LINK FOR WINDOWS

Wednesday, December 20, 2000

Page 1 of 2

Design: Nompjija Judith K.

Layout: E. Lwanga-Semakula

Editor: Peter Amunyo

Official use only

Request Code:.....

Project Code:.....

Staff receiving
.....



Question and Answer Service

INFORMATION REQUEST FORM

APPENDIX E

The National Centre for Agricultural and Rural Cooperation (NCAR) has for years provided a Question and Answer Service (QAS) for the agricultural sector in the African, Caribbean and Pacific (ACP) countries. It has now decided to decentralise this service. For the Eastern African region, the Agricultural Research Information Service (ARIS), - a unit of the National Agricultural Research Organisation (NARO), - has been selected as a focal point. The service is a pilot project from July 1999 to July 2000.

Complete this form and submit it to ARIS.

Description of the type of information that you need.

Provide Keywords / Terms / Phrases, relevant to your request.

Level of information required:

Elementary

☐

Advanced

Specify any limitations or preferences (i.e. years, geographical boundaries, etc.) if any.

Area for request; (Choose one)

Primary production (Crop, Livestock, etc.)

Research

Agro-Processing

Marketing Information

Lecture / Address

☐

Policy Development

☐

Community Education

☐

Product Development

☐

Personal Use

☐

Other _____

PERSONAL INFORMATION

This information is needed to determine the type of user the information is being supplied to:

I am a:

- | | | |
|--|--|--------------------------------------|
| ☐ Farmer | ☐ Extension Officer | ☐ Student |
| ☐ Researcher | ☐ Processor | ☐ Librarian |
| ☐ Trainer / Teacher | ☐ Policy Maker | ☐ Other _____ |

Gender

- | | |
|-------------------------------|---------------------------------|
| ☐ Male | ☐ Female |
|-------------------------------|---------------------------------|

Client Country

- | | |
|-----------------------------------|--------------------------------------|
| ☐ Ethiopia | ☐ Kenya |
| ☐ Uganda | ☐ Other _____ |

Type of organisation you are affiliated with:

- | | |
|--|---|
| ☐ Government Organisation | ☐ Commercial Company |
| ☐ NG | ☐ Co-operative / Association |
| ☐ University / College | ☐ Private Person |
| ☐ Research Institute | ☐ Other _____ |

How can we get in touch with you?

Title: ☐ Mr. ☐ Mrs. ☐ Ms. ☐ Dr. ☐ Prof.

Name: _____

Postal Address: _____

Tel: _____ Fax: _____ E-mail: _____

URGENCY:

Your request is usually processed promptly. Should you need the information sooner, please indicate urgency.

- | | |
|---------------------------------|--|
| ☐ Urgent | ☐ Not so urgent |
|---------------------------------|--|

Date request submitted: _____

Please return this form to:

Agricultural Research Information Service (ARIS)

P.O. Box 11098 Kampala, Uganda

Tel: 256-041-567622

Fax: 256 -041- 566049

E-mail: aris@imul.com

Question and Answer Service



APPENDIX F RESPONSE EVALUATION FORM

ago, you sent us a request for information. We have been able to get some
This was your request:

ensure that the services we offer are of the highest quality, we request that you
minutes to complete this form, and return it to us.

Mr. ☐ Mrs. ☐ Ms. ☐ Dr. ☐ Prof. ☐

Address: _____

Fax: _____ E-mail: _____

irrelevance of information provided.

relevant ☐ Relevant ☐ Not relevant

the information well presented?

☐ More or less

☐ No

how could it be improved?

the information received within the time that it was needed?

☐ More or less

☐ No

you any suggestion(s) on how we can improve the service?

post the completed form to the address below.

ation and Documentation Service (IDS)

c. 57811 Nairobi Kenya

-02-583301-20

l. -02- 583344

mmwariri@yahoo.com

ou for your time.

Official use only

Request Code: _____

Project Code: _____

Staff forwarding
response: _____



TEEAL



TEEAL by
Cornell University & The Rockefeller Foundation

The Essential Electronic Agricultural Library

What is TEEAL

- The Essential Electronic Agricultural Library on CD-ROM.
- Comprises of over 100 major agricultural journals and FAO monograph series.
- It is full text.
- Has powerful searching capabilities using author, title, keywords, subjects.

Subject areas of TEEAL

- Agricultural Engineering
- Animal Management
- Crop Development
- Economics
- Environment
- Food Processing
- Forestry
- Natural Resources
- Nutrition
- Pest Control
- Range Management
- Rural Development
- Soil Science
- Sustainable Agriculture
- Veterinary Medicine

APPENDIX G: TEEAL

TO USE TEEAL

Contact:

- 1) The Librarian
ARIS
P.O. Box 11098 Kampala
e-mail aris@imul.com
Tel. 041-566048
Fax: 041-566049
- 2) Go to ARIS at Kawanda
Agricultural Research Institute; or,
- 3) Ask ARIS to install TEEAL index
on your PC to access journal titles
and their pages of contents
- 4) Visit the TEEAL web site at :
<http://teegal.cornell.edu>

ma

APPENDIX H: Researcher's Work Plan

ACTIVITY	2000		2001					
	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Proposal								
Data collection								
Data processing and analysis								
Typing of the report								
Submission of the report								

NB: The study was done and completed during the times when the researcher was taking on additional academic work at EASLIS.

MAKERERE UNIVERSITY
EAST AFRICAN SCHOOL OF LIBRARY
AND INFORMATION SCIENCE

APPENDIX I: Introduction Letter

March 22, 2001

Director,
Agricultural Research Information Service (ARIS)

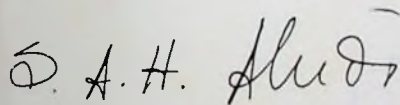
Dear Sir,

Re: Introductory letter for Mr. Mayanja Richard (BLIS III)

This is to introduce to you Mr. Mayanja Richard (Reg.No.98/U/2620) who is a bonafide student for Bachelor of Library and Information Studies (BLIS) at the East African School of Library and Information Science, Makerere University. The student has been asked to carry out a research in your organisation on "The Impact of automation on agricultural information services in the National Agriculture Research Organisation (NARO) Uganda". The research is a requirement for the award of Bachelors Degree in Library and Information Science of Makerere University.

Any assistance rendered to him will be highly appreciated.

Yours faithfully,



Dr. Syed A. H. Abidi
DIRECTOR

SAHA/jtk.

RY

may