AUTOMATING AGRICULTURAL INFORMATION AND DOCUMENTATION SERVICES IN TANZANIA

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DECLARATION

This work has not been accepted for any degree, nor is it being submitted in candidature for any degree other than Magister in Scientia Bibliothecaria of the University of Wales.

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STATEMENT OF ORIGINALITY

The conception, research, organization and writing of this dissertation is entirely that of the candidate, Julian J. Massawe. It has been carried out at the College of Librarianship Wales, Aberystwyth, under supervision of John B. Hepworth, M.A. (London), F.L.A. All quotations are distinguished and identified by references.

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DEDICATION

This dissertation is dedicated to my family

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ABBREVIATIONS AND ACRONYMS

AALS	African Agricultural Literature Service
ADONIS	Automated Document Order over Network Information Service
AGLINET	Agricultural Libraries Network (worldwide)
AGRICOLA	Agricultural Online Access
AGRINDEX	The printed index produced by AGRIS
AGRIS	International information system for agricultural sciences and technology
AIBA	Agricultural Information Bank for Asia
ASFA	Aquating Sciences and Fisheries Abstracts
BIOSIS	Bioscience Information Service (of Biological Abstracts)
CABI	Commonwealth Agricultural Bureaux International
CARIS	Current Agricultural Research Information System
CCE	Centre for Continuing Education
CD-ROM	Compact Disc Read Only Memory
CEC	Commission of European Commission
CGIAR	Consultative Group on International Agricultural Research
CIDIA	Centro Interamericano de Documentacion e Informacion y Communication Agricola
CODE	Canadian Organization for Development Education
DANIDA	Danish International Development Agency
DIALOG	[Online Information Retrieval Service]
DIMDI	Deutsches Institut fur Medizinsche Dokumentation und Information
DSE	[German Foundation for International Development]
EAC	East African Community
ERP	Economic Recovery Programme (Tanzania)
ESAMI	Eastern and Southern African Management Institute
FAO	Food and Agriculture Organization of the United Nations

EALS	East African Literature Service
ECA	Economic Commission for Africa
GNP	Gross National Product
IAALD	International Association of Agricultural Libraries and Documentalists
ICRAF	International Council for Research in Agroforestry
IDM	Institute of Development Management
IDRC	International Development Research Centre
IFIS	International Food Information Service
IFM	Institute of Finance Management
IITA	International Institute of Tropical Agriculture
IFLA	International Federation of Library Associations
ILCA	International Livestock Centre for Africa
ILRAD	International Laboratory for Research on Animal Diseases
IRA	Institute of Resource Assessment
ISIS	Integrated Set of Information System
MINISIS	Microcomputer based ISIS, developed by IDRC
NACL	National Advisory Council for Libraries
NAL	National Agricultural Library (USA)
NATIS	National Information System (Unesco programme)
NORAD	Norwegian Agency for International Development
NPLD	National Policy for Library Development
NTIS	National Technical Information Service (USA)
DMVS	"Centre de documentation de l'Organisation pour Mise en Valeur du fleuve Senegal"
PADIS	Pan African Documentation and Information Service
SADIS	Southern African Documentation and Information Service
SAREC	Swedish Agency for Regional and Economic Cooperation
SUA	Sokoine University of Agriculture
TADIS	Tanzania Agricultural Database and Information Service

TAFIRI	Tanzania Fisheries Research Institute
TAFORI	Tanzania Forestry Research Institute
TALIRO	Tanzania Livestock Research Organization
TALIS	Tanzania Literature Service
TANRIS	Tanzania Research Information Service
TARO	Tanzania Agriculture Research Organization
TBS	Tanzania Bureau of Standards
TFNC	Tanzania Food and Nutrition Centre
TIRDO	Tanzania Information, Research and Documentation
TISCO	Tanzania Industrial Studies and Consulting Organization
TLS	Tanzania Library Services
TNSRC	Tanzania National Scientific Research Council
TPRI	Tanzania Pests Research Institute
TROPAG	"Abstracts on Tropical Agriculture"
UAC	Uyole Agriculture Centre
UDSM	University of Dar es Salaam
UNESCO	United Nations Educational, Scientific and Cultural Organization

ABSTRACT

Agricultural development is essential for Tanzania's economic growth and national development. This dissertation reviews the development of agricultural documentation and information services, examines factors that pose obstacles in the development process and looks at the role and prospects of information technology, especially microcomputers, in agricultural information management in Tanzania.

It is argued that there is need to adopt a coordinated approach to national agricultural information services. An effective exploitation and better management of these resources is the expected outcome. National bibliographic control is also envisaged. The major agricultural information systems - AGRICOLA, AGRIS and CAB International are described and their possible inputs into the proposed Tanzania Agricultural Database and Information Service (TADIS) considered.

The services expected from TADIS and their contribution toward the country's Economic Recovery Programme are indicated. New developments, mainly CD-ROM and its potential as both a storage medium and a vehicle of document delivery are discussed.

CHAPTER 1

THE SETTING

This chapter identifies those key features which are considered to have a bearing on the development of agricultural information in general and the capacity to introduce new technology in information management. These features include the geographical location, the population, agriculture, power, communications, mass media and the country's links with other countries in the region.

1.1 LOCATION AND GEOGRAPHY

The United Republic of Tanzania (URT) with an area of 945,087 sq. km. incorporates mainland Tanganyika and a number of off-shore islands including Mafia, Zanzibar and Pemba. Lying on the east coast of Africa, the URT shares borders with Kenya and Uganda to the north; Rwanda, Burundi and Zaire on the west; and Zambia, Malawi and Mozambique to the south. The borders are completed by the waters of the Indian Ocean on the east (Figure 1). The climate varies with altitude ranging from tropical in Zanzibar to semi-temperate on the north eastern highlands and the Southern Highlands.

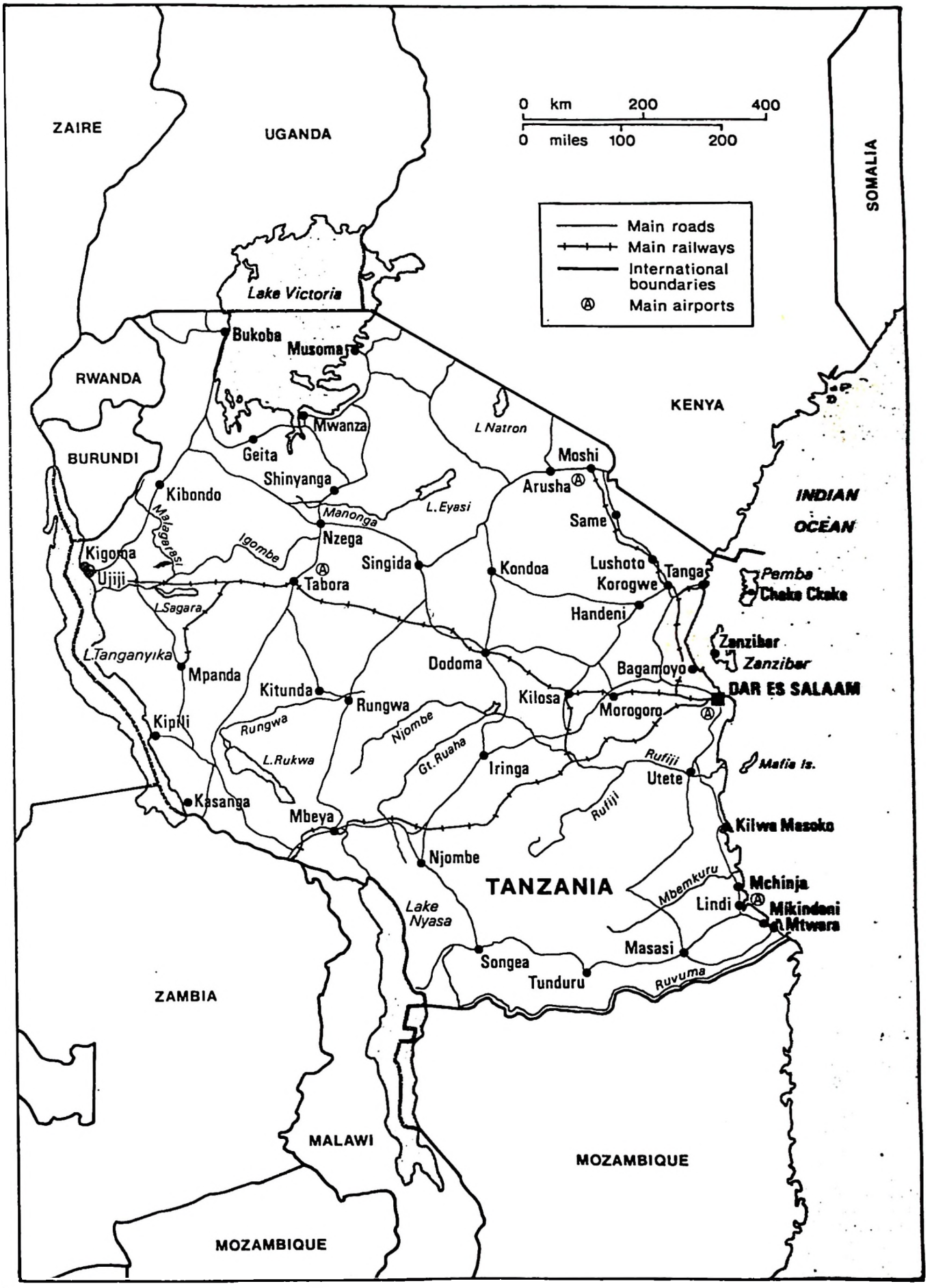
Rainfall is variable from place to place ranging from 500 mm received in about one third of the country to 1,250 mm expected in only 3% of the country and fluctuates from year to year. The country has some large rivers and lakes which have pontential for irrigation and hydroelectric power development.

1.2 THE POPULATION

Tanzania had an estimated population of 22.5 million in 1986 with about 90% residing in rural areas. The main feature of the pattern

FIGURE 1

MAP OF TANZANIA



of population distribution is sharp discontinuity in density, with most densely populated areas separated from each other by zones of sparse populations. Rural settlements especially in the low rainfall areas, tend to consist of scattered individual homesteads.

The problem of scattered rural population prompted the government to encourage the formation of nucleated cooperative villages ("ujamaa" villages). The main preoccupation of the government since independence in 1961 has been to lift the majority of the population out of illiteracy, poverty and disease. Today, life expectancy is 51 years, 41% of rural population have access to safe water and adult literacy is at 85%.

1.3 THE ECONOMY

The economy of Tanzania is characterized by two distinct economic structures, consisting of a large traditional rural sector and a small capital intensive modern, urbanized sector. The former is concerned essentially with the growing of food and cash crops, while the latter with manufacturing and service activities. Enshrined in the Arusha Declaration is the country's strategy of development along a path of socialism and self reliance. The major means of production inclusive of major industries and agricultural estates are state controlled. The per capita income in 1987 was US $290.

Long droughts and price increases on oil and other industrial commodities seriously affected the country's ability to realize economic development targets from the mid 70's. The country had to import food (maize, rice and wheat) averaging 262,500 tons per annum. In 1986, the government with the assistance of the International Monetary Fund launched an Economic Recovery Programme (ERP). Two of the five major objectives of the ERP are:

" (i) to increase the output of food and cash crops through the use of corrective production incentives, strengthening the marketing system, timely crop collection and marketing, and injecting investments into agriculture.

(ii) to rehabilitate basic economic infrastructure especially in the transport and communications, energy and water sectors in order to support the productive sectors fully."[1]

1.3.1 Agriculture

Agriculture comprising of food and cash crops, fishing and forestry is the mainstay of Tanzania's economy. It contributes 46% of GNP, 75% of total export earnings and supports 90% of the population. 83% of agricultural production is carried out by small scale farmers on privately owned plots averaging 2.2 hectares and relying mainly on manual labour and hand implements. The main food crops include maize, rice, wheat, cassava, millet, beans, sorghum, bananas, a variety of vegetables, fruits, potatoes and other root plants. Export crops comprise coffee, cotton, sisal, tobacco, tea, cashew nuts, pyrethrum and cloves.

Although the country is rich in rivers, fresh water lakes and irrigable plains, most current farming activities rely on the availability of rains. In 1984, the livestock population consisted of 13 million heads of cattle, 6 million goats, 3.8 million sheep, 170,000 pigs and 25 million poultry. Existing data show that out of 40 million hectares of arable land, only 6 million are currently under use. Production yields per hectare are much lower compared to production levels in neighbouring countries. It is therefore considered that there is good potential for increasing the volume and quality of produce through proper utilization of existing arable land and by farmers applying modern farming methods.

1.3.2 Manufacturing and energy

The manufacturing sector accounts for only 5% of the GDP. The overall share of manufacturing activities has fallen but some industries including gunny bags, hoes and hand ploughs increased their production in 1984. Poor performance in most industries has been caused by frequent interruptions of electricity and water supply. Consumer goods industries: food, beverages, tobacco, textiles, garments and shoes, account for about 70% of industrial value added.

In 1985, a US $260 million pulp mill (the country's largest ever development project), started production in Mufindi. It is expected to satisfy local paper demand and generate foreign exchange from exports. A large project for the production of ammonia fertilizer using natural gas is being established at Kilwa Masoko.

Energy is supplied mainly by biomass fuel sources. Imported petroleum, hydroelectricity and coal supply the rest. More than 70% of the country's electricity is generated by hydro-power. In 1986, the Tanzania Electric Supply Company launched a $103 million programme to rehabilitate the country's power network including transmission lines and power stations, and to improve technical and financial management. There are plans for a large coal-fired power station using local coal in Mbeya.

1.3.3 Communications and transport

The large size of the country with its widely dispersed population, requires the movement of goods over large distances for an efficient functioning of the economy. The transport network consists of about 3,600 km of railroads; 50,000 km of roads (of which only 5% are bituminized; three major ports (Dar es Salaam, Mtwara and Tanga); two

international airports (Dar es Salaam and Kilimanjaro) and about 50 domestic air fields. Road transport accounts for approximately 60% of the total internal freight traffic. Rehabilitation is under way particularly of the Tanzania-Zambia Railway which also aims to reduce the Southern African States' dependence on transport through South Africa.

Telecommunication facilities are available in all regions and they link Dar es Salaam to district centres, regional centres and to international satellite services. In 1987, the World Bank agreed to a $23 million loan for the rehabilitation of communication networks and for restructuring the management of Tanzania Posts and Telecommunications Corporation (TPTC).

1.4 EDUCATION

Education at primary level is free. In secondary schools, a government stipulated fee is paid. Universal primary education was introduced in 1977 and was made compulsory the following year. Primary education starts at 7 years and lasts another 7 years. Secondary school starts at 14 years and lasts for further 6 years. There are two universities - University of Dar es Salaam and an agricultural university - Sokoine University of Agriculture.

