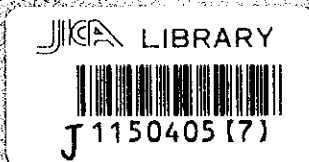


JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)
MINISTRY OF AGRICULTURE (MOA)
REPUBLIC OF KENYA

**THE STUDY
ON
COMMUNITY-BASED SMALL HOLDER IRRIGATION
DEVELOPMENT PROJECT
FOR
PROMOTION OF HORTICULTURAL PRODUCTION
IN
THE FOOTHILLS OF MT. KENYA**

MAIN REPORT FOR MASTER PLAN



MARCH, 1999

SANYU CONSULTANTS INC.

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JR
99-05

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PREFACE

In response to a request from the Government of the Republic of Kenya, the Government of Japan decided to conduct the study on Community-Based Small Holder Irrigation Development Project for Promotion of Horticultural Production in the Foothills of Mt. Kenya and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Kenya a study team headed by Mr. Seiji Takeuchi, Sanyu Consultants Inc., three times between July 1997 to August 1998.

The team held discussions with the officials concerned of the Government of Kenya, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Kenya for their close cooperation extended to the Team.

March 1999



Mikio Fujita
President
Japan International Cooperation Agency

Mr. Kimio Fujita
President,
Japan International Cooperation Agency (JICA)
Tokyo, Japan

March 1999

Letter of Transmittal

Dear Sir,

We are pleased to submit herewith the Feasibility Study Report on Community-Based Small Holder Irrigation Development Project for Promotion of Horticultural Production in the Foothills of Mt. Kenya.

The Report, which describes the proposed plan for improvement of irrigated horticultural development with a participation of farmers in the area, is compiled in reflecting the advice and suggestions for the formulation of the above mentioned project by the authorities concerned of the Government of Japan and your Agency. Also comments made by the related agencies of the Government of the Republic of Kenya are incorporated in the Report.

The study had been carried out in the phasing manners, Phase-I, Phase-II and Phase-III. In the courses of the Phase-I study, Master Plan for the project was formulated, and Model Areas were preliminarily selected. During the Phase-II study followed by the Phase-I study, four Model Areas were finally selected through the discussions and field survey in collaboration with the Kenyan government staff. Furthermore, during the Phase-III study Feasibility Study on the selected Model Areas was made.

