REDD+ Technical Working Group Meeting

Participants : TWG members and Stakeholders

Date : 4th October 2021

Place : Utalii Hotel in Nairobi

Time	Activity	Facilitator
8:30 - 9:00	Registration	Ms. Veronica Syombua
9:00 – 9:15	Introduction	Mr. Peter Nduati
9:15 - 9:30	Opening Remarks	Mr. Alfred Gichu
9:30 – 10:00	Overview of modification of NFMS document Ver.1	Dr. Mwangi Kinyanjui
10:00 - 10:30	Ch.1 Background and Purpose of NFMS documents	Mr. Peter Nduati
10:30 - 11:00	Ch.2 Basic Conditions of Kenya's NFMS and Ch.3 Conceptual design of NFMS in Kenya	Dr. Mwangi Kinyanjui
11:00 - 11:30	Health Break / Tea Break	
11:30 - 12:00	Ch.4 Monitoring Function of NFMS ➢ Forest Cover and Forest Cover Change for AD ➢ Forest Carbon Stock for Emission Factor	Mr. Peter Sirayo
12:00 - 12:30	Ch.4 Monitoring Function of NFMS ➢ Policies and Measures (PaMs) ➢ Biodiversity ➢ REDD+ and AR-CDM projects	Dr. Mwangi Kinyanjui
12:30 - 13:00	Ch.5 Data Management Function of NFMS	Mr. Richard Ngugi
13:00 - 14:00	Lunch Break	
14:00 - 14:30	Ch.6 Institutional Arrangements for NFMS	Dr. Mwangi Kinyanjui
14:30 - 15:00	Ch.8 Future Improvement	Dr. Mwangi Kinyanjui
15:00 - 15:30	Closing remarks	Mr. Alfred Gichu
15:30 - 16:00	Tea Break and departure	

*Question and Answerer time will be set in each session

DRAFT MINUTES OF REDD+ TECHNICAL WORKING GROUP MEETING
Participants: TWG members
Date: 4th October 2021
Venue: Utalii Hotel, Nairobi

1 PURPOSE

Validation of the NFMS draft document and its adoption as version 1

2 PARTICIPANTS

The meeting was attended by 14 participants.

List of participants

S/No	NAME	ORGANIZATION
1	ALFRED GICHU	ME&F
2	PETER NDUATI	KFS
3	MWANGI KINYANJUI	KARATINA UNIVERSITY
4	JANE WAMBOI	KWS
5	DAVID ADEGU	CCD
6	BALOZI BEKUTA	UNIVERSITY OF ELDORET
7	ALI MWANZEI	NEMA
8	FELIX MUTUA	JKUAT
9	P. SAMSON NZIOKI	C I
10	PETER SIRAYO	KFS
11	RICHARD MWANGI	KFS
12	KAZUHISA KATO	AAS
13	YOSHIHIKO SATO	AAS
14	VERONICA SYOMBUA	AAS

3 AGENDA

1) Registration / Introduction
2) 0pening Remarks
3) Review of Modifications made to the NFMS document
4) Future Improvement
5) Way forward /Closing Remarks
6) Closing Remarks /Adjournment

7)

3.1 REGISTRATION AND INTRODUCTION

The meeting started with a word of prayer at 9:30am led by Dr. Mwangi Kinyanjui. A self-introduction session followed where all the participants introduced themselves, mentioning names and the organizations they represented.

3.2 OPENING REMARKS

Mr. Nduati introduced the main agenda of the meeting, which was to review and validate the NFMS document as Version One. There were changes and improvements made to the document based on comments and views given during the previous TWG meeting held in Naivasha in July. He reiterated that the current NFMS document, now Version1, will be constantly revised based on emergence of new technologies, information, and/or methodologies.

Mr. Nduati opened the floor for the day's deliberations.

Reactions
Prof. Balozi had noted that University of Eldoret and NEMA were missing in the acknowledgement section of the document and requested that the two entities be included.

3.3 REVIEW OF MODIFICATIONS MADE TO THE NFMS DOCUMENT

3.3.1 Overview of modification of NFMS document Ver 1

Dr. Kinyanjui provided an overview of all the modifications made to the NFMS document as under:

- Report Reorganization
- Edits of titles to improve alignment
- Revision of illustrations such as tables, figures and maps among others.
- Deletion of irrelevant sections
- Provision of guidelines for future improvement. A chapter on future improvement was added
- Editing made to improve grammar and sentence structure.

He also indicated that a link between the NFMs and NFMS roadmap would be added to show the progress made.

Reactions
Prof. Balozi expressed dissatisfaction with the use of the word 'potential' in the definition of a forest in the document. He requested that the word be removed to ensure the definition covered forests that meet the threshold.
There was also a suggest by one of the member to provide the definition of tree cover in the document.

Prof. Balozi felt that the meaning given to forest land was inadequate and suggested that a footnote be added for more information

It was agreed that the document remain as is and that the two definitions can be reviewed later when working on Version 2, noting that the same definition was used in the other documents related to NFMS for REDD+ implementation.
It was suggested that the technical manual from SLEEK be published first, because the NFMS borrows a lot of its methodology from that manual. UNDP can be consulted about funding the publishing of the said material.
Another member expressed their dissatisfaction by the use of the word 'document' and suggested a suitable replacement be sought.

3.3.2 Ch.2 Basic Conditions of Kenya's NFMS and Ch.3 Conceptual design of NFMS in Kenya

Dr. Kinyanjui made a presentation on these chapters under the following subheadings highlighting all the modifications that were made and led the participants in a Q/A session

- Land Use Categorization,
- Forest Definition Adopted by the NFMS
- Forest Stratification
- Carbon Pools
- REDD+ in Kenya
- Conceptual Design of NFMS in Kenya

Reactions
It was suggested that soil organic carbon be considered in the future improvement as part of carbon pools that are being monitored by the system. It can be a source of excellent indicators. Data on soil organic carbon was limited and hence the same could not be included in the current version.
Dr. Kinyanjui reiterated that according to IPCC guidelines the soil organic carbon changes significantly after the 20th year of conversion, therefore it would not be sufficient to measure carbon.
It was felt that more information in the document was needed to show how conservation helps reduce emissions and whether it takes into consideration the activity of the trees sequestering carbon
There was a suggestion to correct one of the maps on forest stratification based on the new ocean boundary at the coastal line.
It was suggested that the mangrove and coastal stratification zone be separated because the two types of forests are very different and do not have similar emission factors. It was also noted that the methodology of assessment is different for both.
Dr. Kinyanjui pointed out that the area occupied by the mangroves is too small to affect the total numbers of EF at the national level. It was also noted that for purposes of consistency between the FRL and NFMS the two forests can remain as is, but with future improvements and more studies on the mangroves by FAO and other organizations this matter can be revisited.

3.3.3 Ch.4 Monitoring Function of NFMS

Sirayo covered Forest cover and forest cover change for AD, and Forest Carbon Stock for Emission Factor. He mentioned that no modifications were done in this chapter except the re arrangement of the numbering system and the grammar checks. He took the participants through a brief presentation and opened it up for reactions.

Reactions
The allometric equations used to calculate EF will need a co efficient due to slight variations depending on which location the forests exist. Dr. Kinyanjui agreed to add the coefficients for the various species.
It was also noted that the images used in Fig.5.3.1 were not very clear, therefore there was need to look for higher resolution images that can be seen clearly. The numbering also could be changed to alphabetical instead of numerical.
A member that a footnote be added to describe the ICFRA and SLEEK manuals to give more information whenever they are mentioned within the documents. A participant also suggested that the ICFRA manual can be given a better name.

3.3.4 Ch.5 Monitoring Function of NFMS -Policies and Measures (PaMs); Biodiversity; REDD+ and AR-CDM projects

Chapter 5 was presented by Dr. Mwangi Kinyanjui who took the participants through the modifications made in policies and measures, biodiversity concepts and the REDD+ and AR-CDM projects. Modifications done mainly were on inclusion of biodiversity components monitored through the ICFRA inventory methodology
There was provision of more information on REDD+ and AR-CDM projects that will be monitored in the NFMS highlighting their purpose and scope of work among many other things and record of how these REDD+ projects in Kenya contribute to national targets.

Reactions
There was a suggestion to add a sub model to the FIP where stakeholders can upload their data into the system. This sub model would offer detailed information from the specific organizations that have authority over their data.
It was felt that a paragraph or more be added stating which other further information can be found on FIP from our stakeholders like KWS etc.
There was a suggestion, that the NFMS roadmap that was done on the roles assigned to each institution need to be revisited and put into consideration.
KFS was required to convene a stakeholder meeting in order to discuss how they can provide data for the NFMS.

3.3.5 Data management function of NFMS

Data management function was presented by Mr. Richard. He reiterated that the FIP was work in progress. He took the participants through the modifications that had been done on the section.

Reactions
A member suggested that instead of specifying which game rangers are sent to carry out ground truthing, it would be better to use a general word "ranger" given that this system serves every stakeholder in the forestry sector.
It was suggested that the project comes up with a fire plan for the protected areas because such cases have increased significantly in the recent past.
It was felt that even though the ongoing works in Kwale county were for the pilot project, there was need to bring all the other stakeholders on board for the same study.

3.4 Future Improvement

A stepwise improvement procedure has been provided towards developing version 2 of the NFMS document
Dr. Kinyanjui made a presentation on the future improvements that are likely to be incorporated in the NFMS Ver.2 under the following sub topics:

- Future/stepwise improvements from the technical assessment of FRL
- Future/stepwise improvements from comments given during the meeting.
- Emerging issues from REDD+ strategy
- Linkage to the National GHG/MRV system

There were no reactions on this session.

3.5 Way forward /Closing Remarks on NFMS by Mr. Gichu

Mr. Gichu gave the closing remarks of the meeting
He emphasized that the NFMS document has to deliver on all the indicators and processes happening within the forestry sector.
He also added that a methodology of monitoring tree cover be sought and included in the NFMS.
He also urged the current custodian of NFMS (KFS) to engage all stakeholders so that they can pool resources together towards establishment and management of the system. Left alone KFS alone may lack the financial budget for the task ahead.
In future, an NFMS center or a regulatory body could be established so as to move its operations from the stakeholder's facilities to a totally independent agency. This request can be added into the National REDD+ Strategy.
He reiterated that funding may not be obtained with the current version. There was therefore need to improve this document to meet the minimum requirements for REDD+ implementation and hence funding.

3.6 Adjournment

The meeting ended at 4pm with a word of prayer from Mr. Peter Sirayo.

Minutes prepared by:
Name: Veronica Syombua Signature: ……
Date: 5.10.2021.

NATIONAL FOREST MONITORING SYSTEM

Overview of modification of NFMS document Ver.1

By
Mwangi Kinyanjui – Karatina University

Introduction

- A presentation of the NFMS document was done to the TWG on 1st July 2021 (Masada hotel)
- The TWG made comments on the Document which have been looked into and today we are presenting a modified document
- This is Version 1 of the NFMS document
- Kenya needs an NFMS document Ready to help implement the REDD+ programme.
- Already the other documents for REDD+ implementation are being finalized
  - Forest Reference level Submitted to UNFCCC in August 2020
  - REDD+ Strategy/Investment Plan – in final Stage of completion
  - SIS – procurement for Tender has been done and is in development phase

Introduction Cont'

- This being Version 1 of the NFMS document, it provides an opportunity to improve on a stepwise basis consistent with Kenya's ***national circumstances and capabilities (*Decision 4 of COP 15)**
  - Methodologies
  - Definitions
  - Tools
  - Jurisdictions
- Finalization of this document therefore allows Kenya to engage in the process of developing version 2 of the NFMS document as a build up to issues identified for improvement
- It is noted that technology is rapidly changing and Carbon markets are also introducing new guidelines and Kenya needs to align to such requirements in future
- Version 1 document is based on already existing manuals –
  - ICFRA For Biomass assessment and development of EF
  - SLEEK land cover mapping manual for development of maps and AD

Summary of types of modification

- Report reorganization
- Addition of missing information
- Enhancing clarity of information
- Edits of titles to improve alignment
- Revising illustrations
- Deletion of irrelevant sections
- Provision of guidelines for future improvement

Report Reorganization

- Chapter two was deleted and the whole content inserted into chapter 1 as section 1.3. this is the section that introduces International guidelines for developing NFMS
- Section 4.4 - The PAM tables which were based on Thematic areas of the NFP were replaced with the strategic Options of the Draft REDD+ strategy
- PAMS related to mitigation actions are best reported through emission reductions while those addressing adaptation may use other appropriate indicators

Addition of missing information

- Additional information included
  - Chapter 3- an introductory section on Conceptual design
  - Section 5.5. on biodiversity assessment – information indicated in the ICFRA manual on monitoring biodiversity components was included
  - Section 5.6 – an explanation of the components of a REDD+ and AR-CDM Project/Registry
  - Section 6.2 – a description of how the NFMS links to the Plantation inventory was described
  - A whole Chapter on future improvement was added. This improvement is based on Suggestions of the FRL TA and also the REDD+ strategy
  - Addition of information on participatory approach

Enhancing clarity of information

- Enhancement of information was done to make unclear sections become clearer. This included editing statements in sections indicated below
  - Paragraph 1 section 2.1 – and categorization and also last paragraph on SLEEK land cover mapping manual
  - Section 2.3 forest stratification
  - Section 2.3 (2) Mangroves to clarify on mangrove area indicators
  - Section 4.1.2 on land cover mapping interval
  - Section 4.2.1 on sampling methodology- calculation of sampling intensity, inclusion of sample clusters as the reference sampling unit and Revising the allocation of Permanent sample clusters to 25%
  - Recalculation of Table 5.2.4 on sample size and sample intensity for Permanent clusters
  - A detailed description of the sampling procedures and data sets collected in sample plots
  - Section 4.4. – description of monitoring of PaMs
  - Description of the FIP procedures – Section 5.3

Edits of titles to improve alignment

Titles edited to enhance clarity are

- Chapter two from basic conditions to basic considerations
- Chapter three to allow use of possessive form (Kenya's Design and not Design in Kenya)

Revising illustrations

Illustrations that have been revised/improved are

- Figure 2.1 – clarity for print
- Table 5.2.3 – numbers revised accordingly
- Table 5.2.4 – numbers revised accordingly
- Table 5.2.6 – clarity of some sections
- Figure 5.2.6- Clarity of process diagram
- Figure 5.3.2- Detection of deforestation – updated diagram used
- Figure 5.3.3 – flow diagram enhanced for print
- Figure 5.3.5 – updated diagram used
- Table 5.4.1 – PaMs table replaced with updated information
- Figure 6.1.1 – FIP objectives diagram corrected
- Appendix 2 for uncertainty assessment tables
-

Deletion of irrelevant sections

Section 6.2 was deleted – description of access rights and approval process to the FIP

Provision of guidelines for future improvement

- A chapter on future improvement has been added. The chapter provides a way forward for improving the NFMS on the basis of suggestions provided in the FRL and upcoming issues (Technologies, carbon markets, juridsdictional units etc)
- The chapter also identifies opportunities for participatory approaches in implementation of the NFMS

Editorials

- Editorials have been done to improve grammar and sentence framing

Other issues

- Some recent comments
  - Link NFMs with NFMS roadmap to show progress

Modification of Ch.1 Background and Purpose of NFMS

REDD+ TWG AND STAKEHOLDERS MEETING ON 4TH OCTOBER 2021

COMPONENT MANAGER OF COM.3 IN CADEP-SFM

MR. PETER NDUATI

Modification Point

✓ **Reorganized chapter**

Ver. 1.7	Ver. 1.8
Chapter1. Background and Purpose of NFMS document 1.1 Background 1.2 Milestones in Forest Sector Legal Legislation 1.3 The Purpose of the NFMS document	Chapter 1. Background and Purpose of NFMS Document 1.1 Background 1.2 Milestones in Forest Sector Legal Legislation 1.3 UNFCCC Requirements for NFMS 1.4 The Purpose of the NFMS Document
Chapter2. UNFCCC Requirements	
Chapter3. Basic conditions of Kenya's NFMS	Chapter 2. Basic Considerations of Kenya's NFMS

✓ **Reorganized**

Contents

✓ **Not changed**

Ch.1 Background and Purpose of NFMS document

1.1 Background

In reference to the National Forest draft Policy 2020 Kenya is endowed with a wide range of forest ecosystems ranging from montane rainforests; savannah woodlands; dryland forests; plantation forests and coastal forests, which include mangroves and Kayas. The current forest cover of 6.0% of the land area of the country is still below the constitutional requirement of 10%. Kenyan forests have high species richness and endemism, which has made the country be classified as mega diverse. They rank high as the country's natural capital due to their environmental, life supporting functions, and the provision of diverse ecological and economic goods and services.

Ch.1 Background and Purpose of NFMS document

✓ Not changed

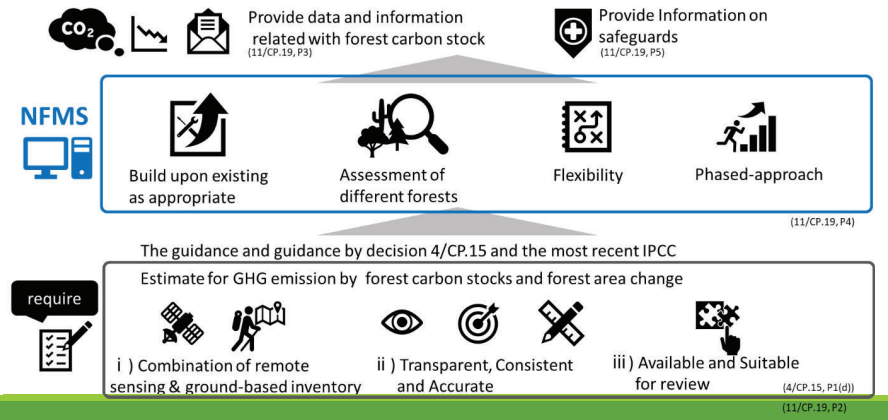
1.2 Milestones in Forest Sector Legal Legislation

- ✓In 1957, the first formal Forest Policy was prepared
- ✓In mid-90's, a revised Forest Policy and Legislation was prepared as a result of emergent challenges facing the forestry sector.
- ✓Forest Act 2005 became effective in 2007 after it was implemented.
- ✓In 2015, a draft Forest Policy was prepared so as to align Forests legislation with the Constitution.
- ✓the Sector still experienced issues such as climate change, payment for ecosystem services, green growth, rights of forest dependent communities, conflicts over natural resources, benefit sharing of natural resources and partnerships with communities and the private sector for commercial forestry and conservation.
- ✓a draft National Forest Policy, 2020 was formulated and it proposed changes to the Forest Conservation and Management Act, 2016 in order to align it with the current Policies.

Ch.1 Background and Purpose of NFMS document

✓ Not changed

1.3 UNFCCC requirement



Ch.1 Background and Purpose of NFMS document

✓ Not changed

1.3 UNFCCC requirement

Kenya intends to take a step-wise approach to develop its NFMS based on National circumstances and technological capacities available at the time. As such, the current NFMS reflects the latest available information at present and its scope and methodologies will be modified with improvement in technical capacities.

✓ Not changed

1.3 UNFCCC requirement

Decision 4 of COP 15 in 2009 in Copenhagen, Denmark

In Paragraph 1, The Conference of the Parties requests developing country Parties to establish, according to national circumstances and capabilities, a robust and transparent national forest monitoring systems and, if appropriate, sub-national systems as part of national monitoring systems that:

(i) Use a combination of remote sensing and ground-based forest carbon inventory approaches for estimating, as appropriate, anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest area changes;

(ii) Provide estimates that are transparent, consistent, as far as possible accurate, and that reduce uncertainties, taking into account national capabilities and capacities;

(iii) Are transparent and their results are available and suitable for review as agreed by the Conference of the Parties

✓ Not changed

1.3 UNFCCC requirement

Decision 1 of COP 16 in 2010 in Cancun, Mexico

In paragraph 70, developing countries are encouraged to contribute to mitigation actions in the forest sector, in accordance with their respective capabilities and national circumstances, by undertaking the following activities:

(a) Reducing emissions from deforestation;

(b) Reducing emissions from forest degradation;

(c) Conservation of forest carbon stocks;

(d) Sustainable management of forests;

(e) Enhancement of forest carbon stocks

✓ Not changed

1.3 UNFCCC requirement

Decision 1 of COP 16 in 2010 in Cancun, Mexico

Also in paragraph 71, developing countries aiming to undertake REDD+ activities under the convention are requested, in the context of the provision of adequate and predictable support, including financial resources and technical and technological support, to develop a number of elements as follows:

(a) REDD+ National Strategy or Action Plan

(b) Forest Reference Emission Level/Forest Reference Level (FREL/FRL)

(c) A robust and transparent National Forest Monitoring System

(d) Safeguards Information System

✓ Not changed

1.3 UNFCCC requirement

Decision 11 of COP 19 in 2013 in Warsaw, Poland

The conference of the Parties decides that national forest monitoring systems should

(a) Build upon existing systems, as appropriate;

(b) Enable the assessment of different types of forest in the country, including; natural forest, as defined by the Party;

(c) Be flexible and allow for improvement;

(d) Reflect, as appropriate, the phased approach as referred to in Decision 1 of COP 16.

✓ Not changed

Ch.1 Background and Purpose of NFMS document

1.4 The Purpose of the NFMS Document

The main objectives of this document are presented below.

- ✓To develop the methodology of how forest is monitored.
- ✓To develop the data management system for REDD+ and sustainable forest management
- ✓To clarify the institutional arrangement for implementation of NFMS
- ✓To clarify the mid/long time calendar for implementation of the national forest monitoring system

The NFMS document has to be constantly revised on the basis of new technologies, information/data, and/or methodologies. This is indispensable for the forest monitoring of Kenya.

Basic Conditions of Kenya's NFMS

GEORGE TARUS

Topics

- Land use categorization
- Forest Definition
- Forest Stratification
- Carbon pool
- Scope gas
- REDD+ in Kenya
- NFMS Design




Land use categorization

The 2006 IPCC Guidelines provided the categorization

- **Forest Land**:
- **Cropland**:
- **Grassland**:
- **Wetlands**:
- **Settlements** and **Other Land**:

Forest Definition

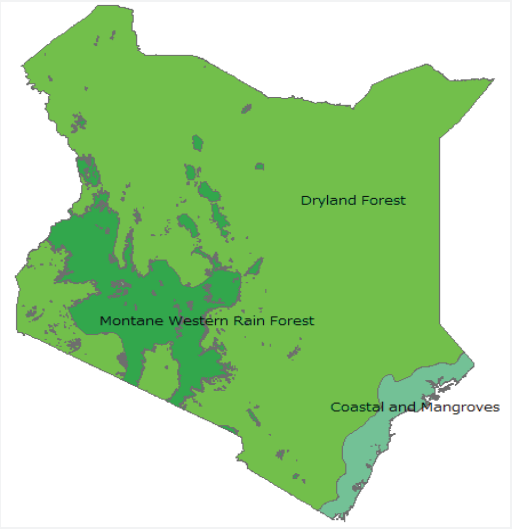
An area cover a minimum of 0.5 ha, minimum 15% canopy cover, and potential to reach a minimum height of 2 meters at maturity.

Perennial tree crops like coffee and tea are not considered as forests under this definition irrespective of whether they meet the definition of forests.

This definition was informed by five basic considerations;

- Provision of opportunity to many stakeholders within the country to participate in incentivized forestry
- Inclusion of the variety of forest types
- Possibility of providing consistent data for establishing the reference level and for monitoring of performance based on available technology;
- Need to balance the costs of implementation and monitoring and the result-based incentives
- Consistency with the national forest agenda to optimize, manage and conserve Kenya's forests.

Forest stratification



(The National Forest Reference Level for REDD+ Implementation, 2020)

Stratum	Area(ha)
Montane and western Rain forests	1,356,317
Coastal and Mangrove forests	499,658
Dryland forest	1,541,323
Plantation forest	90,246

First level stratification	Second level stratification
Montane and western rain forests and bamboo	Dense (canopy cover ≥65%)
	Moderate (Canopy cover 40-65%)
	Open (Canopy cover 15-40%)
Mangrovesand coastal forests	Dense (canopy cover ≥65%)
	Moderate (Canopy cover 40-65%)
	Open (Canopy cover 15-40%)
Dryland forests	Dense (canopy cover ≥65%)
	Moderate (Canopy cover 40-65%)
	Open (Canopy cover 15-40%)
Plantation forest land	Plantation forest managed by KFS

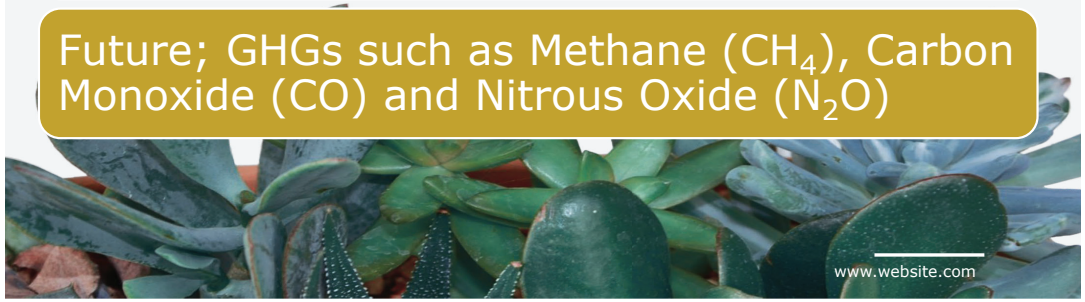
Carbon pool

Carbon pools	Included
Above ground biomass (AGB)	Yes
Below ground biomass(BGB)	Yes
Soil organic carbon	No
Dead wood	No
Litter	No

Scope gas

The currently focus on carbon dioxide (CO_2).

Future; GHGs such as Methane (CH_4), Carbon Monoxide (CO) and Nitrous Oxide (N_2O)



REDD+ in Kenya

Scale

- National
- Nesting/Jurisdictional?
- Project Level??

REDD+ activity	Included
Reducing Emissions from Deforestation	Yes
Reducing Emissions from Forest Degradation	Yes
Conservation of Forest	No
Sustainable Management of Forest	Yes
Enhancement of forest carbon stocks	Yes

Definition of REDD+ activities

Forest strata			Area in 20XX+(X)													
			Forest										Non Forest			
			Montane & Western Rain Forest			Costal and Mangrove forest			Dryland Forest			Public Plantation Forest	Cropland	Grassland	Wetland	Settlement & Otherland
			D	M	O	D	M	O	D	M	O					
Area in 20XX	Forest	Montane & Western Rain Forest D	n	dg	dg								df	df	df	df
		Montane & Western Rain Forest M	e	n	dg								df	df	df	df
		Montane & Western Rain Forest O	e	e	n								df	df	df	df
		Costal and Mangrove forest D				n	dg	dg					df	df	df	df
		Costal and Mangrove forest M				e	n	dg					df	df	df	df
		Costal and Mangrove forest O				e	e	n					df	df	df	df
		Dryland Forest D							n	dg	dg		df	df	df	df
		Dryland Forest M							e	n	dg		df	df	df	df
		Dryland Forest O							e	e	n		df	df	df	df
		Public Plantation Forest										n	s	s	s	s
	Non Forest	Cropland	e	e	e	e	e	e	e	e	e	s	NA	NA	NA	NA
		Grass land	e	e	e	e	e	e	e	e	e	s	NA	NA	NA	NA
		Wetland	e	e	e	e	e	e	e	e	e	s	NA	NA	NA	NA
		Settlement & Otherland	e	e	e	e	e	e	e	e	e	s	NA	NA	NA	NA

df Deforestation (F→NF) | dg Forest Degradation (F→F(Degraded)) | e Enhancement (F→F(Improved) .NF→F)
n Nc Change (F→F) | s Sustainable Management of Forest (F→NF, NF→F) | NA Not Availabe

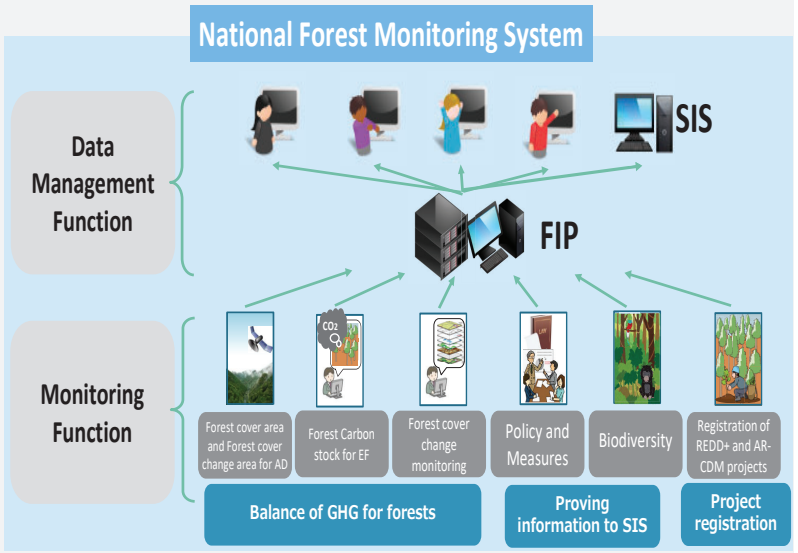
9

CONCEPTUAL DESIGN OF NFMS IN KENYA

Objectives

- Gather accurate and transparent data and information related with Kenya forest management
- Providing it to inform interested stakeholders on the forest status,
- Report to international conventions,
- Use information for sustainable forest management in Kenya.

Layout of NFMS



Monitoring items in Kenya

Item	Information resource
Forest cover area and forest cover change area (AD)	Land cover/Land use map,Land cover/Land usechange map
Forest carbon stock (EF)	National Forest inventory, Biomass survey
Forest cover change Monitoring	JJ-FAST, Extraction of deforestation area using optical image (Sentinel 2) developed by Forest 2020, and ground truth using Survey 123
Policy and Measures	National REDD+ strategy and National Forest Program, etc.
Biodiversity	Protected area management plan, biodiversity assessment etc.
Project registration	Registration form of REDD+, A/R CDM project based on the information and data to be gained through REDD+ and A/R CDM projects in Kenya

Data management function

To ensure transparency and accessibility of information related to the forest sector in Kenya

To store and provide the forest data gathered according to the methodologies indicated in the guideline

To store and provide data and information on policy and measures of the forest sector.

To provide useful information to the SIS

To register the project level activities of forest sector.

Thank you

NATIONAL FOREST MONITORING SYSTEM

Monitoring Functions Of The NFMS

By
Mwangi Kinyanjui – Karatina University

BIODIVERSITY

INTRODUCTION

- Modifications done mainly is on Inclusion of biodiversity components monitored through the ICFRA inventory methodology i.e
  - No biodiversity component,
  - presence of Big mammals,
  - presence of Other mammals,
  - presence of Reptiles,
  - presence of Birds,
  - presence of insects, and Butterflies,
  - presence of climbers,
  - presence of Epiphytes,
  - presence of fungus,
  - observed Rare biotope (e.g. spring, oasis etc.)

Assessing biodiversity from inventory data

By measured components as shown below

Measuring Item	Size or location from centre of Sample plot	Data to record
Shrubs	Within 15m radius	-
Tree regeneration	Two circular (1.5 m radius subplots) locating 10 meters from the sample plot centre.	Height ≥10cm, DBH ≤2cm
Tree	Within 2m radius	DBH ≥2cm (seedlings)
	Within 5m radius	DBH ≥5cm (Saplings)
	Within 10m radius	DBH ≥10cm (poles)
	Within 20m radius (Dryland Forests Stratum)	DBH ≥20cm
	Within 15m radius (other than Dryland Forests Stratum)	
Dead wood	Within 15m radius	Diameter ≥10cm
Stumps	Within 15m radius	Diameter ≥10cm
Bamboo	Within 10m radius	All bamboo shoots ≥1.3m
Climbers	Within 2m radius	DBH ≥2cm
	Within 5m radius	DBH ≥5cm

Biodiversity assessment opportunities

- Using PSPS, compare biodiversity changes over time – may illustrate effects of REDD+ implementation
- Using TSPS compare biodiversity among
  - Strata
  - Ecosystems
  - Clusters
  - Plots in a cluster
  - Tree size classes

Biodiversity assessment

Biodiversity indicator	purpose for monitoring	Methodology for monitoring
Abundance by numbers	Identifies the number of trees identified in a forest. Noting the uneven distribution of trees in forests, a forest with more trees is better stocked compared to one with less trees	Abundance is derived from the total number of individuals recorded in a forest
Species richness	Identifies how many species are found in a forest. A forest with more species is richer and has a wider variety	Species richness is calculated from total number of species in a forest
Relative abundance	Identifies the contribution of a species to the total population of a forest. A species with more numbers in the population has a higher relative abundance. Such a species may not be threatened by overuse in that forest	Calculated from the total number of individuals of each species as a fraction of the total population
Relative frequency	Identifies the distribution of a species among sample sites. A species that is recorded in most sample sites is well distributed and can be described as adaptable to different ecological conditions or different levels of anthropological/natural stress	Calculated from the total number of samples a species is recorded as a proportion of the total number of sample sites

Biodiversity assessment opportunities

Biodiversity indicator	purpose for monitoring	Methodology for monitoring
Relative dominance	Identifies the contribution of a species to the total basal area of a forest. Large trees with more basal area normally form the dominant trees in the forest and may comprise emergent/top canopy trees, mother trees for seed production. They may also influence water catchment and are major hosts of biodiversity.	Calculated from the total basal area of a species as a proportion of the total forest biomass
Importance Value Index	This is a combined index that caters for relative abundance, relative frequency and relative dominance and indicates the overall dominance of a species based on several indicators	Calculated as the sum of relative abundance + relative frequency + relative dominance per species (Kinyanjui, 2009)
Species similarity	Forests exists as associations where certain group of species grow together. A forest with a wide variety of associations deviates from monoculture characteristics and therefore host more biodiversity	Calculated from a variety of similarity indices e.g. Sorenson's or Jacard's indices (Washington, 1984)
Diversity	Diversity of species in a forest explain the variety of roles the forest has. This variety includes the opportunities for hosting flora and fauna as well as microorganisms	The most commonly used index for species diversity is the Shannon- wiener diversity index (Omayio and Mzungu, 2019) it takes into account the number of species present, as well as the relative abundance of each species
Species evenness	Describes how homogenous or evenly distributed the species described in the diversity index occur	Is calculated form the diversity index and the species richness of the forest

REDD+ and AR-CDM projects

Purpose

- To compile greenhouse gas reduction efforts in forests in Kenya and to prevent duplication of credits in emissions trading.
- To keep record of REDD+ projects in Kenya and their contribution to national targets? – Jurisdictional units
- To keep record of climate finance provided to the different REDD+ projects

What kind of information?

- ✓ Name of Project
- ✓ Implementer,
- ✓ Location of the project (County, Sub-County, Location)
- ✓ Area(ha)
- ✓ Start date of the project
- ✓ End date of the project (expected)
- ✓ Target emission reduction amount (CO2t)
- ✓ Actual emission reduction amount (CO2t)
- ✓ Quantities for which payments ware received (CO2t, Year)
- ✓ Entity paying for results
- ✓ Kinds of activities
- ✓ Monitoring method
- ✓ Pools measured

Modifications

- PaMs have become the Strategic investment areas in the REDD+ strategy

Policies and Measures

MONITORING FUNCTION OF NFMS

BY

SIRAYO P.L.

