Remote sensing technology applications — the Kenya experience

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Abstract

The Republic of Kenya is situated in the Eastern Region of the continent of Africa. It is a land of diversity with regard to climate, terrain and ecological conditions. With a rapidly growing population, now at 20 million, and an annual growth rate of 4.1%, the need for urgent applications of remote sensing technology in Kenya is growing so as to deal with the pressure on land. The techniques are used to speed up the collection of resources data as the base for planning development.

Remote sensing technology has been applied in Kenya since the mid 1970's. However, the application of aerial photographs for mapping dates back to three decades. To the present the application of remote sensing techniques to the evaluation of hydrological resources is still very limited and not as extensive as in land use mapping. However, there are significant indications that the applications of remote sensing to hydrological studies in Kenya will increase very fast in the next decade.

The growth of remote sensing in Kenya was put into motion by the events which led to the formation of the African Remote Sensing Council in the mid 1970's. This paper traces this development and analyzes the current state of the application art and/or science of remote sensing technology in Kenya. Considered here, are the major programs which include governmental and non-governmental agencies that use the technology. Governmental agencies include the Kenya Rangeland Ecological Monitoring Unit (KREMU), the Central Bureau of Statistics (CBS), National Agricultural Laboratories (NAL), and the Survey of Kenya (SK). The non-governmental agencies include the Regional Remote Sensing Facility and the Global Environment Monitoring System (GEMS).

Emphasis is placed on the need for the training and development of skilled manpower especially in the fields of photography and satellite image interpretation. Presently, the leading training institution in Kenya, which unfortunately is hampered with shortage of equipment and personnel, is the University of Nairobi, one of the three National Universities in the country. To some extent the Regional Remote Sensing Facility provides training. Other training opportunities organized and provided locally are sponsored by international agencies (e.g. FAO, ESA, etc.) and institutions (e.g. ITC).

Trends in the growth of the technology are elucidated and proposals for the establishment of a National Remote Sensing Centre are presented. Such a centre would manage the proposed LANDSAT Ground Receiving Station proposed for construction in Nairobi. Also it would be responsible for the collection, storage and dissemination of data received by the station; conduct research; guide the government on all aspects of the management of natural resources; promote sub-regional, regional and international co-operation; to launch resource surveys; and other aspects of the application of remote sensing technology.

The paper makes recommendations on various aspects for facilitation of the application of remote sensing technology. It is observed that the potential for application of remote sensing technology in Kenya is tremen-
dous. Thus there is need for design and development of relevant programmes for the natural resources scenario of Kenya with an emphasis on utilization of water resources, land use, forestry and food production systems. Equally, there is need to promote co-operation at all levels aimed at obtaining the necessary technological and financial aid from international bodies, if Kenya, like other developing countries has to maximize from the experience of developed nations, especially in the field of remote sensing applications, in order to improve the welfare of her peoples.

Introduction

The Republic of Kenya covers an area of 582,646 sq. Kms. of which 11,230 sq. Km (1.93%) is water. The country is characterized by a highly diversified terrain, climate and ecological conditions endowed with a wide range of niches, resource use opportunities, practices and challenges. Kenya has a human population of nearly 20 million people (with a growth rate of about 4%). Nearly 60% of this population is youth. Agricultural potential, defined as the ability of the land to support rainfed agriculture, is limited because nearly 2/3 of the total land surface of the Republic is classified as low potential (Table I). This vast area constitutes the arid and semi-arid regions which accommodates 10% of the people, 50% of the cattle, 55% of the sheep, 75% of the goats, and all the camels in the Republic. Recent opening-up of irrigable settlement schemes has resulted in immigration of more people into the low potential areas.

Hence the major primary resource in Kenya is the dry lands characterized with a very small arid zone. Although the inhabitants of these areas are fairly well adapted to its harsh environment, the new immigrants are not. Therefore, this calls for utilization of new technologies such as remote sensing approaches in order to develop scientific knowledge necessary for the development of these areas.