1.5 MASS MEDIA

The country has only two daily newspapers - the Daily News (English) with a circulation of 80,000 and government owned; and Uhuru (Swahili - the lingua franca) with a circulation of 100,000 and owned by the Party. There is a national radio station. Zanzibar has a colour television network but the Mainland has no television service. In 1986, there were an estimated 1.5 million radio receivers in use in

Tanzania and 10,000 television receivers in use in Zanzibar in 1984. The use of video mainly for entertainment has increased tremendously since 1986. There is a tax levy on video rentals in the 1988 national budget.

1.6 REGIONAL ORGANIZATIONS

1.6.1 East African Community: 1967-1977

Tanzania was a member of the East Africa Community (EAC) established in 1967 with Kenya and Uganda. The three countries maintained East African corporations to run their airways, railways, harbours, posts and telecommunications, research and an East African Bank. The EAC collapsed in 1977 largely as a result of political differences and the only large communal venture remaining is the East African Bank. In November 1983, a new chapter in East African cooperation was opened when the three heads of state signed the Arusha accord aimed at looking into the possibility of re-establishing some joint ventures once again.

1.6.2 Southern African Development Coordination Conference (SADCC)

SADCC was established in 1980 by the states of Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe with the main objective of reducing economic dependence on South Africa and of building genuine regional integration. In the 8 years of its existence, more than 250 projects have been approved and completed especially in transport and telecommunications. Each member country has responsibility for coordinating projects in a specific economic sector. A Feasibility Study of Southern African Documentation and Information System (SADIS)[2] was conducted in 1983 for SADCC member states.

1.6.3 Kagera Basin Organization (KBO)

The KBO was founded by Burundi, Rwanda and Tanzania in 1977 and later joined by Uganda in 1981. It aims to develop the 60,000 sq. km. of the basin which is shared by all four countries. Its responsibilities include agriculture, transport and power. A feasibility study on a telecommunications network has already been completed.

1.7 CONCLUSION

The Economic Recovery Programme notes that:

> "Large potential for expanding crop production remains unexploited, mainly as a result of low levels of technology, insufficient supply of inputs and tools, and poor agricultural infrastructure."[3]

The variety of climatic conditions permit the introduction of other crops than those currently being produced. With the government's recognition that increased agricultural productivity and output are not only crucial for economic recovery, but also fundamental to Tanzania's ultimate goal of equity and integrated development, there are indications that the economy is gradually progressing.

Under her policy of Ujamaa and Self-Reliance, Tanzania has achieved good progress mainly in social services within a very stable political climate. Partly with the assistance of international finance and her involvement and participation in regional activities, there is reason to be hopeful that Tanzania's ERP will succeed. Agricultural information should be perceived as having a key role in agricultural progress as agriculture has on the Tanzania economy as a whole.

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CHAPTER 2

EXISTING LIBRARY/DOCUMENTATION/INFORMATION FACILITIES AND SERVICES

2.0 INTRODUCTION

Today's library and documentation facilities and services can be traced to pre-independent days (1961), back to the Hockey Report (1960). The report recommended the creation of nationwide library services centrally coordinated from libraries based in the capitals. Although the legislation and infrastructure was created in Tanzania, the nationally coordinated system as perceived by Unesco never materialized. The general feeling today is that more services could have been provided if better strategies and proper planning methods had been employed.

A National Policy on Library Development (NPLD) draft (1983) has been circulated but it is still to be promulgamated. An implementation of this policy should produce a nationally coordinated network to serve real and assessed information needs for national development.

Foreign assistance, in the beginning seen as augmentory, has currently become essential and some major services would virtually perish without it. This external component's utility could even be maximized if it had been nationally coordinated and shared. It must be realized that when it comes to allocating foreign exchange for importing materials and services, information will not command priority over food, medicines, transportation and fuel.

2.1 LIBRARIES IN TANZANIA: AN OVERVIEW

The historical development of libraries and documentation services in Tanzania is fairly short but has enjoyed wide coverage in the professional literature. It is however observed that:

> "most of the said writing. . .is of a descriptive rather than a probing nature. Great prominence is given to long narrative accounts of events considered to be of major importance, the focal point being on what happened, how it happened and how one event led to another"[1]

The proliferation of descriptive literature would seem to be a result of the general thinking by librarians that library development means more libraries, larger libraries and a greater variety of public service.

This overview adopts the premise that libraries and documentation centres should not merely exist within a given social system, but should also be relevant to the needs of their intended users. The existing library development trend in Tanzania is mainly a result of the Hockey Report (1960). The Report, "Development of Library Services in East Africa" mainly recommended for the setting up of nationwide library systems administered by statutory boards, starting with national central library based in the capitals then moving downwards to the regions, districts and finally villages.

Tanzania (then Tanganyika) became the first amongst the three East African states to accept the Hockey Report and immediately passed legislation to establish the Tanganyika Library Services Board (1963) and Libraries (Deposit of Books) Act and Order in 1962 and 1963 respectively. Max Broome (1964) observed that:

> "on paper at least, Tanganyika is way ahead of the other East African countries in coordinating existing library facilities and establishing a library service for the people"[2]

According to the Directory of Libraries in Tanzania (1984), there are about 170 libraries administered by different institutions ranging from government ministries and departments, parastatal organisations, research centres, schools, religious bodies to foreign missions and

intergovernmental agencies. For purposes of this overview, these libraries have been classified as follows:

(a) **Public Libraries**

These are centrally administered from Dar es Salaam under the Tanzania Library Services (TLS) Board Act (1975). Through very generous support from the government, the Board has established a nationwide library and documentation service with a National Central Library in Dar es Salaam. The National Central Library houses the Tanzania National Documentation Centre (TANDOC) and the National Bibliographic Agency which compiles the Tanzania National Bibliography. The national public library network consists of 17 regional libraries and several district libraries funded by the Board. At village level, the Directorate of Adult Education in the Ministry of Education is running 3,167 village book centres each with an average of 500 books meant mainly for graduands of adult literacy programmes. More than 5,000 villages are without library services.

(b) **Educational Libraries**

(b.1) University

The only two universities under this category are those of the University of Dar es Salaam (UDSM) and Sokoine University of Agriculture (SUA). The UDSM library with its services covering the legal, medical, engineering, social sciences and marine sciences was established in 1970 following the creation of the UDSM which was formally a constituent college of the University of East Africa. The Medical collection at Muhimbili campus is the most developed in its field in the country and is currently the basis for a medical literature service.

There is an equally strong marine collection at the Institute of Marine Sciences based in Zanzibar. SUA Library will be covered in detail in Chapter 3.

(b.2) Post secondary school institutions' libraries

Under this category, one would find libraries belonging to different training and research institutes and colleges. Some of the most notable include those of:

- The Eastern and Southern African Management Institute (ESAMI) in Arusha,
- The Institute of Finance Management (IFM),
- The Institute of Development Management (IDM),
- Dar es Salaam College of National Education,
- Kivukoni Party Ideological College,
- Dar es Salaam Technical College,
- Moshi Cooperative College and
- Mozambique/Tanzania Centre for Foreign Relations.

Most of these libraries are well developed and professionally manned and a good number of them receive substantial foreign assistance, including that of expertise and equipment.

(b.3) School Libraries

School libraries is here used to refer to library collections of secondary schools as it is unusual to find libraries in primary schools. A centralised school library service to be coordinated from the Ministry of Education under the technical advice by TLS was enshrined in the Hockey Report. This service received an additional boost from Unesco in 1968 through the

expertise of Ms Emma Frost but never really matured despite the creation of some model school libraries.

> "In 1987 there were 103 government secondary schools and 136 private secondary schools inclusive of seminaries"[4]

(c) **Special Libraries**

The number of special libraries in Tanzania is growing fast as society in general and decision makers in particular increasingly appreciate the role and value of information in the process of decision making and research. Because of their varied specialities, they may generally be categorized by administering or parent bodies, namely government, international bodies and parastatal bodies.

Major libraries under this category include those belonging to:

- The Tanzanian Research Information Service (TANRIS),
- The Tanzania Bureau of Standards (TBS),
- Tanzania Industrial Research Organization (TIRDO),
- Tanzania Agricultural Research Organizational (TARO) and Tanzania Livestock Research Organization (TALIRO) and
- The United Nations Food and Agricultural Organization in Dar es Salaam.

Key libraries and documentation in the context of this dissertation include those falling under the Ministry of Agriculture, TARO and TALIRO. A summary of libraries in Tanzania is available in Massawe.[5]

2.2 LIBRARY COOPERATION

Nawe (1984) concluded that cooperative endeavour of library services in Tanzania has met a number of problems, but all along it has been realized that coordination of activities is of prime importance at

every level of development. It should be emphasized that cooperation and resource sharing are the basic tenets of 'UJAMAA' which is Tanzania's chosen philosophy for national development.

The general paucity of resources, both material and human, would seem to be a sufficient catalyst for cooperative ventures which should in turn result in economising on resources and maximisation of overall benefits. Yet as observed by Mchombu (1982):

> "it is one thing to agree on the importance of cooperation but a very different thing to practise it"[6]

He contends that there are some psychological barriers that need to be overcome if libraries are to cooperate in developing countries. The main obstacle to the initiation of formalized cooperative schemes is seen as lack of self-confidence by key professionals who tend to regard new ventures as entailing either a loss of all or part of their "empires", or undue credit to someone else who might be their junior within the professional and status rankings.

In the absence of notable formal joint ventures, cooperative activities have mainly been on an informal basis. The most common such activities are inter library lending, exchanges of accession lists and duplicates and of late, joint consultations on issues of national significance such as the drafting of a national libraries policy and training. Whereas for example the two largest libraries in the country - the TLS and UDSM Libraries, do independently participate in regional and international exchange programmes, one would still like to see a resurrection of the cooperative spirit which prevailed between these two institutions until the early 70's. Ilomo (1969) noted that the two libraries for example shared photocopying and binding facilities, still functional at the UDSM but no longer administered by the UDSM Library.

The National Policy on Library Development (NPLD) Draft, 1983 observes that existing library resources do not satisfy user need. It accordingly directs that it is necessary to establish formal cooperation between libraries so that resources are fully utilized. Some of the activities specified by the policy for cooperative activities are:

> "8.3.1 Purchasing of publications in order to ensure that there is availability of books in various disciplines in our libraries and that proper utilization of our resources is made.
>
> 8.3.4 Compiling Union Catalogues of Books, Periodicals, etc which are held in various libraries so that such publications are widely known and used.
>
> 8.3.6 Cooperating in the purchase and use of modern technology as well as expensive equipment in order to reduce costs, and
>
> 8.3.7 Cooperating in library research preparing, implementing and coordinating library service development programmes."[7]

In implementing areas such as those of joint acquisitions and consultations, Tanzanian librarians should exploit the momentum built on such programmes as the joint submission of periodical lists to SAREC by University libraries (section 2.4.2) and the joint formulation of the NDLD by professionals representing various libraries and archives.

2.3 THE NATIS CONCEPT

National Information System (NATIS) is a strategy incorporating a development programme of action designed to improve the individual nation's information infrastructure and services. The main areas normally covered are libraries, documentation and archives. The concept, which was internationally endorsed by the Unesco Intergovernmental Conference (1974) in Paris, provided for sufficient flexibility to allow individual states to implement the programme

within their own social, political and economic contexts. NATIS also addressed itself to the need and mechanism for obtaining external information as well as the technology involved in its transfer.

In essence, the programme aims at maximizing the use of limited resources through the establishment of a systematically planned information system at national level. Ensuring the provision of information for all people at all levels and in all national activities is the fundamental task of NATIS. To achieve this goal, the Unesco Conference (1974) did consider the need for compatibility and standards in an international context and subsequently formulated sixteen objectives to be pursued by both individual states and international agencies.

The central emphasis in NATIS was placed on the need to formulate national information policies which will spell out a systematic organization of national information agencies and activities leading to their coordination under one legally backed central body. Thus the Tanzania Library Services Board Act (1975) is described as having the main objective of:

> "reorganizing the Tanganyika Library Services Board so as to confer upon the Board wide functions. The Board will have the functions not only in relation to library services but also in relation to documentation services, training of librarians, control and supervision of public libraries,. . .stimulation of public interest in Tanzanian literature. . .and other allied functions in relation to libraries and literature."[8]

In effect, this meant that the Board was legally charged with the responsibility of coordinating all types of libraries in order to evolve a national information system which is yet to materialize. At this stage it must be noted that legislative enactments, however comprehensive, will make little sense if they are not accompanied by policy statements and the means to carry through with finance etc.

and this brings us to consider the need for a national information policy.

2.3.1 The Need for a National Information Policy

The need for a national information policy has already been expressed in relation to library cooperation and also with regard to its centrality in the NATIS programme. The very first objective of this programme stipulates that "a national information policy should be formulated to guide the formulation of a national information plan".

Only a handful of developing countries have been able to formulate national information policies. Saracevic (1980) indicates that within Africa only Nigeria and Ghana had national information policies. Wijasuriya (1983) contends that policy formulation is clearly a highly complex and continuous operation which requires intellectual input of a very high order. He opines that perhaps it has been very difficult to formulate one in accordance with the Unesco Guidelines (1975) because the NATIS concept itself is too wide. He further concludes that:

> "political realities in developing countries require only a qualified access to information and not the universal concept as often understood by UN bodies."[9]

Within developing countries, considerations of national unity, stability and security do not always permit complete access to information.

In the light of these considerations, it would appear more practical to concentrate on 'national policy for libraries and documentation centres' rather than 'national information policy'. The formulation of such policy however, must involve related sectors mainly in telecommunications, computer technology and mass media. The draft Tanzanian National Policy on Library Development (NPLD) issued by the

Ministry of Education sets out to provide basic information as well as a new policy stand with regard to library development.

The document provides a summary of library and documentation facilities in the country and pinpoints prevalent problems confronting smooth library development. The NPLD further underscores the need to review the exploitation of library resources along cooperative lines and accordingly apportions specific responsibilities to various organizations dealing with library and documentation in the country. Two very positive statements made by the Policy which should serve as a compass to library development as well as instilling a fresh spirit of trust amongst professionals are:

> "(i) the directive that the TLS Board should establish a National Advisory Council for Libraries (NACL) to be the main advisory and coordinating body between the TLS Board and other libraries in Tanzania and
>
> (ii) The declaration that "the implementation of the policy will be the responsibility of the Ministry of Education acting through the TLS Board"[10]

According to the policy, individual organizations are viewed as having full powers of building and developing their own libraries. The government expects these organizations to take initial steps in implementing this policy.

It is significant to note that the NPLD is in the main expressed in broad general terms. As a result, the NACL and individual organizations or groups of similar organizations should be able to formulate more detailed programmes within the broad framework of the policy document.