REDD+ TWG WORKSHOP-UTALII HOTEL, NAIROBI-4TH OCTOBER 2021

Outline

- Forest Carbon Stock for EF-NFI & Carbon Stock Calculation
- Forest Cover and Forest Cover Change for AD
- Forest Cover Change Monitoring

Forest Cover and Forest Cover Change for AD

- No modifications made

Forest cover area

Classification System

Categorization was based on **international guidelines, local definitions** of land uses

Broad class	1st level sub category	2 level sub category (based on ancillary data)
Forestland	➢ Natural • Dense Forest (above 65% Canopy) • Moderate Forest (40% < 65%) • Open Forest (15% ≤ 40%)	Montane and Western rain forests and bamboo Mangroves and Coastal forests Dryland forests
	➢ Plantation	-
Grassland	➢ Wooded Grassland ➢ Open Grassland	-
Cropland	➢ Perennial Cropland ➢ Annual Cropland	-
Wetland	➢ Vegetated Wetland ➢ Open Water	-
Other Land	➢ Settlement	-

Forest cover area cont'd

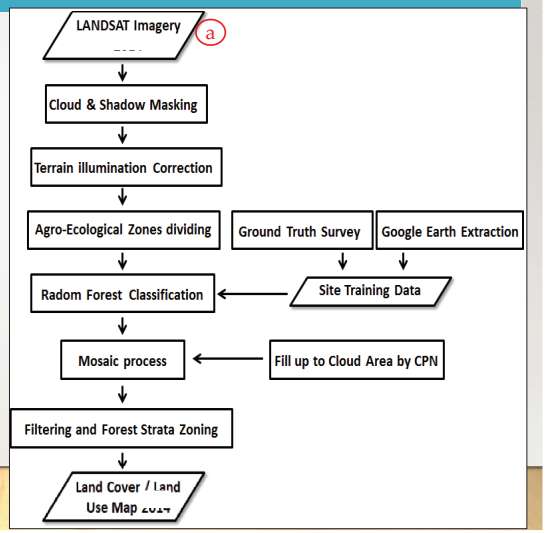
Methodology

a) Landsat Imagery

Land Sat data from the USGS website was selected following the technical manual guidance

- Availability at the USGS archive
- Date of acquisition (Season)
- Cloud cover percentage

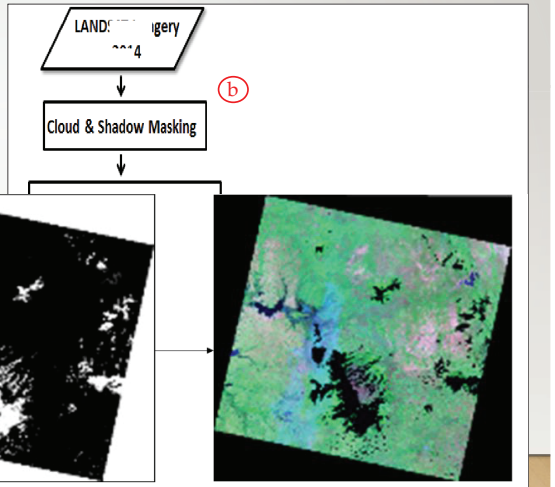
Landsat was selected because it is freely available, historical images are available, has medium resolution and it is already pre- processed



Forest cover area cont'd

b) Cloud and shadow masking

- Masking (Removing) all clouds and their shadow
- Used "cfmask" band from USGS

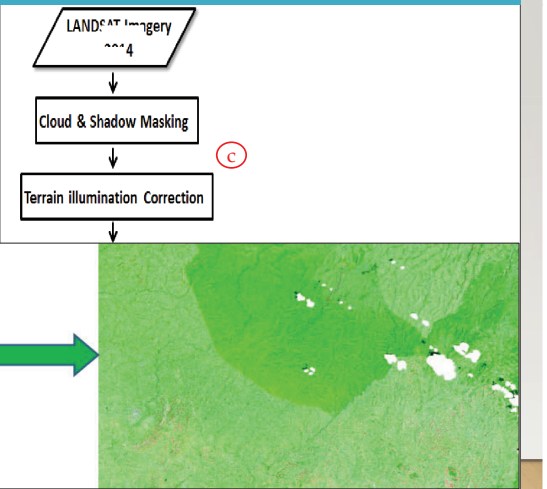


Raw Image | cfmask Band | Masked (Removed)Cloud

Forest cover area cont'd

c) Terrain Illumination Correction (TIC)

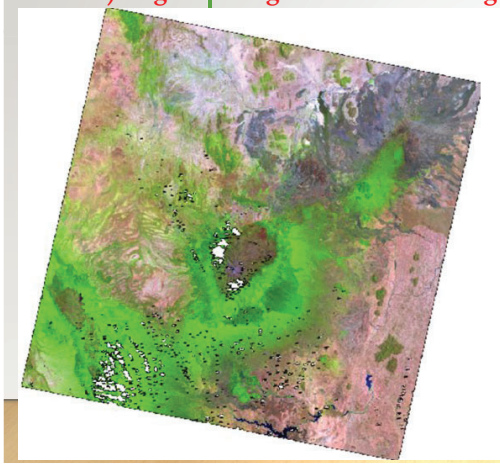
- Affected by variations in slope and aspect
- The process corrects terrain illumination effects so that the same land cover will

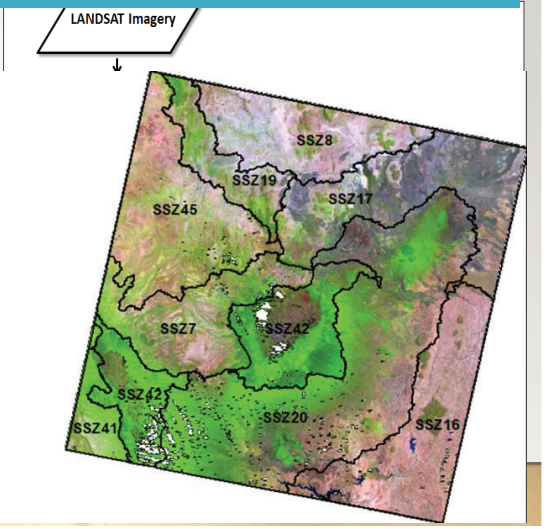


Before TIC | After TIC

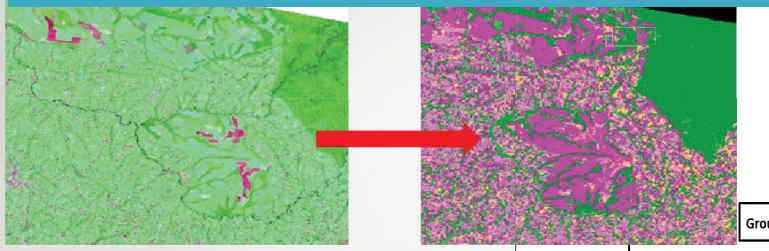
Forest cover area cont'd

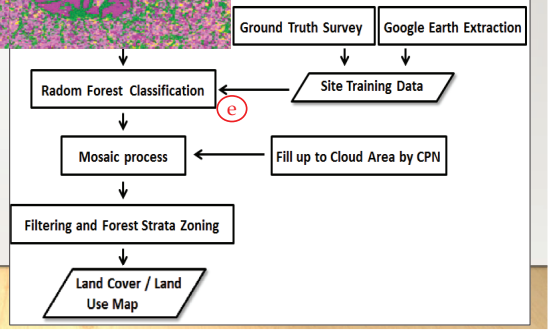
d) Agro-Ecological zones dividing





Forest cover area cont'd

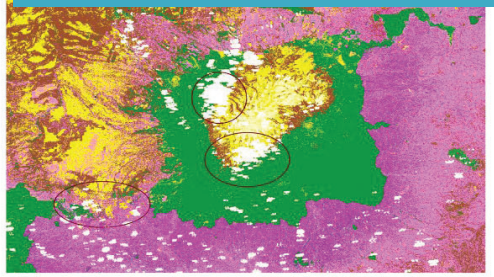




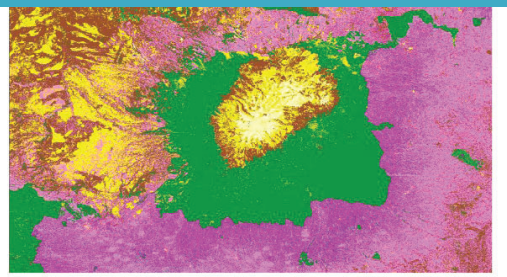
e) Random Forest Classification

- Training sites were extracted from ground truth survey and Google Earth in cases of inaccessible areas
- Running R-Scripts - Random forest was selected as it is open source, has higher accuracy, stores uncertainty
- QAQC – Both internal and external

Forest cover area cont'd

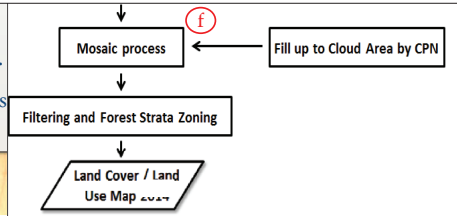


Before gap filling

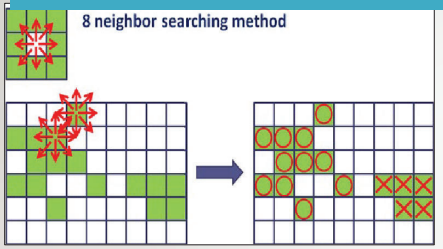


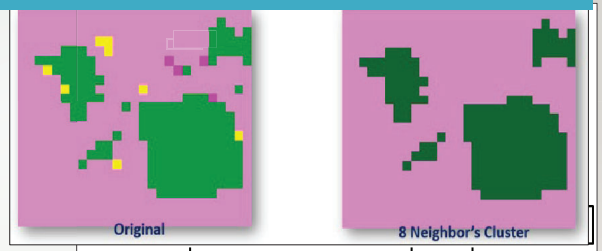
After filling with CPN

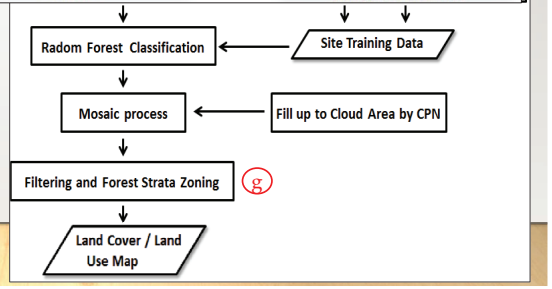
- Due to data gaps a mathematical model known as a conditional probability network (CPN) is used to fill.
- It uses the time series maps and the probability bands developed during classification



Forest cover area cont'd

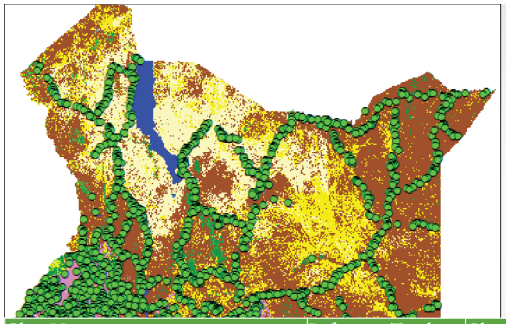






g) Filtering and Forest Strata Zoning

- Image filtering is done to correspond with a country's forest definition
- In Kenya, a forest is defined with a minimum **0.5ha ,2m height and 15% canopy**

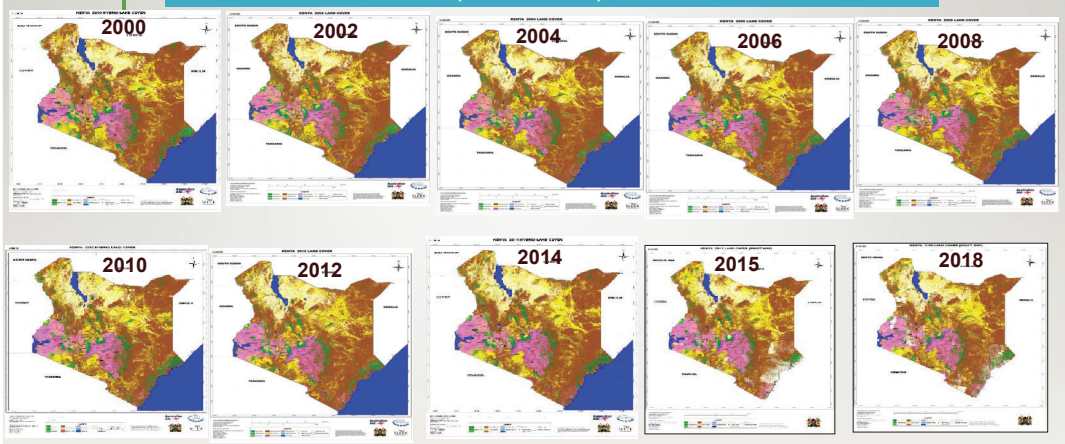


h) Accuracy Assessment

- Checking the correctness of the map
- Sampling Procedure - *Proportionate stratified random*
- *Use of High resolution images and Aerial photography*

Class Name	Reference Totals	Classified Totals	Number Correct	Producers Accuracy	Users Accuracy
Dense Forest	270	232	171	63.33%	73.71%
Moderate Forest	213	174	87	40.85%	50.00%
Open Forest	152	118	51	33.55%	43.22%
Wooded Grassland	1084	1157	945	87.18%	81.68%
Open Grassland	499	599	413	82.77%	68.95%
Perennial Cropland	216	230	169	78.24%	73.48%
Annual Cropland	875	846	696	79.54%	82.27%
Vegetated Wetland	86	61	50	58.14%	81.97%
Open Water	41	36	30	73.17%	83.33%
Otherland	212	195	162	76.42%	83.08%
Totals	3648	3648	2774		
Overall Classification Accuracy =		76.04%			

Land cover Time Series (2000 – 2018)



Forest cover Change for AD

Calculation of area of change

- The measuring of area of change in forest cover to estimate the AD
- Done by comparing two subsequent Land Cover/Land Use maps, extracts of land cover change areas can be made and their specific areas calculated
  - Deforestation,
  - Forest degradation,
  - Sustainable management of forest, and
  - Forest carbon stock enhancements

Forest cover Change for AD cont'd

Forest strata			2018												
			Montane and western rain Forests and bamboo			Mangroves and coastal Forests			Dryland Forests			Plantation Forest land	Crop land	Grass land	Wet land	Settlemen t& Otherland
			Dense	Moderate	Open	Dense	Modera te	Open	Dense	Moderate	Open					
2014	Montane and western rain forest and bamboo	Dense	834,862	49,209	19,734								88,835	91,849	416	821
		Moderate	60,248	83,235	12,849								11,406	53,825	78	33
		Open	9,843	10,324	26,260								6,435	51,566	10	25
	Mangroves and coastal forests	Dense				164,282	87,918	1,363					6,422	160,174	1,632	825
		Moderate				22,023	40,366	2,040					3,565	50,419	458	233
		Open				1,116	989	452					110	2,797	9	12
	Dryland Forests	Dense							344,985	97,928	42,170		24,559	455,918	3,874	2,307
		Moderate							57,877	60,223	33,164		4,763	127,932	1,229	1,018
		Open							21,221	20,412	66,984		4,012	185,783	1,445	4,274
	Plantation forest land											56,315	17,880	7,263	26	23
	Cropland		78,641	8,156	6,568	1,689	2,567	438	21,204	9,163	10,163	3,886				
	Grassland		85,367	48,885	38,956	76,856	82,563	13,417	377,850	207,559	158,441	4,834				
	Wetland		267	176	12	343	316	38	1,648	1,083	1,877	14				
	Settlement & Other land		866	107	1,702	398	470	15	1,667	2,424	3,279	6				

Forest cover Change for AD cont'd

Uncertainty Assessment for AD

- **"Activity Data" (AD)** - area of land undergoing the transmission e.g., the area deforested per hectare.
- **The accuracy assessment** - checking the correctness of the land cover and forest cover change maps.
- The accuracy information - crucial in estimating area and **uncertainty.**
  - To reduce uncertainties as far as practicable to have neither **over nor underestimates**.
  - To allow for calculation of error propagation due to AD and EF

$$S(\hat{P}_j) = \sqrt{\sum_{i=1}^{q} W_i^2 \frac{\frac{n_{ij}}{n_i}\left(1-\frac{n_{ij}}{n_i}\right)}{n_i - 1}}$$

"Error-adjusted" estimator of area formula (Olofsson, et al, 2013) used to calculate the uncertainty

Forest Carbon Stock for EF

Areas modified

- Determination of Permanent Samples
- Replacement of PSPs with PSCs
- Determination and marking of PSCs

National Forest Inventory

- Methodology for national forest inventory was developed by IC-FRA (KFS, 2016a)
- IC-FRA methodology adopted a slightly **different forest stratification** with SLEEK methodology which develops AD based on the time series land cover/land use maps
- Part of IC-FRA inventory methodology related to the forest stratification such as **sample plot setting; sampling design, calculation of the required number of samples, and selection of place of samples**, was revised to be consistent with forest stratification for the AD

NFI Cont'd

Sampling design

- Kenya has adopted a **stratified random sampling** method
- The strata are the four main forest strata with their sub categorizations
- Based on results of the pilot inventory the statistically significant number of sample plots was generated and the pre-determined number of plots placed randomly within each stratum

NFI cont'd

- To reduce heterogeneity in the forest at the sample point, cluster sampling has been adopted
- For Montane and western rain forests, and Dryland forests, the cluster comprises of six sample plots in a rectangular shape. The plots are placed at distances **250 meters** distance from each other.
- For Coastal and mangrove forests, and Plantation forest land, a cluster comprises of four sample plots in a square shape with a distance of **150 meters** between the plots.
- The plots are located in a **N-S** and **W-E** direction in the field; making it easy to trace them using a GPS.

NFI cont'd

Cluster design of 6 sample plots in rectangular shape and 4 sample plots in a square shape

Stratum	Plot number in a cluster	Plot size (radius meter)	Total plots area in a cluster(m^2)
Montane forests and western rain forests and bamboo	6	15	4,239
Coastal and mangrove forests	4	15	2,826
Dryland forests	6	20	7,536
Plantation forest land	4	15	2,826

Plot number and size per cluster in each forest stratum

NFI cont'd

- The required **number of samples** for the proposed NFI was calculated using the results of pilot forest inventory data from IC-FRA and CADEP-SFM for standard deviation and mean biomass value per hectare in each stratum, which were used in Kenya's FRL (GOK, 2020)
- The calculation of the sample size also requires the establishment of the required **accuracy and confidence intervals** for the NFI survey results.
- For the NFI survey in Kenya, the target error rate is **10%** and the confidence interval is **95%**
- The equation, Hirata at el, 2012, is used for the calculation of the required number of samples

NFI cont'd

$$n = \left(\frac{t_{0.05} * C_v}{e}\right)^2 \text{ Equation 1}$$

n = the minimum required number of clusters for a stratum
$t_{0.05}$ = Critical value from a two tail-test with n-1 degrees of freedom, based on confidence interval of 95%
C_v = Coefficient of variation which is the standard deviation divided by the mean biomass value per hectare in a stratum.
e = Target error rate

- The **required number of samples** is regarded as the **required number of clusters** in the Kenyan NFI
- The minimum number of clusters per forest class was set at **30 clusters**

NFI cont'd

Stratum		Pilot Inventory Data			Cv	t0.05	e	n
		Sampling No.	Mean Biomass (t/ha)	Standard Deviation (t/ha)				
Montane and western rain forests and bamboo	Dense	8	335.37	216.38	0.65	1.96	0.10	160
	Moderate	7	80.05	47.46	0.59	1.96	0.10	135
	Open	5	25.08	9.55	0.38	1.96	0.10	56
Costal &mangrove Forest	Dense	18	113.55	54.04	0.48	1.96	0.10	87
	Moderate	11	63.30	22.00	0.35	1.96	0.10	46
	Open	14	28.81	17.01	0.59	1.96	0.10	134
Dryland forests	Dense	7	54.31	41.10	0.76	1.96	0.10	220
	Moderate	8	44.19	19.21	0.43	1.96	0.10	73
	Open	7	18.26	8.82	0.48	1.96	0.10	90
Plantation forests land	-	36	412.48	316.71	0.77	1.96	0.10	226
Total		121						1227

Number of sampling clusters calculated for each forest class

NFI cont'd

- The NFMS proposes supplementary clusters set at **20%** of the calculated number of clusters for each forest stratum/class as a safeguard that allows **representation** of all stratum/class in the data collected from the NFI;

- **land use change** has occurred since the last mapping that was used to generate sampling clusters

- some identified clusters may be quite difficult to access due to **terrain**, **barriers**, **water bodies** or any other causes

Note: The design will be generated every time before an NFI is carried out based on the distribution and size of forest classes in the previous mapping programme

NFI cont'd

The NFMS identifies that, for management purposes, **25%** of the proposed calculated samples should be marked as PSCs to allow **continuous monitoring** of the different forest units

Strata		No of Sampled Clusters	No of Permanent Sample Clusters
Montane and western rain forests	Dense	160	40
	Moderate	135	34
	Open	56	14
Coastal & Mangrove Forest	Dense	87	22
	Moderate	46	12
	Open	134	34
Dryland forests	Dense	220	55
	Moderate	73	18
	Open	90	23
Plantation forest		226	57
Total		1,227	307

Required number of PSCs

NFI cont'd

Selection of location of sample clusters

- Location of the clusters is extracted adopting **stratified-random sampling** using the following procedure:

-A1 km x 1 km grid on the latest Land Cover/Land Use Map is generated on a GIS platform. Intersections of the grid are candidate for the sampling cluster.

-The intersection points are assigned cluster IDs.

-All potential clusters (intersection points) for each stratum, in which four (4) or six (6) plots has same forest type on the land cover/land use map, are identified.

NFI cont'd

-Based on the calculated number of clusters per stratum/forest class, the random sampling tool on GIS is used to select priority clusters and supplementary clusters (based on the 20% safeguard described above).

-The list of randomly selected clusters, their forest stratum, cluster ID, administrative units and coordinate are recorded.

-Plot 1 of the cluster is located at the intersection point which is the southwestern part of the cluster. The six (6) or four (4) plots in a cluster are set clockwise from the intersection and their plot numbers follow the order in the clockwise direction

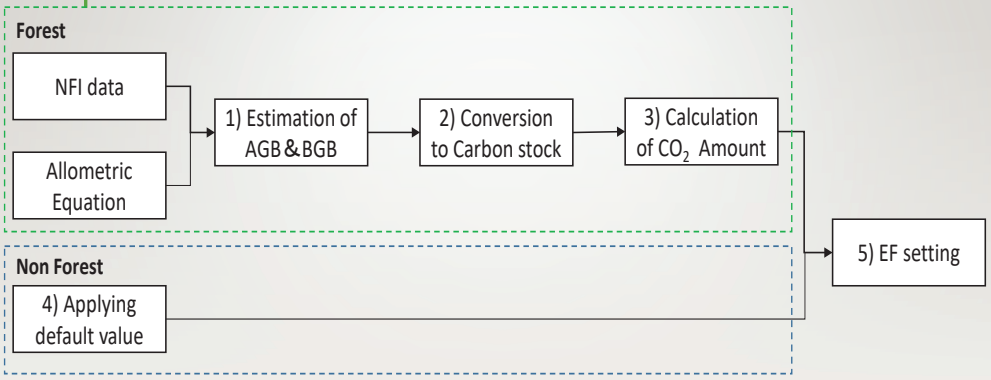
QA/QC of NFI

- Quality Assurance in the NFI is done through use of **conventional methods**, **proper training of inventory teams**, **use of qualified technicians** and ensuring that tools used are **properly calibrated**
- For all the sampled plots, a **10% sample** will be premeasured by an independent team to provide quality control of the data
- Quality Control is proposed to be done by **research institutes** such as KEFRI or the University staff
- The QC process identifies weaknesses of the NFI process, allows calculation of the uncertainty of the NFI data and forms a basis for future improvement

Conversion of inventory data to carbon stocks

- To determine forest carbon stocks, the forest biomass is first estimated, by using allometric equations (Hirata at el, 2012)
- Generally, an allometric equation is developed by biomass survey
- The IC-FRA project developed a **Field Manual for Tree Volume and Biomass Modelling** (KFS, 2016b). This manual gives guidelines on how allometric equations may be developed and is based on scientific guidance
- Currently, Kenya has **limited** generic and species specific allometric equations. Examples of such equations are found in Kuyah et al (2012) and Owate et al (2018) but these are for agroforestry species and were developed in small geographical extents.
- It is proposed that **international equations** such as those of Chave et al (2014) may be used until when locally developed allometric equations are available and verified for use in the country.

Conversions to carbon stocks cont'd



AGB estimation

- When the data of the forest inventories is obtained, the amount of above ground biomass (AGB) (t/ha) can be estimated from allometric equations

Type	Volume (m^3)	Reference	Equation for AGB (kg)	Reference
Common for natural forests and plantations	$\pi \times (DBH/200)^2 \times H \times 0.5$	Henry et al. 2011	$0.0673*(0.598*D^2H)^{0.976}$	Chave et al. 2009, 2014
Rhizophora sp. in mangroves	$\pi \times (DBH/200)^2 \times H \times 0.5$	Henry et al. 2011	$0.128 \times DBH^{2.60}$	Fromard et al. 1998, Komiyama et al. 2008
Bamboo in montane forests	$d^2-(d*0.7)^2/4*\pi*h*0.8$	Dan et al. 2007	$1.04+0.06*d*GW_{bamboo}$ $GW_{bamboo}=1.11+0.36*d^2$ (bamboo diameter > 3 cm) $GW_{bamboo}=1.11+0.36*3.1^2$ (bamboo diameter ≤ 3 cm)	Muchiri and Muga. 2013
Climbers in natural forests	-	-	$e^{(-1.484+2.657*\ln(DBH))}$	Schnitzer et al. 2006

BGB estimation

- Root shoot ratios may be applied when the allometric equation used only related to the AGB

Forest strata	Root shoot ratio	Source in table 4.4 of IPCC 2006 guidelines V4.4
Montane	0.37	For Tropical rainforest
Dryland	0.28	Above-ground biomass >20 tonnes ha^{-1} for Tropical Dryland forests
Coastal and Mangrove	0.20	Above-ground biomass <125 tonnes ha^{-1} for Tropical moist deciduous forest
Plantation	0.27	For Tropical Mountain systems

Conversion of AGB and BGB to Carbon Stocks to CO_2

- **Carbon stock (tC/ha)=(AGB (t/ha) +BGB (t/ha))× CF**

Part of biomass	Carbon Fraction	Reference
Above ground biomass (ABG) Below ground biomass (BGB)	0.47	IPCC, 2006

- From the amount of carbon stock calculated, the amount of CO2 can be estimated using the formula shown below which is obtained from IPCC 2006 guidelines.
- **CO_2 amount (tCO_2/ha) = Carbon stock (tC/ha) ×44/12**

Estimation of the CO_2 amount in Non-Forest land class

- Based on lack of conclusive data on carbon stocks of the non-forests, Kenya has used IPCC **default values** of CO_2 amount in Non-Forest land class
- **CO_2 amount (tCO_2/ha) of Non Forest area = Area (ha) × applied default value (t/ha)**

Class	CO_2 Amount(t/ha)	References
Cropland	0	IPCC Guideline 2006
Grassland	14.99	IPCC Guideline 2006
Wetland	0	IPCC Guideline 2006
Settlement and Other land	0	IPCC Guideline 2006

Setting of EF

- The Emission factor for each land use change is the values of CO_2 that changes at two points in time based on the initial carbon stock and the resultant carbon stock
- **-EF (Forestland to Forestland) = CO_2 amount (Forestland) - CO_2 amount (Forestland)**
- **-EF (Forestland to Non-forestland) = CO_2 amount (Forestland) - CO_2 amount (Non-forestland)**
- **-EF (Non-forestland to Forestland) = CO_2 amount (Non-forestland) - CO_2 amount (Forestland)**

Forest Cover Change Monitoring

- No modifications made

Introduction

- Kenya has identified near real time processes for forest cover change monitoring - detect deforestation
- These are:
  - JJ-FAST;
  - The Near Real Time Forest Alert System (NRTFAS); and
  - Field report by ground truth using Survey 123

JJ-FAST

- The system capable of detecting deforestation every 1.5 months
- It Uses L-band Synthetic Aperture Radar (SAR) data acquired by the PALSAR-2 sensor aboard JAXA's Advanced Land Observing Satellite 2 (ALOS-2)
- Data provided is free to users *(https://www.eorc.jaxa.jp/jjfast/jj_index.html).*
- Can be viewed in FIP

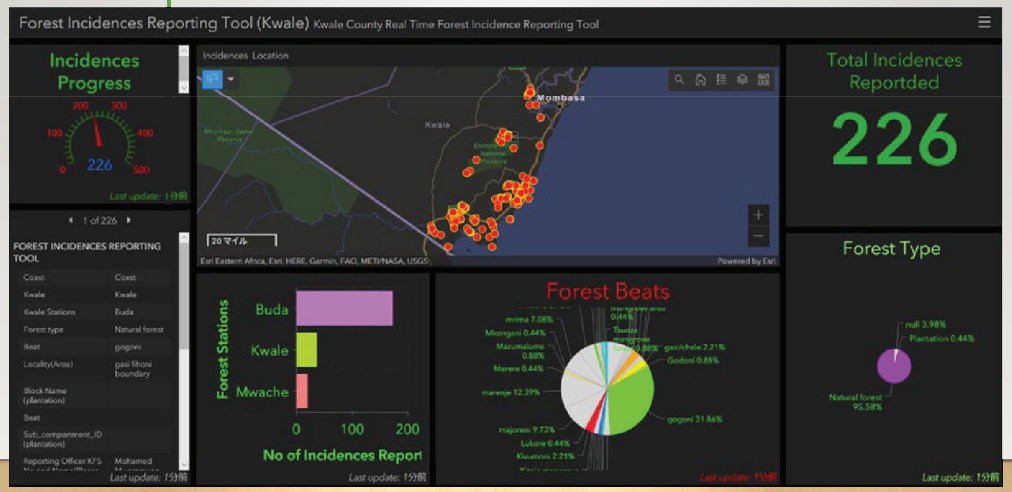
The Near Real Time Forest Alert System (NRTFAS)

1. NRTFAS has been implemented as a pilot project in the UK-sponsored Forest 2020 project
2. NRTFAS for deforestation detection using the optical satellite (Sentinel 2) data – 10m resolution
3. Implemented using PYthon for Earth Observation (Pyeo) developed by the University of LEICESTER
4. NRTFAS is updated every week
5. Can be viewed in FIP

Field report by ground truth using Survey 123

1. The deforestation alert information detected by JJ-FAST and NRTFAS are validated in the field by officers using a smartphone or tablet device equipped with an application that utilizes Survey123.
2. They also report deforestation activities they find in their line of duty
3. The reported data is viewed online, and all reports are displayed as statistical information in dashboard format.
4. This dashboard is one of the function of “Forest cover change monitoring” in FIP.

Field report by ground truth using Survey 123



Thank you!!!

Forest Information Platform for NFMS , REDD+ and SFM

4th October 2021

Richard Mwangi
GIS Developer/Geo-database Admin

Table of Presentation

- FIP Design
- JJ Fast
- Forest Alerts
- Forest and Landscape Restorations
- Field Data Collection

Definition of the NFMS in Kenya

Defining the NFMS as methodology and the NFMS as a database (forest information platform)

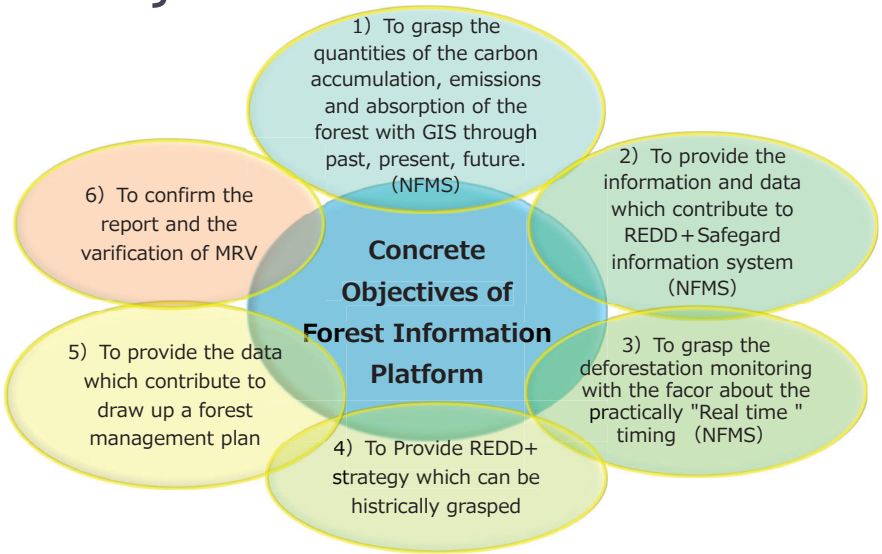
➢ **NFMS**

Methodology of how forests are monitored

➢ **Forest Information Platform**

A database to provide information that does not only include the information identified according to the NFMS but the information necessary for implementing REDD+ and sustainable forest management

FIP Objectives



FIP Functional description

To **replace KFIS's** functionality with the Web Portal Service with ArcGIS Enterprise

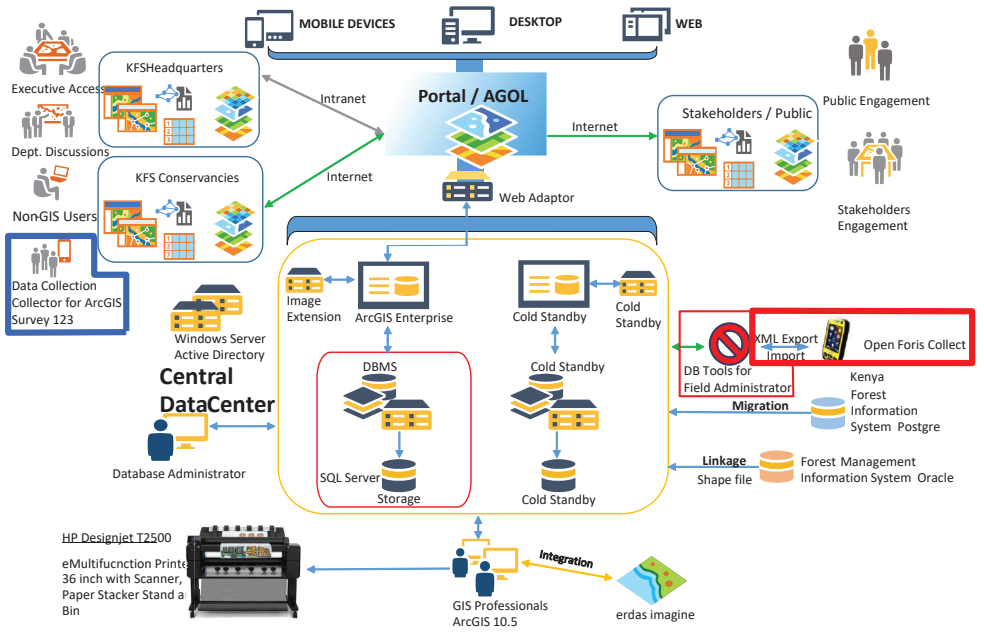
To use the Portal for ArcGIS Server with the limited access to the contents.

To utilize ArcGIS Online as the gateway to the accessible contents .

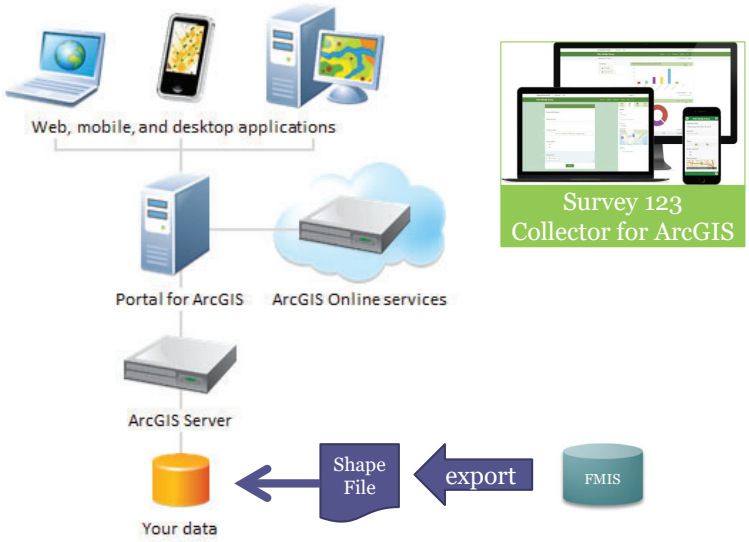
To support PDA devices for the data collection activities at the field

To support the other external system data with the static link.

Forest Information Platform (overview design)



FIP Basic Components



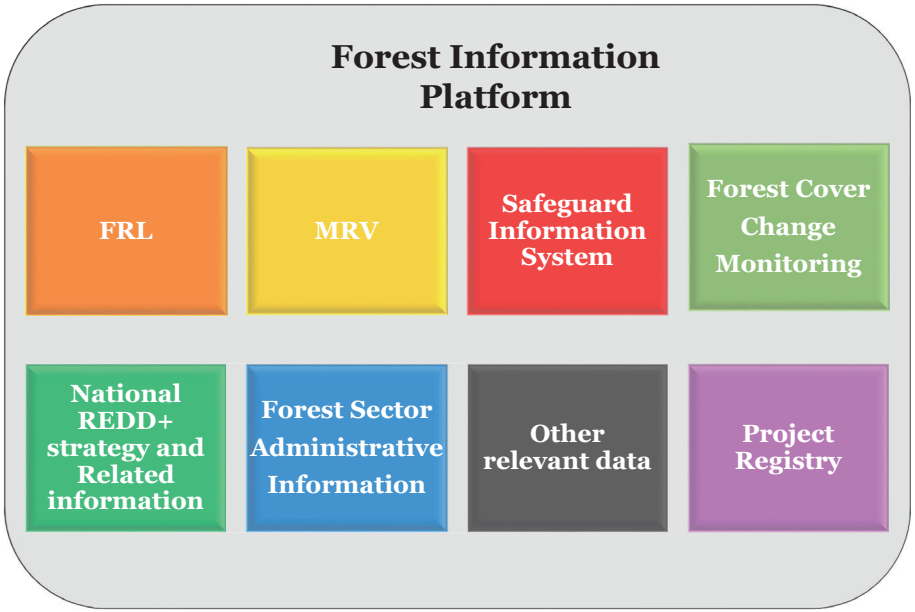
FIP Main Functions

1 . FIP Site Map

2 . Management of Field Survey Data

3 . FMIS Linkage

FIP Main 8 Components(Draft)

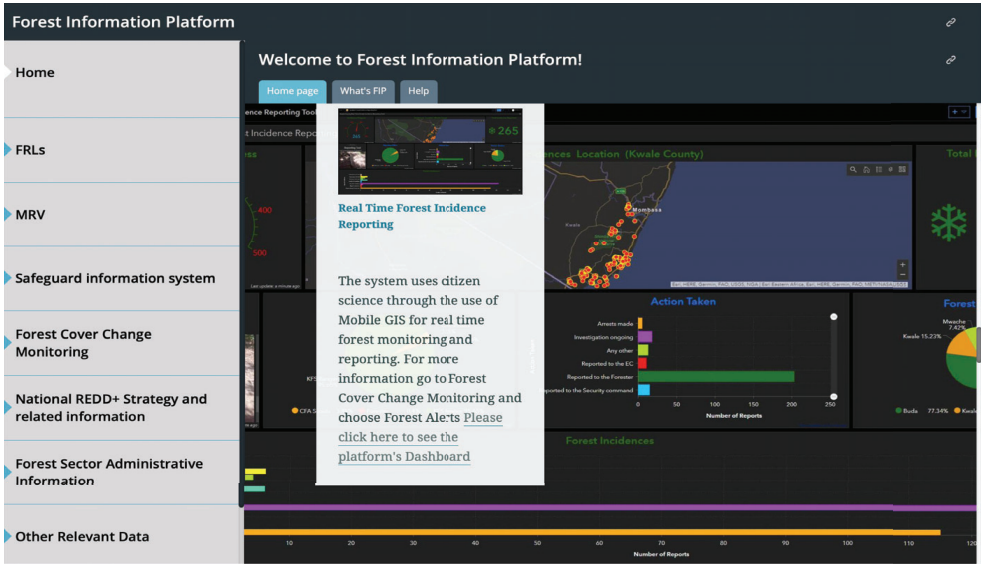


Contents type and persons to access FIP

- 4 type Contents
  - ①Description：Explanation of Contents
  - ②GIS data
  - ③Table：The result of calculation or Inventory
  - ④Document
- 4 type persons with access right on FIP
  - FIP Administrator
  - KFS
  - Related Stakeholder
  - General Citizen

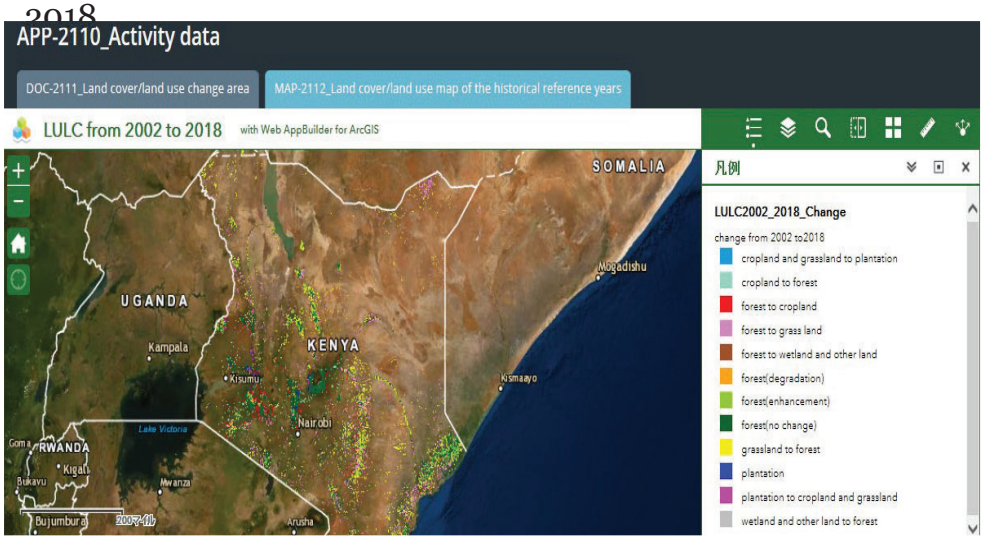
Development of FIP

The FIP sample layout as sitemap have been developed

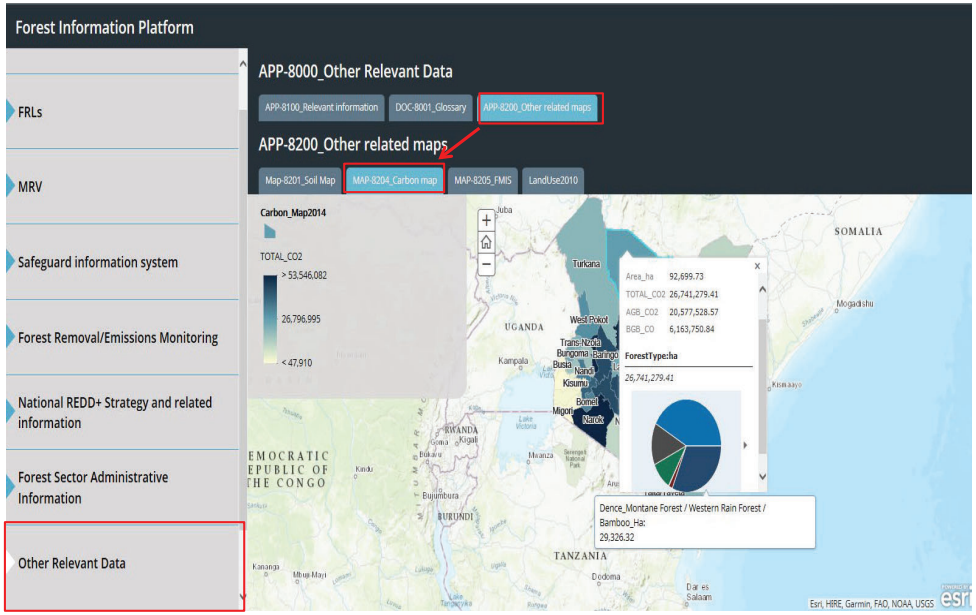


On the Land use/cover change map, it enables to change maps

5)Land Use and Land Cover Change from 2002 to 2018



8.Other Relevant Data→Other related map→Carbon Map(2014)



2． Management of Field Survey Data

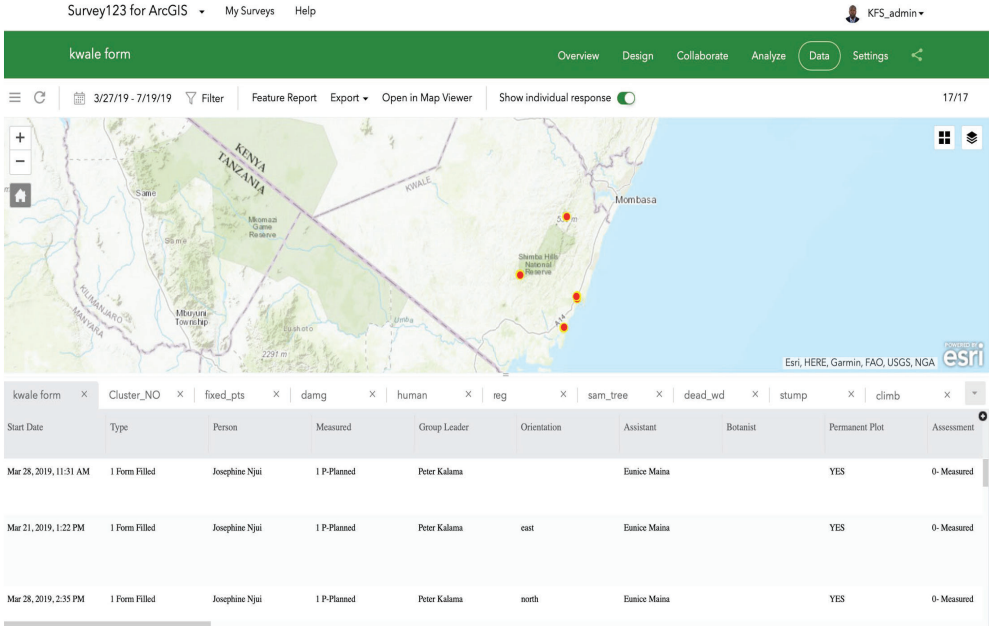
Field Survey Data collection Tool: Summary

・Depending on the intended use of the field survey tool by the Kenya, both Survey123 and Collector for Arc GIS are preferred to utilize together.