The other important resource is water, a scarce and vital resource in Kenya's dry lands, as elsewhere in the third world. The demand for water in rural and urban areas of Kenya is estimated at 4.2 million m³ per year

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<th>Land Category (Potential)</th>
<th>Rainfall Range</th>
<th>Area (hectare)</th>
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<tr>
<td>High</td>
<td>&gt;889 mm</td>
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<td>(Coast Province)</td>
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<tr>
<td>Medium</td>
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<td>Eastern Prov. (635-899 mm)</td>
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<td>Nyanza/Rift Valley Prov. (762-889 mm)</td>
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<td>All Others</td>
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<td>Total</td>
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Remote sensing in Kenya and irrigation demand is expected to rise to nearly tenfold by 1990. The major river catchment and drainage areas in Kenya include the Suam-Turkwel (43,898 Km$^2$), the Kerio (18,130 Km$^2$), the Ewaso Ng'iro (205,000 Km$^2$), the Athi (70,000 Km$^2$) and the upper Tana-Thiba (19,658 Km$^2$) (Fig. 1). Most rivers in western and Nyanza Provinces drain their waters into Lake Victoria, an international water mass shared among Kenya, Uganda and Tanzania. It is important to note the problem of floods affecting mainly the Lake Victoria Basin and parts of Narok District in the South West part of the country. Recent reports indicate extensive destruction of property by this calamity. Its control has become a national priority leading to the establishment of a permanent technical committee under the auspices of the Ministry of Water Development to conduct studies and make recommendations that would enhance development of resources in the affected areas.

Although the Government of Kenya requires constant supply of information regarding its natural resources for purposes of economic development, only a limited effort is underway to collect it, by any means, including remote sensing. It is well known that the applications of remote sensing are developing very quickly. The information gathered through satellites, visual and digital data processing, computerized geo-base information systems, simulation modelling and automated cartography, have opened new avenues for natural resource assessment. So far, the application of remote sensing in Kenya by various government ministries and other agencies has been on an ad hoc basis with little or no co-ordination. However, the establishment of the Kenya Rangeland Ecological Monitoring Unit (KREMU), now in the new Ministry of Planning and National Development, has to some extent, introduced an orderly application of remote sensing techniques to national data inventory for resource use planning.

The State of Remote Sensing Technology in Kenya

Satellite based remote sensing, because it relies on the recording of electromagnetic energy rather than the more limited photography is a fast advancing technology which has quickly moved into digital information acquisition and processing, and the exciting possibility of automated mapping systems. With the fast advances registered by other airborne and orbital remote sensing techniques, it is possible to have real time digital processing of data acquired on resources of the earth's surface with increased accuracy. The introduction of new systems with thematic mapping capability (e.g. LANDSAT-D) and high ground-resolution systems (E.g. SPOT) should enhance this goal. Hence, Kenya cannot ignore this advancement in remote sensing technology provided suitable for rapid resource data inventory. Thus, the relevance of remote sensing to our national resource development is unquestionable.

Nevertheless, the present level of applications of remotely sensed data in Kenya, like in most developing nations, is well below its potential, yet we fall within the food deficit region, Africa South of the Sahara. Data so far used in Kenya is acquired from the U.S.A. In recent times, the establishment, in Kenya, of the Regional Remote Sensing Facility, a joint project of the Regional Centre for Services in Surveying and Mapping, and the United States Agency for International Development (USAID) has tended to speed the utilization of LANDSAT data, supplemented with aircraft photography, usually commissioned by the Survey of Kenya, a government department of the Ministry of Lands and Settlement and other agencies.

In the last decade, the work done using remote sensing technology has offered the country tremendous opportunities for mapping and assessment of location, state and dynamics of natural resources. In particular, there is a growing need for natural resource information. As already mentioned, Kenya possesses extensive and diversified resources and is prone to
ecological disturbances such as droughts, floods, etc., which can be easily recorded by satellites and the resulting data be analyzed for effective management. The vast rangelands, river stages and inland lakes can easily be mapped by LANDSAT satellite for quick establishment of resource development priorities. Examples of such priorities include: harnessing of the irrigation potential of the Kano Plains of the Lake Victoria Basin, and the Lower Tana Plains in the Coast Province; the protection of wildlife ecosystems such as the Amboseli and Tsavo National Parks; rangeland improvement in the North-Eastern Province; and monitoring of flood hazards.
The availability of remote sensing data in Kenya is matched with very low utilization, hence it is not easy to obtain information, for example, on long-term effects of weather dynamics on the utilization of natural resources such as rangeland biomass. Data on weather can easily be derived from meteorological satellites while that on rangeland biomass from LANDSAT. There are reasons for this low utilization of remote sensing data, and they include:

1. Lack of adequate and constant supply of remote sensing specialists for employment in applications agencies. This problem is aggravated by the inability of the government and other public corporations to retain skilled remote sensing professionals who tend to be lured by better prospects offered by private industry, where some may never utilize their knowledge fully.