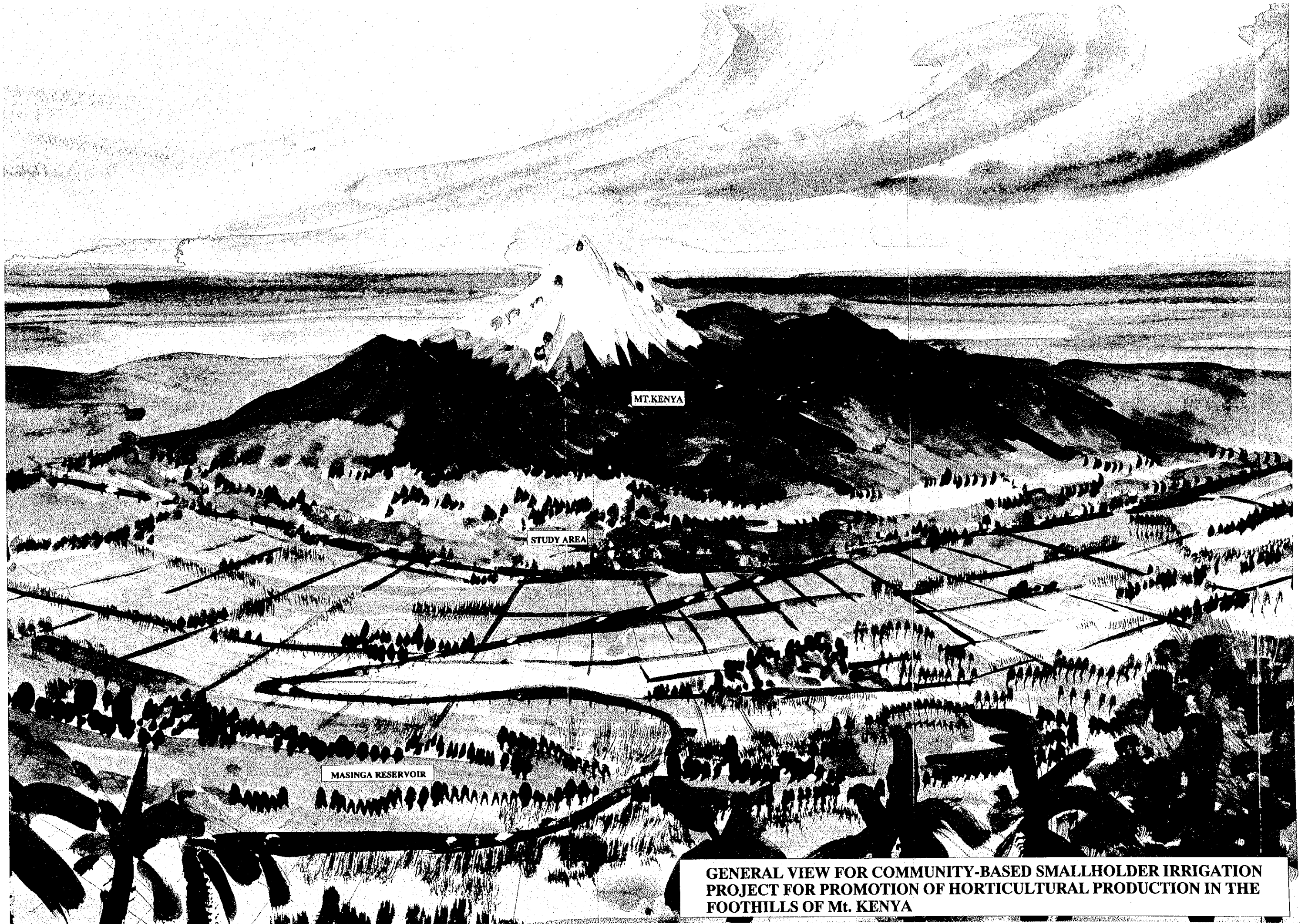
As the result of the study, the project plan involving a) introduction of small holder irrigation system, b) improving management of sustainable horticultural farming, c) organization of small farmers, d) construction of rural infrastructure such as farm roads, marketing facilities, etc., and operation and maintenance works for them, e) improvement of agricultural extension and credit services, and f) improving access to information on marketing and various information route, etc. was proposed under the participation of beneficial farmers. Through the improvement of the above-mentioned conditions, it will surely be believed that project will greatly contribute to the improvement of socio-economic well-being and sustainable regional development of the communities around Mt. Kenya.

Finally, we take this opportunity to express our sincere gratitude to Ministry of Agriculture (MOA) of the Government of the Republic of Kenya, Ministry of Foreign Affairs, Ministry of Agriculture, Forestry and Fisheries of the Government of Japan, and Japan International Cooperation Agency, especially for Advisory Committee which gave useful advice to the study team from time to time so as to smoothen the study.

