2. Lecture for Project Implementation

THE PROJECT ON
IRRIGATION SCHEME DEVELOPMENT IN CENTRAL AND EASTERN UGANDA
(PISD)

Training for Project Management System

- DATE : 23rd 24th October 2014
- PLACE : City Royal Hotel

NTC INTERNATIONAL CO., LTD
IRRIGATION ADOVISOR /MAAIF
UNDER JICA ASSISTANCE

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Contents

1. Proposed Demarcation of Irrigation Development in Wetland Area
2. Agriculture in Japan and Type of Project Management System
3. World Atlas of Irrigated Agriculture for Sustainability Science (WAIASS)
4. Land Improvement Law and Roles of WUA (LID) and Establishment and Registration of Water Users Association (WUA)
5. Operation and Maintenance of irrigation systems in Tanzania

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Time schedule

Time	Contents	Lecturer
~9:15	Confirmation of attendance	
9:15	Opening remark Outline of the training Self-introduction	Mr.Negishi Mr.T.Kobayashi
9:30	**Lecture 1**: Proposed Demarcation of Irrigation Development in Wetland Area - Review of Joint Workshop -	Mr.Negishi
10:30	Coffee break	
11:00	**Lecture 1**: Discussion the concerns and countermeasures	Mr.Negishi
12:00	**Lecture 1**: Proposed Demarcation of Irrigation Development for 10 candidate sites	Mr.Negishi
13:00	Lunch break	
14:00	**Lecture 2**: Agriculture in Japan and Type of Project Management System	Mr.T.Kobayashi
15:30	**Lecture 2**: Agriculture in Japan and Type of Project Management System	Mr.T.Kobayashi
16:30	Review of today's activity and Discussion	Mr.T.Kobayashi
17:00	Close	

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Time schedule

Time	Contents	Lecturer
9:15	Review of Yesterday	Mr.Negishi
9:30	**Lecture 3:** World Atlas of Irrigated Agriculture for Sustainability Science (WAIASS)	Mr.T.Kobayashi
10:30	Coffee break	
11:00	**Lecture 4**: Land Improvement Law and Roles of WUA (LID) and Establishment and Registration of Water Users Association (WUA)	Mr.T.Kobayashi
13:00	Lunch break	
14:00	**Lecture 4**: Discussion for how to Apply Registration System in Ugandan Water Users Association	Mr.T.Kobayashi
14:30	**Lecture 5**: Operation and Maintenance of irrigation systems in Tanzania	Mr.K.Sato
16:30	Review of training activity and Comment from participants	
17:00	Closing remark and Issuance of Completion Certificate	Mr.Negishi

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Self-introduction

- Name
- Title
- What is expected in two days

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Lecture 1

Proposed Demarcation of Irrigation Development in Wetland Area

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THE PROJECT ON
IRRIGATION SCHEME DEVELOPMENT IN CENTRAL AND EASTERN UGANDA
(PISD)

Lecture 1

Proposed Demarcation of Irrigation Development Area in Wetland Area

- DATE : 23th October 2014
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Contents

- Outline of the Project
- Related Laws and Regulations
- The concerns regarding Irrigation Development in the wetland
- Challenges and problems in candidate sites
- Proposed Demarcation of Irrigation Development Area in the Wetland Area

2

Outline of the Project

- Purpose of the Project
- Frame Work of the project

3

PURPOSE OF THE PROJECT

- To assure national food security and farmer household income through increased sustainable irrigated rice production
- To built capacity for irrigation/natural resources management among the different stakeholder categories
- Beneficial area of irrigation is increased in Central and Eastern Uganda

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PROJECT OUTPUT

1. Potential 10-sites for Irrigation Development are identified.
2. Feasibility Study for prioritized areas is conducted.
3. Stakeholders' capacity of irrigation development, operation and management is developed.

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Frame work of 2 phases

	Phase 1	Phase 2
Duration	**June 2014 to March 2015**	**May 2015 to June 2016**
Target Area	Candidate 10 sites	Selected 2 to 3 sites
Output	**Irrigation Scheme Development Plan in Central & Eastern Uganda (ISDP)**	**Feasibility Study (F/S)**

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Related Laws and Regulation

- The Constitution of the Republic of Uganda, 1995
- The Water Act, 1995
- The Local Government Act, 1997
- The Land Act, 1998
- The National Water Policy, 1999
- National Wetland Policy, 1995 (National Policy for the Conservation and Management of Wetland Resources)
- The National Environment (Wetlands, River banks and Lake shores Management) Regulations, 2000
- Water for Production Strategy and Investment Plan (2010-2035)
- The Wetland Sector Strategic Plan 2001-2010 (WSSP)

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Constitution of the Republic of Uganda 1995

- Chapter XIII: Protection of Natural resource

  The State shall protect important natural resources, including land, water, **wetlands**, oil, minerals, fauna and flora on behalf of the people of Uganda.

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National Wetland Policy 1995

(National Policy for the Conservation and Management of Wetland Resources)

Clause	Specific Policy	Strategy
7.2	Environmentally sound management	Only those uses that have proved to be non destructive to **Wetlands** and their surroundings will be allowed and/or encouraged. These include water supply, fisheries, wetland edge gardens and grazing.
7.3	Sustainable use of Wetlands	**Wetlands** may be utilized in such a way that they do not lose traditional benefits presently obtained from them.
7.4	Conservation of Wetlands	i. Government will establish fully "Protected Wetland Ares" of important biological diversity. ii. Government may also establish wetlands which will be used for partial exploitation as research. iii. No modification , drainage or other impacts will be entertained for the so protected wetlands.

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National Wetland Policy 1995

(National Policy for the Conservation and Management of Wetland Resources)

Clause	Specific Policy	Strategy
7.6	Tenure and Use	i. All wetlands are a public resource to be controlled by the government on behalf of the public. There shall be no leasing of any wetland to any person or organization in Uganda at any given moment and for whatever reason ii. However, **communal use will be permitted**, but only if environmental conservation and sustainable use principles and strategies are adhered to.