2. Lack of coordination among government agencies which may find remote sensing technology useful to their application, hence the result is duplication of data utilization leading to diffusion of scarce financial and personnel resources. However, to some degree, this problem has been minimized by the formation, in 1976, of the National Committee on the Application of Satellite and Space Technology (COASST) under the auspices of the National Council for Science and Technology. Unfortunately, this committee lacks executive powers protected by the law so as to ensure proper use of remote sensing data in the country.

3. Non-availability of sufficient and advanced training facilities in the country resulting in the prevalence of rudimentary interpretation techniques.

4. Lack of a ground receiving station for remote sensing data. Such a facility could provide a multiplier-effect on growth of professionals and techniques as well as enhance demand for remote sensing applications as the latter could be effectively used to obtain repetitive, synoptic, spatial and temporal data on natural resources which could be effectively put into national economic and social development plans.

Remote Sensing Programs in Kenya

Despite the fact that Kenya became aware of the potential of using remote sensing data in the early 1970’s, it was not until the beginning of the last decade that serious thought was focused in this direction. The United Nations Economic Commission for Africa (ECA) took the lead by putting remote sensing on the agenda of the meeting of the Council of African Ministers of Economic Planning, held in Nairobi in 1975. This action resulted in Resolution 280/X11 which documented the agreement by African Ministers to establish the African Remote Sensing Council, to enable member states to share the technology by focusing attention on manpower training, technology transfer, and international co-operation in the peaceful uses of Outer Space, with the view to adoption and sharing of the benefits of remote sensing by earth satellites to all countries in the region.

In 1976, an intergovernmental meeting under the auspices of ECA considered a report by experts and hence resolved that in addition to the creation of an African Remote Sensing Council (which took root in 1978 with headquarters in Bamako, Mali), the following should be planned and achieved:

1. The establishment of three ground receiving stations to be located at Ouagadougou (Upper Volta) Kinshasa (Zaire) and Nairobi (Kenya).

2. The establishment of five training and user assistance centres to be located at Ouagadougou, Kinshasa, Nairobi, Cairo (Egypt) and Ile-Ife (Nigeria).

The African Remote Sensing Council, which was officially approved after a ratification of its constitution by ten African countries at a meeting in
Ouagadougou, Upper Volta, during September 1979, had the following objectives:

1. To keep member countries abreast of relevant scientific activities and development in remote sensing.
2. To encourage greater interest and African participation of remote sensing and related technologies to development problems.
3. To avoid duplication of remote sensing facilities.

To ensure that these objectives are achieved, two regional management committees of the African Remote Sensing Council were formed. These are: the West Africa Regional Remote Sensing Management Committee (WARMCOM) and the East Africa Regional Remote Sensing Management Committee (EARMCOM). In addition, these committees ensure that the regional remote sensing facilities are managed economically and efficiently.

As a result of the creation of the afore-analyzed awareness, the following remote sensing programs have been established in Kenya:

1. Regional Remote Sensing Facility. Situated at Ruaraka in Nairobi, this facility was funded initially by the U.S. Agency for International Development (USAID). The facility is the remote sensing division of the Mapping Centre. It provides advice, services (e.g. training resource managers), and support for users (e.g. providing subsidized consultancy for investigators) in the Eastern Africa Region. The main source of imagery for the facility is EROS Data Center, Sioux Falls, South Dakota, U.S.A. Hence, the facility provides copies of satellite images from an extensive library of photographic transparencies and can create scaled enlargements, map overlays and photographically enhanced images using a Super Chromega Camera F, a Wing-Lynch Photographic Processor, a Chromega D Camera, Photo Processor, Light tables and a Karzl Reflecting Projector. There is also equipment for image interpretation. The facility also contributes significantly to natural resource development projects in the region.

2. Kenya Rangeland Ecological Monitoring Unit (KREMU). KREMU is a project funded by the Canadian International Development Agency (CIDA)—through a bilateral agreement between the government of Canada and Kenya. Initially, the Unit belonged to the Ministry of Wildlife and Tourism, then moved to the Ministry of Environment and Natural Resources and later moved to the Ministry of Finance and Economic Planning. At present, the Unit belongs to the newly created Ministry of Planning and National Development. The Unit has three light aircrafts and a fleet of Landrover vehicles which are used to collect data under the widened mandate for land use mapping, forest cover mapping and related aspects, and ecological monitoring of Kenya's rangelands. The data is collected on a 5x5 Km. grid network covering nearly 500,000 Km² of the country's land surface. The data is stored in a computerized geographical information system and later retrieved for resource analyses.