Respectfully yours,



Seiji Takeuchi
Team Leader of the Study Team



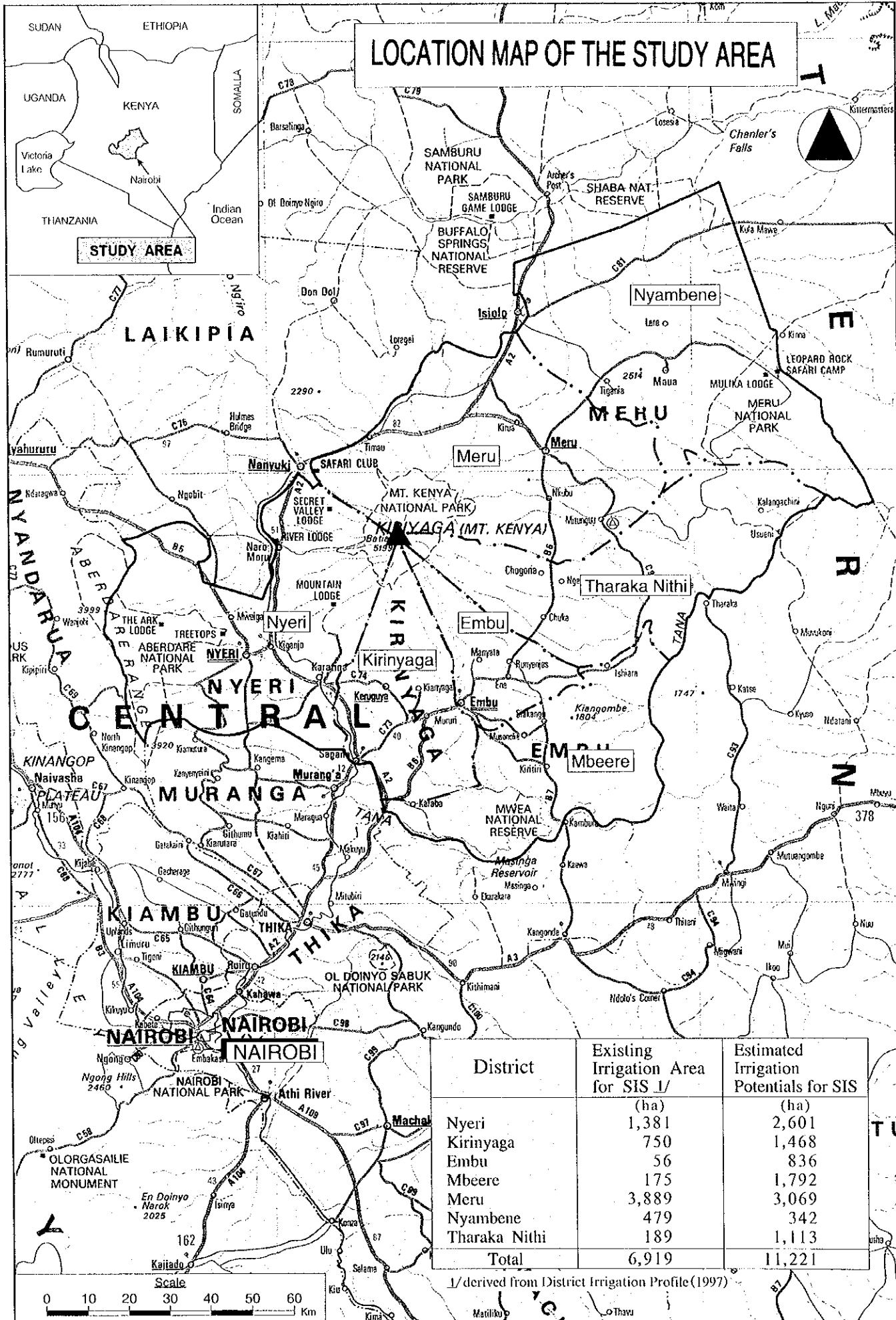
MT. KENYA

STUDY AREA

MASINGA RESERVOIR

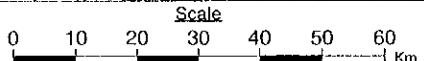
GENERAL VIEW FOR COMMUNITY-BASED SMALLHOLDER IRRIGATION PROJECT FOR PROMOTION OF HORTICULTURAL PRODUCTION IN THE FOOTHILLS OF Mt. KENYA

LOCATION MAP OF THE STUDY AREA



District	Existing Irrigation Area for SIS 1/ (ha)	Estimated Irrigation Potentials for SIS (ha)
Nyeri	1,381	2,601
Kirinyaga	750	1,468
Embu	56	836
Mbeere	175	1,792
Meru	3,889	3,069
Nyambene	479	342
Tharaka Nithi	189	1,113
Total	6,919	11,221

1/ derived from District Irrigation Profile (1997)



Present agricultural
condition at the foothills of
Mt. Kenya



Tea garden on sloping areas



Tea and coffee gardens on
sloping areas



Soil conservation with
Napier Grass on sloping
areas



Soil conservation method
using Napier Grass on
sloping areas (Napier Grass
is also used for animal feed)



Preventive countermeasures
from soil intrusion to canal
using Napier Grass in
Rupingazi Ngerwe
Irrigation Scheme