2.4 GENERAL ASSESSMENT OF EXISTING LIBRARY/DOCUMENTATION/ INFORMATION FACILITIES

Library and documentation services in Tanzania have enjoyed good support from the government. This support, which was povided from the very first days of independence, has come in the form of regular and substantial financial resources as well as legislation. Table 1 shows figures of government subvention to the TLS Board for the years 1964/65 to 1975/76.

TABLE 1

GOVERNMENT SUBVENTION TO THE TLS BOARD FOR THE YEARS 1964/65 - 1975/76

YEAR	RECURRENT			CAPITAL
	CENTRAL	LOCAL	TOTAL	
1964/65	84,100	25,300	109,400	-
1965/66	855,920	67,460	923,380	- approximate
1966/67	1,268,620	10,440	1,374,060	- shillings
1967/68	1,473,840	239,980	1,713,820	- 3,00 million
1968/69	1,600,000	223,574	1,823,574	-
1969/70	2,000,000	301,814	2,301,814	940,000
1970/71	2,500,000	322,260	2,822,260	985,000
1971/72	2,600,000	528,509	3,128,509	1,050,000
1972/73	2,650,000	29,797	2,679,797	-
1973/74	3,000,000	149,318	3,149,318	1,000,000
1974/75	4,983,333	NIL	4,983,333	2,600,000
1975/76	4,300,000	NIL	4,30Q,000	1,000,000

Source: Kaungamno and Ilomo (1979) p.68

In addition to domestic funding, external donors have contributed to this development in Tanzania. Amongst the leading donors, one would include:

(i) The Danish International Development Agency (DANIDA)

(ii) The British Council

(iii) "German Foundation for International Development" (DSE)

(iv) United Nations Educational, Scientific and Cultural Organization (UNESCO)

(v) Norwegian Agency for International Development (NORAD)

(vi) Swedish Agency for Regional and Economic Cooperation (SAREC), and

(vii) The United Nations Food and Agricultural Organization (FAO).

In spite of this financial, political and moral support, Mchombu (1984) states that:

> "library and documentation services have only managed to reach 1% of the population. In addition, the existing infrastructure has been developed in a lopsided way so that more than 80% of the existing infrastructure is aimed at less than 5% of the people living in the major towns of Dar es Salaam, Moshi-Arusha, Morogoro, Mbeya, Iringa. . ."[11]

Although the same author is convinced that a better and faster pace development of library and documentation services could have been attained if a different strategy had been adopted, one cannot brush aside problems experienced and still prevalent in this development process. It is a tenable submission than an earlier solution to some of these problems would have resulted in a better strategy reflective of economic ability and guided by a national libraries/documentation policy. A national information policy may be the best guide for a

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methodical approach to the development of library and documentation services in a national context.

2.4.1 Main barriers to library and documentation development in Tanzania

Several librarians and information experts have addressed themselves to problems retarding the pace of the Tanzanian library and documentation sector. Ilomo (1978) states that:

> "major problems are in areas of manpower, planning, finance, human and environmental factors, people's ignorance of the value of information, illiteracy, lack of reading materials and the acquisition of information"[12]

Even if the manpower problems could be solved quantitatively, it is contended that a qualitative problem would still prevail. Mchombu (1984) insists that the workforce should be products of theoretical librarianship which recognizes the needs of developing countries.

In a broader context, Woodward (1980) observes that the development of viable information services in less developed countries has been hampered by:

> " (i) poor and inadequate postal and telecommunication system
>
> (ii) shortage of finance (especially foreign exchange) and the attendant bureaucratic difficulties and
>
> (iii) lack of trained staff and the lack of well-stocked libraries"[13]

In consonance to the above observation, the NPLD rightly ranks lack of expertise in the form of scarcity and poor development of trained library staff as the major problem. It further states that the staff scarcity is a result of unplanned training programmes. It goes on to conclude that "without adequate trained manpower, a proper library service cannot exist".[14] Table 2 shows the deployment, actual requirements, vacancies and requirements of library personnel to the year 2000.

TABLE 2

NATIONAL LIBRARY MANPOWER NEEDS UP TO YEAR 2000

	EXISTING STAFF	ACTUAL REQUIREMENTS	VACANCIES	REQUIREMENTS BY THE YEAR 2000
Librarians	112	190	78	415
Library Assistants	227	475	248	1,245

Source: NPLD (1983) p.6

A properly trained workforce and in sufficient numbers, could therefore be the paramount requirement for library development in Tanzania. Such professionals would be able to initiate policies, canvas political and financial support for the creation of a cooperatively organized service aimed at serving national interest.

With the objective of bringing about a speedy library development and national development in general the NPLD aims at ensuring that all the people in Tanzania have access to and utilize information, data and new developments in many areas including technology, education and agriculture. Woodward (1980) postulates a three stage approach aimed at improving the information services in less developed countries. These are:

> " (i) systematic organization of the information already available, especially locally generated
>
> (ii) improvement of access to internationally available sources. . . and
>
> (iii) coordination of existing and future information services to make the maximum use of the limited services and resources available"[15]

While Tanzania could implement (i) and (iii) with minimum difficulty through the implementation of the NPLD, extra expertise, finance,

experience and awareness would be called for in implementing the second stage. This implementation would entail the deployment of foreign technology - in most instances for the first time. This requirement would subsequently involve the expenditure of that small foreign exchange which is normally allocated to the more sensitive commodities namely food, medicines, petrol, vehicles, machinery and spares.

Nonetheless, Woodward's three stage proposal will be examined in relation to the agricultural sector in an attempt to identify and assess those steps which might reasonably be implemented. Existing internal developments and the possible influence of external growth in information transfer technology will be taken into account.

2.4.2 The Role of Foreign Aid in Library Development

Aid is the transfer (at less than commercial cost) of resources from a donor country to a recipient country. Aid resources mainly come in the form of finance, expert advice, materials and equipment. It is universally accepted that aid is not cooperation, nor is it charity. Donors always seek some return.

Most development economists and aid workers think that aid will probably always be necessary for the poorest countries. Many believe that effective aid can help people and countries to develop in appropriate and independent ways.

Forms of library aid

Clow (1986) has itemized the usual forms taken by library aid as:

" - consultancy; recruitment and/or funding of expatriate professionals for long-term projects;

- presentations (of stock, especially books);

- donations (second-hand or remaindered stock);

- gifts of equipment and furniture; buildings;
- subsidized education and training for library and information specialists; and
- support for research, associations, or individuals"[16]

In the Tanzanian context, the general trend has started with expert missions, funding of buildings, equipping and furnishing them, education and training, followed by presentations and donations of materials.

In addition to the normal conditions attached to any type of aid (reflective of donor expectation), the main limitations with regard to presentations and donations are related to actual management of presented stock as well as the lack of selectivity by recipients. It has been noted that books may be supplied but not be fully exploited for lack of qualified staff to process them. Books presented by the British Council are known to have remained unprocessed for up to two years because of lack of cataloguers and processing stationery. Donations, although criticized for lack of selectivity, may be defended in broad interest areas such as the public library.

Training for junior staff, which is normally offered in the recipient country, encounters the main limitation of the difficulty of foreign trainers in adjusting to local conditions (a problem equally experienced by expatriates), and the problem of trainees in understanding the alien trainers. With regard to professional training which is normally offered in the donor country, limitations would include the irrelevance of some aspects of professional education to the recipient countries.

In the area of equipment, Schwarz and Winkel (1984) discovered that because of lack of appropriate paper and other technical problems,

TLS had not made use of off-set printing equipment donated by DANIDA since 1980.

Kaungamno and Ilomo (1979) concluded that:

> "Though Tanzania has used significant quantities of foreign resources (capital, personnel, etc.) and the absolute levels of each has increased sharply, their relation to total investment has diminished. In Tanzania, the role of foreign aid is essentially augmentory and such aid will be rejected from donors if there are harmful strings attached to it"[17]

In reviewing the situation in 1984, although in a narrower perspective (scientific and technical information), Schwarz and Winkel (1984) noticed that:

> "many tasks have been discontinued as a result of insufficient funds and lack of manpower. Also the general resource and service situation in the country, mainly in the University Central Library and its branches of medicine and agriculture, and the TLS, has encountered setbacks through reduced funding"[18]

These authors proposed an aid package worth over $100,000 annually to cover textbook provision, journals and abstracts, subscriptions as well as a selective dissemination of information based on major Scandinavian libraries. The report concludes with an indication that Scandinavian libraries would be in a position to assist in investigating the advantages of microcomputer applications in the processes of library and information services.

Two main criticisms levelled against foreign aid as a whole are that it creates dependency and that it is inappropriate to local needs. It is partly in realization of both the limitations and criticisms that the UDSM has been directed by the NPLD to initiate training in librarianship (NLDP 3.2.1). Several foreign donor agencies are funding training programmes locally drawing resource persons from both within and outside the host countries. The "Management of Agricultural Information Services" training course, hosted by ESAMI

in Arusha 19-30 October 1987 is a case in point. Funded mainly by the German Foundation for International Development (DSE), the course' resource persons came from ESAMI itself, DSE, FAO and received documentation support from the Commonwealth Agricultural Bureau (CAB) International.

With a competent local manpower base therefore, foreign aid should contribute to Tanzania's library and documentation development. The local and external blend should be able to provide a service based on a total assessment and identified needs facilitated by new and appropriate technology. It should then be possible to devise programmes which would facilitate a full exploitation of resources both local and externally generated.

2.5 CONCLUSION

On paper, Tanzania can be said to have developed a fairly complete and strong library and documentation infrastructure mainly in the public library sector. A closer examination of the whole system reveals that it is confronted by a series of financial and psychological problems.

The NPLD seems to have revived a cooperative spirit which although largely dependent on a voluntary approach, would be enhanced greatly by a nationally enunciated cooperative policy. This chapter has attempted to expose the history and types of library and documentation facilities and services available in Tanzania. It has also examined the value of coordinating services in internationally declared frameworks such as NATIS and measures its relevance to the Tanzanian situation.

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CHAPTER 3

AGRICULTURAL INFORMATION IN TANZANIA

3.0 INTRODUCTION

This Chapter seeks to provide a character of 'agricultural information' and to examine the role and significance of agricultural information in the Tanzanian economy.

Agricultural research and its documentation, which is both the main generator and consumer of information, is reviewed and the main forms of recording indigenous agricultural information are outlined. The process of dissemination is discussed with a reiteration of the need to create a coordinated national agricultural information and documentation network in order to maximize the utilization of this vital resource for national development.

Sokoine University of Agriculture's mission with the highest concentration of agricultural expertise in the country is outlined. The University library's collection, services and plans of improvements and expansion to meet new service demands are described. The Library's intentions to assume a greater role amongst agricultural libraries in the country is highlighted.

3.1 DEFINITION

Before the twentieth century, agriculture was understood to be related only to farming. Since then, it has been redefined to embrace many other disciplines and activities. Kanamugire and Newa (1983) view:

> "agriculture in its broad sense as a sector which deals with the development and improvement of the production of plants and animals as sources of food and primary commodities for man"[1]

It would therefore be expected to include the main facets of plant and animal production, protection and utilization as well as other related subjects.

Lendvay considers that:

> "Scientific agriculture, like medicine rests upon the fundamental principles of the physical sciences; it must draw upon not only botany, zoology, chemistry, mathematics and physics, but also upon geology, metrology, economics, statistics and engineering; . . . and it incorporates a great diversity of practice and specialisation"[2]

The International System for Agricultural Sciences and Technology (AGRIS), has a subject scope classed into 16 main subject groups[3] ranging from general agriculture through pollution and ending with auxiliary disciplines. When considered in relation to library and documentation services, Lendvay (1980) submits that, "agriculture is so vast a subject that it is almost impossible to acquire everything published on it".[4]

In recognition of the extensive and interdisciplinary nature of the agricultural activity, it may be useful to reiterate that information sources must be collected for the purpose of serving established needs in order to fulfil defined objectives. This reminder is necessary because agricultural literature is fragmented, scattered by language, country of origin, document/media form, level of treatment and above all, is interdisciplinary.

One last but vital characteristic of agricultural information is its universality. It is universally accepted that agricultural information is both a national and international resource which should be utilized for the technical and socio-economic progress of mankind as a whole. This characteristic has forced nations to become

interdependent and increasingly development programmes have to be viewed from a global perspective.

3.2 THE ROLE OF AGRICULTURAL INFORMATION

When nations are increasingly recognising the value of information, it is a cliche in many national contexts to state that information is a vital resource which contributes to material advancement, a factor of production just as other conventional factors such as land, labour, capital and organisation. The statement becomes particularly relevant to developing nations like Tanzania however, which are trying hard to improve their economic progress as a contribution towards national social and economic development.

It must be accepted that meaningful economic development is dependent on accurate, reliable and up-to-date information. Agricultural production requires the use of technology whose understanding requires some basic information, demonstrable in the latest techniques of production. Farmers require information on when to plant, where to get seeds, on pests, credit facilities, marketing, etc. Agricultural information in this regard would be expected to help agriculturalists and farmers in finding solutions to problems and finally lead to the development of the individual and the community.

Confronted by a growing dependence on food imports as a result of a decline in agricultural production and of food production in particular, more and more emphasis is presently placed in Tanzania on the improvement of production. Attainment of an increase in agricultural production would be expected to result if farmers understand and adopt new and better farming methods and practices.

The centrality of modification and change in agriculture and rural development is best expressed by Russell (1981) who states that:

> "Agriculture and rural development are primarily concerned with the introduction or modification of farm practices and agricultural systems to take advantage of new technology or new crops or varieties. . . This thrust to develop agriculture is a common one in developing countries where increasing populations and the ever present threat of crop failures lead to undernutrition. . . and the risk of famine. . ."[5]

3.3 AGRICULTURAL RESEARCH

Since basic and applied sciences became academic disciplines mainly at the beginning of the 19th century, research and development (R&D) have become the major information producers for agriculture as for any other science.

Agricultural research in Tanzania is basically problem-solving oriented, aiming at technical innovation, improved production methods, better breeds (crops and livestock), and is mainly performed in response to existing farmers' needs. Researchers, extension officers and representatives of farmers and related industries like fertilizer companies meet annually to discuss, agree, and recommend research programmes.

A large proportion of research is linked with formal teaching and training institutions the majority of which were until 1980 administered directly by the Ministry of Agriculture and Livestock. The bulk of the crop and soils research is at present carried out under the umbrella of the Tanzania Agricultural Research Organisation (TARO) which was established by an Act of Parliament in 1980 to co-ordinate agricultural (crop) research in the country. The remaining crop research is conducted mainly by large teaching

institutions like Sokoine University of Agriculture (SUA), Uyole Agricultural Centre and Tropical Pests Research Institute (TPRI).

