REPORT
ON
TOPOGRAPHIC MAPPING PROJECT
IN
EAST KENYA
(SEVENTH YEAR)
THE REPUBLIC OF KENYA

FIELD RECONNAISSANCE SURVEY

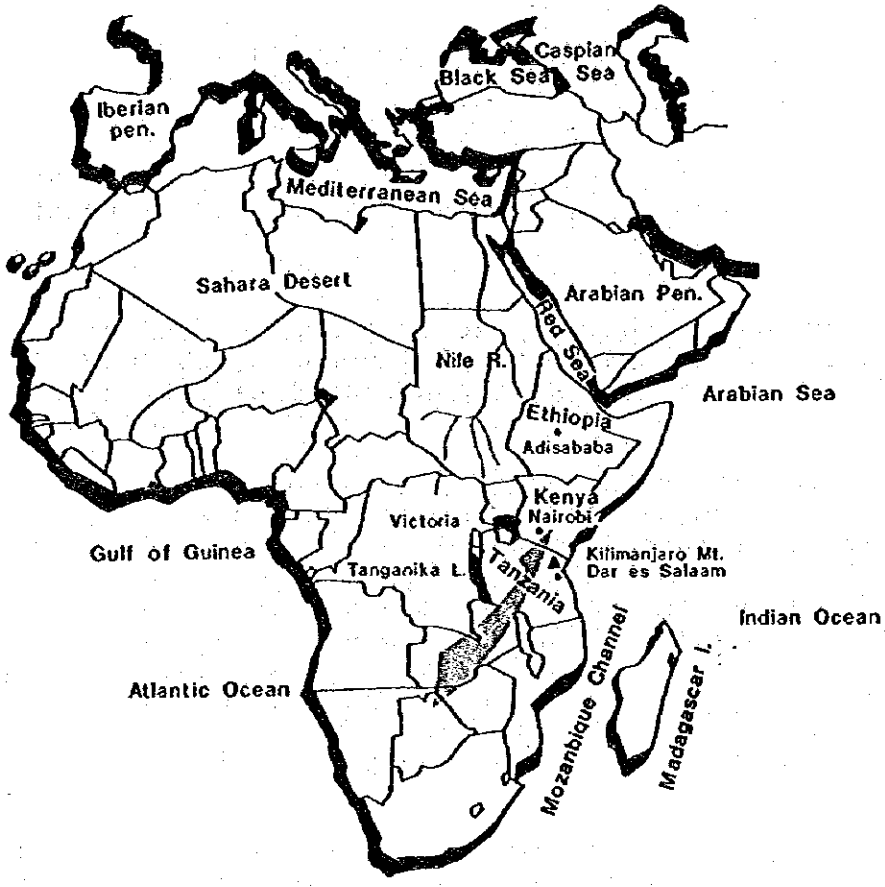
PHOTO INTERPRETATION FOR TANA RIVER DELTA AREA

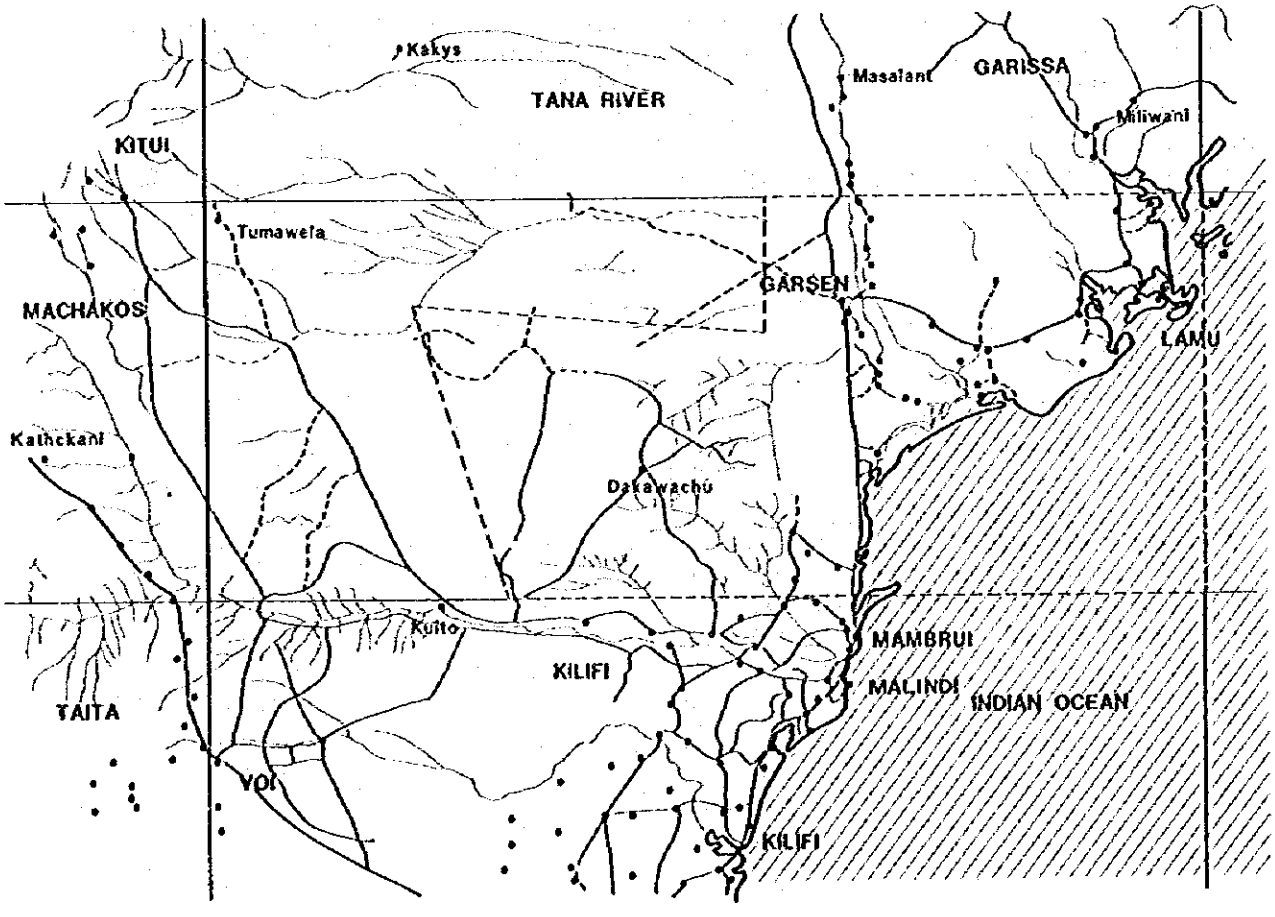
FIELD IDENTIFICATION FOR RANCHING PROJECT AREA

MARCH, 1982

JAPAN INTERNATIONAL COOPERATION AGENCY

Location Map of Project Area





Road Sea and River Project area

LETTER OF TRANSMITTAL

Mr. Keisuke Arita, President
Japan International Cooperation Agency

The Report on the Seventh Year of the Topographic Mapping Project in East Kenya conducted during the period from July 1981 to March 1982 in compliance with your request is herein submitted to you.

The Seventh Year marked the beginning of the production of the land use map and other thematic maps to be used for development of this area on the basis of the national base maps prepared taking the preceding six years, and as its initial stage work, the reconnaissance survey of the entire project area and the survey of the eastern half of the area, namely, the Tana River Delta Area. We are confident that the results accomplished during this period have laid ground for subsequent phases of work and contributed significantly to the transfer of technology involved in the production of thematic maps.

On behalf of the survey team, I would like to express our most sincere appreciation to the officials of the Survey of Kenya, the Kenya Soil Survey, the Mines and Geology Department, and other Kenyan Government agencies concerned as well as those of the Japanese Embassy in Kenya, the Nairobi Office of the Japan International Cooperation Agency and other offices concerned of Japanese Government, who assisted us during the period of the survey work. At the same time, it is hoped that the work for the eighth and subsequent years will be conducted without delay.

March 1982

E. Gojo

Eiji Gojo

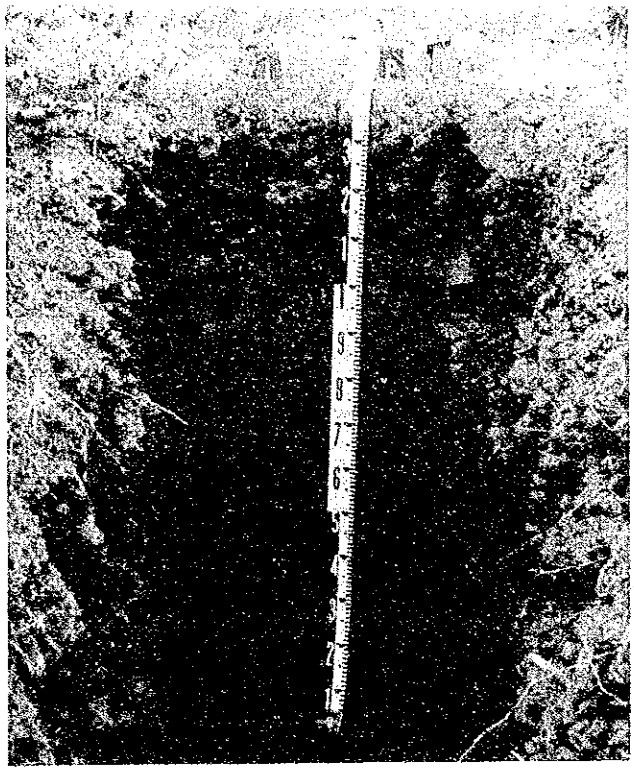
Team Leader,
Topographic Mapping Project
in East Kenya,
International Engineering
Consultants Association

* Vegetation study near Witu ("Witu" Sheet)

  Wooded bushland thicket (2), (WBt-2) is distributed.

* Landform study near air-strip in the Manda Island ("Lamu" Sheet)

  Criff of approximately 4m in height consists of limestones and raised coral reefs are distrubuted.



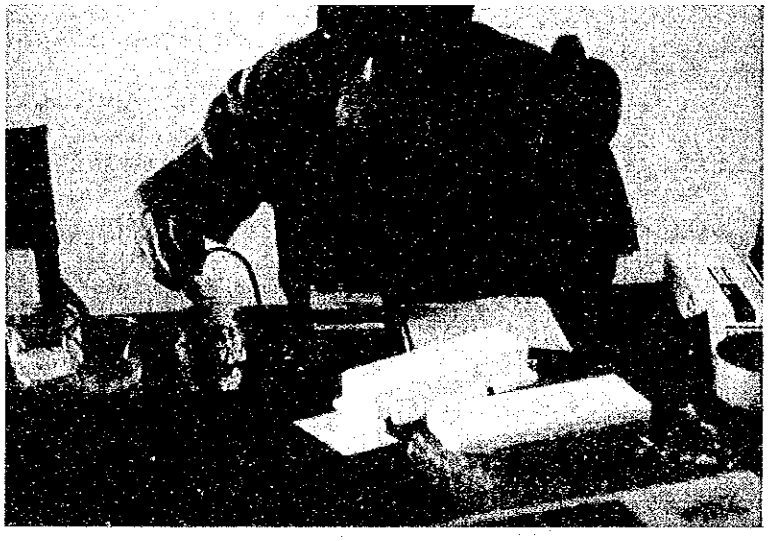
* Soil study near Ida-Sa-Godana Ranch ("Wema" Sheet) Orthic Solonetz is widely distributed.

* Geologic study near Witu ("Witu" Sheet)

  Limestones including shells, corals and spines of sea urchin are distributed.

* Electric prospecting work about 20km northwest of Milhoi ("Mkunumbi" Sheet)

  Using car battery, apparent earth resistivity was measured.



* Laboratory in base camp

  Electric conductivity of soils was measured.

REPORT ON TOPOGRAPHIC MAPPING PROJECT IN EAST KENYA
(SEVENTH YEAR)

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2. " (Sep. 4, 1981, JMT/SK/KSS)

3. " (Nov. 20, 1981, JMT/SK/KSS)

4. " (Nov. 23, 1981, JMT/SK/KSS)

5. " (Feb. 9 & 12, 1982, JMT/SK/KSS/MG/TRDA)

6. " (Feb. 15, 1982, JMT/SK)

Appendix 1A Legend of Soils and Geology

" 1A-2 Legend of Soils

" 1B Legend of Vegetation/Present Land Use

" 2 Legend of Geology

" 3 Legend of Landform

Chemical Analysis Records of Soil Samples (Attached envelope)

1. Background of Project

1-1. Background

In compliance with the request of Kenyan Government, it was determined to carry out the Topographic Mapping Project in East Kenya (Land Use Mapping) as continuation of the national base maps at scale of 1/50,000 (completed in March 1981) according to the Scope of Work, which was agreed upon between Kenya and Japan in April 1981 and attached to the verbal note, after two pre-feasibility studies conducted in January ∿ February and April, 1981.

1-2. Summary of Entire Program

Summary of entire program as follows:-

(1) Planned Area: Eastern part of Kenya (Tana River Delta Area and Ranching Project Area) Approximately 14,700 km^2 (See Fig. 1)

(2) Planned Work Period: Three years, 1981 ∿ 1983

(3) Item of Works: Information/Data Collection
Aerial Photo Interpretation
Field Identification
Compilation of Thematic Maps
Land Use Capability Analysis
Reporting
Reproduction of Maps and Report

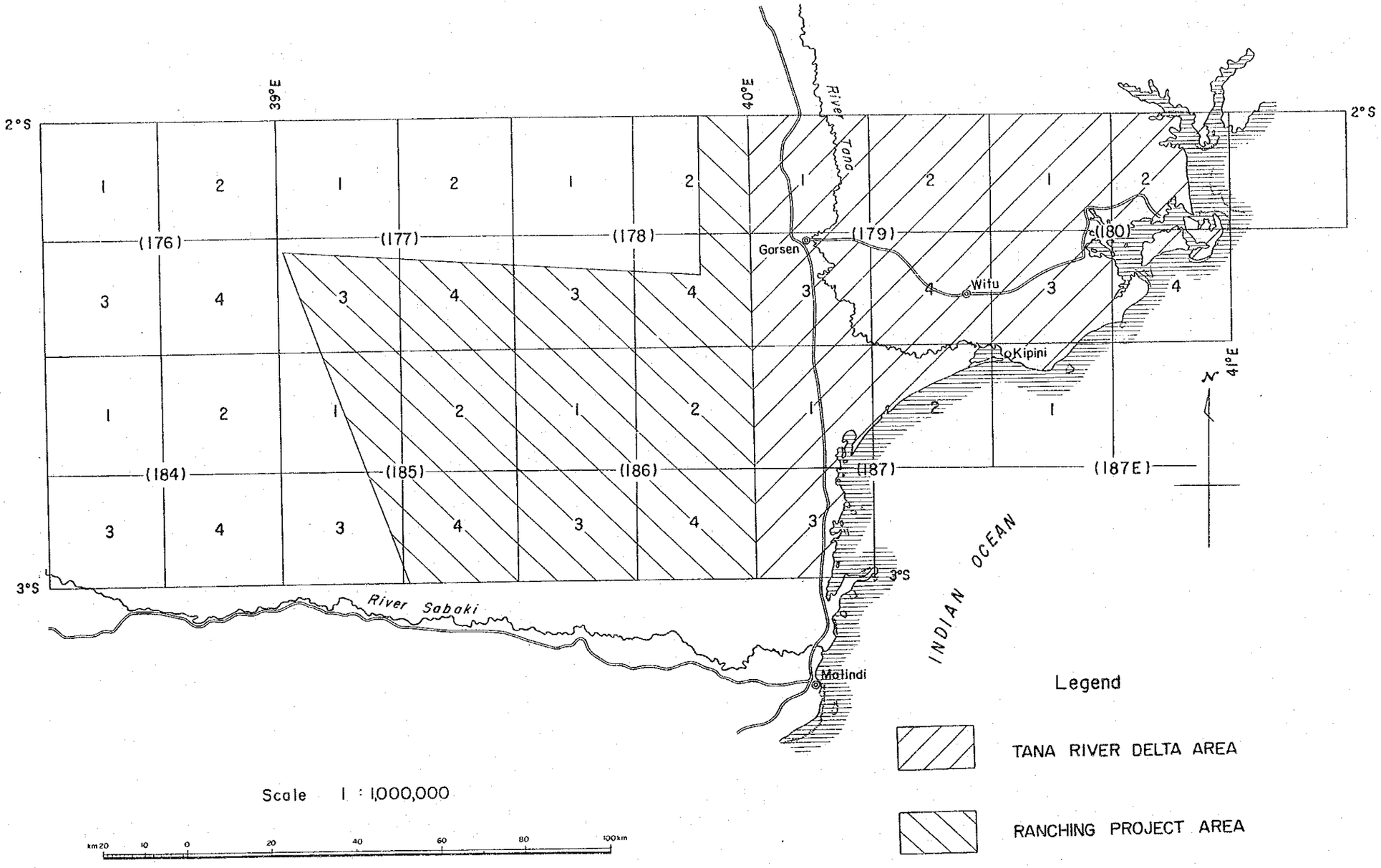


Fig. 1 Location map for land use mapping

Following the suggestion in the pre-feasibility report, it was determined to conduct field reconnaissance survey covering the entire survey areas at earlier stage of works.