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The National Environment (Wetlands, River banks and Lake shores Management) Regulations, 2000

Clause	Content
11	1. A person desiring to carry out any of the regulated activities listed in the Second Schedule or extract any wetland produce in a wetland shall make an application in form A set out in the First schedule to these regulations. 2. Following traditional uses of wetland resources shall not be subject to the application of these regulations. Harvesting of papyrus, medicinal plants, trees and reeds, **any cultivation where the cultivated area is not more than 25% of the total area of the wetland**,.....
29	1. The rivers specified in the Sixth Schedule to these regulations shall have a protection zone of <u>one hundred meters from the highest water mark of the river.</u> **R. Manafwa, R. Sipi, R. Namatala, R. Sironko** 2. Rivers not specified in the Sixth Schedule shall have a protected zone <u>thirty meters from the highest water mark of the river.</u>

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The Wetland Sector Strategic Plan 2001-2010 (WSSP)

Strategy 7.

- Community-based regulation and administration of wetlands resource use established and strengthened through central and district administrations

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The concerns regarding irrigation development in the wetland

- What are Wetlands?
- Where are wetlands?
- What is the buffer zone?
- Where are protection/buffer zone?

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What are Wetlands?

- Are Definitions and Understandings harmonized?
  - NEMA
  - MAAIF, MWE other Ministry
  - District and Sub-County
  - Local farmers

14

What are wetlands?

Under the text of the Ramsar Convention (Article 1.1), wetlands are defined as:

- "areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters".

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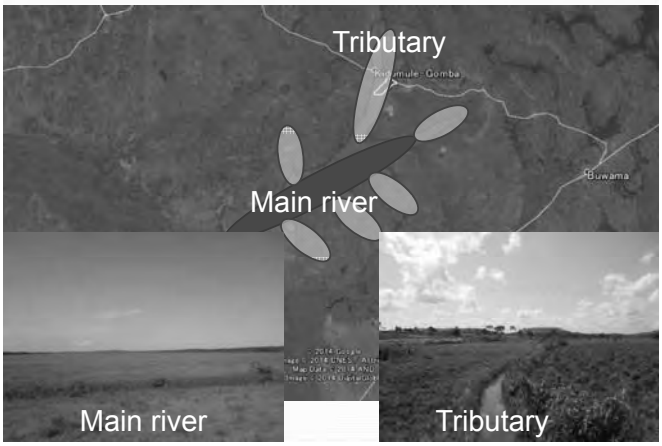
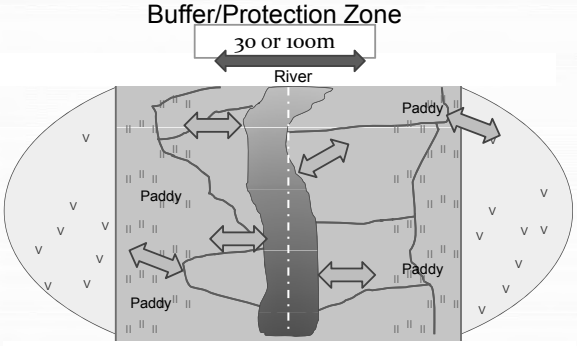
Where are wetlands? Ex. Bulo site



Where are wetlands? Ex. Namatala site

17

Where is the buffer zone?



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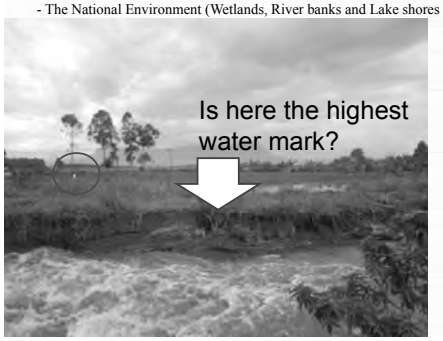
Where is the highest water mark?

- Rivers shall have a protected zone thirty meters from the highest water mark of the river.

- The National Environment (Wetlands, River banks and Lake shores Management) Regulations, 2000-



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Legally agreed boundary

These are necessary because the ecological wetland boundary is mobile; moving in and out from the wetland centre seasonally and inter-annually. For this reason a fixed legal boundary will have to be identified and surveyed to allow management to work effectively. The method for making the legal boundary will be established.

From the booklet "Wetland and the Law" WMD, MWE

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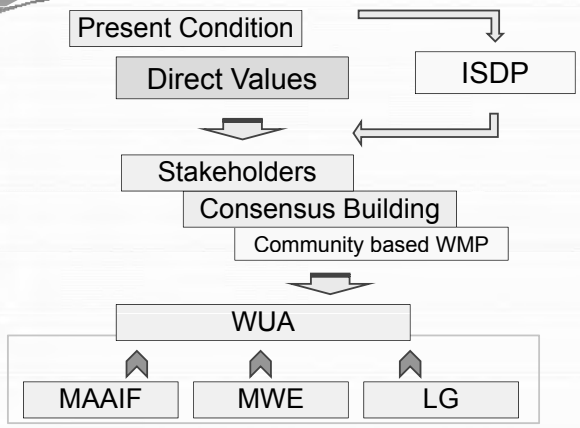
Wetland Values

Direct Values	Indirect Values	Option Values	Non-use Values
Production and consumption goods and services	Ecosystem functions and services	Premium placed on possible future uses and applications	Intrinsic significance
Such as ... •Fish •Fuel wood •Building poles •Sand, gravel, clay •Thatch •Water •Wild food	Such as ... •Water quality •Water flow •Water storage •Water purification •Water recharge •Flood control •Storm protection	Such as ... •Pharmaceutical •Agricultural •Industrial •Leisure •Water use	In terms of... •Cultural value •Aesthetic value •Heritage value •Bequest value •Existence value
•Medicines •Agriculture/cultivation •Pasture/grazing •Transport •Recreation	•Nutrient retention •Micro-climate regulation •Shore stabilization		

From: Wetland Sector Strategic Plan 2001-2010

Considering the Wetland Values (1)



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Considering the Wetland Values (2)

Indirect Values

Indirect Values	Planning	Design/ Implementation	O&M
Water Flow	Multifunction of Paddy Field		Water Management
Water Storage			
Water Recharge			
Flood Control			
Water Quality	Zoning	Maintenance flow & Monitoring	Training & Guideline
Water Purification			

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Challenges and problems in candidate sites

- Concerns from villagers occurred during consultation meeting

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Farmer's reactions & concerns (1)

Site	Farmer's Reactions, Challenges and Suggestion
Bulo	A farmer said floods destroy even pit latrines and make them prone to infections, and asked if the Project would look into flood problem.
Buikwe	A farmer expressed his fear that NEMA might threaten them to chase away from the wetland.
Buikwe	Who owns the wetland in terms of law? Who is responsible for the wetland?
Buikwe	How to form a Water Users Association after the Project? Whether up-land farmers will be included in the Project? How to maintain the irrigation system after the Project?