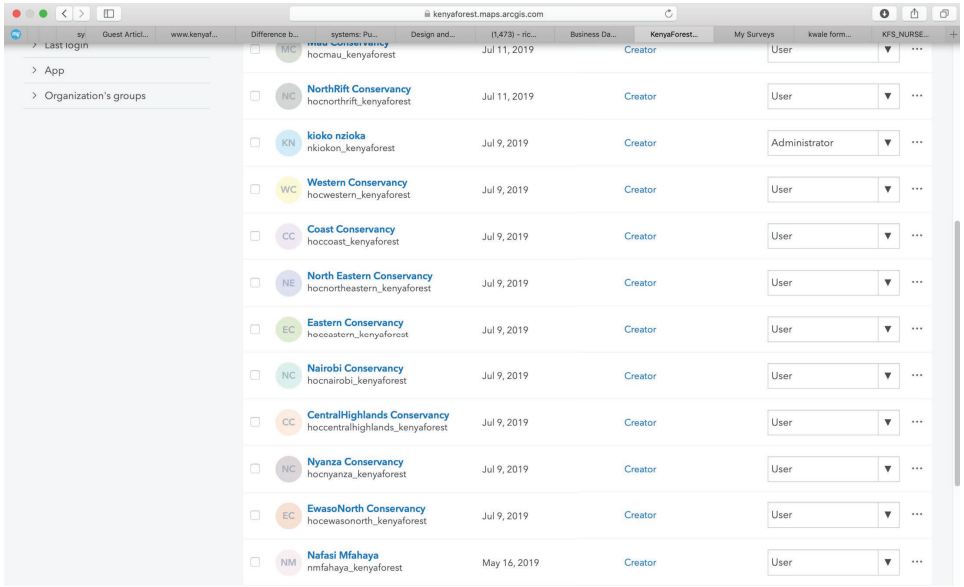
・For the forest inventory research tool, Collector for Arc GIS is preferred because of the function "setting the locations for the research in advance, and register their results.“

・For field survey of remote sensing or Patrol, Survey123 is preferred because of user friendly GUI and easy management of data.

Survey 123



Survey 123



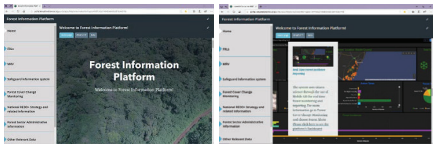
FIP Milestones

- ❖ Intergration with JJFast.
- ❖ Intergration with forest Alerts.
- ❖ Introduction of Forest and Landscape restoration Module.
- ❖ Intergration with Mobile GIS(Survey 123) For Citizen science
- ❖ Development of Real time Data Dashboards.

1 Progress and achievements with future work plan

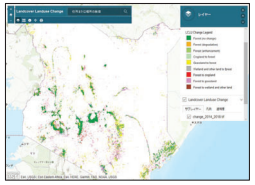
1.3 Activity 3-2: Operationalize the Forest Information Platform (in progress)

Previous top page (just single image)



New top page (slideshow like interface)

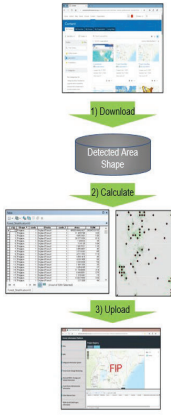
- Regarding the improvement of FIP, updating the documents and maps including the land use/land cover change maps used for FRL were made and top page of FIP was modified. The counterparts learned how to design and upload the GIS data to FIP more easily with latest GIS application.



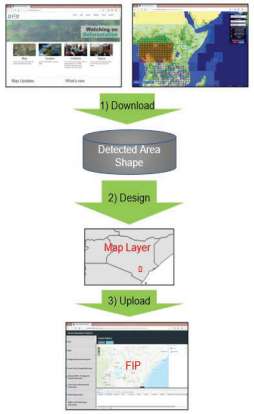
Land use / Land cover change maps

1 Progress and achievements with future work plan

Future work plan for Improvement of FIP as Activity 3-2



Workflow of carbon and biomass calculation tool



Workflow of JJ-FST Data import tool

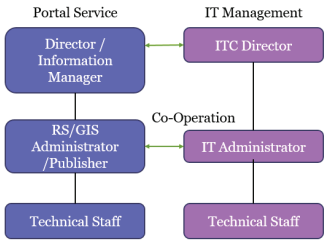
- ◆ Development of the arithmetic program for automatically calculating carbon amount using data of plot survey on the assumption of future implementation of NFI as the additional tool.
- ◆ Development of deforestation monitoring system by use of JJ-FAST as the additional tool. This will help the users to retrieve the data from JJ-FAST and import them to FIP easily.
- ◆ The information/data will be continuously uploaded.

FIP should be opened in public as early as possible.

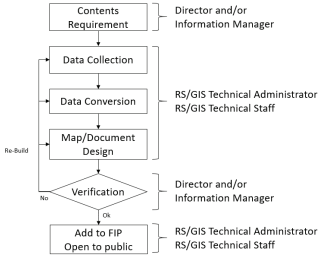
1 Progress and achievements with future work plan

1.3 Activity 3-2: Operationalize the Forest Information Platform (in progress)

- Regarding the operation and maintenance of FIP, the flame work of organization and workflow was developed.



Organization for FIP management



Workflow of FIP contents management

Future work plan

- The operation flame work and workflow will be practiced and improved.

This activity is very important for the sustainable use of FIP.

FIP Challenges

Activity Data (Delays in National Mapping)

Lack of data to populate some modules eg GHG

The citizen science module has not been fully utilized

All stakeholders have not been brought on board(county government, private sector, community)

Biodiversity module not yet implimented in the system.

Questions Comments

- Thank you
- Merci
- Arigatogozaimas
- Gracias

NATIONAL FOREST MONITORING SYSTEM

Way forward and linkage of NFMS to other REDD+ processes

By
Mwangi Kinyanjui – Karatina University

INTRODUCTION

Decision 4 of COP 15 in 2009 in Copenhagen Paragraph 1,
The CoP requests developing country Parties to establish, ***according to national circumstances and capabilities***, a ***robust and transparent national forest monitoring systems*** and***, if appropriate, sub-national systems*** as part of national monitoring systems that:

- ✓ Use a combination of remote sensing and ground-based forest carbon inventory approaches for estimating, as appropriate, anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest area changes;
- ✓ Provide estimates that are transparent, consistent, as far as possible accurate, and that reduce uncertainties, taking into account national capabilities and capacities;
- ✓ Are transparent and their results are available and suitable for review as agreed by the Conference of the Parties

Kenya's NFMS and basic MRV principles

- ✓ Demonstrates methodological guidance **(Transparency)** on use of
  - ✓ The SLMS for land cover and land cover change
  - ✓ The Ground data collection
  - ✓ EF and AD generation
- ✓ Demonstrates **Consistency** in methods over the time series, **Completeness** (e.g. Wall-Wall coverage) and demonstrates **Comparability** spatially
- ✓ Explains procedures for uncertainty assessment and Provides opportunities for improving **Accuracy**

Future/stepwise improvements – from TA of FRL

- ✓ Improve the SLEEK mapping programme, making it possible to monitor a single pixel over time preventing the under- or overestimation of emissions and removals – the FLINT vision
- ✓ Implementing the sampling design for an increased number of PSPs, which could capture the carbon stock changes in forest land remaining in the same canopy class and would in turn enhance the accuracy of future removal estimates (Can capture emissions arising from a canopy remaining in same canopy class)
- ✓ Estimating carbon stock changes for changes in canopy cover in public plantations using an improved NFI
- ✓ Refining the SLEEK mapping programme and increasing sampling, which would help to enhance the transparency of land-use transitions and the accuracy of emission and removal estimates

Future/stepwise improvements – from TA of FRL

- ✓ Updating the EF used for deforestation to cropland, which could capture carbon stocks in annual cropland more appropriately in the future
- ✓ Resolving the contradiction in the capping manipulation using an improved NFI or appropriate literature references
- ✓ Developing carbon fractions corresponding to each forest type and species
- ✓ Differentiating between tree species in public and private plantations
- ✓ Ensuring consistency in the methods, data sources and time intervals used for the FRL with those used for the GHG inventory included in Kenya's next national communication
- ✓ Improving the uncertainty analysis, for example by analysing not only the overall accuracy of land-cover maps but also individual land classes and by increasing the number of validation points

Future/stepwise improvements – from comments

- ✓ Disaggregate emission factors to capture sub strata
  - ✓ Mangrove forests
  - ✓ Bamboo forests
  - ✓ Separate western rain forests from montane forests
  - ✓ Separate Dry montane and moist montane forests
  - ✓ Separate dry land forests into at least three categories
  - ✓ Deepen understanding of biomass components in wooded grasslands
- ✓ Explore use of other SLMS tools e.g. SAR
- ✓ Explore use of SEPAL on GEE to reduce image downloads

Emerging issues from REDD+ strategy

- ✓ Development of jurisdictional REDD+ projects based on carbon market demands. Regional /site specific REDD+ projects allows more accurate validation, allows buyers with small commitments
- ✓ Kenya may allocate the reference level (52 million Tones of CO_2 eq) to the regional projects and provide a consistent method of accounting
- ✓ Participation of the private sector requires more targeted assessment of private forests e.g. develop a mapping procedure that separates such forests from the natural forests in a way equivalent to what has been done for Public plantations
- ✓ Participation of indigenous communities may require identification of specific forests where the IPs have special interests as described above
- ✓ Kenya may need a local validation mechanism for REDD+ projects that do not necessarily market their carbon but are geared towards supporting the NDC/or FRL – **Anchored in the Registry**

Emerging issues from SIS

- ✓ Monitoring of Safeguards like Biodiversity requires clarity of methodology based on standard operating procedures for monitoring such biodiversity aspects
- ✓ The Monitoring of safeguards by the NFMS may be linked to the SIS

Linkage to the National GHG/MRV system

- ✓ Data from the NFMS has been used to develop the 3rd NGHG Inventory for Kenya which was supposed to support the 3rd NC
- ✓ Forest sector statistics were
  - ✓ Tier 3 – Land cover change (this was completely locally generated data)
  - ✓ Tier 2 – EF (Used a combination of local ad Default factors)
- ✓ The process of data entry into the National MRV platform is manual for all sectors

Way forward

- ✓ Draft of the NFMS document Version 1 has been discussed and opportunities for finalizing the document availed in this meeting.
  - ✓ Availability of such a document allows upcoming REDD+ projects adopt nationally accepted Standard operating procedures to allows comparability among projects and assessment of performance based on FRL allocation
  - ✓ The document also provides opportunities for enhancing local decision making e.g. use of Deforestation alerts
  - ✓ The version 1 document is also a step in Kenya's REDD+ process where already a FRL is approved and a REDD+ strategy is being finalized
- ✓ A stepwise improvement procedure has been provided towards developing version 2 of the NFMS document

Memo OF FRL MEETING HELD ON 10TH OCTOBER 2016 AT CANTEEN HALL, KFS HEADQUARTERS.

Members present;

1. Alfred Gichu – Head Climate Change Response Program, KFS.
2. Peter Nduati – Project Manager, JICA project.
3. Jamleck Ndambiri – FIS section, KFS.
4. Sarah Kahori – FIS section, KFS.
5. Faith Mutwiri – GIS section, KFS.
6. Rose Akombo – Climate Change Response Program, KFS.
7. George Tarus – Climate Change Response Program, KFS.
8. Kenichi Takano – Chief Advisor, JICA project.
9. Kazuhisa Kato – Team Leader, REDD+ Readiness component.
10. Kei Sato – Team member, REDD+ Readiness component
11. Sahori Fujimura – Team member, REDD+ Readiness component.
12. Peter Sirayo – Local Technical Assistant, REDD+ Readiness component.

AGENDA.

1. Confirmation of forest from viewpoint of land use such as agroforest taking into consideration of forest policy to increase forest area.
2. Confirmation of AD and EF taking into account the feasibility and practicability to generate data of AD and EF.
3. Pending issues for FRL construction based on the confirmation of classification of AD and EF mentioned in agenda 2 above.

PRELIMINARIES.

The meeting came to an order at 9.30 am. The chair of the meeting, Mr. Gichu, welcomed all to the meeting and requested Rose Akombo to open the meeting with a word of prayer. Mr. Kato was then asked by the chair to lead the discussion based on the agenda present.

MIN 1/10/2016: CONFIRMATION OF FOREST FROM VIEW POINT OF LAND USE SUCH AS AGROFOREST TAKING INTO CONSIDERATION OF FOREST POLICY TO INCREASE FOREST AREA.

This had ensued following a field survey done by REDD+ Readiness component members together with counterparts (KFS, DRSRS, RCMD, KEFRI and SoK) – to ascertain 2014 land cover maps - where issues arose in regions where trees are integrated with crops and as much as they occupied more than 15% canopy cover, they did not qualify to be called forests. From the discussion the following was agreed upon;

- From the FIS section of KFS, agroforest was not included as forest in all activities done since 2010.
- Agroforest can only be considered may be in SLEEK and National Forest Program, but not in REDD+.
- Afforestation is not enhancement of forest carbon stocks.

- Afforestation and reforestation are not included as REDD+ activities in Kenya. However, plantation forest is included in REDD+ as trees clear felled and planted is sustainable forest management, which is one of the REDD+ activities.

The head of climate change response program reaffirmed that the Kenyan definition of a forest has been accepted by bodies such as FAO, FCPF and others, and as such relooking at the definition again would not be done.

On the issue of plantation forest extend, plantation belt can only be found in public forests manned by KFS and not in community forests.

MIN 2/10/2016: CONFIRMATION OF AD AND EF TAKING INTO ACCOUNT THE FEASIBILITY AND PRACTICABILITY TO GENERATE DATA OF AD AND EF.

From the KFS members' present, Kenyan national circumstance was considered when doing stratification of the forest types. The canopy cover (open, moderate and dense) was considered because of the strong potential for forest restoration whereas plantation forest was included in REDD+ because of sustainable forest management.

In the Kenyan context, forest type stratification is not a problem as data already exists. However, drivers of forest degradation and deforestation is quite challenging.

KFS proposed carbon maps to be generated by county first and then for the whole country to be used in FRL. It was agreed that the same will be done.

It was agreed that the Kenyan way is to move from tier 1 to tier 2 as much as possible. To achieve this, data from ICFRA would be used. Where EF data is not available, tier 1 as provided by IPCC may be used.

Mr. Nduati was asked to provide raw data of ICFRA to the team members of REDD+ Readiness component so as a glimpse of what data is missing can be obtained. Data that may not be available from ICFRA would require that a pilot project be done (National Forest Inventory) to carry out carbon stocks evaluation to be used in carbon maps generation. JICA would be requested to fund the inventory work. However, if JICA would not accept the proposal of funding Forest Inventory, it was agreed that another meeting would be convened to chat the way forward.

In conclusion, otherwise, it was agreed that as much as possible data available should be used in constructing carbon maps and FRL generation and where data would not be available at all, Tier 1 data by IPCC can be used.

MIN 3/10/2016: PENDING ISSUES FOR FRL CONSTRUCTION BASED ON THE CONFIRMATION OF CLASSIFICATION OF AD AND EF.

For reporting purposes, to the UNFCC, FRL generation would be on national level. However, a proposal on dividing the country into six regions and generate for each FRL and then combining the same to get one national FRL was agreed upon. This was arrived at after the KFS team informed the members that breaking the country into six regions (which would be

discussed at a later date) would assist in implementation of REDD+ activities by various stakeholders, especially the county governments.

The areas of jurisdiction proposed are as follows;

- Mau ecosystem.
- Aberdare and Mount Kenya.
- Chyulu Hills.
- Mount Elgon and Cherangany Hills.
- Northern Kenya.
- Coastal region.

Counties with almost the same biodiversity/ forest types would then be allocated to one of the six regions created and a FRL would then be generated for each.

It was also discussed that an accuracy assessment of 2014 maps would be done.

AOBKei

It was agreed that the term used in 2014 maps would be changed from land use maps to land cover -land use maps.

An issue was also raised on how to change ICFRA volume data to biomass in which case the members who contributed in ICFRA mentioned that the data is already in biomass and there is no need to worry.

It was also agreed that if the pilot survey (Forest Inventory) would be done, the same methodology as the one that was used in ICFRA would be used. This is for uniformity purposes in the data to be obtained.

The National REDD+ coordinator also informed the members that the REDD+ Technical Working Group would meet in two weeks' time to deliberate on issues raised and other issues concerning Kenya's REDD+ Readiness. JICA consultancy team was asked to make sure that one of their members attend the meeting.

ADJOURNMENT.

The meeting came to a close at 11.27 a.m. The next meeting would be communicated later.

FIELD NOTE for Remote Sensing Analysis

No.	: 002		Date	: 26/09/2016	
			Surveyor	: Sahori Fujimura	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 56′ 01.6″	
Category Type (GT)	:	3	UTM(Y)/Long	: E 36° 37′ 07.6″	
County	: Kiambu		Elevation	:	2588
			Remark	:	

1. Forest land

Type	: Plantation
Height	: 20m
Density(Crown)	: Open
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Open forest

South: Open forest

East: Open forest

West: Open forest

FIELD NOTE for Remote Sensing Analysis

No.	: 003		Date	: 26/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 54′ 52.6″	
Category Type (GT)	:	3	UTM(Y)/Long	: E 36° 36′ 33.6″	
County	: Kiambu		Elevation	:	2619
			Remark	:	

1. Forest land

Type	: Plantation
Height	: 15M
Density(Crown)	: Open
Remark	: Adjacent to a tree nursery

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Open forest

South: Open forest

East: Open forest(Plantation)

West: Nursery

FIELD NOTE for Remote Sensing Analysis

No.	: 004	Date	: 26/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: S 00° 54′ 21.8″
Category Type (GT)	: 1	UTM(Y)/Long	: E 36° 36′ 08.8″
County	: Kiambu	Elevation	: 2655
		Remark	:

1. Forest land

Type	: Plantation
Height	: 18M
Density(Crown)	: Dense
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

In 2014 is was dense forest but in 2016 clearfelled

Photo

North : Dense forest plantation

South: Dense forest plantation

East: Dense forest plantation

West: Dense forest, more than 200M,

FIELD NOTE for Remote Sensing Analysis

No.	: 005	Date	: 26/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 00° 53′ 30.2″
Category Type (GT)	: 2	UTM(Y)/Long	: E 36° 35′ 11.3″
County	: Kiambu	Elevation	: 2688
		Remark	:

1. Forest land

Type	: Plantation
Height	: 15M
Density(Crown)	: Moderate
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Moderate dense forest(Plantation)

South: Moderate dense forest(Plantation)

East: Moderate dense plantation forest

West: Grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 006		Date	: 26/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	32	UTM(X)/Lat	: S 00° 49′ 07.7″	
Category Type (GT)	:	42	UTM(Y)/Long	: E 36° 34′ 41.4″	
County	: Nakuru		Elevation	:	2509
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Cropland(Annual crop)
Remark	:

Comments

Photo

North : Crop land

South: Crop land(with trees)

East: Crop land

West: Crop land

FIELD NOTE for Remote Sensing Analysis

No.	: 007		Date	: 26/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:		UTM(X)/Lat	: S 00° 47′ 29.0″	
Category Type (GT)	:	3	UTM(Y)/Long	: E 36° 31′ 10.4″	
County	: Nakuru		Elevation	:	2328
			Remark	:	

1. Forest land

Type	: Natural Forest
Height	: 10M
Density(Crown)	: Open
Remark	: Forest without photos, aroud the point, settlements, cropland(annual crops)

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Annual crops

No photo

South: House

No photo

East: House

No photo

West: Open forest

No photo

FIELD NOTE for Remote Sensing Analysis

No.	: 008		Date	: 26/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: S 00° 37′ 54.5″	
Category Type (GT)	:	3	UTM(Y)/Long	: E 36° 23′ 12.6″	
County	: Nakuru		Elevation	:	1921
			Remark	:	

1. Forest land

Type	: Natural Forest
Height	: 14M
Density(Crown)	: Open
Remark	: Road passes in between

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Open natural forest (Acacia)

South: Open natural forest (Acacia)

East: Open natural forest (Acacia)

West: Open natural forest (Acacia)

FIELD NOTE for Remote Sensing Analysis

No.	: 009		Date	: 27/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 16′ 34.0″	
Category Type (GT)	:	42	UTM(Y)/Long	: E 36° 01′ 42.0″	
County	: Nakuru		Elevation	:	1898
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual crop
Remark	: Maize plantation

Comments

Photo

North : Maize plantation

South: Maize plantation

East: Maize plantation

West: Wooded grassland, 200M adjacent is road and settlement

FIELD NOTE for Remote Sensing Analysis

No.	: 010	Date	: 27/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 00° 17′ 47.7″
Category Type (GT)	: 42	UTM(Y)/Long	: E 35° 59′ 50.0″
County	: Nakuru	Elevation	: 1995
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Crop land (Annual crop)
Remark	: Maize plantation

Comments

Photo

North : Crop land

South: Crop land until 1km, above 1km, is open forest

East: Crop land

West: Crop land until 800m

FIELD NOTE for Remote Sensing Analysis

No.	: 011	Date	: 27/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 32	UTM(X)/Lat	: S 00° 20′ 35.6″
Category Type (GT)	: 42	UTM(Y)/Long	: E 35° 56′ 31.4″
County	: Nakuru	Elevation	: 2171
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Crop land (Annual crop)
Remark	: trees along farm boundary

Comments

Photo

North : Crop land

South: Crop land adjacent is a road

East: Crop land adjacent is a road

West: Crop land

FIELD NOTE for Remote Sensing Analysis

No.	: 012	Date	: 27/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: S 00° 22′ 57.4″
Category Type (GT)	: 1	UTM(Y)/Long	: E 35° 56′ 56.3″
County	: Nakuru	Elevation	: 2238
		Remark	:

1. Forest land

Type	: Plantation(wood lot)
Height	: 15M
Density(Crown)	: Dense
Remark	: Small (0.5ha) Eucalyptus wood lot plantation

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Dense wood lot plantation

South: Dense wood lot plantation

East: Dense wood lot plantation

West: Dense wood lot plantation adjacent is cropland

FIELD NOTE for Remote Sensing Analysis

No.	: 013	Date	: 27/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	:	UTM(X)/Lat	: S 00° 23′ 00.3″
Category Type (GT)	: 42	UTM(Y)/Long	: E 35° 56′ 57.4″
County	: Nakuru	Elevation	: 2242
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crops
Remark	:

Comments

Photo

North : cropland;100m is settlemet

South: Cropland;200m is settlement

East: Crop land

West: Cropland, wheat plantation

FIELD NOTE for Remote Sensing Analysis

No.	: 014	Date	: 27/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	:	UTM(X)/Lat	: S 00° 29′ 42.2″
Category Type (GT)	: 42	UTM(Y)/Long	: E 35° 58′ 30.3″
County	: Nakuru	Elevation	: 2406
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual crops
Remark	: photo 500m a disatnce

Comments

1990 it was dense forest ,2016 Crop land surrounding area

Photo

North : 0

South: 0

East: 0

West: 20Km natural regenerateion forest.

FIELD NOTE for Remote Sensing Analysis

No.	: 015	Date	: 27/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 3	UTM(X)/Lat	: S 00° 32′ 34.1″
Category Type (GT)	: 3	UTM(Y)/Long	: E 35° 58′ 09.9″
County	: Nakuru	Elevation	: 2589
		Remark	:

1. Forest land

Type	: Natural forest (regeneration)
Height	: 6M
Density(Crown)	: Open
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

People used to live but removed in 2011, *Dombeya goetzenii* species dominant

Photo

North : Opent forest, Adjacent is cropland

South: Open forest

East: Open forest, Adjacent is cropland

West: Open forest

FIELD NOTE for Remote Sensing Analysis

No.	: 016		Date	: 27/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	: 1		UTM(X)/Lat	: S 00° 34′ 29.2″	
Category Type (GT)	: 1		UTM(Y)/Long	: E 35° 59′ 21.4″	
County	: Nakuru		Elevation	: 2544	
			Remark	:	

1. Forest land

Type	: Natural forest (regeneration)
Height	: 15M
Density(Crown)	: Dense
Remark	: *Dombeya goetzenii* and *Junipems procera* tree species dominant

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Crop land

South: Sourthwest Natural forest(Dense)

East: 0

No Photo

West: Natural forest (Dense)

FIELD NOTE for Remote Sensing Analysis

No.	: 017		Date	: 27/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	: 2		UTM(X)/Lat	: S 00° 43′ 28.5″	
Category Type (GT)	: 2		UTM(Y)/Long	: E 35° 53′ 49.4″	
County	: Narok		Elevation	: 2661	
			Remark	:	

1. Forest land

Type	: Natural forest
Height	: 15M
Density(Crown)	: Moderate
Remark	: original point is 200M from the GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North :

South:

West cropland before ther forest

West:

FIELD NOTE for Remote Sensing Analysis

No.	: 018		Date	: 26/09/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 32		UTM(X)/Lat	: S 00° 55′ 07.6″
Category Type (GT)	: 42		UTM(Y)/Long	: E 35° 53′ 19.5″
County	: Narok		Elevation	: 2271
			Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Crop land (Annual Crops)
Remark	:

Comments

Photo

North : Cropland

South: Cropland

East: Cropland

West: Cropland

FIELD NOTE for Remote Sensing Analysis

No.	: 019		Date	: 27/09/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31		UTM(X)/Lat	: S 01° 02′ 42.8″
Category Type (GT)	: 31		UTM(Y)/Long	: E 35° 52′ 05.2″
County	: Narok		Elevation	: 2070
			Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded grassland
Remark	: dominated by shrubs

Comments

Photo

North : Wooded grassland

South: Wooded grassland, over 800 M cropland

East: wooded grasland

West: wooded grasland

FIELD NOTE for Remote Sensing Analysis

No.	: 020	Date	: 26/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 01° 04′ 06.3″
Category Type (GT)	: 31	UTM(Y)/Long	: E 35° 45′ 35.1″
County	: Narok	Elevation	: 1976
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded grassland
Remark	:

Comments

Photo

North : Wooded grassland

South: Wooded grassland

East: wooded grassland

West: Open grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 021	Date	: 27/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 32	UTM(X)/Lat	: S 01° 02′ 43.6″
Category Type (GT)	: 32	UTM(Y)/Long	: E 35° 43′ 45.0″
County	: Narok	Elevation	: 2005
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Open grassland and/ crop land(Wheat)
Remark	:

Comments

In 2014, Landsat open grassland, 2016 crop land(wheat)

Photo

North : Annual crops/Open grassland

South: Annual crops/Open grassland

East: Annual crops/Open grassland

West: Open grassland/wooded grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 022	Date	: 27/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 01° 00′ 34.9″
Category Type (GT)	: 31	UTM(Y)/Long	: E 35° 38′ 17.0″
County	: Narok	Elevation	: 2041
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded grassland
Remark	:

Comments

Photo

North : Wooded grassland, 200M cropland

South: Wooded grassland

East: Wooded grassland, 150M cropland

West: Wooded grassland, 3Km cropland

FIELD NOTE for Remote Sensing Analysis

No.	: 023	Date	: 27/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 32	UTM(X)/Lat	: S 00° 59′ 28.7″
Category Type (GT)	: 32	UTM(Y)/Long	: E 35° 34′ 30.7″
County	: Narok	Elevation	: 2042
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Open grassland
Remark	: Land use is Livestock keeping, Over 100M 500M where viewed

Comments

Photo

North :

South: Open grassland, >100M from road

East:

West:

FIELD NOTE for Remote Sensing Analysis

No.	: 024		Date	: 27/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	41	UTM(X)/Lat	: S 00° 51′ 16.0″	
Category Type (GT)	:	31	UTM(Y)/Long	: E 35° 23′ 33.9″	
County	: Bomet		Elevation	:	2049
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded grassland
Remark	:

Comments

Photo

North : Open grassland(small area)

South: shrubland

East: Open forest (Small area)

West: shrubland

FIELD NOTE for Remote Sensing Analysis

No.	: 025		Date	: 27/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 49′ 09.5″	
Category Type (GT)	:	71	UTM(Y)/Long	: E 35° 20′ 09.4″	
County	: Bomet		Elevation	:	1990
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Other Lands
Remark	: Quarring has been going on for more than 20 years

Comments

Photo

North : Other land / Open grassland

South: Crop land / settlement

East: Other land/Crop land

West: Other land / Cropland

FIELD NOTE for Remote Sensing Analysis

No.	: 026		Date	: 28/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: S 00° 14′ 18.0″	
Category Type (GT)	:	3	UTM(Y)/Long	: E 35° 54′ 54.3″	
County	: Nakuru		Elevation	:	2029
			Remark	:	

1. Forest land

Type	: Forest plantation
Height	: 5M
Density(Crown)	: Open
Remark	: . Point is 200M from road. Fire occurred affecting the Plantation

2. Non-Forest Land

Land use	:
Remark	:

Comments

In 2014 is was <2m, classified as wooded grassland

Photo

North : Open forest

South: Cropland

East: Open forest

West: Cropland

FIELD NOTE for Remote Sensing Analysis

No.	: 027		Date	: 28/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 12′ 00.3″	
Category Type (GT)	:	42	UTM(Y)/Long	: E 35° 49′ 17.6″	
County	: Nakuru		Elevation	:	1968
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual crops
Remark	:

Comments

Photo

North : Annual crops

South: 0

no photo

East: 0

no photo

West: 0

no photo

FIELD NOTE for Remote Sensing Analysis

No.	: 028		Date	: 28/09/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1		UTM(X)/Lat	: S 00° 13′ 28.9″
Category Type (GT)	: 1		UTM(Y)/Long	: E 35° 46′ 17.7″
County	: Nakuru		Elevation	: 2285
			Remark	:

1. Forest land

Type	: Plantation/natural
Height	: 25M
Density(Crown)	: dense
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Dense Forest

South: Dense Forest

East: Dense Forest

West: Dense Forest

FIELD NOTE for Remote Sensing Analysis

No.	: 029		Date	: 28/09/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1		UTM(X)/Lat	: S 00° 13′ 36.1″
Category Type (GT)	: 1		UTM(Y)/Long	: E 35° 45′ 28.2″
County	: Nakuru		Elevation	: 2371
			Remark	:

1. Forest land

Type	: Natural forest
Height	: 15M
Density(Crown)	: Dense
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Dense forest

South: SE: Dense forest, >2Km cropland and forest

East: 0

West: 0

FIELD NOTE for Remote Sensing Analysis

No.	: 030		Date	: 28/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	1	UTM(X)/Lat	: S 00° 13′ 00.4″	
Category Type (GT)	:	1	UTM(Y)/Long	: E 35° 44′ 55.2″	
County	: Baringo		Elevation	:	2396
			Remark	:	

1. Forest land

Type	: PELIS
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

In 2014 dense forest regeneratation but cleared in 2016, Preparation for plantation forest , Under PELIS now(2016)

Photo

North : >200m dense forest

South: Dense forest

East: 100-500m moderate forest; >500m dense forest

West: Preparation for plantation

FIELD NOTE for Remote Sensing Analysis

No.	: 031		Date	: 28/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	41	UTM(X)/Lat	: S 00° 12′ 24.1″	
Category Type (GT)	:	1	UTM(Y)/Long	: E 35° 43′ 32.0″	
County	: Baringo		Elevation	:	2462
			Remark	:	

1. Forest land

Type	: Plantation Forest
Height	: 15M
Density(Crown)	: Dense
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Crop Land (Annual crops)

South: Dense Plantation forest

East: Dense Plantation forest

West: 0

No photo

FIELD NOTE for Remote Sensing Analysis

No.	: 032		Date	: 28/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	1	UTM(X)/Lat	: S 00° 09′ 57.4″	
Category Type (GT)	:	1	UTM(Y)/Long	: E 35° 39′ 04.2″	
County	: Kericho		Elevation	:	2424
			Remark	:	

1. Forest land

Type	: Plantation Forest
Height	: 28M
Density(Crown)	: Dense
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Some patches, moderate forest.

Photo

North : Dense forest

South: Dense forest

East: Dense forest

West: Dense forest

FIELD NOTE for Remote Sensing Analysis

No.	: 033		Date	: 28/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	32	UTM(X)/Lat	: S 00° 09′ 54.0″	
Category Type (GT)	:	32	UTM(Y)/Long	: E 35° 38′ 44.9″	
County	: Kericho		Elevation	:	2422
			Remark	:	

1. Forest land

Type	: PELIS
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

In 2014, it was an open grassland;In 2016, PELIS; Preparation for plantation establishment.

Photo

North : Cropland, preparation for plantation establishment

South: Moderate forest

East: 400m is moderate forest

West: 150m dense forest

FIELD NOTE for Remote Sensing Analysis

No.	: 034		Date	: 28/09/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1		UTM(X)/Lat	: S 00° 09′ 58.1″
Category Type (GT)	: 2		UTM(Y)/Long	: E 35° 38′ 39.9″
County	: Kericho		Elevation	: 2420
			Remark	:

1. Forest land

Type	: Plantation
Height	: 20M
Density(Crown)	: Moderate
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Some illigal cutting has be done

Photo

North : Moderate forest plantation

South: Moderate forest plantation

East: Moderate forest plantation

West: Moderate forest plantation

FIELD NOTE for Remote Sensing Analysis

No.	: 035		Date	: 28/09/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 2		UTM(X)/Lat	: S 00° 08′ 34.9″
Category Type (GT)	: 2		UTM(Y)/Long	: E 35° 41′ 07.4″
County	: Baringo		Elevation	: 2590
			Remark	:

1. Forest land

Type	: eucalypt Plantation
Height	: 12M
Density(Crown)	: Moderate
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Moderate forest (eucalypt)

South: Open forest; >100m cropland

East: Moderate forest (eucalypt)

West: Moderate forest (eucalypt)

FIELD NOTE for Remote Sensing Analysis

No.	: 036	Date	: 28/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: S 00° 06′ 23.2″
Category Type (GT)	: 32	UTM(Y)/Long	: E 35° 40′ 45.0″
County	: Kericho	Elevation	: 2555
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

Comments

2. Non-Forest Land

Land use	: Open grassland
Remark	:

Photo

North : Annual crops

South: Open grassland/ Moderate forest

East: Open grassland

West: Moderate forest

FIELD NOTE for Remote Sensing Analysis

No.	: 037	Date	: 28/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 32	UTM(X)/Lat	: S 00° 04′ 20.1″
Category Type (GT)	: 32	UTM(Y)/Long	: E 35° 38′ 47.4″
County	: Kericho	Elevation	: 2467
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

Comments

2. Non-Forest Land

Land use	: Open grassland
Remark	:

Photo

North : Open grassland; open forest

South: Open grassland; dense forest

East: Open grassland;Moderate forest

West: Open grassland; Moderate forest

FIELD NOTE for Remote Sensing Analysis

No.	: 038		Date	: 28/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	32	UTM(X)/Lat	: S 00° 03′ 40.6″	
Category Type (GT)	:	32	UTM(Y)/Long	: E 35° 38′ 25.6″	
County	: Kericho		Elevation	:	2470
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Open grassland
Remark	: Saw mill nearby

Comments

Photo

North : Open grassland; 300m settlement

South: Open grassland; 300m dense forest

East: Open grassland

West: open grassland; 200m dense forest

FIELD NOTE for Remote Sensing Analysis

No.	: 039		Date	: 28/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	2	UTM(X)/Lat	: S 00° 03′ 40.0″	
Category Type (GT)	:	1	UTM(Y)/Long	: E 35° 38′ 21.1″	
County	: Kericho		Elevation	:	2470
			Remark	:	

1. Forest land

Type	: Forest Plantation
Height	: 22M
Density(Crown)	: Dense
Remark	: Thinning being carried(2016)

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Dense Forest >100M Open grassland

South: Dense Forest >150M Sawmill

East: Dense Forest >50M open grassland

West: Dense Forest

FIELD NOTE for Remote Sensing Analysis

No.	: 040		Date	: 28/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	1	UTM(X)/Lat	: S 00° 02′ 38.1″	
Category Type (GT)	:	2	UTM(Y)/Long	: E 35° 38′ 06.2″	
County	: Kericho		Elevation	:	2511
			Remark	:	

1. Forest land

Type	: Plantation
Height	: 23M
Density(Crown)	: Moderate
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Moderate forest

South: Moderate forest

East: Moderate forest

West: Moderate forest

FIELD NOTE for Remote Sensing Analysis

No.	: 041		Date	: 28/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 00′ 07.8″	
Category Type (GT)	:	42	UTM(Y)/Long	: E 35° 32′ 09.7″	
County	: Kericho		Elevation	:	2768
			Remark	:	

1. Forest land

Type	: Bamboo
Height	: 5M
Density(Crown)	: Dense
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Open forest 2016, 2014 a Cropland

South: Open forest 2016, 2014 a Cropland

East: Cropland 2014, Open forest 2016

West: Bamboo Forest

FIELD NOTE for Remote Sensing Analysis

No.	: 042		Date	: 28/09/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1		UTM(X)/Lat	: N 00° 02′ 32.6″
Category Type (GT)	: 52		UTM(Y)/Long	: E 35° 32′ 20.3″
County	: Uasin Gishu		Elevation	: 2758
			Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Water Body
Remark	: East 370M, Dense Forest

Comments

Photo

North : 0

South: S. East – Waterbody

East: 370m is dense forest

West: 0

No photo

FIELD NOTE for Remote Sensing Analysis

No.	: 043		Date	: 28/09/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31		UTM(X)/Lat	: N 00° 05′ 52.4″
Category Type (GT)	: 51		UTM(Y)/Long	: E 35° 29′ 25.6″
County	: Uasin Gishu		Elevation	: 2660
			Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wet Land (Vegetated)
Remark	:

Comments

Photo

North : Open grassland

South: Vegetated wet land >300M moderate forest

East: Vegetated wetland

West: Open grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 044	Date	: 28/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 2	UTM(X)/Lat	: N 00° 06′ 11.0″
Category Type (GT)	: 2	UTM(Y)/Long	: E 35° 28′ 32.3″
County	: Uasin Gishu	Elevation	: 2652
		Remark	:

1. Forest land

Type	: Coppice Open forest Eucalyptus plantation
Height	: 6M
Density(Crown)	: Open
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

2016 it is open forest plantation; 2014 it was moderate forest.

