



REPUBLIC OF KENYA

1990
ANNUAL REPORT

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Department of Resource Surveys and Remote Sensing
Ministry of Planning and National Development
P O Box 47146, Phone 502223 Nairobi.

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A publication of the
Department of Resource Surveys and Remote Sensing
Ministry of Planning and National Development, Kenya

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INTRODUCTION AND HISTORICAL BACKGROUND

The Department of Resources Survey and Remote (DRSRS) in the ministry of Planning and National Development was established in the mid-1970s bearing the name Kenya Rangeland Ecological Monitoring Unit (KREMU). The principal objectives of the unit then were to establish the basis for a reliable and continuous flow of information on livestock, wildlife, and cultivation in rangeland areas. In particular, the unit was to determine the conditions of the rangelands of Kenya and thereafter monitor changes and the direction of those changes.

Since the early 1980s the department has added to its responsibilities land use mapping land suitability studies, forestry studies, and crop production forecasting. The department has also been assessing erosion types, including measuring the extent of each erosion type and producing maps of them, usually on a district basis.

Therefore, as a result the department's increasing capabilities in resources assessment and monitoring, and taking advantage of advance in technology, the department's terms of reference have been expanded.

Objectives

The department continues to use ecological monitoring techniques in its activities, most of

which aim at:

1. Providing a continuous flow of data on population estimates, temporal, and spatial distribution of livestock and wildlife species, and relating them to environmental parameters like water and habitats..
2. Assessing and monitoring vegetation changes within the rangelands of Kenya and designated forest estates..
3. Providing data on land use, crop cover and yield, and their projected production.
4. Determining the extent, nature and impact of human activity in both the rangelands and the high-potential areas.
5. Analysing and processing relevant data into usable forms and developing a data bank on renewable resources for use, particularly by ministries and departments of government, and the scientific community in general.
6. Coordinating the applications of Remote Sensing technology in the government.

Administration

The department is headed by the Director and is divided into six sections: Aerial Surveys, Ground Surveys, Remote Sensing, Data Management, Publications and Information, and Administration. The administrative services include accounts, stores, training, and personnel matters.

INTRODUCTION AND HISTORICAL BACKGROUND

The Government of India, in its policy of planning, has been following a long and successful tradition of central planning since the early 1950s. The Government has been successful in achieving a rapid rate of growth and development, and has been able to maintain a high level of social and economic stability. The Government has also been successful in achieving a high level of social and economic stability, and has been able to maintain a high level of social and economic stability.

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AERIAL SURVEYS SECTION

Introduction

The Aerial Surveys Section is charged with censusing and monitoring the numbers and distributions of both livestock and wildlife, monitoring of vegetation condition (type, cover and greenness), agricultural and human settlement activities in the Kenya rangelands. In addition, the section also coordinates the maize and wheat forecast and land-use programmes.

In 1990 the section undertook and implemented the following projects: livestock/wildlife census in northern and southern Kenya, crop production forecast and land use mapping. These activities were followed by intensive data analysis.

Livestock/Wildlife Census in Northern Kenya

The livestock/wildlife monitoring programme in the Kenya rangelands has traditionally been executed on a three year cycle by the department. All the rangelands cannot be completely covered in one year therefore, they have been divided into two portions: southern and northern Kenya. Each portion is surveyed once in every three years. The last time northern Kenya was surveyed was in 1987. It was therefore once again surveyed in 1990 with the main objective being to provide population data on livestock and their distributions.

The districts included in the survey are Turkana, West Pokot, Laikipia, Isiolo, Samburu, Wajir, Mandera, Marsabit and Baringo. In August, Baringo, West Pokot, Laikipia and Samburu districts were surveyed. Turkana and Marsabit were surveyed in September, and Mandera, Wajir and Isiolo were surveyed in November. However, Garissa and Meru were not surveyed due to security reasons.

Completion of Livestock/Wildlife Census in Southern Kenya

This project was started in 1989 and was

completed in May 1990. The main objective was to provide each district in the study area with statistics on livestock and wildlife population estimates, their spatial distributions and the influencing environmental factors. Kitui, Tana River, Machakos, Kajiado, Nakuru, Narok and Baringo districts were covered in 1990.

Maize and Wheat Production Forecast

This is an on-going departmental routine programme started in 1984 with the aim of providing the government with early warning information on maize and wheat production using remote sensing techniques. The 1990 forecasting programme commenced in early June instead of early May due to delay in planting which was caused by late onset of the long rains. At the end of August 1990, country-wide preliminary results were available and given to relevant government authorities. However, due to financial constraints, field checks were not undertaken in the Rift Valley Province.

Land-use Mapping

Due to the increasing demand for land-use data by district planners and decision makers, the section in collaboration with other sections of the department started interpreting the aerial photos taken in 1990 with the purpose of providing land-use data summaries. Interpretation was completed for Nandi, Kisii, Embu, Nakuru and Siaya districts.

The departmental aerial photographs taken yearly for the crop production forecast programme, are analysed to obtain yearly land use data summaries. The aim is to produce standardised products to facilitate comparison over years and to develop a data base on land-use. The Aerial Surveys Section and the Data Management Section have developed a computer based methodology for the analysis of land-use data.

Data Analysis

The section has developed data analytical capabilities using the geographic information system (GIS). The section is now capable of analysing its data quickly and presenting it in both tabular and map form.

During 1990, the section re-analysed all the aerial survey data collected between 1977 and 1990 using GIS. The analysed data are now being used to prepare a ten year report (1977-1987) on livestock/wildlife population trends in the Kenya rangelands.

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GROUND SURVEYS SECTION

Introduction

Once again the Ground Surveys Section suffered most under the government's austerity measures to curb expenditure. Most funds were channelled to priority projects of the department, mainly those involving use of aircraft. However, the staff continued to re-organise existing plant data, particularly those related to abundance, density and cover by species and total cover. All the same, the plant data has only been partially adapted to the ARC/INFO software since the section still awaits modification of the 'Decorana' software for analysing plant species data and their environmental parameters.

During the year, the documentation of all the plants collected in Kenya and stored in some of the major herbaria was completed. The data records were entered into the GIS computer by species, geographic location, date of collection, etc. This information will reduce search time by taxonomists and genetic resource experts, who will no longer have to go through numerous search files of the herbaria.

In view of the stringent austerity measures cited earlier, most of the section's technical staff were seconded to other sections notably Remote Sensing Section to undertake interdisciplinary resource assessment and analysis.

National Vegetation Mapping

The project's aim was to map all the vegetation types in Kajiado, Samburu and Kitui districts, in relation to landscape. Of all the three districts projected for mapping during the year, only Kitui was partially covered during one field visit.

Fuelwood Analysis

Initial work using the current front seat observer (FSO) woody cover data was done for the southern half of Kenya, but there are still some inconsistencies in lifeform cover classes and data gaps. However, this problem should be overcome with the new FSO data emanating from the new FSO vegetation classification system. Preliminary cover maps were run for Narok District using the GIS.

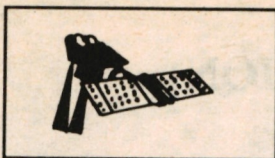
Genetic Resources Assessment

The programme involved assessment of plant species in a region, their abundance and use. This programme continued well, and a preliminary report on Meru has been prepared. A similar exercise was carried out in Amboseli National Park and the surrounding areas. In the case of Meru it was found that the medicinal species have been over-exploited. It was also observed that attempts to domesticate these species are being made by local farmers.

Land Use

The land use planning exercise did not take off due to financial constraints. However, sectional staff participated in a similar joint project between the department and ICIPE to map out agro-ecological zones for the Kendu and Oyugis divisions in South Nyanza District. An effective use of the GIS, saw the integration of soils, vegetation, rainfall, geology and current land use data resulting in an agro-ecological zone map. It is hoped this exercise can be done for other areas at district level when funds become available.

Finally, the departmental laboratory continued to function. It is our hope that funds will be available to enable the section carry out some of its programmes, so as to maintain staff morale and curb staff desertion.



REMOTE SENSING SECTION

Introduction

The Remote Sensing Section recorded appreciable progress despite the financial constraints experienced during the year. Emphasis was given to completing projects started during the previous year in addition to conducting a monitoring programme in order to report trends, especially for land use/land cover types. Besides, the section also participated in a number of workshops and seminars, both locally and abroad. To facilitate the section's development, a number of its officer were trained both locally and abroad.

A new project on range biomass assessment using National Oceanic and Atmospheric Administration (NOAA) Advanced Very High Resolution Radiometer (AVHRR) satellite data was also started. However, little progress was recorded except in the acquisition of equipment, choosing of test sites and efforts in the establishment of a suitable vegetation classification system. Much work is expected to be carried out in this project in the coming years.

The section also published two reports on the *The Vegetation of Boni and Dodori Game Reserves and the Adjoining Areas* and *The Vegetation of the Aberdares Mountain Ranges*. Both reports deal with vegetation mapping.

The section continues to give priority to coordinating the use of remote sensing techniques in collecting and assessing data on both renewable and non-renewable natural resources. The techniques range from the use of satellite images, high and low level aerial photography, to collection and verification of data during field checks.

Urban Land Use

During the year, photography was done on towns of Kisii, Muranga, Hola, Bura, Kapsabet and Garissa. Digitization work on Kitale town map was also started.

Rural Land Use

The first draft report on Elgeyo Marakwet District was produced incorporating maps and statistics. The GIS was used to generate maps on land-use/land-cover types distribution in the district.

The study on the impacts of the Bura Irrigation Scheme on the regional land use also witnessed great progress. SPOT satellite image of 12 May 1989 at an enlarged scale of 1:100,000 and aerial photographs of scale 1:10,000 were used for detailed classification and delineation of the land-cover/land-use types of the study area. Based on tone and texture, various classes were delineated and field checks conducted on sample plots. A draft report is ready.

Forest Mapping and Monitoring

Much progress was recorded in the forest mapping project. Maps of all the gazetted forests have been prepared and a draft report with all the statistics and maps is complete. The detailed forest cover report for Kakamega, North Nandi, Kisere, Malaba, Namanga, Mau, Kikuyu and Elburgon forests was also completed in draft form.

In addition, about 40-50% of the ungazetted forests were also covered. This project aims at achieving the following objectives.