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Farmer's reactions & concerns (2)

Site	Farmer's Reactions, Challenges and Suggestion
Up Sironko	A farmer said that sometimes water level reduces dramatically, and asked that how the Project help to solve the problem.
Up Sironko	Land owner by the Sironko river: recently he had got a communication to stop using the areas next to the river, so he asked if the government would disturb them using the project.
Up Namatala	A farmer said that people had been arrested for cultivating in wetlands which caused fear among farmers.
Up Namatala	Small land owners within the wetland: the Project is going to take away their land.

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Farmer's reactions & concerns (3)

Site	Farmer's Reactions, Challenges and Suggestion
Sipi	Farmers expressed their fears of losing their land immediately after the project begins.
Sipi	According to a farmer, the area was not wetland originally but was became through repeated flooding.
Sipi	Farmers expressed their desire to control floods during rainy seasons.
Namatala	Tenant farmers near to the river: if they approve the Project, they may be chased away from the farm plot by the owner.
Namatala	Farmers asked if the Project put into consideration water harvesting techniques which will enable them to have enough water for irrigation during the dry season. At the moment irrigation all the year around is impossible due to lack of water.
Namatala	How to solve the flood problem? How to solve the problem of water shortage during the dry season?

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Farmer's reactions & concerns regarding Water Resources & Wetland

- Water Shortage
- Flooding
- Maintenance
- Land concerns in the wetland
  - Fears of losing their land by the project

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Proposed Demarcation of Irrigation Development Area in the Wetland

- Function of the buffer zone
- Zoning
- Existing cultivated land
- Basic concept of irrigation development in the wetland
- Other Concerns

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Function of the buffer zone

1. Function as Buffer
   - ✓Habitat environment
   - ✓Water Quality Purification
   - ✓Flood alleviation ••••
2. Function as river course during flooding
   - ✓Flood protection Dike;
     Flow section for flood

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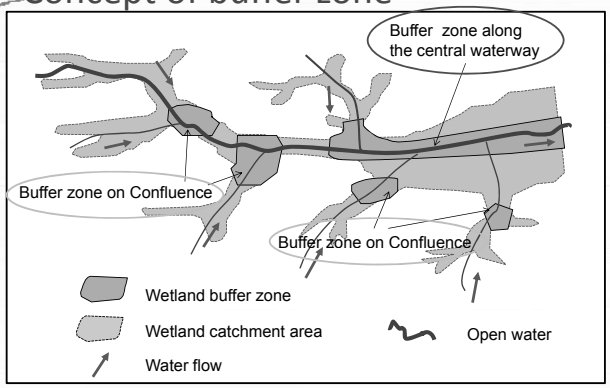
Concept of buffer zone



Arranged from the booklet "Guidelines for Smallholder Paddy Rice Cultivation in Seasonal Wetlands" WMD, MWE, 2005

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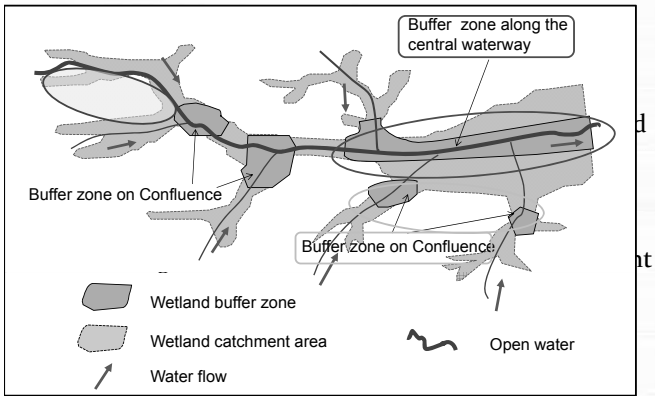
Flow Section for Flood Ex. River in Japan

Zoning

- Demarcation of Protection Zone & Development Area



Categorization by River Type and zoning by location

- River Type
  - Designated river by regulation
  - Main river
  - Tributary
- Zoning
  - Upstream and downstream

R. Manafwa
R. Namatala
R. Sipi
R. Sironko
...

Other rivers
Not specified in the regulation
Central Waterway

The Sixth Schedule, The National Environment (Wetlands, River banks and Lake shores Management) Regulations, 2000

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Zoning Ex. Bulo site

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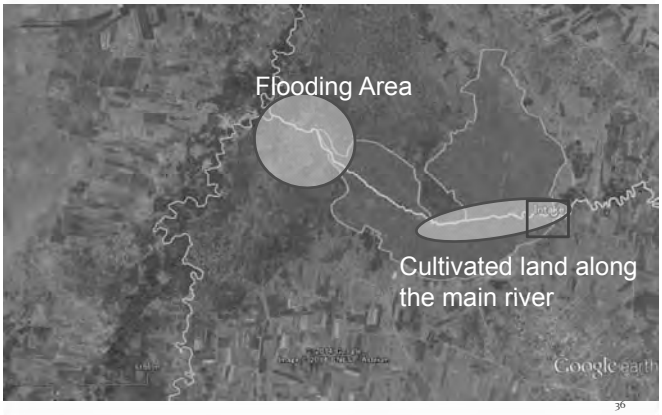
Existing cultivated land Ex. Sipi site



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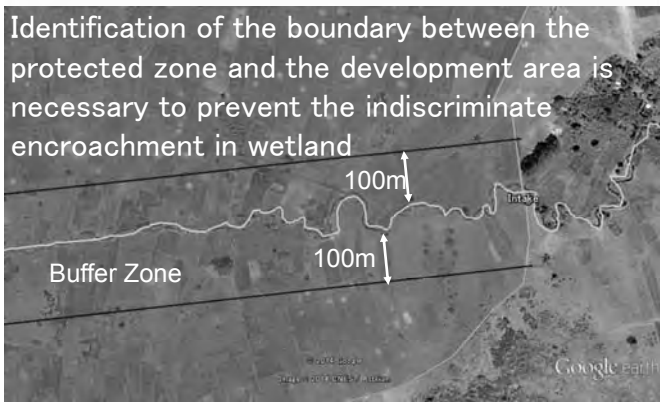
How can we remove the existing farmers?