Under the aegis of TARO's headquarters in Dar es Salaam, are eight research institutes, nineteen affiliated research centres and a variety of experimental stations situated at locations throughout Tanzania. Studies and experiments are carried out on all food and cash crops grown in different agronomical zones of the United Republic.

Livestock research is carried out under the Tanzania Livestock Research Organisation (TALIRO) which administers four institutes. At the time of writing, there is a strong possibility that TARO may merge with TALIRO, in line with recommendations of a World Bank Mission concerning the support to agricultural research in Tanzania. Forestry and Fisheries research are carried out under Tanzania Forestry Research Institute (TAFORI) and Tanzania Fisheries Institute (TAFIRI) respectively.

As the final objective of research is developmental, it becomes essential that agricultural research must provide the government with appropriate, reliable, interpreted and well documented information on the current agricultural situation, its potential and the resources required to achieve that potential.

The break up of the East African Community in 1977, had a very adverse effect upon agricultural research activities in Tanzania. To be missed most is the defunct East African Literature Service which was operating from Muguga in Kenya. This service used to provide researchers all over East Africa with photocopies of articles requested. The Government fully recognizes that strengthening of research is fundamental to the long term expansion of agricultural

production. In its 'Economic Recovery Programme', the government declares that:

> "In reorganizing existing research institutions, the government is aware of the need to consider farming systems as a whole, to give more emphasis to the link between research and extension and to secure adequate financial resources. Cooperation with the international research community will be actively pursued."[6]

The impact of agricultural research is generally determined by the extent to which its results are utilized. Utilization is however not only a consequence of both a proper recording or documenting of the research process and results but also the use of adequate communication channels and methods to disseminate agricultural information.

3.3.1 Documentation of agricultural research

How pertinent documentation is to the whole process of research and development may be deduced from Woodward (1987) when he warns that:

> "If the results of each phase of a research project or programme are not properly recorded and organized in such a way as they can be easily retrieved at a later date, then the results of that research will for all practical purposes, be lost. This means that the investment in the research is wasted; . . . and weakens the foundation upon which further advancement in agricultural research, and therefore knowledge, will take place."[7]

There is also a great risk that research may be duplicated because lack of information has made the present researcher ignorant of previous work. It has been remarked by Tell (1984) that restricted access to the latest information has often led scientists in Third World countries to produce substandard work, or even produce work which is out-of-date because the discovery has already been made elsewhere.

An effective documentation service would be expected to properly record and organize the information derived from research and to

obtain timely and relevant information required for the effective conduct of the research. These two processes are interlinked since the output from one research activity becomes part of the input to another piece of research.

In addition to documenting information directly generated from applied research, data and information on related topics of importance to agriculture are collected and recorded. The major related topics are environmental factors and socio-economic analyses. Data describing environmental factors such as rainfall distribution, altitude, temperatures and soil fertility, are collected in many areas of the country. Socio-economic studies are carried out particularly in areas associated with farming systems projects in order to test their socio-cultural feasibility.

3.3.2 Forms of information

Tanzania is endowed with having very special agricultural research stations established during the colonial period. One example is Lyamungu established in 1934 as a coffee research station but now acts as a multicrop crop research institute. There are subsequently large amounts of research information already available mainly in Reports. Much more local information is scattered throughout libraries in relevant institutes, ministries, government offices and some libraries. Efforts have been made (Menou - 1975, Munn - 1976, TLA Report 1978, Holmberg - 1982) and are still being made (Woodward 1987) to draw up a mechanism for comprehensive collection and categorization of this information into a form which can be made useful to all those concerned with agricultural development.

The most common types of research reports normally include the following:

(i) Annual reports of Research Institutes providing details of staffing, weather conditions, completed and ongoing research and problems encountered. These are mainly compiled to serve administrative need.

(ii) Some research stations produce bulletins and newsletters which summarize events and research findings at the particular stations. Confronted by such problems as lack of editorial skills and shortage of the most basic stationery, the bulletins are rarely regular and are produced in very limited runs. Mlaki (1984) has pointed out that 'Ukulima wa Kisasa' which is aimed at more than 5 million farmers, has a total circulation of only 20,000.

(iii) Papers may also be submitted to the limited number of local scientific journals, e.g. 'Uhandisi' or international journals for publication. The major problem which local scientists must cope with is the high standard demanded by these journals. However, once papers are published, the articles are abstracted and enter the international resource of available information.

(iv) Some crop committees compile their own research reports which are produced annually. Such is the case with Cotton Research Report which although it is produced by Ukiriguru Institute, covers cotton research for the whole of the United Republic of Tanzania.

(v) Reports about current research in both crop and livestock are presented at the Annual Crop and Livestock Research Co-ordinating Committee Meetings. Papers submitted and the proceedings of these meetings have been the one most complete

and consistent form of recording agricultural information in Tanzania.

(vi) Students' projects and field study reports resulting from their field attachments to farms and research stations as well as dissertations do form an important source of primary research information.

3.4 DISSEMINATION OF AGRICULTURAL INFORMATION

Broadbent (1987) asserts that:

> "there are three basic elements to be considered in combating low productivity in agriculture: good research, good education and good information management."[8]

He further emphasizes that all three need to work in harmony and that a constant free flow of information is crucial at all levels of research. Dissemination of agricultural information is largely linked with information management which requires the existence of linkages between farmers, planners, extension staff and researchers. To prevent research documents from becoming lost, repositories and a means of identifying documents must be created.

Information transfer requires that a system exists to link the source to the user, who must have sufficient education and skill to exploit the information and access to someone who can interpret that information. It is at this stage that the extension agent, preferably a member of the users' community, becomes the bearer of the messages and communicator of innovation.

As agricultural information becomes more and more technical, the need to package the information in a usable manner becomes increasingly important. The extension agent normally communicates technical information which has been synthesized and repackaged to meet the

farmers' needs and in a form in which it can be assimilated easily. Most of the technical reports end up in the form of pamphlets, posters, fact sheets, calendars, and newspapers articles, all of which fall under the broad 'grey literature' category. Other forms, some of which are particularly appropriate to print-illiterate societies, are slides, films, radio and television broadcasts and above all, the village demonstration plots.

To maintain an information infrastructure which requires constant funding, qualified personnel, and foreign input becomes quite a challenge for developing nations. Under such scenarios, research results may hardly reach the farmers themselves. This anomaly would appear to have been caused by poor linkages between research institutes and extension services as well as lack of adequate and properly managed information and documentation centres. Gessesse and Mbwana (1987) found that "agricultural library services in Tanzania as a whole are generally weak if not unsatisfactory".

Some of the several remarks made by Samaha (1978) on the question of information dissemination are:

> " (iv) Repackaging of information to farmers by extension units in the Ministry has not been very effective. . .
>
> (vii) The release of information on research carried out locally is delayed by one or two years. All research results are not reported in detail due to lack of publication media.
>
> (viii) The present research reports lack adequate indexes for retrieval of the contained information.
>
> (xii) There is a serious weakness in the dissemination of information either due to financial constraints or to the lack of appropriate dissemination methods.
>
> (xvi) Research and development officers are receiving little scientific and technical information needed for their activities. Their institutions

> lack appropriate library and documentation facilities and no mechanism is available as yet in the country to meet their needs."[9]

In spite of some uncoordinated efforts aimed at facilitating the identification of research findings as demonstrated by Mascarenhas,[10] Kaisamba, et al[11] and TANDOC's Tanzania Agricultural Abstracts, there has been little if any progress. Though SUA has already issued 3 volumes of Record of Research covering the period 1968-1980, it is with the intention of remedying the situation that the country still seeks assistance (e.g. Woodward op. cit.) and is sending its nationals overseas for training in information management.

Since a large proportion of the input information required for the conduct of research is generated abroad and may not be held in the country, the desire to coordinate both its acquisition and its exploitation has already been noted. Much can still depend upon individuals and their strengths or weaknesses. For example, Tanzanian researchers were denied a free Selective Dissemination of Information service (SDI) provided to East and Central African countries by The Commonwealth Agricultural Bureau International because a national coordinator would not even acknowledge receipt of the offer.

The need for greater interlibrary cooperation has already been pointed out in Chapter 2. What is being demanded in the agricultural sector is the creation of a network of agricultural libraries and documentation centres, possibly to be coordinated by a National Agricultural Library (Mbwana and Gera).[12]

3.5 SOKOINE UNIVERSITY OF AGRICULTURE

Sokoine University of Agriculture (SUA) located in Morogoro was

promulgated by an out of Parliament and officially launched in July 1984. SUA which is the only other University in Tanzania was created from the former Faculty of Agriculture, Forestry and Veterinary Science of the only other University of Dar es Salaam (UDSM) located 200 km away in Dar es Salaam. The history of SUA can be traced to 1965 when the College of Agriculture was started. This College grew to become a Faculty of Agriculture (1969-73), a Faculty of Agriculture and Forestry (1974-76) and finally a Faculty of Agriculture, Forestry and Veterinary Science (1976-84).

The University owns about 3,350 hectares of land, 2,300 ha of which constitutes the University Farm mainly used for training in crop and animal husbandry, research, farm management and demonstration purposes.

Some of the stated objects and functions of the University include:

> "(a) to provide facilities for university education in the fields of or connected with agricultural services. . .,
>
> (b) to assist in the preservation, transmission, dissemination and enhancement of knowledge in the fields of agriculture, fisheries, forestry, veterinary and allied complementary sciences,
>
> (d) to prepare students to work with the workers and peasants of Tanzania. . . for purpose of the better development and strengthening of the national economy,
>
> (g) to initiate and conduct basic and applied research . . . and to promote the integration of research with training and agricultural extension services,
>
> (h) to develop, promote and undertake the provision of adult and continuing education alongside the teaching of regularly enrolled students designed to secure the development and dissemination of various applied sciences and technology required for the enhancement of the rural economy and the efficacious solution of the economic and social problems of rural areas of the United Republic, and

(j) to develop and maintain a reference library and provide library services in agricultural sciences and related disciplines for the benefit of the University community and the people of Tanzania generally."[13]

The University has three faculties namely Agriculture, Forestry and Veterinary Medicine which offer courses in their respective disciplines. Of particular significance with respect to providing links with extension services is the Centre for Continuing Education (CCE). The CCE collaborates with the University faculties, departments and units to implement the outreach activities of SUA. Like the library, CCE is the only other unit whose activities not only cut across academic disciplines and faculty demarcations but also extend beyond the boundaries of the University to serve the needs of the nation as a whole. These two units may benefit from each other by pooling some of their resources particularly the technical side mainly in the process of disseminating information.

The number of full time students ranging from undergraduates, masters and a couple of doctoral students most of whom are resident on campus is nearing 1000. This figure is growing fast not only with larger intakes but also because of new programmes like the food science and technology study programme. The size of teaching staff is about 300 and their academic standards improve as more and more members are returning to practise after their doctoral studies overseas. As observed by Gamble (1987), "in many countries, the largest pool of trained manpower for research resides in the agricultural universities and faculties of agriculture".[14]

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University libraries' objectives are generally identical the world over - to support and enhance the broader objectives of the parent

institution which are expressed as teaching and research. The library's main mission is therefore to support the fulfilment of the University's objectives (some of which have been cited above). In addition to supporting the preservation, transmission and dissemination of knowledge, the library's place within the University and country as a whole comes out quite clearly under SUA objects, especially under (j) above.

3.6.1 The Library Collection and Services

SUA Library with its collection of approximately 50,000 volumes and subscribing to nearly 600 current journals is the single largest agricultural library in Tanzania and may also be the largest one agricultural collection in the whole of the Eastern and Southern Africa Region. The library maintains a rich collection of primary sources of agricultural information generated by University staff and students as well as reports from various agricultural research institutes in the country. These documents together with those acquired through legal deposit are located in a Special Collection Section which houses most of the Tanzaniana materials.

SUA library is also a deposit library for documents of the United Nations Food and Agricultural Organizations. The library has a sizeable number of documents in microfiche based on Tanzanian sources. These were prepared by the International Livestock Center for Africa (ILCA) based in Addis Ababa, Ethiopia. These together with some microfilm are still to be fully exploited partly because of lack of a microfilm reader and partly because of lack of skill in their organization within the library itself.

Most documents are acquired through purchase but as a result of dwindling foreign exchange allocations for importation of library

materials, book presentations and donations have recently become the main means of acquiring foreign materials. The library maintains a Reports Collection based on documents by international agricultural agencies and institutes. These documents are largely acquired as gifts although once in a while we try to reciprocate by sending copies of the few publications originating from the University. Reports from the Consultative Group on International Agricultural Research (CGIAR) are very up-to-date and quite comprehensive.

The library's services are mainly traditional - lending of books, providing reading space and minimal services in bibliographical searches, reference enquiries and photocopy requests from the British Library Document Supply Centre. The Tanzania Literature Service (TALIS) which provides an SDI service based on the library's periodicals collection to researchers all over Tanzania is unfortunately non operational since 1985 because of lack of spare parts for the xerox photocopier. Mbwana and Gera (1987) noted that:

> "a good number of agricultural library users expressed interest in obtaining additional modern library and information services such as abstracting and indexing bibliographies, fast photocopy and current awareness to facilitate their activities."[15]

Plans are under way to revive the TALIS services by either finding spares for the photocopier or by replacing it, while the other services should be provided as the staffing situation gradually improves. At the time of writing, pledges have already been received from the Irish Government - the original sponsors of TALIS, and the Canadian Organization for Development Education (CODE) to support its revival.

The scope and breadth of services will certainly increase if and when the library becomes the national agricultural library. As such it could claim status as the AGRIS and CARIS national focal point, a

role presently held rather ineffectively by the Ministry of Agriculture and Livestock library.

3.6.2 Staffing

The Library has been understaffed since the days of its Faculty Status. This problem, which is more pronounced at professional (graduate) level, has been felt even more since the inception of SUA which has markedly accelerated the institution's growth and subsequently increased demand for professional staff in all sectors within the University. The workforce in 1987 comprised 4 professionals (2 nationals and 2 expatriate volunteers), 1 graduate trainee, 2 para-professionals (diploma level), 1 diploma trainee, 14 library assistants (certificate level) and 13 supporting staff inclusive of secretarial, technical, administrative and cleaning staff.

The established posts for professional staff are 6. This figure if implemented would enable the library to deploy a professional for each of the following responsibilities:

(i) Head of Library - mainly administrative,
(ii) Head of Cataloguing and Acquisitions,
(iii) Head of Special Collection,
(iv) Head of Reports and Documentation,
(v) Head of Periodicals, and
(vi) Head of Circulation and Reference Service.

The present practice is for Special Collection and Reports to be under one professional and Circulation to be headed by a para-professional. The professional members of staff enjoy equal status in remuneration and promotion criteria (publish or perish) to members of the teaching staff. Current manpower recruitment at professional level is aimed at attracting agricultural science graduates whom it

is hoped would become more effective scientific information officers and subject specialists to serve this largely scientific clientele.