(4) Final Results

a. Tana River Delta Area:

Vegetation/Present Land Use Map	1/50,000 (12 sheets)
Landform Classification, Slope and Drinaige Pattern Map	1/50,000 (12 sheets)
Surface Geology and Soil Map	1/50,000 (12 sheets)
Land Use Capability Analysis Map	appropriate scale (1 ∿ 4 sheets)

b. Ranching Project Area:

Vegetation/Present Land USe Map	1/100,000 (4 sheets)
Landform Classification and Drinaige Pattern Map	1/100,000 (4 sheets)
Land Use Capability Analysis Map	appropriate scale (1 ∿ 4 sheets)

Final Report ..... One Set

After discussions between the Kenyan Side and the pre-feasibility study mission, it was determined to produce mono-colour maps (blue print) showing surface geology and soils respectively for both Tana River Delta Area and Ranching Project Area.

2. Outline of Work

Outline of Works done in this fiscal year as follows:-

2-1. Objective and Item of Work

In this fiscal year, works surrounded by solid lines in Fig. 2 "Work Flow Chart" were carried out.

(1) Field Reconnaissance Survey (Entire Area: Approx. 14,700 km^2)

Field Reconnaissance Survey was conducted aiming to examine unified study standards and effective executing policies for subsequent works through understanding of general situation of vegetation/present land use, land forms, soils, surface geology and so on covering the entire survey area.

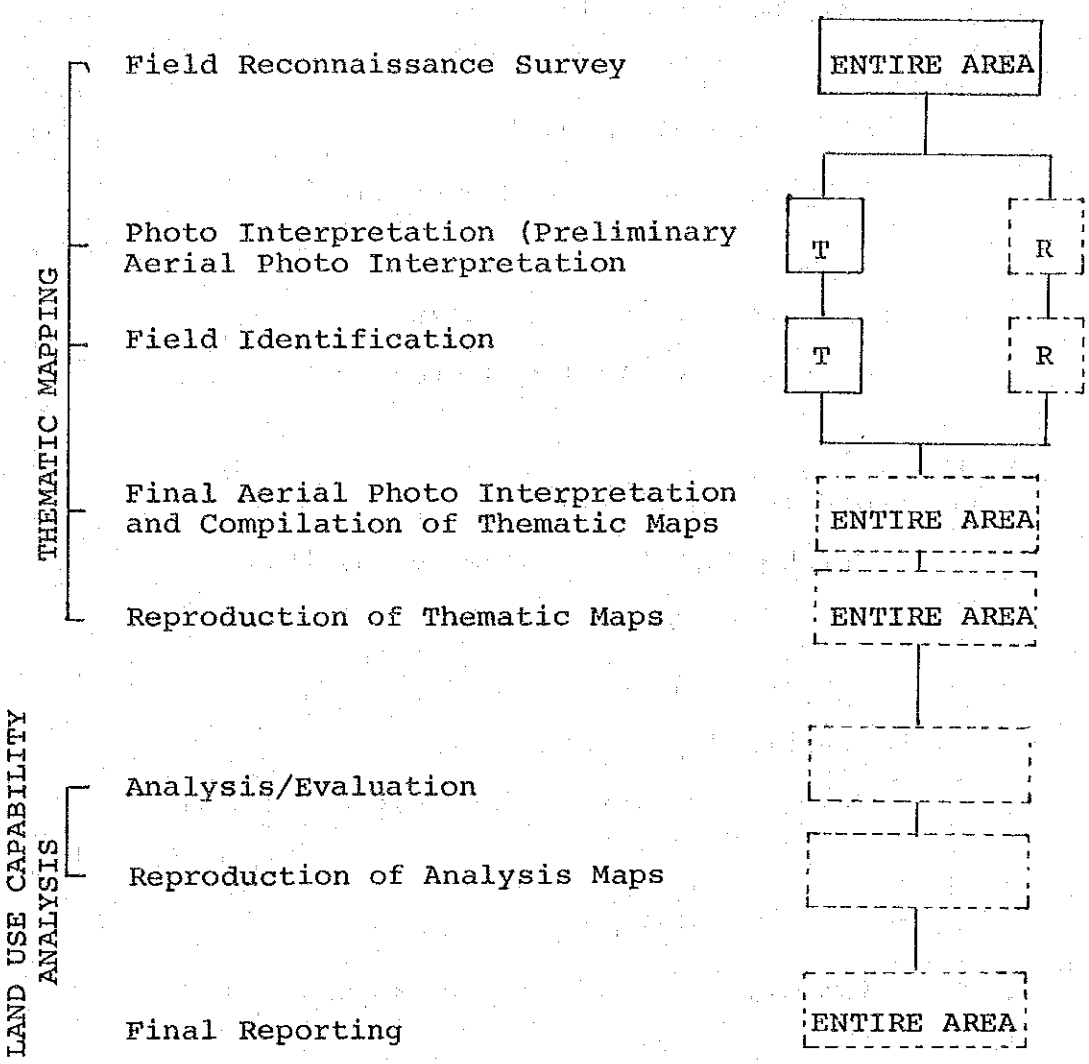
(2) Photo Interpretation (Preliminary Aerial Photo Interpretation etc. Tana River Delta Area: Approx. 7,000 km^2)

Based on results of the Field Reconnaissance Survey and the study of existing documents, preliminary study of each theme (vegetation/present land use, landform classification, soils and surface geology) was conducted in Japan by means of aerial photo interpretations.

(3) Field Identification (Tana River Delta Area: Approx. 7,000 km^2)

Based on results of the Photo Interpretation, site confirmation, supplementary study and other works were done and information/data to compile each thematic map was collected.

Fig. 2 Work Flow Chart



1) "T" shows the Tana River Delta Area and "R" shows the Ranching Project Area.

2) Works surrounded by solid lines were done in this fiscal year.

2-2. Work Period

(1) Field Reconnaissance Survey

Preparations in Japan

July 9, 1981 ∿ July 30, 1981

Field Reconnaissance Survey

July 24, 1981 ∿ September 15, 1981

Works after Return to Japan

September 9, 1981 ∿ September 30, 1981

(2) Photo Interpretation

October 1, 1981 ∿ November 4, 1981

(3) Field Identification

Preparations in Japan

October 29, 1981 ∿ November 19, 1981

Field Identification

November 13, 1981 ∿ February 22, 1982

Works after Return to Japan

February 16, 1982 ∿ March 17, 1982

2-3. Survey Team Members and Their Specialities

See "LIST OF SURVEY TEAM MEMBERS AND THEIR SPECIALITIES".

2-4. Equipment Used

LIST OF SURVEY TEAM MEMBERS AND THEIR SPECIALITIES

Name	Speciality	Field Reconnaissance Survey	Preliminary Photo Interpretation	Field Identification
Eiji Gojo	Team Leader	X	-	X
Sukeshige Buso	Deputy Team Leader(Field Reconnaissance Survey)	X	-	-
Sei Nakajima	Deputy Team Leader(Field Identification), Geology/ Soils	X	X	X
Shoji Ando	Vegetation/Present Land Use and Soils	-	X	X
Tetsuya Ohtsuki	Soils	X	X	X
Eiichi Hayakawa	Landform	-	X	X
Hisao Ohtsuka	Geology/Landform	-	X	X
Makoto Yoshida	Vegetation/Present Land Use	-	X	X
Tohru Nishikawa	Soils	X	X	X
Hayata Kusaka	Soils	-	X	X
Sumio Iida	Landform	-	X	X
Naoya Yunohara	Geology	-	X	X
Yoshiaki Yokota	Vegetation/Present Land Use	X	X	X
Shigeo Suzuki	Coordinator	X	-	X
Hitoshi Hagawa	Mechanical Engineer	X	-	X

Description	Number
Pick Hammer	4
Chisel Hammer	4
Clinometer	8
Binocular	4
Camera	4
Reflecting Stereo Scope	1
Earth Resistivity Measuring Machine	1
Drier for Soil Sample	1
Down Transformer	1
Hand Auger	2
Earth Auger	2
Soil Hardness Meter	4
PH Meter	2
EC Meter	2
Water Purifier	1
Balance	2
Blumeleiss	2
Circle Scale	2

2-5. Field Inspection by Technical Advisor and JICA Official

(1) Presentation and Explanation of Final Results of National Base Map

Mr. Kazuto Nakazawa, Executive Director, JICA

July 31, 1981 ∿ August 8, 1981

(2) Presentation and Explanation of Final Results of National Base Map/Field Reconnaissance Survey

Mr. Minoru Tajima, Deputy Director-General, Geographical Survey Institute (GSI)

July 31, 1981 ∿ August 14, 1981

Mr. Hiroshi Kimura, Development Survey 1st Division, Social Development Cooperation Department, JICA

July 31, 1981 ∿ August 20, 1981

(3) Field Reconnaissance Survey

Mr. Eisaku Tsurumi, Technical Advisor, Head of 1st Geographic Division, Geographic Department, GSI

August 7, 1981 ∿ September 8, 1981

(4) Field Identification

Mr. Eisaku Tsurumi, Technical Advisor, Head of 1st Geographic Division, Geographic Department, GSI

November 13, 1981 ∿ December 4, 1981

Mr. Hideki Murayama, Development Survey 1st Division, Soicial Development Cooperation Department, JICA

November 13, 1981 ∿ December 4, 1981

Mr. Takeshi Hirai, Technical Advisor, Director, Geographic Department, GSI

February 5, 1982 ∿ February 19, 1982

Mr. Hideki Murayama, Development Survey 1st Division,
Soicial Development Cooperation
Department, JICA

February 5, 1982 ∿ February 19, 1982

3. Field Reconnaissance Survey

3-1. Preparations in Japan

Prior to departure for the Field Reconnaissance Survey, the following works were done in Japan.

(1) Documents and information collected by JICA's pre-feasibility study missions were examined.

(2) Aerial photo interpretations were conducted on experimental basis.

(3) Detailed work schedule in Kenya was prepared.

(4) Tentative legend items for respective thematic maps were discussed and prepared.

(5) "Specifications for Seventh Year" was prepared for meetings to be held with the Kenyan Side.

(6) Purchasing, packing and delivery of necessary equipments and documentations for customs clearance, etc., were conducted.

3-2. Summary Progress Record of Work

Year	Month	Day	Description
1981	July	25	Suzuki and Hagawa arrived in Nairobi
	Aug.	02	5 members led by Team Leader arrived in Nairobi
	"	04	Attended the official presentation of final results of national base maps/ Meeting with SK
	"	05	Discussion with SK

Year	Month	Day	Description
1981	Aug.	06	Signing of the minutes of the meeting held on August 4, 1981
	"	06 & 07	Messrs. Tajima and Kimura and Survey team left Nairobi for Malindi via Mombasa
	"	08 & 09	Setting up of base camp at Malindi
	"	10	Messrs. Tajima and Kimura and Team Leader left Malindi for Nairobi
	"	10 ~ 14	Field reconnaissance survey basing at Garsen
	"	12	Mr. Tajima left Nairobi for Japan/ Mssrs. Tsurumi, Kimura and Team Leader left Nairobi for Malindi
	"	16	Mr. Kimura left Malindi for Nairobi
	" ~ "	17 ~ 21	Field reconnaissance survey basing at Galana
	" ~ "	24 ~ 28	Field reconnaissance survey basing at Mokowe
	" ~ "	29 ~ 31	Demobilization from Malindi base camp to Mombasa
	Sep.	01	Moved to Nairobi
	"	04	Meeting with the Kenyan Side
	"	05	Signing of the minutes of the meeting held on September 5, 1981
	"	06	Mr. Tsurumi left Nairobi for Japan
	"	07	4 members led by Deputy Team Leader left Nairobi for Japan
	"	14	Team Leader, Suzuki and Hagawa left Nairobi for Japan

3-3. Preparations in Kenya

An advance party comprising Messrs. Suzuki and Hagawa

arrived in Nairobi on July 25. The work performed by them in Nairobi included:

(1) Set the date (August 4) and procedure of the official presentation to the Kenyan Government of the 1/ 50,000 topographic maps completed at the end of 1980 in consultation with the Japanese Embassy, JICA Nairobi Office, the Survey of Kenya, and preparations made accordingly.

(2) Arranged a meeting with Kenyan side to be held on the afternoon of August 4, and consulted with the Survey of Kenya in preliminary preparation concerning the counterpart, vehicles, drivers, etc.

(3) Arranged the check-up of the vehicles to be presented to the Survey of Kenya from JICA (6 Landcruisers, 2 trucks).

(4) Customs clearance of the equipment and materials air-lifted from Japan involving the Treasuary, the Foreign Ministry and the Customs Office, and 9 crates of 11, excepting 2 unconfirmed, checked out on August 4.

3-4. The First Meeting with The Kenyan Side

The first meeting was held on the afternoon of August 4 in the office of the Director of the Survey of Kenya. (Attended by: Kenyan side - Mr. Kamau, Ag. Director of

Surveys, Mr. Obel, Ag. Assist. Director, Mr. Wainaina, Mr. Aganyo. Japanese Side - Dr. Tajima, Deputy Director-General, GSI, Mr. Kimura, Coordinator, JICA and five other survey team members led by Team Leader). At this meeting, the executing plan of this fiscal year's work was confirmed and supporting arrangements to be made by the Kenyan side during the field reconnaissance survey were agreed upon. (See Appendix 1.)