- (i) Stratify the forests into major cover types including water catchment zones.
- (ii) Assess land-use activities around the forests and relate them to deforestation activities.

Photography

Photographs of varying scales were provided upon request to other government agencies,

private organisations and other sections of the department. The government agencies which requested for aerial photographs included the Survey of Kenya, National Museums of Kenya and the Ministry of Public Works. Sir Alexander Gibb and Partners (EA) Ltd, a private company also ordered for aerial photographs; so did EDFI/KPC.

Aerial photographs for the survey of Kenya were obtained for the following areas: Kapenguria, Marmanet, Kodhiambo, Mfangano Island, Rusinga Island, Kakhdiwa, Koyigi, Kaura, Kanyada, Kotieno, Kakwajuok, Keroka, Birongo, Keumbu, Gesima, Oyugis, Elgeyo Marakwet Lunga Lunga, Mariakani, Oloitokitok, Kakutha and eight areas in Kilifi District, all at scale 1:12500. Turkana was covered at scale 1:24500 for the National Museums of Kenya. Murang'a, Kiambu, Meru and Machakos districts all at scale 1:10,000 were covered for Sir Alexander Gibb and Partners (EA) Ltd. The Munya Dam was covered at scale 1:10,000 for the EDFI/KPC.

The Aerial Atlas

The draft aerial atlas of Kenya is ready. The project was jointly conducted by DRSRS, Centre De Recherche d' change et de Documentation (CREDU), and the Cultural and Cooperation Service of the French Embassy. The main aim of the project was to produce a bilingual English-French atlas which describes Kenya pictorially through vertical and oblique photographs, and satellite images like SPOT and landsat MSS and TM. Features on different themes like desertification, urbanisation and geography are highlighted

Seminars and Conferences

From March to November, the section

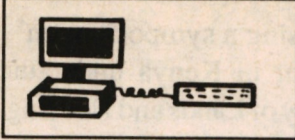
participated in organising a symposium on Disasters Management in Kenya under the auspices of the Ministry of Lands and Housing. An officer from the section participated in the seminar both as an organiser and by presenting a paper on pest invasion (desert locust).

In March, the section participated in a training programme for Provincial Foresters at the Kenya Forestry Research Institute (KEFRI), Muguga.

The section also participated and presented a paper in the ERIM symposium of remote sensing on Environment in Bangkok, Thailand in May.

In September, the section participated and presented a paper on the ecology of mangroves and related ecosystems at the coast. During the same month, the section also participated and presented a paper on remote sensing activities at the DRSRS at the Kenya Meteorological Department. In October the section prepared a paper for the National Council for Science and Technology (NCST), on Remote Sensing activities in Kenya.

And lastly, in October and November, the section participated and presented papers in the regional workshop in Ethiopia on the Planning and management of participatory forestry projects in the Intergovernmental Agency for Drought and Development (IGADD) countries. Proceedings of this regional workshop are ready and are available for reference in the department and at the Forestry Department's Forestry Extension Services Division (FESD).



DATA MANAGEMENT SECTION

Introduction

During the year the Data Management Section was unable to record much success due to the failure of both the PRIME computer operational disk and its spare. This and the related delays in disk replacement resulted in the computer system being inoperational from April to October. However, the section continued to implement both its short term and long term projects.

A variety of projects are being pursued using the departmental geographic information system (GIS). For example, a district level analysis on Narok is being conducted. In addition, an assessment of Nairobi National Park is underway. A cooperative project with Kenya Wildlife Service was recently initiated to provide an assessment of Amboseli area. The National Oil Corporation of Kenya (NOCK) has requested for assistance in developing software capability. However, NOCK was unable to provide resources required for such activities but the department continues to provide tape storage facility for NOCK.

Wildlife Livestock Data Base

This data base represents a unique wealth of information about the populations of wildlife and livestock in the Kenya rangelands over the last 15 years. All historic systematic reconnaissance flights (SRF) data have been converted to GIS format and is accessible through programs speedily designed to facilitate user interaction. The 1990-91 results being the most recent national rangelands survey data are currently being analysed. A report describing general trends in wildlife/livestock populations of 1977-87 is in preparation. It is expected that more detailed studies will be undertaken in future to describe particular trends at district level for particular species. A special study to evaluate the

available data for Narok District is already underway.

Rangeland Land Use Data Base

The data gathered by aerial during the systematic reconnaissance flights (SRF) are being used to establish a rangeland land use database. This database is intended for use in describing land use in the rangelands. All programming and database design have been completed. However, project completion is being delayed by the unavailability of disk space.

High Potential Land Use Data Base

In 1989 the Aerial Surveys Section developed a methodology for land use assessment in high potential areas. Programming has been developed to allow data base development, cartographic display, and report generation. Data for Kirinyaga district have been automated. This project will be followed in 1991 by Elgeyo Marakwet, Meru and Embu districts.

Urban/Market Centre Land Use Data Base

Land use maps of urban and market areas was proposed for available aerial photography. However a land use map of Kitale was delayed due to system problems (see facility development). Renewed interest by the Physical Planning Department should promote further development of this data base. Participation by the Remote Sensing Section is required.

Cartographic Data Base

(a) *Woodfuel Database*

software to allow access to front seat observer (FSO) data was developed. In addition, a new FSO form to facilitate data collection was developed. It is anticipated that this new form will assist in providing aerial data which can meaningfully be interpreted for fuelwood analysis. Continued development of this project will

require commitment from Ground Surveys Section personnel to GIS processing.

(b) **Central Bureau of Statistics(CBS)**

Census Database: DRSRS is cooperating with CBS to develop a GIS capability for mapping and analysis of human population census data. This capability would be an important resource to researchers both within DRSRS and among other government department. An initial data base design has been proposed and is being investigated. In addition to software development, careful consideration will be given to data access.

(c) **Herbarium Database:** A data base structure and conversion software have been developed to allow transfer of Wang WP text files to a data base manager.

Progress on this project has been delayed by difficulties in securing the conversion of Wang WP to AGCII by a local lender. However, through recent hardware and software purchase, the department may now be able to complete conversions.

Other proposals for data base development include Ministry of Health data base to assist in evaluation and display of health data, forest data base in collaboration with Remote Sensing Section, Forestry Department and IDA, and hydrology data base for the Ministry of Water Development. Infrastructure data base based on the Rural Planning Department inventory has been investigated and a pilot project in Narok has been completed. Continued coordination with the Rural Planning Department is required.

Facility Development

Due to the failure of the computer system a

replacement was required and the necessary components were returned to the PRIME-UK so as to allow the upgrading of both the operating system and the corresponding ARC/INFO GIS system. However, delays in securing PRIME exchange made the department to consider alternative GIS computing resources. Through the co-operation of the French technical assistance, VAX as the alternative GIS computing system was acquired. Several upgrade proposals were written to allow GIS resources to be included with the proposed microwave facility. To date, agreement to provide conversion resources has been achieved; however implementation is phased and will require continuous coordination. Rapid completion of this transition to VAX is encouraged owing to persisting problems in PRIME operations and the obvious difficulties in obtaining the necessary support from PRIME-UK.

In addition the department purchased two Wang PCs and a MacIntosh desk top publishing system. The WANG PCs are fully operational and one is linked to the WANG OIS. This allows wider access of users to Wang OIS publication environment as well as providing a PC for general operations. The MacIntosh desk top system will provide efficiency and improve the quality of publications. It will be linked to the common WANG environment.

Additional funding for workstations has been secured. This will allow for the development of a GIS capability able to meet the demands of future GIS growth. Careful coordination of hardware must be made to ensure final growth of DRSRS/ GIS. DRSRS still requires operational statistical software to assist in analysis.



PUBLICATION AND INFORMATION SECTION

Introduction

During the year the section effectively continued to pursue its objectives of publishing and disseminating results, and that of managing the departmental library. The section also acquired a new documentation officer whose duties are to assist the technical editor in editing and preparing research results and other various departmental reports.

Publication

Assisted by the editorial committee, the section edited and prepared the pending research reports as well as new ones. A total of seven reports were published and another 21 edited during the year. The following are the reports published during the year:

1. Karime, O N I, *The Changing Lands Use Patterns in the Ngorengore/Loita Plains*. Technical Report No. 135
2. Muchoki, C H K, *Land Use in Kwale District*. Technical Report No. 136
3. Ottichilo, W K and Sinange, R K, *Long Rains Maize and Wheat Production Trends in Kenya for 1985-1989*. Technical Report No. 137
4. Ng'ang'a, E M and Kamande, L M, *The Vegetation of Aberdares Mountain Ranges*. Technical Report No. 138
5. Oduori, S M, *The Vegetation of Boni and Dodori Game Reserves and the Adjoining Areas*. Technical Report No. 139
6. Work Programme 1990-1991
7. The 1989 Annual Report

Reports Under Preparation

1. *Aerial Surveys Manual* by J W Kufwafwa, et al.
2. *Land Use in Kakamega District* by N Ochanda
3. *Land Use in Elgeyo Marakwet District* by S M Oduor
4. *Plant Genetic Resources and Utilisation in Meru District* by B N Nzioka

5. *Long Rains Maize and Wheat Production in Kenya in 1990* by W K Ottichilo and R K Sinange
6. *The status and Distribution of Mangrove Forest in Kenya: A Case Study in Mida Creek, Sabaki and Ngomeni areas* by P O Gang.
7. *Some Biological Attributes of Impala, Grant Gazelle, Thomson Gazelle, Waterbuck and Hunters Hartbeeste* by J Muchemi.
8. *Behavioral Characteristics of the Major Predators in their Natural Habitat and their Distribution in Kenya* by Daniel K Ronoh.
9. *Elephant Population Estimates and Distribution in Kenya 1982-1990* by W K Ottichilo.
10. *Resource Inventories in Lugari and Tongaren divisions* by F Muzami and W K Ottichilo.
11. *Soil Types/Plant Species Association in Kilifi District*, by S O Nyakweba.
12. *Soil Types/plant Species Association in Kwale and Taita Taveta Districts*, by F Msafiri.
13. *Land Use in Embu District* by E K Wahome
14. *Land Use in Kirinyaga District* by M I Katendwa and W K Ottichilo.
15. *Land Use in Nandi District* by L H Muyodi and W K Ottichilo.
16. *Land Use in Nyeri District* by Z Oningo and W K Ottichilo.
17. *Land Use in Kisii District* by L Muyela, Z Oningo and R K Sinange.
18. *Land Use in Nakuru District* by Owour, Malisa and R K Sinange.
19. *Land Use in Meru District* by D Wambua and R K Sinange.
20. *A Remote Sensing Approach to Mapping and Monitoring Forest Cover in Kenya* by J L Agatsiva, J P Delsol, N Ochanda, M Shimba and J M Terres.