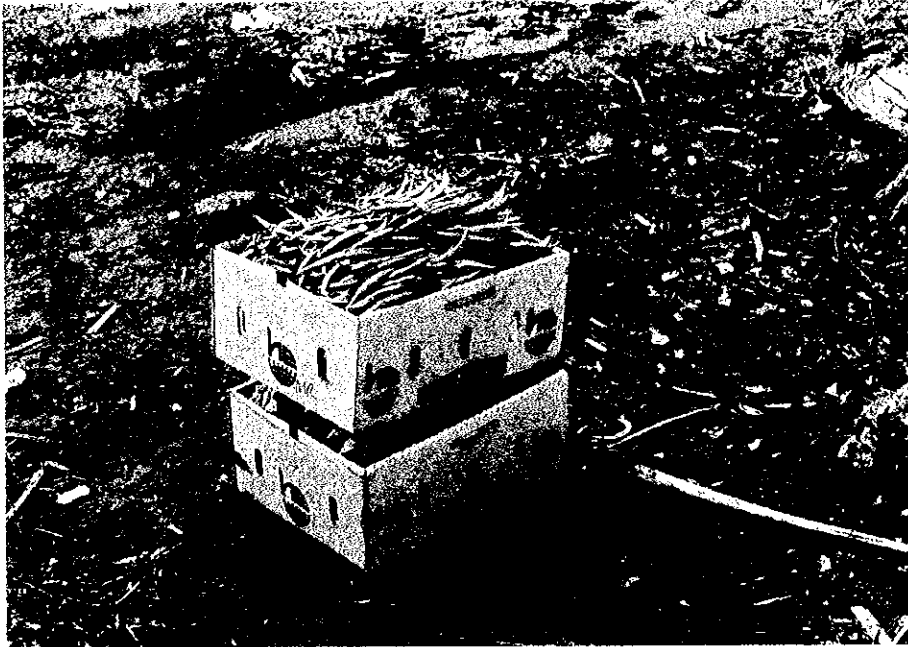
Horticultural farming by
smallholders (Okra)



Horticultural farming by
smallholders (French
Beans)



Horticultural farming by
smallholders (Okra)