3-5. Field Work

3-5-1. General

(1) Survey Team Base Camp

The base camp was located at Malindi chalets (boarding facilities comprising family suites unit) in the northern part of the city of Malindi (approximately 25km south of the end of the project area on the Indian Ocean coast) after taking into account such factors as communications with government agencies of both Japan and Kenya, maintenance of vehicles, conditions for off-site work and efficiency. On August 7 and 8, the camping equipment and materials stored in the Mombasa District Survey Office warehouse since the previous year were delivered out to a part of the national road land adjoining the base camp where, with the permission of the police, a materials and supplies tent and a vehicle maintenance pit were set up. After the site work was finished,

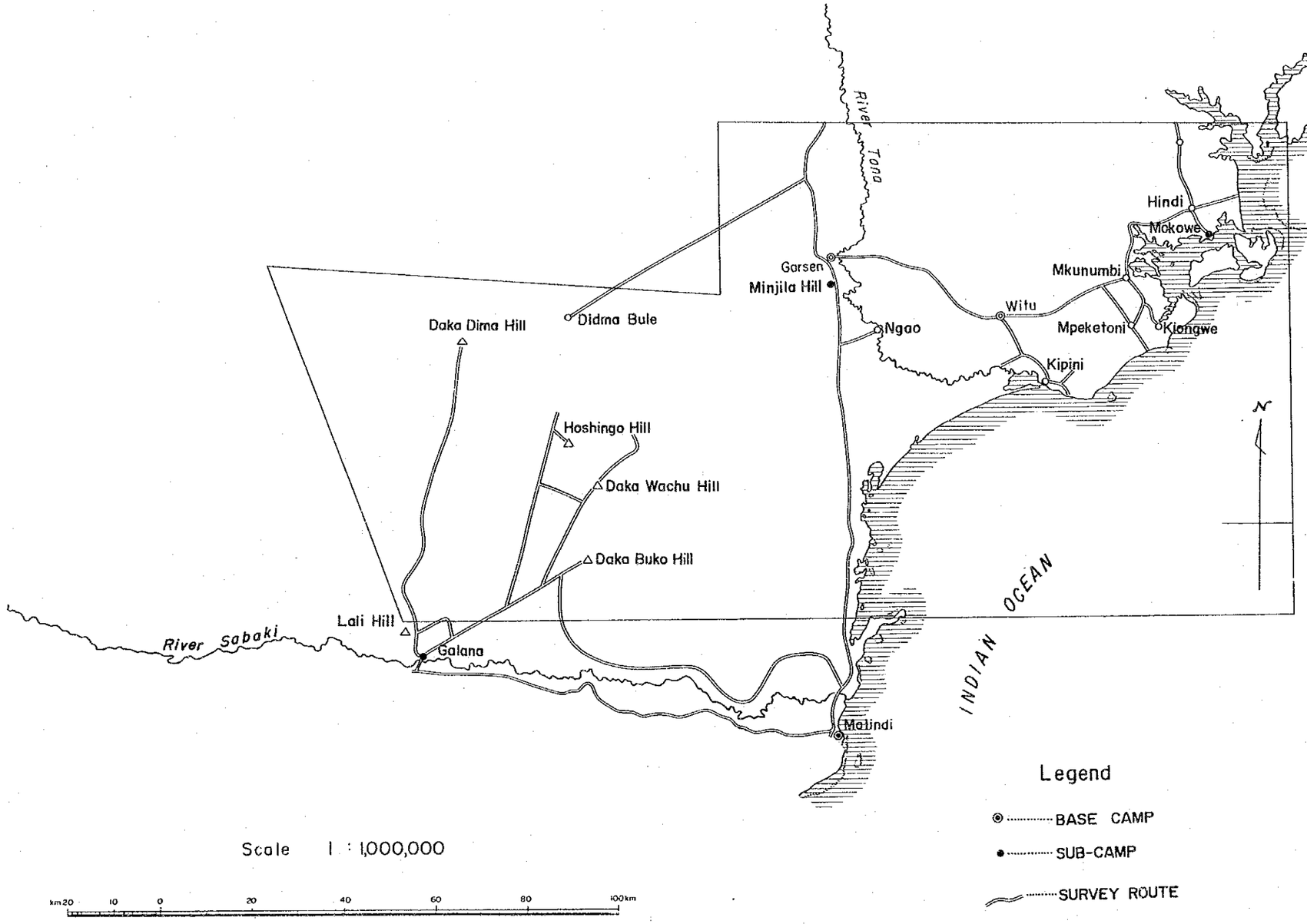


Fig.3 Survey route at reconnaissance

the base camp was removed during August 29 - 31, a part of the survey equipment, and materials were stored in the Mombasa warehouse.

(2) Sub-camp

Sub-camps were set up at three locations, i.e. Garsen (south of Garsen township on old sand dunes along the national roadway), Galana (near the Galana Ranch management office, approx. 90km upstream from the estury of the Galana River) and Mokowe (within the compounds of the police and other government offices), considering the geographical locations in relation to the survey area, survey period, road traffic conditions, security, etc. Gasoline and drinking water were supplied from the base camp by truck except for Mokowe where both are locally available.

(3) Survey Activities

Working out from each sub-camp, the survey team studied the surrounding area for one week. The survey being of a reconnaissance level, the whole survey team was on the same move engaging in observation of vegetation, landforms, geology, and soil observation by auger boring and electric prospecting (Wener's Method) and also the regional accessibilities were studied. Survey routes were as shown in Fig. 3.

(4) Vehicle

From the fleet of vehicles presented to the Survey of Kenya, 4 Landcruisers and one truck were used for this survey. One of the Landcruisers (GK39L) was broken (August 13, front wheel pin and bearings) and fixed temporarily and later repaired in Nairobi on August 17. There was no other accident of breakdown except for flat tires (punctures).

(5) Equipment

Concerning the two crates of those air-lifted from Japan whose arrival had not been confirmed in Nairobi and the importing agent had been instructed to investigate, word was received of their recovery on August 13 from Nairobi. They were checked out on August 17 and transported to the sub-camp at Galana on the following day.

(6) Game Guard

At our request to the Malindi Game Office, one game guard (for each sub-camp) was assigned throughout the site work.

(7) Labourers

Local labourers were hired for auger boring,

electric prospecting, and other site work, mobilization and demobilization of the base and sub camps.

(8) Weather Conditions

The weather conditions during the site work were generally good except that there was one day (August 19) when the road surface became so muddy from rains as to hamper the work efficiency.

3-5-2. Results of Field Reconnaissance Survey

(1) Vegetation and Land Use

The existing vegetation and land use were found, as verified in the field, to mostly match the interpretation of the aerial photos. At the same time, however, there were known following problems.

a) There are some vegetations which appear identical on the photo but actually represent different dominant vegetation types.

b) Boundary is not clear enough in some cases between natural forests and plantations (Cashew nuts, mango, etc.)

c) In some cultivation lands, types of crops grown are different from those seen on the photo because of the secular changes.

d) Some tree and grass types were difficult to be identified with scientific names.

As for a) and b) the specimen survey was conducted on-site and for b) and c), it is necessary to perform hearings. For d), it was decided to ask the Kenyan side to provide a counterpart , who is knowledgeable about the local plants, to work with the team.

(2) Landform Classification

In the reconnaissance survey, such landforms as flood plains/natural levees/river terraces/ dissected fans (?) of the Tana River Delta Area, and raised coral reefs/sand dunes/ interlevee lowlands along the shorelines, and peneplains or dissected peneplains which accounts for the bulk of the inland Ranching Project Area, were observed.

Generally the land is flat and it is difficult to deliniate boundaries simply on-site distinguishing landform. The results of the photo interpretations and auger boring should be also utilized for this purpose. With respect to areas where access is extremely difficult, existing reports and documents are fully utilized in addition to photo interpretation. And for such areas which are hard

to define by landforms, survey should be selectively performed with special attention paid to them.

(3) Soils

Referencing the existing reports and documents of auger boring (16 locations) and pit digging (4 locations) were conducted. As a result, following types of soils were observed.

Orthic Solonetz
Pellic Vertisols
Ferric Luvisols
Fluvisols
Cambic Arenosols
Gleyic Luvisols
Chromic Luvisols

In the subsequent surveys, it is important to properly select locations for auger boring and pit digging by fully utilizing photo interpretation and existing documents. Areas where access is difficult will be simulated from similar natural conditions that can be observed elswhere in the survey area.

(4) Surface Geology

Various types of geology are distributed ranging from the alluvium of the The Tana River Delta Area to Mesozoic or Paleozoic of the

Ranching Project Area but commonly there are few outcrops. Therefore, information will be sought additionally from the existing documents to be supplemented by auger boring results.

From the results of experimental electric prospecting (17 survey lines) for a combined purpose of groundwater survey, it can be assumed that there exists no constant shallow depth groundwater (10 ∿ 20m deep) except for the Tana River and lake areas. Therefore, electric prospecting for this project will be conducted for selected areas.

3-5-3. Supplementary Information/Data Cllection

After field work, information and data were additionally collected in Nairobi. The Meteorological Department, Mines and Geology Department, Forest Department and the National Museum were visited for information and refernce books were purchased at bookstores. The list of the data and documents obtained is given in Table 1.

3-6. The Second Meeting with the Kenyan Side

The Second Meeting with the Kenyan Side was held on the morning of September 4 in the office of Director, the Survey of Kenya. (Attended by: Kenyan side - Mr. Kamau, Ag. Director of Surveys, Mr. Obel, Ag. Assist. Director, SK, Mr. Wainaina, Mr. Aganyo, Mr. Olulo, Ag. Head, KSS

Table 1. List of Supplementary Information/Data Collected in Field Reconnaissance Survey

No.	Description	Format	Size	Page	Original (O) or Copy (C)	Volume	Publisher or Supplier	Purchase (P) or Donation (D)
1	City of Nairobi (Map and Guide)	Map			O	1	Survey of Kenya 1978	D
2	Topographic Map (East Kenya)	"			O	2 shts. 1 set	Meteorological Department	D
3	Mean Monthly Rainfall Map of East Africa	"			O	"	" "	D
4	Probability Map of Annual Rainfall of East Africa	"			O	"	" "	D
1	The Tree of Kenya	Book	B5	105	O	1	Kenya Literature Bureau	D
2	Tropical Wild Flowers	"	"	200	O	1	Hulton Educational Publications	D
3	The 1977 Catalogue of Government Publications	"	"	85	O	1	The Government Printer	D
4	African Tree	"	"	64	O	1	Hangroaves Company, Inc.	D
5	Climatelogical Statistics for East Africa. Part-1 1975	Data Table		92	O	1	Meteorological Department	D
6	Summary of Rainfall in Kenya and Seychells. Part-1 1959	"		34	O	1	" "	D
7	Summary of Rainfall in Kenya and Seycheils. Part-1 1960	"		34	O	1	" "	D
8	Summary of Rainfall in Kenya. Part-1 1963	"		38	O	1	" "	D
9	Summary of Rainfall in Kenya. Part-1 1965	"		39	O	1	" "	D
10	Summary of Rainfall in Kenya. Part-1 1966	"		39	O	1	" "	D
11	Summary of Rainfall in Kenya. Part-1 1969	"		41	O	1	" "	D
12	Summary of Rainfall in Kenya. Part-1 1973	"		40	O	1	" "	D
13	Meteorological Data Recorded at Agricultural, Hydolological and other regional stations in Kenya 1966 - 67	"		167	O	1	" "	D
14	Meteorological Data Recorded At Agricultural, Hydolological and Other Regional Stations in Kenya 1968	"		113	O	1	" "	D
15	Meteorological Data Recorded At Agricultural, Hydolological and Synoptic Stations in Kenya 1969	"		127	O	1	" "	D

No.	Description	Format	Size	Page	Original (O) or Copy (C)	Volume	Publisher or Supplier	Purchase (P) or Donation (D)
16	Meteorological Data Recorded at Agricultural, Hydolological and Synoptic Stations in Kenya 1970	Data Table		129	O	1	Meteorological Department	D
17	" " " 1971	"		131	O	1	" "	D
18	" " " 1973	"		139	O	1	" "	D
19	" " " 1974	"		153	O	1	" "	D
20	The Weather of East Africa During 1964	"		56	O	1	" "	D
21	" " 1965	"		56	O	1	" "	D
22	" " 1967	"		52	O	1	" "	D
23	" " 1968	"		51	O	1	" "	D
24	" " 1969	"		51	O	1	" "	D
25	" " 1970	"		52	O	1	" "	D
26	" " 1971	"		52	O	1	" "	D
27	" " 1972	"		53	O	1	" "	D
28	" " 1973	"		54	O	1	" "	D
29	" " 1974	"		54	O	1	" "	D
30	Monthly and Annual Rainfall in Kenya During the 30 years 1981 to 1960	"		172	O	1	" "	D
31	List of Publications 1970	Book	B5	16	O	1	East African Meteoro-logical Department	P
32	A Rivised List of Kenya Grasses	"	"	82	O	1	The Government Printer	D
33	A Study of the Plant Ecology of Coast Region of Kenya	"	"	54	O	1	" "	D
34	A Numbered Check-list of Trees, Shrubs and Noteworthy Lianes Indigenous to Kenya	"	"	67	O	1	" "	D
35	Common Trees of the Highveld	"	"	99	O	1		D
36	Common Poisonous Plants of East Africa	"	"	254	O	1		D

	Description	Format	Size	Page	Original (O) or Copy (C)	Volume	Publisher or Supplier	Purchase (P) or Donation (D)
37	East African Grasslands	Book	B5	95	O	1	Prestige Book-Sellers	D
38	Report on the Agro-Ecological Zones Project	"			O	1	Text Book Centre	D
39	Flora of Tropical East Africa Alicmataceae	"		15	O	1	" "	D
40	" " Cactaceae	"		6	O	1	" "	D
41	" " Cabombaceae	"		3	O	1	" "	D
42	" " Foreword and Preface	"		12	O	1	" "	D
43	Geology of the Hadu-Fundisa Area, North Malindi	"	B5	62	O	1	Ministry of Commerce & Industry Geological Survey of Kenya	D
44	Geology of the Voi-South Yatta Area	"	"	48	O	1	" "	D
45	Geology of the Ikutha Area	"	"	37	O	1	" "	D
46	Geology of the Mid-Galana Area	"	"	50	O	1	" "	D
47	Shape of the Sub-Miocene Erosion Bevel in Kenya	"	"		O	1	" "	D
48	Geology of the Enyali-Ndiandaza Area	"	"	27	O	1	Ministry of Natioanl National Resources Geological Survey of Kenya	D
49	Bibliography of the Geology of Kenya 1859 - 1968	"	"	65	O	1	" "	D
50	Geology of the Malindi Area	"	"		O	1	" "	D
51	Geology of the Lali Hills-Dakadima Area	"	"	13	O	1	" "	D
52	The Geology and Mineral Resources of Kenya	"	"	34	O	1	" "	D
53	Rifts and Voleanoes	"	"	128	O	1	Text Book Centre	D
54	Landforms in Africa	"	A4		O	1	" "	D
55	East African Coaste and Reefs	"	"	116	O	1	Prestige Book Sellers	D
56	The Warm Desert Environment	"	B5	88	O	1	Text Book Centre	D
57	Agricultural Research in Tropical Africa	"		193	O	1	" "	D

No.	Description	Format	Size	Page	Original (O) or Copy (C)	Volume	Publisher or Supplier	Purchase (P) or Donation (D)
58	Crop Science	Book	B5	106	O	1	Prestige Book Sellers	D
59	A Tropical Agriculture Ha dbook	"	"	219	O	1	" "	D
60	Souvenir Guide Book to the National Museum of Kenya	"			O	1	National Museum	D
61	Peoples and Cultures of Kenya	"	A4		O	1	" "	D
62	The Book of Kenya	"	B4	207	O	1	Prestige Book Sellers	D
63	Luo-English Botanical Dictionary of Plant Names and Users	"		199	O	1	" "	

Mr. Rachiro, KSS. Japanese side - Mr. Tsurumi, Technical Advisor, GSI, Team Leader and 6 other members. At this meeting, results of field reconnaissance survey and further study policies were explained and subsequent Field Identification schedule for the Tana River Delta Area and contributions to be provided by the Kenyan side were discussed.

3-7. Work after Return to Japan/Sorting and Organizing of Acquired Data

After return to Japan from the field survey work, the survey team performed the following work.

(1) The field notes, photos, soil profile survey records, electric prospecting records, etc. produced during the field reconnaissance survey as well as the data and documents collected were sorted and organized.

(2) The items for the thematic map legends were developed (draft).

a) Vegetation and land use map

Vegetation is represented mainly in terms of physiognomic classification (Density of crowns and heights). The land use includes cultivated land, ranch, plantation, settlement (village), salt field, air-strip, etc.

b) Landform classification map

The classification is based on "The Definition of Landforms" supplied by KSS. But some modifications were made of the lowland classification.

c) Soil map

The FAO/UNESCO World Soil Map Legend is applied.

d) Geology map

In addition to geologic ages, rock facies classifications are included. Classification boundaries are in conformity with the landform classification, consideration is given so.

4. Photo Interpretation

4-1. Study of Existing Documents

From the documents collected by the JICA preliminary survey mission and those additionally acquired, the survey area was studied in terms of vegetation, landforms, soils, and geology.