21. **Vegetation Types and Land Use/Cover Types in the Oldonyo Sabuk National Park and Adjacent Areas** by L Ojiambo and I K Lubia

Purchase of Publication Facilities

The section acquired a Wang PC which has been linked to the OIS and is used like any other workstation of the OIS word processor. The section also ordered a desk top publishing system which was purchased with French Government technical assistance.

Distribution of Publications

During the year the section distributed the departmental publications through postal services. However, in August two officers from the section travelled to several districts in the Rift Valley Province where they distributed research reports to planning, livestock, and agricultural officers. In return the officers were presented with various district annual reports.

Seminars

Mr K S A Buigutt attended District Planning Seminars held at:

- Webuye, 18th -22nd March
- Kericho 22nd - 27th April
- Diani Beach, 20 - 25th May.

Mr. Buigutt also participated in a seminar on Media Policy and Planning Issues in Health and Environment Reporting, held at the Aberdare Country Club in Mweiga, Nyeri, from 1st to 4th October 1990.

Library Services

The departmental library continues to expand and to offer services to the officers within the department as well as the outside community including educational institutions, parastatals, government departments and individuals. In fact the DRSSRS library is becoming popular as a reference centre for variety of information including the following among others; environment, vegetation, land use and remote sensing.

About 200 books were bought during the year most of which were recommended by the staff

At the same time the library acquired some publications through donations and as gifts all of which are appended to this report as **Accession List 1990**. Also appended is the list of the department's publications which contain research results of the department over the years.

During the year the library acquired several armchairs and reading tables which can be used in fairly the same way as study carrels.

Periodicals

Added to the rich collection of reference books, the library also provide newspapers, magazines and journals. This includes the *Kenya Times*, *New Scientist*, *The Weekly Review*, *Economist*, *Newsweek*, *Time*, Newsletters and reports from United Nations Environment Programme (UNEP), International Council for Research in Agroforestry (ICRAF), Kenya Forest Research Institute (KEFRI), International Development Research Centre (IDRC), Panoscope, International Rice Research Institute, KENGO (Kenya Energy and Environment Non Governmental Organisations) and many others. District annual reports from the Ministry of Agriculture and Ministry of Livestock Development were also received in the library.

Binding

Over the last several years the library has been binding issues of the *Kenya Times*, the *Weekly Review*, *Newsweek*, *Economist*, and the *Kenya Gazette*. In order to preserve the vital reading materials the library continued to bind both newspapers, magazines and scientific journals as well as various annual reports and loosely covered books that were in danger of tearing. the following is a list of the publications that were bound during the year 1990:

1. *Kenya/Sunday Times* - January to June
2. *Weekly Review* - January to June
3. *Economist* - 1988-89 issues
4. *The Journal of Physiological Society*-Vol 270, Vols 271, 265,180,181,188
5. *Physiology and Behaviour*, Vol 8
6. *The Journal of Ecology* Vol, 50 & 56

7. *Ecology* vol 51
8. *Journal of Applied Physiology*, Vol 32, 33, 36, 38, 39, 40
9. *Bulletin of Animal Health and Production in Africa*: Vol XXXV, XXX VI, XXX VII
10. *New Scientist* 1988 issues.
11. *Radiation Research*: Vol 37, 38, 61, 62, 62, 63, 64.
12. *Journal of Wildlife Management*: Vol 23, 43, 17.
13. *Science* Vol 237-244.
14. *Oxford Advanced Dictionary*.
15. *Nature* Vols 333-339
16. *Kenya Gazette*; 1988 and 1990 issues.
17. *Journal of Entomology*; Vol 44.
18. *Journal of Biological Chemistry*; Vol 248 & 250
19. *Wildlife Review*; Nos 164-171.
20. *The Journal of Soil Science*; Vol. 23 & 26.
21. *Weed Research*; Vol. 10
22. *Indian Journal of Agricultural Science*; Vol 46.
23. *Wildlife Monographs*; No. 55, 58, 63, 73.
24. *Plants International Journal of Plant Biology*; Vols 119 & 136.
25. *Systematic Entomology*; Vol. 14 & 2
26. *Biochemical Journal*: Vol. 133 & 143.
27. *East African Agricultural and Forestry Journal*; Vol. 52 & 53.
28. *Journal of Applied Ecology*; Vol 12
29. *Kenya Journal of Science and Technology Series*; (a) *Physical and chemical Science* Vol. 1-7
(b) *Biological science* Vol. 1-8.
30. *Journal of Comparative Physiology*; Vols 96, 98 and 101.
31. *Post*; Vols 5, 6, 7 and 9.
32. *Reference Manual - for the locations of Kenyan Plants* Vols 1-3
33. *Preliminary floristic survey of Kenya forests of coastal Kenya*
34. *Disease of Cattle in Tropical Africa*
35. *A Report from a Planning Mission on Reforestation in the Turkana Area*
36. *Register of International Treaties and other Agreements in the Field of Environment*.
37. *Report of the 13 Meeting of the Council of Ministers*
38. *Mission Planning and en-Route Radio Navigation*
39. *Quality Inspection and Radio Rectification*
40. *Air Navigation*
41. *Aerial Photography, Theory and Planning*
42. *Aerial Photography: Introduction Subjects*.
43. *Basic Photography*.
44. *Principles of flight and Associated subjects*
45. *District Annual Reports*;
 - (a) Ministry of Livestock Development, Kilifi District
 - (b) Ministry of Livestock Development, Lamu District
 - (c) Ministry of Livestock Development, Nandi District
 - (d) Ministry of Agriculture, Embue)
 - (e) Ministry of Agriculture, Kisii District
 - (f) Ministry of Agriculture, Laikipia District
 - (g) Ministry of Livestock Development, Isiolo District
 - (h) Ministry of Livestock Development, Nyamira District.



AIR SERVICE SECTION

Introduction

Most of the DRSRS survey work involves the use of aircraft and it was for this reason that an Air Service Section was created. It is a section that provides services to the other sections of the department. Most of the survey work is risky since it involves unconventional flying. For this reason the department has a team of four experienced pilots.

Aircraft

The department has five planes of which four are twin engined Partenavias and one single engine Cessna 185. Two of the Partenavias are over ten years old and have been flying for the department for the last decade. These two have non-turbo charged and normally aspirated engines. The other two, which are new and have turbo-charged engines were bought to enhance safety and accuracy.

The Partenavias are utilised in aerial photography and low level aerial survey. The Cessna 185 is a special platform for surveys which Partenavias are not suited; these include total animal counts, oblique photography and operations from short and rough airfields. Photo work requires the aircraft to be flown up to 20,000 thousand feet above ground to produce photo mosaics. During normal survey work the aircraft operate at 400 feet above ground level and at an average speed of 165 km per hour, while maintaining a precise tract over the ground.

Departmental aircraft are specially equipped and have specific features to carry out the special duties among which are:

- (a) Long range fuel capability, since survey work demands longer airborne time than general aviation operations.
- (b) High-wing configuration for observer look down ability, spotting wildlife, etc.
- (c) Slow flight capability: not many twin engine aircraft can fly at the slow speed of 165

km per hour, up and down hills and into down wind situations.

(d) Twin engine for added safety in the event of one engine failing, and for its increased electrical power to run all on board systems.

(e) There are many specialised equipment which are essential in survey operations, (among which are:

- VLF/OMEGA/GPS long range navigation for enhanced accuracy.
- Radar altimeter for accurate altitude control.
- Intercom systems for better cockpit communication.
- Vertical positioning seats for the observers.
- Power supplies to run various equipment such as cameras, tapes, and photometers.
- Census rods for accurate calculations of ground area covered during a survey.
- Hatches to mount cameras for various types of aerial photography.

New Aircraft and Pilot

In April the department hired a third Canadian pilot; Captain Jack Bergeron, whose arrival assisted in the fast completion of the Northern Kenya survey. A large part of each year is devoted to aerial photography thus previously only one pilot was available to carry out the mandate of the Aerial Survey Section. The year also saw the arrival of our fifth aircraft which is now operational and is currently engaged in aerial photography. The two new aircraft purchased over the last two years have enhanced our ability in aerial photography, greatly increased safety, and cut down-time because these new aircraft require less hangar time. Included with the new aircraft is a spares package to support the maintenance thus saving on both time and money.

Areas of Operations and Work Carried Out in 1990

Aerial photography was carried out in Loyangalani, the coast, western Kenya, and Nairobi areas. Wildlife, Livestock, land use

surveys were carried out in Tsavo National Park, Taita Taveta, Kajiado and Narok districts, and all of northern Kenya. The annual maize harvest estimates were also carried out. Following is a table of the hours and types of flying carried out in 1990.

Month	Survey	Photo	Maize	Ferry	Test	VIP	Total
January	0.0	13.6	0.0	3.4	0.5	0.0	17.5
February	35.5	26.0	0.0	8.1	0.0	0.0	69.6
March	53.0	0.0	0.0	10.5	0.2	0.0	63.7
April	0.0	0.0	0.0	0.0	1.5	0.0	1.5
May	61.3	0.0	4.0	1.9	0.0	0.0	67.2
June	0.0	0.0	174.2	12.0	0.0	1.0	187.2
July	0.0	0.0	0.0	0.0	0.0	0.0	0.0
August	86.5	0.0	0.0	8.4	0.0	0.0	94.9
September	204.7	0.0	0.0	10.3	0.0	0.0	215.0
October	28.2	4.2	0.0	3.8	3.8	2.0	42.0
November	188.1	15.6	0.0	20.7	20.7	0.0	224.4
December	0.0	0.0	0.0	0.0	0.0	1.8	1.8
Total	657.3	59.4	178.2	79.1	6.0	4.8	984.8





ADMINISTRATION SERVICES

Training Programmes 1990

Introduction

The department has over the last ten years been pursuing an aggressive training programme with a view to improving human resources capability in the department. The training programme became necessary because of the increasingly complex nature of resource surveys. The objectives of the training have been twofold, namely;

- (a) To promote productive performance in the resource survey programme as outlined in the departmental terms of reference.
- (b) To boost staff morale by according trainable officers opportunities for further training on the basis of their lines of qualifications and departmental priorities.