Boxes packed with French beans and Bitter Ground



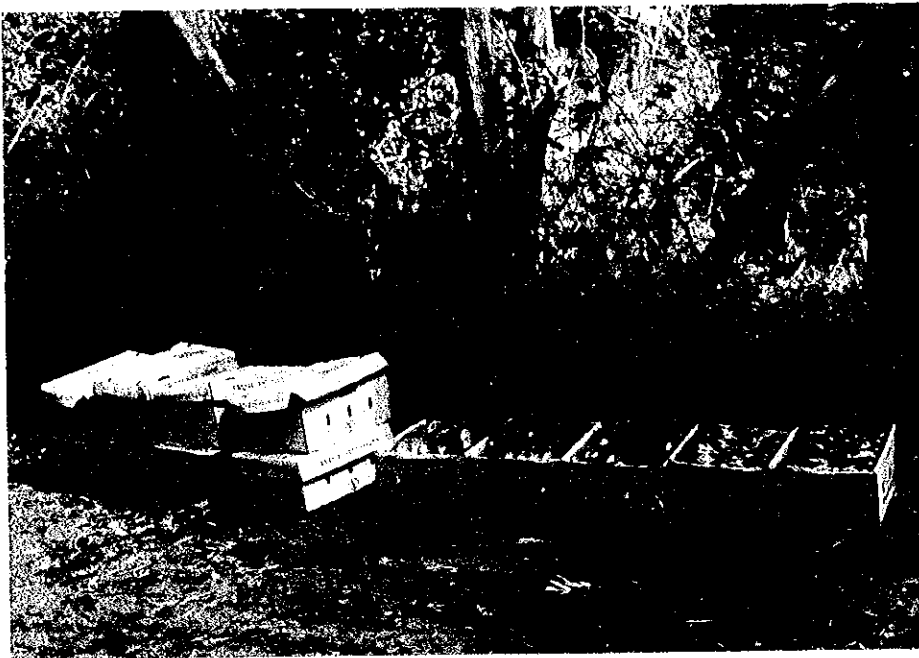
Transportation of crops by smallholders



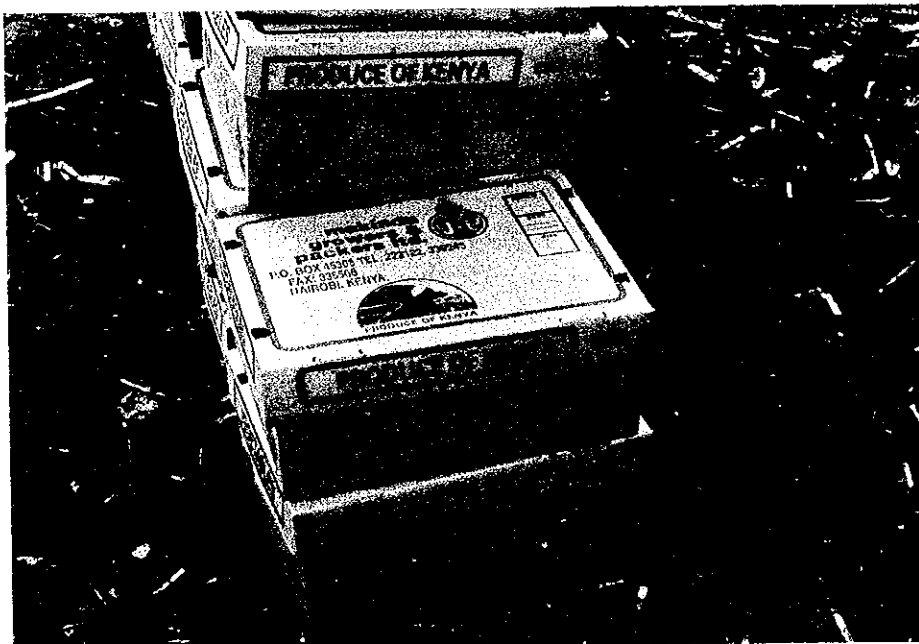
Transportation of crops by smallholders



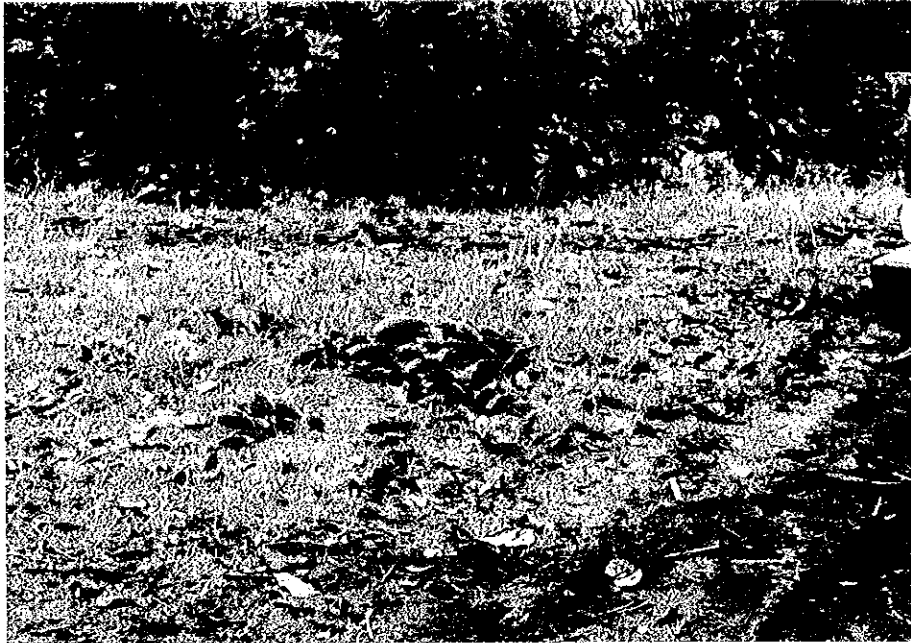
Smallholders waiting for traders/exporters at collection point