4-2. Preliminary Aerial Photo Interpretation

Based on the results of the field reconnaissance survey and study of existing documents, preliminary aerial photo interpretation was conducted of the Tana River Delta Area. The classification applied for interpretation was based on the proposed legends of the respective thematic maps.

With respect to the vegetation/present land use and landform classification, interpreted boundaries were delineated on the aerial photos and such areas that required field verification were marked. Soils and surface geology were delineated on phots by roughly estimated boundaries utilizing the interpreted boundaries of vegetation and landforms.

4-3. Preparation of Photo Interpretation Maps

The existing vegetation and land use, landforms, soils, surface geology as interpreted from and delineated on the aerial photos were transferred onto the 1/50,000 topographic maps to make Photo Interpretation Maps.

4-4. Examination of Auger Boring Locations for Soil Survey

For soil survey, the candidate locations for auger boring and pit digging were examined taking into account the result of preliminary survey and road conditions.

5. Field Identification

5-1. Preparations in Japan

Preparations prior to the departure for the field identification included:

(1) The legend items (draft) for the respective thematic maps were modified in part and a revised plan was made. Major modifications made included:

a) Physiognomic classification of "Rangeland Management and Ecology in East Africa" by D.J. Pratt and et al is applied.

b) Lowland classifications were studied carefully in a series of meetings in an effort to systematize it.

(2) Proposed locations of auger boring and pit digging for soil survey were summarized on the maps.

(3) A detailed program for field activities was made.

(4) The progress of work after the field reconnaissance survey schedule, classifications for the respective thematic maps (modified), were organized into documents (in English) for a meeting with the Kenyan side.

(5) Acquisition of necessary equipment and materials, their crating, shipping, paper work for customs clearance.

5-2. Summary Progress Record of Work

Year	Month	Day	Description
1981	Nov.	14	Messrs. Tsurumi and Murayama, Deputy Team Leader, Suzuki and Hagawa arrived in Nairobi
	"	17	Discussion with SK
	"	20	Meeting with SK
	"	21	11 team members led by Team Leader arrived in Nairobi
	"	23	Meeting with Kenyan side
	"	25	Signing of the Minutes of the meeting held on November 20 & 23, 1981
	"	25 ~	Left Nairobi for Malindi via Mombasa
	"	26	
	"	27 ~	Setting up of base camp at Malindi
	"	28	
	"	29	Mr. Murayama left Malindi for Nairobi
	Dec.	01 ~	Field identification basing at Garsen
	"	07	
	"	06	Team Leader left Malindi for Nairobi
	"	09	Team Leader left Nairobi for Japan
	"	11 ~	Field identification basing at Garsen
	"	22	
	"	23	New vehicles delivered to JMT
	"	25 ~	Study of Kurawa and Fundisa areas basing at Malindi
	"	27	
	"	28	Comprihension of eastern half, the Tana River Delta Area
1982	Jan.	05 ~	Field identification basing at Mokowe
	"	23	
	"	26 ~	Study of Ngao - Kipini along the Tana River by boat
		27	

Year	Month	Day	Description
1982	Jan.	28 ~	Field identification of Fundisa area basing at Malindi
	"	31	
	Feb.	01 ~	Reporting and demobilization of base camp
	"	04	
	"	05	Left Malindi for Nairobi via Mombasa
	"	06	
	"	08	Messrs. Hirai and Murayama, and Team Leader arrived in Nairobi
	"	09	Meeting with the Kenyan side in the afternoon
	"	12	Meeting with the Kenyan side in the afternoon
	"	13	Detailed discussion at KSS in the morning
	"	14	10 team members left Nairobi for Japan
	"	15	Meeting with the Kenyan side and Signing of the minutes
	"	17	Mssrs. Hirai and Murayama, Team Leader and Deputy Team Leader left Nairobi for Japan
	"	21	Suzuki and Hagawa left Nairobi for Japan

5-3. Preparations in Kenya

Messrs. Nakajima, Deputy Leader, Suzuki and Hagawa arrived at Nairobi (Nobember 14) in advance and performed the following.

(1) On November 17, consultation with SK in a preliminary meeting asking for review of the conference documents prepared by tee Japanese side, and the date for the conference set.

(2) Customs clearance of the equipment and materials air-lifted from Japan and they were checked out November 19.

(3) Check-up of the vehicles to be leased from SK.

(4) Supply of new vehicles originally planned was cancelled and through JICA, arrangement was made to lease 3 vehicles (2 Suzuki Jimnies, 1 Datsan Sanny) from a car rental company.

5-4. The First and Second Meetings with the Kenyan Side

The first and second meetings were held respectively, the first on the afternoon of November 20, (attended by: Kenyan side - Mr. Obel, Ag. Assist. Director, Mr. Wainaina, Mr. Michieka, Ag. Head of KSS, Mr. Kibe, Soils Counterpart, KSS, Japanese side - Mr. Hagio, First Secretary, Embassy of Japan, Mr. Tsurumi, Technical Advisor, GSI, Mr. Murayama, JICA, Mssrs. Yamamoto and Tekenaka, JICA Nairobi Office and other 6 team members including Leader). Both meetings were held in the office of the Director of Surveys.

The two meetings discussed schedule and methodology of the Field Identification, determination of respective thematic map legends and Kenyan support to be provided during field works. (See Appendix 3 & 4.)

5-5. Field Work

5-5-1. General

(1) Base Camp

The base camp was set up at the Malindi Chalet, in the northern part of urban Malindi, at the same location as for the field reconnaissance survey. A part of the national roadway premise adjoining the Chalet was used with permission of the police, for storage of camping equipment and materials which were transported from the Mombasa werehouse. During November 26 - 28, a pit for maintenance of vehicles, a tent for material storage, and aerials for the wireless, were set up as base camp facilities. After completion of the field work, the camping equipment and materials, and survey equipment were stored in the warehouse at Mombasa on February 1 to 4, and the base camp demobilized on February 5.

(2) Sub-camp

The sub-camps were set up at two locations, one at Garsen on the right bank of the Tana River and the other at Mokowe on the left river bank. Both locations were the same as selected for field reconnaissance survey previously. In Garsen, gasoline was not available locally and it was delivered, together with foodstuffs, in trucks from Malindi.

Drinking water was made available from the Garsen Water Bureau. In Mokowe, gasoline supplies were not stable and they were transported from Malindi by truck, though toward the end of the survey, they were available in enough quantities at local gasoline stations. As for drinking water, the Mokowe Water Bureau was turned to for most. Foodstuffs were procured locally.

(3) Vehicles and Drivers

During the first half of the work period, 4 Landcruisers and 1 truck loaned from SK plus 2 units of Suzuki Gimny that were rented, were used. On December 23, new 4 units of Mitsubishi Jeep arrived and after some break-in time, they were fully mobilized from early January. Those jeeps were in good conditions.

One Landcruiser was returned to SK on January 18. With respect to the Isuzu truck, no breakdown was experienced except for flat tires. While out in the field, emergency supplies of food, drinking water, gasoline, tires were taken along. Fortunately, there was no accident experienced except for occasional flat tires.

Seven drivers were assigned by SK to work for

the survey team. Three was a turnover of three drivers during the survey but a crew of 7 drivers was maintained throughout. Their overtime work was paid for by the Japanese side in accordance with the agreement with SK.

(4) Equipment

The equipment (mainly instruments for soil analysis) air-lifted from Japan arrived at Nairobi November 19 and transported to the base camp at Malindi November 27.

(5) Counterparts

As counterparts, two specialists from SK (Mssrs. Katunga and Mwangi) and two from KSS (Mssrs. Kibe and Ochung) joined the Japanese team. The two SK counterparts stayed with the survey team for nearly the whole period and two KSS counterparts for abount 30 days.

(6) Game Guard

In response to our request to District Commissioner of Lamu, regional authorities of Garsen, Witu, Mokowe and the police, a game guard was dispatched to ensure safety of the field work. Due to scheduling, he could not stay with the team for the entire period, but he accompanied the team for a total of 150 man-days, namely, 12 days in December,

and 17 days in January.

(7) Labourers

Labourers were locally hired to help survey work such as pit making, auger boring, electric prospecting, as well as camp setting and demobilization for a duration of two and half months. In January when Mitsubishi jeeps were mobilized for the survey, the crew of labourers were augmented by additional three to increase work efficiency.

(8) Weather conditions

The weather throughout the survey period was good. In December which comprised the first half of the survey period, there was little rainfall except for squalls which occurred around 3:00p.m. lasting 5 - 10 minutes, and it was extremely hot every day the heat reaching 30°C. For safety precautions, therefore, the team tried to make it a rule to leave early in the morning and come back early in the afternoon to the sub-camp.

5-5-2. Execution of Survey Work

By working out of each sub-camp, observations and studies were made of vegetation/present land use, landforms, soils, and geology in accessible areas through auger boring.

As for vegetation, the listing format of KSS was followed. 70 sampling points were selected on the basis of Photo Interpretation Maps prepared in Japan. Villages, cultivated land, various types of facilities were also surveyed.

For landforms, macro-relief, micro-relief and constituent materials were observed and compared with Photo Interpretation Maps for verification.

Soils were also listed according to the KSS formula. Locations of pit and auger boring points were considered on the basis of the Photo Interpretation Maps, and 20 points for pits and 200 for auger boring were selected. Each pit was dug to a depth of 1.5m and auger boring to 2.0m. Soils were listed in terms of texture, colour, depth, composition, property etc. Three samplings were acquired from each pit, totaling 60 sampling.

Geology was studied not only by observation of outcrops but also by means of auger boring to define the geologic composition and history of the survey area. In addition, electical prospecting was conducted at 20 locations near Mkunumbi. In the course of above survey, assistance was provided by the counterparts in such areas as identification of tree species and grass names,

vegetation classification, listing formula in soil survey, review of landform classification, hearings from local residents, and also in control and management of work hours of SK drivers.

5-5-3. Results of Field Identification

The findings of the field survey were noted on photos used in preliminary aerial photo interpretations and Photo Interpretation Maps. There will be eventually incorporated into 1/50,000 maps after final photo interpretation. At this stage of work, the result can be summarized in the schematic maps at a smaller scale for the respective thematic maps, as given in Figs. 4, 5, 6 and 7.

The final plan for the proposed legends for the respective thematic maps covering the survey area was made in Kenya. It was modified in the meetings with the Kenyan officials held in Nairobi during the period February 9 - 15 and finalized as shown in Figs. 1A, 1A-2, 1B, 2, 3, attached to the Appendix 6.

In the following, the vegetation/present land use, landforms, soils, geology of the Tana River Delta Area are described on the basis of the schematic maps and the legends as defined in the above.