The following are the training courses completed and ongoing during the year.

1. Completed Courses

(a) Degree Courses

-S.W. Mbugua	M.Sc. (Dev.Studies)	East Anglia, UK
-J.H. Muga	M.Sc. (R.S.A.)	France

(b) Diploma Courses

-L. Ojiambo	I.R.D.,	PAID Cameroon
-M. Katendwa	I.R.D.,	PAID Cameroon
-F. Msafiri	Herbarium Techniques	Kew Cardens, UK
-L. Muyela	Computer Science,	Mombasa Polytechnic
-W. Nduka	Computer Science,	Mombasa Polytechnic
-J. Mirangi	Computer Science,	Mombasa Polytechnic
-M. Said	Geographic Inf.Systems	ITC, Netherlands
-J. Mwangi	Environmental Studies	Kenya Polytechnic
-P. Nguru	Environmental Studies	Kenya Polytechnic
-S. Bokea	Human Settlement Analysis	IIRS, India
-A. Akumonyo	Human Settlement Analysis	IIRS, India

(c) Certificate Courses

-J.K. Chemjor	Aerial Photography,	ITC, The Netherlands
-E. Ojema	Cartography	ITC, The Netherlands
-H.A Mwendwa	Environ.Impact Analysis	CEMP, UK
-C.H.K.Muchoki	Environ.Impact Analysis	CEMP, UK
-M Mbato	Cartography	NGI, Paris, France
-J.N. Mbithi	Supplies /Stores	Baringo Dev. Ins.

2. -Ongoing Courses

(a) Degree Courses

-S.K. Koimett	M.Sc. Resource Managt	Calgary, Canada
-P. Wargute	M.Sc. Resource Managt	Manitoba, Canada

(b) *Diploma Courses*

-F. Msafiri	R.S.A. to F&E	IIRS, India
-S. Nganga	Comp. Proc. & I.S.	ISPC, USA
-F. Muchiri	I.R.D.	PAID Cameroon
-I. Lubia	I.R.D.	PAID Cameroon
-F. Waliaula	Rural Survey & Ecology	ITC, Netherlands
-M.M. Omurambi	Wildlife Management	Mweka, Tanzania
-J Ndakala	Wildlife Management	Mweka, Tanzania
-G.I. Ojwang	Wildlife Management	Mweka, Tanzania

(c) *Certificate Courses*

- J.M. Katembu	Forestry	Londiani Fost. College
-M.O. Okoth	Forestry	Londiani Fost. College
-S. Waruingi	Meteorology	KMD, Nairobi

3. **Approved Pending Courses***Degree Courses*

(a) -M.S. Shimba	M.Sc. (R.S.A.)	London, U.K.
-W.K. Ottichilo	PhD (Ecology)	London, U.K.
-B. Nzioka (Mrs)	M.Sc. (Env. Plan & Manag.)	Canada
-P. Wakhu	M.Sc. (Env. Plan & Manag.)	Canada

(b) *Diploma Courses*

-P.K. Kanja	Wildlife Management	Mweka, Tanzania
-H.B. Mukunda	Wildlife Management	Mweka, Tanzania
-Nyabate	Wildlife Management	Mweka, Tanzania
-M.N. Waweru	Wildlife Management	Mweka, Tanzania
-M.O. Omari	Wildlife Management	Mweka, Tanzania
-J. Muchemi	H.S.A.	IIRS, India
-Kiilu	H.S.A.	IIRS, India
-Raburu	H.S.A.	IIRS, India

Seminars, Symposiums & Workshops Attended

1. J.L. Agatsiva and P.O. Gang: The Ecology of Mangroves and Related Ecosystems: 23rd - 30th September, 1990. The paper presented was on Mida Creek Mangroves.
2. J.L. Agatsiva: Second Symposium on Meteorology: 15th September, 1990. The paper presented was on DRSRS activities in utilising remote sensing data.
3. J.L. Agatsiva: First KEFRI Conference, Research Activities in Forest Related Studies: 17-18 October, 1990.
4. H.A. Mwendwa, C.H.K. Muchoki, E.K. Wahome, J.L. Agatsiva, W.K. Ottichilo and R.K. Sinange: IGADD Symposium at KICC: 16-19 October, 1990.
5. J.L. Agatsiva: Environment 2000 Conference: 23-27 October 1990.
6. J.L. Agatsiva, R.K. Sinange, W.K. Ottichilo and E.K. Wahome: Symposium on Natural Disaster Management, Ministry of Lands and Housing: 12-17 November 1990.
7. C.H.K. Muchoki: UNEP Environmental Awareness Building Workshop for Cadres from African Ministries: Planning, Industry, Education and Agriculture: 24-30 November 1990.

8. S.M. Oduori : Training Workshop Programme on Planning and Management of Community Forestry Projects, Addis Ababa, Ethiopia, (three weeks): Oct 1990.
9. T.H. N. Kamau : Course on Computer Application to Planning and Data Management, Nyeri: 1st October - 23rd November 1990.

Student Attachment-

D.K. Mugambi	Egerton University	Range Management
Miss K.W. Mburu	University of Nairobi	Survey and Photogrammetry
C.C. Rweyemamu	University of Nairobi	School of Journalism
Sarah W. Wathuta	Kenya Polytechnic	Environmental & Liberal Studies
Ruth N. Thendu	Kenya Polytechnic	Environmental & Liberal Studies
Catherine N Muiru	Kenya Polytechnic	Environmental & Liberal Studies

Departmental Seminars; response from people from other institutions has not been very encouraging. A list from within is still under preparation.

Supplies Services

Introduction

The Supplies sub-section within the administration section has the following major role:

- (a) Co-ordination of all matters related to supplies work.
- (b) Determination of the department's supply requirements and arrangement for the disposal of unserviceable stores.
- (c) Maintenance of stocks at optimum levels consistent with operational requirements and financial allowances.
- (d) Proper maintenance of stock records to ensure that issues are made against properly authorized documents and to accredited users.
- (e) Adherence to regulations and procurement governing the supplies aspects which include efficient operation in procurement, provisioning, receipts, storage, security, safety and verification of goods and materials of the department.

Staff

In 1990 the supplies sub-section had a work force of seven officers who included: one Supplies Officer 11 who is head of the sub-section, one Supplies Assistant, four Storemen 1 & 11 and one store issuer (sub-staff). The Supplies Officer 11 joined the department on 5 February 1990 on ministerial transfer.

Goods & Services

During the year the sub-section carried out the following major expenditures on various goods/ service:-

Purchase

1.	Plant and Equipment:-	
	Photocopier Machine	Kshs. 751,500.00
	Motor vehicle	Kshs. 1,012,725.45
2.	Transport:-	
	Tyres and tubes	Kshs. 145,845.00
	Spare parts for vehicles	Kshs. 524,743.50
	Fuel for motor vehicles	Kshs. 858,062.00
	Fuel for aircraft	Kshs. 719,584.50

3	Computer:		
	2 Computer PC/250	Kshs.	475,680.00
	Computer stationary	Kshs.	156,775.00
	Remote Alarm Monitor	Kshs:	69,194.00
4.	Photographic Materials	Kshs.	1,541,421.00
5.	Documentation:		
	Printing	Kshs.	526,118.65
	Library books	Kshs.	118,609.95
6	Camping gear	Kshs.	132,512.00
7	Building maintenance:		
	Cleaning/electrical materials	Kshs.	79,317.85
	Repairs and decorations	Kshs.	194,989.50
	Paint	Kshs.	216,340.00
	Furniture	Kshs.	550,530.00
8.	Projectors/slides	Kshs.	315,200.00
9.	Stationery	Kshs.	137,806.00
10.	Staff uniforms	Kshs.	59,365.45

Transport Services

The departmental fleet of Landrovers continues to grow. The year saw the arrival of two new landrovers. The purchase of new vehicles is necessary in that the original fleet is becoming too old, a fact that maybe a liability given the fact that the department is entrusted with work which requires an efficient transport system. The following is a table to show the vast distances covered during the year

Reg No.	Vehicle type	Distance(Km)	Some of the places travelled
L043	Peugot 504 saloon	14306	Kisumu, Kakamega, Koru, Kapsabet, around Nairobi
G647	Toyota corolla	14857	Around Nairobi
478L	Peugot 504 st/w	7448	Eldoret, Kabarnet, Kaimosi, Kisumu, Nakuru, Nairobi
468L	Land Rover st/w	10567	Baringo, Maralal, Loyangalani, Narok
469L	Land Rover st/w	330	Around Nairobi/Engine knockout
470L	Land Rover st/w	5137	Siaya, Port Victoria, Baringo, Nairobi
471L	Land Rover st/w	5168	Narok, Bura, Hola, Around Nairobi
472L	Land Rover st/w	1518	Kitale, around Nairobi
473L	Land Rover st/w	1000	Around Nairobi
474L	Land Rover st/w	9577	Baringo, Nakuru, Kakamega, Amboseli
475L	Land Rover st/w	2019	Around Nairobi
4766	Land Rover st/w	3615	Narok, Around Nairobi
479L	Volkswagon Kombi	Nil	Inoperational
480L	Bedford Lorry		Kirinyaga, Amboseli, around Nairobi
481L	Bedford Lorry	Nil	Inoperational
H608	Isuzu Lorry	19079	Isiolo, Samburu, Marsabit, Kakamega, Loyangalani, Narok
755U	Volkswagon	10418	Eldoret, around Nairobi
756U	Land Rover pick	14044	Mombasa, Malindi, Oldonyo Sabuk, Marsabit, Garissa
757U	Land Rover st/w	9412	Voi, Tsavo, Oldonyo Sabuk, around Nairobi.
B136	Land Rover st/w	1211	Around Nairobi/Accident
F362	Land Rover st/w	15257	Malindi, Lugari, Kisumu, Kwale, Nairobi
F363	Land Rover st/w	14752	Yala, Kisumu, Embu, Mwingi, Nairobi
F364	Land Rover st/w	16269	Baragoi, Lonyangalani, Baringo, Nairobi
F365	Land Rover st/w	16524	Amboseli, Samburu, Isiolo, Marsabit, Nairobi
M104	Land Rover st?w	5062	Emali, Loitokitok, around Nairobi
M105	Land Rover st/w	10831	Namanga, Ngong, around Nairobi
M196	Land Rover st/w	8720	Around Nairobi
M358	Isuzu Trooper	14478	Mombasa, Kisii, Oyugis, Siaya, Nairobi
M359	Isuzu Trooper	9637	Kisumu, Webuye, Mombasa, Kitale, Meru
N524	Land Rover st/w	5379	Around Nairobi
R044	Landrover st/w	625	Around Nairobi
S388	Landrover st/	1262	Around Nairobi