Basic concept of irrigation development in the wetland

- Harmonized Development is necessary to prevent the indiscriminate encroachment in wetland
- Clarification of Protection zone/Development area by setting the Boundary, the protection dike
- The protection dike shall be designed as flow section for flood
- Do not develop any more in Protection Zone
- To give the incentive the beneficiaries by investing the Development Area to be high valued land

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Harmonized Development is necessary for wise use of wetland

- Encroachments in Buffer Zone affects wetland environment; unregulated water use, destruction of habitat, water pollution...
- The multifunction of paddy field is essential for sustainability and harmony with environment
- Well developed and managed paddy field have;
  - Flood control
  - Protection of soil erosion
  - Equal water distribution, return flow
  - Ecological correctness...
- Paddy field is a kind of artificial wetland; multifunction of paddy field enables wise use of wetland

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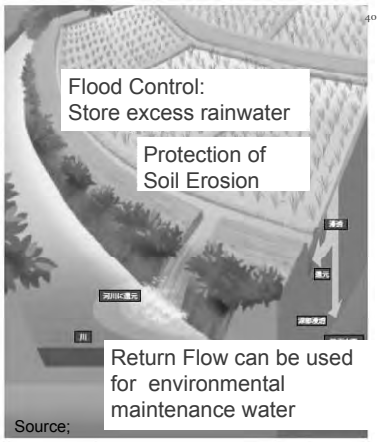
Multifunction of paddy field

- Paddy fields store rainwater temporarily. This function prevents a rapid rainwater flow, and can prevent or reduce the flood damage in the surrounding/downstream area .
- Paddy field can protect soil erosion.
- Return Flow can be used for environmental maintenance water .
- Formed and maintained paddy field have developed ecosystem with rich biodiversity as semi natural system which provides rich habitats for diverse insects, animals and plants.



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Clarification of Protection zone/Development area by setting the Boundary

- The highest water mark is not clear.
- The farmers cultivate randomly near to the river where it is easy to access the water, not very much aware it is illegal.
- The buffer zone has been opened up over the years with increased speed without stopping.
- It is important to indicate physical boundary on the site to stop the illegal or insensible encroachment in the buffer zone.
- The boundary shall be set for two purpose;
  - Flood Protection Dike
  - To clarify the boundary between protection zone and development area for all

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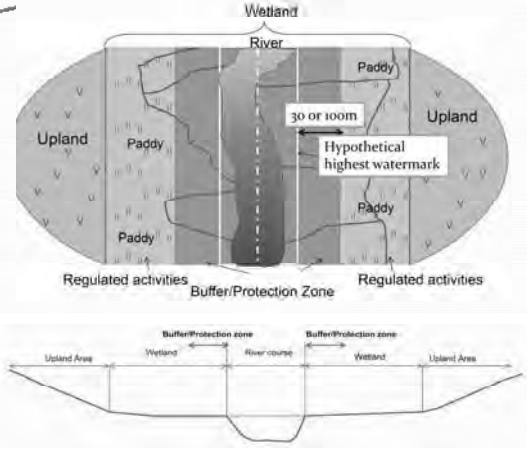
Definition of Buffer/Protection Zone



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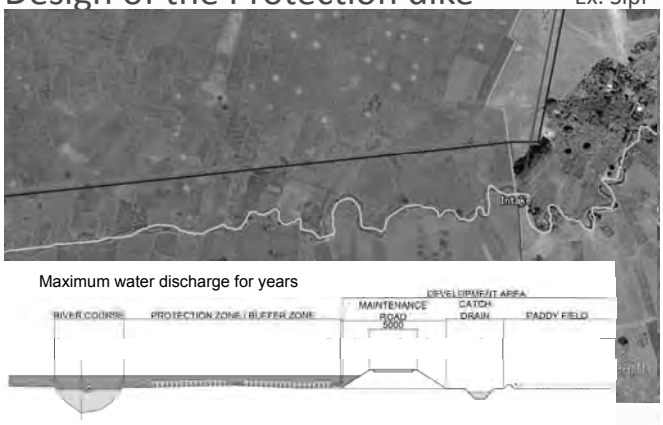
Design of the Protection dike

Ex. Sipi



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Countermeasure for existing farmland in the Protection Zone

- No forcible expropriation of existing farmland in Protection Zone/ Buffer Zone
- Do not permit any more new activities in Protection Zone

How to give the Incentive

- To invest the Development Area to be high valued land
- To prevent the flood damage by the protection dike
- To invest the Development Area for cultivation, fisheries, live stocks and so on under the community consensus

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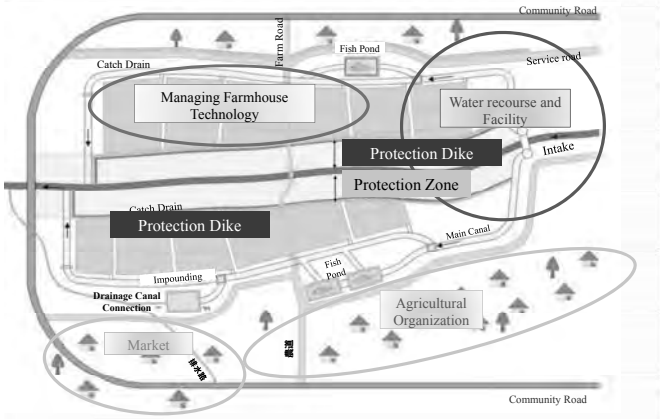
Development Plan



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Other concerns

1) Maintenance Flow

- Purpose
  - To maintain the habitat environment
  - To keep the water quality
- Methodology
  - Hydrological analysis
  - Targeting 10 years probability of drought discharge

Drought discharge is the stream flow not less than 10 days within 365days

10 years probability means not expected more than one time per 10 years

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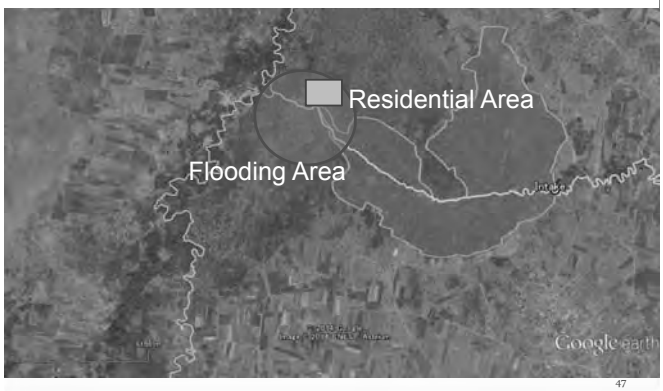
2) River dredging to recover the residential area



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2) River dredging to recover the residential area

- River dredging shall be conducted according community request.
- River dredging for recovering of residential land due to sedimentation shall be conducted under permission.
- River dredging shall be conducted according the guideline.
- Guideline shall be established considering environmental issues on the ground.