(1) Vegetation/present land use

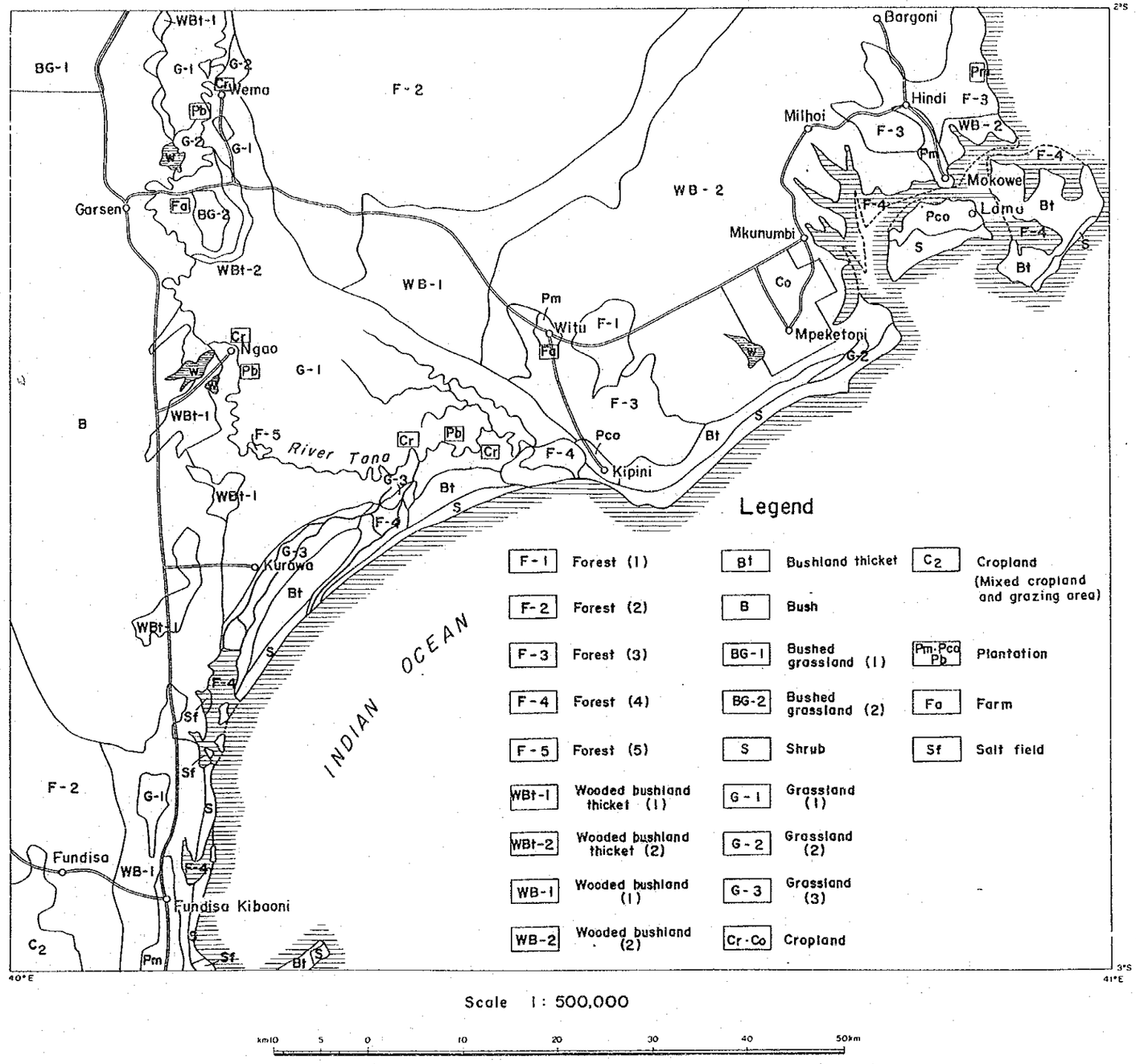


Fig.4 Schematic map of Vegetation/present land use

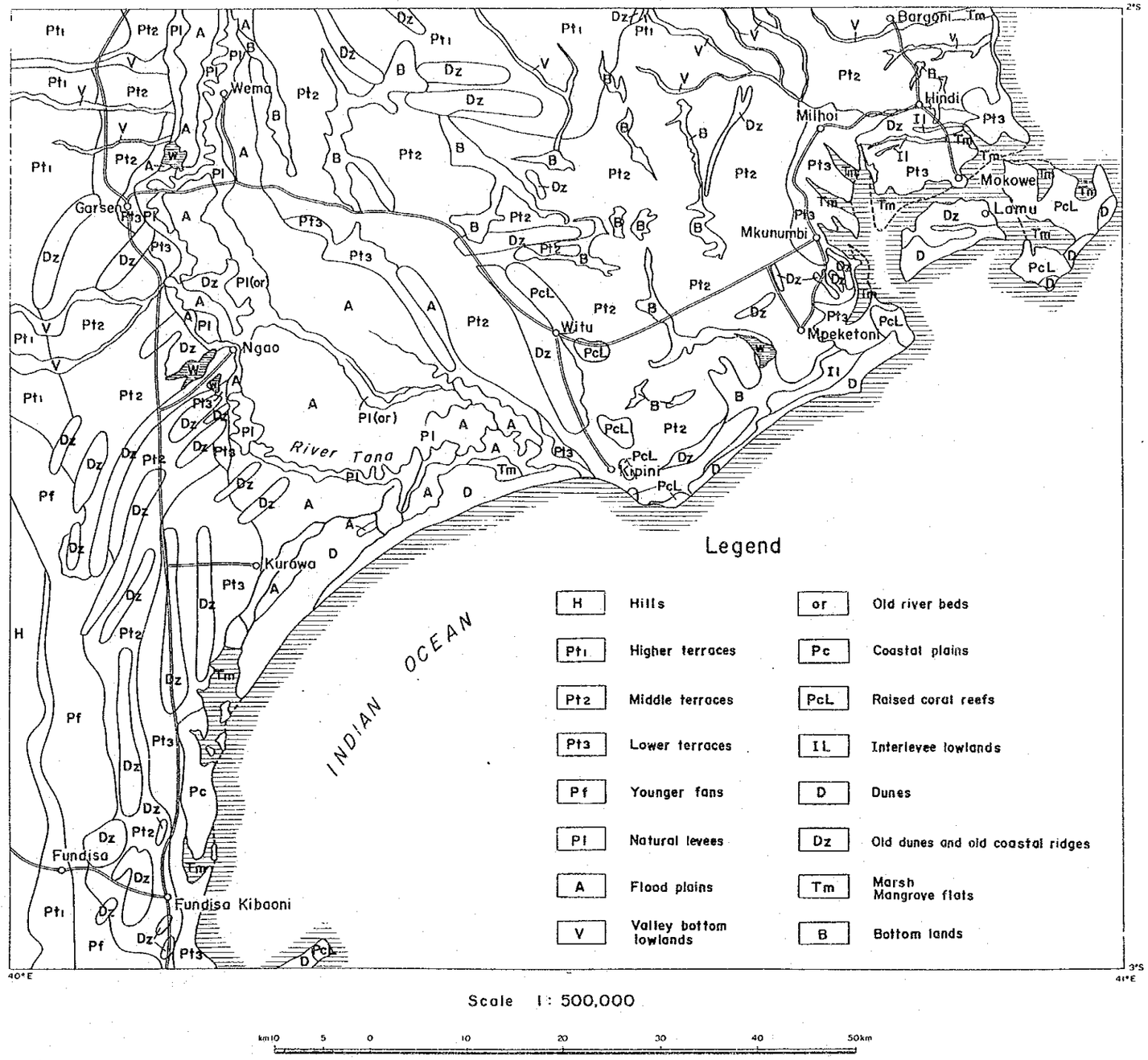
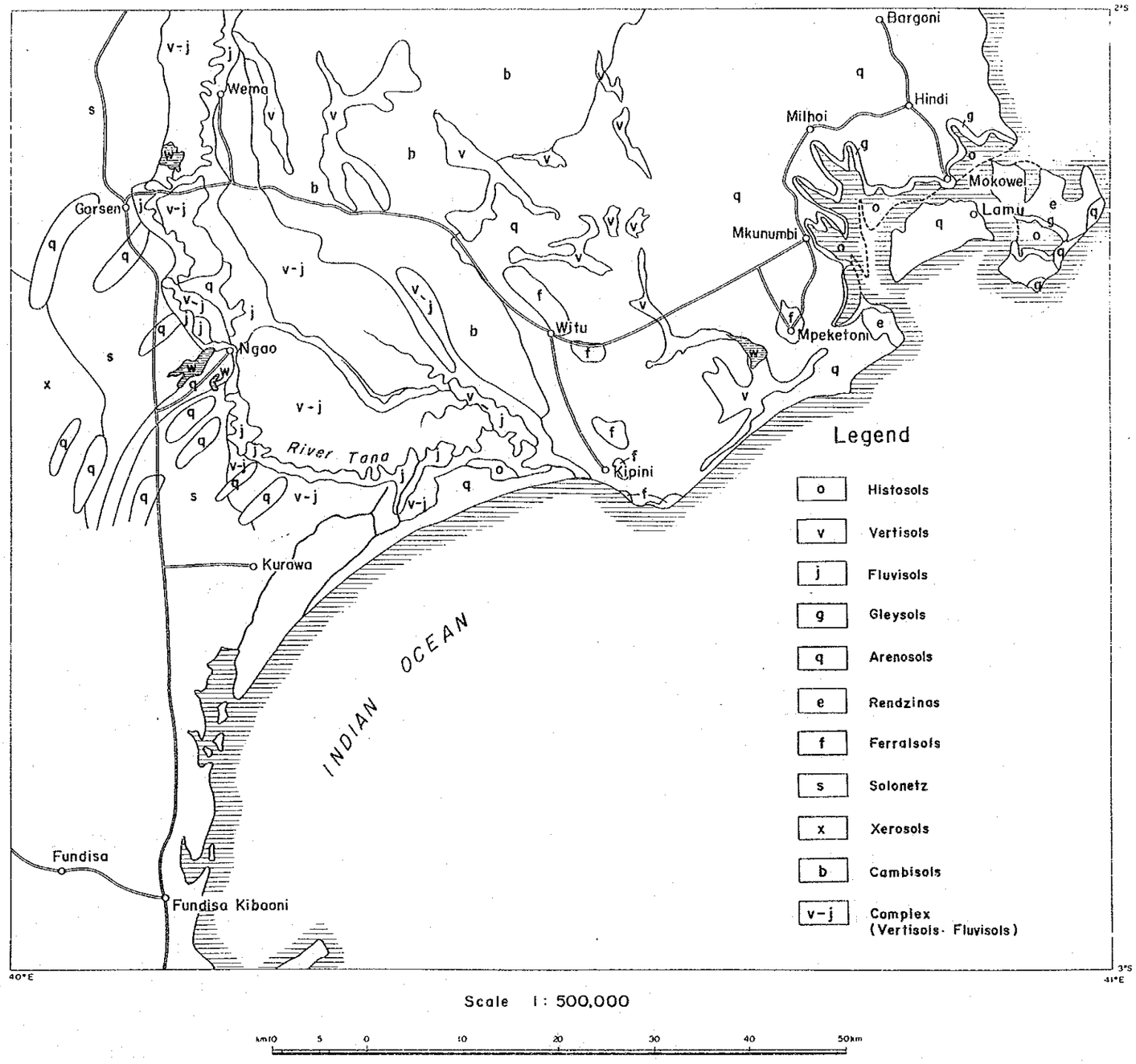


Fig. 5 Schematic map of Landform



Scale 1 : 500,000

km10 5 0 10 20 30 40 50km

Fig.6 Schematic map of Soil

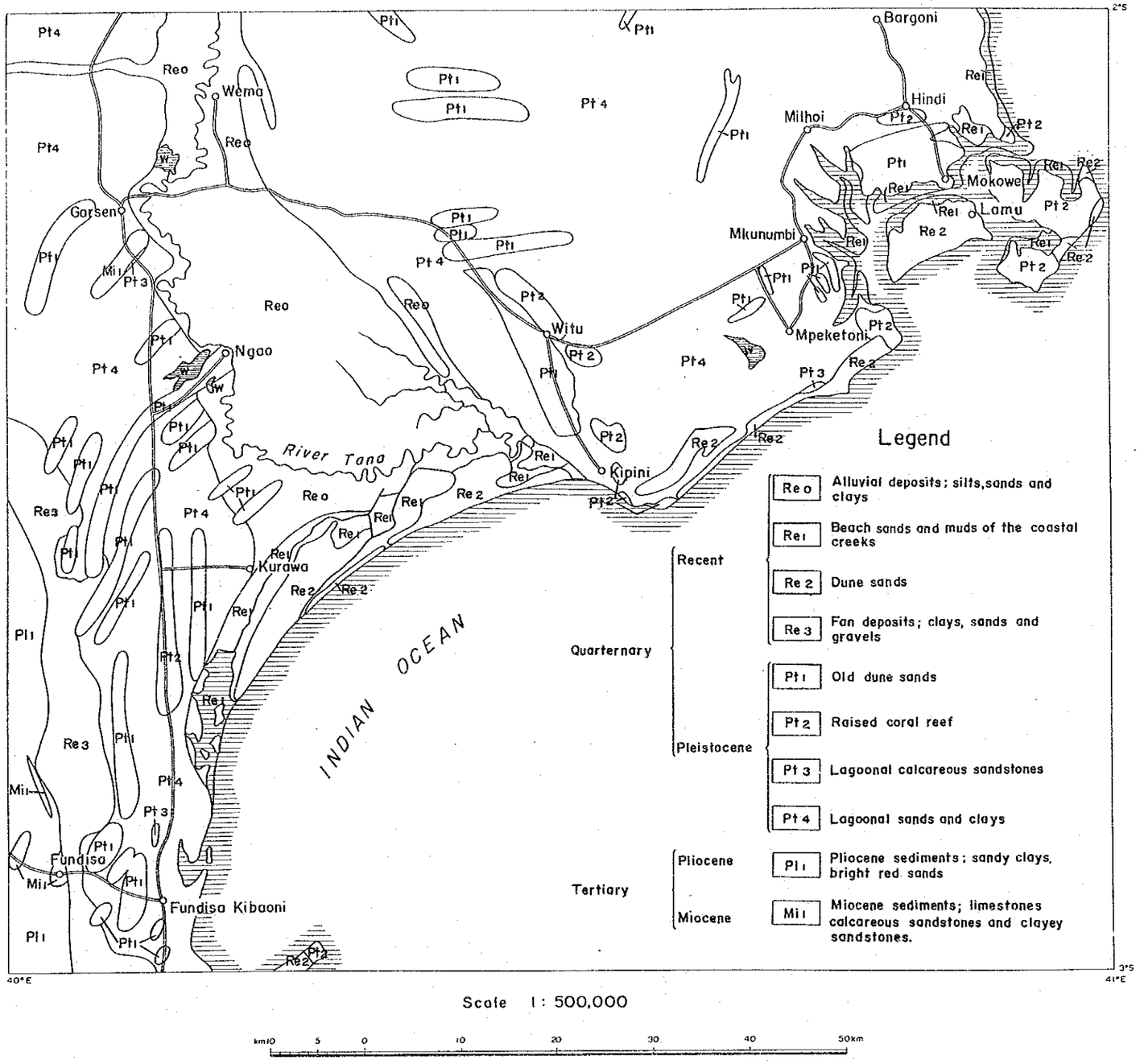


Fig. 7 Schematic map of Geology

Woodland

By physiognomical classification, Woodland is classified into Forest, Wooded bushland thicket, Wooded bushland. Forest is further divided, by dominant species, into 5 types. (F-1, F-2, F-3, F-4, F-5). F-1 is climax forest type as found east of Witu. F-4 is a mangrove grove type found on the sea coast and estury. F-2 and F-3 have an average height of 10m and widely distributed in the survey area.

Wooded bushland thicket has two types (WBt-1 and WBt-2). WBt-1 occurs in old dunes in the Ngao area, and WBt-2 on natural levees on the left banks of the Tana River. Wooded bushland also has two types (WB-1 and WB-2). They are lower in height than F-2 and F-3 and correspond to secondary forests in Japan.

Bushland

By physiognomical classification, Bushland is divided into Bushland thicket, Bush, and Bushed grassland. Bushland thicket (Bt) occurs on the inland side of new sand dune. Bush (B) has an average height of 7m and occurs widely on the right bank of the Tana River. Bushed grassland is divided further into 2 sub-types (BG-1 and BG-2). BG-1 is distributed in the northwest of the survey area, presently used

for the cattle grazing ground. BG-2 is distributed in areas which are flooded during the rainy season.

Dwarf shrubland

Dwarf shrubland refers to shrub (S) alone here and it is distributed on the sea side of new sand dune.

Grassland

Grassland is classified by dominant species, into three types (G-1, G-2 and G-3). G-1 occur widely on the flood plains along the Tana River, G-2 in marsh land, and G-3 on the inland side on the mangrove grove (F-4) in the coastal area.

Cultivation land

Cultivation land consists of two main types of Cropland and Plantation. Cropland (Cr, Co) is for cultivation of rice, corn, cotton, sesame, bananas, etc., and Cropland (C2) is cropland mingled by grazing land. Plantation (Pm, Pco and Pb) is of cashew nuts, coconuts, bananas mixed with mangos, whereas P2 refers to plantations not well taken care of.

Farmland

Farmland has one type only, Farm (Fa), and it refers to the land where cattle is raised in

the stacked ground.

Others

Town (T) refers to an area with a high density of permanent dwellings, whereas Village (V) indicates a group of housing. Salt field (sf) is distributed in to Kurawa area. Air strip (Ab, Am and Ag), and Motorable road (Ra and Rd) are classified according to surface conditions. Pan and Pond (P) is to be represented according to the 1/50,000 topographic map. Barren land (Bl) is bare land with no growth of vegetation.

(2) Landforms

The survey area is divided by landform features, into three types of areas, namely, the left river bank area consisting mainly of middle terraces, alluvial plains of the Tana River with extended flood plains, and the right river bank area consisting of hills and terraces of three levels.

Left river bank area

Higher terraces (Pt1), Middle terraces (Pt2), Lower terraces (Pt3)

Higher terraces are 50 - 60m in elevation with a relative height of about 10m,

occurring north of Pandango. Middle terraces are 10 - 30m with a relative height of several meters occurring widely from Witu to Milhoi. Lower terraces are less than 10m in elevation with a relative height of several meters, occurring in the Mokowe area. They are all composed of sandy sediments.

Old dunes and old coastal ridges (Dz), Dunes (D)

Old dunes and old coastal ridges are distributed from north of Pandango to south of Witu, and further to west of Milhoi, Hindi and north of the Lamu island, whereas dunes occur in coastal areas from Kipini, Lamu island and Manda Island. Both present features of hills or micro-relief land and composed of sandy sediments.

Bottom lands (B)

This is a basin-like lowland with little hydrology. This type of land is distributed south of Lake Kenyatta, north of Witu, west of Mkunumbi, in varying forms. It is made of silt-clay sediments.

Raised coral reefs (PcL)

This is distributed in most of Manda Island, east of Mpeketoni, north of Mokowe, from

Kipini to Witu. They are divided, by age, into those with elevations ranging from 10m to 15m, and others of 18 - 22m in elevation.

Valley bottom lowlands (V), Marsh, Mangrove flats (Tm)

Valley bottom lowlands are distributed upstream in the Milhoi area, while Marsh and Mangrove flats occur on the coastal area northeast of Hindi. Both are composed of siltic sediments.

Interlevee lowland (Il)

This is distributed on the inland side of dunes occurring from Kipini to Manda Island partly marshland. It is composed mainly of siltic sediments.

Tana River Alluvial Plain

Flood plain (A)

Flood plains are distributed widely along the Tana River. They are about 6m in elevation at the south end, and about 24m at the north end. They consist mainly of clayish river sediments. They are totally flooded during the rainy season.

Natural levees (Pl), Old river beds (Or)

Natural levees are distributed along the

Tana River in extending strips. With a relative height of several meters, it is composed mainly of sandy sediments. Old river beds are distributed in the Wema, Garsen and Shirikisho areas and made of soft siltic sediments. It has oxbow lakes with constant water and marsh land.

Old dunes and old coastal ridges (Dz), Dunes (D)

Old dunes and old coastal ridges are distributed north and south of Ngao, and dunes are from Kipini to Kurawa as if to block Tana River. Composed of sandy sediments, they present features of hills and micro-relief land.

Right Bank Area

The right bank consists of hills in the south and terraces.

Hills (H)

Composed of the Tertiary limestones and sandstones, this forms the Fundisa Hills. Ranging in elevation from 50m to 190m, and 50 - 30m in relative relief, they make very gentle slopes.

Younger fans (Pf)

Distributed on the eastern side of the Fundisa Hills, they are composed mainly of

sandy sediments.

Higher terraces (Pt1), Middle terraces (Pt2), Lower terraces (Pt3)

Higher terraces are distributed west of Garsen, Middle terraces west of Ngao, and Lower terraces in the Kurawa area. The sediments are finer compared with the left river bank, and siltic to clayish.

Old dunes and old coastal ridges (Dz), Dunes (D)

Old dunes and old river beds are distributed in several belts from Garsen to Fundisa, forming small hills. Dunes occur in Ngomeni Peninsula. They are all composed of sandy sediments.