Photo

North : Open Forest Coppice eucalyptus plantation

South: Open Forest Coppice eucalyptus plantation

East: Open Forest Coppice eucalyptus plantation

West: Open Forest Coppice eucalyptus plantation

FIELD NOTE for Remote Sensing Analysis

No.	: 045	Date	: 28/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: N 00° 08′ 33.1″
Category Type (GT)	: 1	UTM(Y)/Long	: E 35° 28′ 08.8″
County	: Uasin Gishu	Elevation	: 2529
		Remark	:

1. Forest land

Type	: PELIS
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

In 2014 it was dense forest, 2016 under pelis preparation for plantation establishment (maize)

Photo

North :

No Photo

South: S.East- PELIS; >100m dense forest

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 046	Date	: 28/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 3	UTM(X)/Lat	: N 00° 18′ 15.1″
Category Type (GT)	: 2	UTM(Y)/Long	: E 35° 22′ 50.1″
County	: Uasin Gishu	Elevation	: 2237
		Remark	:

1. Forest land

Type	: natural Forest
Height	: 14M
Density(Crown)	: moderate
Remark	: >200M moderate natural forest

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : 0

No photo

South: S.West- >200m moderate natural forest.

East: 0

No Photo

West: 0

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 047	Date	: 28/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 32	UTM(X)/Lat	: N 00° 21′ 18.3″
Category Type (GT)	: 32	UTM(Y)/Long	: E 35° 21′ 20.6″
County	: Uasin Gishu	Elevation	: 2213
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Open grassland
Remark	:

Comments

In 2014 might have been a vegetated wetland.

Photo

North : Openg Grassland(2016), >100 M settlement

South: Open grassland

East: Open grassland(2016)

West: Open grassland(2016);>150m settlement.

FIELD NOTE for Remote Sensing Analysis

No.	: 048	Date	: 28/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: N 00° 24′ 29.5″
Category Type (GT)	: 1	UTM(Y)/Long	: E 35° 19′ 09.6″
County	: Uasin Gishu	Elevation	: 2186
		Remark	:

1. Forest land

Type	: Plantation(Eucalypts woodlot)
Height	: 10M
Density(Crown)	: Dense
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Woodlot estimated to be 5 years old (2016)

Photo

North :

No Photo

South: Dense eucalypts woodlot

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 049	Date	: 29/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	:	UTM(X)/Lat	: N 00° 36′ 54.4″
Category Type (GT)	: 42	UTM(Y)/Long	: E 35° 06′ 34.9″
County	: Uasin Gishu	Elevation	: 1928
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crop(Maize)
Remark	:

Comments

Photo

North : Annual crop (maize)

South: Annual crops (maize)

East: 0

West: 0

FIELD NOTE for Remote Sensing Analysis

No.	: 050		Date	: 29/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	1	UTM(X)/Lat	: N 00° 37′ 54.8″	
Category Type (GT)	:	3	UTM(Y)/Long	: E 35° 03′ 39.4″	
County	: Kakamega		Elevation	:	1825
			Remark	:	

1. Forest land

Type	: Plantation	
Height	:	22
Density(Crown)	: Open	
Remark	: Eucalypts Plantation	

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Open Forest

South: Open Forest, SE >50M tree nursery

East: Open Forest

West: Open Forest, >100M moderate forest

FIELD NOTE for Remote Sensing Analysis

No.	: 051		Date	: 29/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: N 00° 38′ 08.8″	
Category Type (GT)	:	31	UTM(Y)/Long	: E 35° 01′ 49.8″	
County	: kakamega		Elevation	:	1831
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded grassland
Remark	:

Comments

Photo

North :

No Photo

South: Wooded grassland

East: Wooded grassland

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 052	Date	: 29/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: N 00° 37′ 59.4″
Category Type (GT)	: 42	UTM(Y)/Long	: E 35° 01′ 04.9″
County	: kakamega	Elevation	: 1856
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual crops
Remark	: >70M from road is the point (Annual Crops)

Comments

Photo

North :

No Photo

South: 70m cropland

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 053	Date	: 29/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	:	UTM(X)/Lat	: N 00° 36′ 20.6″
Category Type (GT)	: 41	UTM(Y)/Long	: E 34° 56′ 51.7″
County	: Uasin Gishu	Elevation	: 1747
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perenial crops
Remark	:

Comments

Sugarcane Plantation(Perennial) adjacent is annual crops (maize)

Photo

North :

No Photo

South: 50 m sugarcane plantation (perennial crop)

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 054	Date	: 29/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: N 00° 35′ 28.9″
Category Type (GT)	: 42	UTM(Y)/Long	: E 34° 55′ 28.7″
County	: Uasin Gishu	Elevation	: 1794
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crop(Maize)
Remark	: The point is 125M from the road

Comments

Photo

North : 0

South: Annual crop (maize)

East: 0

West: 0

FIELD NOTE for Remote Sensing Analysis

No.	: 055	Date	: 29/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: N 00° 35′ 00.2″
Category Type (GT)	: 41	UTM(Y)/Long	: E 35° 48′ 01.5″
County	: kakamega	Elevation	: 1478
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crop
Remark	: East 30M from the road is Cropland

Comments

Photo

North :

No Photo

South:

No Photo

East: Perennial crop (30m from road); along R. Nzoia

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 056		Date	: 29/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	32	UTM(X)/Lat	: N 00° 27′ 53.8″	
Category Type (GT)	:	32	UTM(Y)/Long	: E 34° 51′ 23.3″	
County	: kakamega		Elevation	:	1601
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: PELIS
Remark	:

Comments

In 2014 it was open grassland, 2016 community removed and there are small planted trees(50cm –2M)

Photo

North : Open grass land (2014)

South: Open grass land (2014), 30M dense natural forest

East: Open grass land (2014)

West: Open grass land (2014)

FIELD NOTE for Remote Sensing Analysis

No.	: 057		Date	: 29/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	1	UTM(X)/Lat	: N 00° 27′ 40.8″	
Category Type (GT)	:	1	UTM(Y)/Long	: E 34° 51′ 25.9″	
County	: kakamega		Elevation	:	1623
			Remark	:	

1. Forest land

Type	: Natural forest
Height	: 30M
Density(Crown)	: Dense
Remark	: Point is 100M East direction into the forest

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Dense natural forest

South: Dense natural forest

East: Dense natural forest

West: Dense natural forest

FIELD NOTE for Remote Sensing Analysis

No.	: 058	Date	: 29/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 41	UTM(X)/Lat	: N 00° 24′ 45.3″
Category Type (GT)	: 41	UTM(Y)/Long	: E 34° 51′ 25.4″
County	: kakamega	Elevation	: 1640
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

Comments

2. Non-Forest Land

Land use	: Perenial Crops
Remark	:

Photo

North :

No Photo

South: S.East 80M from road is perenial crop land

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 059	Date	: 29/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: N 00° 19′ 25.4″
Category Type (GT)	: 41	UTM(Y)/Long	: E 34° 49′ 04.0″
County	: kakamega	Elevation	: 1593
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

Comments

2. Non-Forest Land

Land use	: Perenial Crops(Tea)
Remark	:

Comments

Photo

North : Perennial crop (tea)

South: Perennial crop (tea)

East: Perennial crop (tea)

West: Perennial crop (tea)

FIELD NOTE for Remote Sensing Analysis

No.	: 060	Date	: 29/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: N 00° 19′ 01.5″
Category Type (GT)	: 31	UTM(Y)/Long	: E 34° 49′ 05.3″
County	: kakamega	Elevation	: 1584
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 20M from this point, Adjacent with Perennial crops (tea)

Comments

Photo

North : 0

South: S. East– Wooded grassland

East: 0

West: Perennial crops (tea)

FIELD NOTE for Remote Sensing Analysis

No.	: 061	Date	: 29/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: N 00° 17′ 49.0″
Category Type (GT)	: 42	UTM(Y)/Long	: E 34° 46′ 15.8″
County	: kakamega	Elevation	: 1561
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crops
Remark	: Under PELIS

Comments

Photo

North : 0

South: Dense forest

East: Crop land (annual crops)

West: 0

FIELD NOTE for Remote Sensing Analysis

No.	: 062	Date	: 29/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: N 00° 13′ 48.7″
Category Type (GT)	: 1	UTM(Y)/Long	: E 34° 51′ 59.0″
County	: kakamega	Elevation	: 1608
		Remark	:

1. Forest land

Type	: Natural Forest
Height	: 30M
Density(Crown)	: Dense
Remark	: Point is 180M N.East from the road

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : NE dense natural Forest

South: dense natural Forest

East: S.East Dense Natural Forest

West: dense natural Forest

FIELD NOTE for Remote Sensing Analysis

No.	: 063	Date	: 29/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: N 00° 13′ 38.5″
Category Type (GT)	: 1	UTM(Y)/Long	: E 34° 52′ 37.1″
County	: kakamega	Elevation	: 1601
		Remark	:

1. Forest land

Type	: Natural Forest
Height	: 28M
Density(Crown)	: Dense
Remark	: Point is 120M from the road

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Dense cypress plantation

South: Dense natural forest

East: Dense natural plantation

West: Dense cypress plantation

FIELD NOTE for Remote Sensing Analysis

No.	: 064		Date	: 29/09/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1		UTM(X)/Lat	: N 00° 02′ 39.3″
Category Type (GT)	: 2		UTM(Y)/Long	: E 34° 43′ 34.4″
County	: Vihiga		Elevation	: 1581
			Remark	:

1. Forest land

Type	: Woodlot(Eucalypts)
Height	: 18M
Density(Crown)	: moderate
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Moderate eucalyptus woodlot

South: Moderate eucalyptus woodlot

East: Moderate eucalyptus woodlot

West: Moderate eucalyptus woodlot

FIELD NOTE for Remote Sensing Analysis

No.	: 065		Date	: 29/09/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42		UTM(X)/Lat	: N 00° 00′ 36.1″
Category Type (GT)	: 31		UTM(Y)/Long	: E 34° 43′ 41.5″
County	: Vihiga		Elevation	: 1540
			Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded grassland
Remark	:

Comments

Photo

North : Wooded grassland

South: Wooded grassland

East: Wooded grassland

West: Wooded grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 066		Date	: 30/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	51	UTM(X)/Lat	: S 00° 05′ 22.8″	
Category Type (GT)	:	51	UTM(Y)/Long	: E 34° 45′ 16.9″	
County	: Kisumu		Elevation	:	1146
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Vegetated wetland
Remark	: Original point is 130 M from Gps Point

Comments

Photo

North : Vegetated wetland

South: Vegetated wetland

East: Vegetated wetland

West: Vegetated wetland

FIELD NOTE for Remote Sensing Analysis

No.	: 067		Date	: 30/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 08′ 51.1″	
Category Type (GT)	:	31	UTM(Y)/Long	: E 34° 48′ 24.1″	
County	: Kisumu		Elevation	:	1151
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original point is 10m from GPS point (N.East)

Comments

2014 in reality it was wooded grassland , water body appeared because of rain maybe

Photo

North : Wooded grassland

South: Wooded grassland

East: Wooded grassland

West: Wooded grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 068		Date	: 30/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 09′ 31.8″	
Category Type (GT)	:	31	UTM(Y)/Long	: E 34° 51′ 55.1″	
County	: Kisumu		Elevation	:	1154
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	:

Comments

Photo

North : Wooded grassland

South: Wooded grassland

East: Wooded grassland

West: Wooded grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 069		Date	: 30/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 10′ 07.6″	
Category Type (GT)	:	42	UTM(Y)/Long	: E 34° 53′ 42.7″	
County	: Kisumu		Elevation	:	1156
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual crops
Remark	:

Comments

Photo

North : N. E Annual crop

South:

No Photo

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 070	Date	: 30/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: S 00° 13′ 24.3″
Category Type (GT)	: 42	UTM(Y)/Long	: E 34° 57′ 24.8″
County	: Kisumu	Elevation	: 1155
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual crops
Remark	: Rice field

Comments

Photo

North :

No Photo

South: S. West Annual crops (rice)

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 071	Date	: 30/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: S 00° 13′ 55.1″
Category Type (GT)	: 42	UTM(Y)/Long	: E 34° 57′ 25.7″
County	: Kisumu	Elevation	: 1159
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual crops
Remark	: I point is 200M SW from GPS point

Comments

Photo

North : 0

South: S. West Annual crops

East: 0

West: 0

FIELD NOTE for Remote Sensing Analysis

No.	: 072		Date	: 30/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	51	UTM(X)/Lat	: S 00° 19′ 46.0″	
Category Type (GT)	:	51	UTM(Y)/Long	: E 34° 49′ 04.4″	
County	: Kisumu		Elevation	:	1148
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Vegetated wetland
Remark	:

Comments

Photo

North : 0

South: 0

East: Vegetated wetland and water body

West: 0

FIELD NOTE for Remote Sensing Analysis

No.	: 073		Date	: 30/09/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: S 00° 23′ 22.4″	
Category Type (GT)	:	51	UTM(Y)/Long	: E 34° 37′ 33.4″	
County	: Homabay		Elevation	:	1156
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Vegetated wetland
Remark	: Original point is 200M N from GPS point

Comments

Photo

North : Vegetated wetland

South: Open grassland

East: Open grassland

West: Vegetated wetland

FIELD NOTE for Remote Sensing Analysis

No.	: 074		Date	: 30/09/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42		UTM(X)/Lat	: S 00° 26′ 19.9″
Category Type (GT)	: 42		UTM(Y)/Long	: E 34° 34′ 59.8″
County	: Homabay		Elevation	: 1190
			Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crops
Remark	: Original Point is 30 M from GPS point (West)

Comments

Photo

North :

No Photo

South:

No Photo

East:

No Photo

West: Annual crops (30m)

FIELD NOTE for Remote Sensing Analysis

No.	: 075		Date	: 30/09/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31		UTM(X)/Lat	: S 00° 27′ 19.2″
Category Type (GT)	: 31		UTM(Y)/Long	: E 34° 33′ 29.7″
County	: Homabay		Elevation	: 1165
			Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original point is 60M east from GPS point

Comments

Photo

North :

No Photo

South:

No Photo

East: Wooded grassland (60m)

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 076	Date	: 30/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 52	UTM(X)/Lat	: S 00° 29′ 28.0″
Category Type (GT)	: 52	UTM(Y)/Long	: E 34° 30′ 10.7″
County	: Homabay	Elevation	: 1150
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: water Body
Remark	:

Comments

with floating water hyacith(north and west)

Photo

North : Water body (covered by hyacith)

South:

No Photo

East:

No Photo

West: Water body (covered by hyacith)

FIELD NOTE for Remote Sensing Analysis

No.	: 077	Date	: 30/09/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 52	UTM(X)/Lat	: S 00° 31′ 19.0″
Category Type (GT)	: 52	UTM(Y)/Long	: E 34° 27′ 16.2″
County	: Homabay	Elevation	: 1162
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: water Body
Remark	:

Comments

SE covered by hyacith

Photo

North : NW water body coverd by hyacinth

South: SE water body coverd by hyacith

East:

No photo

West: water body coverd by hyacinth

FIELD NOTE for Remote Sensing Analysis

No.	: 078		Date	: 01/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	51	UTM(X)/Lat	: S 00° 06′ 32.1″	
Category Type (GT)	:	51	UTM(Y)/Long	: E 34° 46′ 23.0″	
County	: Kisumu		Elevation	:	1150
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Vegetated wetland
Remark	: Original Point is 60M E from GPS point

Comments

Photo

North :

No Photo

South:

No Photo

East: Vegetated wetland (60M East)

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 079		Date	: 01/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: S 00° 06′ 33.8″	
Category Type (GT)	:	51	UTM(Y)/Long	: E 34° 46′ 25.8″	
County	: Kisumu		Elevation	:	1150
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Vegetated wetland
Remark	: Original Point is 60M NE from GPS point

Comments

Photo

North : NE Vegetated wet land

South: Vegetated wet land (60M)

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 080		Date	: 01/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: S 00° 09′ 25.1″	
Category Type (GT)	:	41	UTM(Y)/Long	: E 35° 03′ 17.3″	
County	: Kisumu		Elevation	:	1233
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: Original point is 15M SE from GPS point

Comments

Photo

North : NE Perennial Crops (sugarcane)

South: Perennial Crops(Sugarcane)

East: SE Perennial Crops(sugarcane)15M

West: SW Perennial Crops(sugarcane)

FIELD NOTE for Remote Sensing Analysis

No.	: 081		Date	: 01/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 12′ 25.6″	
Category Type (GT)	:	2	UTM(Y)/Long	: E 35° 09′ 46.1″	
County	: Kisumu		Elevation	:	1331
			Remark	:	

1. Forest land

Type	: Eucalypt plantation
Height	: 8M
Density(Crown)	: moderate
Remark	: Eucalypts Plantation(coppices)

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Eucalypts Plantation(coppices)

South: Eucalypts Plantation(coppices)

East: Eucalypts Plantation(coppices)

West: Eucalypts Plantation(coppices)

FIELD NOTE for Remote Sensing Analysis

No.	: 082		Date	: 01/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 12′ 06.4″	
Category Type (GT)	:	41	UTM(Y)/Long	: E 35° 10′ 16.9″	
County	: Kisumu		Elevation	:	1329
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: sugarcane

Comments

Photo

North : Perennial Crops(Sugarcane)

South: Perennial Crops(Sugarcane)

East: Perennial Crops(Sugarcane)

West: Perennial Crops(Sugarcane)

FIELD NOTE for Remote Sensing Analysis

No.	: 083		Date	: 01/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	41	UTM(X)/Lat	: S 00° 23′ 04.3″	
Category Type (GT)	:	41	UTM(Y)/Long	: E 35° 14′ 44.3″	
County	: Kericho		Elevation	:	1966
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: OP is 90M south from GPS point

Comments

Photo

North :

No Photo

South: Perennial crop (tea Plantation)

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 084		Date	: 01/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	1	UTM(X)/Lat	: S 00° 27′ 58.5″	
Category Type (GT)	:	1	UTM(Y)/Long	: E 35° 10′ 45.3″	
County	: Kericho		Elevation	:	1734
			Remark	:	

1. Forest land

Type	: Natural forest
Height	: 15M
Density(Crown)	: Dense
Remark	: OP is South East-180M from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Dense Natural Forest

South: Dense Natural Forest

East: Dense Natural Forest

West: Perennial Crops(tea)

FIELD NOTE for Remote Sensing Analysis

No.	: 085		Date	: 01/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	41	UTM(X)/Lat	: S 00° 32′ 29.2″	
Category Type (GT)	:	41	UTM(Y)/Long	: E 35° 10′ 34.1″	
County	: Kericho		Elevation	:	1894
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial crops
Remark	: OP is 20M from GPS point(tea)

Comments

Photo

North : Crop land

South: Crop land

East: Crop land

West: Crop land

FIELD NOTE for Remote Sensing Analysis

No.	: 086	Date	: 01/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 32	UTM(X)/Lat	: S 00° 35′ 38.9″
Category Type (GT)	: 42	UTM(Y)/Long	: E 35° 12′ 34.6″
County	: Kericho	Elevation	: 1973
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual crops
Remark	: OP is 50M S from GPS point

Comments

Photo

North : Annual crops

South: Annual crops

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 087	Date	: 01/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 3	UTM(X)/Lat	: S 00° 35′ 56.4″
Category Type (GT)	: 41	UTM(Y)/Long	: E 35° 14′ 27.1″
County	: Bomet	Elevation	: 1986
		Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial crops
Remark	: OP is 110M W from GPS point

Comments

Photo

North :

No Photo

South: SE Open grassland

East:

No Photo

West: 110m perennial crops

FIELD NOTE for Remote Sensing Analysis

No.	: 088		Date	: 01/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 41		UTM(X)/Lat	: S 00° 38′ 43.7″
Category Type (GT)	: 41		UTM(Y)/Long	: E 35° 17′ 44.2″
County	: Bomet		Elevation	: 1927
			Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial crops
Remark	: OP is 20M S from GPS point

Comments

Photo

North : Perennial crops (tea)

South: Perennial crops (tea)

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 089		Date	: 03/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 51		UTM(X)/Lat	: N 00° 02′ 32.5″
Category Type (GT)	: 51		UTM(Y)/Long	: E 36° 22′ 18.6″
County	: Laikipia		Elevation	: 2337
			Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Vegetated wetland
Remark	: Original point is 160m SE from GPS point

Comments

Photo

North :

Nophoto

South: SE:Vegetated wetland (160M)

East:

No photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 090		Date	: 03/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1		UTM(X)/Lat	: N 00° 02′ 12.8″
Category Type (GT)	: 2		UTM(Y)/Long	: E 36° 23′ 27.7″
County	: Laikipia		Elevation	: 2356
			Remark	:

1. Forest land

Type	: Plantation forest
Height	: 25M
Density(Crown)	: Moderate
Remark	: Original point is 30M East from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North :

Nophoto

South:

No Photo

East: Plantation forest (30m)

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 091		Date	: 03/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42		UTM(X)/Lat	: N 00° 01′ 25.7″
Category Type (GT)	: 42		UTM(Y)/Long	: E 36° 24′ 57.2″
County	: Laikipia		Elevation	: 2364
			Remark	:

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crops
Remark	: Original Point is 15M NW from the GPS point

Comments

According to interview with local,in 2014 it was open grassland

Photo

North : NW:Annual crops(15M)

South: SE Annual Crops

East:

No Photo

West:

No Photo

No.	: 092		Date	: 03/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: S 00° 00′ 44.6″	
Category Type (GT)	:	31	UTM(Y)/Long	: E 36° 30′ 00.3″	
County	: Nyandarua		Elevation	:	2293
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Glassland
Remark	:

Comments

Photo

North : Wooded Grassland

South: Wooded Grassland

East: Wooded Grassland

West: Wooded Grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 093		Date	: 03/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	1	UTM(X)/Lat	: S 00° 03′ 21.4″	
Category Type (GT)	:	1	UTM(Y)/Long	: E 36° 31′ 12.2″	
County	: Nyandarua		Elevation	:	2333
			Remark	:	

1. Forest land

Type	: Natural forest
Height	: 12M
Density(Crown)	: dense
Remark	: Original point is 160M SW from GPS Point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Aroud the GPS point is Open grassland, NE 200M Open forest

Photo

North : NE 300M from GPS point is Open forest

South: 300M from GPS point is dense forest

East: Open grassland, SE 450M from GPS point is dense

West: SW 160M from GPS point is dense forest

FIELD NOTE for Remote Sensing Analysis

No.	: 094		Date	: 03/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	1	UTM(X)/Lat	: S 00° 04′ 29.4″	
Category Type (GT)	:	1	UTM(Y)/Long	: E 36° 32′ 48.0″	
County	: Nyandarua		Elevation	:	2305
			Remark	:	

1. Forest land

Type	: Natural forest
Height	: 11M
Density(Crown)	: dense
Remark	: Original point is 90M NE from GPS Point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : NE Dense Natural forest

South: Dense Natural Forest

East:

No Photo

West:

No photo

FIELD NOTE for Remote Sensing Analysis

No.	: 095		Date	: 03/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	32	UTM(X)/Lat	: S 00° 04′ 43.6″	
Category Type (GT)	:	32	UTM(Y)/Long	: E 36° 38′ 37.2″	
County	: Laikipia		Elevation	:	2230
			Remark	:	

1. Forest land

Type	:
Height	:
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Open Grassland
Remark	: Original Point is 45M NE from GPS point

Comments

Photo

North : NE Open grassland

South:

No photo

East:

No Photo

West: Open grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 096	Date	: 03/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: S 00° 11′ 22.1″
Category Type (GT)	: 1	UTM(Y)/Long	: E 36° 47′ 12.4″
County	: Nyeri	Elevation	: 2144
		Remark	:

1. Forest land

Type	: Natural Forest
Height	: 16M
Density(Crown)	: Dense
Remark	: Original Point is 180M S from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North :

No photo

South: Dense Forest(180M)

East:

No Photo

West: Open grassland

No phot

FIELD NOTE for Remote Sensing Analysis

No.	: 097	Date	: 03/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 00° 12′ 33.3″
Category Type (GT)	: 2	UTM(Y)/Long	: E 36° 51′ 08.0″
County	: Nyeri	Elevation	: 1994
		Remark	:

1. Forest land

Type	: Natural Forest
Height	: 9M
Density(Crown)	: Modelate
Remark	: Original Point is 180M W from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North :

No photo

South: Moderate Forest

East:

No Photo

West: Natural Moderate Forest(180M)

FIELD NOTE for Remote Sensing Analysis

No.	: 098		Date	: 03/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 22′ 05.5″	
Category Type (GT)	:	31	UTM(Y)/Long	: E 36° 55′ 55.9″	
County	: Nyeri		Elevation	:	1896
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 20M E from GPS point

Comments

Photo

North : Wooded Grassland

South: Wooded Grassland

East: Wooded Grassland(20M)

West: Wooded Grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 099		Date	: 03/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: S 00° 23′ 26.6″	
Category Type (GT)	:	31	UTM(Y)/Long	: E 37° 00′ 12.1″	
County	: Nyeri		Elevation	:	1776
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 70M E from GPS point

Comments

Photo

North :

No Photo

South:

No Photo

East: Wooded Grassland(70M)

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 100	Date	: 03/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: S 00° 20′ 29.1″
Category Type (GT)	: 42	UTM(Y)/Long	: E 37° 00′ 14.1″
County	: Nyeri	Elevation	: 1835
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crops
Remark	: Original Point is 70M SE from GPS point

Comments

Photo

North : NW Open grassland

South: SE Annual Cropland

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 101	Date	: 03/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 00° 18′ 45.8″
Category Type (GT)	: 32	UTM(Y)/Long	: E 37° 00′ 26.2″
County	: Nyeri	Elevation	: 1884
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Open Grassland
Remark	:

Comments

Photo

North : Open grassland

South: Open grassland

East: Open grassland

West: Open grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 102	Date	: 03/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 32	UTM(X)/Lat	: S 00° 13′ 59.5″
Category Type (GT)	: 32	UTM(Y)/Long	: E 37° 00′ 50.9″
County	: Nyeri	Elevation	: 1953
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crop
Remark	: Original Point is 100M W from GPS point

Comments

In 2014 it was open grassland

Photo

North : Annual cropland

South:

No photo

East:

No Photo

West: Annual Crops(100M)

FIELD NOTE for Remote Sensing Analysis

No.	: 103	Date	: 03/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 00° 09′ 39.9″
Category Type (GT)	: 2	UTM(Y)/Long	: E 37° 01′ 14.8″
County	: Nyeri	Elevation	: 1972
		Remark	:

1. Forest land

Type	: Riverine Forest
Height	15M
Density(Crown)	: Moderate
Remark	: Original Point is 20 m SE from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Found along a river

Photo

North :

No Photo

South: SE moderate forest

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 104		Date	: 03/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	1	UTM(X)/Lat	: S 00° 06′ 34.9″	
Category Type (GT)	:	1	UTM(Y)/Long	: E 37° 02′ 18.4″	
County	: Nyeri		Elevation	:	1943
			Remark	:	

1. Forest land

Type	: Natural Forest
Height	10M
Density(Crown)	: Dense
Remark	: Original Point is 30m E from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North :

No Photo

South:

No Photo

East: Natural Dense forest

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 105		Date	: 03/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: S 00° 03′ 02.7″	
Category Type (GT)	:	31	UTM(Y)/Long	: E 37° 03′ 02.2″	
County	: Nyeri		Elevation	:	1940
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 20m SE from GPS point

Comments

Photo

North :

No Photo

South: SE Wooded Grassland

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 106	Date	: 03/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: S 00° 00′ 35.6″
Category Type (GT)	: 1	UTM(Y)/Long	: E 37° 04′ 04.3″
County	: Nyeri	Elevation	: 1968
		Remark	:

1. Forest land

Type	: Woodlot/Plantation
Height	10M
Density(Crown)	: Dense
Remark	: Original Point is 10m NE from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Eucalypts species dominant
Small area covered with trees
Private owned

Photo

North : NE Dense Forest

South:

No Photo

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 107	Date	: 04/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: N 00° 02′ 19.1″
Category Type (GT)	: 1	UTM(Y)/Long	: E 37° 08′ 22.4″
County	: Meru	Elevation	: 2025
		Remark	:

1. Forest land

Type	: Natural Forest
Height	10M
Density(Crown)	: Dense
Remark	: Original Point is 40m N from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Dense natural Forest

South:

No Photo

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 108		Date	: 04/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	2	UTM(X)/Lat	: N 00° 02′ 17.9″	
Category Type (GT)	:	2	UTM(Y)/Long	: E 37° 08′ 27.6″	
County	: Meru		Elevation	:	2026
			Remark	:	

1. Forest land

Type	: Woodlot/Plantation
Height	10M
Density(Crown)	: Open
Remark	: Original Point is 95m SE from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North :

No Photo

South: SE Open natural forest (1)

East: SE Open natural forest (2)

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 109		Date	: 04/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: N 00° 05′ 29.1″	
Category Type (GT)	:	31	UTM(Y)/Long	: E 37° 15′ 43.5″	
County	: Meru		Elevation	:	2294
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 590M S from GPS point

Comments

Photo

North :

No Photo

South: Wooded Grassland

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 110	Date	: 04/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 32	UTM(X)/Lat	: N 00° 05′ 05.7″
Category Type (GT)	: 32	UTM(Y)/Long	: E 37° 19′ 48.1″
County	: Meru	Elevation	: 2523
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Open grassland
Remark	:

Comments

Photo

North : Open grassland

South: Open grassland

East: Open grassland

West: Open grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 111	Date	: 04/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: N 00° 05′ 12.1″
Category Type (GT)	: 42	UTM(Y)/Long	: E 37° 20′ 24.8″
County	: Meru	Elevation	: 2532
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crops
Remark	: Original Point is 140M S from GPS point

Comments

Photo

North :

No photo

South: Annual Crops

East: Annual Crops

West:

No photo

FIELD NOTE for Remote Sensing Analysis

No.	: 112	Date	: 04/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: N 00° 08′ 05.5″
Category Type (GT)	: 3	UTM(Y)/Long	: E 37° 27′ 51.5″
County	: Meru	Elevation	: 2147
		Remark	:

1. Forest land

Type	: Natural Forest
Height	12M
Density(Crown)	: Open
Remark	: Original Point is 80M S from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North :

No photo

South: Open natural Forest

East:

No photo

West:

No photo

FIELD NOTE for Remote Sensing Analysis

No.	: 113	Date	: 04/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: N 00° 10′ 27.6″
Category Type (GT)	: 2	UTM(Y)/Long	: E 37° 19′ 52.7″
County	: Meru	Elevation	: 2058
		Remark	:

1. Forest land

Type	: Natural Forest
Height	15M
Density(Crown)	: Moderate
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Moderate natural forest

South: Moderate natural forest

East: Moderate natural forest

West: Moderate natural forest

FIELD NOTE for Remote Sensing Analysis

No.	: 114	Date	: 04/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: N 00° 11′ 15.4″
Category Type (GT)	: 3	UTM(Y)/Long	: E 37° 22′ 51.4″
County	: Meru	Elevation	: 1860
		Remark	:

1. Forest land

Type	: Dryland Forest
Height	4M
Density(Crown)	: Open
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

only around the hill, Dry land forest does not reach the hill top

Photo

North :

No Photo

South: SW dryland forest

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 115	Date	: 04/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 00° 08′ 11.0″
Category Type (GT)	: 31	UTM(Y)/Long	: E 37° 31′ 58.2″
County	: Meru	Elevation	: 1996
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 60M S from GPS point

Comments

Photo

North :

No Photo

South: Wooded Grassland

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 116	Date	: 04/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: N 00° 05′ 51.2″
Category Type (GT)	: 1	UTM(Y)/Long	: E 37° 37′ 02.3″
County	: Meru	Elevation	: 1768
		Remark	:

1. Forest land

Type	: Natural Forest
Height	15M
Density(Crown)	: Dense
Remark	: Original Point is 10M NE from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : NE Dense Forest

South:

No Photo

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 117	Date	: 04/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: N 00° 04′ 60.4″
Category Type (GT)	: 2	UTM(Y)/Long	: E 37° 37′ 20.5″
County	: Meru	Elevation	: 1761
		Remark	:

1. Forest land

Type	: Natural Forest
Height	18M
Density(Crown)	: Moderate
Remark	: Original Point is 15M E from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North :

No Photo

South:

No Photo

East: natural Forest

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 118	Date	: 04/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: N 00° 04′ 01.1″
Category Type (GT)	: 1	UTM(Y)/Long	: E 37° 37′ 44.9″
County	: Meru	Elevation	: 1745
		Remark	:

1. Forest land

Type	: Natural Forest
Height	18M
Density(Crown)	: Dense
Remark	: Original Point is 30M S from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North :

No Photo

South: Dense Natural Forest

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 119	Date	: 04/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 41	UTM(X)/Lat	: S 00° 01′ 55.5″
Category Type (GT)	: 41	UTM(Y)/Long	: E 37° 39′ 43.7″
County	: Meru	Elevation	: 1530
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial crops
Remark	: Original Point is 60M E from GPS point

Comments

Photo

North :

No Photo

South:

No Photo

East: Perennial Crops

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 120		Date	: 04/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 41		UTM(X)/Lat	: S 00° 02′ 15.4″
Category Type (GT)	: 41		UTM(Y)/Long	: E 37° 39′ 43.8″
County	: Meru		Elevation	: 1533
			Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial crops
Remark	: Original Point is 20M NW from GPS point

Comments

surrounnded by agroforest(Trees with Crops)

Photo

North : NW Perennial Crops(Banana dominant)

No Photo

East:

No Photo

West: perenial Crops

FIELD NOTE for Remote Sensing Analysis

No.	: 121		Date	: 04/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 41		UTM(X)/Lat	: S 00° 03′ 27.3″
Category Type (GT)	: 41		UTM(Y)/Long	: E 37° 39′ 32.6″
County	: Meru		Elevation	: 1542
			Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: Original Point is 40M S from GPS point

Comments

surrounnded by agroforest(Trees with Crops)

Photo

North :

No Photo

South: Perennial Crops(Coffee, Banana)

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 122	Date	: 04/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 1	UTM(X)/Lat	: S 00° 09′ 36.3″
Category Type (GT)	: 41	UTM(Y)/Long	: E 37° 40′ 28.8″
County	: Meru	Elevation	: 1252
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: Original Point is 60M N from GPS point

Comments

surrounnded by agroforest(Trees with Crops)

Photo

North : perennial Crops

South:

No Photo

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 123	Date	: 04/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 41	UTM(X)/Lat	: S 00° 14′ 34.5″
Category Type (GT)	: 41	UTM(Y)/Long	: E 37° 38′ 23.4″
County	: Theraka Nitti	Elevation	: 1472
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: Original Point is 140M SW from GPS point

Comments

Photo

North : NE perennial Crops

South: SW Perennial crops

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 124		Date	: 04/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	41	UTM(X)/Lat	: S 00° 14′ 52.9″	
Category Type (GT)	:	41	UTM(Y)/Long	: E 37° 38′ 34.3″	
County	: Tharaka Nithi		Elevation	:	1504
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: Original Point is 60M S from GPS point

Comments

Photo

North :

No Photo

South: Perennial crops (Banana dominant)

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 125		Date	: 04/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 15′ 51.3″	
Category Type (GT)	:	42	UTM(Y)/Long	: E 37° 38′ 58.5″	
County	: Tharaka Nithi		Elevation	:	1421
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crops
Remark	:

Comments

Photo

North : Annual Crops

South:

NoPhoto

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 126		Date	: 04/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	1	UTM(X)/Lat	: S 00° 21′ 29.5″	
Category Type (GT)	:	1	UTM(Y)/Long	: E 37° 36′ 06.4″	
County	: Tharaka Nithi		Elevation	:	1530
			Remark	:	

1. Forest land

Type	: Natural Forest
Height	18M
Density(Crown)	: Dense
Remark	: Original Point is 60M NW from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : NW Dense Natural Forest

South:

No Photo

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 127		Date	: 04/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 26′ 40.3″	
Category Type (GT)	:	42	UTM(Y)/Long	: E 37° 33′ 29.6″	
County	: Embu		Elevation	:	1445
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crops
Remark	: Original Point is 50M W from GPS point

Comments

Foto

North :

No Photo

South:

No Photo

East:

No Photo

West: Annual crops

FIELD NOTE for Remote Sensing Analysis

No.	: 128	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 41	UTM(X)/Lat	: S 00° 28′ 30.0″
Category Type (GT)	: 41	UTM(Y)/Long	: E 37° 28′ 12.2″
County	: Embu	Elevation	: 1537
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	:

Comments

Agroforestry
15-20% crown cover

Photo

North : Perennial Crops

South: Perennial Crops

East: Perennial Crops

West: Perennial Crops

FIELD NOTE for Remote Sensing Analysis

No.	: 129	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 41	UTM(X)/Lat	: S 00° 28′ 11.1″
Category Type (GT)	: 1	UTM(Y)/Long	: E 37° 28′ 11.1″
County	: Embu	Elevation	: 1547
		Remark	:

1. Forest land

Type	: Woodlot
Height	25-28M
Density(Crown)	: Dense
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Eucalyptus Plantation
Around 70% Crowncover

Photo

North : Dense Plantation forest

South: Dense Plantation forest

East: Dense Plantation forest

West: Dense Plantation forest

FIELD NOTE for Remote Sensing Analysis

No.	: 130	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 41	UTM(X)/Lat	: S 00° 28′ 29.9″
Category Type (GT)	: 41	UTM(Y)/Long	: E 37° 29′ 14.7″
County	: Embu	Elevation	: 1562
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: Original Point is 80M S from GPS point

Comments

Agroforestry
Crown cover 25%

Photo

North :

No Photo

South: Perennial Crops

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 131	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 00° 30′ 48.4″
Category Type (GT)	: 31	UTM(Y)/Long	: E 37° 26′ 58.6″
County	: Embu	Elevation	: 1456
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Point is 200M E from GPS point

Comments

Photo

North :

No Photo

South:

No Photo

East: Wooded Grassland(200M)

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 132		Date	: 05/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	41	UTM(X)/Lat	: S 00° 30′ 45.4″	
Category Type (GT)	:	1	UTM(Y)/Long	: E 37° 26′ 58.5″	
County	: Embu		Elevation	:	1468
			Remark	:	

1. Forest land

Type	: Woodlot
Height	25M
Density(Crown)	: Dense
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Eucalyptus woodlot
67-70% Crown cover

Photo

North : Eucalyptus woodlot

South: Eucalyptus woodlot

East: Eucalyptus woodlot

West: Eucalyptus woodlot

FIELD NOTE for Remote Sensing Analysis

No.	: 133		Date	: 05/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	42	UTM(X)/Lat	: S 00° 32′ 50.5″	
Category Type (GT)	:	42	UTM(Y)/Long	: E 37° 23′ 16.5″	
County	: Kirinyaga		Elevation	:	1369
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crops
Remark	: Original Point is 15M NE from GPS point