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Lecture 1

Free Discussion

1

The concerns regarding irrigation development in the wetland

1. What are Wetlands?
   Where are Wetlands?
2. What is the buffer zone?
3. Where are protection/buffer zone?

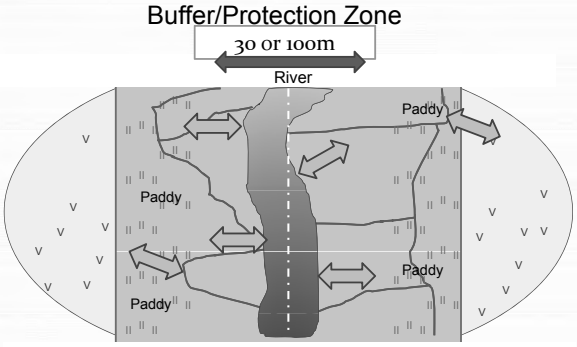
2

1. What are Wetlands?

- Are Definitions and Understandings harmonized?
  - NEMA
  - MAAIF, MWE other Ministry
  - District and Sub-County
  - Local farmers

3

3. Where is the buffer zone?



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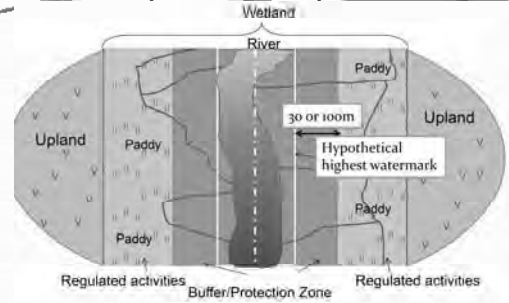
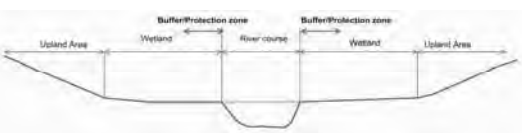
4.Where are protection/buffer zone?





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Challenges and problems in candidate sites

- What is your opinion about the existing farm land in buffer zone?

6

Questions from Farmers

1. Who owns the wetland in terms of law?
2. Who is responsible for the wetland?
3. How to form a Water Users Association after the Project?
4. How to maintain the irrigation system after the Project?
5. Will NEMA chase away the farmers from the wetland?
6. Is it wetland where the area was not wetland originally but was became through repeated flooding?
7. How to solve the flood problem?
8. How to solve the problem of water shortage during the dry season?

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Proposed Demarcation of Irrigation Development Area in the Wetland

1. How can we demarcate the buffer zone?
2. How about the concept of Zoning?
3. How can we deal with existing cultivated land in the wetland?
4. River dredging to recover the residential area

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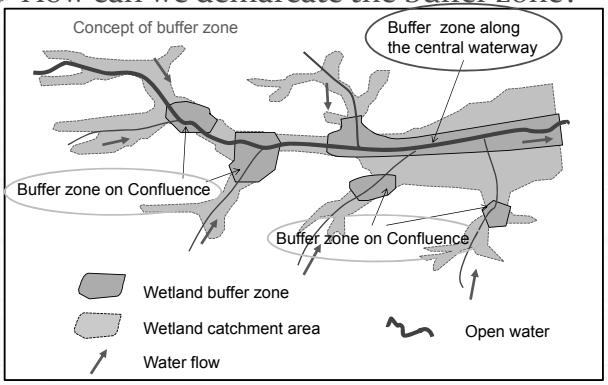
How can we demarcate the buffer zone?



Arranged from the booklet "Guidelines for Smallholder Paddy Rice Cultivation in Seasonal Wetlands" WMD, MWE, 2005

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How about the concept of Zoning?

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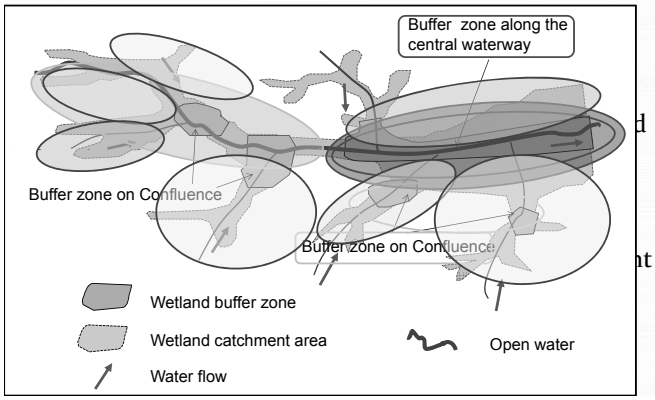
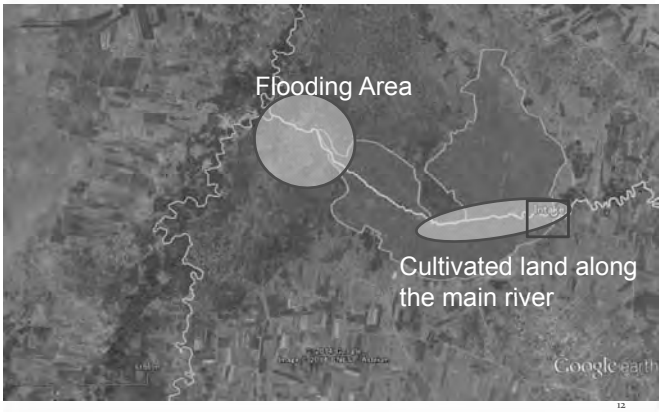
Zoning

- Demarcation of Protection Zone & Development Area



Existing cultivated land

Ex. Sipi site



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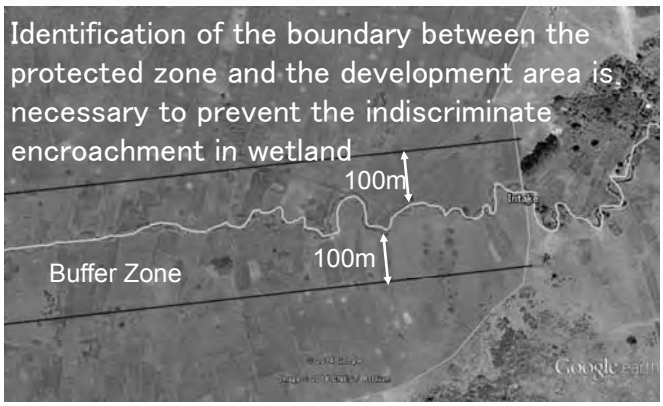
How can we deal with existing cultivated land in the wetland?