3.6.3 The Library Budget

The University depends mainly on government subvension for its funding which is allocated through the Ministry of Education. The Library budget proposals, which are usually scrutinized by the Library Senate Committee, have always been honoured within the University. The main problem has been with regard to the foreign exchange allocation by the Bank of Tanzania. The small amounts allocated at times are hardly sufficient to subscribe to ten periodicals. The whole of the 1986/87 external book fund could not be expended because a certain World Bank foreign exchange component for publications centrally coordinated by the Ministry of Education did not come through.

The foreign exchange allocation problem is further aggravated by rising costs of library materials and a fast depreciating Tanzanian currency. The exercise of preparing an annual library budget can be a nightmare at times when the Tanzanian shilling is devalued by as much as 150% within a single year (1986-87), Nawe (1988) recommends that:

> "there is need for allocating more funds both in foreign and local currency to buy reading materials as rapid development requires people with more up-to-date information and technology, especially for those documents/areas of knowledge that are central."[16]

The use of Unesco Coupons purchased locally was extremely useful until they ceased to be available in 1986 as a result of the withdrawal of the United States of America, the United Kingdom and Singapore from Unesco. Faculties and other departments are encouraged to initiate links with foreign counterparts and to solicit

publications support from donor agencies to augment those which are directly presented to the library.

3.6.4 Library expansion

In response to a growing student and teaching/research staff population, the single storey library building (which was originally designed with a foundation capable of holding two storeys) is presently being expanded. Targeted for completion in 1988, this will physically double the present seating capacity of 150. The extension has been planned in such a way that it will provide fully air-conditioned rooms for housing special materials and their accompanying hardware, photocopiers and ultimately microcomputers.

The demands for new services are mainly from members of teaching staff who have been exposed to such services overseas in the course of their training. The introduction of computers would serve as a very strong attraction to provide new services and pursue the implementation of a national agricultural information network which would greatly be enhanced by the new technology.

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CHAPTER 4

NEW TECHNOLOGY

4.0 INTRODUCTION

Man has always developed mechanized techniques and technologies not only aimed at assisting him master the environment but in particular to assist him perform some of the tasks which have to be performed manually. The application of information technology in the library and documentation sector is increasingly becoming popular in both the developed and developing countries.

This chapter attempts to provide a working definition of automation in a library context and briefly outlines the development of the computer. We also try to provide an account of this universal trend in library automation which seems to evolve around the computer's characters of speed, efficiency and communications. Appropriate technology is traced in relation to its applicability in developing countries. The particular areas within the library mostly suited for automation are outlined and these include the creation of local databases.

Software is described with some highlights of portable packages specifically developed to run on a range of computer hardware. The chapter concludes with an examination of problems militating against library automation in developing countries.

4.1 DEFINITIONS

The "new technology" under examination in this chapter is broadly with reference to information technology (IT) and the main focus is placed on the use of computer-based systems in libraries and information units. IT in the library context has resulted from "the

combination of computing technology and communications technology for acquisitions, processing, storage and dissemination of vocal, pictorial, textual and numeric information".[1]

Central to IT is the use of computing power to contain and handle very large amounts of information, including bibliographic, which can be manipulated to produce various outputs related to information retrieval.

In general terms, a computer is a device that can be used to emulate human behaviour to some degree, including computation, design, manufacturing, information retrieval plus many other functions. At the outset it is important to understand that a computer system is composed of:

(i) The hardware or equipment which processes information and performs operations,

(ii) The data or information to be processed, and

(iii) The software or programmes which cause the hardware to perform specified operations on the data.

The 1980's have witnessed a growing interest in the use of microcomputers particularly as a result of their increased amount of disk storage space and the rapidly decreasing cost of both hardware and software. In general, microcomputers are seen as being economical, flexible and easy to use or "user-friendly".

4.2 RATIONALE FOR AUTOMATING LIBRARY SERVICES

Computers have been devised to reduce or eliminate tedious, time consuming and repetitive tasks that otherwise must have been performed by humans. It is generally accepted that:

> "Computing enables man to overcome the limitations of mechanical devices in performing work that would have been done by people. More importantly, the computer serves as an extension of man's mental abilities in a way similar to that in which mechanical devices have served as an extension of man's physical abilities"[2]

Several factors call for library automation. One of these is the failure of existing manual methods to cope efficiently with the increasing volume of activity and demand on the library. Today's libraries are characterized by a large number of bibliographic processes and library maintenance operations which when undertaken manually are long and boring and hence subject to error. The use of computers to perform physical tasks such as the maintenance of large files, to update sequences, to link related records and in facilitating immediate access to up-to-date information as well as to share limited resources effectively.

With specific reference to the microcomputer, Bowden (1980) contends that:

> "In theory, then, the new technology should release the librarian from many of the chores connected with information collection, organization and updating in order to concentrate on the task of getting the resources used. . ."[3]

Ndagana (1980) paraphrases Markuson's two categories of library automation needs as:

> "The genuine needs are:-
>
> Increase in library activity;
> Need to improve operations;
> Need to control volume of activity efficiently and accurately;
> Need to prevent duplication of effort;
> Need to make provision for new services;
> Need for pilot project to acquire experience.
>
> The artificial needs include:
>
> Computer availability;
> Emotional reason; and
> Cheapness of computers"[4]

In examining the reasons for the development of computer-based library systems Lucy Tedd (1984) states that:

> "The provision of on-line access (by users and staff) to a library's catalogue, the ability to access much more information via on-line . . . and the ability to produce easily management information . . . are just some examples of new improved services to both library staff or library users that are possible with computer-based systems"[5]

The increased workload and service improvement as a result of improved accessibility factors are also reported by Gates.[6] The first microcomputer to be installed in a library environment in Tanzania was:

> "anticipated to facilitate storage and easy retrieval of information on company profile, products/services, location; TIRDO/Company/institions interaction on visits, technical problems/inquiries, on-going projects, updating of 'Directory of Technical Resources in Tanzania'; mailing list for TIRDO Newsletter and information products as well as library collection"[7]

A librarian's viewpoint for automating library operations can therefore be expressed as:

- the need for greater efficiency,
- increasing accuracy and speed.

The real motivation however, should be the desire to provide more and improved services to patrons for whom the libraries are established as well as to contain the ever increasing costs of labour.

4.3 APPROPRIATE TECHNOLOGY

It has been suggested by the United Nations Advisory Committee on the Application of Science and Technology to Development that the vast gaps between the rich and poor countries are due to inadequate scientific and technological information. It is the inadequacy or non availability of the new technology which became the main focus of efforts to assist the poor countries to develop their information

capacities. It is the failures of the new technology developed in the West and transferred in toto to the poor countries that gave birth to the term "appropriate technology".

Researchers realized that the appropriateness of acts of transfer had been explored inadequately and began to call for a systematic and interdisciplinary approach to technology assessment. Today, there appears to be a general agreement among information experts on the conditions required for a successful introduction of new information technology to developing countries. Munn (1978) contends that:

> " (i) the new project must be seen as both useful and feasible. . . . It must relate to national problems. . . and must consider national constraints and must be based on cost-benefit analysis approach and
>
> (ii) it must be designed to fit fiscal manpower and local attitudes and practices"[8]

He concludes that the unthinking application of "off-the-shelf" technology designed in the West cannot be justified. He emphasizes that technical expertise must be combined with real understanding of local conditions, attitudes and aspirations.

The understanding of the poor countries is further underscored by Massil (1982) who sees appropriate technology as:

> "the use of less expensive approaches designed to fit the economic, manpower and cultural conditions of the country concerned; in library terms, it should concentrate on the kinds of information involved, the delivery of documents and not just references, the maintenance of a labour force using techniques or technologies designed to provide work that is satisfying and useful"[9]

More recently Shibata (1987) views appropriate technology as a new opportunity because:

> "it is intensive in its use of abundant resources (labour and domestic inputs) and economical in use of scarce resources (capital and expertise). It is small scale but efficient, readily adapted, operated, maintained and repaired. And it is a technology compatible with the local cultural, social and physical environments"[10]

Within the context of developing countries and with regard to types of computers, microcomputers could be considered under the appropriate technology category because of their relative ease of installation, portability and user-friendliness. It can therefore be assumed that this new technology, refined to appropriate levels, has the potential to help developing countries overcome the 'cultural shock' which they had experienced during the era of mainframe computers.

4.4 POSSIBLE AREAS FOR AUTOMATION

Having illustrated that computers are widely used in the library sector in developed countries and gradually being introduced in developing countries, it is my intention now to point out specific areas in which computers can be used. Computer application in libraries and documentation centres can be divided into two categories - namely housekeeping operations and information retrieval. Housekeeping application is generally used to refer to:

- circulation control,
- serial holdings records/lists plus their updating, and sending reminders,
- cataloguing, as well as interlibrary loans.

Under 'information retrieval', one would normally be referring to the capacity to allow the retrieval of information from local files and searching external online data bases both numeric and bibliographic. Searching for full text of documents in external data bases is also possible.

The production of indexes can be very conveniently accomplished using a computer because data can be sorted according to various attributes

in relation to intended output. This can save time and money, particularly in the production of cumulative annual indexes.

Burton (1983) noted that microcomputers were being used for a wide variety of tasks including:

> "intelligent terminals, data base creation and maintenance, issue systems and catalogues, although the overall emphasis was on the automation of housekeeping routines. The three most popular applications were word-processing, issue systems and terminals for online databases"[11]

From Kenya, Ouma[12] reported that several libraries particularly those belonging to international agencies based in Nairobi, have introduced computers primarily to facilitate access to information from external data bases. In Tanzania, a microcomputer is being installed through Unesco assistance, to automate the records of the National Bibliographic Agency (NBA).

For the purpose of this dissertation, most emphasis will be put on the creation of local data bases. This would seem to be a logical choice in a poor environment but where there is determination to ensure that sources of information are effectively recorded and can be made available to the larger national and international library community - in effect making sure of its own national bibliographic control.

4.5 DATABASES

4.5.1 Definitions

The Dictionary of Information Technology (1985) defines a database as:

> "a collection of interrelated data stored so that it may be accessed by authorized users with simple user friendly dialogs"[13]

According to Mavuba (1986):

> "A data base may be defined as a collection of interrelated data stored without redundancy to serve multiple applications; the data are stored so that they are independent of programs which use them; and a common and controlled approach is used in adding new data and in modifying and retrieving existing data within the data base"[14]

Common to both definitions, is the factor of "interrelated data". Databases may be manual or computer-based. Librarians have always created data bases operated manually in the forms of indexes, catalogues, lists of borrowers and bibliographies. In a library context, data base is frequently used to mean a computer-based file of bibliographic references, such as found in bibliographic retrieval systems like the AGRIS data base.

4.5.2 Justification

In consideration of the fact that any computer application in a library is bound to be both expensive and demanding of skills, there is need to undertake careful systems analysis and planning before its introduction. Any detailed examination of the SUA Library situation would be bound to reveal the following problems which may suggest the applicability of an in-house data base:

(i) The library is understaffed mainly at professional level. This leads to heavy work loads, less time for indexing and abstracting and backlogs,

(ii) Lack of full bibliographic control of Tanzanian sources of agricultural information and research findings in particular,

(iii) The growing demand by a gradually growing number of patrons as the University expands, and

(iv) Greater national responsibilities as SUA Library awaits to be officially designated the National Agricultural Library.

The operation of a computer-based agricultural information service at SUA Library would also pave the way for accessing and acquiring externally generated agricultural information from data bases such as the Commonwealth Agricultural Bureau (CAB) International. Woods[15] has a comprehensive chapter on the use of microcomputers for in-house data base support. In assessing whether to go on-line or adopt an off-line strategy, one is forced to make a detailed comparison of notes with Ouma's (12) revelation:

> "that real online information retrieval connected to international databases does not exist in Kenya"[16]

The Tanzanian computer-based databases with which SUA Library might with benefit consider sharing of data and experience would be the NBA (under implementation) and TARO (proposed by Woodward - 1987).

4.6 SOFTWARE CONSIDERATIONS

In making recommendations on a methodology for automating information handling procedures using small-scale computing equipment, it is necessary to relate the information requirements of individual institutions to the availability and capability of hardware and software. Saffady (1982) presents software as:

> "the programs or predetermined sequences of instructions which a computer executes to accomplish a given information processing task. This can be with fixed electronic circuitry designed to perform one or more functions. . ."[17]

Whatever size and facilities are offered by hardware, an operating system and programming software are needed to make the hardware work effectively.

There are two categories of software for information retrieval systems - Database Management Systems (DBMS) and Free Text Retrieval Systems (FTX). There are a number of detailed accounts of the two

systems such as Ashford[18] and Tagg.[19] Mavuso[20] has a useful review of the software features.

4.6.1 Software for developing countries

A number of off-the-shelf software packages suitable for management and retrieval of bibliographic information are presently available on the market.

In recognition of the peculiar problems experienced by developing countries, specific software packages which can assist these countries to create databases for handling locally generated information as well as facilitate the exchange of information in computer readable form have been developed. One of these packages, described by Lohner and Koch (1985), is:

> "CDS/ISIS (Computerized System/Integrated Set of Information System), developed and maintained by Unesco, which runs on IBM mainframes (and certain compatible equipment of other manufacturers. . .)[21]

A second example is MINISIS, developed and maintained by the International Development Research Centre (IDRC) in Canada. This runs on the HP-3000 series of minicomputers and is provided free of charge to developing countries.

Unesco has considered the matter of 'portability' (the ability to run on different makes of computers). In this regard it has defined some general features and specific applications' requirements which a portable software should fulfill. These include:

> "- Provide sophisticated online input data management and retrieval facilities appropriate for the efficient handling of a relatively large bibliographic database (containing several tens of thousands of records),
>
> - Be functionally compatible and to the extent possible, end-user compatible with packages already in wide use in developing countries as CDS/ISIS and MINISIS,

- Accept machine-readable files in the RM, UNIMARC and eventally CCF formats to directly generate bibliographic descriptions and output file formatted in accordance with the RAM for UNIMARC and/or CCF specifications,

- Support connection to external online information retrieval systems and

- Support different forms of output (Computer output microfiche/microfilm-COM, photocomposition, etc.)[22]

Unesco has subsequently supported the development of the microcomputer based information system IV+V which in German stands for 'Information Vermittlug und Verarbeitung' meaning Information and Processing. This package is being installed at the NBA while CDS/ISIS has been recommended for TARO by Woodward.[23]

From practical exposure of the IV+V system and its successful application at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Satyanarayana (1988) concludes that:

> "the IV+V system appears to be a well designed software and could be utilized by Indian information scientists and librarians, for developing computer-based information storage and retrieval systems as well as for automating some of the library operations"[24]

4.7 BARRIERS TO AUTOMATION

This examination of barriers to library automation is made with special reference to those problems experienced mostly by developing countries.