STAFF LIST 1990

NAMES	DESIGNATION	REMARKS
D.K. Andere	Director	
H. Mwendwa	Chief Ecologist	
W.K. Ottichilo	Chief Biologist	
J.W. Kufwafwa	Senior Biologist	
W.K. Wahome	Senior Ecologist	
J.L. Agatsiva	Senior Ecologist	
C.H. K. Muchoki	Senior Ecologist	
N. Ochanda	Ecologist 1	
S.W. Mbugua (Mrs)	Biologist 1	
K.S.A. Buigutt	Documentation Officer	
Ruben Sinange	Biologist 1	
J.M. Kiruri (Mrs)	Biologist 11	
E.M. Ng'ang'a	Biologist 11	
P.W. Wargut	Biologist 11	
P.A. Wakhu	Biologist 11	
E.M. Mwangi	Biologist 11	Resigned in 1990
C.S. Mulambalah	Biologist 11	
B. Nzioka (Mrs)	Ecologist 11	
C.O. Ataya	Ecologist 11	
D. K. Rono	Ecologist 11	
L.O. Banda	Ecologist 11	
M.S. Mshimba	Ecologist 11	
E.N. Osoro	Ecologist 11	
H.J. Muga	Research Officer 1	
M. Y. Said	Research Officer 1	
L. Kamande (Mrs)	Research Officer 1	
S. M. Oduori	Research Officer 1	
M. O. Nyabenge	Staff Surveyor	
S. K. Koimett	Staff Surveyor	
S. N. Ng'ang'a	Syst. Analyst/Programmer	
J.N. Mwobobia	Accountant 11	
S. G. Kibocho	Documentation Officer 11	
T. K. Githirwa	Documentation Officer 11	Joined in 1990
V. W. Muthee (Miss)	Executive Officer 11	Joined in 1990
P. O. Aoko	Draughtsman 111	
E. M. Ojema	Draughtsman 111	
A. Gwandaru	Executive Officer 11	Transferred in 1990
N. O. Karime	Technical Officer 11	
E. C. Njuguna	Computer Programmer	
T. M. Kamau	Computer Programmer	Joined in 1990
J. O. Onduso	Supplies Officer 11	Joined in 1990
J. M. Gachunji	Executive Assistant	
J. G. Mureithi	Supplies Assistant	

E. C. Omahe (Miss)	Mechanic 11	
D K. Latonga	Higher Clerical Officer	
B.B. Ligami	Higher Clerical Officer	
L. N. Wambua (Mrs)	Higher Clerical Officer	
M.O. Magovi	Higher Clerical Officer	
T. Nyakango	Aerial T.S. Leader	
G.E. Munyinyi	Ground T.S. Leader	
D. M. Kamau	Range Assistant	Resigned in 1990
J. N. Mbithi	Storeman 1	
Y. N. Okombo	Driver Grade 1	
J. M. Nguru	Driver Grade 1	
J. N. Ng'ang'a	Driver Grade 1	
G. Njenga	Driver Grade 1	
S. Kioko	Driver Grade 11	
J. Kihumba	Security Warden 1	
J. O. Ongei	Artisan 11	
P. K. Taiti	Radio Operator 1	
J. M. Katembu	Photographic Assistant 1	
L.H.W. Muyodi	Photographic Assistant 1	
M.O. Okoth	Photographic Assistant 1	
Bernie G. Waruru	Photographic Assistant	Resigned in 1990
Charles O. Munala	Mechanic 11	
C. M. Kyalo	Data Machine Operator 1	
M. Ogeto	Technical Assistant 11	
W. Muli	Technical Assistant 11	
C. Chelule	Technical Assistant 11	
W. A. Nyaga	Technical Assistant 11	
W. Soita	Technical Assistant 11	
M. Waweru (Miss)	Technical Assistant 11	
L. Gitau (Miss)	Technical Assistant 11	
H. Kamulla	Technical Assistant 11	
J. W. Wathuo	Technical Assistant 11	
S. C. Kifugo	Technical Assistant 11	
N. Matheka	Storeman 1	
T.O. Muhindi	Mechanic 111	
M. J. Makokha	Mechanic 111	
C N. Kimanthi	Mechanic 111	
D. Kimani	Artisan 111	
S. K. Kimani	Artisan 111	
P.E. Muiruri	Clerical Officer	
J. M. Kaingo	Clerical Officer	
P. M. Njagi	Clerical Officer	Resigned in 1990
J. Maina Thiong'o	Clerical Officer	
A. Ndirangu (Miss)	Clerical Officer	
D. M. Gatonga (Miss)	Storeman 11	
M. O. Oyamo	Corporal Ranger	
J. M. Gathimbu	Technical Assistant	
Peter J. Ochieng	Technical Assistant	

G. M. Kiilu	Technical Officer 111	
S. Akumonyo	Technical Officer 111	
H. Mukanga	Technical Officer 111	
G. Muriuki	Technical Officer 111	
J. Muchemi	Technical Officer 111	
B. O. Raburu	Technical Officer 111	
S. Bokea	Technical Officer 111	
J. Chemjor	Technical Officer 111	
F. Msafiri	Technical Officer 111	
H. Roimen	Technical Officer 111	
F. Waliaula	Technical Officer 111	
D.A.K. Wambua	Technical Officer 111	
L. Ojiambo	Technical Officer 111	
J. Ndakala	Technical Officer 111	
J. M. Gitau	Technical Officer 111	
P. O. Gang	Technical Officer 111	
C. Agwanda	Photo Technician	
J. K. Mutira	Coding Technician	
C. P. Mwaniki	Accounts Assistant	
J. M. Kioko	Junior Cartographer	
M. M. Omondi	Junior Cartographer	
M. M. Mbato (Miss)	Junior Cartographer	
R. D. Mwilu	Library Assistant	
P. D. Kasusya	Technical Assistant 1	Resigned in 1990
P. Kanja	Technical Assistant 1	
C. Omari	Technical Assistant 1	
J. Mtwerandu	Technical Assistant 1	
H. P. Mukunda	Technical Assistant 1	
I. K. Lubia	Technical Assistant 1	
M. I. Katendwa	Technical Assistant 1	Resigned in 1990
J. Mwangi	Technical Assistant 1	
A. N. Njenga	Technical Assistant 1	
S. H. Waruingi	Technical Assistant 1	
M. M. Omurambi	Technical Assistant 1	
G. S. Ojwang	Technical Assistant 1	
Daniel K. Ronoh	Technical Assistant 1	
P. N. Nyabate	Technical Assistant 1	
P. Nguru	Technical Assistant 1	
W. A. Nduka	Technical Assistant 1	
Z. Oningo	Technical Assistant 1	
Lucas Muyela	Coding Technician	
Joseph M. Mirangi	Coding Technician	
J. N. Lusimbo (Miss)	Lab. Technician	
A. K. Olukune	Shorthand Typist	
Maureen A. Otieno	Shorthand Typist	
B. Imbensi	Shorthand Typist	
P. Gatweri (Miss)	Shorthand Typist	Resigned in 1990
Anne K. Charles	Shorthand Typist	Joined in 1990
S. K. Arimi	Artisan 1	

Susan W. Muiyuro	Technical Assistant	
A. V. Noru (Mrs)	Copy Typist	
R. A. Otieno (Mrs)	Copy Typist	
N. W. Muriuki (Miss)	Copy Typist	
M.A. Ochieng (Miss)	Copy Typist	
John O. Owuor	Photographic Assistant 11	
F. Wepo Malisa	Photographic Assistant 11	
A. Rono	Photographic Assistant 111	
B. Mumbi (Miss)	Data Machine Operator	
C. K. Kithinji (Mrs)	Data Machine Operator	
E. M. Mwandoko (Miss)	Telephone Operator	
P. N. Mutilu (Miss)	Telephone Operator	
P. Mwakidoshi	Driver Grade 11	
B. Macharia	Driver Grade 11	
S. C. Minodi	Driver Grade 11	
B. W. Karoki	Driver Grade 111	
D. M. Mwawasi	Driver Grade 111	Resigned in 1990
M.A. Nyandwa	Driver Grade 111	Retired in 1990
S. N. Ngoroi	Driver Grade 111	Jailed in 1990
R. K. Kinuthia	Driver Grade 111	Resigned in 1990
T. K. Maina	Driver Grade 111	Resigned in 1990
K. Chebor	Driver Grade 111	Resigned in 1990
J. Nyanunge	Driver Grade 111	Resigned in 1990
K. Ngugi	Driver Grade 111	
P.O. Gisore	Driver Grade 111	
D. M. Kamau	Driver Grade 111	
C. Lumwamu	Driver Grade 111	
V. Orido	Driver Grade 111	
J. M. Mutiso	Driver Grade 111	
J. M. M'mathiu	Driver Grade 111	
C. O. Ayoti	Driver Grade 111	
C. Ngugi	Driver Grade 111	
T. M. Ngusu	Driver Grade 111	
N. A. Kiganane	Driver Grade 111	
H. K. Maigua	Driver Grade 111	
G. M. Mbuina	Driver Grade 111	
J. K. Koima	Driver Grade 111	
A.A.A. Noor	Driver Grade 111	
F. K. Wahome	Driver Grade 111	
H.O. Akhongo	Ranger	
C. N. Changawa	Ranger	Resigned in 1990
S. N. Muiruri	Ranger	
A.M. Ng'ang'a	Ranger	
W. Angwenyi	Ranger	
J. K. Nthenge	Ranger	Resigned in 1990
J. N. Mati	Ranger	
B.M.W. Twele	Ranger	
John T. Ngala	Ranger	