Comments

Photo

North : NE Annual Crops

South:

No Photo

East:

No Photo

West: >100M Plantation Forest(Dense)

FIELD NOTE for Remote Sensing Analysis

No.	: 134	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: S 00° 33′ 26.6″
Category Type (GT)	: 41	UTM(Y)/Long	: E 37° 22′ 23.8″
County	: Kirinyaga	Elevation	: 1349
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: Original Point is 80M N from GPS point

Comments

Agroforestry Practised

Photo

North : Perennial Crops

South:

No Photo

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 135	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: S 00° 33′ 26.5″
Category Type (GT)	: 42	UTM(Y)/Long	: E 37° 22′ 30.0″
County	: Kirinyaga	Elevation	: 1337
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crops
Remark	:

Comments

Rice Field

Photo

North : Rice Field

South: Rice Field

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 136	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: S 00° 36′ 11.9″
Category Type (GT)	: 41	UTM(Y)/Long	: E 37° 15′ 56.5″
County	: Kirinyaga	Elevation	: 1270
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	:

Comments

Banana Plantation

Photo

North : NE Perennial Crops(Banana)

South:

No Photo

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 137	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: S 00° 37′ 07.1″
Category Type (GT)	: 51	UTM(Y)/Long	: E 37° 15′ 31.9″
County	: Kirinyaga	Elevation	: 1265
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Vegetated wetland
Remark	:

Comments

Photo

North : Vegetated wetland, >20M Annual Crops

South: vegetated wetland

East: Vegetated Wetland

West: Vegetated wetland, >20M Annual Crops

FIELD NOTE for Remote Sensing Analysis

No.	: 138	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 00° 40′ 22.4″
Category Type (GT)	: 31	UTM(Y)/Long	: E 37° 11′ 54.2″
County	: Muranga	Elevation	: 1265
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	:

Comments

Photo

North : Wooded Grassland

South: Wooded Grassland

East: Wooded Grassland

West: Wooded Grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 139	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 00° 43′ 18.3″
Category Type (GT)	: 31	UTM(Y)/Long	: E 37° 10′ 32.2″
County	: Muranga	Elevation	: 1231
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Open Grassland
Remark	:

Comments

In 2014 it was wooded Grassland
In the future, May be it would be a cropland or settlement

Photo

North : Open grassland

South: Open grassland

East: Open grassland

West: Open grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 140		Date	: 05/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	: 1		UTM(X)/Lat	: S 00° 43′ 30.3″	
Category Type (GT)	: 1		UTM(Y)/Long	: E 37° 04′ 58.6″	
County	: Muranga		Elevation	: 1499	
			Remark	:	

1. Forest land

Type	: Woodlot
Height	12M
Density(Crown)	: Dense
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Eucalyptus Coppices(Plantation)
Around 75-80% Crown cover
Planted 2008 and cut 2013
Coppices are around 3 years

Photo

North : Eucalyptus Plantation

South: Eucalyptus Plantation

East: Eucalyptus Plantation

West: Eucalyptus Plantation

FIELD NOTE for Remote Sensing Analysis

No.	: 141		Date	: 05/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	: 41		UTM(X)/Lat	: S 00° 42′ 30.3″	
Category Type (GT)	: 41		UTM(Y)/Long	: E 37° 00′ 15.0″	
County	: Muranga		Elevation	: 1667	
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	:

Comments

Agroforestry practised(Coffee)

Photo

North :

No photo

South:

No photo

East: Perennial Crops(Coffee)

West:

No photo

FIELD NOTE for Remote Sensing Analysis

No.	: 142	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 41	UTM(X)/Lat	: S 00° 41′ 14.7″
Category Type (GT)	: 41	UTM(Y)/Long	: E 36° 50′ 50.8″
County	: Muranga	Elevation	: 1845
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	:

Comments

NE Tea &coffee perennial Crops

Photo

North : NE Perennial Crops (Tea & Coffee)

South:

No photo

East:

No Photo

West:

No photo

FIELD NOTE for Remote Sensing Analysis

No.	: 143	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 2	UTM(X)/Lat	: S 00° 48′ 12.4″
Category Type (GT)	: 2	UTM(Y)/Long	: E 37° 08′ 20.1″
County	: Muranga	Elevation	: 1372
		Remark	:

1. Forest land

Type	: Plantation Forest
Height	12M
Density(Crown)	: Moderate
Remark	: Original Point is 50M NE from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Crown Cover is around 40-50%
May be in 2014 it was an Open forest

Photo

North : NE Plantation Forest(Eucalyptus)

South:

No photo

East:

No Photo

West:

No photo

FIELD NOTE for Remote Sensing Analysis

No.	: 144	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: S 00° 48′ 59.8″
Category Type (GT)	: 51	UTM(Y)/Long	: E 37° 08′ 27.5″
County	: Muranga	Elevation	: 1378
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Vegetated wetland
Remark	: Original Point is 40M E from GPS point

Comments

Photo

North : Vegetated wet land over 200M is banana and

South: vegetated wetland and over 200M is eucalyptus

East: vegetated wetland and over 200M is eucalyptus

West:

No photo

FIELD NOTE for Remote Sensing Analysis

No.	: 145	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: S 00° 53′ 47.5″
Category Type (GT)	: 41	UTM(Y)/Long	: E 37° 07′ 09.2″
County	: Muranga	Elevation	: 1401
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: Original Point is 10M NE from GPS point

Comments

Photo

North : NE perennial Crops (Banana)

South: SW perennial Crops (Banana)

East:

No Photo

West:

No photo

FIELD NOTE for Remote Sensing Analysis

No.	: 146	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 41	UTM(X)/Lat	: S 00° 57′ 55.1″
Category Type (GT)	: 41	UTM(Y)/Long	: E 37° 06′ 01.4″
County	: Muranga	Elevation	: 1522
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: Original Point is 120M E from GPS point

Comments

Pineapple plantation

Photo

North :

No photo

South:

No photo

East: Perennial Crops(Pineapple plantation)

West:

No photo

FIELD NOTE for Remote Sensing Analysis

No.	: 147	Date	: 05/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 52	UTM(X)/Lat	: S 00° 59′ 58.0″
Category Type (GT)	: 52	UTM(Y)/Long	: E 37° 04′ 56.8″
County	: Muranga	Elevation	: 1496
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Water Body
Remark	: Original Point is 40M NE from GPS point

Comments

Photo

North : NE Water body

South:

No photo

East:

No photo

West:

No photo

FIELD NOTE for Remote Sensing Analysis

No.	: 148	Date	: 06/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 71	UTM(X)/Lat	: S 01° 28′ 23.7″
Category Type (GT)	: 71	UTM(Y)/Long	: E 37° 01′ 29.1″
County	: Machakos	Elevation	: 1568
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Other land
Remark	:

Comments

Photo

North : Other land

South: Other land

East: Other land

West: Other land

FIELD NOTE for Remote Sensing Analysis

No.	: 149	Date	: 06/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 01° 31′ 59.8″
Category Type (GT)	: 31	UTM(Y)/Long	: E 37° 09′ 04.7″
County	: Machakos	Elevation	: 1728
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded grassland
Remark	: Original Point is 35M NE from GPS point

Comments

Photo

North : NE Wooded grassland

South: Wooded grassland

East: Wooded grassland

West: Wooded grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 150		Date	: 06/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31		UTM(X)/Lat	: S 01° 31′ 21.0″
Category Type (GT)	: 31		UTM(Y)/Long	: E 37° 13′ 05.5″
County	: Machakos		Elevation	: 1626
			Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded grassland
Remark	: Original Point is 20M N from GPS point

Comments

Photo

North : Wooded Grassland

No Photo

East:

No Photo

West: Wooded grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 151		Date	: 06/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31		UTM(X)/Lat	: S 01° 31′ 13.3″
Category Type (GT)	: 2		UTM(Y)/Long	: E 37° 14′ 48.8″
County	: Machakos		Elevation	: 1612
			Remark	:

1. Forest land

Type	: Plantation Forest
Height	15M
Density(Crown)	: Moderate
Remark	: Original Point is 60M NE from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Moderate Plantation forest

NE: Moderate Plantation Forest

East: Moderate Plantation forest

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 152		Date	: 06/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 52		UTM(X)/Lat	: S 01° 32′ 17.3″
Category Type (GT)	: 52		UTM(Y)/Long	: E 37° 14′ 11.4″
County	: Machakos		Elevation	: 1613
			Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Water body
Remark	: Original Point is 80M NW from GPS point

Comments

Photo

North : NW Waterbody

East:

No photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 153		Date	: 06/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31		UTM(X)/Lat	: S 01° 40′ 43.9″
Category Type (GT)	: 32		UTM(Y)/Long	: E 37° 11′ 41.1″
County	: Makueni		Elevation	: 1692
			Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Open Grassland
Remark	: Original Point is 95M W from GPS point

Comments

Photo

North : Open grassland

Sourth: Open grassland

East: Open grassland

West: Open grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 154		Date	: 06/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: S 01° 52′ 05.7″	
Category Type (GT)	:	31	UTM(Y)/Long	: E 37° 15′ 44.0″	
County	: Makueni		Elevation	:	1485
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 20M W from GPS point

Comments

Photo

North : Wooded Grassland

South : Wooded Grassland

East: Wooded Grassland

West: Wooded Grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 155		Date	: 06/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: S 02° 07′ 11.1″	
Category Type (GT)	:	31	UTM(Y)/Long	: E 37° 31′ 59.8″	
County	: Makueni		Elevation	:	1114
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 150M N from GPS point

Comments

Photo

North : Wooded Grassland

No Photo

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 156	Date	: 06/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 2	UTM(X)/Lat	: S 02° 09′ 14.3″
Category Type (GT)	: 1	UTM(Y)/Long	: E 37° 35′ 02.2″
County	: Kajiado	Elevation	: 1045
		Remark	:

1. Forest land

Type	: Natural Forest
Height	16M
Density(Crown)	: Dense
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Acacia xanthophloea dominant

Photo

North : Dense Forest

Sourth Dense Forest

East: dense Forest

West: Dense Forest

FIELD NOTE for Remote Sensing Analysis

No.	: 157	Date	: 06/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 02° 12′ 27.6″
Category Type (GT)	: 31	UTM(Y)/Long	: E 37° 41′ 47.5″
County	: Makueni	Elevation	: 948
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Annual Crops
Remark	: Original Point is 100M N from GPS point

Comments

2014 it might be wooded grassland

Photo

North : Annual Crops, >150m wooded grassland

Sourth

No Photo

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 158	Date	: 06/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 2	UTM(X)/Lat	: S 02° 12′ 41.1″
Category Type (GT)	: 2	UTM(Y)/Long	: E 37° 42′ 49.5″
County	: Makueni	Elevation	: 939
		Remark	:

1. Forest land

Type	: Riverine Forest
Height	16M
Density(Crown)	: Moderate
Remark	: Original Point is 10M SW from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North :

No Photo

Sourth

No Photo

East: SE moderate riverine forest

West: SW moderate riverine forest

FIELD NOTE for Remote Sensing Analysis

No.	: 159	Date	: 06/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 42	UTM(X)/Lat	: S 02° 17′ 25.6″
Category Type (GT)	: 41	UTM(Y)/Long	: E 37° 49′ 41.4″
County	: Makueni	Elevation	: 1015
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: Original Point is 15M S from GPS point

Comments

2014 was annual crops

Photo

North :

No Photo

Sourth perennial Crops(Mango dominat)

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 160		Date	: 06/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: S 02° 24′ 04.4″	
Category Type (GT)	:	31	UTM(Y)/Long	: E 37° 55′ 20.8″	
County	: Makueni		Elevation	:	956
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded grassland
Remark	: Original Point is 30M NE from GPS point

Comments

Photo

North : Wooded Grassland

Sourth

No Photo

East: NE Wooded grassland

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 161		Date	: 06/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	1	UTM(X)/Lat	: S 02° 24′ 27.0″	
Category Type (GT)	:	2	UTM(Y)/Long	: E 37° 55′ 46.1″	
County	: Makueni		Elevation	:	952
			Remark	:	

1. Forest land

Type	: Natural Forest
Height	8M
Density(Crown)	: Moderate
Remark	: Original Point is 50M SW from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North :

No Photo

Sourth Open Forest

East:

No Photo

West: SW Moderate forest

FIELD NOTE for Remote Sensing Analysis

No.	: 162	Date	: 06/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 02° 24′ 54.1″
Category Type (GT)	: 3	UTM(Y)/Long	: E 37° 57′ 35.2″
County	: Makueni	Elevation	: 932
		Remark	:

1. Forest land

Type	: Plantation Forest
Height	7M
Density(Crown)	: Open
Remark	: Original Point is 50M NE from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : NE Open forest

Sourth

No Photo

East:

No Photo

West: NW >100m moderate natural forest

FIELD NOTE for Remote Sensing Analysis

No.	: 163	Date	: 06/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31	UTM(X)/Lat	: S 02° 40′ 23.5″
Category Type (GT)	: 31	UTM(Y)/Long	: E 38° 08′ 33.2″
County	: Makueni	Elevation	: 799
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 120M N from GPS point

Comments

Photo

North : Wooded Grassland

Sourth Wooded Grassland

East: Wooded Grassland

West: Wooded Grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 164	Date	: 07/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 41	UTM(X)/Lat	: S 03° 24′ 18.4″
Category Type (GT)	: 41	UTM(Y)/Long	: E 38° 33′ 50.3″
County	: Taita Taveta	Elevation	: 607
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: Original Point is 40M E from GPS point

Comments

Photo

North : Perennial Crops

Sourth Perrenial Crops

East: Perennial Crops

West: Perennial Crops

FIELD NOTE for Remote Sensing Analysis

No.	: 165	Date	: 07/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 41	UTM(X)/Lat	: S 03° 25′ 55.2″
Category Type (GT)	: 41	UTM(Y)/Long	: E 38° 30′ 46.7″
County	: Taita Taveta	Elevation	: 678
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 110M N from GPS point

Comments

2014, it was perennial Crops and in 2016 it was changed as wooded grassland

Photo

North : wooded Grassland

Sourth

No Photo

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 166		Date	: 07/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: S 03° 28′ 12.5″	
Category Type (GT)	:	31	UTM(Y)/Long	: E 38° 27′ 44.9″	
County	: Taita Taveta		Elevation	:	722
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	:

Comments

Photo

North : wooded Grassland

South wooded Grassland

East: wooded Grassland

West: wooded Grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 167		Date	: 07/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	3	UTM(X)/Lat	: S 03° 27′ 56.1″	
Category Type (GT)	:	3	UTM(Y)/Long	: E 38° 22′ 37.2″	
County	: Taita Taveta		Elevation	:	937
			Remark	:	

1. Forest land

Type	: Natural Foreast
Height	6M
Density(Crown)	: Open
Remark	: Original Point is 80M S from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North :

No Photo

South Open Forest

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 168		Date	: 07/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 3		UTM(X)/Lat	: S 03° 27′ 25.3″
Category Type (GT)	: 3		UTM(Y)/Long	: E 38° 21′ 49.7″
County	: Taita Taveta		Elevation	: 1053
			Remark	:

1. Forest land

Type	: Natural Foreast
Height	7M
Density(Crown)	: Open
Remark	: Original Point is 30M NE from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : NE Open Forest

South

No Photo

East:

No Photo

West: NW Open forest

FIELD NOTE for Remote Sensing Analysis

No.	: 169		Date	: 07/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 2		UTM(X)/Lat	: S 03° 25′ 18.2″
Category Type (GT)	: 2		UTM(Y)/Long	: E 38° 21′ 49.6″
County	: Taita Taveta		Elevation	: 1442
			Remark	:

1. Forest land

Type	: Plantation Forest
Height	25M
Density(Crown)	: moderate
Remark	:

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Moderate Forest

South Moderate Forest

East: Moderate Forest

West: Moderate Forest

FIELD NOTE for Remote Sensing Analysis

No.	: 170		Date	: 07/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	31	UTM(X)/Lat	: S 03° 24′ 01.5″	
Category Type (GT)	:	41	UTM(Y)/Long	: E 38° 21′ 50.6″	
County	: Taita Taveta		Elevation	:	1402
			Remark	:	

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Perennial Crops
Remark	: Original Point is 20M S from GPS point

Comments

Photo

North :

No Photo

South Perennial Crops

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 171		Date	: 07/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	1	UTM(X)/Lat	: S 03° 22′ 50.1″	
Category Type (GT)	:	3	UTM(Y)/Long	: E 38° 22′ 49.6″	
County	: Taita Taveta		Elevation	:	1151
			Remark	:	

1. Forest land

Type	: Natural Forest
Height	11M
Density(Crown)	: Open
Remark	: Original Point is 20M N from GPS point

2. Non-Forest Land

Land use	:
Remark	:

Comments

Photo

North : Open Forest

South

No Photo

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 172		Date	: 07/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	2	UTM(X)/Lat	: S 03° 22′ 45.5″	
Category Type (GT)	:	3	UTM(Y)/Long	: E 38° 23′ 43.5″	
County	: Taita Taveta		Elevation	:	1003
			Remark	:	

1. Forest land

Type	:	Riverine Forest
Height		15M
Density(Crown)	:	Open
Remark	:	Original Point is 15M E from GPS point

2. Non-Forest Land

Land use	:	
Remark	:	

Comments

Photo

North : NW Open forest

Sourth

No Photo

East: Open forest along season river

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 173		Date	: 07/10/2016	
			Surveyor	: Sirayo Peter	
Category Type (LC/LU Map)	:	3	UTM(X)/Lat	: S 03° 23′ 57.8″	
Category Type (GT)	:	3	UTM(Y)/Long	: E 38° 23′ 26.7″	
County	: Taita Taveta		Elevation	:	910
			Remark	:	

1. Forest land

Type	:	Natural Forest
Height		4M
Density(Crown)	:	Open
Remark	:	Original Point is 50M E from GPS point

2. Non-Forest Land

Land use	:	
Remark	:	

Comments

Photo

North :

No Photo

South

No Photo

East: Open forest

West: Open forest >100M;<100M wooded grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 174		Date	: 07/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 32		UTM(X)/Lat	: S 03° 21′ 16.3″
Category Type (GT)	: 31		UTM(Y)/Long	: E 38° 31′ 56.7″
County	: Taita Taveta		Elevation	: 631
			Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 130M NE from GPS point

Comments

Photo

North : NE Wooded grassland

Sourth

No Photo

East:

No Photo

West:

No Photo

FIELD NOTE for Remote Sensing Analysis

No.	: 175		Date	: 07/10/2016
			Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 31		UTM(X)/Lat	: S 02° 52′ 32.9″
Category Type (GT)	: 31		UTM(Y)/Long	: E 38° 20′ 42.6″
County	: Taita Taveta		Elevation	: 617
			Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 100M NE from GPS point

Comments

Photo

North : NE Wooded grassland

South SE Wooded grassland

East:

No Photo

West: NW Wooded grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 176	Date	: 07/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 32	UTM(X)/Lat	: S 02° 49′ 37.3″
Category Type (GT)	: 31	UTM(Y)/Long	: E 38° 18′ 46.8″
County	: Taita Taveta	Elevation	: 631
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 15M E from GPS point

Comments

Photo

North : Wooded Grassland

South:

No Photo

East: Wooded Grassland

West: Wooded Grassland

FIELD NOTE for Remote Sensing Analysis

No.	: 177	Date	: 08/10/2016
		Surveyor	: Sirayo Peter
Category Type (LC/LU Map)	: 32	UTM(X)/Lat	: S 01° 33′ 52.8″
Category Type (GT)	: 31	UTM(Y)/Long	: E 37° 08′ 57.9″
County	: Machakos	Elevation	: 1683
		Remark	:

1. Forest land

Type	:
Height	
Density(Crown)	:
Remark	:

2. Non-Forest Land

Land use	: Wooded Grassland
Remark	: Original Point is 50M SW from GPS point

Comments

Photo

North :

No Photo

South SW Wooded Grassland

East:

No photo

West:

No photo

Training for Land Cover / Land Use Map 2020

on

The REDD+ Readiness Component

in

the Capacity Development Project for the Sustainable Forest Management in the Republic of Kenya

By Faith MUTWIRI, Kei SATO, Sahori FUJIMURA

2017.9.22

Today's Agenda

1. Position of activity data for REDD+
2. Basic Remote Sensing and Image processing
3. Why Field Survey
4. How to extract field data (Sample points)
5. Field data collection sheet
6. Explanation for SLEEK Manual

Introduction background of Activity Data

Back Ground of the training Positioning of AD in REDD+

The REDD+ Readiness Component
in
the Capacity Development Project for the Sustainable Forest Management (CADEP-SFM) in the Republic of Kenya

By SAHORI Fujimura 2017.9.22

Back Ground

Global Environmental Crises and the Consideration of Solution

1. Promotion of Sustainable Forest Management

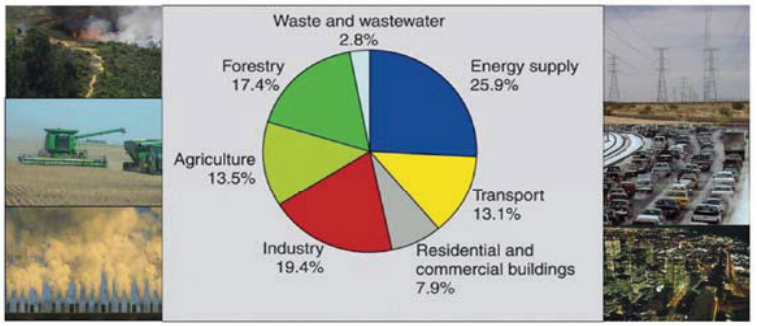
- **The Earth Summit ; UN Conference on Environment and Development (1992 Agenda 21)**
- **Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management**
- **Conservation and Sustainable Development of All Types of Forests**

2. Measures against Global Warming

- **The Intergovernmental Panel on Climate Change (IPCC) points out global warming**
- **THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)**

Back Ground

How much of the greenhouse gases (GHG) are emitted by the forestry sector



Source: IPCC Fourth Assessment Report, 2007

What is REDD Plus?

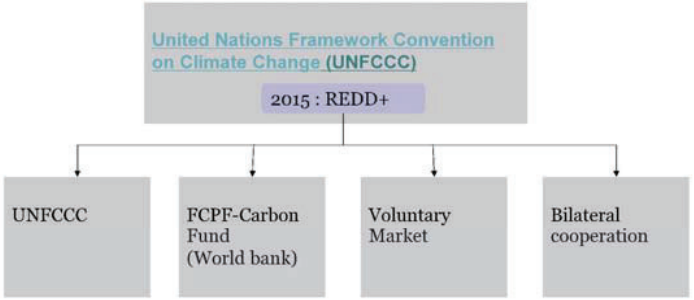
- REDD+ （REDD-plus） Mechanism

  The basic concept of REDD+ is to provide economic incentives such as funding to developing countries for activities reducing GHG emissions from deforestation and forest degradation, and maintaining or enhancing carbon stocks through forest conservation.

✓REDD is “Reducing Emissions from Deforestation and Forest Degradation”

✓“+” is forest conservation, sustainable forest management and enhancement of forest carbon sinks

Framework of REDD+



Requirements for Participation for REDD+ Framework

To develop the following elements:

(a) A National Strategy(NRS) or action plan

(b) A national Forest Reference Emission Level (FREL) and/or Forest Reference Level (FRL)

(c) A robust and transparent National Forest Monitoring System (NFMS)

(d) A System for providing Information on Safeguards (SIS)

Five activities decided as REDD+ activities

① Reducing emissions from deforestation

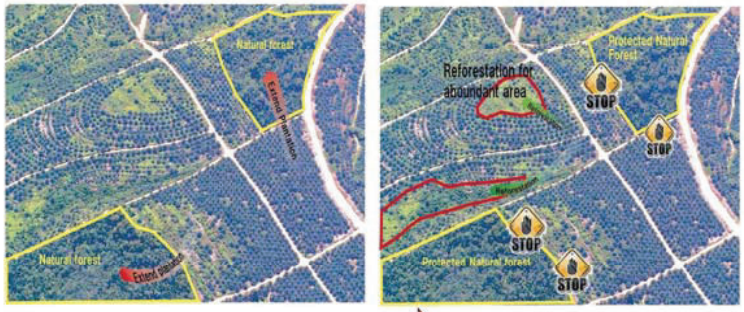
② Reducing emissions from forest degradation

③ Conservation of forest carbon stocks

④ Sustainable management of forests

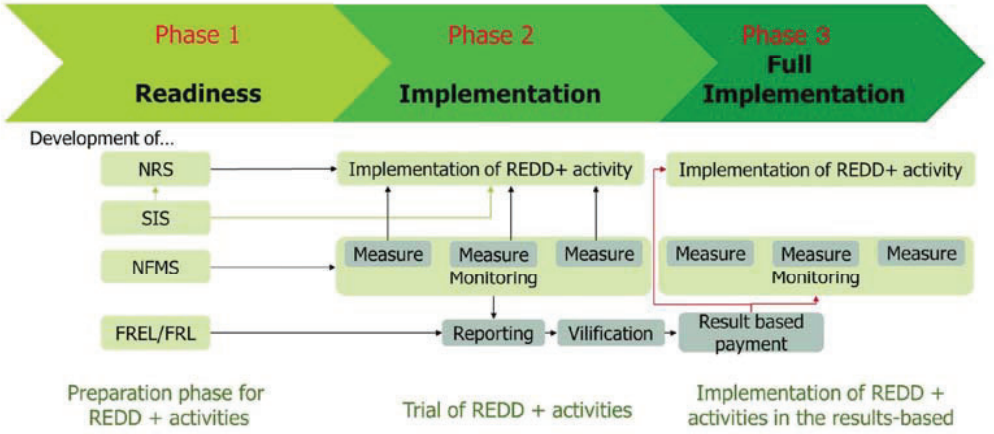
⑤ Enhancement of forest carbon stocks

REDD Mechanism and Concept



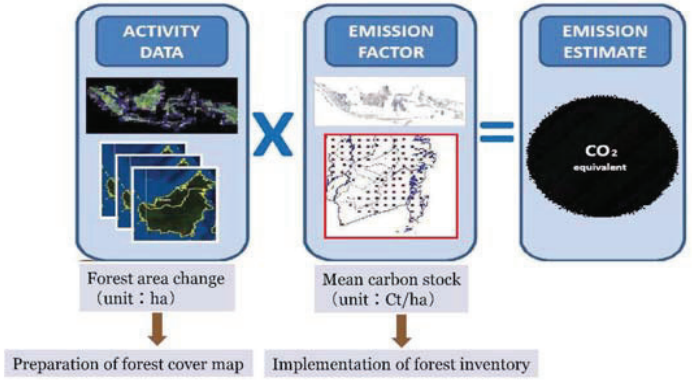
Business as usual (Now) → **Protection activity** → **Protect forest and sequence carbon (Future)**

Process of REDD+



National Forest Monitoring System (NFMS)

【Necessary monitoring based on the estimation method of emission amount】



Emission Factor（EF）

Kenya's Carbon Stock

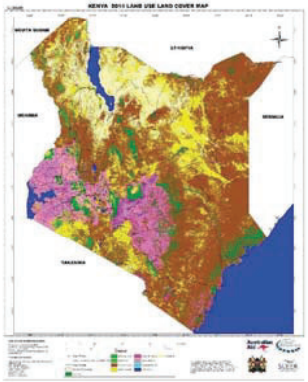
Class	Canopy coverage	Volume**	AGB		BGB		TOTAL	
			Biomass stock	Carbon stock	Biomass stock	Carbon stock	Biomass stock	Carbon stock
Montane Forest & Western Rain Forest	Dense	437.86	344.75	162.03	93.08	46.54	437.83	208.57
	Moderate	69.59	58.36	27.43	15.76	7.88	74.12	35.31
	Open	26.23	23.02	10.82	6.22	3.11	29.23	13.93
Coastal forest & Mangrove forest	Dense	97.35	92.82	43.62	27.39	13.70	120.21	57.32
	Moderate	64.53	60.45	28.41	13.64	6.82	74.09	35.23
	Open	41.92	35.24	16.57	7.48	3.74	42.72	20.30
Dryland Forest	Dense	98.55	79.27	37.26	31.29	15.64	110.56	52.90
	Moderate	38.74	33.83	15.90	12.72	6.36	46.55	22.26
	Open	16.00	14.26	6.70	3.85	1.93	18.12	8.63
Plantation	Dense	539.23	436.68	205.24	117.90	58.95	554.58	264.19
	Moderate	137.79	113.54	53.36	30.66	15.33	144.20	68.69
	Open	174.54	138.22	64.96	37.32	18.66	175.54	83.62
*(Agro-forestry)		106.98	74.23	34.89	20.04	10.02	94.27	44.91

* The class of Agro-forestry has been considered to apply for setting FRL. **Volume does not include volume of Climber.

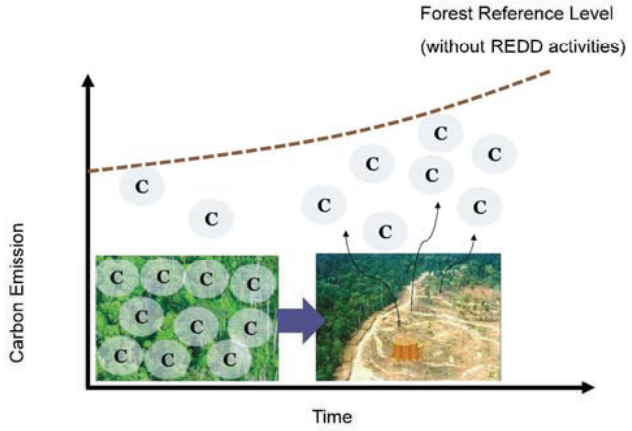
Activity data（AD）

Class	Canopy coverage	EF Carbon stock	AD
Montane Forest & Western Rain Forest	Dense	208.57	?? ha
	Moderate	35.31	?? ha
	Open	13.93	?? ha
Coastal forest & Mangrove forest	Dense	57.32	?? ha
	Moderate	35.23	?? ha
	Open	20.30	?? ha
Dryland Forest	Dense	52.90	?? ha
	Moderate	22.26	?? ha
	Open	8.63	?? ha
Plantation	Dense	264.19	?? ha
	Moderate	68.69	?? ha
	Open	83.62	?? ha
*(Agro-forestry)		44.91	

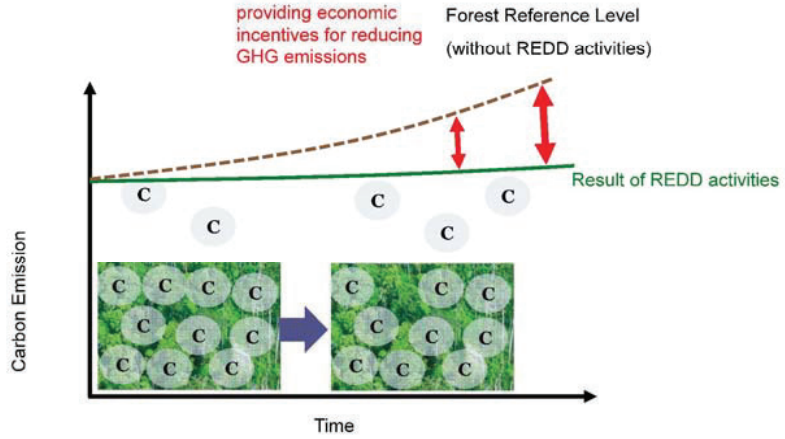
* The class of Agro-forestry has been considered to app



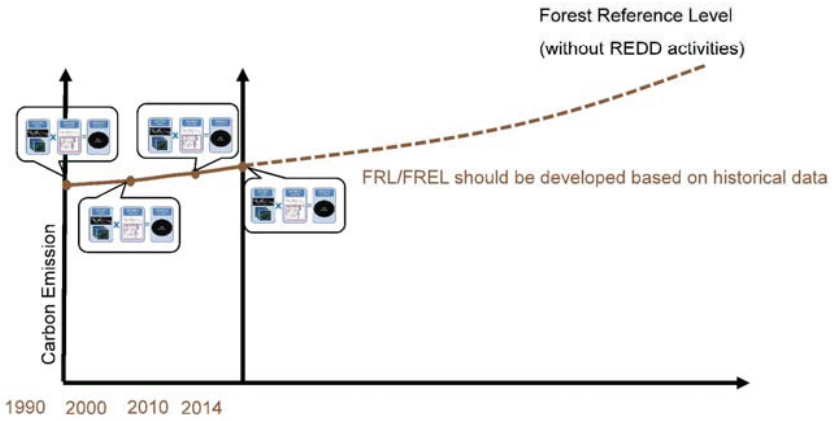
Forest Reference Level (FRL) /Forest Reference Emission Level



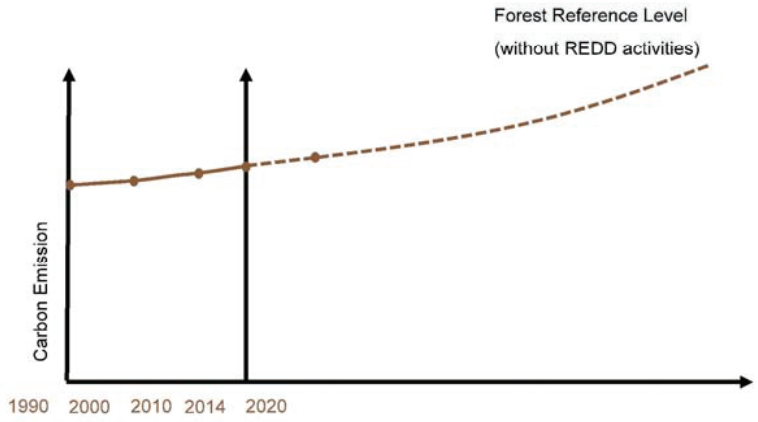
Forest Reference Level (FRL) /Forest Reference Emission Level



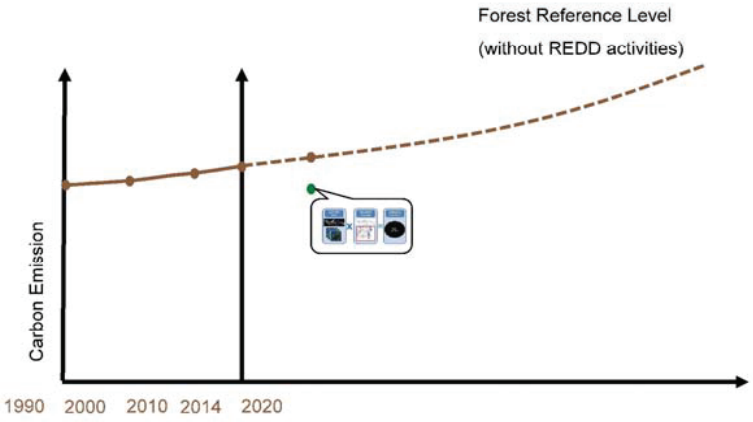
Forest Reference Level (FRL) /Forest Reference Emission Level



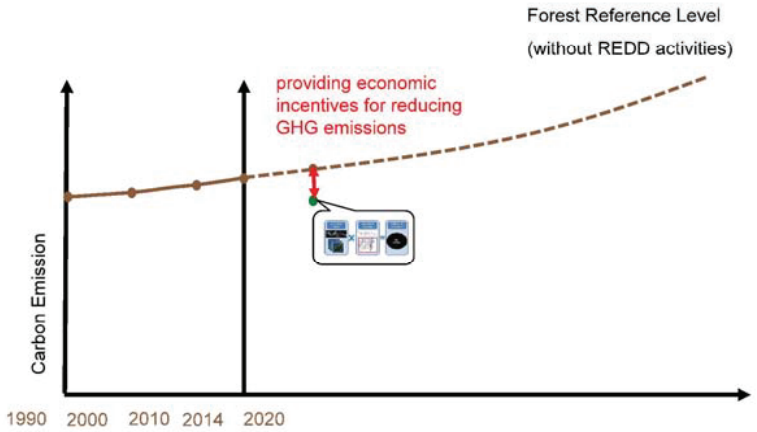
Forest Reference Level (FRL) /Forest Reference Emission Level



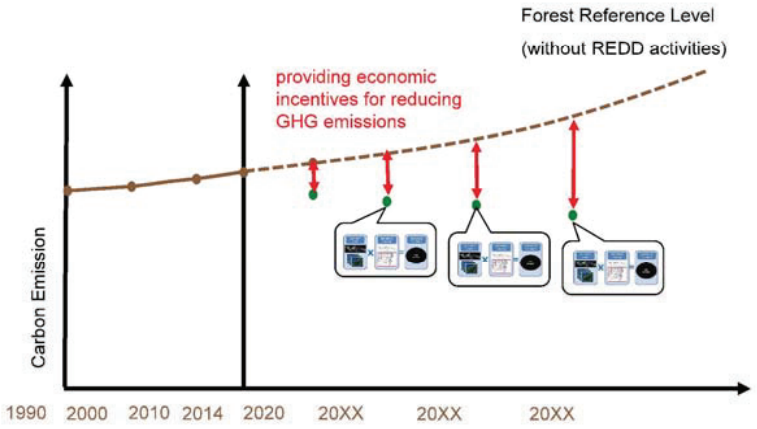
Forest Reference Level (FRL) /Forest Reference Emission Level



Forest Reference Level (FRL) /Forest Reference Emission Level



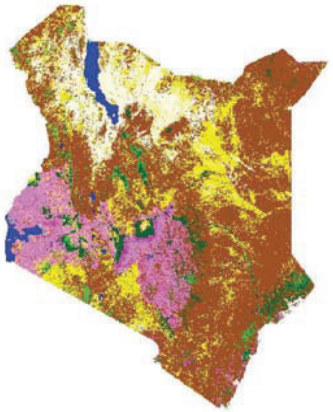
Forest Reference Level (FRL) /Forest Reference Emission Level



Ground of the training – Positioning of AD in REDD+ –

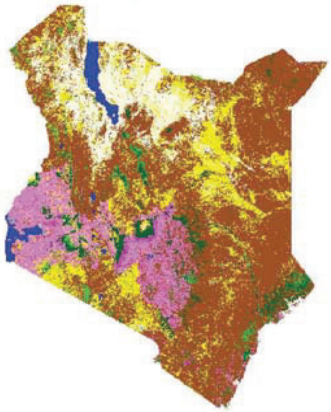
What we have done for Activity Data

What we have done for Activity Data for FRL (REDD+)



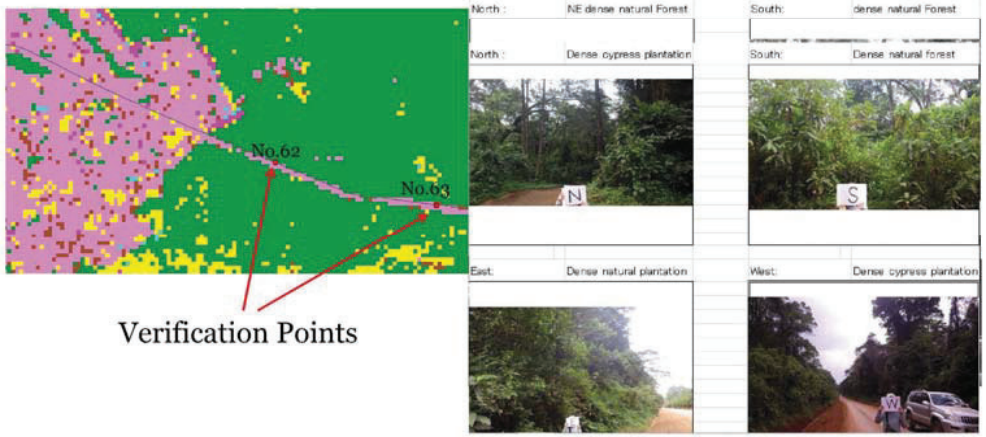
- Producing of Land Cover / Land Use Map 2014
- Producing historical Land Cover / Land Use Map
- Data screening for reference year
- Filtering for forest definition
- Forest zoning for detailed forest type classification

Producing of Land Cover / Land Use Map 2014



- Produced by RS team through the SLEEK project
- Methodology and each steps were collect way
- Class type was mixed of land cover and use
- Correctness was 75.1%

Example of Land Cover/Land Use Map with Filed Note



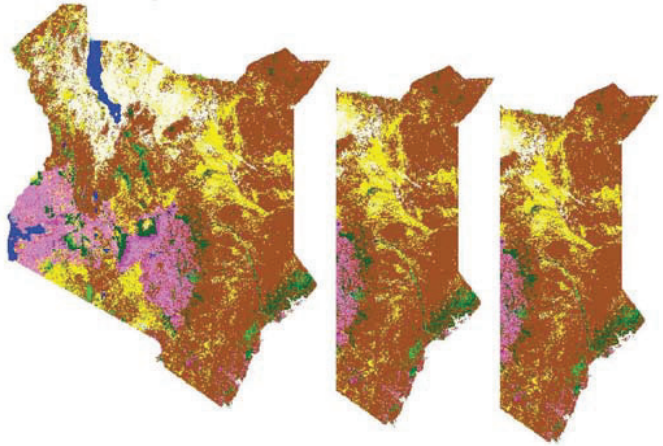
Correctness of Land Cover / Land Use Map 2014

Correctness Table by Verification Survey (SLEEK and JICA Consultant team)

Class Name	Land Cover / Land Use	Number of correct	Accuracy Ratio
Dense Forest	312	239	76.6%
Moderate Forest	221	152	68.8%
Open Forest	150	97	64.7%
Wooded Grassland	984	761	77.3%
Open Grassland	581	406	69.9%
Perennial Cropland	205	165	80.5%
Annual Cropland	989	748	75.6%
Vegetated Wetland	95	70	73.7%
Open Water	47	40	85.1%
Other Land	215	174	80.9%
TOTAL	**3799**	**2852**	**75.1%**

Class Name	Land Cover / Land Use	Number of correct	Accuracy Ratio
Forest	683	488	71.4%
Wooded Grassland	984	761	77.3%
Open Grassland	581	406	69.9%
Perennial Cropland	205	165	80.5%
Annual Cropland	989	748	75.6%
Vegetated Wetland	95	70	73.7%
Open Water	47	40	85.1%
Other Land	215	174	80.9%
TOTAL	**3799**	**2852**	**75.1%**

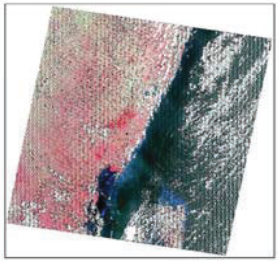
Producing of historical Land Cover / Land Use Map

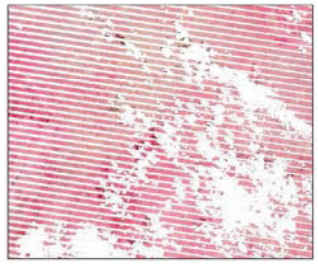


2014 → 1990

Why do we need the data screening?