Several information/technology experts have studied the problems militating against the introduction of new information technology particularly in the libraries of developing countries. McCarthy[25] used a catalogue of nineteen problems while East (1983) identified four problems which appear to be fairly common in many developing areas. He itemizes these as:

" (i) lack of appreciation by national decision makers of the role of scientific and technical information,

(ii) the absence of adequate infrastructure for information storage and processing,

(iii) the absence of adequate infrastructure for information use and absorption by users and

(iv) economic, administrative, technological, cultural, educational and structural barriers to adequate information flow"[26]

In addition, Ipaye[27] and Were[28] list nine and ten barriers respectively with each listing:

- limited choice of systems,

- software problems,

- environmental - heat, humidity and dust as well as

- lack of cooperation among librarians.

Mlaki (1987) groups all problems into:

"Socio-cultural, economic and financial, manpower and other problems"[29]

Mchombu (1985) amplifies East's (26) problem area (iii) and conjectures that most listed problems may not be the real problems but:

"merely the results of a more fundamental problem - namely the low social demand for up-to-date knowledge, low demand for a product leads to low investment in its manufacture"[30]

In spite of all the problems noted above, or any assortment of those and others, it is clear that the number of computer installations in developing countries is increasing. The main areas applying computers are in government-planning, statistics, accounting and administrative procedures; in research and teaching institutes; in banks and in finance. It must however be emphasized that successful automation requires the ready availability of both hardware and software, appropriate infrastructural back up in the form of

efficient telecommunications, reliable and stable power supply plus a skilled and experienced workforce.

Confronted by what might be termed the two major problems - financial and manpower, it would seem logical that libraries start with microcomputers which are increasingly becoming affordable, robust and user friendly in order to develop skills and gain experience. In opting for small-scale computing equipment, particularly at the lower end of the scale, we are reminded by Griffiths[31] that they have a number of significant limitations including limited storage capacity, delicacy of floppy disk drives, limited portability and servicing.

On the basis of practical experiences, one can expect that the application of microcomputers should lead to the provision of improved and new services to the library clientele. With the availability of trained and informed personnel, appropriate equipment and an institutional and international support, first steps are being made in automating housekeeping operations and in creating local databases. Database technology is viewed with particular interest because of its potentiality in liaising with established external databases.

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CHAPTER 5

MAJOR AGRICULTURAL INFORMATION SYSTEMS

5.1 THE MAJOR INTERNATIONAL AGRICULTURAL INFORMATION SYSTEMS

Amid the enormous progress in information technology, agricultural research is generating large amounts of agricultural information. AGRIS (1981) estimates that every year some 250,000 documents are generated in the domain of ways of improving agriculture and producing more food. The efforts by information personnel to bibliographically control this mass of agricultural documentation has, in the process, created a proliferation of automated agricultural information systems. Hundreds of databases exist with information ready to be exploited by the world agricultural community.

The new developments which are primarily to be found in the industrialized nations, have in a way made agricultural information more difficult to obtain by the technology-poor nations. The three major agricultural abstracting and indexing services in the world are FAO's, AGRIS, the CAB International's database and the US Department of Agriculture's AGRICOLA system. These three databases have been labelled the "big three" primarily because of their sizes, international coverage and multi-disciplinary scope.

The three databases and their products are briefly described in this Chapter. An examination of their geographical coverage, origin of their materials and document delivery potential is made. We also review some agricultural information databases based in Africa and the process of accessing external databases.

5.1.1 AGRIS

AGRIS, which stands for the International Information System for the agricultural sciences and technology, was established in 1975 in response to the need for easily accessible information about research and development in food and agriculture throughout the world. AGRIS database with participation from 120 countries and 14 international centres is coordinated by the AGRIS Coordinating Centre of the FAO in Rome.

In AGRIS, is an international cooperating network, with each participating national centre responsible for the creation of bibliographic data on all its agricultural publications (input) as well as administering the in-country utilization of output from Rome. The merged input records are used to produce the monthly AGRINDEX on magnetic tape as well as in book form. No abstracts are prepared for AGRIS records. AGROVOC, the multilingual thesaurus was published in 1982 to aid the indexing and retrieval of relevant bibliographic citations.

The functions of AGRIS are:

> "(1) To create a single, comprehensive, current inventory of world-wide agricultural research and extension literature.
>
> (2) To meet information needs by producing a published agricultural bibliography with appropriate indexes and to provide the databases required to meet individual requirements by means of SDI (Selective Dissemination of Information) and specialized subject retrieval services.
>
> (3) To cooperate with new and/or existing secondary specialized information services so as to increase efficiency and eliminate unnecessary duplication.
>
> (4) To encourage the development of national agricultural information handling capabilities in developing countries, bringing them into the partnership with developed countries in this field".[1]

There are four multinational (regional) centres which coordinate AGRIS activities among countries of a given region. These are:

(i) AIBA (Agricultural Information Bank for Asia), covering Southeast Asian countries,

(ii) CEC (Community of the European Communities) in Belgium covering the countries of the European Community,

(iii) CIDIA (Centro Interamericano de Documentacion e Information y Communicacion Agricola) in Costa Rica, covering Latin America and the Caribbean, and

(iv) OMVS (Centre de documentation de l'Organisation pour Mise en Valeur du fleuve Senegal), covering Mali, Mauritania and Senegal.

The objectives of the regional centres are to expedite and assist the development of information activities at both national and regional levels. It will be observed that there is not an African region FAO regional centre. Chaudhry[2] suggests that an Arab regional system for cooperation in agriculture should be developed on the model of AIBA.

5.1.2 CAB International

The world's largest agricultural database is produced by CAB International (CABI), formerly The Commonwealth Agricultural Bureaux (CAB). The organization was established in the late 1920s following success in the setting up of scientific and information services in entomology for workers in East and West Africa. Since then, CAB has expanded and today provides worldwide scientific services and information services through the abstracting and indexing of agricultural publications in nearly 40 languages. There are 26 main indexing journals and 19 specialist journals that correspond to all

records of the database. Approximately 8,500 journals are reviewed regularly for articles.

CABI's membership of 29 Commonwealth nations is largely drawn from developing countries. A new CABI constitution expected to be effected in 1987 is intended to open membership to non-Commonwealth countries and accord the organization an international status. The new status would facilitate funding by donor agencies, of projects related to the needs of developing countries.

The CABI Abstracts database now contains more than two million records of articles published since 1973 and is used to provide current awareness and retrospective information in both hard copy, as computer printout or as abstract journals, and in machine-readable form, as magnetic tapes and floppy disks. The first CAB Thesaurus was published in 1983 and contains more than 48,000 terms. A second edition expected to be issued in 1987 would include many American phrases, spellings and indigenous terms as well as topics outside CABI's scope such as home economics and social science.

5.1.3 AGRICOLA

AGRICOLA (AGRICultural OnLine Access) is a bibliographic database consisting primarily of the index to the document collection of the US National Agricultural Library (NAL). The database contains over 2 million bibliographic references and is growing at a rate of approximately 125,000 records per year (Griffiths, 1985). Although AGRICOLA is international in scope, its coverage is most complete with respect to American publications. Abstracts are provided for some subfiles but not in the majority of citations.

AGRICOLA can be directly accessed through several US and European database brokers (DIALOG, DIMDI, with the library's records on OCLC)

and on magnetic tape. In 1985, the NAL adopted the CAB Thesaurus as the standard vocabulary for indexing records. This new development is expected to greatly improve retrieval from AGRICOLA and aid in cooperative efforts with the CAB International and other database producers. However, all cataloguing records use the Library of Congress subject headings.

5.1.4 International Coverage

The "big three" databases practically cover the whole world. However, each has its strengtns and weaknesses. AGRICOLA's strongest point (from an American perspective) is its non-journal coverage, which includes many state and federal publications not indexed elsewhere. The major weakness of AGRIS stems from its total dependence on what the participating national centres supply. One barrier encountered by AGRIS has been to get all nations to cooperate. Simmons (1986) for example noted that the US position toward AGRIS has vacillated over the years according to the attitude of NAL's administration.

Deselaers'[3] study showed substantial duplication in citation among all three databases. The smallest overlap was between AGRICOLA and AGRIS (34%), and the greatest was 46% duplication in the number of citations appearing in AGRIS that also appear in both CAB and AGRICOLA. Brooks (1980) found that:

> "CAB contains a higher percentage of international literature than the other databases and fairly extensive abstracts. This makes it easier to retrieve geographical parameters".[4]

Gal's[5] comparative SDI evaluation based on CAB and AGRIS revealed that both chiefly contain data on articles published in journals but a significant difference was found in favour of AGRIS with respect to the number of non-traditional documents (grey literature).

A recent comparison of how the three databases covered publications of the CGIAR centres (Table 3) shows differences in coverage and handling of materials originating from developing countries. A more specific coverage analysis at national and regional level is provided by Shibata.[6] While most differences can be attributed to each database's objectives, mission, funding and organization, Griffiths (1985) observes that, "closer cooperation between the three is possible and would greatly benefit the users."[7]

Deselaers[3] had actually proposed for a single integrated agricultural information system, citing cost-effectiveness and efficient use of time in searching as major benefits. This proposal is supported by Munn (1984) who suggests that if the duplication and triplication of records is to be avoided among the 3 databases, to the convenience and affordable cost to the users, there is:

> "need for greater cooperation between CAB, AGRIS and NAL as well as associated databases - ASFA and IFIS and ultimately lead to the creation of a single coordinated world system for food and agricultural information".[8]

First steps have already been taken towards creating a more cooperative working relationship as indicated by:

(i) AGRICOLA's adoption of the CAB Thesaurus, and

(ii) AGRICOLA and AGRIS's agreement that the NAL should concentrate on indexing US publications and publications not indexed elsewhere in an effort to avoid the duplication inherent in their databases.

5.1.5 Other International Databases

Other important agricultural databases include:

(i) BIOSIS Previews, which provides extensive and worldwide coverage of research in the life sciences,

TABLE 3

COMPARISON OF THE COVERAGE OF CGIAR CENTER PUBLICATIONS IN MAJOR INDEXING SERVICES

CGIAR CENTER	AGRICOLA (1970-4/85)	CAB ABSTRACTS (1972-4/85)	AGRIS (1975-5/85)
CIAT	60	196	465
CIMMYT	34	179	139
CIP	29	86	433
IBPGR	6	34	85
ICARDA	6	45	10
ICRISAT	77	173	10
IFPRI	59	24	82
IITA	40	109	20
ILCA	9	73	96
ILRAD	5	8	3
IRRI	140	362	1546
ISNAR	1	10	2
WARDA	14	14	7

Source: Griffiths, Jose-Marie and Kinney Jane, "Agricultural information needs and services to developing countries". Rockville, MD: King Research, Inc. 1985. p.10.

(ii) TROPAG, the machine-readable version of Abstracts on Tropical Agriculture, providing an important coverage in the area of tropical agriculture,

(iii) Food Science and Technology Abstracts, produced by the International Food Information Service (IFIS), and

(iv) Aquatic Sciences and Fisheries Abstracts, produced by FAO and the Intergovernmental Oceanographic Commission of Unesco.

Williams and Rubins[9] have compiled a directory of databases providing detailed agricultural information to information seekers worldwide. Most of the described databases cover information generated in both developed and developing countries.

5.2 AFRICA BASED AGRICULTURAL DATABASES

Other parts of the developing world, i.e. Latin America and Asia appear to be way ahead of Africa in the deployment of new information technology as exemplified by their creation of regional agricultural associations and databases. The major agricultural databases in Africa are found to enjoy very strong financial and technical support from major development agencies like the IDRC or actually belonging to international groups like the CGIAR. Only a few databases like PADIS and SACCAR which are still in their very early stages of development can be described as truly African.

5.2.1 ILCA

ILCA (International Livestock Centre for Africa) based in Ethiopia was established in 1974 to carry out research and development on improved livestock production and marketing systems in tropical Africa. ILCA which is heavily supported by IDRC and also belongs to the CGIAR group, has just completed a microfiche project which covered 25 countries in Africa during which 20,000 "grey literature" documents were microfilmed.

ILCA produces an SDI service to African researchers with monthly updates of relevant world literature according to individual research interests. This service is based on the monthly supply of information from CABI and AGRIS. ILCA's Information Department which incorporates the Library, is highly automated has already designed training programmes aimed at imparting new skills to participants in

the region. MINISIS software is the chosen software for ILCA's database.

5.2.2 PADIS

PADIS (Pan African Documentation and Information System) has been created by the UN Economic Commission for Africa (ECA) in Ethiopia to facilitate development information exchange among ECA member states. The PADIS system is being conceived as a network oriented towards the user, taking into consideration the various needs and development priorities in the region. According to Teshager (1986), the structure of PADIS will include eight components based on:

(i) a bibliographic reference service,

(ii) a descriptive inventory service, and

(iii) a numerical data bank.

Some of the eight components are:

> "- PADIS-PROM - project data base concerning research and development projects,
>
> - PADIS-TEND - technical numerical non-statistical data bank on natural resources, industrial facilities, industrial products, commodities, etc., and
>
> - PADIS-NET/STISD - Science and technical information system for development".[10]

PADIS has devised a training programme which aims at developing and coordinating a network of facilities capable of meeting the national information and documentation needs of Africa. Inganji[11] highlights the PADIS training programme with details of the types of training and content.

5.2.3 SACCAR

SACCAR (Southern African Centre for Cooperation in Agricultural Research) based in Botswana was established in 1985 to serve the agricultural research needs of the Southern African Development

Cooperation Conference (SADCC) member countries. It coordinates national research systems and operates a small research grants programme. SACCAR's documentation unit has installed a computerized Documentation System/Intergrated Set of Information System (CDS/ISIS) bibliographic database management system.

5.2.4 Other Africa based Agricultural Databases

Other notable African based databases which can provide the required agricultural information service in addition to serving as training laboratories in the area of information technology would include the following:

(i) IITA (International Institute of Tropical Agriculture) in Nigeria which specializes in lowland tropical agriculture worldwide with emphasis on roots and tubers, cereals and grain legumes. Its library and documentation centre is under the management of highly experienced African librarians who have represented Africa on the IAALD.

(ii) ILRAD (International Laboratory for Research on Animal Diseases) in Kenya. In 1986, ILRAD library acquired an IBM/PC/AT computer and the INMAGIC software. It has already automated its catalogue and acquisition system. The library has supplied information and advice on library computerization in Kenya and Malawi.

(iii) ICRAF (International Council for Research in Agroforestry. The ICRAF library database is an electronic form of the library catalogue with each record being an equivalent to a catalogue card. The database management is done on Knowledge MAN or KMAN DBMS.