Boxes packed with eggplant and Bitter Ground



Cartons used for marketing



Bitter Ground abandoned by traders because of poor quality control



Maize, staple food of Kenyan people



Beans are also another staple food of the Kenya people



Local market dealing with many Cabbages



Local market beside the road



Retailers selling crops at local market



PRA



PRA



Hearing from smallholder

Export-Oriented Horticultural Crops



ASPARAGUS



RUNNER BEANS



FRENCH BEANS



BOBBY BEANS



BABY CARROTS



CHILLIES



SWEETCORN



SNAP PEAS



LEEKS



CURRY LEAVES



VALORE



TINDORI



OKRA



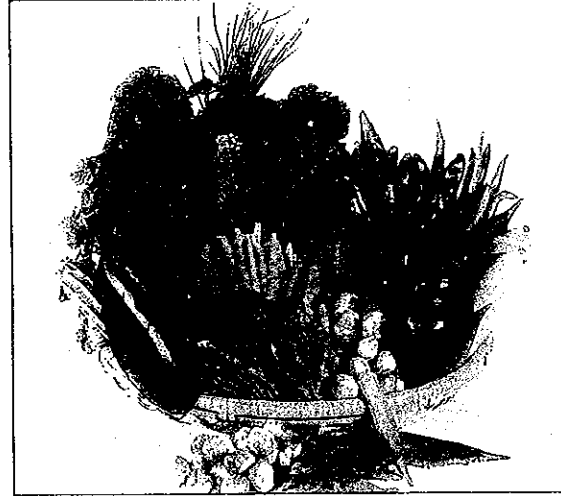
COURGETTE



KARELLA



BRINJALS



CHERRY TOMATO



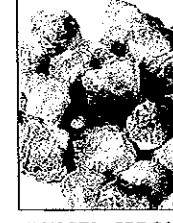
SNOW PEAS



GUWAR



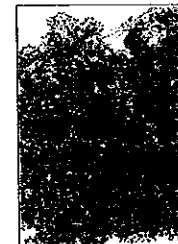
DUDHI



BRUSSEL SPROUTS



CAULIFLOWER



PARSLEY



CORIANDER



MARJORAM



ROSEMARY



DILL



LOVAGE



MINT



GARLIC



GINGER



FENNEL



CELERY



BASIL



CHIVES

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ABBREVIATIONS AND GLOSSARIES

(as of August 1997)

1. Related Agencies

ADB	: African Development Bank
AED	: Agricultural Engineering Division
AFC	: Agricultural Finance Corporation
ASK	: Agricultural Society of Kenya
BADC	: Belgian Administration for Development Cooperation
BAT	: British-American-Tabacco Co.
CBK	: Cooperative Bank of Kenya
CBOK	: Coffee Board of Kenya
CBS	: Central Bureau of Statistic
CBOs	: Community-Based Organizations
CC	: County Council
CRF	: Coffee Research Foundation
DANIDA	: Danish International Development Agency
DBK	: Development Bank of Kenya
DDC	: District Development Committee
DDP	: District Development Plan
DEAR	: Department of Extension and Adaptive Research
DFID	: Department for International Development(UK)
DIU	: District Irrigation Unit
DPIS	: Department of Planning and Information Services
DPD	: Development Planning Division
DvDC	: Divisional Development Committee
DWDP	: District Water Development Plan
DWDS	: District Water Development Study
EC	: European Commission
EDF	: European Development Fund
EEC	: European Economic Commission
EPC	: Export Promotion Council
EU	: European Union
FAO	: Food and Agricultural Organization of the United Nations
FINNIDA	: Finnish International Development Agency
FPEAK	: Fresh Produce Exporters Association of Kenya
FRG	: Federal Republic of Germany
GOK	: Government of Kenya
GTZ	: Deutsche Gesellschaft fur Technische Zusammenarbeit (German Agency for Technical Cooperation)
HCDA	: Horticultural Crops Development Authority
IBRD	: International Bank for Reconstruction and Development
ICDC	: Industrial and Commercial Development Corporation
IDA	: International Development Association
IDB	: Irrigation and Drainage Branch
IFAD	: International Fund for Agricultural Development