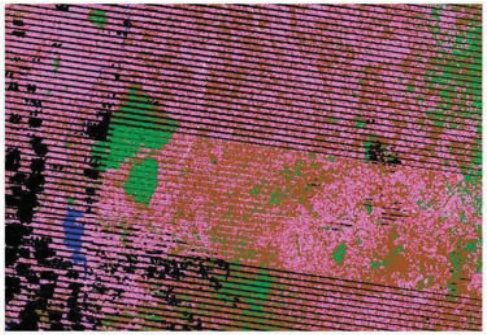
- The quality of Land Cover/ Land Use Map by image classification is affected by the quality of source data which is satellite imagery.
- So the good quality satellite imagery shall be utilized
- Stripping is from end of May 2003



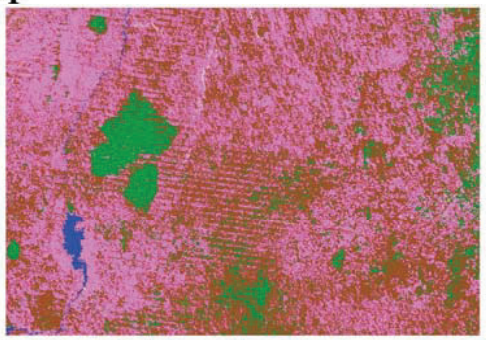


Stripping effect on classification

2006 Land cover Land use map



Before CPN



After CPN

Result of data screening and Recommendable Year

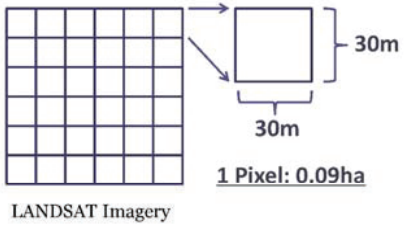
	1990	1995	2000	2002	2003	2004	2005	2006
No DATA (%)	10.59%	14.35%	6.50%	6.53%	8.56%	23.77%	20.86%	23.13%
LANDSAT4 (scene)	26	0	0	0	0	0	0	0
LANDSAT5 (scene)	8	34	0	0	0	0	0	0
LANDSAT7 (scene)	0	0	34	34	34	34	34	34
Missing scenes	0	0	0	0	0	0	0	0
LANDSAT8 (scene)	0	0	0	0	0	0	0	0
Stripping Effect (scene)	0	0	0	0	0	34	34	34
Ratio of Stripping Effect (%)	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**100.00%**	**100.00%**	**100.00%**

	2007	2008	2009	2010	2011	2012	2013	2014
No DATA (%)	26.14%	28.00%	15.85%	6.81%	12.51%	20.85%	16.98%	3.75%
LANDSAT4 (scene)	0	0	0	0	0	0	0	0
LANDSAT5 (scene)	0	0	11	24	15	0	0	0
LANDSAT7 (scene)	34	34	23	9	19	34	13	0
Missing scenes	0	0	0	1	0	0	0	0
LANDSAT8 (scene)	0	0	0	0	0	0	21	34
Stripping Effect (scene)	34	34	23	9	19	34	13	0
Ratio of Stripping Effect (%)	**100.00%**	**100.00%**	**64.60%**	**26.50%**	**55.90%**	**100.00%**	**38.20%**	**0.00%**

10 Year's epoch shall be utilized and 2014 as recent Activity Data

Filtering for forest definition

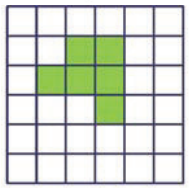
0.5ha as minimum mapping unit was considered as concept of SLEEK Map



1 Pixel: 0.09ha

Forest Definition

- Canopy Cover Ratio: ≥ 15%
- Area size: 0.5ha

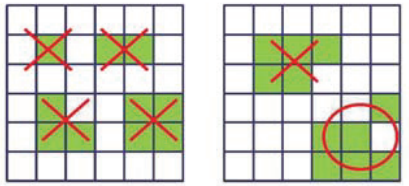


Forest area size: 0.54ha

Clustering of forest pixels

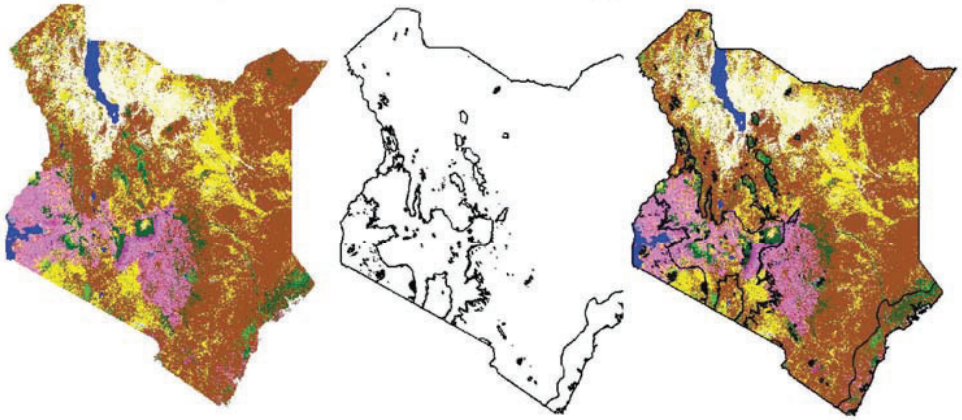
How to searching the forest cluster as same group?

8 neighbor searching method



Eliminate the pixels which are less than 6 pixels

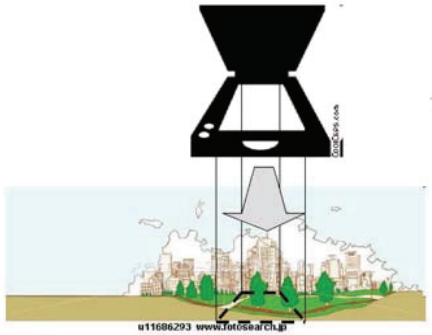
Forest zoning for detailed forest type classification



What is Remote Sensing?

Concept of Typical Remote Sensing

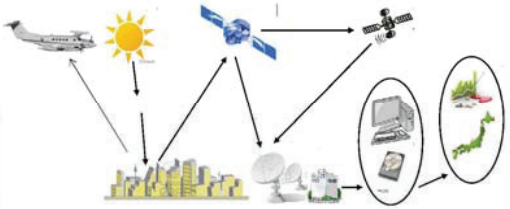
Scanning to the Earth
Earth Observation from Space



like Flatbed Scanner

Earth Surface Information Gathering

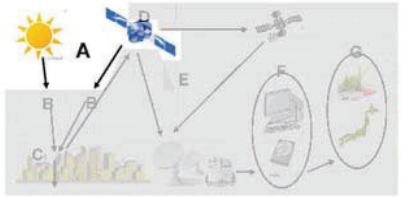
Processes of Remote Sensing
for Gathering Earth Surface Information

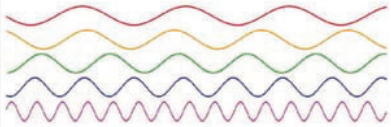


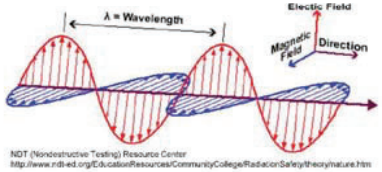
Indirect Measurement
using Electromagnetic Wave

Basic Knowledge of Remote Sensing

Electromagnetic Radiation

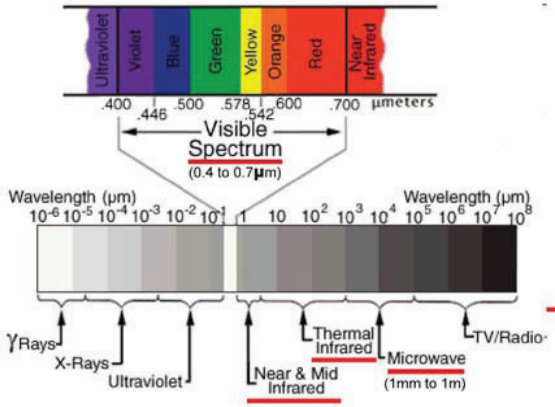






$C = \lambda v$
λ: wavelength (m)
v: frequency (cycle per second, Hz)
c: speed of light (3×10^8 m/s)

Electromagnetic Spectrum



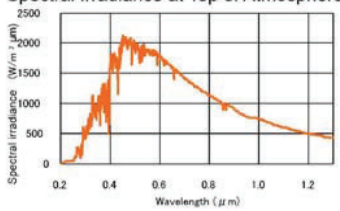
Band	Wavelength (mm)
Ka	7.5-11
K	11-16.7
Ku	16.7-24
X	24-37.5
C	37.5-75
S	75-150
L	150-300
P	300-1000

Remote Sensing Used Wavelength

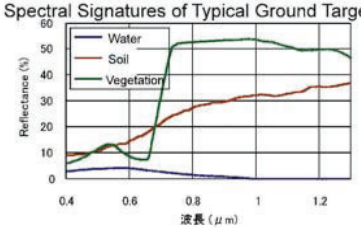
1 cm = 10^{-2} m
1μm = 10^{-6} m
1 nm = 10^{-9} m

Wavelength of Visible-Infrared Remote Sensing

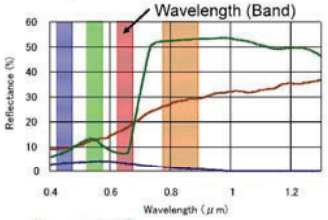
Spectral Irradiance at Top of Atmosphere

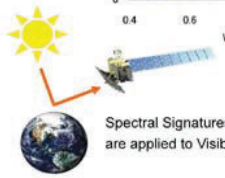


Spectral Signatures of Typical Ground Targets



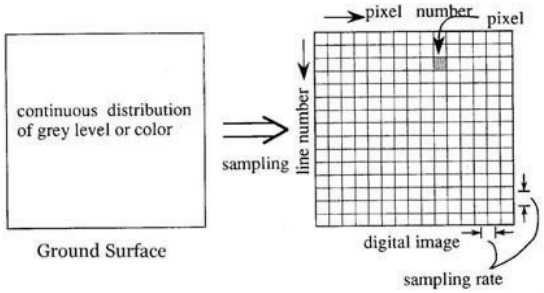
Remote Sensing Sensors' Wavelengths' and Spectral Signature

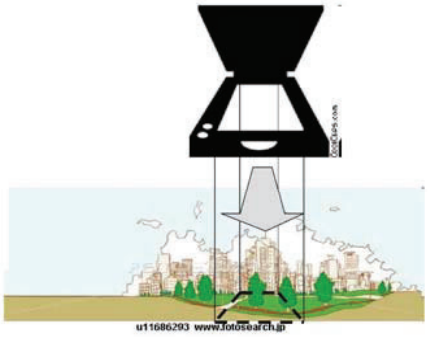




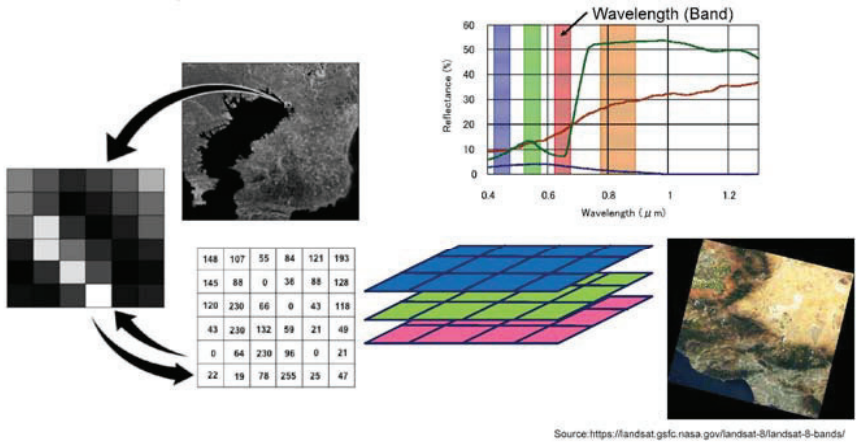
Spectral Signatures that reflected on Earth Surface are applied to Visible-Infrared Remote Sensing

What is scanning to the Earth?





What is scanning to the Earth?



Source:https://landsat.gsfc.nasa.gov/landsat-8/landsat-8-bands/

Limitation of Remote Sensing

Sampling Size and Quantization Bit Rate on Imagery

The digital imagery is defined by sampling size and quantization bit rate.

The quantization bit rate is determined by how many levels it is necessary to express the information.

The sampling size is determined by the utilization purpose.
For examples, what you want to know what's that or what gender, age….

Limitation of Remote Sensing

Different Quantization Bit Rate and its Effect on Imagery

Effects depend on the different quantization bit rate

Sampling Size 256X256

8 bit	4 bit
2 bit	1 bit

Limitation of Remote Sensing

Different Sampling Size and its Effect on Imagery

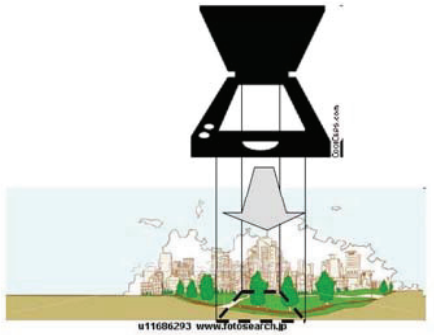
Effects depend on the different sampling size

8bit Quantization

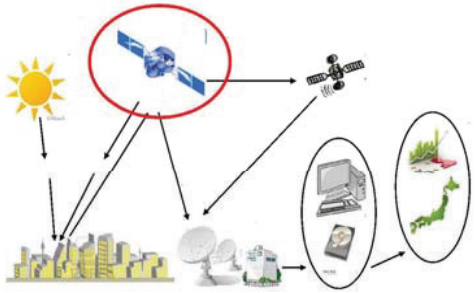
256X256	128X128
64X64	32X32

What is Satellite Imagery Remote Sensing?

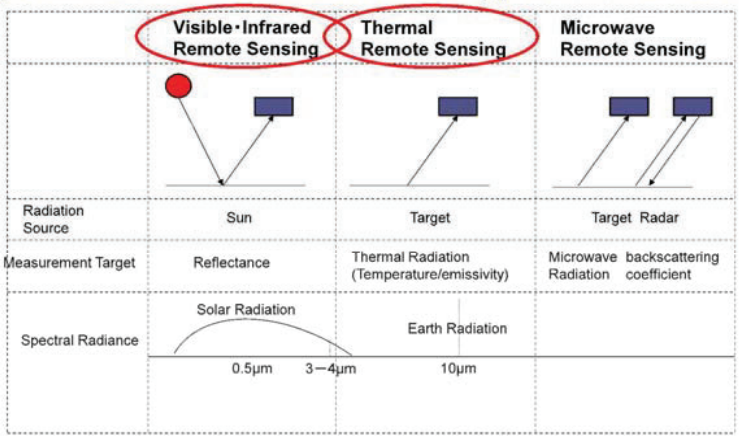
What is Satellite Imagery Remote Sensing?



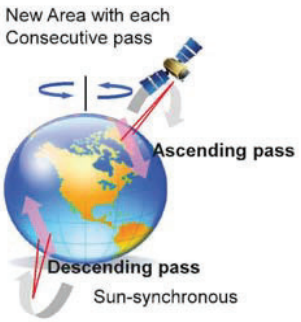
e.g. LANDSAT Satellite series

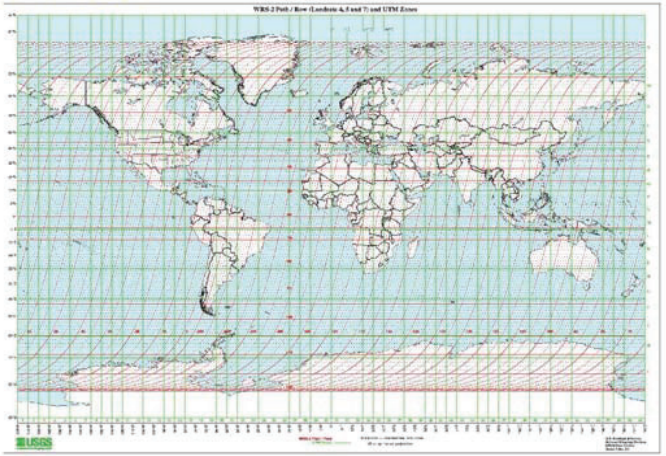


Type of LANDSAT Satellite as typical EO satellite

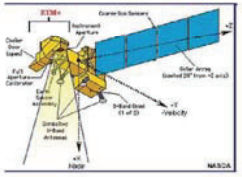


LANDSAT Orbit and Swaths





Specification of LANDSAT 7



Sun-synchronous Sub-Recurrent Orbit
Recurrent Period 16 days
Circles the Earth every 98.9 minutes
altitude of 705 km (438 mi)
Launched: April1999

Sensor	Wavelength Range/ Frequency	Spatial Resolution	Observation Width
Enhanced Thematic Mapper Plus (ETM+)	Band 1 Visible (0.45 – 0.52 μm) Band 2 Visible (0.52 – 0.60 μm) Band 3 Visible (0.63 – 0.69 μm) Band 4 Near-Infrared (0.77 – 0.90 μm) Band 5 Near-Infrared (1.55 – 1.75 μm) Band 6 Thermal (10.40 – 12.50 μm) Band 7 Mid-Infrared (2.08 – 2.35 μm) Band 8 Panchromatic (PAN) (0.52 - 0.90 μm)	Band 1 30 m Band 2 30 m Band 3 30 m Band 4 30 m Band 5 30 m Band 6 60 m Low Gain / High Gain Band 7 30 m Band 8 15 m	Swath width, 185 km (115 mi)

Source:http://landsat.usgs.gov/about_landsat7.php
http://www.satimagingcorp.com/satellite-sensors/alos.html

Specification of LANDSAT 8

Sun-synchronous Sub-Recurrent Orbit
Recurrent Period 16 days
Circles the Earth every 98.9 minutes
altitude of 705 km (438 mi)
Launched: February 2013

Sensor	Wavelength Range/ Frequency	Spatial Resolution	Observation Width
Operational Land Imager (OLI)	Band 1 New Deep Blue (0.43 – 0.45μm) Band 2 Visible (0.45 – 0.52 μm) Band 3 Visible (0.53 – 0.60 μm) Band 4Visible (0.63 – 0.68 μm) Band 5 Near-Infrared (0.85 – 0.89 μm) Band 6 SWIR 2 (1.56 – 1.66 μm) Band 7 SWIR 3 (2.10 – 2.30 μm) Band 8 PAN (0.50 – 0.68 μm) Band 9 SWIR (1.36 - 1.39 μm)	Band 1 30 m Band 2 30 m Band 3 30 m Band 4 30 m Band 5 30 m Band 6 30 m Band 7 30 m Band 8 15 m Band 9 30m	Swath width, 185 km (115 mi)
Thermal Infrared Sensor (TIRS)	Band 10 TIRS 1 (10.60 - 11.19 μm) Band 10 TIRS 2 (11.50 - 12.51 μm)	Band10 100m Band11 100m	

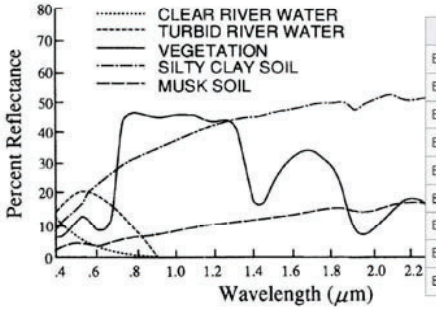
Source:https://landsat.gsfc.nasa.gov/landsat-8/landsat-8-bands/

LANDSAT Imagery

False Color (LANDSAT 7)

True Color (LANDSAT 8) Source:https://landsat.gsfc.nasa.gov/landsat-8/landsat-8-bands/

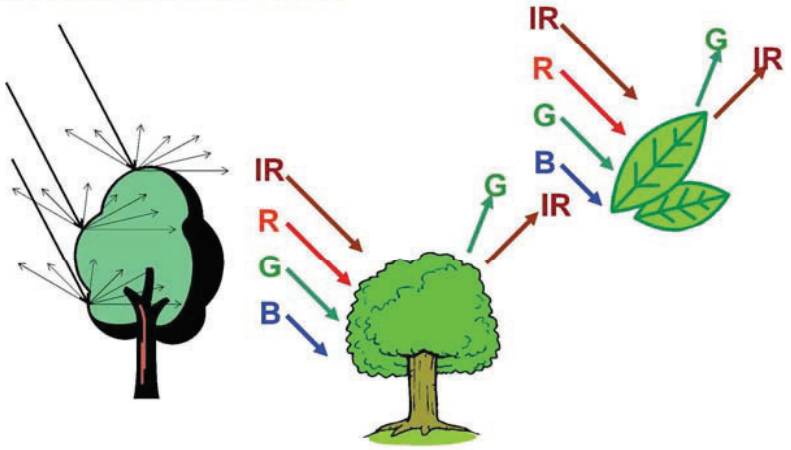
Characteristic of Electromagnetic Wavelength



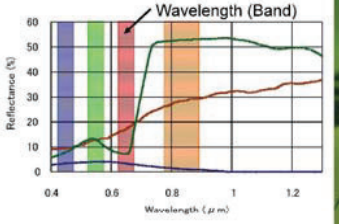
Spectral Band	Wavelength	Resolution	Solar Irradiance
Band 1 - Coastal / Aerosol	0.433 – 0.453 µm	30 m	2031 W/(m²µm)
Band 2 - Blue	0.450 – 0.515 µm	30 m	1925 W/(m²µm)
Band 3 - Green	0.525 – 0.600 µm	30 m	1826 W/(m²µm)
Band 4 - Red	0.630 – 0.680 µm	30 m	1574 W/(m²µm)
Band 5 - Near Infrared	0.845 – 0.885 µm	30 m	955 W/(m²µm)
Band 6 - Short Wavelength Infrared	1.560 – 1.660 µm	30 m	242 W/(m²µm)
Band 7 - Short Wavelength Infrared	2.100 – 2.300 µm	30 m	82.5 W/(m²µm)
Band 8 - Panchromatic	0.500 – 0.680 µm	15 m	1739 W/(m²µm)
Band 9 - Cirrus	1.360 – 1.390 µm	30 m	361 W/(m²µm)

Figure shows **three curves of spectral reflectance** for typical land covers; vegetation, soil and water.

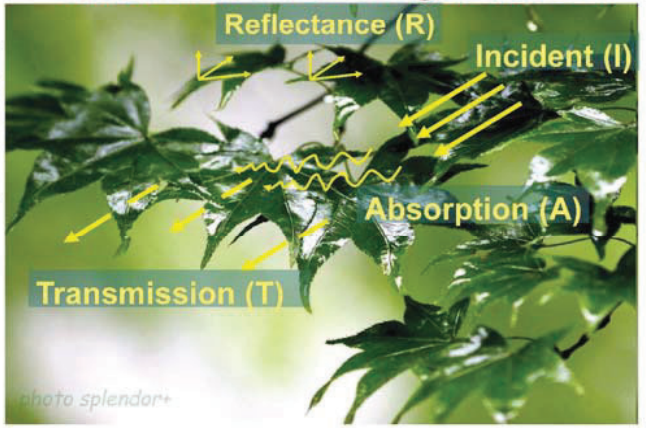
Spectral Characteristics



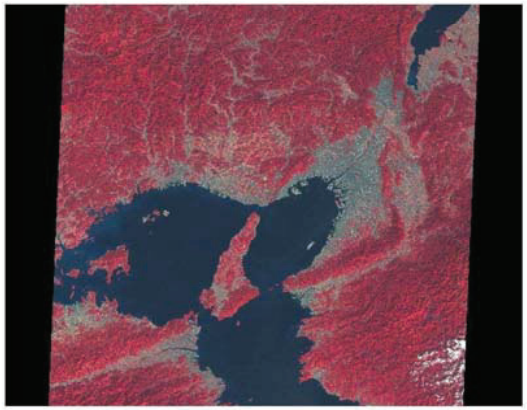
Visible-Infrared Remote Sensing



Model of Radiation and Target Interaction



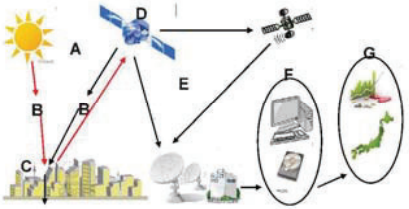
Gathering the reflection from the Earth Surface



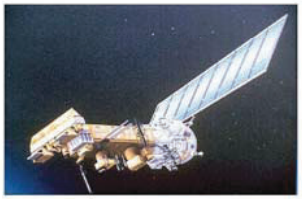
False Color

Earth Surface Information Gathering

Processes of Remote Sensing
for Gathering Earth Surface Information



NOAA(National Oceanic and Atmospheric Administration)

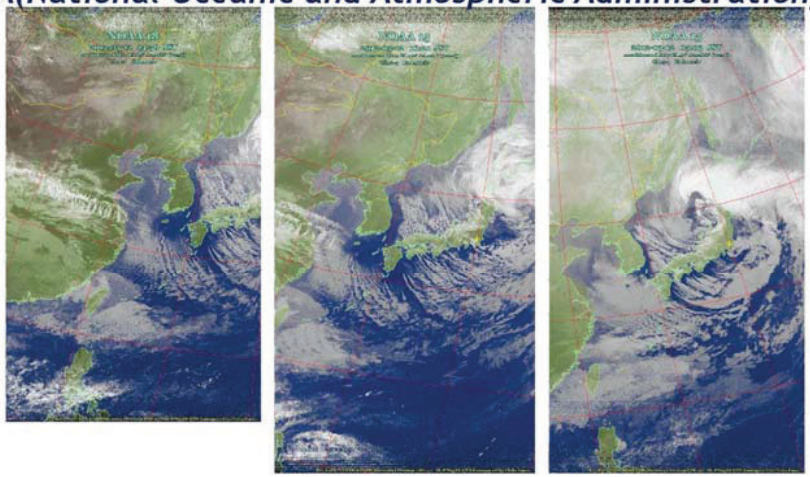


Now Operating:
NOAA 15 : AM Secondary **NOAA 18 : PM Secondary**
NOAA 16 : PM Secondary **NOAA 19 : PM Primary**
NOAA 17 : AM backup
Geostationary Orbit
Altitude: Approximately 870 km
Launched: 02/06/2009 **NOAA 19**

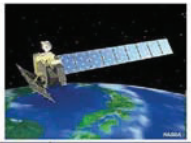
Sensor	Wavelength Range/ Frequency	Spatial Resolution	Observation Width
AVHRR/3	Channel 1: 0.58 - 0.68(μm)(Visible) Channel 2: 0.725 - 1.00(μm) (NIR) Channel3A: 1.58 - 1.64(μm) (NIR) Channel3B: 3.55 - 3.93(μm) (MIR) Channel 4: 10.30 - 11.30(μm) (TIR) Channel 5: 11.50 - 12.50(μm) (TIR)	0.5 km 1.0 km 1.0 km 1.0 km 1.0 km 1.0 km	Swath Width : 2800km

Source:http://ja.allmetsat.com/satellite-noaa.php

NOAA(National Oceanic and Atmospheric Administration)



ALOS

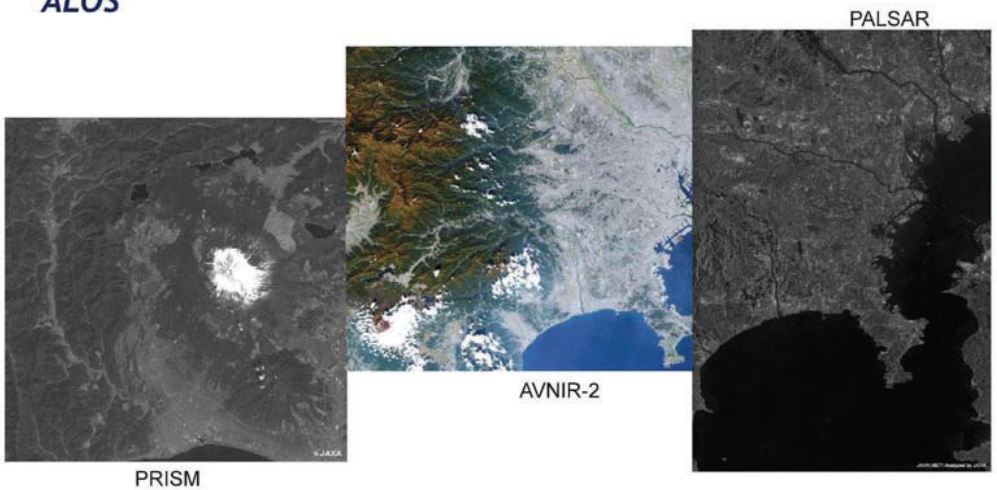


Sun Synchronous Sub-Recurrent Orbit
Recurrent Period: 46 days
Sub cycle: 2 days
Altitude: Approximately 692km (above the equator)
Launched: January 2006

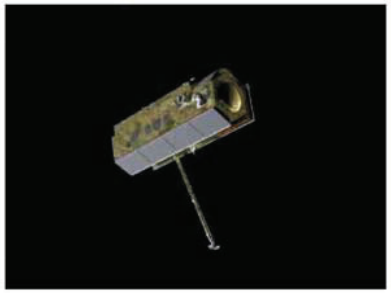
Sensor	Wavelength Range/ Frequency	Spatial Resolution	Observation Width
PRISM	0.52-0.77(μm)	2.5m	Swath Width : 35km(Triplet mode) 70km(Nadir Only)
AVNIR-2	Band1:0.42-0.50 (μm)(blue) Band2:0.52-0.60 (μm)(green) Band3:0.61-0.69 (μm)(red) Band4:0.76-0.89 (μm)(near-IR)	10m	Swath Width : 70km
PALSAR	Frequency L-Band 1.3 (GHz)	10m(fine resolution mode) 100m(Scan Sar mode)	Observation Swath : 70km(fine mode) 250-350km(Scan SAR)

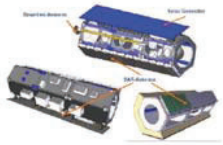
Source:http://www.alos-restec.jp/en/staticpages/index.php/aboutalos
http://www.satimagingcorp.com/satellite-sensors/alos.html

ALOS



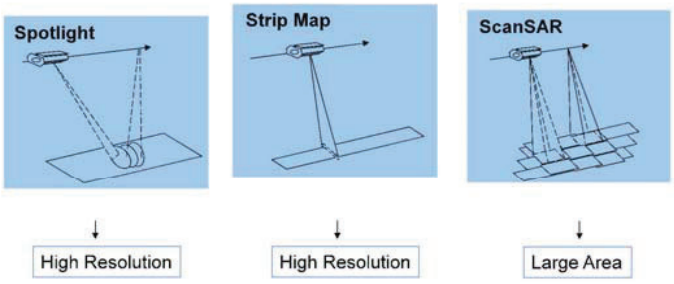
TerraSAR-X (Commercial Satellite)



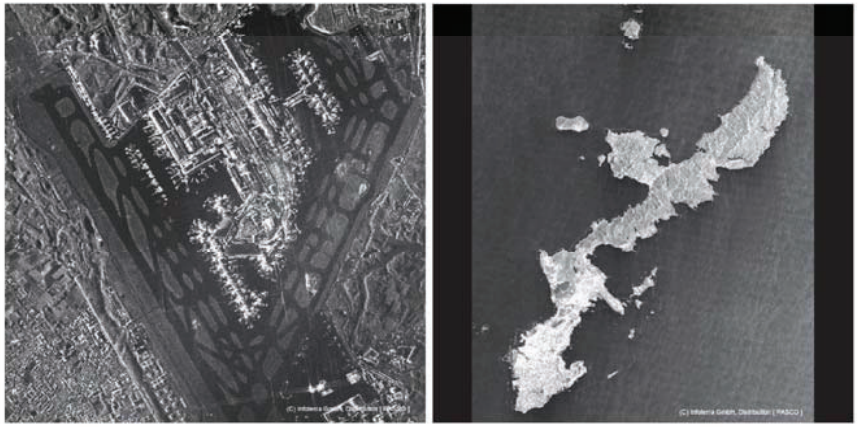


Sensor	Active Phased Array X Band SAR
Satellite Mass	1,230kg
Antenna Size	4.8m × 0.7m × 0.15m
Orbit	Sun Synchronous Sub-Recurrent
Recurrent Period	11 days
Orbit Altitude	514km
Angle of inclination with respect to the equator	97.44°
Equatorial Crossing Time (Local Time)	06:00±0.25h (Descending) 18:00±0.25h (Ascending)

Three Acquisition mode of TerraSAR-X



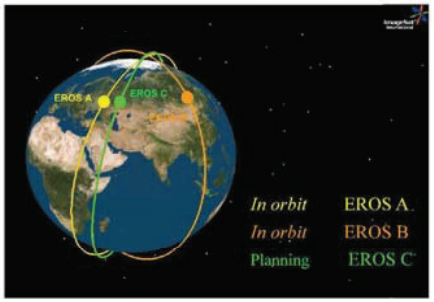
TerraSAR-X (Commercial Satellite)



Sub-Meter Commercial Satellite EROS-A&B

EROS-A

2000～
ImageSat International
Designed Life Time 10years
Overflight AM9:45 (EROS-A)
AM13:45 (EROS-B)
over Japan
Altitude:500km
Recurrent Period : less than 7days



	EROS-A	EROS-B	EROS-C
Launch	Dec.,2000	Apr.,2006	(Designed)
Wavelength	0.50 -0.90 mm	0.50-0.90 mm	0.50-0.90 mm
Ground Resolution	1.9 m	0.7 m	0.7 m 2.8 m (Multi-mode)
Swath	14 km	7 km	–

Sub-Meter Commercial Satellite EROS-A&B

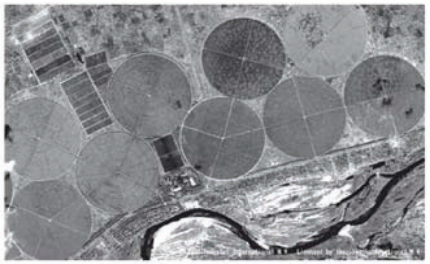
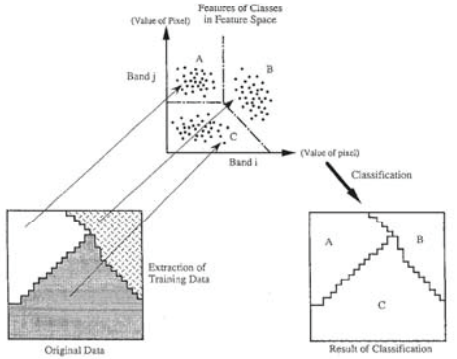


Image processing for classification

What is image classification?



In many cases, classification will be undertaken using a computer, with the use of mathematical classification techniques.

This Figure shows the concept of classification of remotely sensed data.