5.3 ACCESSING EXTERNAL DATABASES

The proliferation of databases in electronic format has denied scientists in many developing nations access to high quality information partly because neither the requisite hardware/software nor good telephone lines supported by satellite are at their disposal. Where such facilities exist within reach, they have been very useful. Agha (1987) observes that:

> "The establishment of computerized databases and commercially accessible database hosts has enabled access to a comprehensive coverage of recorded literature (provided one has the accessing technology).[12]

5.3.1 Online Access

Lack of a modern telecommunications system is not only related to the advancement of technology, but greatly influenced by geographical distances. Ouma (1987) for example argues that:

> "In Kenya, for example, a very advanced telecommunications system exists through which users can easily communicate to the outside world through telex system. The only problem in the application of this service is the high cost involved".[13]

This argument is supported by Online Review[14] which reported that, "The cost of searching online through commercial vendors is higher than most African institutions can afford". The only documented Tanzanian experience with online information retrieval was reported by Kayumbo, Munisi and Nguli[15] in 1983 but nothing has been reported since then.

The need for access is underscored by Kinney (1988) when she states that:

> "Affordable access to many of the online information services in agriculture would at least eliminate problems of unawareness of the existence of information which is a major impediment to indigenous research and planning in a developing country".[16]

5.4 DOCUMENT DELIVERY

Bibliographic control processes supported by the International Federation of Library Associations (IFLA) particularly the Universal Bibliographic Control Programme (UBC) have met with some degree of success. The creation of computerized databases and telecommunications technology have enabled access to a comprehensive coverage of recorded literature.

Since most databases are bibliographic (with or without abstracts), gaining physical access to literature that has been identified will pose as a major problem although Kinney (1988) remarks that, "the very serious problems of document delivery in Africa should not discourage the progress toward solution of the first problem of identifying relevant materials".[17] Another IFLA programme supporting is the one of Universal Availability of Publication (UAP). According to Line and Vickers:

> "the objective is the widest possible availability of published material (that is recorded knowledge issued for public use) to intending users wherever and whenever they need it".[18]

Developing nations have two alternatives to telecommunications with regard to accessing distant databases. The first one would involve leasing of the database on magnetic tape (assuming that one has the compatible hardware). The second is to correspond in writing with the database sending search profiles after which the producers will search and mail the search results. This second method although quite inferior to on-line access in terms of response time, relevance of retrieved information and ability to browse and change search strategy, will still be useful to those without the means to identify the existence of such literature.

With the development of various technologies in the storage, retrieval and communication of information, several of the traditional steps involved in document delivery (the transport of the physical vehicle of information from a stored location to the user), may need to be changed. Nitecki (1984) believes that:

> "The time has come for us in a practical setting to re-examine the process and evaluate it in the light of our primary objective of linking information and users. I would like to propose that not merely the process, but the very concept of document delivery may warrant a review in the light of the advent of automation".[19]

Cornish[20] presents a very comprehensive and up-to-date review of document delivery processes inclusive of a thought provoking treatise on the introduction of payments for this service in some countries.

Of the "big three" databases, AGRICOLA does not have associated document delivery services. The National Technical Information Service (NTIS) might be considered a good American substitute largely because of its strong international network of distribution centres making them accessible to developing countries. AGRIS was designed to both provide a world bibliographic control of agricultural literature as well as to facilitate access to the documents which are recorded by national and regional centres.

Samaha[21] addresses the problems encountered by AGRIS and developing countries in realizing a document delivery service. He proposes a coupon scheme which should alleviate the foreign exchange shortage faced by developing countries. CABI supplies photocopies of most of the publications listed in their database. CABI is considered to accord high priority to the needs of developing countries and collaborates with international and bilateral and agencies to deliver agricultural information to these countries.

5.4.1 Literature Service

The function of supplying the user with the actual documents completes the process of document delivery. Literature service is a type of document delivery activity which has been quite successful in many developing countries (Cooney, et al., 1988). It basically involves the making of primary current literature, mainly in scientific journals, more easily and promptly accessible to users. This service which in essence operates by sending photocopies of content pages and later articles, relies on a large collection of journals. The service has been found to be quite cost-effective and appropriate especially where electronic data bases and good telecommunications are hard to find.

Some successful literature services cited by Cooney[22] include the following:

(i) East African Literature Service (EALS) which collapsed in 1977 with the demise of the East African Community. The Kenya Agricultural Research Institute (KARI) has since 1985 been offering a similar service to Kenyan researchers from the same premises. On the Tanzanian side, the Tanzania Literature Service (TALIS) was an effort to continue the same service based on SUA library's periodicals collection;

(ii) The Philippines Council for Agriculture and Resources Research and Development (PCARRD) Literature Service, and

(iii) SNICA ("National Subsystem for Agricultural Science Information") and Collaborative Pages Contents Service in Colombia.

Reddy[23] presents an overview of a service similar to (ii) and (iii) above, coordinated by the Indian Council of Agricultural Research.

Inspired by the spirit of the EALS, CABI has launched an African Agricultural Literature Service (AALS) although still as a pilot project (Bellamy[24]). On the African scene, ILCA operates a "current titles" service by gathering and reproducing content pages of

journals. ILCA's mailing list contains over 7000 addresses of institutions and individuals, of which 66% are in Africa.

5.4.2 CD-ROM (Compact Disk - Read Only Memory)

With the proliferation of personal computers and their increasing capacity, and with the development of new storage technologies, other ways of exchanging information and delivering documents are available. New disk technologies have suddenly become of potential interest to developing countries largely because they can be connected to small microcomputers for information retrieval purposes. Disks are also the least expensive of the laser technology products. Compact laser disk (CD-ROM) is just one of the several new disk technologies and has already been the distribution medium for several producers of databases.

The development, range of uses and the future of CD-ROM is very ably reviewed by Feldman.[25] Rivett[26] reports that CD-ROM disks typically hold 600 Mbytes of data (270,000 typed A4 pages or the contents of 1000 full floppy disks). With regard to their immediate use to developing countries, Hartevelt (1988) claims that:

> "For these countries, CD-ROM will appear to be the only short-term alternative for access to relevant computerized files. The complete package of information, hardware and software can be located in the most remote rural areas, provided of course that electricity is available (systems that run on batteries may also be used)".[27]

Muller[28] speculates that CD-ROM may replace on-line databases altogether. Rivett (1987) is however more cautious and thinks that: "CD-ROM is unlikely to replace traditional online searching in the near future, but may lead to different forms of data-base usage".[29]

5.4.2.1 CD-ROM products

Most CD-ROM database products include both the database and the

software to search it on the same disk or set or disks. This makes updating software easier and saves microcomputer memory. Perhaps the more applicable optical disk technology is the publication of discrete packages of information to serve specific needs. In the area of publishing for example, a number of full text CD-ROM products have already been developed. The Academic American Encyclopedia, Bowker's Books in Print, Whitaker's British Books in Print and the Library and Information Science Abstracts are some of the products already in use in the CD-ROM format.

Of particular relevance to agricultural document delivery (full text), is the ADONIS project. The ADONIS concept of storing journals in machine-readable form (CD-ROM) is based on 210 high use research journals in the field of biomedicine. Operating from the British Library Document Supply Centre, the project is described by Merry[30] as satisfying requests from as far as Australia, Japan and Mexico. In theory, it should be possible to replicate this project for the agricultural and food sciences.

5.4.2.2 Agricultural information on CD-ROM

The most important development and certainly most accessible in Africa at this stage appears to be the CD-ROM prototype commissioned and distributed by CABI. The disk contains article references and abstracts entered into the CAB ABSTRACTS database from January 1984 to March 1985, approximately 180,000 records in total. It is currently being field-tested in forty sites throughout the world. ICLA, SACCAR and the national agricultural library system in Malawi are some of the chosen testing sites in Africa. Onate[31] reports of a six month evaluation of this prototype at AIBA.

FAO and AGRICOLA are also working on their compact disks. The CGIAR which is currently microfiching the publications by its centres, is also reported to be studying an eventual convertion of the fiche data into CD-ROM. All that would seem to be remaining for African professionals would be for them to investigate modalities of enabling the continent to benefit from such projects as put forward by the CABI prototype, Hartevelt[27] and the ADONIS project. Failure to participate in such projects especially by Tanzania, may result in the nation falling further behind in the information age.

5.4.3 AGLINET (Worldwide Network of Agricultural Libraries)

AGLINET was established within the framework of the IAALD for the primary objective of organizing at regional and international levels cooperation among agricultural libraries. The library network is being used quite effectively to complement the AGRIS delivery activities. Clients are encouraged to try local and national libraries before requesting copies from their regional AGLINET libraries.

The network is composed of two African libraries (ILCA and IITA), three Asian, eight European, one North American (NAL), four South American libraries plus FAO in Rome as an international centre. It is observed that an active branch/regional group of the IAALD for Africa would greatly strengthen the AGLINET document delivery in the region.

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CHAPTER 6

PROPOSED AGRICULTURAL DATABASE: TADIS

6.0 PREAMBLE

Databases have become indispensable in the process of information supply not only because masses of bibliographic references are made available for searching, but also because of the efficiency and speed with which a computer system can provide answers. This may greatly reduce the time needed for literature searching and compiling bibliographies.

TADIS (Tanzania Agricultural Database and Information Service) is conceived as an electronic database - an extension of Mbwana's[1] proposal for a national agricultural documentation centre. This proposal, which is on a national scale, is made in the full knowledge that Tanzania is yet to formulate a national agricultural information policy. The proposal attempts to be reflective of the need for better management of information for maximum use by researchers, academicians, policy makers, extension workers and farmers. It is equally understood that there are some overlaps of functions in the establishment statuses of the Tanzania Agricultural Research Organization (TARO), Tanzania Research Information Service (TANRIS) and Sokoine University of Agriculture (SUA) Library with regard to providing and coordinating agricultural information at national level. Several reports (2-8) have put forward proposals aimed at redressing the situation but all seem to have remained academic exercises.

Amongst several agriculturally oriented institutions, SUA Library is proposed to host TADIS for several reasons but mainly because:

(i) SUA Library collection is the most comprehensive agricultural collection in the country.

(ii) SUA's staff are experienced in agricultural documentation, and

(iii) SUA possesses experience in information dissemination gained from the days of the TALIS project.

Tne introduction of automation in SUA Library should help the library to solve some of her problems, mainly the shortage of professional staff. This exercise should also provide new possibilities for using MARC records and CD-ROM. TADIS should also augment TALIS activities if and when revived.

It is stressed that appropriate links and effective cooperation between the key institutions should be established from the very beginning if the TADIS proposal is to be translated into action.

TADIS is being proposed almost at the same time as a Programme for the rehabilitation of documentation system in TARO[9] has been submitted. It is advisable that TARO and TADIS should establish very close work relations in order to exchange programmes and share experiences, mainly in order to avoid duplication of effort.

6.1 TADIS OBJECTIVES AND FUNCTIONS

TADIS is being proposed as a national project mainly as a result of the growing awareness of the importance and need for timely and relevant information. This necessary input to improve agricultural research and decision making is aimed at improving production techniques and increasing output for national development. For Tanzania to achieve her Economic Recovery Programme objectives, she will need to develop agricultural programmes to provide answers to

production shortages and information for planning new production strategies and products.

From a theoretical viewpoint, it is emphasized that any new project's objectives need to be clearly stated. The objectives would normally state the rationale reasons for the intent to launch a project as well as specifying the expected beneficiaries of the project. These statements would then be followed by a plan or scheme for accomplishing the objectives.

The details of planning for TADIS are best accomplished on site, with access to all the required data and information required for the planning process. M. Hlava and J. Ven Eman[10] and K. Pickens[11] provide detailed accounts of the issues to be considered in database development. Specific details such as the database structure and number of fields will be influenced by available software and the range of documents to be indexed. While the indexing and vocabulary control will mainly be determined by existing and expected usage patterns, it is quite likely that they might be influenced by current technical and material support from the major external agricultural information systems.

The objectives have been drawn in line with SUA library functions (3.5), some of which are institutional while others are national in scope. The proposed objectives are:

1. To serve the information needs of SUA staff and other users in the country in the field of agriculture and related disciplines.

2. To promote new methods and techniques for handling and disseminating agricultural information in Tanzania.

3. To stimulate and initiate the sharing and coordination of agricultural information in order to attain bibliographic control in the agricultural information sector.

4. To improve the services of SUA Library and particularly the exploitation of agricultural documents which are only partially indexed.

5. To facilitate Tanzania's exploitation of externally originating agricultural information and provide a national linkage for Tanzanian information to external databases and users.

It is important to stress the need for a cooperative effort amongst Tanzanian agricultural oriented organizations if some of the stated objectives are to be realized. If for example recommendations in the Report by Woodward[9] have been implemented, then national bibliographic control should have been partly attained.

6.2 ORGANIZATION OF TADIS

TADIS will largely be owned and based within the SUA Library. It is expected to rely and draw on this library's technical and material resources. However TADIS is expected to benefit from some key national agencies during input and output processes. Addressing himself to the subject of networking in agricultural information, Holmberg (1982) noted that such a system:

> "will make optional use of existing resources, make participants more involved, securing continuity as regards staffing and other resources. Technical solutions are adapted to networking, e.g. the excellent Tanzanian telex links. . .".[12]

Hoey[13] and Hansen with Nielsen[14] provide very useful descriptions of the logistics involved in setting up automated national networks for agricultural information. Hansen and Nielsen are particularly

relevant because of the Danish experience in creating joint responsibilities between the Ministry of Education and Ministry of Agriculture for coordinating and sponsoring agricultural research inclusive of information and documentation. The key organizations which are likely to become the closest partners of SUA Library in implementing TADIS are:

(i) TARO - Tanzania Agricultural Research Organization.

(ii) TALIRO - Tanzania Livestock research Organization.

(iii) TANRIS - Tanzania Research Information Service.