Coastal Plains (Pc)

Distributed in Fundisa and north of Kibaoni, there are composed of slit-sand sediments.

Raised coral reefs (PcL)

These are distributed on the tip of Ngomeni Peninsula.

(3) Soils

Soils of the survey area can be classified into ten major types.

Solonetz (s)

Solonetz which is characterized by concentration of sodium occur widely in the right river bank of the Tana River. Solonetz was formed in a semi-arid climate.

Xerosols (x)

This is distributed widely on the right bank of the Tana River and west of Garsen. Like Solonetz, Xerosols was formed in a semi-arid climate.

Vertisols (v), Fluvisols (j)

Vertisols and Fluvisols are distributed widely in mosaic shapes in the Tana River Alluvial Plains. Generally, Vertisols is dominantly present in the flood plain and Fluvisols on the natural levee.

Cambisols (b)

Cambisols appear widely on the left bank of the Tana and north of Witu. This type of soil was formed under more humid climatic conditions compared with those of Vertisols and Fluvisols.

Arenosols (g)

Consisting of coarse quartz sands, Arenosols is widely distributed on the left bank of the Tana River from east of Witu to Hindi. Looking redish, because of high contents of iron

oxicide, and coarse, Ferraric Arenosols is found scatteredly in the old dunes of the Ngao area.

Ferralsols (f)

Ferralsols which is characterized by oxidized B horizon is distributed in belts over the raised coral reefs occurring from Witu to Kipini. Also it is found scatteredly in Mpeketoni and south of Hindi.

Histosols (o), Gleysols (g)

Having thick humic horizon, Histosols appears in the estury of the Tana River, Mpeketoni to coastal areas of Mokowe. On their inland side is distributed Gleysols accompanied by high level groundwater.

Rendzinas (e)

Immature soils occurring on limestones, Rendzinas is distributed mainly on the raised coral reefs of Manda Island.

Those soil names that were given in the course of field survey are subject to change after the chemical analysis data are made available.

(4) Geology

Miocene Deposit (Mil)

Composed of limestones with high contents of shell fish fossils in the main and calcareous sandstone and clayish sandstones, these are distributed in the Fundisa Hills and Minjila Hills (south of Garsen).

Pliocene (Pll)

Composed mainly of dark redish brown sands and dark brown sandy clays, these are distributed widely in the Fundisa Hills. The former is accompanied by gravel beds, consisting of granule of quartzite, and the latter by finer grain limestones and sea shell fossils.

Pleistocene Deposit

Lagoonal sands and clays (Pt4)

Composed mainly of sands and clay, these are distributed in most of the survey area. Clays consist of dark gray - dark brown sandy clays in the main accompanied by granule of limestones and sea shell fossils. Very similar to pliocene dark brown sandy clays. Sands are mostly light yellowish brown and fine to medium in grain size.

Lagoonal calcareous sandstones (Pt3)

Composed mainly of light brown - grayish white calcareous sandstones of medium to

coarse grain sizes. Lamina and sand pipes are well developed. Distributed in Fundisa, north of Kibaoni and southeast of Mpeketoni.

Raised coral reefs (Pt2)

Composed of light yellowish - redish brown conglomeratic or beded reef limestones, there are distributed west of Kurawa, in small hills from Witu to Kipini, east of Mpeketoni, south of Hinde and Manda Island. The limestones contain large amounts of coral, sea shells, spines of sea urchins, etc.

Old dune sands (Pt1)

Composed mainly of redish brown - yellow grayish brown sands of fine to coarse sands, these present features of hills and micro-relief land. The old dune sands occur east of the Fundisa Hills in the north-south direction, in the Ngao area in the north-east- southwest direction, in the Witu area in the east-west direction, and northeast of Milhoi in the northeast-southwest direction.

Recent Deposit

Fan deposits (Re3)

These are distributed along the eastern side of the Fundisa Hills. Composed mainly of

clays originating from pliocene dark brown sandy clays and accompanied by pebbles of Miocene limestones or quartzite.

Dune sands (Re2)

Composed of light yellowish white - light yellowish brown fine to medium size grain sands, they are distributed in strips along the present coasts.

Beach sands and muds of the coastal creeks (Re1)

Coastal sands consist of white - light yellowish white coarse to fine grain size sands forming the present shorelines. The muds of coastal creeks consists of black - dark brown clays and are distributed in areas affected by tides. In areas where mangrove grows, humic horizon is developed.

Alluvial deposits (Re0)

Composed of light yellowish gray - redish brown silts, sands and clays, they are distributed in the alluvial plains formed by the Tana River.

5-5-4. Supplementary Information/Data Collection

After the field survey work was finished, supplementary information/data were collected in Nairobi mostly in the forms of reference books purchased

at ordinary bookstores. The list of the collected information/data is given in Table 2.

5-6. The Third, Fourth and Fifth Meeting with the Kenyan Side

The Third and Fourth meetings were held in the office of Director of Surveys on the afternoons of February 9 and 12 respectively. (Attended by; Kenyan side - Mr. Kamau, Ag. Director of Surveys, Mr. Obel, Ag. Assist. Director, SK, Mr. Wainaina, Mr. Ndunda, Mr. Katunga, Mr. Mwangi, of SK; Mr. Gachene, Mr. Kibe, Mr. Ochung, of KSS; Mr. Hamilton, Mr. Kuguru, of Tana River Development Authority. Japanese side - Mr. Hagio First Secretary, Japanese Embassy, Mr. Hirai, Technical Advisor, GSI, Mr. Murayama, JICA, Mr. Takenaka, JICA Nairobi Office, and three survey team members including the leader.) The Fifth meeting was held on the afternoon of February 15 in the office of Director of Surveys. (Attended by: Kenyan side - Mr. Kamau, Ag. Director of Surveys, Mr. Obel, Ag. Assist. Director, SK, Mr. Wainaina. Japanese side - Mr. Hirai, GSI, Mr. Murayama, JICA, 3 survey team members including the leader.)

At these meetings, agreement was reached on the legends for respective thematic maps and plans for the next year phase of survey work were discussed. (Appendix 5 and 6, minutes)

5-7. Work after return to Japan

Following works were performed after return to Japan.

Table 2. List of Supplementary Information/Data Collected in Field Identification

No.	Description	Format	Size	Page	Original (O) or Copy (C)	Volume	Publisher or Supplier	Purchase (P) or Donaition (D)
1	Karibuni Kenya	Book	A4	87	O	1	Text Book Centre	
2	Kenay 1981 - 1982 Uhuru 17	"		288	O	1	" "	
3	Cultural Atlas of Africa	"		240	O	1	" "	
4	Faces of Kenya	"		215	O	1	" "	
5	Geological Map (1:1,000,000)	Map	-	-	O	1	Ministry of Commerce and Industry Geological Survey of Kenya	

(1) The field notes, photos, vegetation sampling survey records soils profile survey records, electric prospecting records, etc. produced in the course of the field work as well as aerial photos and Photo Interpretation Maps were sorted and organized.

(2) Analysis were made of soil samplings.

(3) The report on the Seventh Year Work was produced.

6. Specifications of Thematic Maps

Establishment of specifications for the respective thematic maps is a most basic and important part of the work. Among such specifications, the legends were finally agreed upon by the Kenyan side during this year's work period. Following is the review of the discussions that took place on this subject and problems involved.

6-1. Progress Before Determination of Legend Item

(1) Agreements made after the JICA prefeasibility study mission visit: Based on the findings of the JICA mission made as of April 1981, it was agreed that the legends for the respective thematic maps would be proposed by the Japanese side for consideration of the Kenyan side. As for soils, however, the FAO/UNESCO World Soil Map Legend was agreed to be used in compliance with the desire of KSS.

(2) Review before the start of field reconnaissance survey: Prior to the departure for the field reconnaissance survey (July - September 1981), outlines of legends were considered for the respective thematic maps based on the JICA mission's findings including documents and map information as well as trial aerial photo interpretations. After the field reconnaissance survey, its results were taken into account to work out the following legends for proposal, as previously mentioned.

a) Vegetations are represented mainly in terms of

physiognomical classification and additional types of tree species and grass names. The land use includes cultivated land, ranch, plantation, village, salt field, air-strip, etc.

b) As for landforms the classification is based on "The Definition of Landforms" supplied by KSS, but with some modifications to the lowland classification.

c) For soils, the FAO/UNESCO World Soil Map Legend is applied.

d) With respect to geology, in addition to geologic ages, roch facies classifications are included.

These legend items were applied for the preliminary photo interpretation and preparation of Photo Interpretation Maps.

(3) Preparation of Revised Legends and Consultation with the Kenyan Side:

Prior to the start of the field survey of the Tana Delta (November 1981 - February 1982), the already proposed legends were reviewed again in the light of preliminary aerial photo interpretations, and modified versions were prepared. Major modifications included:

a) For vegetation, the physiognomical classification by Platt and et al is applied.

b) For lowland classifications, attempts were made to include additional items to systematize them.

At the meeting held at the start of the field survey (November 20, and 23, 1981), the revised plan was submitted for consultation with the Kenyan side. The discussions that took place on the subject can be summarized as follows.

a) As for landforms classification, a number of questions and comments were made by the Kenyan side in connection with our attmpts to include additional revised plan, and it was agreed that details would be worked out in consultation with the counterparts in the course of the field work.

b) Soils, the Kenyan side contended that the Soils should be arranged not merely according to the FAO/UNESCO World Soil Map Legend but listed also according to the KSS format (Landforms and geology classifications followed by soil type properties and type names).

c) Geology, KSS commented the Tertiary should be further classified by rock facies.

(4) Finalization of Legends and Consultation with the Kenyan Side:

In the course of the field identification, the details of classification for the landform legend were studied

and agreed to by the counterparts. For vegetation, with assistance of the counterparts, details of the physiognomical classification were established based on the dominant tree species and grass names. As for geology, some modifications were made of the revised plan. Including the above, the final plan for the legends was produced.

The final plan was submitted to the meeting held at the end of the field identification (February 9, 12 and 15, 1982) for discussion, and finalized with some modifications, as shown in the attached figures 1A, 1B, 2, and 3 of Appendix 6, Minutes.

The modifications made at this meeting were as follows.

a) Present land use (timber production, charcoal production, cattle raising, wild life, unused, etc.) should be added to the vegetation legend. Classifications and sub-types were partly changed.

b) With respect to the soil map (geology and soils), it was confirmed that KSS's legend format (mentioned above) should be followed. But in the single-colour map (blue print) representing soils only, soil type names alone should be listed.

c) In response to the opinion of the Mines and Geology Department, some changes were made of classification symbols.

6-2. Future Tasks

(1) As seen in the above, the legends for the respective thematic maps were finalized this year. However, depending on the results of the field survey of the ranching project area, some addition might be made to the legend items.

(2) Based on the legends for the respective thematic maps, cartographic (printing) specifications, including colour design, marginal information, annotation, should be determined after due consultation with the Kenyan side. At the meeting held in February, it was agreed as that the number of colours should be six including the base colour in principle, and this decision is still applicable.

7. Results

The following are submitted as results of the Seventh Year Work.

(1) The Report on the Seventh Year Work (with the results of soil sampling analysis)

(2) Vegetation Sampling Survey, Soil Profile Survey, Electrical Prospecting Records

(3) Field Photo Album

APPENDIX

Appendix 1.

PHOTO/16/VOL.II/32

6TH AUGUST, 1981.

MINUTES OF THE MEETING BETWEEN THE JAPANESE LAND USE MAPPING TEAM AND SURVEY OF KENYA, HELD ON 4TH AUGUST, 1981 IN THE OFFICE OF THE ACTING DIRECTOR OF SURVEYS, AT 2.30 P.M.

PRESENT:

1.	Mr. D. Kamau	-	Ag. Director of Surveys.
2.	Mr. J.D. Obel	-	Ag. Assistant Director (M).
3.	Dr. Minoru Tajima	-	Deputy Director-General, G.S.I.
4.	Mr. Hiroshi Kimura	-	Coordinator - JICA.
5.	Mr. Eiji Gojo	-	Leader, Recce Team.
6.	Mr. Sukeshige Buso	-	Deputy Leader, Recce Team.
7.	Mr. Shigeo Suzuki	-	Coordinator, Recce Team.
8.	Mr. Sei Nakajima	-	Geologist.
9.	Mr. Yoshiaki Yokota	-	Vegetation/Land Use Researcher.
10.	Mr. P. Ndunda	-	Chief Cartographer.
11.	Mr. J.R.R. Aganyo	-	Staff Surveyor I, SK Counterpart Recce Team.
12.	Mr. O.M. Wainaina	-	Ag. Superintending Surveyor (M).

The meeting discussed issues concerning work of the seventh year of mapping by the Japanese Team. It started with Mr. Kimura introducing the members of the Japanese Survey Team while Mr. Kamau introducted the Survey of Kenya members of the staff. Mr. Kamau also praised the cooperation which had lead to successful mapping and hoped it would continue.

SPECIFICATIONS

A document showing the detailed specifications for the 7th year programme was distributed (See Appendix 1). The work to be done in Kenya covered the Tana Delta, about 7,000 sq. kms. and ranching area west of the Delta comprising about 7,700 sq. kms. Photo Interpretation to be done in Japan covers about 7,000 sq. kms. Mr. Suzuki informed the meeting that the reconnaissance will cover the whole area, 14,700 sq. kms. The work periods were specified as:-

Reconnaissance	-	July 24th to September 15th, 1981.
Photo Interpretation	-	September 1 to November 4th, 1981.
Field Identification	-	November 13th, 1981 to February 22nd, 1982.

The document also gave the methodology and the results to be give as:-

(a) An overall report

(b) Photo Album of field Identification.

(c) Soil profile with sample point location map.

(d) Results of electric prospecting.

...../2

Mr. Obel asked the Team when they would require a soil analyst from Kenya Soil Survey and enquired about the technical specifications to be followed, e.g. scales. Mr. Suzuki said in reply that the soil analyst would be required during the November, 1981, field work. Survey of Kenya would be notified before Field Identification. Mr. Suzuki added that the Japanese Mapping Team will come out with tentative specifications after the reconnaissance. Discussions on the tentative specifications would then follow to identify any necessary changes.

TRAINING

On training of Kenyan staff in Japan Mr. Kimura informed the meeting that two participants will attend a 2 month course in Japan between the reconnaissance and detail survey. This means from middle of September to November, 1981. It was agreed that the two trainees should:-

(a) be from Survey of Kenya, preferrably with geomorphological University training background. If such person is not available one with knowledge in photo interpretation or cartographic knowledge may qualify.

(b) leave for Japan after 15th September and hence A2 and A3 forms should be collected for them immediately from the Embassy of Japan or JICA office.

(c) arrive back in Kenya with the Japanese team, in November, 1981, and thereafter work with the Japanese team on Field Identification until 22nd February, 1982.

DRIVERS

It was agreed that arrangements be made for 5 drivers from Survey of Kenya to work with the team. The drivers were to meet Mr. Suzuki on 5th August, 1981 at Survey Field Headquarters, at 10.00 a.m. for instructions.

SUPPORT FROM PROVINCIAL SURVEYOR COAST

The JMT would require the usual storage facilities and may need help during employment of labour. The Provincial Surveyor would help in such occassions. It was agreed that Mr. Wainaina would prepare letters addressed to local administration and the Provincial Surveyor, Coast, for such support. Mr. Wainaina promised that the letters would be ready for the Team on 5th August, 1981. A letter had already been sent requesting for Gate Passes for the Tsavo National Park and game scouts.

ID CARDS

These had already been prepared and needed signatures only. They would be ready by 5th August, 1981.

COUNTERPART FROM SK

Mr. Aganyo had been appointed by Survey of Kenya to be with JMT. He would proceed with the team to the Coast when he is ready. A meeting was also arranged for Mr. Aganyo and the team on 5th August, 1981.

WORK SCHEDULE

An elaborate work schedule for the team had been prepared (see Appendix 2). This was distributed during the meeting and covered Mr. Nakazawa, Dr. Tajima, Mr. Kimura, Mr. Tsurumi and the JICA Team.