Methodology of classification processing

Pixel based classification **Object based classification**

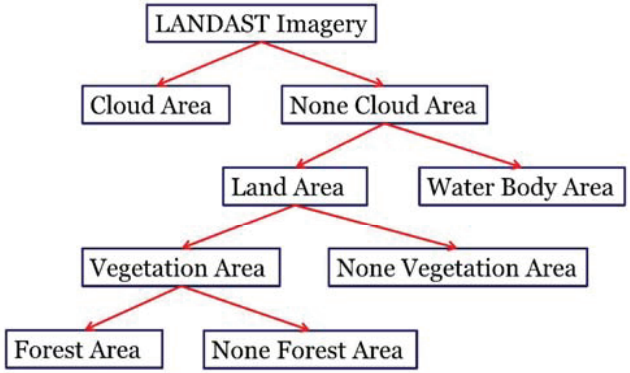
Typical methodology of classification processing

- Multi level slice classifier
- Decision tree classifier
- Minimum distance classifier
- Maximum likelihood classifier
  - Supervised, unsupervised, clustering

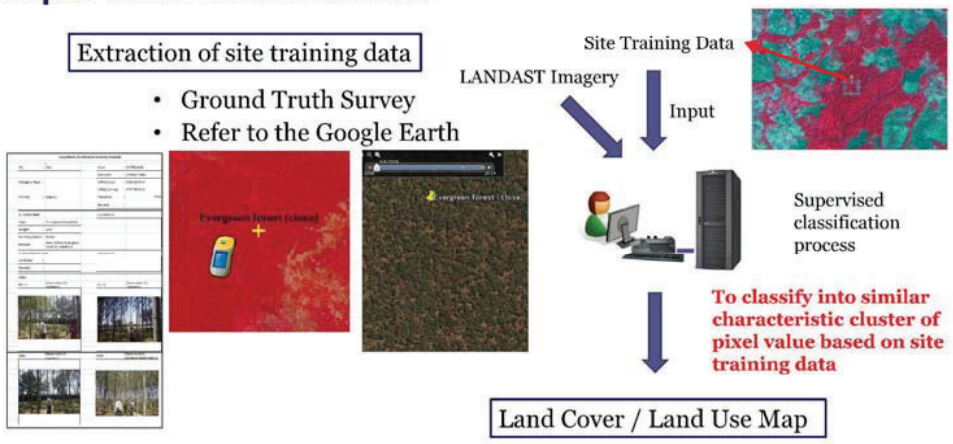
Other methodology of classification processing

- Fuzzy theory
- Expert system
- Neural Network i.e. AI

Decision Tree classifier



Supervised classification



Example as application of Satellite Remote Sensing

Extraction of logging area by image processing

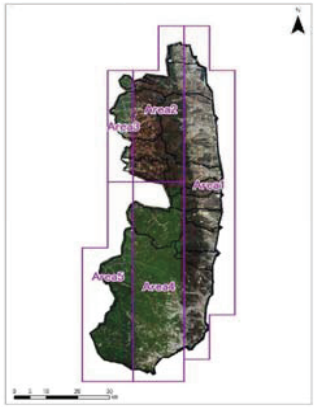
Satellite Imagery

NDVI calculation

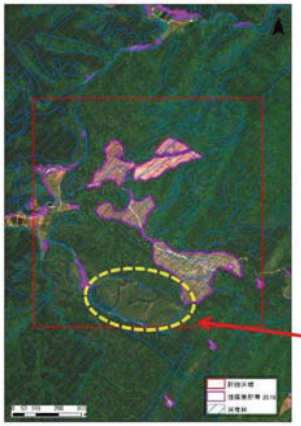
Setting threshold of NDVI

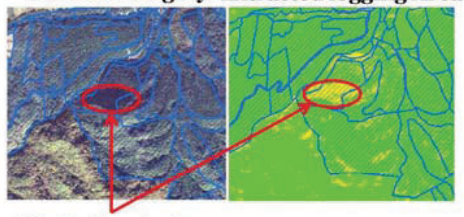
Extraction of logging area

$$\text{NDVI} = \frac{NIR - R}{NIR + R}$$



Extraction of logging area by image processing

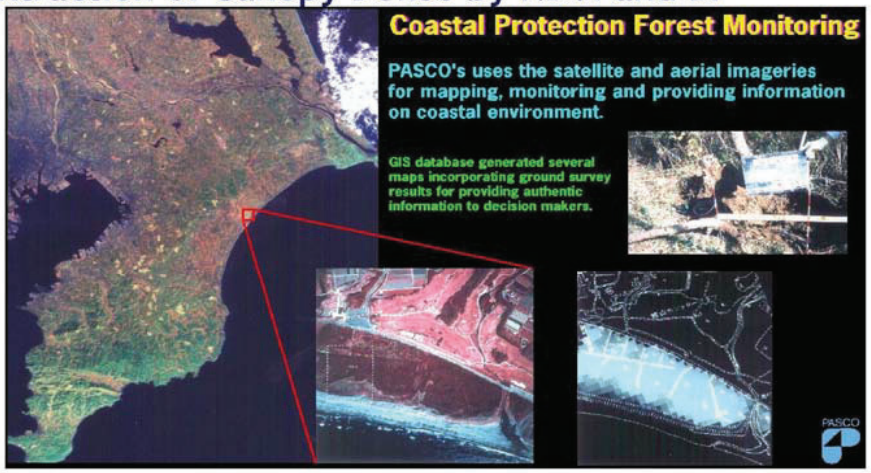




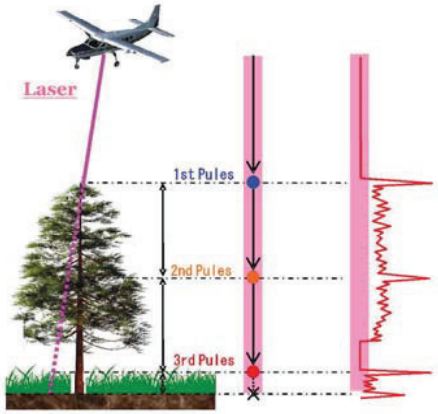
Affected by shadow

Affected by grass after logging

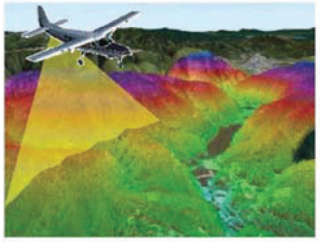
Extraction of Canopy Dense by NDVI and BI



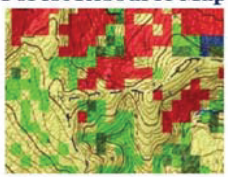
Analysis of Airborne Lidar survey for canopy density

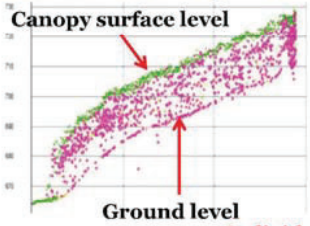


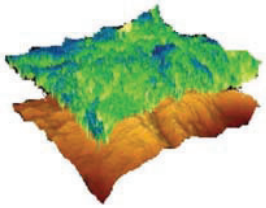
Analysis of Airborne Lidar survey for canopy density



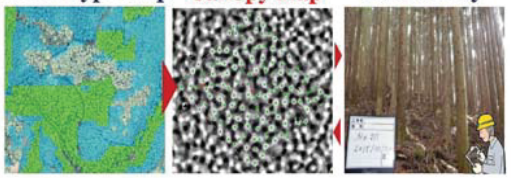
Forest Resource Map



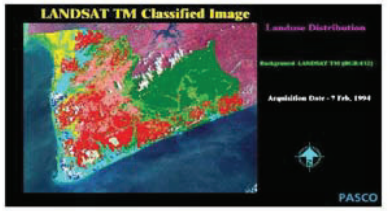


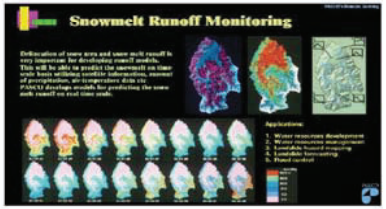


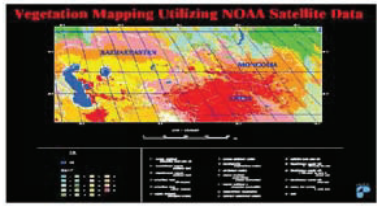
Forest Type Map | Individual Canopy Map | Site Survey



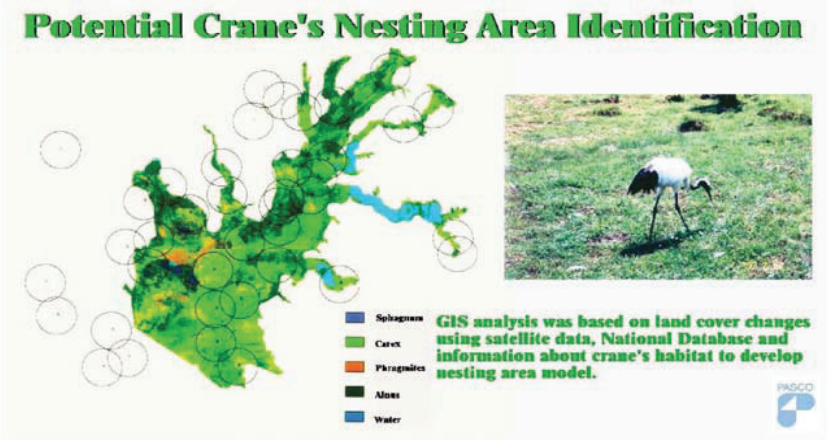
Example of other application



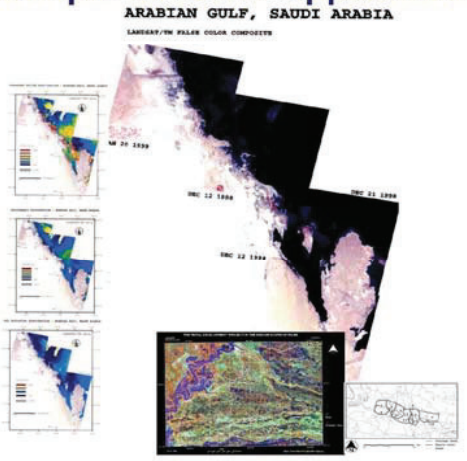


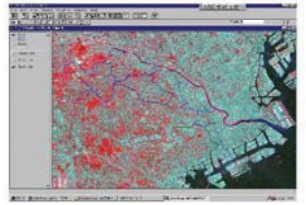


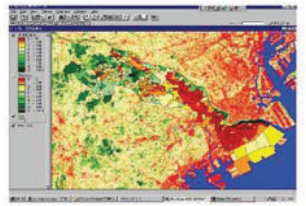
Example of other application



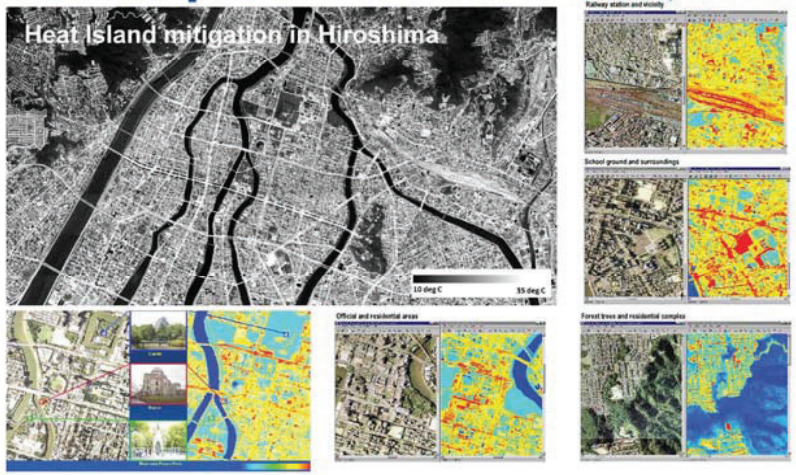
Example of other application



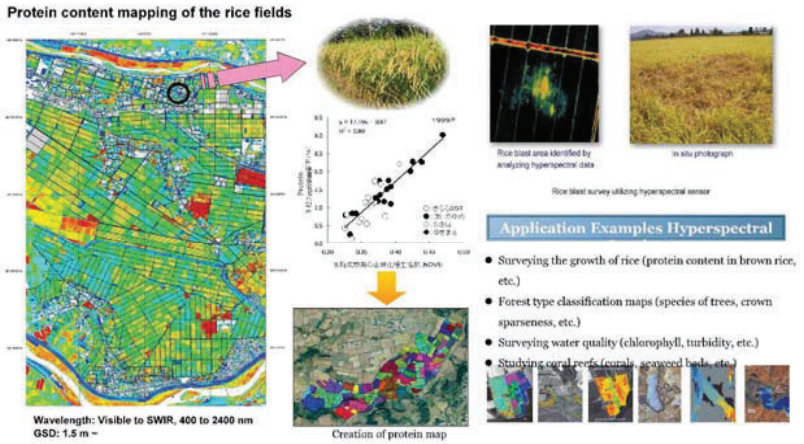




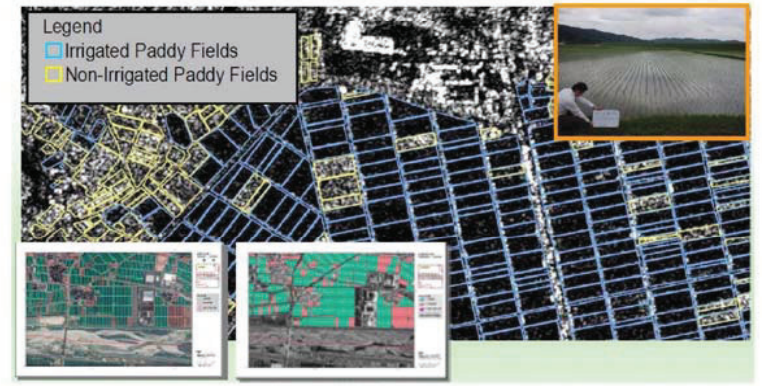
Surface Temperature Measurement (Thermal Mapping)



Hyperspectral Sensing



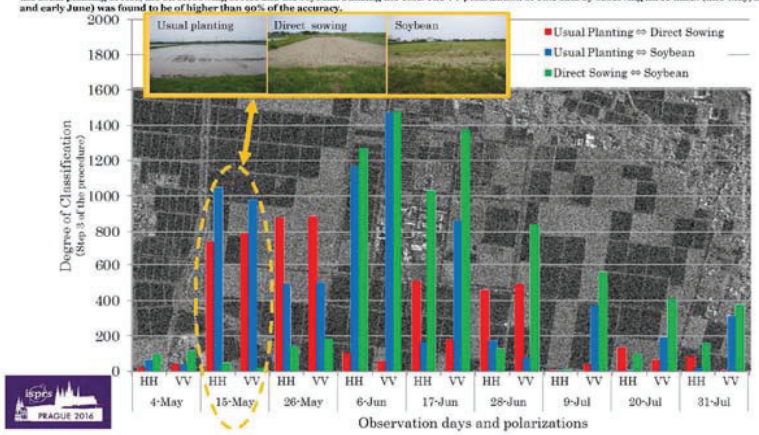
Agriculture Monitoring



The data were created for the project of the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan.
Project: "Name: Feasibility Study for Wet Paddy Fields using satellite data".

SAR Data Observation Time for the Classification of Planting Condition of Paddy Fields

The study was conducted to determine quantitatively the observation time of the paddy fields' planting conditions using space-borne SAR. We were able to classify the usual planting of rice, the direct sowing of rice and the soybean utilizing the TSX. The VV polarization of TSX data by observing three times (mid-May, late May and early June) was found to be of higher than 90% of the accuracy.

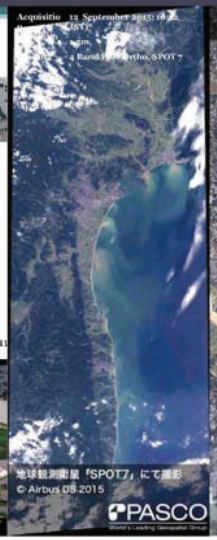


Flooding

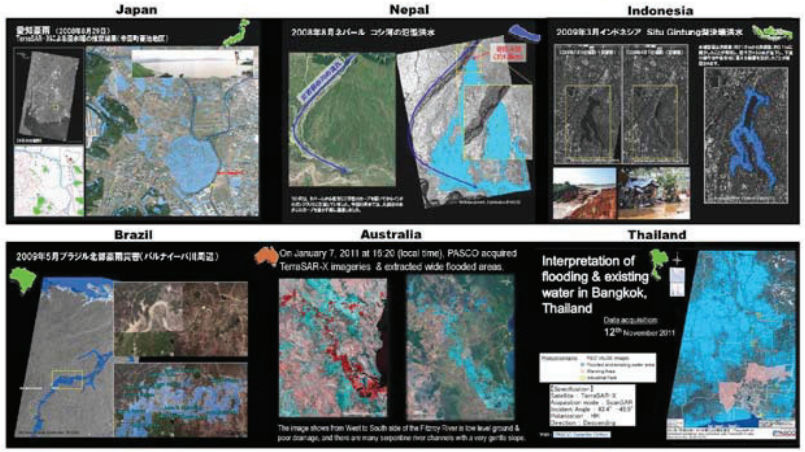
Tropical Storm Etau caused disastrous flooding north of Tokyo, due to heavy rain on September 11, 2015.

Images captured by Heliborne PALS and SPOT 6 and SPOT 7 Satellites.

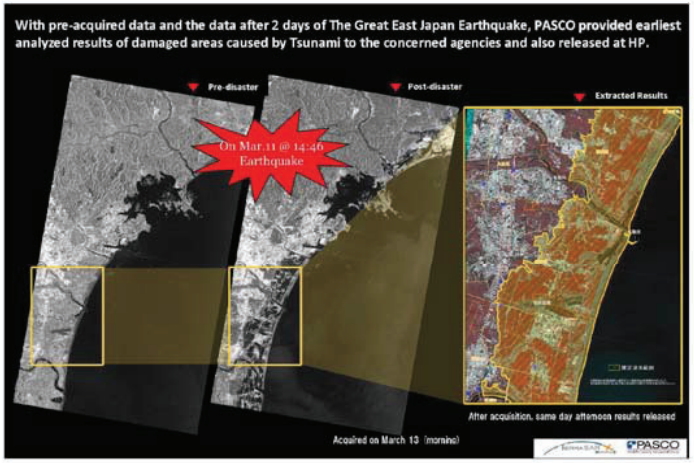
http://www.pasco.co.jp/disaster_info/150911



Flood Monitoring

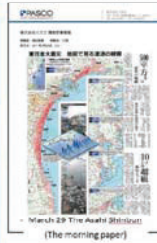


Rapid Mapping for the Flooded Areas by Tsunami

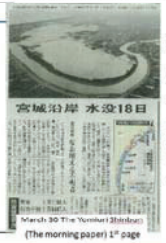


Disaster monitoring utilizing multi-temporal images

Several TV news and Newspapers reported PASCO's effort

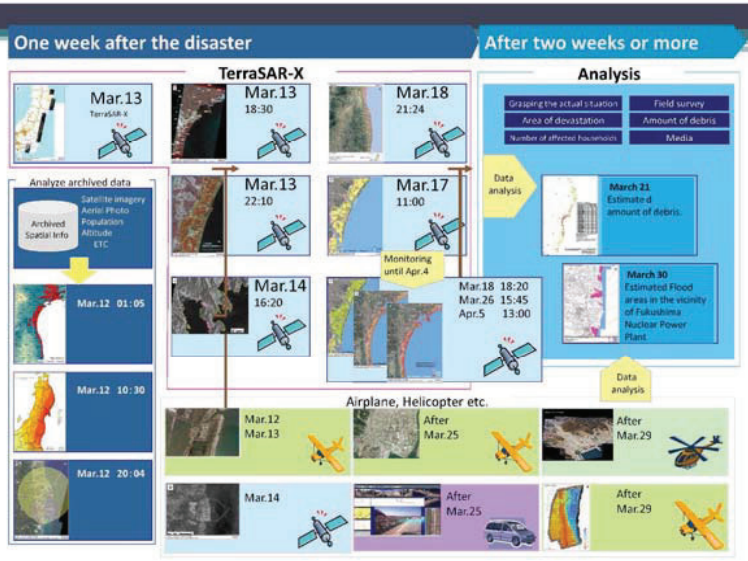


(The morning paper)



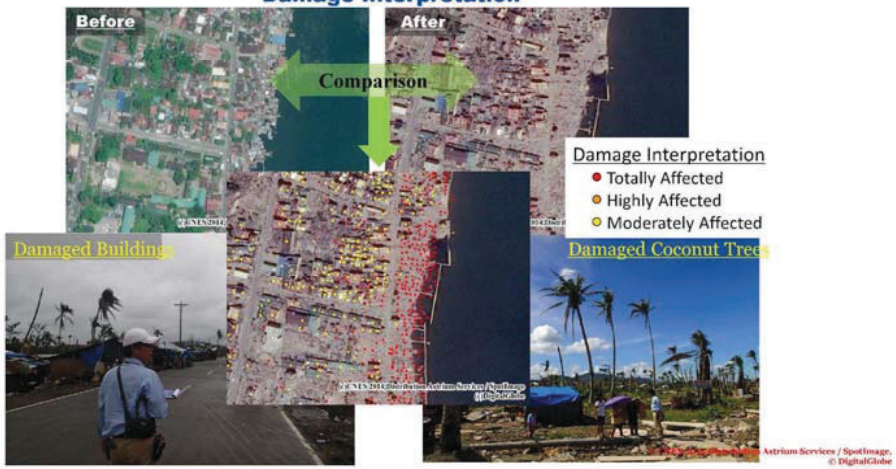
(The morning paper) 1st page

- Japan Broadcasting Network morning news
- Japan Broadcasting Network evening news
- Asahi Broadcasting Corporation
- Nikkei, Inc.
- Nillei BP Marketing, Inc.
- GISNEXT
- ***etc.



Damages caused by Typhoon Haiyan, in the Philippines

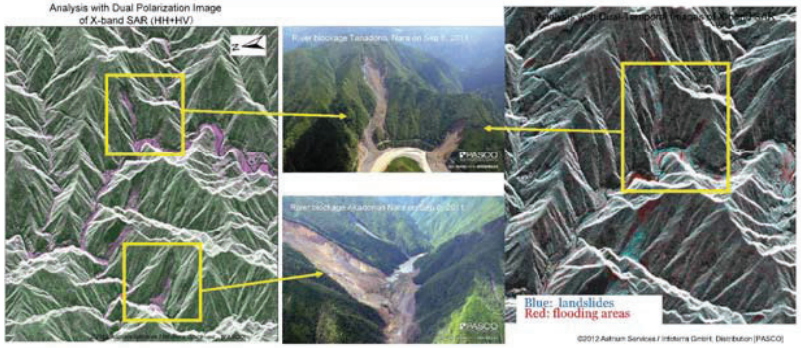
Damage Interpretation



Landslide monitoring

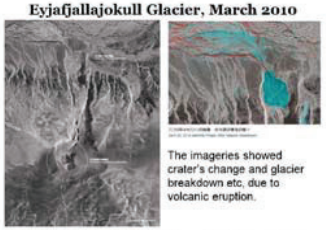
Landslides caused by Typhoon Talas in 2011 were initially found by satellite data.

Sep. 5		SAR data acquisition request from MLIT
Sep. 5	18:00~	Data acquisition and processing
Sep. 5	21:00~	Extraction of possible landslides
Sep. 6	01:00	Analyzed data provision to MLIT
Sep. 6	10:00~	Helicopter survey and visual identification of landslides and river blockages
Sep. 8		Evacuation order to local residents



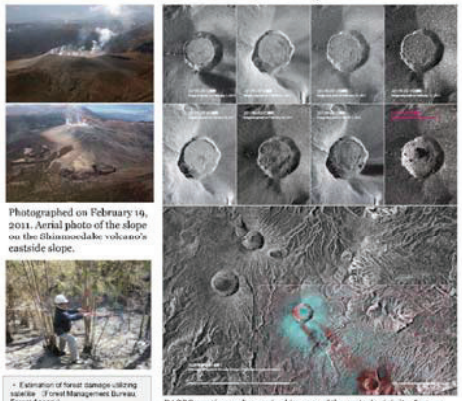
Volcano Monitoring

Eyjafjallajokull Glacier, March 2010



The imageries showed crater's change and glacier breakdown etc. due to volcanic eruption.

Shinmoedake Volcano, January 2011



Photographed on February 19, 2011. Aerial photo of the slope on the Shinmoedake volcano's eastside slope.

Merapi Volcanic Eruption, October 2010

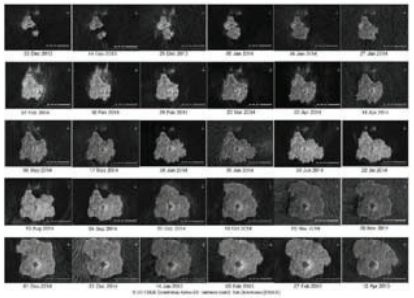
On October 26, 2010, Mt. Merapi in Central Java erupted for the first time in 5 years. On October 27, 2010 & November 7, PASCO acquired TerraSAR-X images & extracted the topographical changes in a series of volcanic activities. This is monitored data of topographic changes in a series of volcanic activities by utilizing SAR images.

- Estimation of forest damage utilizing satellite (Forest Management Bureau, Forest Agency)
- Volcano Monitoring (National Research Institute for Earth Science and Disaster Prevention [NIED])

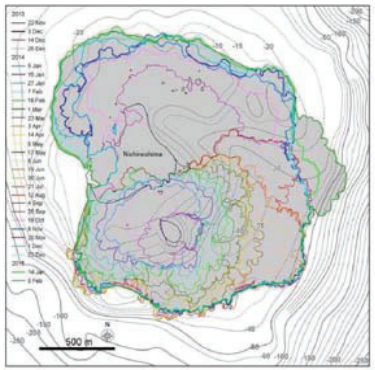
PASCO continuously acquired images of the crater's vicinity. Images clearly showed the interior of the volcanic crater even during rising smoke & to record growth of the lava dome.

Monitoring Volcanic Activity of the Nishinoshima Island from Spaceborne SAR

Tadashi Sasagawa[1] and Fukashi Maeno[2]
[1]PASCO CORPORATION, Tokyo
[2]Earthquake Research Institute, The University of Tokyo, Tokyo



PASCO is performing time-series monitoring utilizing spaceborne sensors. Volcano Research Center of Earthquake Research Institute, University of Tokyo is utilizing the TerraSAR-X imageries for the detailed interpretations of the Nishinoshima Island.



Outlines of the newly formed Nishinoshima.

Field Survey

Field Survey

Why field Survey?

1. **Collect training data**
   - To train the computer to recognize the various land cover categories latent in the imagery and to assess the categorical accuracy of the resulting classification
2. **Collect data for accuracy assessment**
   - Enables a degree of confidence to be attached to the land cover products
     - *How accurate is the map?*

How to extract field data (Sample points)

Planning phase

1. **Before field work**
   - what is the overall aim or goal?
     - Implementing REDD+ readiness activities
   - what objectives do you hope to achieve?
     - Generate activity data
   - are there any maps or previous studies of your study area?
   - which surveying and sampling techniques are appropriate?
   - does the project have appropriate staff and equipment?
   - how much time (and money) will the project require?

2. Field work

- Where are your study areas located?
  - Kakamega county
- how precise are your maps?
- how should field data be collected and stored?
  - Using Field forms, GPS
- how will laptops, GPS units, etc, be powered in remote settings?

Extracting field data

Sampling

- Sampling Procedure - *Proportionate stratified random*
  - ***Proportionate*** *- a method for gathering participants for a study) used when the population is composed of several subgroups that are vastly different in number.*
    - *The number of participants from each subgroup is determined by their number relative to the entire population.*
    - *Area covered by each land cover type*
  - ***Stratified*** *- Category type*
  - ***Random*** *- each sample has an equal probability of being chosen*

Training for Land Cover / Land Use Map 2020

on

The REDD+ Readiness Component

in

the Capacity Development Project for the Sustainable Forest Management in the Republic of Kenya

By Faith MUTWIRI, Kei SATO, Sahori FUJIMURA

2017.9.28

Today's Agenda

1. How to select the image & Download
2. How to prepare image for classification
3. Cloud and Shadow cover masking

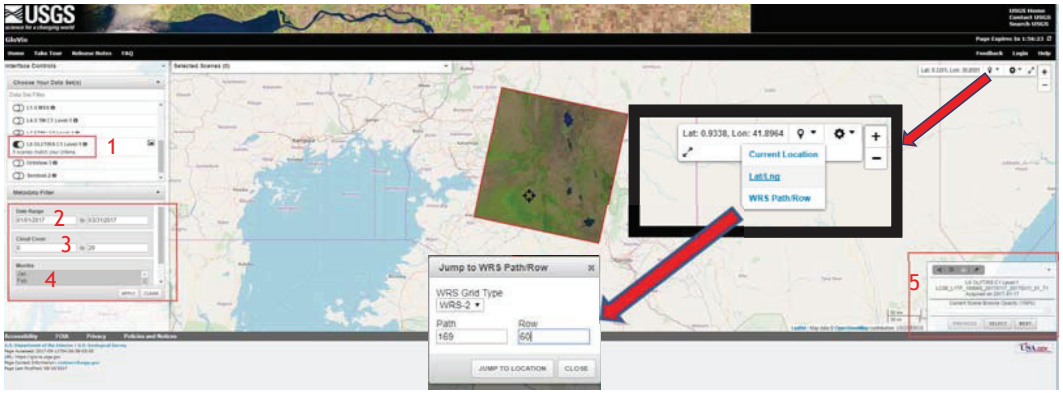
How to select the image & Download

Data Selection

Note: These archives were accessed at (http://glovis.usgs.gov/ or http://earthexplorer.usgs.gov/).

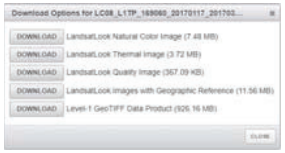
Data Selection

1. Sensor
2. Date
3. Cloud cover
4. Months (dry season)
5. Path and Row
6. Best image



Data Download

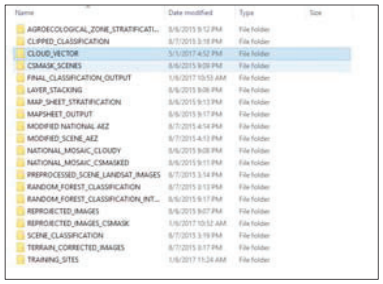
1. To download you must be registered
   - *Log in using your username*
2. Downloaded image is in *TIFF* and *Zipped*
   - *Unzip the files*



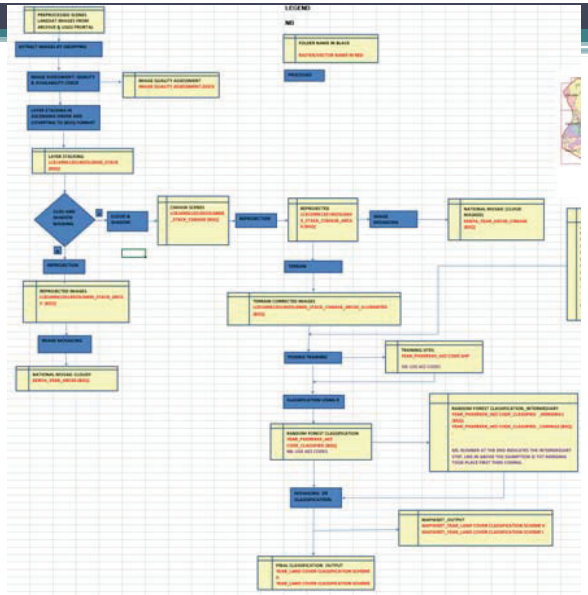
How to prepare image for classification

Folder Arrangements

- C or D:/ Working Folder/……..

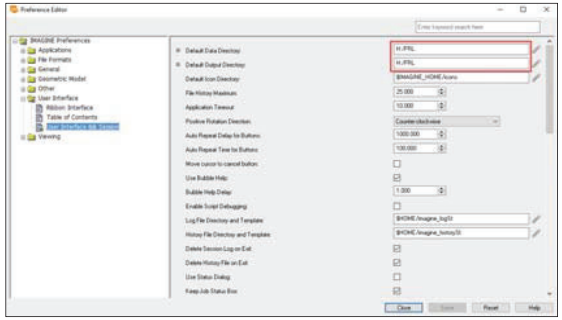


Naming Standards



Using Erdas Imagine

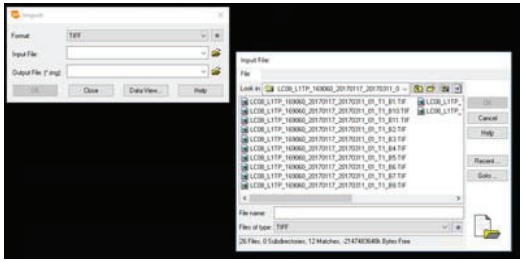
1. Open Erdas imagine
2. Set working directory
   - *File -> Preference*



Using Erdas Imagine

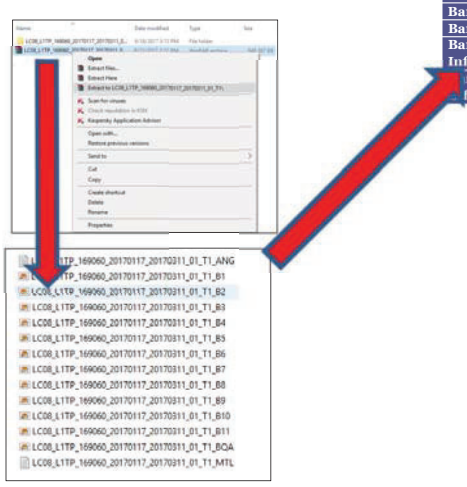
Importing Data

Manage data -> Import data



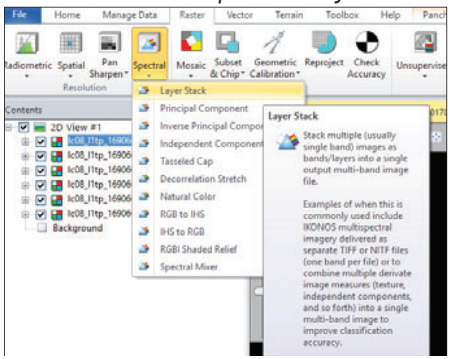
Data extraction and layerstacking

1. *Right click on the data and Extract*

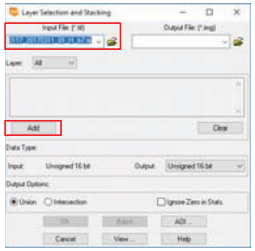


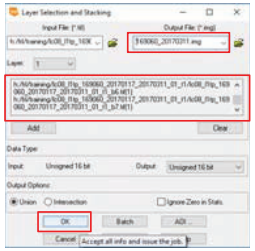
Band (LS8)	Wave length (LS8)	Band (LS4,5 & 7)	Wave length (LS4, 5 &7)
Band 2 – blue	0.45 - 0.51	Band 1 - blue	0.45 - 0.52
Band 3 - green	0.53 - 0.59	Band 2 - green	0.52 - 0.60
Band 4 - red	0.64 - 0.67	Band 3 - red	0.63 - 0.69
Band 5 - Near Infrared	0.85-0.88	Band 4 - Near Infrared	0.77 - 0.90
Band 6 - Short-wave Infrared	1.57 - 1.65	Band 5 - Short-wave Infrared	1.55 - 1.75
nd 7 - Short-wave frared	2.11 - 2.29	Band 7 - Short-wave Infrared	2.09 - 2.35

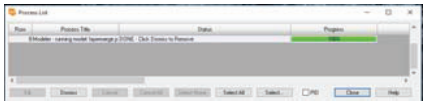
2. *Raster-> Spectral ->layerstack*



Data extraction and layer stacking





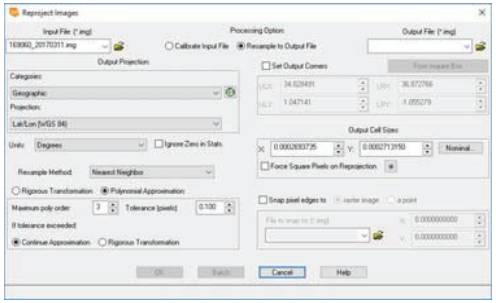


1. Layer stack all the relevant bands
2. Save using the name of the image and the year of acquisition
3. Wait until the processing is over
4. Output image is false colour image

Reprojection to the Kenyan Coordinate System

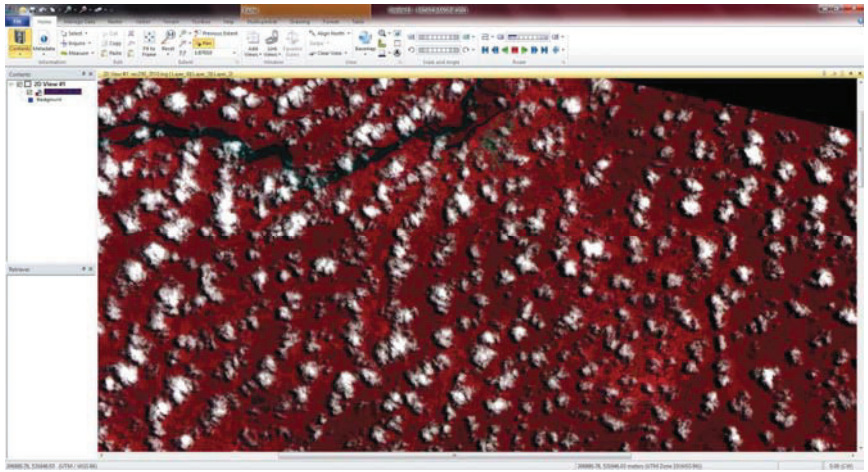
Kenya national mapping agency : UTM, spheroid: - Clarke 1880 and Datum: - Arc1960

Raster-> Reproject

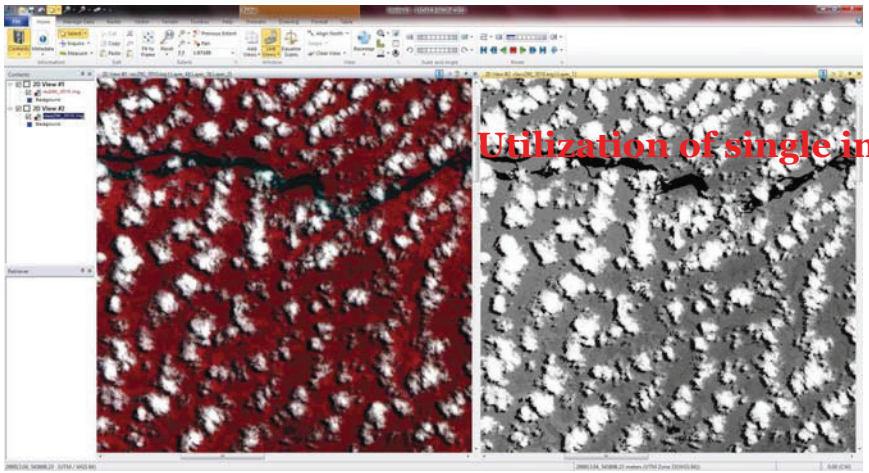


Cloud and Shadow cover masking

How to mask the image (1)



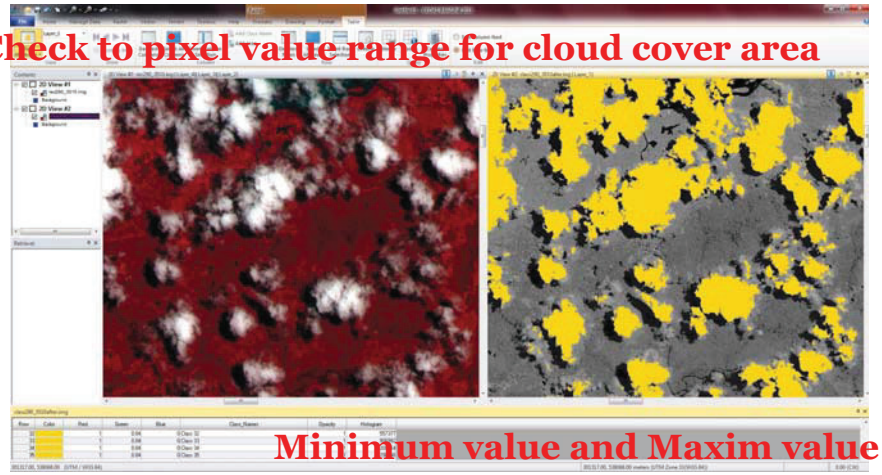
How to mask the image (2)



Utilization of single image

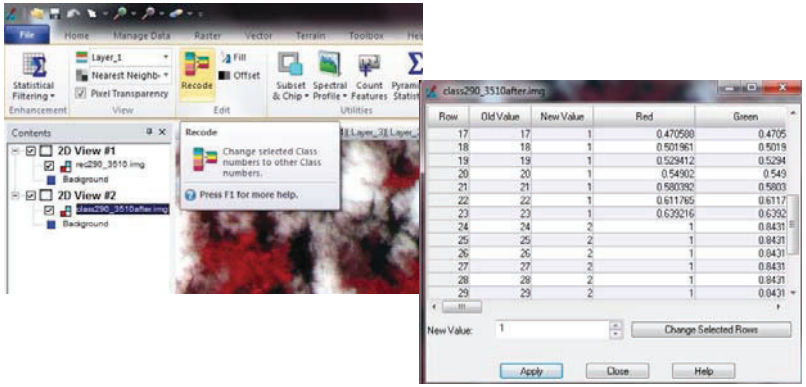
How to mask the image (3)