L. Mwangangi	Aircraft Attendant	
A. Omungala	Aircraft Attendant	
F. K. Mbogori (Miss)	Senior Sub. Staff	
J. D. Khayumbi	Senior Sub. Staff	
S. Wamoro (Miss)	Senior Sub. Staff	
J. Kibagendi	Senior Sub. Staff	Transferred in 1990
P. M. Masika	Senior Sub. Staff	
J. K. Matiri	Senior Sub. Staff	
T. M. Kavithi	Senior Sub. Staff	
J.W. Kibugi (Miss)	Sub. Staff 1	
E.M. Maina (Miss)	Sub. Staff 1	
M.M. Watiri (Miss)	Sub. Staff 1	
Aaron M. Nziu	Sub. Staff 1	
H. Agoi	Sub. Staff 1	
I. Mwendwa (Miss)	Sub. Staff 1	
C. G. Ondiek	Sub. Staff 1	
O. Ayot	Sub. Staff 1	
R.M. Kinganga	Sub. Staff	
M. J. Akech (Mrs)	Sub. Staff	
D. Musyimi	Sub. Staff	Resigned in 1990
M. Ndirangu (Miss)	Sub. Staff	
J. Sichenga (Miss)	Sub. Staff	
M. I. Nyaga	Sub. Staff	
J. Maina	Sub. Staff	Resigned in 1990
D. Ominde (Miss)	Sub. Staff	
Anne Njeri K. (Miss)	Sub. Staff	
P. K. Mbiuki (Miss)	Sub. Staff	
E. N. Kumenda (Mrs)	Sub. staff	
A. B. Dado	Sub. Staff	
G. Muyagu	Sub. Staff	
P. N. Kamau	Sub. Staff	
J. S. Mutua	Sub. Staff	
S. A. Chumba	Sub. Staff	
A. N. Kimani	Sub. Staff	
Musa Olewe	Sub. Staff	
A. Mkamzungu	Sub. Staff	Resigned in 1990
B. K. Ngeno	Sub. Staff	
F. Okubo	Sub. Staff	
M. Njoroge	Sub. Staff	Joined in 1990
J. M. Njagi	Sub. Staff	Joined in 1990

EXPATRIATE STAFF

Capt.A. M. Stepanowich	Chief Pilot
Capt. F. K. Hamilton	Senior pilot
Capt. John F. Bergeron	Senior Pilot
Mr. Jess E.Grunblatt	GIS Technical Expert
Dr. Jean P. Delsol	Senior Technical Expert
Mr. Joel P.M. Guerlais	Flight Photographer
Nicolas Ganzin	Senior Technical Expert

ACCESSION LIST 1990

1. Food and Agricultural Organisation (1989). *An Illustrated Manual of Kenya Grasses*. Rome: FAO.
2. Sulbert, Ester (1989). *Professional Education In Agroforestry: Proceedings of An International workshop*. Nairobi: ICRAF
3. United Nations Environmental Programme (1989). *Environmental Data Report*. London: Blackwell.
4. International Development Research Centre (1989). *Strategies and Methodologies for the Planning and Implementation of Information Systems in Public and Administration: Proceedings of the international Conference held in Beijing China 23-28 May, 1988*. - IDRC.
5. Young, Anthony (1989). *Agroforestry for Soil Conservation* London: CAB International.
6. Huxley, Peter A., Westley Sidney B. (1989). *Multipurpose Trees, Selection and Testing for Agroforestry: Multipurpose Tree and Shrubs for Special Agroforestry Technologies and Land-Use Systems - the ICRAF approach* - Nairobi: ICRAF.
7. NAIR P K R (1984). *Soil Productivity Aspects of Agroforestry (science and practise of agroforestry: 7)*. Nairobi: ICRAF.
8. Burley, J (1984). *Global Needs and Problems of the Collection Storage and Distribution of Multipurpose Tree Germplasm (science and practise of Agroforestry; 2)*. - Nairobi: ICRAF.
9. Munyua H., Bondole B.M. Magistu L (1984). *Agroforestry Literature: A Selected Bibliography on Sub Sahara Africa*. Nairobi: ICRAF.
10. Muller, E.U., Scherr, S.J. (1989). *Technology Monitoring and Evaluation in Agroforestry Projects: An Annotated bibliography*. Nairobi: ICRAF.
11. International Council for Research in Agroforestry (1989). *Meteorology and Agroforestry: Proceedings of An international Workshop on the Application of Meteorology to Agroforestry Systems, Planning and Management. Nairobi 9-13 February 1987*. Nairobi: ICRAF.
12. The World Bank (1989). *Sub-sahara Africa: From Crisis to Sustainable Growth, A long-term Perspective Study*. Washington D.C.: The World Bank.
13. Kilewe, A.M., Kealey, K.M. and Kebaara K K (1989). *Agroforestry Development in Kenya: Proceedings of the Second Kenya National Seminar on Agroforestry held in Nairobi, Kenya 7-16 November 1988*. - Nairobi ICRAF.
14. Kershaw, Kenneth A, (1973) *Quantitative and Dynamic Plant Ecology*. London: ELBS.
15. Broom Donald M. (1979). *Biology of Behaviour, Mechanism, Functions and Applications*. London: Cambridge University Press.
16. Cluley, J.C. (1984). *Programming for Mini Computers*. New York: Crane, Russak and Co. Inc.
17. Clegg, C J and Lox Gene (1978). *Anatomy and Activities of Plants: A Guide to the Study of Flowering Plants*. London: John Murray.
18. Joves, R. N. and Harp, A (1986). *Introducing Genetics*. London: John Murray.
19. Cloudsley- Thomson, J.L. (1981). *Man and the Biology of Arid Zones*. London ELBS.
20. Lamprey, R.H. and D.E. Leeuw, P.N. (1987). *Monitoring East African Vegetation with the use of NOAA-AVHRR Imagery: UNEP/ILCA, NOAA-AVHRR Calibration Project 2nd year Report June 1987*. - Nairobi: ILCA.
21. Simmons I.G. (1981). *The Ecology of Natural Resources*. London: ELBS
22. Cracknell, Arthur and Hayes, Ladson (1988). *Remote Sensing Year Book 1988/89*. London: Taylor and Francis.
23. Heyer Judith Dunstan Ireri, John Moris (1981). *Rural Development in Kenya (East African Rural development studies: 6)*. Nairobi: East African publishing House.
24. Simmon Herbert (1968). *Introduction Printing: The Craft of Letter Press* London: Faber and Faber.
25. Marvullo, Joe (1982). *Improving Your Colour Photography. (master class photography series)*. London: Blandford Press
26. MacDonald Ian and John Low (1984). *Tropical Field Crops*. London: Evans Brothers.
27. Robins. Kate (1984) *Subject Guide to Information Sources in Kenya*. Nairobi: Kenya Library Association.
28. Von Frisch Offo (1969). *Animal Migration*. London: Collins.
29. Woodcock. R.G. (1976). *Weather and Climate. (The M and E Handbook series)* Plymouth: Macdonald and Evans.
30. Whiteman, P.C. (1980). *Tropical Pasture Science*. Oxford: OUP.
31. Muller, Jan-Peter (1988). *Digital Image Processing in Remote Sensing*. London: Taylor and Francis.
32. Garside, L. (1986). *Modern Business Correspondence: A Comprehensive Guide to Business Writing and Related Office Service*. 4th ed. London: Pitman
33. James, Philip S. (1979) *Introduction to English Law*. 6th ed. London: Butherworths.
34. Norman, M. J.T., C.J. Pearson and P.G.E. Searle (1984). *The Ecology of Tropical Food Crops*.

35. Davies, Martin P. (1963). *A career in Advertising*. London: Museum Press.
36. Gregerson, Hans, Sidney Draper, Dieter Elz (1989). *People and Trees, the Role of Social Forestry in Sustainable Development*. Washington D.C.: IBRD.
37. Preston John A. (1980). *Wild Animals* London: Lollins.
38. Dolan L. (1986). *Motor Vehicle Technology: A Practical Work, Parts I and II*. Nairobi: Heinemann.
39. The Asian Vegetable and Research (1977). *Proceedings of the Workshop on Pre and Post-Harvest Vegetable Technology in Asia. 7-12 February*. Shanhra: AVRDC.
40. Labelle, R.L. Majisu and H. Munyua (1988). *Agroforestry Literature: A Selected Bibliography - Nairobi: ICRAF*.
41. Resource Surveys & Remote Sensing, Department of (1990). *A Methodology for Assessment and Mapping of Desertification: Report of the Kenya Pilot Study*. Nairobi: UNEP.
42. International Service for National Agricultural Research (1987). *Guidelines for Strengthening National Agricultural Research Systems in Sub-sahara Africa (special programme for African Agricultural Research.)* Washington D.C.: IBRD.
43. Minae, Susan (1988). *Agroforestry Research Project Proposal for the Coffee Based Systems in Bimodal highlands, Central and Eastern Provinces*. Kenya. Nairobi: ICRAF.
44. Haigis, Bill (1983). *Methods of Preserving Wildlife Habitat* (Working paper No. 25). Ottawa: Lands Directorate and Environmental.
45. Martin, Elizabeth (1985). *Concise Dictionary of Biology*. Oxford: Oxford University Press.
46. Tivy, Joy. Grey O'Hare (1981). *Human Impact on Ecosystems*. Edinburgh: Oliver and Boyd.
47. Sparks, B.W. (1986). *Geomorphology* 3rd ed. - London: Longman.
48. Heady H.F. and E.B. Heady (1982). *Range and Wildlife Management in the Tropics* (Intermediate tropical Agricultural Series), London: Longman.
49. Chamber, Robert (1983). *Rural Development: Putting the Last First*. London: Longman.
50. O'Hare Grey (1988). *Soils and Vegetations, Ecosystems*. (conceptual) London: Longman
51. Pomeroy, D.E. (1986). *Tropical Ecology*. London: Longman.
52. Lake Basin Development Authority (1989). *Five Years Development Plan. 1989-93*. Kisumu: Lake Basin Development Authority.
53. Baumer, Michael (1987) *Agroforestry Desertification*. Rome: ICRAF
54. Huxley P.A. Westley S.B. (1989). *Multipurpose Trees Selection and Testing for Agroforestry: Multipurpose Trees and shrubs for Specified agroforestry Technology and Land Use Systems Approach*. Nairobi: ICRAF.
55. Fortmann, Louise, Riddel James (1988). *Trees and Tenure: An Annotated Bibliography for Agroforesters and others*. Wisconsin: University of Wisconsin.
56. Provincial Planning Officer, Rify Valley (1988). *Rift Valley Province: Socioeconomic Achievements Quarter Century of Peace and Prosperity 1963-1988*. Nakuru: provincial Planning office.
57. Ministry of Planning and National Development, District Support Section (1990). *Proceedings of the District Planning Seminars held at Webuye, April 8-13, Kericho, April 22-27, Nyeri May 6-11 and Diani Beach May 20-25*- Nairobi: MPND.
58. World Resource Institute (1990) *World Resources 1990 - 1991* New York: OUP
59. Karanja, Gichuki and Fissiha Tefera (1990). *Soil and Water Conservation in Kenya: Bibliography with Annotations*. Nairobi: University of Nairobi, Department of Agricultural Engineering
60. Peterson, W.W. (1974). *Introduction to Programming Languages*. Englewood Cliffs N.J.: Prentice Hall