(iv) Uyole Agricultural Centre (UAC), and

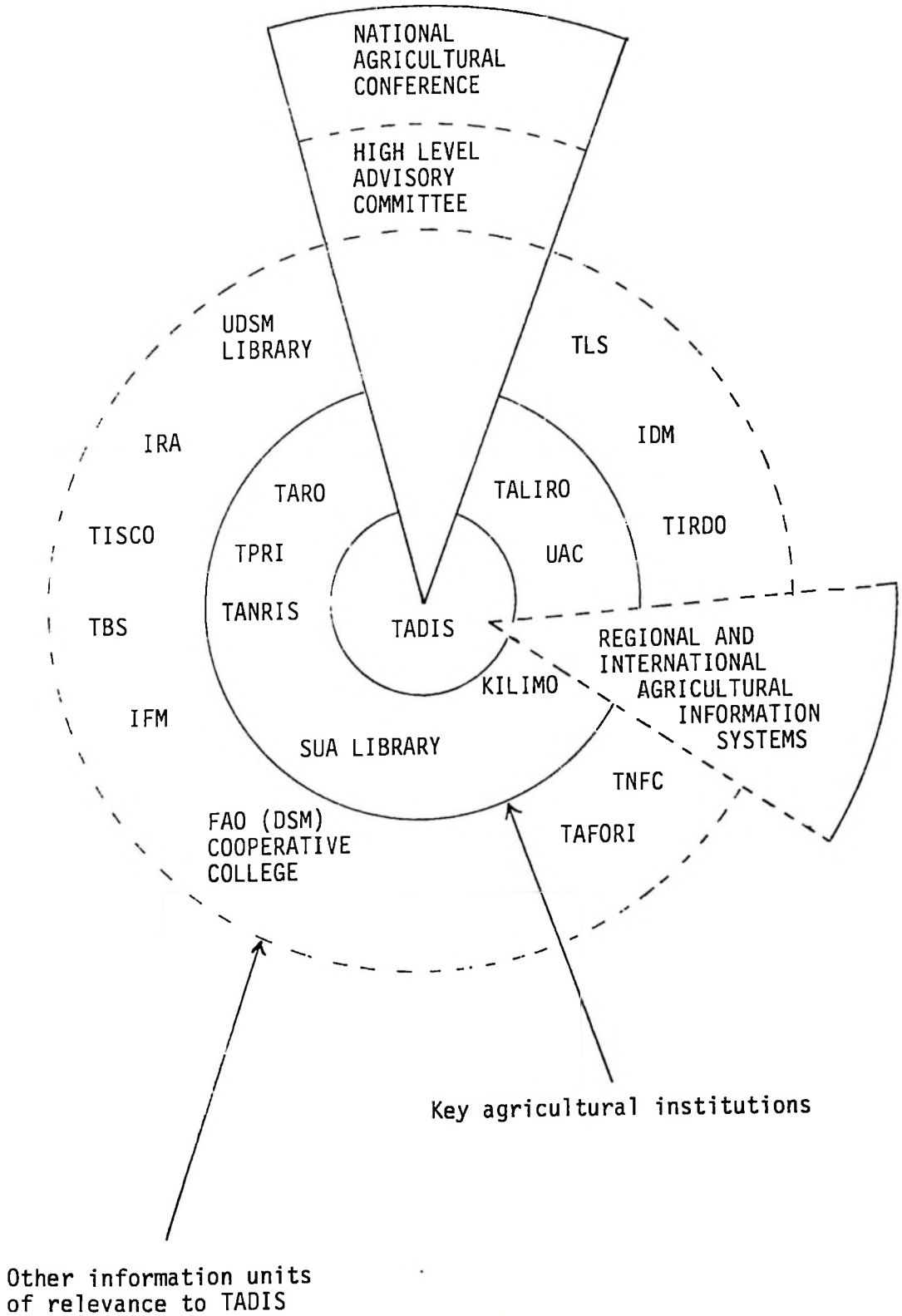
(v) TPRI - Tanzania Pests Research Institute.

TADIS is expected to secure the cooperation of the main depository libraries in the country - National Central Library and the University of Dar es Salaam Library. A high level Advisory Committee with membership from the key organizations and the Ministry of Agriculture and Livestock. Further, it is recommended that TADIS should seek fora at the national agriculture and livestock annual conferences mainly for the purpose of promotion and creating a national image for automated agricultural information. Figure 2 shows a conceptual framework for a national agricultural information network.

Other organizational aspects to be drawn up during the planning process will include consideration for staffing and training, itemization of transport requirements for acquisition trips and delivery services, identification of appropriate equipment such as duplicating machines, copiers, binding machines and printing supplies. Presumably TADIS will use that hardware and software which will be made available by the major aid agencies.

FIGURE 2

CONCEPTUAL FRAMEWORK OF TADIS



6.3 NATIONAL AGRICULTURE CONFERENCE

Every year, researchers, extension officers and representatives of farmers and related commercial companies meet at national level to discuss and draw up annual research plans. Every crop committee must submit its programme to a National Crop Research Committee (NCRC) before being forwarded to the National Agriculture Conference - the nexus of agricultural activites, for approval. TADIS participation in this Conference would be highly useful primarily because of some functional similarities between the NCRC and TADIS. Samaha (1978) noted that:

> "the coordinating committees are not only responsible for coordination of research projects but also for mobilization of research findings, and development of delivery system for effective dissemination of research results at national level".[15]

Fully aware of these Committees' shortcomings as dissemination media, Mbwana suggested that:

> "Planners of agricultural information policies in Tanzania must continuously take into account the body of behaviour patterns, traditions, customs and devices, etc., worked out by scientists over years on how to go about finding information in order to satisfy their information needs".[16]

6.4 INFORMATION INPUT AND PROCESS IN TADIS

SUA Library has been acquiring and preserving a wide range of information materials pertaining to Tanzanian agriculture and rural development. Lately, SUA Library has been acquiring Tanzanian documents through legal deposit. Most of these documents are kept in the Special Collection. The variety of documents include annual reports, newsletters and bulletins, research reports and studies, dissertations and thesis, student projects, conference proceedings, occasional papers, official publications and legislation, maps, microfiche and microfilms, etc. This collection plus other documents

to be acquired by the library will form the basis of the TADIS database.

It has been noted that available hardware and software will provide an influencing factor on the details of TADIS processes. The most likely software to be used, because they are available free of cost to developing countries, are MINISIS and the IV + V package. Both have been successfully applied in library situations and the IV + V package in a developing country context.[17] Figure 3 shows building of an application using IV + V system.

The indexing must accommodate documents in Swahili, which should not be too difficult as the language uses Roman letters and characters. The English component of AGRIS might be adopted with some local modifications. Special input forms may be designed and these would be particularly useful for cooperating agencies which may not wish to part with their documents.

6.5 TADIS OUTPUT AND SERVICES

TADIS is expected to provide a range of products and services to cater for the general and specific needs of its varied clientele. Amongst the possible products to be considered are:

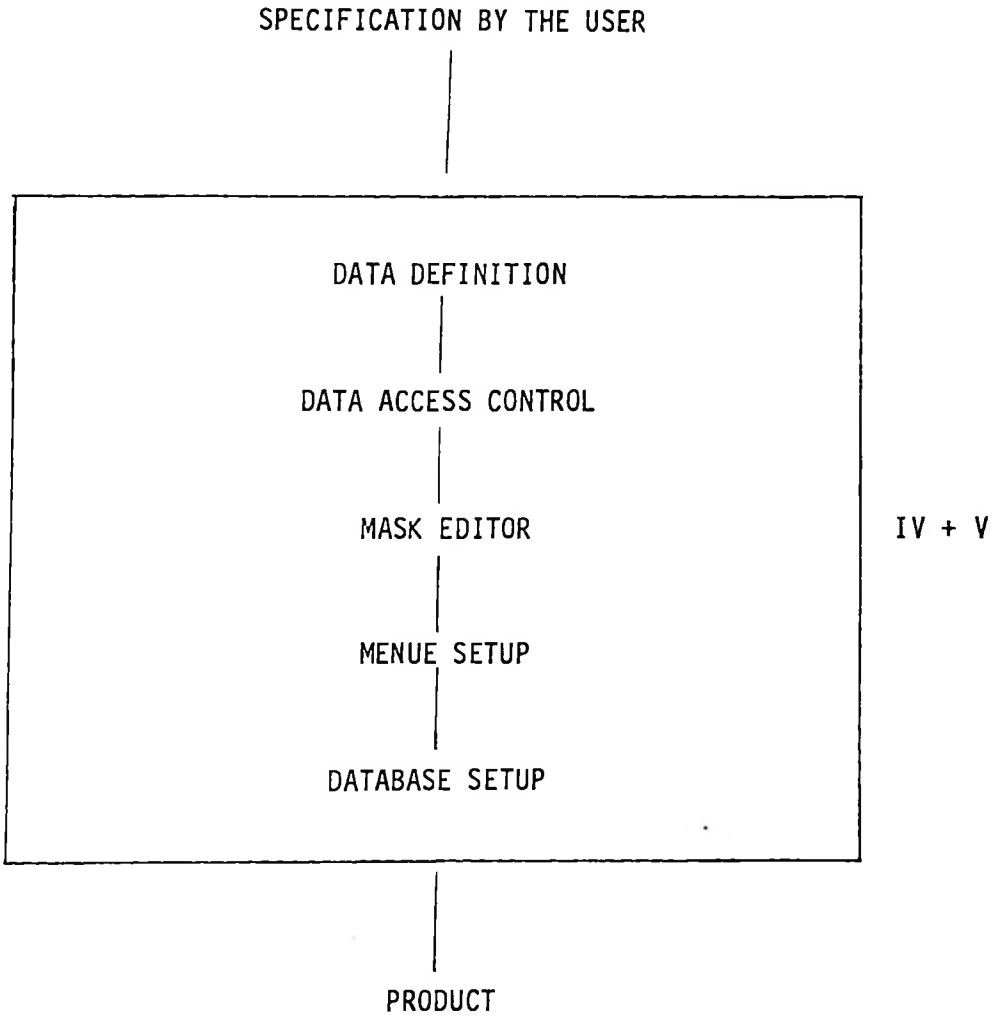
- A regular computer print-out,
- Printed bulletins/current awareness,
- Selective Dissemination of Information,
- Bibliographies,
- Question and answer service supported by a document delivery service.

6.5.1 Question-and-answer service

The rapid provision of answers to specific queries by using the information resources within SUA Library will be viewed as an

FIGURE 3

BUILDING OF AN APPLICATION USING IV + V SYSTEM



Source: Satyanaraya. p.10.

important service to TADIS users. TADIS should also incorporate a referral service to appropriate specialists or other institutions. A regular subject index print-out to agricultural literature and related disciplines should greatly facilitate accessibility by the users. The provision of specific enquiry services utilizing AGRINDEX, CABI abstracts and other external services should be explored. Experiences gained by AGDEX[18] and UPDATE[19] are worth

reviewing as they are based in educational environments similar to SUA.

6.5.2 Current-Awareness Bulletins

The rapid changes now taking place in agriculture, compounded by the amount of literature being issued, make it extremely difficult for an individual to be able to scan and index relevant literature on a regular basis. A current awareness bulletin/service is intended to keep users of TADIS alert and informed on developments in their respective areas of specialization.

The bulletin, which should appear on a monthly basis to achieve necessary currency, would list all the references to particular subject areas based on searches on the database for the current dated entries. In order to enhance its value as a search medium, efforts should be made to provide abstracts for the records.

6.5.3 Selective Dissemination of Information

Selective dissemination of information, or SDI refers to the process whereby a search strategy (based on a specific user requirement profile) is stored and then executed every time the database is updated. This tailor-made process saves a lot of time on the part of the user as he will receive only information relevant to his expressed profiled needs.

According to Tedd (1984), an SDI system comprises the following features:

> "(a) Descriptions of the information requirements of a user or group of users are compared with descriptions of the contents of recently received documents.
>
> (b) Documents that match are selected.
>
> (c) Information about these documents is sent to the user.

(d) The user is asked to assess details of the document received so that a better description of requirements can be obtained".[20]

6.5.4 National Agricultural Bibliography

TADIS will be expected to spearhead the compilation of a Tanzania National Agricultural Library in order to facilitate access to the country's agricultural information output and finally achieve bibliographic control in agricultural information. TADIS should benefit from the scientific and technical experiences available at SUA. The University has already compiled several bibliographies (Ref. Chapter 3.5) and provided substantial input into a retrospective agricultural bibliography being coordinated by TANRIS.

As a national agricultural bibliography should include references of all agricultural documents produced in the country, it is desirable that TADIS incorporates input from the key agricultural agencies in the country from the very early stages. This input process may also constitute part of the national input to AGRIS and CARIS, which is yet to be effected.

6.5.5 Document Delivery Services

Any secondary information service, no matter how comprehensive, is in itself not enough. An intrinsic part of the transferring process must always be to make available the original document or a copy. The other references based on documents held by other libraries or external journals or databases like CABI's African Literature Service would firstly be indicated and efforts made to order the originals or copies. The delivery system must consider possible constraints which may arise with respect to copyright restrictions.

Delivery of documents in microfiche might be preferred mainly because of mailing convenience. The preservation value of microfiche in the

tropical climate should provide an additional incentive to engage in microfiching local documents. Users in remote research stations may have their enquiries coordinated by TARO and then channelled to TADIS or may address them directly. These options will depend on the organizational capability of TARO's documentation services. Efforts should also be made to explore possibilities of using the public library infrastructure (TLS) which is nationwide for document delivery.

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19. UPDATE is an information service for agriculture based at the Welsh Agricultural College, Aberystwyth.

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CHAPTER 7

SUMMARY

Tanzania, like many developing nations, depends heavily on agriculture for her economic survival. The importance and role of agricultural information and records has been recognized. Lack of an effective national body to initiate the formulation of a national information policy is just one of several technical, financial, socio/cultural and communication problems which militate against effective management of agricultural information services in Tanzania. These problems suggest the need for coordinating and sharing of resources for national development.

Tanzania has a number of good and well managed agricultural information resources and it is noted that their overall contribution to national economic performance might have been greater had they been properly coordinated. A number of studies and missions have been undertaken aimed at prescribing better management of these resources but their recommendations have mainly remained as recommendations.

Cordination, networking and formal cooperation between existing national agricultural agencies are emphasized as necessary strategies for solving some of the prevalent problems. Such strategies should also support and sustain agricultural production techniques and increased output. A National Policy on Library Development appears to have stimulated serious discussion on the development and management of information resources as propagated by NATIS.

The proposed Tanzania Agricultural Database and Information Service (TADIS) incorporating inputs from all agricultural institutions in

the country is seen as a major step towards tackling some of the problems confronting this sector. This network is expected to become more productive as well as gain from external donor agencies, particularly CAB International and AGRIS. It would be extremely beneficial for the country were all external input into this sector - both technical and material, to be provided to the whole sector instead of to individual organizations.

Information technology has enabled the creation of powerful and sophisticated information management and transfer systems. Although these are largely owned and operated in the industrialized countries, developing countries can still tap these resources for their national interest provided they can formulate methodical policies and strategies supported by appropriate technology. The development of new technologies such as CD-ROM should facilitate accessibility to external databases by developing countries. Microcomputers and their software are capable of performing data handling to create local databases as well as to assist in automating some library activities which enhance performance and diversity services.

The realization that no one nation, especially the less industrialized like Tanzania, can effectively provide ideal agricultural information services has created the necessity to consider and create regional cooperative services. The SACCAR project for SADCC countries is just one of several regional initiatives. Luckily, the East African region already benefits from the AALS provided by the CAB International and Tanzania should make use of this free service.

Finally, this dissertation is intended to serve as the first of a series of studies on the need and desirability of deploying

information technology to enhance the performance of Sokoine University of Agriculture library and the overall management of agricultural information in Tanzania in a national context.

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