In recent times KREMU established a remote sensing section which has embarked on analysis of LANDSAT Satellite imagery for resource use mapping. The scale of images used is 1:500,000 hence each image shows an area of 50 x 52 Km². The survey has been supplemented by aerial photography in places where the images are obscured by cloud cover. Digital analysis has been accomplished on computers in CANADA and FRANCE under bilateral agreements. Projects covered by this ongoing exercise include production of a Land Use Map of Kenya, Crop Detection and Monitoring, Forest Mapping (analogue and partially digital) and Wildlife Habitat Maps. Other applications of remote sensing techniques include the use of airborne digital radiometers (green machines) to estimate biomass (in rangeland areas) and maize yield forecasting (in high potential areas).

3. Central Bureau of Statistics (CBS). This is a department of the Ministry of Finance. Its establishment in 1974 was initially funded by the
U.S. Agency for International Development (USAID). Its main objective is to inventory statistics of importance to national development planning e.g. population census, economic surveys, crop yield surveys, etc. In 1979, the bureau used LANDSAT imagery for establishing land use boundaries and related these to human population densities in facilitating enumeration procedures for that year's census. The operational remote sensing equipment found at the bureau include an overhead projector, a colour additive viewer, and a zoom transfer scope.

(4) National Agricultural Laboratories (NAL). This is a department of the Ministry of Agriculture and Livestock Development. At these laboratories is located the Kenya Soil Survey Unit, which has extensively used photo-interpretation techniques to produce soil maps at the scale 1:250,000. LANDSAT imagery has been used for exploratory surveys of Kenya Soils.

(5) Survey of Kenya (SK). Again, this is a department of the Government of Kenya in the Ministry of Lands and Settlement, whose main function is to produce standard and other types of maps required by the state and other user agencies. LANDSAT imagery is mainly used to update the 1:250,000 maps.

(6) University of Nairobi. The University of Nairobi is the most established of the three National Universities of Kenya. It is the only University that has departments offering some remote sensing courses. These departments include Geography, and Surveying and Photogrammetry. The former offers a course on Air-Photo Interpretation (2nd year science undergraduates) and Advanced Environmental Remote Sensing (3rd year science undergraduates). The latter offers an optional course on Remote Sensing and Photo-Interpretation (3rd year undergraduates). None of the departments provide postgraduate training in Remote Sensing. Both departments suffer lack of training equipment. This is one area where technical assistance from donor agencies would be welcome.

Other training programs have been mounted in Kenya by reputable international institutions and agencies (e.g. European Space Agency, International Institute for Aerial Survey and Earth Sciences (ITC), etc.). Such training is organized in the form of seminars and workshops.

(7) Global Environmental Monitoring System (GEMS). Ecological monitoring activities within the renewable resource network of the United Nations Environmental Programme (UNEP), located at Gigiri in Nairobi, are carried out by GEMS. The latter's methodology, developed in East Africa, aims at creating an understanding of the dynamics of the rapidly evolving ecosystems of arid regions. Data is therefore collected at three levels: (i) Ground surveys for biomass productivity and sociological determinants' data. For large areas, it is costly. (ii) Low-level systematic reconnaissance flights to collect information on seasonal abundance and distribution of the human and large mammal components of the system. (iii) Satellite imagery (mainly LANDSAT) for mapping of geomorphic features as well as of the seasonal changes in biomass productivity.

It should be mentioned here that a similar data collection system is used at KREMU, hence this may lead to duplication at national level of the applications of remote sensing technology.

(8) Regional Remote Sensing Receiving Station. Through the African Remote Sensing Council, Kenya successfully bid for the location of remote sensing receiving station within its borders capable of tracking both LANDSAT (American) and SPOT (French) satellites. Encouraging feasibility studies sponsored by the French government were completed in 1984. It is suggested that although the facility would provide services to East, Central and South African governments, it be considered as a Kenyan project and financed in that respect. The reason for this is the prevalence of unpredictable geo-political climate among some countries in the region.
which might not urger well for a regional joint venture. Further, it is hoped that actual handling of data on natural resources from neighboring countries will not pose any politics other than scientific implications. As mentioned earlier, if the Kenyan station takes-off, it should be possible to establish similar projects at Kinshasa (Zaire) and Ouagadougou (Ivory Coast) as proposed by the African Remote Sensing Council under the auspices of the UNECA. So far, the Canadian government has shown interest in funding the Ouagadougou station while NASA indicated willingness, in principle, to assist Kinshasa. However, nothing significant seems to have happened in both cases.