APPENDIX 3. LIST OF PUBLICATIONS OF THE DEPARTMENT

- 1 Wetmore, S.P. & G.H. Townsend (1978). A geographical code for the identification, storage, analysis of ecological data.
2. Wetmore, S.P., H.J. Dirschl & S. W. Mbugua (1977). A comparison of six aerial censuses of Meru National Park and Bisanadi Conservation Area.
- 3 Dirschl, H. J., S. W. Mbugua & S.P. Wetmore (1978). Preliminary results from aerial census of livestock and wildlife of Kenya's rangelands.
- 4 Dirschl, H. J. & S.P. Wetmore (1978). Grevy zebra's abundance and distribution in Kenya, 1977.
- 5 Stelfox, J. G. & J.W. Kufwafwa (1978). Objectives and achievements of KREMU's Aerial Survey Section 1976 to September 1978 and a proposed programme for October 1978 to December 1979.
- 6 Stelfox, J. G., J.W. Kufwafwa & S. W. Mbugua (1979). Livestock and wild herbivore populations in Kenya rangelands in 1977 compared with 1978.
- 7 Stelfox, J.G. & M. Mugambi (1979). Tana delta herbivore and habitat survey, 2-5 February 1979.
- 8 Kufwafwa, J.W. & J.G. Stelfox & J.G. Stelfox (1979). Distribution of livestock & Wildlife in areas within

- and adjacent to the Lake Kenyatta Settlement Scheme and some implications of proposed land use plans on the conservation of wildlife in the area. (out of stock)
- 9 Peden, D.G., J.G. Stelfox, J. K. Mutira & J. Mwanje (1979). Factors affecting the precision and accuracy of nationwide aerial census of animal populations.
 - 10 Stelfox, J.G. & D.G. Peden (1979). KREMU's aerial survey program: 1976-79. A paper presented at an international workshop on aerial survey methods, Nairobi, Kenya Census of animals populations.
 - 11 Nganga, S. N., D. G. Peden & J.G. Stelfox (1979). Relation between observer counts in KREMU's 1977 Survey data.
 12. Wahome, E K & P Kuchar. (1979). Calibration and use of soil moisture neutron probe in ecological monitoring.
 - 13 Stelfox, J.G. & M. Ngatia (1979). Grevy zebra's survey in north central Kenya: 16-18 October 1979. (unpublished)
 - 14 Ngatia, M. & J.G. Stelfox. (1980). Densities and distributions of Grevy zebra's in four density zones: 6-8 March and 3-4 May 1979, (unpublished)
 - 15 Dirschl, H.J., M. Norton-Griffiths & S.P. Wetmore. (1979). Training of aerial observers and pilots for counting animals.
 - 16 Kufwafwa, J. W. & J.G. Stelfox (1980). Livestock and wildlife populations, stocking rates and distributions in relation to environmental conditions in Baringo District, March 1980. (out of stock)
 - 17 Ngatia, M. & J. G. Stelfox (1980). Herbivore-habitat conditions within and adjacent to Samburu, Buffalo Springs and Shaba National Reserves, May 1980.
 - 18 Karstad, E. K., R. J. Hudson, J.G. Stelfox & S.W. Mbugua (1980). Census of hippopotamus populations in Mara River system.
 - 19 Stelfox J.G., D. G. Peden, S.W. Mbugua & R. J. Hudson (1980). Populations, stocking rates & distributions of wildlife and livestock on Mara and Loita plains, December 1978 - November 1979.
 - 20 Epp, H. & J. Agatsiva (1980). Habitat types of the Mara-Narok area, western Kenya. (out of stock)
 - 21 Andere, D. K., J. G. Stelfox & S.W. Mbugua (1980). Distributions and densities of livestock and wild herbivores in the rangelands of Kenya, 1977 & 1978.
 - 22 Kuchar, P. (1978). A methodology for sampling in order to monitor condition, trend and plant biomass in Kenya rangelands. (unpublished)
 - 23 Peden, D. G., H. Epp & J.G. Stelfox (1980). Habitat preferences of twelve large herbivores on the Mara & Loita plains: A method of intergrating aerial survey data and cartographic information (unpublished)
 - 24 Stelfox, J. G., J.W. Kufwafwa & S. W. Mbugua (1979). Distributions, densities & trends of elephants & rhinoceros in Kenya, 1977-1979 from KREMU's aerial surveys.
 - 25 Stelfox, J. G. & J.W. Kufwafwa (1979). Highlights of KREMU's 1979 workshop for biologists and aerial observers.
 - 26 Kabaru, E.W. & J.G. Stelfox (1980). Populations & distributions of herbivores and environmental conditions in Dodori Game Reserve. (unpublished)
 - 27 Stelfox, J.G. (1981). 1979 population estimates of herbivores in Meru National Park and surrounding area from KREMU aerial surveys using sampling intensities from 5% to 31%. (unpublished)
 - 28 Stelfox, J.G. K. Ngatia & R. J. Hudson (1981). Selected bibliography on the biology of African ungulates. (unpublished)
 - 29 Andere, D. K., J. G. Stelfox, P. Kuchar, D.G. Peden & H. Epp. 1978-1979 Annual Report.
 - 30 Doute, R. N. Ochanda & H. Epp (1981). A forest inventory of Kenya using remote sensing techniques. (out of stock)
 - 31 Agatsiva, J.L. & H. Epp (1981). Habitat types of Lamu- Tana River area, Kenya. (unpublished)
 - 32 Peden, D. G. (1980). A precision-based for allocating sampling effort in nation-wide survey of livestock and wildlife.
 - 33 Kufwafwa, J. W., S.W. Mbugua & C. Amuyunzu (1981). Populations and distributions of livestock and wildlife in south Kenya, July-October 1980. (unpublished)
 - 34 Amuyunzu, C. (1981). Seasonal populations * distributions of wildlife and livestock within the Mara study area during 1980. (unpublished)
 - 35 Kabaru, E. & M. Ngatia (1982). Seasonal populations & distributions of wildlife and livestock within the northern study area during 1980. (unpublished)
 - 36 Kufwafwa, J.W. (1981). Seasonal population and distributions of livestock and wildlife in relation to environmental conditions in Baringo District, November 1980.
 - 37 Kufwafwa, J.W. (1981). Tana-Lamu Studies: 1977-1980: A comparison of wet & dry season populations, distributions & stocking rates of herbivores.

- 38 Ottichilo, W.K. (1981). Population estimates and their reliability of cattle and major wild herbivores on Galana Ranch in 1977, 1978, 1979 and 1971. (unpublished)
- 39 Mwendwa, J., & P. Kuchar (1981). KREMU ground stations. (unpublished)
- 40 Ottichilo, W.K. (1981). Population studies of elephant, *Loxodonta africana* Blumenbach in Tsavo ecosystem, 1975-1980.
- 41 Ottichilo, W.K., E. Kabaru, S. W. Mbugua & J.G. Stelfox (1981). The conservation & utilization of wildlife in Kenya as a renewable natural resource.
- 42 Stelfox, J. G. (1981.) Herbivore population estimates on Hopcraft Ranch from aerial & ground surveys during wet & dry seasons, 1980-1981. (unpublished)
- 43 Stelfox, J G., J.W. Kufwafwa & K. Ottichilo (1981). Distributions & population trends of elephants & rhinoceros in Kenya, 1977-1980.
- 44 Stelfox, J.F., J.W. Kufwafwa & S.W. Mbugua, with introduction by D.K. Andere (1981). Livestock & wild herbivore populations in the Kenya rangelands, 1977-1980.
- 45 Odenyo, V.O. (1981). Rangeland mapping of the Masai Mara Game Reserve area by computer analysis of Landsat data. (unpublished)
- 46 Ochanda, N., R. Doute, and H. Epp (1981). Monitoring recent changes in selected natural forests of Kenya using remote sensing techniques. (out of stock)
- 47 Wahome, E.K., & C. Waweru (1981). Chemical analysis method for determining the values of forages. (out of stock)
- 48 Dunne, T., E.K. Wahome, & B. Aubry (1981). An ordinal-scale classification of water erosion intensity. (Reprinted 1990)
- 49 Olang, M.O. (1981). Baseline data for range condition and trend analysis for Baringo, Rumuruti and Maralal eco-units. (out of stock)
- 50 Odhiambo, B.D.O. () Habitat types of the eastern shore of Lake Turkana, northern Kenya. (unpublished)
- 51 Epp, H.,D. Herlocker, D. G. Peden (1981). The use-of large scale aerial photography to determine wood biomass in arid and semi-arid areas of Kenya.
- 52 Kuchar, P. and H. Mwendwa (1981). Vegetation sampling in the Boni and Dadori Game Reserves. (our of stock)
- 53 Muchoki, C. H. K. (1981). Baseline data for vegetation station in Taita-Taveta and Kitui districts. (unpublished)
- 54 Mwendwa, H. (1981). Baseline data reduction for vegetation condition and trend in the Kilifi-Kwale, Hola, Ijara, Tana delta and Lamu eco-units.
- 55 Western, D., J. Ssemakula, P. Kuchar, H. Mwendwa, S. Nganga, & C. L. Amuyunzu (1981). A survey of natural wood supplies in Kenya and an assessment of the ecological impact of its usage. (out of stock)
- 56 Dunne, T., B. Aubry, E.K. Wahome (1981). Effect of woodfuel harvest on soil erosion in Kenya. out of stock)
- 57 Amuyunzu, C. (). A comparison of seasonal population and distribution of wildlife and livestock in the Mara study area, 1979-1981.
- 58 Mbugua, S.W. (1982). Dry and wet season distribution of livestock and wildlife in Northern Kenya, 1977 - 1981.
- 59 Herbivore/habitat conditions within and adjacent to Samburu, Buffalo Spring and Shaba Game Reserves, 1977-1981. (unpublished)
- 60 Kufwafwa, J. (1982). A comparison of dry and wet season populations and distributions of livestock and wildlife in Baringo District, March and November 1980. (unpublished)
- 61 Kabaru, E. (1982). Seasonal distribution of livestock and wildlife herbivore populations in KREMU's areas 1 (Baragoi) and 2 (North Horr) in relation to habitat parameters based on aerial surveys in 1980.
- 62 Kufwafwa, J. W. (1982). Results of two dry and wet season livestock and wildlife information in Baringo District, 1980-1981.
- 63 Kufwafwa, J.W. (1982). Livestock and wildlife populations and distributions in Kajiado District. (unpublished)
- 64 Sinange, R. K. (1982). Livestock and wildlife populations in Kiboko Range Research Ranch. (unpublished)
- 65 Kufwafwa, J.W. (1982). Livestock and wildlife population in Taita Ranches and Tsavo West National Parks. (unpublished)
- 66 Sinange, R.K. (1962). Livestock populations of Mukogodo Division of Laikipia District.
- 67 Amuyunzu, C. (1982). Livestock and Wildlife populations of Laikipia District.
- 68 Sinange, R. K. (1982). Visibility biases and correction factors of herbivores in Laikipia ranches.
- 69 Mbugua, S. W. (1982). Herbivore population estimates on Hopcraft Ranch from aerial and ground surveys during two dry and wet seasons, 1980 - 1981.
- 70 Kufwafwa, J.W. (1982). Livestock and wildlife population and distribution in S. Garissa, lamu, and Tana River districts, 1979 - 1981.