ILO/ASIST	: International Labour Organization, Advisory Support, Information Services and Training
IMF	: International Monetary Fund
IPC	: Investment Promotion Center
ITC	: International Trade Center
JETRO	: Japan External Trade Organization
JICA	: Japan International Cooperation Agency
JKUAT	: Jomo Kenyata University of Agriculture and Technology
KARI	: Kenya Agricultural Research Institute
KBC	: Kenya Broadcasting Corporation
KBS	: Kenya Bureau of Standards
KCC	: Kenya Co-operative Creameries
KDB	: Kenya Dairy Board
KEPHIS	: Kenya Plant Health Inspectorate Services
KETA	: Kenya External Trade Authority
KEWI	: Kenya Water Institute
KfW	: Kreditanstalt fur Wiederaufbau (German Agency for Technical Assistance)
KMD	: Kenya Meteorological Department
KPCU	: Kenya Planters' Cooperative Union
KSA	: Kenya Sugar Authority
KSS	: Kenya Soil Survey
KTDA	: Kenya Tea Development Authority
KWAHO	: Kenya Water for Health Organization
KWS	: Kenya Wildlife Service
LDD	: Land Development Division
MEC(MENR)	: Ministry of Environmental Conservation (Ministry of Environment and Natural Resources)
MGD	: Mines and Geology Department
MOA(MOALD)	: Ministry of Agriculture (Ministry of Agriculture and Livestock Development)
MOCD	: Ministry of Co-operative Development
MOCI	: Ministry of Commerce and Industry
MOCSS	: Ministry of Culture and Social Services
MOE	: Ministry of Energy
MOF	: Ministry of Finance
MOH	: Ministry of Health
MOL	: Ministry of Land
MOLG	: Ministry of Local Government
MOLMD	: Ministry of Labour and Manpower Development
MOPND	: Ministry of Planning and National Development
MORTTT	: Ministry of Research Technical Training and Technology
MOTC	: Ministry of Transport and Communication
MPWH	: Ministry of Public Works and Housing
MWR(MLRRWD)	: Ministry of Water Resources (Ministry of Land Reclamation, Regional and Water Development)
NCPB	: National Cereals and Produce Board
KEDS	: Kenya Export Development Support
NES	: National Environmental Secretariat
NGOs	: Non Governmental Organizations
NIB	: National Irrigation Board

NRI	: National Resources Institute
NSQCS	: National Seed Quality Control Services
NWC&PC	: National Water Conservation and Pipeline Cooperation
OECD	: Organization for Economic Cooperation and Development
OECF	: Overseas Economic Cooperation Fund
OP	: Office of the President
OVP&MPND	: Office of the Vice-President and Ministry of Planning and National Development
PC	: Project Committee
PDA	: Provincial Director of Agriculture
PDMED	: Project Development Monitoring and Evaluation Division
PIO	: Project Implementation Office
PIU	: Provincial Irrigation Unit
RBDA	: River Basin Development Authority
SIDA	: Swedish International Development Agency
SISDO	: Smallholder Irrigation Scheme Development Organization
SISO	: Smallholder Irrigation Support Organization
SOK	: Survey of Kenya
SSIDP	: Small Scale Irrigation Development Project
TARDA	: Tana and Athi River Development Authority
TBK	: Tea Board of Kenya
UNESCO	: United Nations Educational, Scientific, and Cultural Organization
UNIDO	: United Nations Industrial Development Organization
UON	: University of Nairobi
USAID	: United States Agency for International Development
WAB	: Water Appointment Board
WB	: World Bank
WDD	: Water Development Department
WHO	: World Health Organization
WQPCC	: Water Quality and Pollution Control Laboratory
WTO	: World Trade Organization

2. Glossaries

AA	: Agricultural Assistant
AI	: Artificial Insemination
AO	: Agricultural Officer
AAO	: Assistant Agricultural Officer
ADA	: Assistant Director of Agriculture
ADF	: African Development Fund
AE	: Agricultural Engineer
AEZ	: Agro.- Ecological Zone
AO	: Agricultural Officer
AGDP	: Agricultural Gross Domestic Product
AIDS	: Acquired Immuno Deficiency Syndrome
ASAL	: Arid and Semi Arid Land
ASIP	: Agricultural Sector Investment Programme

B/C Ratio	: Benefit Cost Ratio
COC	: Community Organizers Consultants
CAAO	: Chief Agricultural Assistant Officer
DAE	: District Agricultural Engineer
DAO	: District Agricultural Officer
DC	: District Commissioner
DCC	: District Coordinating Committee
DDA	: Deputy Director of Agriculture
DDO	: District Development Officer
DFRD	: District Focus for Rural Development
DHO	: District Horticultural Officer
DIE	: District Irrigation Engineer
DIO	: District Irrigation Officer
DIU	: District Irrigation Unit
DO	: District Officer
DWE	: District Water Engineer
DWO	: District Water Office
ECF	: East Coast Fever
EIA	: Environmental Impact Assessment
EIRR	: Economic Internal Rate of Return
FIRR	: Financial Internal Rate of Return
FY	: Financial Year
GDP	: Gross Domestic Product
GRDP	: Gross Regional Domestic Product
HIV	: Human Immuno-Deficiency Virus
HMP	: High to Medium Potential
IE	: Irrigation Engineer
IEE	: Initial Environmental Examination
IRS	: Integrated Rural Survey
ISH	: Individual Smallholder
JAA	: Junior Agricultural Assistant
KBS	: Kenya Bureau of Standard
KS	: Kenya Standard
LBM	: Labour Based Method
LU	: Livestock Unit
MIDAS	: Minor Irrigation Design Aid Software
M/M	: Minutes of Meeting
MRL	: Maximum Residue Level
MRP	: Minor Roads Programme
M/P	: Master Plan
NEAP	: National Environmental Action Plan
NEP	: National Extension Project
NWMP	: National Water Master Plan
NORAD	: Norwegian Rural Access Road Development