Check to pixel value range for cloud cover area



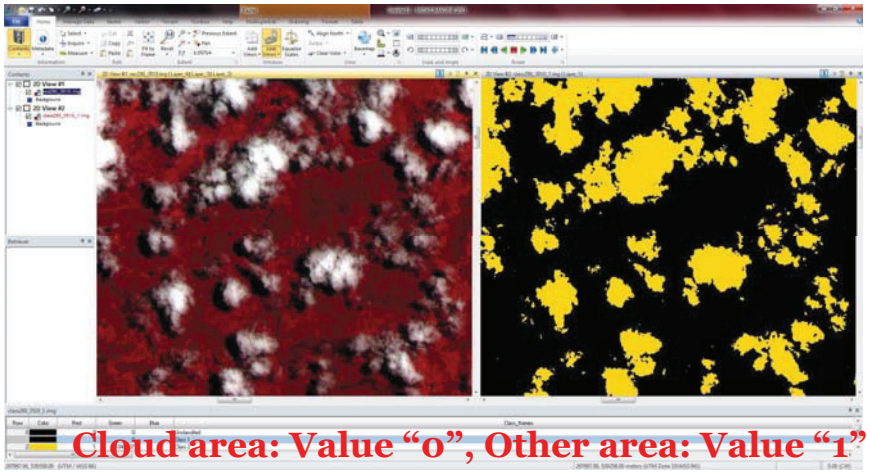
Minimum value and Maxim value

How to mask the image (4)



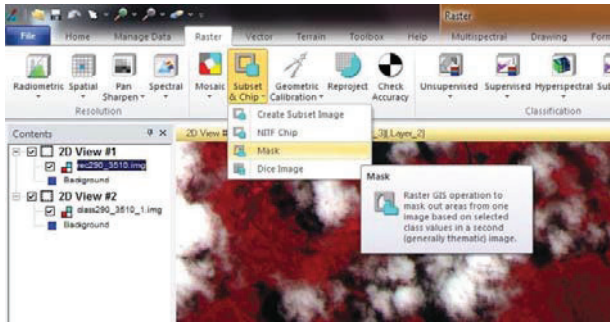
To prepare the mask image by Recode function

How to mask the image (5)

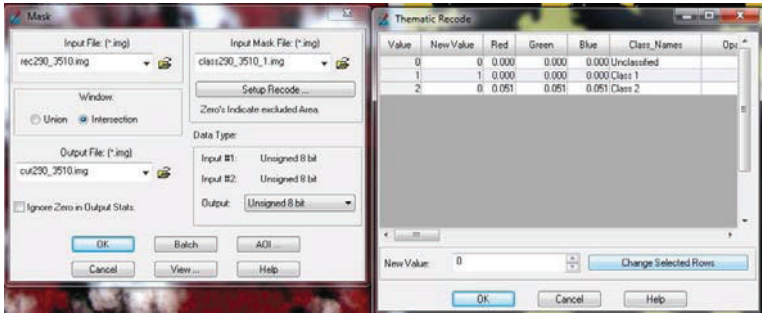


Cloud area: Value “0”, Other area: Value “1”

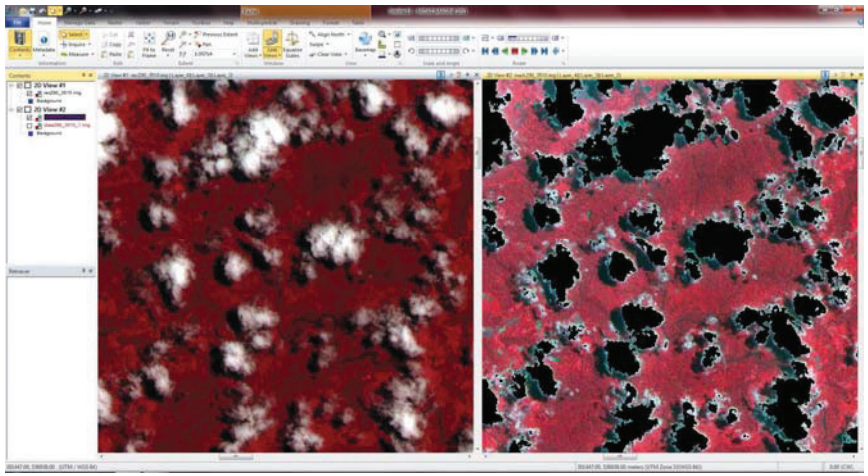
How to mask the image (6)



How to mask the image (7)



How to mask the image (8)



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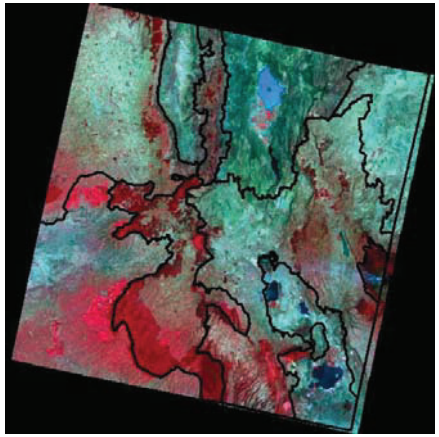
2017.9.29

Today's Agenda

1. Agro-Ecological zoning
2. Extraction of site training data
3. R Script for supervised classification

Agro-Ecological zoning

Agro-Ecological zoning with Landsat Image



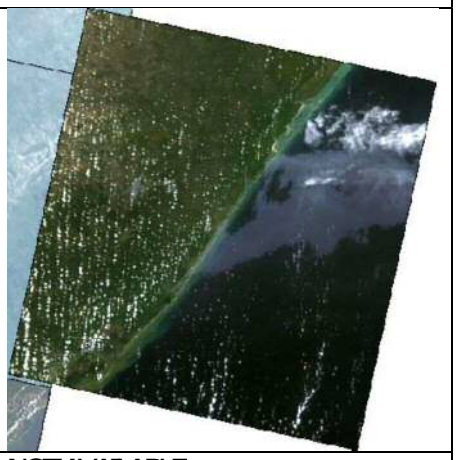
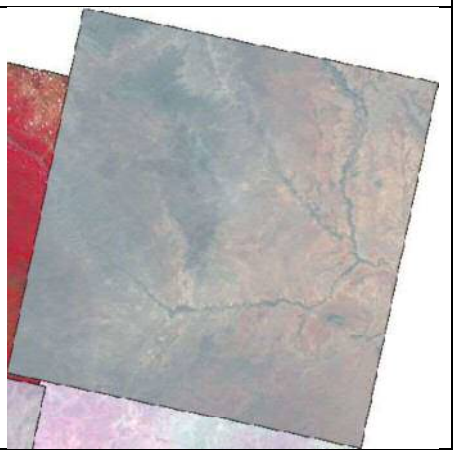
- **Avoid any miss-classification**
- **Different class, but same characteristic pixel value balance (as same pattern)**
- **Classification type is mixed land cover and use type**
- **Ex) Open grassland & Annual crop**

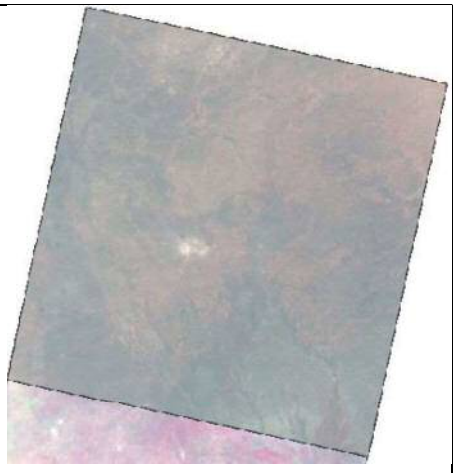
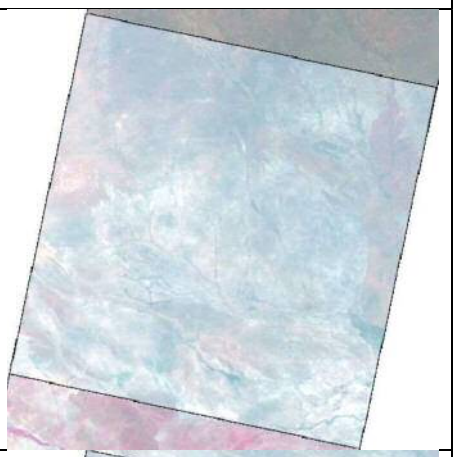
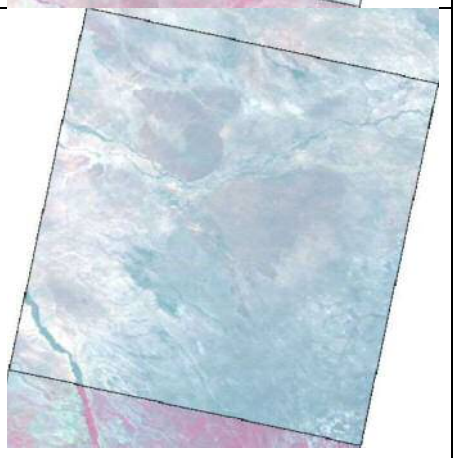
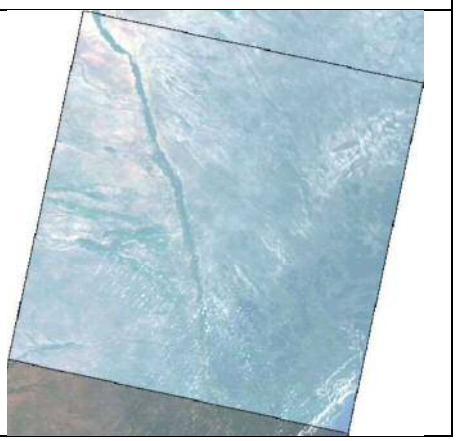
Extraction of site training data

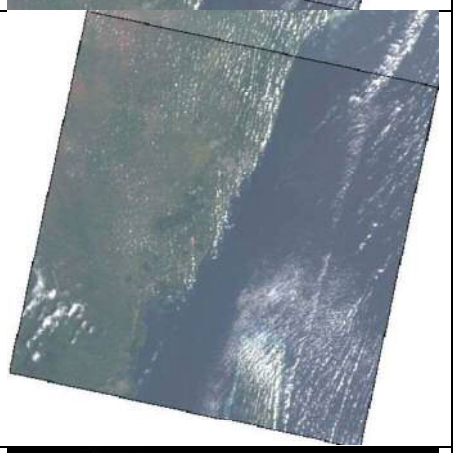
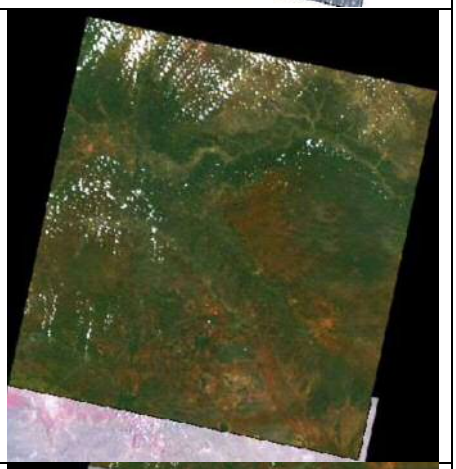
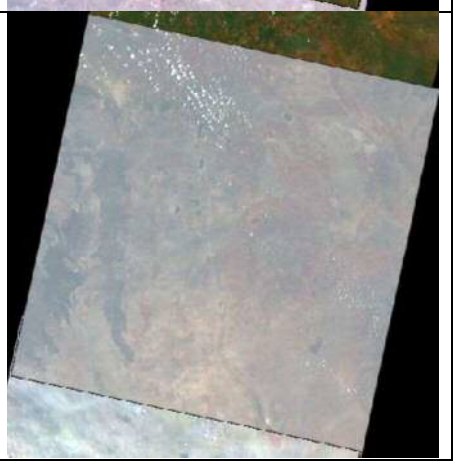
IMAGE QUALITY ASSESSMENT REPORT 2020

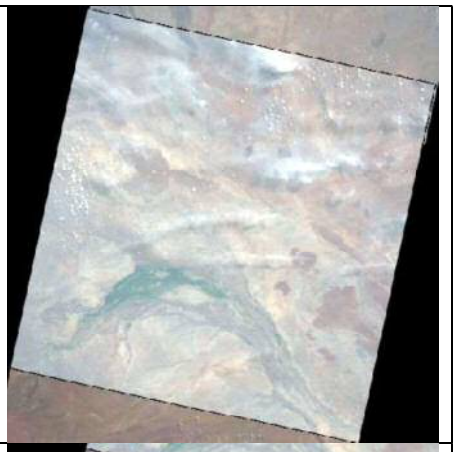
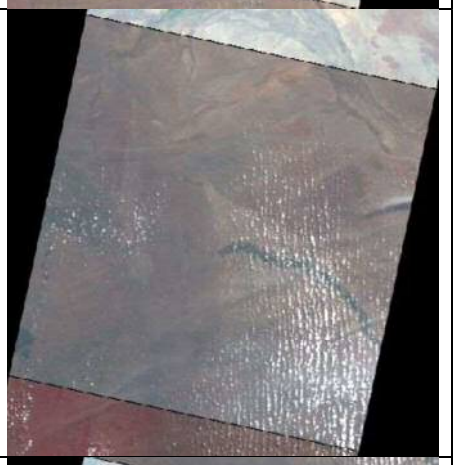
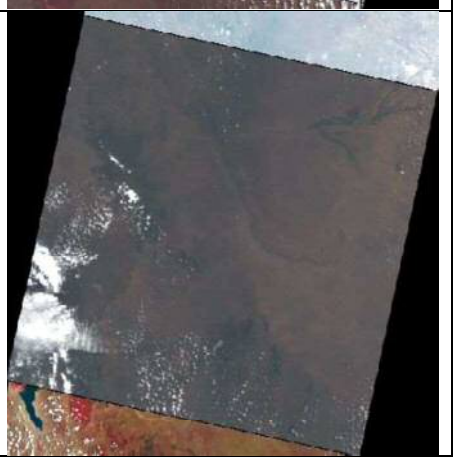
An assessment was done on the availability and quality of the images in the USGS server before downloading. The following criterion was used:

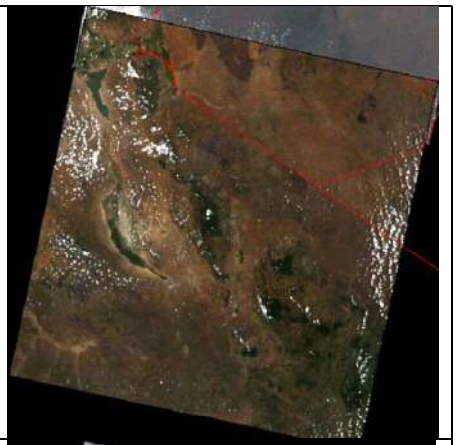
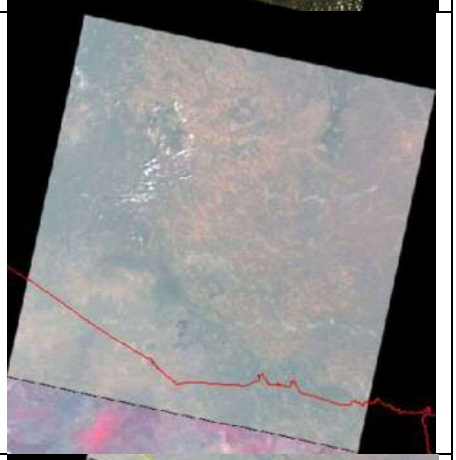
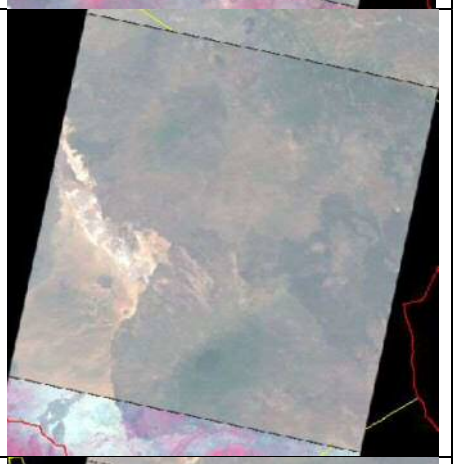
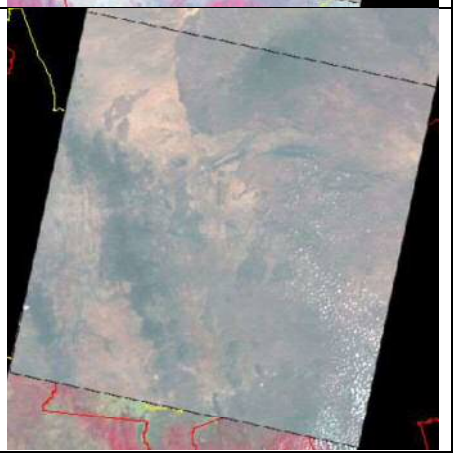
- Checking on the availability of each scene within the study area.
- Assessing the quality of images considering images without cloud cover or with cloud cover less than 20% and giving priority to the dry seasons (Jan-Feb and July-Aug).
- Availability of images was extended to march 2021 due to extension of the rainy season through early 2020.
- All images are from Landsat 8
- Documentation of good images that were available on the server was then done as follows:
- Images are from between Jan and Oct 2020 (1st selection of 2020 images)

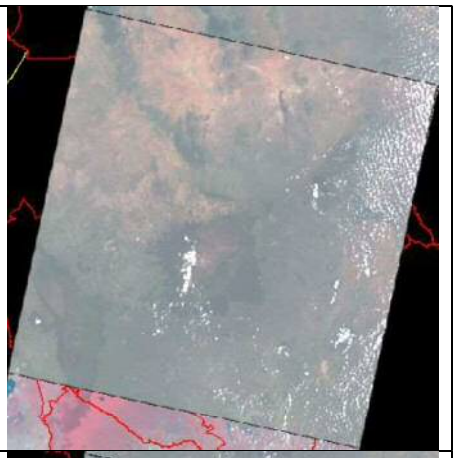
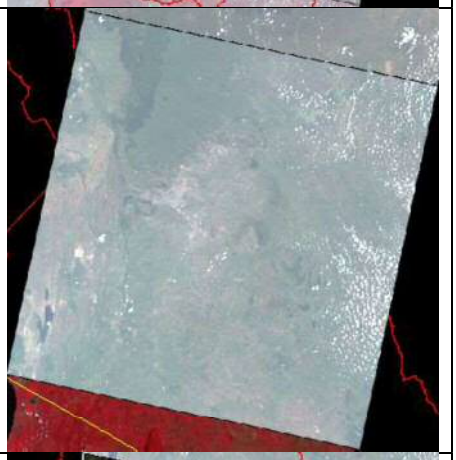
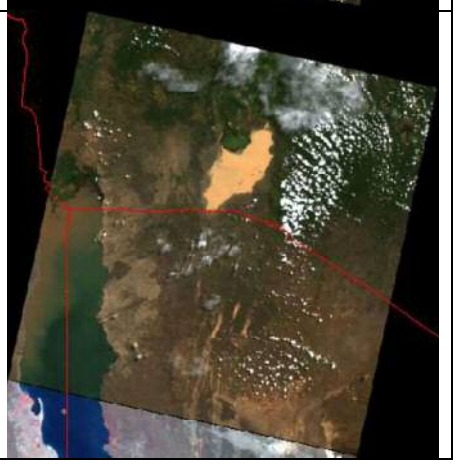
ID/Path-Row	Season	Description	Screen Shot
LC08_L1TP_165061_20200724		CLOUD_COVER = CLOUD_COVER_LAND =	
lc08_l1tp_165062_		CLOUD_COVER = CLOUD_COVER_LAND =	NOT AVAILABLE
LC08_L1TP_166057_20210328		CLOUD_COVER = CLOUD_COVER_LAND =	

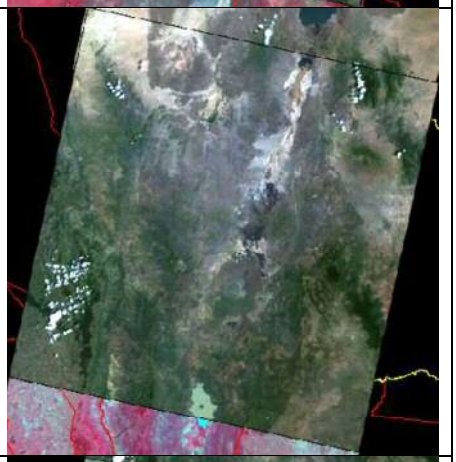
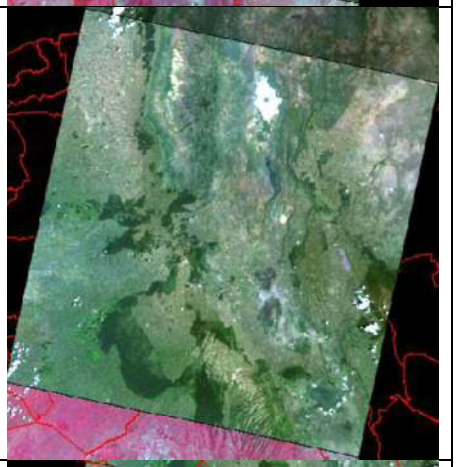
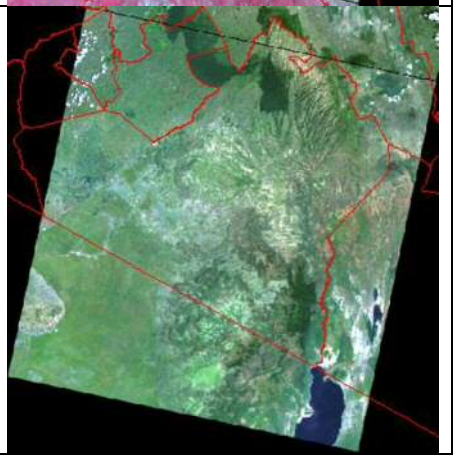
LC08_L1TP_166058_20210328		CLOUD_COVER = CLOUD_COVER_LAND =	
LC08_L1TP_166059_20200121		CLOUD_COVER =0.00 CLOUD_COVER_LAND =0.00	
LC08_L1TP_166060_20200121		CLOUD_COVER =0.00 CLOUD_COVER_LAND =0.00	
LC08_L1TP_166061_20200121		CLOUD_COVER =0.62 CLOUD_COVER_LAND =0.59	

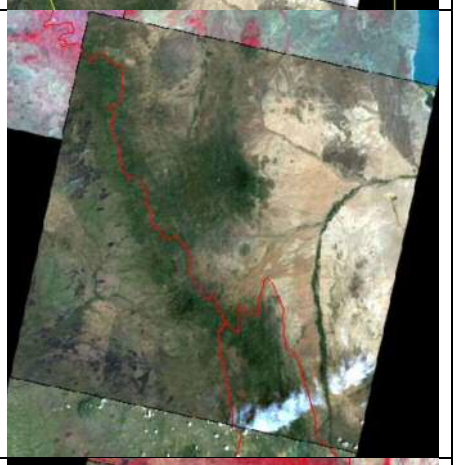
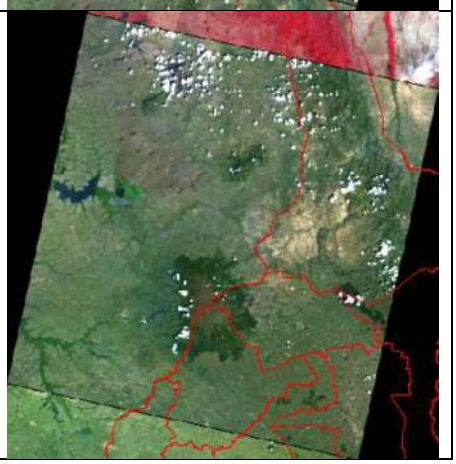
LC08_L1TP_166062_20200121		CLOUD_COVER=6.83 CLOUD_COVER_LAND=3.62	
LC08_L1TP_166063_20200121		CLOUD_COVER= CLOUD_COVER_LAND=	
LC08_L1TP_167057_20200519		CLOUD_COVER= CLOUD_COVER_LAND=	
LC08_L1TP_167058_20200229		CLOUD_COVER=0.46 CLOUD_COVER_LAND=0.46	

LC08_L1TP_167059_20200229		CLOUD_COVER=6.11 CLOUD_COVER_LAND=6.11	
LC08_L1TP_167060_20200706		CLOUD_COVER=10.77 CLOUD_COVER_LAND=10.77	
LC08_L1TP_167061_20200620		CLOUD_COVER=0.83 CLOUD_COVER_LAND=0.83	
LC08_L1TP_167062_20200620		CLOUD_COVER=13.69 CLOUD_COVER_LAND=13.69	

LC08_L1TP_168057_20200119		CLOUD_COVER=2.92 CLOUD_COVER_LAND=2.92	
LC08_L1TP_168057_20200119		CLOUD_COVER=0.27 CLOUD_COVER_LAND=0.27	
LC08_L1TP_168058_20210206		CLOUD_COVER= CLOUD_COVER_LAND=	
LC08_L1TP_168059_20200119		CLOUD_COVER=0.87 CLOUD_COVER_LAND=0.87	

LC08_L1TP_168060_20200220		CLOUD_COVER=2.18 CLOUD_COVER_LAND=2.18	
LC08_L1TP_168061_20200220		CLOUD_COVER=1.30 CLOUD_COVER_LAND=1.30	
LC08_L1TP_168062_20200220		CLOUD_COVER= CLOUD_COVER_LAND=	
LC08_L1TP_169057_20200602		CLOUD_COVER=0.00 CLOUD_COVER_LAND=0.00	

LC08_L1TP_169058_20200602		CLOUD_COVER= CLOUD_COVER_LAND=	
LC08_L1TP_169059_20200211		CLOUD_COVER= CLOUD_COVER_LAND=	
LC08_L1TP_169060_20200211		CLOUD_COVER= CLOUD_COVER_LAND=	
LC08_L1TP_169061_20200211		CLOUD_COVER= CLOUD_COVER_LAND=	

lc08_l1tp_170056_20210204		CLOUD_COVER=0.98 CLOUD_COVER_LAND=0.98	
lc08_l1tp_170057_20210204		CLOUD_COVER=0.00 CLOUD_COVER_LAND=0.00	
LC08_L1TP_170058_20200117		CLOUD_COVER=0.00 CLOUD_COVER_LAND=0.00	
LC08_L1TP_170059_20200101		CLOUD_COVER= CLOUD_COVER_LAND=	

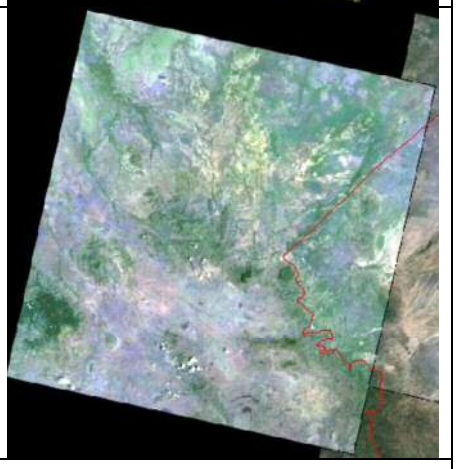
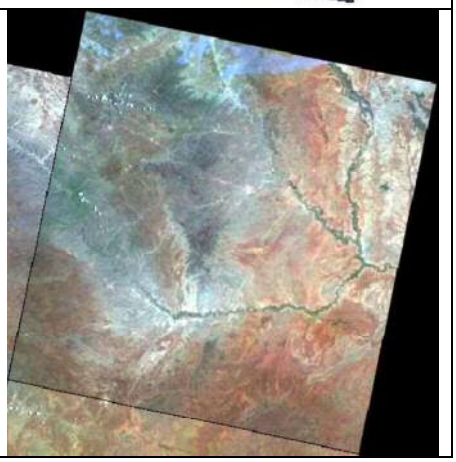
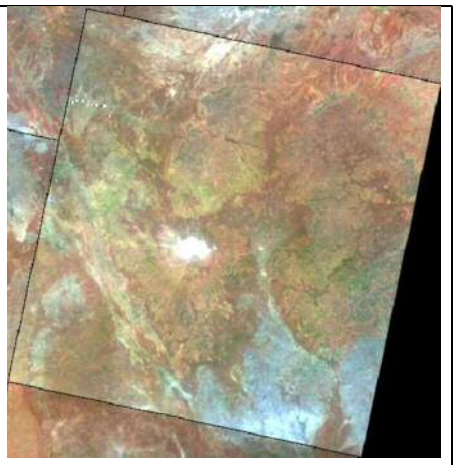
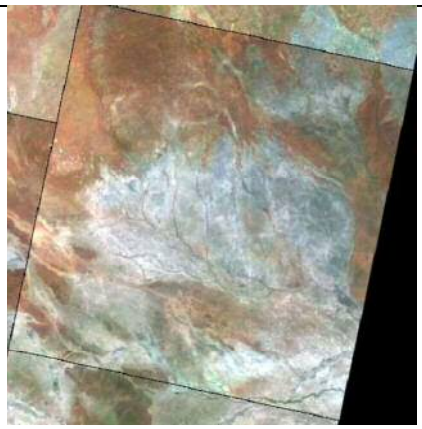
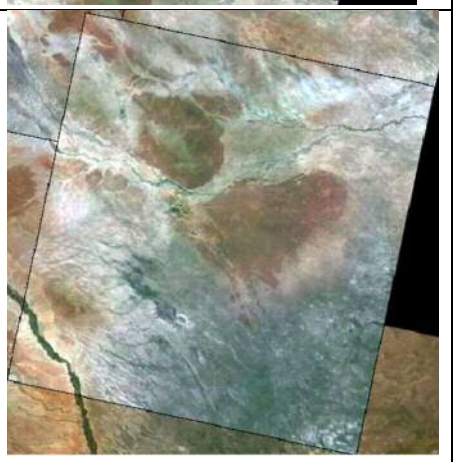
LC08_L1TP_170060_20200101		CLOUD_COVER = CLOUD_COVER_LAND =	
LC08_L1TP_170061_20200218		CLOUD_COVER = CLOUD_COVER_LAND =	
LC08_L1TP_171057_20200209		CLOUD_COVER =1.21 CLOUD_COVER_LAND =1.21	
		Note: Cloud cover information not available for some images	

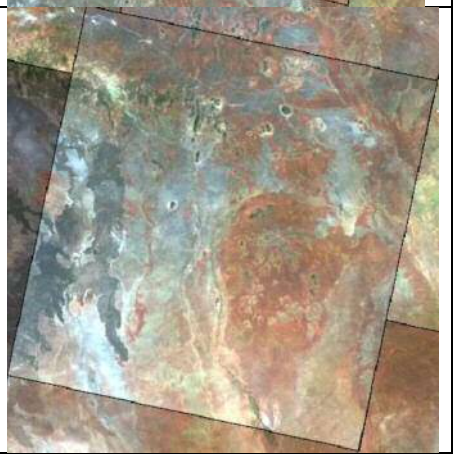
IMAGE QUALITY ASSESSMENT REPORT 2020

An assessment was done on the availability and quality of the images in the USGS server before downloading. The following criterion was used:

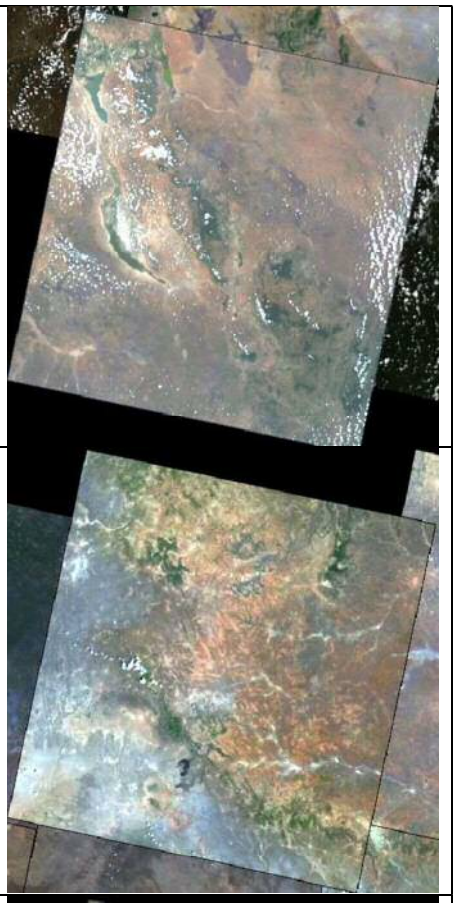
- Checking on the availability of each scene within the study area.
- Assessing the quality of images considering images without cloud cover or with cloud cover less than 20% and giving priority to the dry seasons (Jan-Feb and July-Aug).
- Availability of images was extended to march 2021 due to extension of the rainy season through early 2020.
- All images are from landsat 8
- Documentation of good images that were available on the server was then done as follows:
- Images are from between Oct 2020 to March 2021 (second set to complete 2020 image selection)

ID/Path-Row	Season	Description	Screen Shot
lc08_l1tp_165061_20210305		CLOUD_COVER_LAND=1.81 CLOUD_COVER=5.17	
lc08_l1tp_165062_20210217		CLOUD_COVER=9.01 CLOUD_COVER_LAND=5.30	
LC08_L1TP_166057_20210328		CLOUD_COVER=0.07 CLOUD_COVER_LAND=0.07	

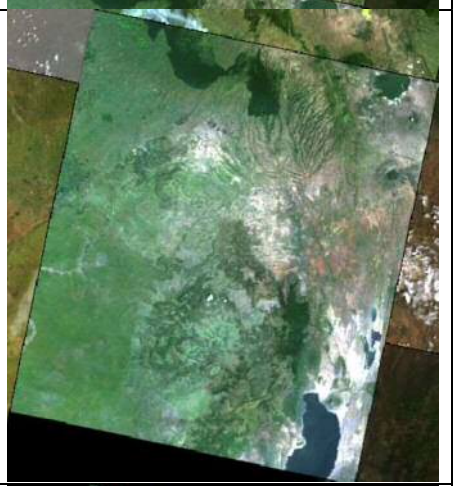
LC08_L1TP_166058_20210328		CLOUD_COVER=0.01 CLOUD_COVER_LAND=0.01	
LC08_L1TP_166059_20210107		CLOUD_COVER=0.00 CLOUD_COVER_LAND=0.00	
LC08_L1TP_166060_20210107		CLOUD_COVER=0.00 CLOUD_COVER_LAND=0.00	
LC08_L1TP_166061_20210107		CLOUD_COVER=1.96 CLOUD_COVER_LAND=1.90	

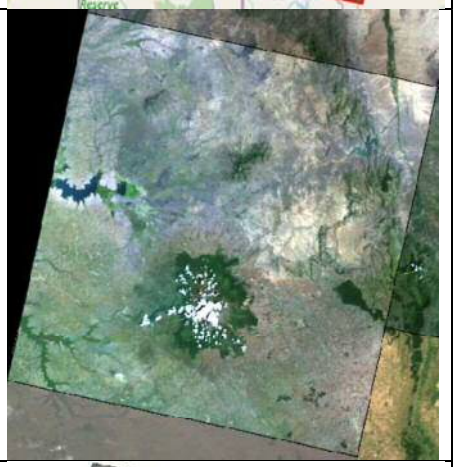
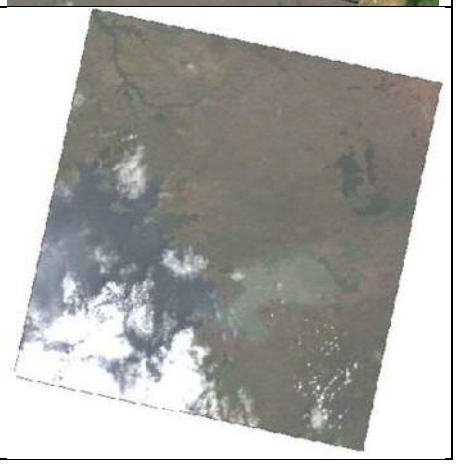
LC08_L1TP_166062_20210328		CLOUD_COVER=19.32 CLOUD_COVER_LAND=20.42	
LC08_L1TP_166063_20201206		CLOUD_COVER=18.58 CLOUD_COVER_LAND=33.34	
LC08_L1TP_167057_20210130		CLOUD_COVER=0.00 CLOUD_COVER_LAND=0.00	
LC08_L1TP_167058_20210130		CLOUD_COVER=0.00 CLOUD_COVER_LAND=0.00	

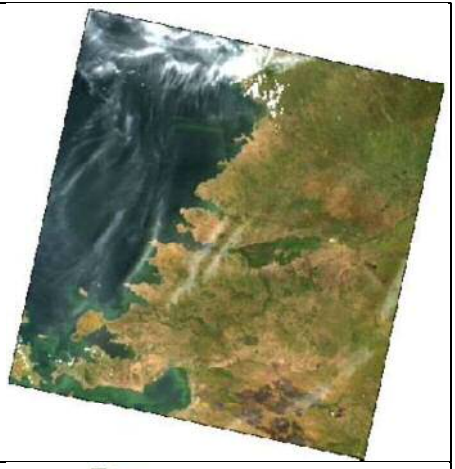
LC08_L1TP_167059_20210114		CLOUD_COVER=0.11 CLOUD_COVER_LAND=0.11	
LC08_L1TP_167060_20201010		CLOUD_COVER=0.65 CLOUD_COVER_LAND=0.65	
LC08_L1TP_167061_20201010		CLOUD_COVER=1.16 CLOUD_COVER_LAND=1.16	
LC08_L1TP_167062_20201010		CLOUD_COVER=1.13 CLOUD_COVER_LAND=1.13	

LC08_L1TP_167063_20201010		CLOUD_COVER=2.92 CLOUD_COVER_LAND=2.92	
LC08_L1TP_168057_20210206		CLOUD_COVER=0.11 CLOUD_COVER_LAND=0.11	
LC08_L1TP_168058_20210206		CLOUD_COVER=0.04 CLOUD_COVER_LAND=0.04	
LC08_L1TP_168059_20201017		CLOUD_COVER=4.47 CLOUD_COVER_LAND=4.47	

LC08_L1TP_168060_20201118		CLOUD_COVER = 12.27 CLOUD_COVER_LAND = 12.27	
LC08_L1TP_168061_20201118		CLOUD_COVER = 6.53 CLOUD_COVER_LAND = 6.53	
LC08_L1TP_169057_20201227		CLOUD_COVER = 0.00 CLOUD_COVER_LAND = 0.00	
LC08_L1TP_169058_20201211		CLOUD_COVER = 0.00 CLOUD_COVER_LAND = 0.00	

LC08_L1TP_169059_20201227		CLOUD_COVER=0.30 CLOUD_COVER_LAND=0.30	
LC08_L1TP_169060_20201227		CLOUD_COVER=2.48 CLOUD_COVER_LAND=2.48	
lc08_l1tp_169061_20210128		CLOUD_COVER=0.02 CLOUD_COVER_LAND=0.02	
lc08_l1tp_170056_20210204		CLOUD_COVER=0.98 CLOUD_COVER_LAND=0.98	

lc08_l1tp_170057_20210204		CLOUD_COVER=0.00 CLOUD_COVER_LAND=0.00	
lc08_l1tp_170058_20210204		CLOUD_COVER=0.00 CLOUD_COVER_LAND=0.00	
lc08_l1tp_170059_20210204		CLOUD_COVER=0.55 CLOUD_COVER_LAND=0.55	
LC08_L1TP_170060_20210204		CLOUD_COVER=18.54 CLOUD_COVER_LAND=18.54	

LC08_L1TP_170061_20210324		CLOUD_COVER=6.30 CLOUD_COVER_LAND=6.30	
LC08_L1TP_171057_20201123		CLOUD_COVER=1.21 CLOUD_COVER_LAND=1.21