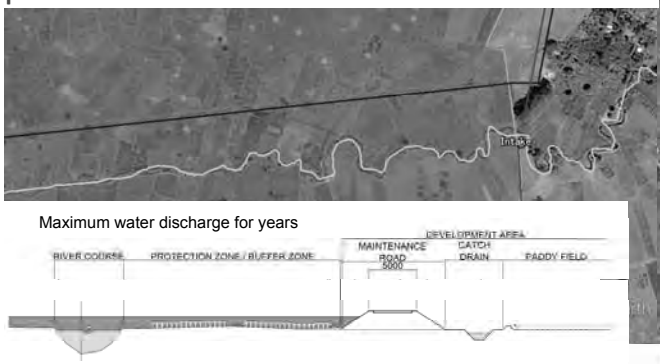


What is your idea as for the existing farmland in the Protection Zone?

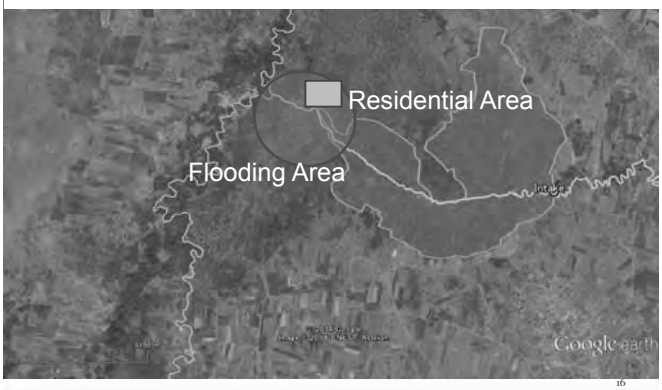
- No forcible expropriation of existing farmland in Protection Zone/ Buffer Zone
- Do not permit any more new activities in Protection Zone

14

What is your idea about proposed protection dike?



2) River dredging to recover the residential area



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2) River dredging to recover the residential area

Is it correspond to this clause?

> No modification, drainage or other impacts will be entertained for the so protected wetlands.

(National Wetland Policy 1995, Clause 7.4 Conservation of Wetlands)

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End

Thank you very much!

18

2. Where are wetlands? Ex. Bulo site

2.Where are wetlands? Ex. Namatala

What are wetlands?

Under the text of the Ramsar Convention (Article 1.1), wetlands are defined as:

- "areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters".

21

Where is the highest water mark?

- Rivers s
  highest
  - The Nationa

Legally agreed boundary

These are necessary because the ecological wetland boundary is mobile; moving in and out from the wetland centre seasonally and inter-annually. For this reason a fixed legal boundary will have to be identified and surveyed to allow management to work effectively. The method for making the legal boundary will be established.

From the booklet "Wetland and the Law" WMD, MWE

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Categorization by River Type and zoning by location

- River Type
  - Designated river by regulation → **R. Manafwa**, **R. Namatala**, **R. Sipi**, **R. Sironko**, ...
  - Main river
  - Tributary

  → **Other rivers** Not specified in the regulation Central Waterway

  The Sixth Schedule, The National Environment (Wetlands, River banks and Lake shores Management) Regulations, 2000
- Zoning
  - Upstream and downstream

24

Related Laws and Regulation

- The Constitution of the Republic of Uganda, 1995
- The Water Act, 1995
- The Local Government Act, 1997
- The Land Act, 1998
- The National Water Policy, 1999
- National Wetland Policy, 1995 (National Policy for the Conservation and Management of Wetland Resources)
- The National Environment (Wetlands, River banks and Lake shores Management) Regulations, 2000
- Water for Production Strategy and Investment Plan (2010-2035)
- The Wetland Sector Strategic Plan 2001-2010 (WSSP)

25

Constitution of the Republic of Uganda 1995

- Chapter XIII: Protection of Natural resource

  The State shall protect important natural resources, including land, water, **wetlands**, oil, minerals, fauna and flora on behalf of the people of Uganda.

26

National Wetland Policy 1995

(National Policy for the Conservation and Management of Wetland Resources)

Clause	Specific Policy	Strategy
7.2	Environmentally sound management	Only those uses that have proved to be non destructive to **Wetlands** and their surroundings will be allowed and/or encouraged. These include water supply, fisheries, wetland edge gardens and grazing.
7.3	Sustainable use of Wetlands	**Wetlands** may be utilized in such a way that they do not lose traditional benefits presently obtained from them.
7.4	Conservation of Wetlands	i. Government will establish fully "Protected Wetland Ares" of important biological diversity. ii. Government may also establish wetlands which will be used for partial exploitation as research. iii. No modification , drainage or other impacts will be entertained for the so protected wetlands.

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National Wetland Policy 1995

(National Policy for the Conservation and Management of Wetland Resources)

Clause	Specific Policy	Strategy
7.6	Tenure and Use	i. All wetlands are a public resource to be controlled by the government on behalf of the public. There shall be no leasing of any wetland to any person or organization in Uganda at any given moment and for whatever reason ii. However, **communal use will be permitted**, but only if environmental conservation and sustainable use principles and strategies are adhered to.

28

The National Environment (Wetlands, River banks and Lake shores Management) Regulations, 2000

Clause	Content
11	1. A person desiring to carry out any of the regulated activities listed in the Second Schedule or extract any wetland produce in a wetland shall make an application in form A set out in the First schedule to these regulations. 2. Following traditional uses of wetland resources shall not be subject to the application of these regulations. Harvesting of papyrus, medicinal plants, trees and reeds, **any cultivation where the cultivated area is not more than 25% of the total area of the wetland**,.....
29	1. The rivers specified in the Sixth Schedule to these regulations shall have a protection zone of one hundred meters from the highest water mark of the river. **R. Manafwa, R. Sipi, R. Namatala, R. Sironko** 2. Rivers not specified in the Sixth Schedule shall have a protected zone thirty meters from the highest water mark of the river.

29

The Wetland Sector Strategic Plan 2001-2010 (WSSP)

Strategy 7.