ODA	: Official Development Assistance(Japan)
O&M	: Operation and Maintenance
OOIP	: Objectives Oriented Intervention Planning
PDA	: Provincial Director of Agriculture
PDM	: Project Design Matrix
PMC	: Project Management Committee
PRA	: Participatory Rural Approach
PSC	: Project Steering Committee
RARP	: Rural Access Roads Programme
RDF	: Rural Development Fund
RMI	: Road Maintenance Initiative
RTF	: Research Trust Fund
RWSDP	: Rural Water Supply Development Project
SAAO	: Senior Assistant Agricultural Officer
SAE	: Senior Agricultural Engineer
SAO	: Senior Agricultural Officer
SDDA	: Senior Deputy Director of Agriculture
SDR	: Special Drawing Right
SIDP	: Smallholder Irrigation and Drainage Project
SIS	: Smallholder Irrigation Scheme
SOK	: Survey of Kenya
SPR	: Special Purpose Road
SSIDP	: Small Scale Irrigation Development Project
SSATP	: Sub-Saharan African Transport Programme
SSIU	: Small Scale Irrigation Unit
S/W	: Scope of Work
SWEP	: Surface Water Extraction Permit
TA	: Technical Assistance
TO	: Technical Officer
T&V	: Training and Visiting
UNDP	: United Nations Development Programme
UNEP	: United Nation Environment Programme
UNICEF	: United Nations International Childrens Emergency Fund
UNFPF	: United Nation Population Fund Programme
UPOV	: Union for the Protection of New Plant Varieties
WID	: Women in Development
WRAP	: Water Resources Assessment Project
WTP	: Water Treatment Plant
WUAs	: Water Users Associations

3. Unit of Measurements

mm	: millimeter
cm	: centimeter
m	: meter
km	: kilometer
sq.m	: square meter
sq.km	: square kilometer

ha	: hectare
l, lit	: liter
cu.m	: cubic meter
MCM	: million cubic meter
cu.m/day	: cubic meter per day
lit/sec	: liter per second
cu.m/sec	: cubic meter per second
ppm	: parts per million
pH	: potential of hydrogen
EC	: electric conductivity
g	: gram
kg	: kilogram
t, ton	: metric ton
sec.	: second
min.	: minute
hr.	: hour
yr.	: year
ave.	: average
min.	: minimum
max.	: maximum
kcal	: kilocalories
kw	: kilowatt
kwh	: kilowatt-hour
%	: percent
No.	: number
°C	: degree centigrade
cap.	: capita
md	: man-day
mil.	: millimho
pers.	: person
mmho	: micromho
msl	: meters above mean sea level
vpd	: vehicle per day
ET	: evapo-transpiration
N	: nitrogen
P	: phosphorus
K	: potassium
Kenya shilling (Ksh)	: Kenya shilling
K £	: Kenya Pound (20 Kenya Shillings)
US\$: US Dollar = 60 shillings (August 1998)

1/ The organization names of the Government of the Republic of Kenya in the Master Plan Report are used as of August 1997, while those in the Feasibility Study are based on the latest Government organization. Major differences in organization names used in both Reports are as follows;

Ministry of Agriculture and Livestock Development (MOALD)→Ministry of Agriculture (MOA)
Ministry of Land Reclamation, Regional and Water Development (MLRRWD)→Ministry of Water Resources (MWR)
Ministry of Environment and Natural Resources (MENR)→Ministry of Environmental Conservation (MEC)