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PRESENTATION CEREMONY

Mr. Kimura commended Survey of Kenya for the good presentation programme. Mr. Kamau noted that there were shortcomings which could not have been controlled by Survey of Kenya. A copy of the Minister's speech was requested for by Mr. Kimura. He also requested that a letter be written to the President of JICA, Mr. Keisuke Arita, by Hon. G.G. Kariuki, Minister of State, Office of the President, acknowledging receipt of the presented items which include vehicles and final results. He presented a list of the items to the Acting Director of Surveys. The list included what was presented and material still in Tokyo. The cartographic material in Tokyo would be sent after land use mapping is completed.

It was agreed that Mr. Buso would explain on some items when they are collected from Mombasa. These include Geodetic records and cartographic material. Mr. Obel said that a person would be sent to Mombasa later to check on the cargo since the ship had arrived on 2nd August, 1981.

MEETINGS

A joint meeting was agreed on to take place on 4th September, 1981, between JMT, Survey of Kenya and Kenya Soil Survey, at 10.00 a.m. An additional meeting will be required during the same afternoon or the following day. The meetings will be at the office of the Director of Surveys. The meeting was informed that three Japanese Geodesists will be coming to Kenya on 15th August, 1981. They will work in Kenya for a period of 2 years. Mr. Yamamoto, Mr. Buso and the three Geodesists, would pay a courtesy call to the Acting Director of Survey on 17th August, 1981 at 2.15 p.m. It was agreed also that Mr. Aganyo would introduce Mr. NishiKawa to the Kenya Soil Survey on 5th August in the afternoon.

GENERAL

Mr. Suzuki informed the meeting that JMT would take care of all labour required. He also gave the contact address while at Malindi as Malindi Chalets, P.O. Box 20, Telephone 6 and telex 21153.

O. M. Wainaina
SECRETARY.

Confirmed By:

.....
for: KENYA TEAM
Date: 6 Aug 1981

Minoru Tajima
.....
for: JAPANESE MAPPING TEAM
Date: 6. Aug. 1981

Appendix 2.

Survey of Kenya,
P.O. Box 30046,
NAIROBI.

PHOTO/16/Vol.II/47

4th September, 1981

MINUTES OF THE MEETING BETWEEN JAPANESE MAPPING TEAM (JMT), KENYA SOIL SURVEY (KSS) AND SURVEY OF KENYA (SK) HELD ON 4TH SEPTEMBER, 1981 AT 10.00 A.M.

PRESENT:

Messrs:

1.	D. Kamau	- Ag. Director of Surveys (Chairman)
2.	D.M. Olulo	- Ag. Head, KSS (Cartographer)
3.	J.D. Obel	- Ag. Assistant Director of Surveys (Mapping)
4.	Eiji Gojo	- Leader, JMT
5.	Sukeshige Buso	- Deputy Leader, JMT
6.	Shigeo Suzuki	- Coordinator, JMT
7.	Sei Nakajima	- Geologist
8.	Yoshiaki Yokota	- Vegetation/Land Use
9.	Eisaku Tsurumi	- Head, 1st Geog. Div.GSI
10.	Tooru Nishikawa	- Surveyor
11.	Tetsuya Ootsuki	- Surveyor
12.	J.R. Rachilo	- Soil Surveyor, KSS
13.	J. Aganyo	- Staff Surveyor I, SK Counterpart
14.	P. Ndunda	- Chief Cartographer, SK
15.	O.M. Wainaina	- Ag. Superintending Surveyor (Mapping)

The meeting was held in the office of the Director of Surveys, Nairobi. Opening the meeting, Mr. Kamau welcomed the participants after which introductions were made. Matters related to the work of the seventh year of mapping by the Japanese team were discussed. The team had prepared a document containing all items for discussion (Appendix).

1. AUGUST/SEPTEMBER 1981 PROGRAMME

An outline was presented by JMT showing the movement of the reconnaissance team from 6th August to 1st September, 1981. Mr. Suzuki noted that the reconnaissance was successful. He thanked SK for assisting the team in many ways especially for the counterpart (Mr. Aganyo) and the drivers.

2. RESULTS OF RECCE SURVEY AND FURTHER STUDIES

Each major subject of study was introduced by a JMT expert as follows:

cont. .../2

(a) Soil - by Mr. Nishikawa
(b) Land form - by Mr. Ootsuki
(c) Vegetation/ present Land Use - by Mr. Yokota
(d) Surface Geology by Mr. Nakajima

for details refer to Appendix.

3. FURTHER SCHEDULE

A tentative programme was presented by JMT for the period between 21st November, 1981 and 14th February, 1982. Mr. Suzuki explained that the only fixed dates were for arrival and departure. The others are subject to change.

4. COUNTERPARTS

(a) It was agreed that one of trainees proceeding to Japan from SK should work with the JMT after his return. He will be technically involved in Land Use Mapping and will also coordinate between SK and JMT.

(b) It was also agreed that KSS will provide a soil surveyor to accompany JMT. Mr. Olulo agreed but said that the issue should be raised with the Ministry of Agriculture in writing. He suggested that the soil surveyor be attached to SK so that any allowances payable to him should come from Office of the President. This was not concluded and was left to SK and KSS to sort out.

(c) It was also agreed that an expert in local trees and grass be sought to aid the JMT in identification of vegetation. Mr. Olulo said that such a person exists in KSS.

5. TRANSPORT

SK was asked to clear with Customs when 4 Jeeps arrive from Japan. The Jeeps are on the way and should be in Kenya at the end of September or beginning of October, 1981. SK will also prepare 8 drivers for the 4 Jeeps, 3 Land Cruisers and 1 Isuzu.

6. LICENCE FOR SOIL EXPORTATION

The JMT requested that they be informed of regulations concerning exportation of soil. Mr. Olulo promised to look into the matter and inform the team leader before 12th September, 1981.

7. RADIOS

It was agreed that JMT will be allowed to use radio frequencies allocated to SK. Any assistance required from SK will be given.

8. KSS SPECIFICATIONS

Mr. Olulo informed the meeting that the Head of KSS (Mr. Muchena) would like to be in constant contact with the Soil Surveyors. He also hoped that the format followed by KSS would be adhered to as much as possible. Mr. Suzuki said that the team leader would like to be informed of any KSS requirements before 12th September, 1981. Mr. Suzuki also informed the meeting that as stipulated in "Scope of Work" earlier, the final map will show soil and surface geology at a scale of 1:50,000 for Tana River Delta. Prior to that, however,

cont. .../3

separate maps, eg for soil alone, will be printed. He also explained that the JMT will keep to FAO and UNESCO systems.

9. EXCHANGE OF VARIOUS ITEMS

The JMT returned the SK Identity Cards issued during the reconnaissance survey. The team requested for various transparencies for 1:50,000 maps, 6 maps at 1:250,000 and various pages of the Kenya Atlas, 4th Edition (under preparation). The team also returned the keys to Mombasa store.

Mr. Kamau closed the meeting by bidding farewell to the members of the team who were to leave for Japan. He also thanked the team and hoped the cooperation existing would continue.

O.M. Wainaina
SECRETARY

CONFIRMED BY

..... Eisaku Tsurumi

for: KENYA TEAM for: JAPANESE MAPPING TEAM

Date: 5 September 1981 Date: 5th, September, 1981

Appendix 3.

SURVEY OF KENYA
P. O. BOX 30046
NAIROBI.

PHOTO/16/VOL. II/72

21st November, 1981

MINUTES OF THE MEETING BETWEEN THE JAPANESE MAPPING TEAM (JMT), THE KENYA SOIL SURVEY (KSS) AND SURVEY OF KENYA (SK) HELD ON 20TH NOVEMBER, 1981

PRESENT:

1. Mr. D. O. Michieka	- Ag. Head, KSS
2. Mr. T. Hagio	- First Secretary Embassy of Japan
3. Mr. J. D. Obel	- Ag. Assistant Director of Surveys, SK.
4. Mr. Yamamoto M.	- JICA Nairobi Office
5. Mr. H. Takenaka	- JICA Nairobi Office
6. Mr. J. M. Kibe	- Soils Counterpart, Kenya Soil Survey.
7. Mr. S. Suzuki	- Coordinator, JMT.
8. Mr. S. Nakajima	- Deputy Leader and Geologist J.M.T.
9. Mr. E. Tsurumi	- Technical Adviser Geographical Survey Institute, Japan.
10. Mr. H. Murayama	- JICA, Tokyo Office
11. Mr. O. M. Wainaina	- Ag. Superintending Surveyor SK.

The meeting was held in the office of the Director of Surveys at 2.15 p.m.

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CONFIRMATION OF MINUTES OF THE LAST MEETING

The minutes of the last meeting held on 16th November, 1981, were confirmed after the following amendments:-

(1) VEHICLES

Vehicle GK 39L will be replaced by GK 39L. GK 38L will however, be released to SK by JMT after the four new vehicles have been cleared and delivered to JMT.

(2) It was agreed that two or three vehicles will be released by JMT to transport the Drivers and counterparts who would wish to collect their pay in Nairobi, together with any member(s) of the JMT.

(3) The JMT will pay for overtime to the drivers at the rate endorsed by SK.

(4) JMT will deliver the letters for the Provincial Administration to the Provincial Surveyor, Mombasa. The Provincial Surveyor will then transmit the letters to the addressees.

KSS REPORTS

The Kenya Soil Survey reported that a soils expert, Mr. Kibe, would join the JMT 25th November, 1981. A vegetation expert would not be available until early December, 1981.

Mr. Michieka (KSS) presented a document, commenting on the report by JMT concerning the work of the seventh year of Mapping. The document would be studied together with an earlier letter DEVP/16/III/27 dated 21st September, 1981. These would be discussed on Monday, 23rd November, 1981 meeting. Kenya Soil Survey expressed the wish that soil tests should be carried out in Kenya. If Soils were tested abroad it would be difficult to verify if the methods used were the same as the ones used in Kenya. The JMT reported that they had obtained permission to import soil to Japan (from Japanese Government). It was noted, however, that no attempt had been made to obtain permission to export soil from Kenya Government, which in this case was obviously more important (as the soil is being exported from Kenya).

Mr. Michieka also informed the meeting that a counterpart, should be in the field for two to three weeks, and in any case, not for more than one month. This was agreed to.

The Kenya Soil Survey has finished the exploratory soil survey covering the whole country and is now busy carrying out reconnaissance soil survey which will also cover the whole of the country. Hence it was emphasized that the survey should be to the KSS specifications so that KSS would not have to resurvey the area.

The KSS representatives also felt that the proposed number of test points was too low for the area to be covered.

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REGULATIONS

It was agreed that one counterpart from Survey of Kenya would supervise the drivers for the smooth running of the safari.

DETAILS OF WORK

Details of movements of the team from 24th November, 1981, were discussed. The lorry would collect camping equipment on 24th November, at Ruaraka in the morning and at the KSS in the afternoon. The drivers and the surveyors would gather at Survey Headquarters on 25th in the morning ready to move to Mombasa. 27th to 29th November, will be spent preparing camping sites, stores, etc., Field work starts on 30th November, 1981.

O. M. Wainaina
Secretary

Confirmed by:

.....	Eisaku Tsurumi	.....
for Kenya Soil Survey	for Japanese Mapping Team	for Survey of Kenya.
	25/11/81	25/11/81

Appendix 4.

SURVEY OF KENYA
P. O. BOX 30046
NAIROBI.

PHOTO/16/VOL. II/73

24TH NOVEMBER, 1981

MINUTES OF THE MEETING BETWEEN KENYA SOIL SURVEY (KSS), JAPANESE MAPPING TEAM (JMT) AND SURVEY OF KENYA (SK) HELD ON 23RD NOVEMBER, 1981.

PRESENT:

1.	Mr. D. Kamau	- Ag. Director of Surveys
2.	Mr. D. O. Michieka	- Ag. Head, KSS
3.	Mr. E. Gojo	- J. M. T. Leader
4.	Mr. H. Takenaka	- JICA Nairobi Office
5.	Mr. E. Tsurumi	- Technical Adviser, G.S.I.
6.	Mr. J. M. Kibe	- KSS Counterpart
7.	Mr. D. J, Obel	- Ag. Assistant Director of Surveys.
8.	Mr. S. Suzuki	- JMT Coordinator
9.	Mr. H. Murayama	- JICA Tokyo Office
10.	Mr. S. Nakajima	- JMT Deputy Leader
11.	Mr. Y. Yokota	- Vegetation/Land Use Researcher.
12.	Mr. T. Otsuki	- Soil/Land Form Researcher
13.	Mr. T. Nishikawa	- Pedologist
14.	Mr. Katunga	- SK Counterpart
15.	Mr. Mwangi	- SK Counterpart
16.	Mr. O. M. Wainaina	Ag. Superintending Surveyor

The meeting took place in the Office of the Director of Surveys at 9.00 a.m.

CONFIRMATION OF MINUTES OF THE LAST MEETING

The minutes of the meeting held on 20th November, 1981, needed a couple of corrections before confirmation. Confirmation was postponed until Wednesday, 25th November, 1981. Corrections should be effected before confirmation.

SUBJECT TO BE DISCUSSED IN THE MEETING HELD BETWEEN JMT/SK/KSS ON 23RD NOVEMBER, 1981

1. Confirmation of the minutes of the meeting held on 20th November 1981 and confirmation scheduling of the minutes of this meeting.

2. New Vehicles and new drivers (procedure, estimated date of delivery to JMT).

3. Arrangement of departure on 25th November before payday.

4. Permit or certificate for JMT to Drive GK Vehicles.

5. Drivers' overtime table.

6. ID-Card and National Park Pass, and Mombasa storage key.

7. Confirmation of the purpose of this project.

   (1) Sample Density

   (2) Soil Sample Exportation

   (3) Explanation to the comments from KSS

MATTERS ARISING FROM THE PREVIOUS MINUTES

It was agreed that SK should fuel the vehicles which transport SK/KSS members of staff to and from Nairobi to collect their pay. SK will also provide the rates for overtime payments to the drivers.

PERMIT FOR JMT MEMBERS TO DRIVE GK VEHICLES

The JMT members were informed that a Kenya Driving Licence was required to drive any vehicle in the country. The JMT requested for a permit to drive GK vehicles when a regular driver was not available. Mr. Kamau informed JMT that he would look into the issue.

ID-CARDS, NATIONAL PARK PASS AND MOMBASA STORE KEY

ID cards for the 7 new members of JMT were handed over to JMT. The old cards and cards and the key to the store would be handed over later.

PURPOSE OF SURVEY AND KSS REPORTS

The purpose of the project, KSS reports and various documents by JMT were discussed at large. The JMT referred particularly to the April 1981 meeting during which a memorandum was presented. This memorandum was discussed.

..... 2/

The JMT reviewed various issues raised by KSS:-

(a) Sample point density:

These are determined by the purpose of the Survey. Though KSS indicated disatisfaction with the number of points JMT stated that they would not increase the number.

(b) Soil Exportation:

The Kenya regulations on the exportation of Soil had not been brought to light. KSS promised to investigate.

It was agreed, however, that duplicate soil samples would be sent to KSS laboratories for testing. The JMT and KSS would exchange reports on test procedures followed by each, it was agreed.

(c) Vegetation/Land Use Mapping:

As specified earlier JMT has planned to carry out the project this way:-

(i) Primary Photo Interpretation

(ii) Reconnaissance Survey

(iii) Detailed Survey

(iv) Secondary Photo Interpretation

(v) Vegetation /Land Use Mapping

It was agreed that in detail Survey ground observations is most important. The scale of the survey is 1:50,000 and 1:100,000 for Tana Basin and Ranching areas respectively.

The base map is the 1:50,000 new topo maps of the area and Photography at 1:60.000. The KSS reprentatives emphasized that the queries raised by KSS were meant to be guidelines and not criticism. Any disagreements between KSS and JMT specifications and procedures should be discussed.

JMT informed the meeting that they had been referring to other orgnizations eg., KREMU apart from Kenya Soil Survey, so as to ensure agreemement in say, legend etc.