The proposed station in Kenya would be more suitable as it would reduce overlap with any future station at Ouagadougou and covers the Red Sea coasts of Sudan, Ethiopia, and Somalia as opposed to a station at Kinshasa. The parts that could be covered by a station at the latter location would be taken care of by the South African station. However, such stations would require permission from the USA and France for access to their respective satellites.

It should be mentioned that the Italian government has established a Telemetry Station at San Marco, near Malindi in Kenya. In September 1973, the Italian Centre Richerche Aerospaziali of the University of Rome began discussions with the government of Kenya on the possibility of converting the San Marco Station into a LANDSAT receiving station. However, considering the costs involved, it would appear that the advantages of an international tracking, receiving and data processing station located at Nairobi would override those of having a limited range receiving station at San Marco. However, the picture may change when the Italian government provides a more attractive proposal. But the results of such action remains to be seen as the proposed Nairobi station seems to be more attractive given the existing efficient and up-to-date infrastructure, in addition to the proximity of user community.

At the Meteorological department, Dagoretti in Nairobi, are equipments that track and receive weather pictures from geostationary weather satellites. However, with the establishment of the proposed remote sensing receiving station and its possible link to the existing systems in Nairobi, it should become feasible to engage in sophisticated data manipulations. This would enable resource use planners to study and monitor such hazards like droughts and floods which are prevalent in some parts of the region.

Hydrological Applications of Remote Sensing Technology in Kenya
In Kenya, like in most developing countries, the identification, evaluation and monitoring of water resources is of vital importance. The application of satellite data in hydrology should include ground water exploration, flood damage estimation and monitoring, water quality analysis, surface water inventory, irrigation monitoring, the detection and mapping of wetland areas, and the mapping of some coastal features and reefs for assessment of marine resources. Proper use of remote sensing data should always result in a rational planning, development and management of hydrological resources.

Of significant economic importance in Kenya are the fresh water lakes. Some of these lakes, namely Victoria and Naivasha are plagued with the problem of floating islands. The latter consisting primarily of papyrus vegetation, drift into harbours (e.g. Kisumu on Lake Victoria) causing problems to steamer traffic and disrupting intake of water at supply stations, required for domestic and industrial consumption. Sometimes they destroy fishing gear, a serious problem on Lake Jipe on Kenya-Tanzania border near Mt. Kilimanjaro, and also on Lake Victoria.

The use of LANDSAT data gathered by the Multi-Spectral Scanner at
selected intervals have assisted in showing the trans-migration of floating islands in Lake Naivasha. Thus, by plotting the distribution of vegetation over the surface of Lake Naivasha on selected dates (i.e. January 9th, 18th, and 27th and February 14th and 23rd of 1979) a record of the mobility of the floating islands of vegetation was compiled. However, no velocity modelling was done, although the synoptic view of the vegetation distribution and pattern at five points over a period of 45 days was revealed. The satellite data also revealed that the floating islands have some internal structure. Hence, this application provides a capability for monitoring the movement of floating islands on Kenyan lakes and elsewhere, a useful achievement for management of fresh water bodies.

A part from this preliminary study, little else has been accomplished on hydrological resources of Kenya. However, new projects are underway and they include the study of flood problem in the Lake Victoria Basin, and the study of seasonal variation of near-surface moisture in Lambwe Valley Ecosystem and its impact on the population dynamics of tsetse flies which are vectors of the African human trypanosomiasis (sleeping sickness) disease. It is hoped that other studies will make extensive use of remote sensing data in order to develop appropriate flood and disease control strategies respectively.

In the consideration of the remote sensing applications in Kenya the progress made so far is small but impressive. The national goal is to achieve high technological advancement in the adoption and application of remote sensing techniques. The present lack of co-ordination among agencies using remotely sensed data has been the demise of the technology. It is therefore hoped that the government of Kenya will soon establish a National Remote Sensing Centre under the Science and Technology (Amendment) Act, No. 7 of 1979, (date of Assent 10th May, 1979) Part IV, Paragraph 12 (2), "Establishment of Research Institutes." Feasibility studies have been completed on this aspect.