- Community-based regulation and administration of wetlands resource use established and strengthened through central and district administrations

30

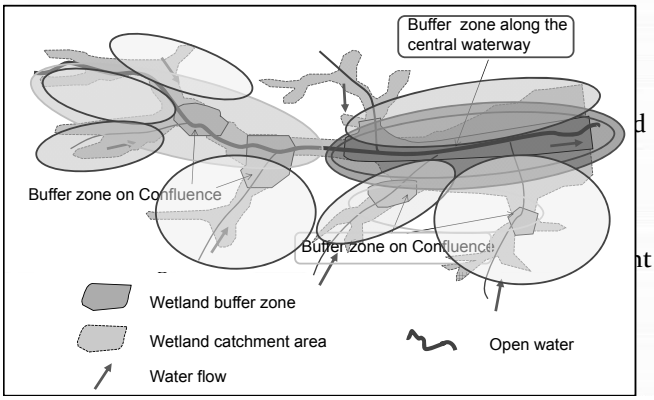
Lecture 1

Proposed Development Area
in Candidate Sites

1

Zoning

- Demarcation of Protection Zone & Development Area



1. Bulo Swamp

3

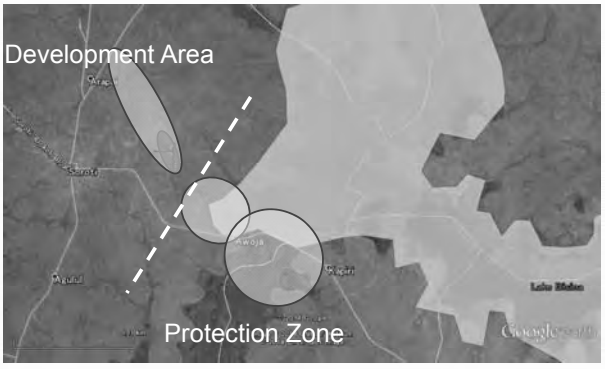
2. Buikwe

4

2. Buikwe

5

3. Omirio

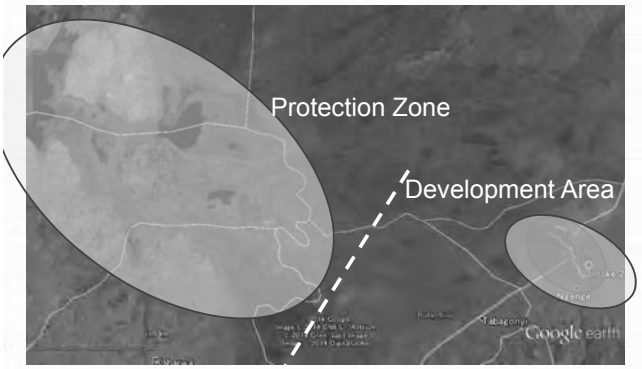


6

3. Omirio

7

4-1. Ngenge

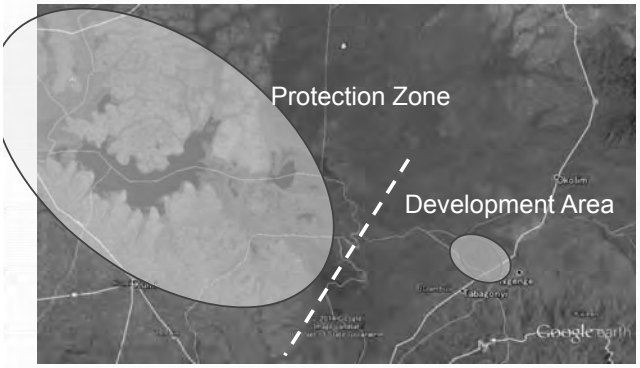


8

4-1. Ngenge

9

4-2. Atari



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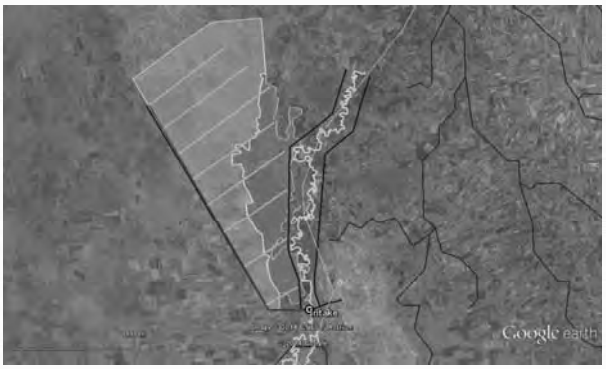
4-2. Atari

11

6. Sironko

12

6. Sironko



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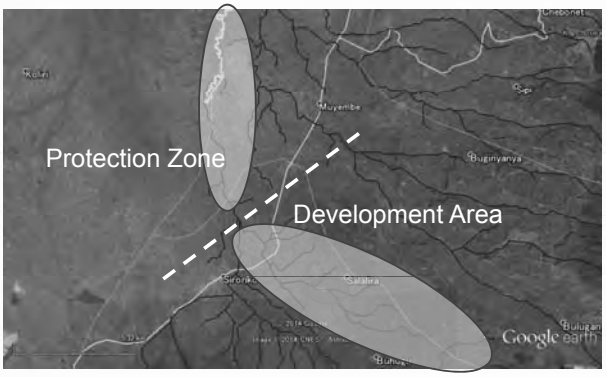
7. Upstream Sironko



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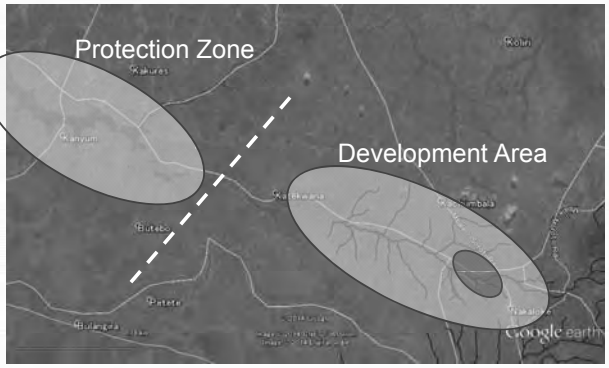
8. Upstream Namatala