DATE OF NEXT MEETING

It was agreed that the minutes be confirmed on Wednesday, 25th November, 1981 at 8.30. a.m.

O. M. Wainaina
Secretary

Confirmed By

.....
for Survey of Kenya
25/11/81

Eisaku Tsunumi
.....
for JMT
25/11/81

Appendix 5.

MEETING ON LAND USE MAPPING OF TANA RIVER DELTA AND ADJACENT RANCHING AREA

PRESENT:

Mr. T. Hagio, First Secretary, Japanese Embassy
Mr. T. Hirai, Technical Advisor, GSI
Mr. E. Gojo, Team Leader, JMT
Mr. H. Murayama, Co-ordinator, JICA H. Q.
Mr. H. Takenaka, JICA, Nairobi Office
Mr. S. Nakajima, Geologist, Deputy Team Leader, JMT
Mr. T. Nishikawa, Pedologist, JMT
Mr. Y. Yokota, Vegetation/Land Use Researcher, JMT
Mr. T. Ohtsuki, Landform Researcher, JMT
Mr. S. Suzuki, Co-ordinator, JMT
Mr. D. Kamau - Ag. Director of Surveys, SK
Mr. J. K. Wachira, Ag. Chief Geologist, Mines and Geological Department, Box 30009, Nairobi.
Mr. J. D. Obel, Ag. Assistant Director Mapping, Survey of Kenya
Mr. O. M. Wainaina, Ag. Supt. Surveyor, Survey of Kenya
Mr. Ndunda P., Chief Cartographer, Survey of Kenya
Mr. J. D. Hamilton, Tana River Manager, T.R.D.A.
Mr. C. K. K. Gachene, Soil Surveyor, Kenya Soil Survey
Mr. J. M. Kibe, Soil Surveyor, Kenya Soil Survey
Mr. H. A. Ochung, Vegetation Surveyor, Kenya Soil Survey
Mr. Humphrey S. Kuguru, Tana River Development Authority - Cartographer
Mr. J. K. Katunga, Surveyor, Survey of Kenya
Mr. C. M. K. Mwangi, Cartographer, ~~Surveyor~~, Survey of Kenya

The meetings were held on 9th and 12th February, 1982, in the Director of Surveys' Office, Nairobi, and was attended by members of Kenya Soil Survey, the Japanese Mapping Team, the Mines and Geology Department, Tana River Development Authority and Survey of Kenya.

The meeting of 9th February, 1982 was attended by the JMT and Survey of Kenya only. During that meeting, the JMT presented the proposed legend for:

(i) Soil Map
(ii) Vegetation/Present Land Use Map
(iii) Landform Map
(iv) Geology Map

It was felt however, that discussions on the legend could not be continued without the presence of representatives of Kenya Soil Survey and Mines and Geology Departments.

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In addition it was decided that representatives of Tana River Development Authority should be invited. Since the area being covered was covered by the Authority the representatives would inform the Appers of any future plans for the development of the area. It was then agreed that a meeting should be held on Friday, 12th February, 1982, and the above departments be invited.

Copies of the legend were also to be distributed to the departments. The topics discussed on 12th February were as follows:-

1. COLOUR DESIGN OF THEMATIC MAPS:

JMT provisionally proposed a six colour thematic map. The details of the maps and colours will be discussed during June/July/August, 1982 when JMT returns to Kenya. The draft colour map will be sent with JMT who will also be accompanied by a Cartographer.

2. NEXT FIELD WORK:

This will take place between June and September, 1982 though the exact date was not identified. However, field work was estimated to be for 65 days and will comprise of about 14 members of staff. Survey of Kenya was requested to provide the assistance it had rendered previously.

3. TRAINING IN JAPAN:

The two counterparts from Survey of Kenya will return to Japan for three months (May to July) to persue further specialised course in Land Use Mapping. On return in August, they would join the JMT in the field. In response to a question from Kenya Soil Survey the JMT said that it was not possible to extend the training to Soil Surveys. Survey of Kenya should contact the Japanese Embassy on the training issue.

4. COUNTERPARTS:

Kenya Soil Survey informed the meeting that it was not possible to confirm whether soils and vegetation experts would be available during the next field period. This is because of the amount of work at Kenya Soil Survey. The Director of Surveys was hence requested to write to Kenya Soil Surveys' Director on the issue. JMT replied that they would write to the Director of Surveys and Director of Kenya Soil Survey early specifying their requirements.

5. LEGEND:

The various aspects of the legend were discussed at length. It was agreed that discussions on the legend on soils and vegetation/present land use should continue at the Kenya Soil Survey Offices at Kabete, on 13th February, 1982, at 9. a.m. Those to attend would be from Kenya Soil Survey, the JMT and the Ag. Director of Mines and Geology. The legend for Geology and Landform was accepted.

6. ADDITIONAL INFORMATION:

JMT requested TRDA to provide the necessary information such as comments, plans, reports, etc., to enable JMT to conduct the land evaluation work effectively. Mr. Hamilton promised to compile this information and deliver to JMT by the end of this month through SK and JICA Nairobi Office.

..... 3/

7. The keys to Mombasa store, the Identity Cards for JMT and the Game Park pass were returned to Survey of Kenya.

O. M. Wainaina
SECRETARY.

CONFIRMED BY:
...Takeshi Hirai.....
FOR JAPANESE MAPPING TEAM

DATE ..15..Feb...1982....

CONFIRMED BY:
.....
FOR KENYA SIDE

DATE 15 February 1982

Appendix 6. MINUTES OF THE MEETING BETWEEN JMT/SK CONCERNING LAND USE MAPPING PROJECT HELD AT SK DIRECTOR'S OFFICE ON 15TH. FEBRUARY, 1982

PRESENT:

Mr. T. Hirai, Technical Advisor, GSI
Mr. E. Gojo, Team Leader, JMT
Mr. H. Murayama, Co-ordinator, JICA H.O.
Mr. S. Nakajima, Geologist, Deputy Team Leader, JMT
Mr. S. Suzuki, Co-ordinator, JMT
Mr. D. Kamau, Ag. Director of Surveys, SK
Mr. J.D. Obel, Ag. Assistant Director of Surveys, Mapping, SK
Mr. O.M. Wainaina, Ag. Supt. Surveyor, SK

The meeting was held on 15th. February, 1982 in the Director of Survey's office as from 2.30 p.m. and the following items were discussed:-

1. Confirmation of the last minutes

After reading through the minutes, the meeting confirmed them and both the SK and JMT signed the minutes.

2. Report of Discussion held on 13th. February, 1982:-

JMT submitted the report of discussion held between JMT/KSS/MG concerning Land Use Mapping Project at KSS's office on 13th February, 1982 and the report was confirmed by the meeting as per attached Appendix 1 of these Minutes.

3. Legends of geology and landform:-

Referring to the Item 5 of the last minutes confirmed in this Item 1 above, JMT submitted both legends as per attached Appendix 2 and 3.

4. Return of Vehicles

JMT informed SK the vehicles have been returned to Survey of Kenya Field Headquarters and JMT handed over the letter on this matter to be confirmed by SK as per attached Appendix 4. JMT mentioned that JMT would ask for use of SK's vehicles in the next field work, in this case, SK will be advised about 30-45 days before.

CONFIRMED BY:

Takeshi Hirai

FOR JAPANESE MAPPING TEAM

DATE 15 Feb. 1982

CONFIRMED BY:

FOR KENYA SIDE

DATE 15 February 1982

Appendix 1A

Legend of Soils and Geology

H Hills

HSL Soils developed on Miocene sediments

HSLqf	Ferralic Arenosols

Pt Terraces

PtJ Soils developed on lagoonal sands and clays

PtJqa	Albic Arenosols
PtJqc	Cambic Arenosols
PtJso	Orthic Solonetz
PtJxk	Calcic Xerosols
PtJbe	Eutric Cambisols
PtJbd	Dystric Cambisols
PtJbg	Gleyic Cambisols
PtJbk	Calcic Cambisols

Pr River alluvial plains

PrA Soils developed on alluvial deposits

PrAvc	Chromic Vertisols
PrAje	Eutric Fluvisols

Pc Coastal plains

PcL Soils developed on raised coaral reefs

PcLeo	Orthic Rendzinas
PcLec	Cambic Rendzinas
PcLfr	Rhodic Ferralsols
PcLfh	Humic Ferralsols

PcA_4 Soils developed on old dune sands

PcA_4qf	Ferralic Arenosols

PcA_2 Soils developed on dune sands

PcA_2qa	Albic Arenosols
PcA_2qc	Cambic Arenosols

PcS Soils developed on lagoonal calcareous sandstones

PcSqf	Ferralic Arenosols

T Tidal Flats

TA_1 Soils developed on beach sands and muds of coastal creek

TA_1od	Dystric Histosols
TA_1oe	Eutric Histosols
TA_1gd	Dystric Gleysols
TA_1ge	Eutric Gleysols

Legend of Soils and Geology

B Bottom lands

BA Soils developed on alluvial deposits

BAvp Pellic Vertisols

S Swamps

SA Soils developed on alluvial deposits

SAgd Dystric Gleysols

SAge Eutric Gleysols

Complex of mapping units

PrAvc - PrAje

Appendix 1A-2 Legend of Soils

o	Histosols
od	Dystric Histosols
oe	Eutric Histosols
v	Vertisols
vp	Pellic Vertisols
vc	Chromic Vertisols
j	Fluvisols
je	Eutric Fluvisols
g	Gleysols
gd	Dystric Gleysols
ge	Eutric Gleysols
q	Arenosols
qf	Ferralic Arenosols
qa	Albic Arenosols
qc	Cambic Arenosols
e	Rendzinas
eo	Orthic Rendzinas
ec	Cambic Rendzinas
f	Ferralsols
fr	Rhodic Ferralsols
fh	Humic Ferralsols
s	Solonetz
so	Orthic Solonetz
x	Xerosols
xk	Calcic Xerosols
b	Cambisols
be	Eutric Cambisols
bd	Dystric Cambisols
bg	Gleyic Cambisols
bk	Calcic Cambisols
v-j	Complex of Vertisols and Fluvisols

Appendix 1B

Legend of Vegetation/present land use

Division	Symbol	Sub-Division	Dominant Species	Land Use	
Woodland	F-1	Forest (1)	* Manilkara sansibarensis/Terminalia brownii/Chlorophora excelsa//Brachiaria brizantha	Forestry (Timber production)	
	F-2	Forest (2)	* Tree sample No.1/Thespesia danis/Grewia sp./Dobera glabra//Panicum maximum/Latipes senegalensis	Wildlife grazing Charcoal production	
	F-3	Forest (3)	* Hyphaene coriacea/Harrisonia abyssinica//Panicum maximum/Panicum infestum/Hyperhenia rufa	Wildlife grazing Charcoal production	
	F-4	Forest (4)	* Avicennia marina/Rhizophora mucronata/Bruguiera gymnorrhiza	Forestry (Timber production)	*1
	F-5	Forest (5)	* Phoenix reclinata/Barringtonia sp.	None	
	WBt-1	Wooded bushland thicket (1)	* Dobera glabra/Grewia sp./Commiphora schimperi//Penicum infestum/Latipes senegalensis/Cenchrus ciliaria/ Panicum maximum	Wildlife grazing	*1
	WBt-2	Wooded bushland thicket (2)	* Borassus aethiopum/Cambretum sp.//Echinochloa sp./ Cynodon dactylon	Wildlife grazing	
	WB-1	Wooded bushland (1)	* Tree sample No.1/Thespesia danis/Terminalia spinosa// Sporobolus marginatus	Wildlife grazing Domesticated livestock grazing	*2
	WB-2	Wooded bushland (2)	* Hyphaene coriaceae/Terminalia spinosa/Thespesia danis// Digitaria milanjiana/Panicum infestum	Wildlife grazing Domesticated livestock grazing	*1,2
Bushland	Bt	Bushland thicket	* Dombeya sp./Grewia similis//Panicum maximum/Enteropogon macrostachyus	Wildlife grazing	
	B	Bush	* Combretum hereroense/Thespesia danis/Dobera glabra/ Acacia zanzibarica/Commiphora riparia//Schoenefeleda transiens/Sporobolus helvolus	Domesticated livestock grazing	*2
	BG-1	Bushed grassland (1)	* Dobera glabra//Eragrostis superda/Enteropogon macrostachyus	Ranching area	
	BG-2	Bushed grassland (2)	* Acacia zanzibarica//Spoloborus helvolus	Domesticated livestock grazing	

Dwarf Shrubland	S	Shrub	* Shrub sample No.4/Balanites arbicularis//Panicum infestum/Cyperus articulatus	None
Grassland	G-1	Grassland (1)	* Echinochloa haploclada/Echinochloa stagnina/Panicum maximum/Cynodon dactylon	Domesticated livestock grazing
	G-2	Grassland (2)	* Cyperus rotundes/Echinochloa colonum	Grazing area and some cultivations
	G-3	Grassland (3)	* Suaeda monoica/Batis maritima//Spolobolus spicatus	None
Cultivation land	Cr・Co	Cropland (Cr: Rice/Co: Others)		
	C_2	Cropland (mixed cropland and grazing area)		
	Pm·Pco·Pb	Plantation (Pm: Cashew nut and Mango/Pco: Coconut/Pb: Banana and Mango)		
	P_2	Plantation (not kept well)		
Farmland	Fa	Farm (keep cattles enclosed area)		
Others	T	Town (permanent buildings and closely gathering houses)		
	V	Village (gathering houses)		
	Sf	Salt field		
	Ab·Am·Ag	Air strip (Ab: Bound surface/Am: Murram surface/Ag: Grass surface)		
	Ra,Rd	Motorable road (Ra: All weather road/Rd: Dry weather road)		
	P	Pan and pond		
	Bl	Barren land		

Notes

*1: Heights of trees are sometimes lower than 10m.

*2: Patches of grasses are sometimes scattered.

Appendix 2

Legend of Geology

Geological Age		Symbol	Explanation
Quaternary	Recent	Re_0	Alluvial deposits; silts, sands and clays
		Re_1	Beach sands and muds of the coastal creeks
		Re_2	Dune sands
		Re_3	Fan deposits; clays, sands and gravels
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	Pleistocene	Pt_1	Old dune sands
		Pt_2	Raised coral reef
		Pt_3	Lagoonal calcareous sandstones
		Pt_4	Lagoonal sands and clays
			∿∿∿∿∿∿∿∿∿∿∿∿∿Unconformity∿∿∿∿∿∿∿∿∿∿∿∿∿
Tertiary	Pliocene	Pl_1	Pliocene sediments; sandy clays and bright red sands
			∿∿∿∿∿∿∿∿∿∿∿∿∿Unconformity∿∿∿∿∿∿∿∿∿∿∿∿∿
	Miocene	Mi_1	Miocene sediments; limestones, calcareous sandstones and clayey sandstones

Appendix 3

Legend of Landform

- Hills: H
  - Residual hills: Hr
  - Minor scarps : Hs
- Footslopes: F
  - Talus (Scree) slopes: C
- Plateaus: L
- Uplands: U
  - Peneplains : Up_1
  - Dissected peneplains: Up_2
- Plains
  - Terraces: Pt
    - Higher terraces: Pt_1
    - Middle terraces: Pt_2
    - Lower terraces : Pt_3
  - River alluvial plains: Pr
    - Younger fans : Pf
    - Natural levees : Pl
    - Flood plains : A
    - Valley bottom lowlands: V
    - Old river beds : Or
- Coastal plains: Pc
  - Raised coral reefs : PcL
  - Interlevee lowlands : Il
  - Coastal ridges : Z
  - Dunes : D
  - Old dunes and old coastal ridges: Dz
- Tidal flats : T
  - Marsh, Mangrove flats: Tm
  - Sand flats : Ts
- Bottom lands: B
- Miscellaneous
  - Swamps : S
  - Oxbow lakes : Ol
  - Pan and ponds: O
  - Bad lands : W
  - River : R
  - Cliff :