- 71 Wahome, E.K., & P. Kuchar (1981). Rainfall data acquisition and use in predicting plants production.
- 72 Agatsiva, J.L. & H. Mwendwa (1982). Land use mapping of Kenya using remote sensing techniques. out of stock)
- 73 Wahome, E.K. (). Baseline vegetation data for monitoring range conditional and trend in Narok and Nakuru districts field sampling stations.
- 74 Peden, D.G., & M.O. Olang (1982). An evaluation of the PCQ method of sampling tree density.
- 75 Mwanje, J.I. (1981). Rapid forage inventory of Kenya rangelands by double sampling for regression estimation: A feasibility study using an airborne digital radiometer.
- 76 Peden, D. G. (1982). KREMU data bank.
- 77 Peden D.G. (1982). KREMLBB.
- 78 Peden, D. G. (1982). KREMCOV.
- 79 Mwanje, J.I., S. Nganga, D.G. Peden, & I. Belsoi (1982). KREMMAN: A programme to edit KREMU's aerial data.
- 80 Peden, D.G., S. Nganga, & J.I. Mwanje (1982). KREMU disc storage system.
- 81 Mwanje, J.I., & C Mulei (1982). Catalogue of KREMU census data stored on cards.
- 82 Mwanje, J.I. (1982). KREMU tape management system.
- 83 Mwanje, J.I., & G. Ogombo (1982). KREMU diskette storage catalogue system.
- 84 Mwanje, J.I., & S. Nganga (1982). KREMU census data management.
- 85 Nganga, S. (1982). KREMU JCL documentation system.
- 86 Mwanje, J.I. (1982). KREMU software.
- 87 Mwanje, J.I. (1982). KREMU data storage and software cataloguing system.
- 88 Msafiri, F. (1982). Checklist of the vascular plants of Trans-Mara area, Narok District (out of stock)
- 89 Olang, M.O. (1982). Methods for determining range utilization and conditions. (out of sotck)
- 90 Epp, H & A. Killmayer (1982). Determination of the agricultural boundary in Kenya. (out of stock)
- 91 Killmayer, A & H. Epp (1982). Method development for crop acreage estimation. (unpublished)
- 92 Ochanda, N. (1982). Kakamega-Nandi remote sensing aided land-use/land cover mapping. (out of stock)
- 93 Peden, D.G., & H. Epp (1982). The using of resource survey data in Kitui District in Kenya.
- 94 Wahome, E.K. (1982). Field experiment on soil erosion in semi-arid Kenya. (out of stock)
- 95 Olang, M.O. (1982). Vegetation classification using remote sensing to locate sampling stand. (out of stock)
- 96 Osoro, E.N. (1982). Baseline data vegetation Kajiado District. (out of stock)
- 97 Epp, H., A. Killmayer, D.G. Peden (1983). Land use in Kisii District.
- 98 Olang, M.O. (1983). Methods of vegetation sampling. (out of stock)
- 99 Olang, M.O. (1983). Vegetation assessment in Turkana District. (out of stock)
- 100 Agatsiva, J.L. (1984). Land use in Bungoma District, Kenya
- 101 Agatsiva, J. L. (1985). Land use in Trans-Nzoia Districtm, Kenya.
- 102 Peden, D.G. (1984). Livestock and wildlife population inventories by district in Kenya, 1977-1983. (Reprinted 1990)
- 103 Olang, M.O. Vegetation mapping using sample photographs and Landsat imagery (Narok District).
- 104 Mwendwa, H. (1984). Land use in Kisumu District.
- 105 Wahome, E.K. (1984). Soil erosion classification and assessment using Landsat imagery: A case study in Baringo District, Kenya. (Reprinted 1990)
- 106 Peden, D.G., H. Epp & Charles le Durand (1984). Land use in Kericho District
- 107 Peden, D.G. H. Epp & A. Killmayer (1984). Land use in Taita Taveta District. (unpublished)
- 108 Lantieri, D. (1983). Digital analysis of satellite data: A case study of land use in Kiambu District: A note. (unpublished)
- 109 Kuchar, P. (1980). Plants of Kenya: A handbook of uses and ecological status.
- 110 Peden, D.G. & H. Mwendwa (1984). Estimating maize yield using airborne digital photometers. (out of stock)
- 111 Agatsiva, J.L., H. Mwendwa, W. K. Ottichilo, D. G. Peden & J. L. Pilloto (1984). Estimating production of maize using sample photography and a digital photometer. (unpublished)
- 112 Osoro, E. N. (1984). Vegetation map of central Kajiado.
- 113 Ottichilo, W.K. & R.K. Sinange (1985). Differences in the visual and photographic measurements in the estimation of strip widths for aerial censuses of animal populations.
- 114 Durand, Charles le (1984). Land use mapping in Kericho town area using digital analysis in satellite data. (out of stock)
- 115 Mwendwa, H. (1984). Maize harvest forecast for 1984 in Bungoma, Elgeyo Marakwet, Kakamega, Nakuru, Nandi, Trans Nzoia, Uasin Gishu and West Pokot districts.
- 116 Mwendwa, H. (1985). Land use in South Nyanza District.

- 117 Muchoki, C.H.K. (1985). Land use in Nyandarua District.
 118 Ottichilo, W.K. (1985). Land use in Busia District.
 119 Msafiri, F. (1985). A vegetation map of Lolgorien area, Narok District.
 120 Muchoki, C.H.K. (1985). Land use in Muranga District.
 123 Ottichilo, W. K. (1986)). Land use in Siaya District.
 124 Mwendwa, H. (1986). Land use in Uasin Gishu District
 125 Ottichilo, W. K., D. G. Peden, H. Mwendwa (1985). Long rains maize production.
- 126 Wahome, E.K. (1986). Soil erosion types and their distribution in Machakos District.
 127 Ottichilo, W. K. (1986). Long rains maize production in Kenya.
 128Waliaula, F. S. (1988). Plants of Baringo District.
 130Ottichilo, W. K. (1988). Long rains maize and wheat production in Kenya, 1987.
 131Ottichilo, W. K. and R. K. Sinange (1988). Long Rains Maize and Wheat Production in Kenya, 1988.
 132Muchoki, C. H. K. (1988). A Preliminary Survey of the Efficiency of Three Methods Used in Studying Rangeland Vegetation: The Quadrat, Point Centre Quarter, and Line Transect Methods.
 133Kamande, L. (1988). Vegetation Types of Lake Nakuru National Park.
 134 Ndakala j. B (1989). Plants of Kilifi.
 135 Karime O. N. I. (1990). The Changing Land Use Patterns in the Ngorengore/Loita Plains.
 136 Muchoki C H K. (1990) Land Use in Kwale District.
 137 Ottichilo W K. & Sinange R. K. (1990). Long Rains Maize and Wheat Production Trends in Kenya for 1985-1989.
 138 Nganga E.M. and Kamande L. (1990) The Vegetation of Aberdares Mountain Ranges.
 139 Oduori S M. (1990). The Vegetation of Boni and Dodori Game Reserves and the Adjoining Areas.

WORKING DOCUMENTS

Work Programme 1986/87

Maurel, P. (1987). *Inventory of available satellite data in KREMU*. Working Document No. 1

KREMU (1987). *Remote Sensing Facilities and Capabilities of KREMU* (a brochure)

Buigutt, K. S. A. (1987). *Know How We Use the Land* (a brochure)
 Work Programme 1987/88

Annual Report 1987

Pilotto, J. L. (1988). *Vertical aerial photography using 35-mm Nikon system in land use surveys and maize yield estimation: Training manual No. 1*

Work Programme 1988/89

Annual Report 1988

Work Programme 1990-1991

Annual Report 1989.

J. Grunblatt, M. Y. Said, and J. K. Mutira(1989) *Livestock and Wildlife Data Summary for Kenya angelands 1987-1988: DRSRS Data Summary No.1*

J. Grunblatt, M. Y. Said, and J. K. Mutira(1989)*Livestock and Wildlife Data Summary for Kenya angelands:1977 DRSRS Data Summary No.2*

B C D E F G H I J K L M N O P Q R S T U V W X Y Z