The functions of the Centre should include the following:
(1) To manage the LANDSAT receiving station and provide satellite data to national and other users at a price.
(2) To observe and ensure standardization of reception and utilization of satellite data.
(3) To obtain permission from relevant organizations and governments for tracking and receiving data from their respective satellites.
(4) To carry out surveys and provide technical knowledge in remote sensing research and applications.
(5) To conduct solid research on issues which could provide new knowledge on the nature and scope of environment and natural resource, and advice decision makers accordingly.
(6) To provide consultancy services and airborne survey facilities to user agencies.
(7) To promote sub-regional, regional and international (multi-lateral) co-operation on all aspects of remote sensing and outer space technologies, and allied sciences.

Trends, Conclusions and Recommendations
The status of remote sensing technology in Kenya has been considered. It has been established that increasing utilization of this relatively new technology resulted from the events which led to the formation of the African Remote Sensing Council in the 1970's. The possibilities and applicability of the airborne remote sensing technique are now on a firm foundation. However, the major problems facing the application of this
technology include cloud cover interference on satellite imagery taken
during same period of the year, lack of a LANDSAT receiving station in the
region, shortage of trained and skilled manpower and lack of applications'
co-ordination at National level.

Remote sensing technology is dynamic and therefore its adoption and use
in Kenya and elsewhere will present new challenges such as keeping abreast
with new ideas and new aspects of the technology which improve and grow
more sophisticated very fast. There will be need for dedicated scientists
to man this rapidly changing technology in order to utilize it fully for
national development. We know that decision making in the field of
development is an intertwined matrix of political moves and technical
decisions promoted by exogeneous influences such as economic change
(e.g. market dynamics) or natural events (e.g. flood disasters, disease
epidemics, etc.). However, with more information derived from satellites,
current political decision "games" on these aspects may become a thing of
the past as the truth must prevail on resources utilization.

Every government needs information to be run properly. On the other
hand, technology has its impact on society. Hence, society should decide
whether it must also have an impact on the way technology is presented.
Reshaping technology (i.e. making it appropriate) may be the main issue in
national development strategy. Therefore, new perspectives in decision
making will result when most policy designers become more and more aware of
the power of information acquired from space. Kenya, like most developing
countries of the world, is therefore at a cross-road with regard to the
mapping of its technological path into the future.

Following these considerations, some recommendations expected to have an
impact on the use of remote sensing technology in Kenya are made. They
include:

(1) Action must be taken to establish a fully-fledged National Remote
Sensing Centre.

(2) A LANDSAT receiving station should be built in Nairobi.

(3) Strengthening of the incorporation of remote sensing techniques
in existing range of data collecting systems so that data
utilization becomes an interaction and collaboration between the
decision maker, the planner, the data collection groups and the
implementing and monitoring organizations and/or agencies.

(4) Implementation of extensive and intensive personnel training
programmes in all aspects of remote sensing technology.

(5) Promotion of sub-regional, regional and multi-lateral co-operation
in all aspects of the adoption, absorption and application of
remote sensing technology which must become a national priority.

(6) Decision makers, planners and personnel in various fields of the
economy, should be made fully aware of the knowledge, potentials
and limitations of remote sensing techniques through seminars,
conferences and other training programmes (or forums) by national
(e.g. Universities, Survey Departments, National Remote Sensing
Centre, etc.), regional (e.g. Universities, Specialized Institu-
tions, Regional Remote Sensing Facilities, etc.) and international
bodies (e.g. FAO, ESA, etc.), in order to improve resources
perception, hence evolve effective policy in the use of such
resources.

(7) Kenyan scientists should become members of the proposed African
Remote Sensing Society.

It can be seen that the establishment of a LANDSAT remote sensing
receiving station in Kenya and the implementation of the foregoing measures
should certainly have a marked impact on the growth of remote sensing
applications. The potential is tremendous.

It is well known that remote sensing technology is yet to be perfected.
Hence, Kenya, like most other developing nations of the World will need more assistance from donor agencies before it can stand on its own in this area of technological development. However, it must be emphasized that goals and means should not be mixed up with each other and, of course, man is not created to serve technology but use it to improve on the quality of human life.

References
Kenya, 1979, The Science and Technology (Amendment) Act, No. 7 of 1979 (Date of Assent 10th May, 1979), Part IV, Para. 12(2)-Establishment of Research Institutes."