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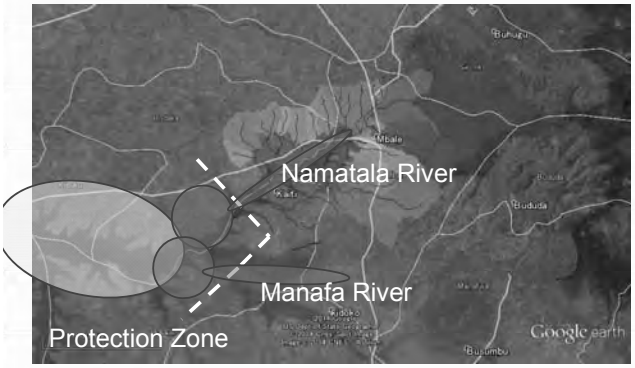
9. Namatala & 10 Doho



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9. Namatala

17

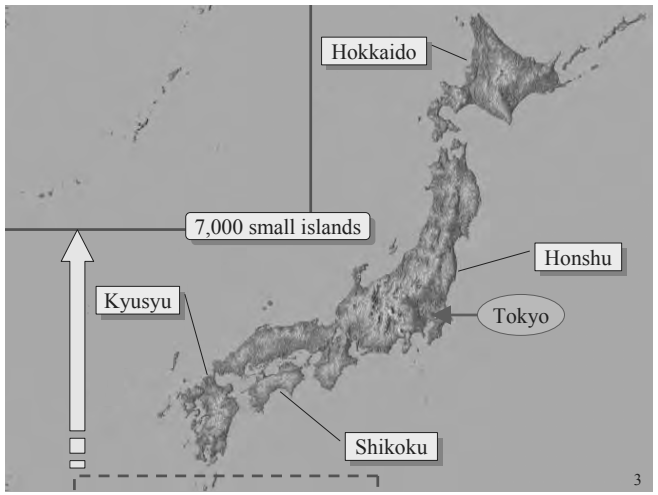
9. Namatala

18

AGRICULTURAL AND RURAL DEVELOPMENT IN JAPAN

Overseas Land Improvement Cooperation Office,
Rural Development Bureau,
MAFF

Features of Japan



Data of Japan

Total area: 37,790,000 ha

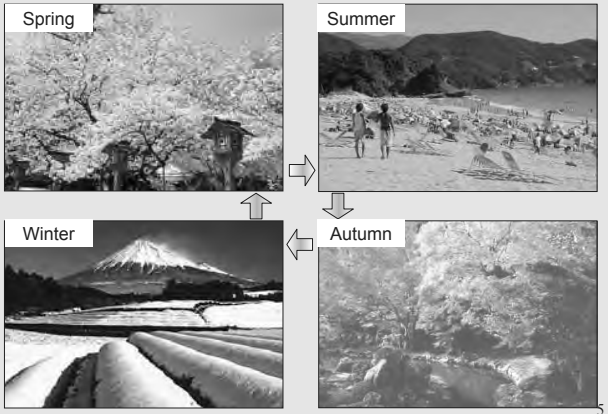
Population: 127,800,000 people (as of 2004)

Agricultural land: 12 % of total area (4,670,000 ha) (as of 2006)
← Mountainous area: around 2/3 of the total land
Paddy field : 54 % (2.54 million ha. Planted area: 1.68 million ha)
Upland field : 46 % (2.13 million ha. Irrigation ratio: around 20%)

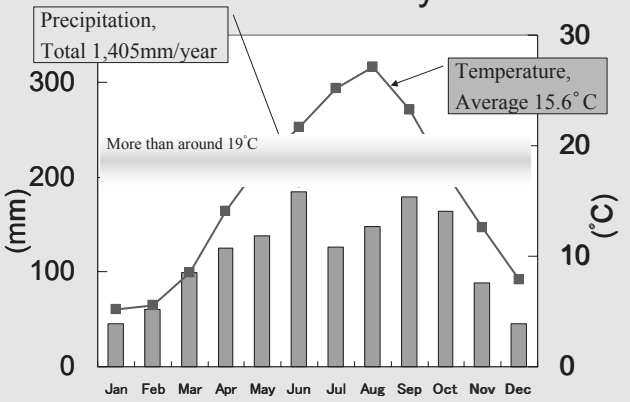
Agricultural population: 3,895,000 people (as of 2004)
Total economically active population in agriculture:
2,172,000 people (as of 2004)

Percentage of GDP from agriculture: 1 % (as of 2003)

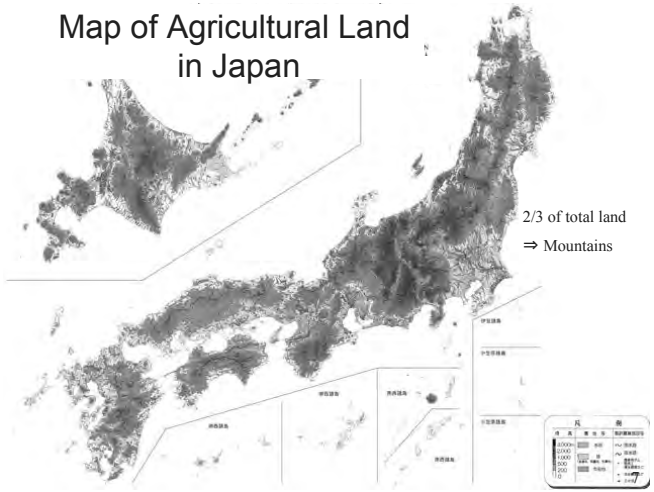
Climate of Japan; the Four Seasons



Climate at Tokyo

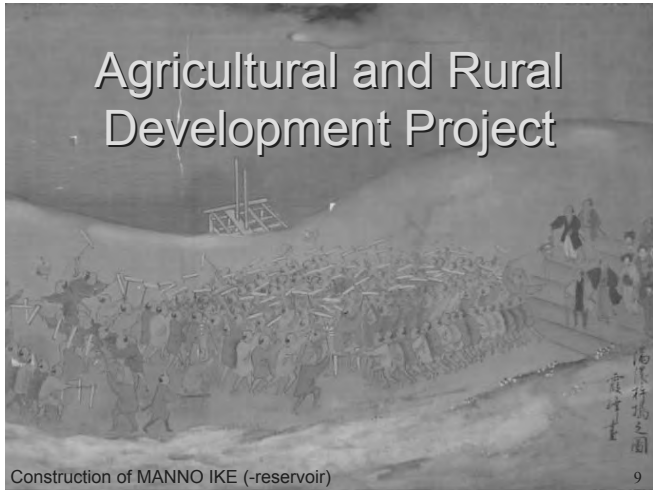


Map of Agricultural Land in Japan



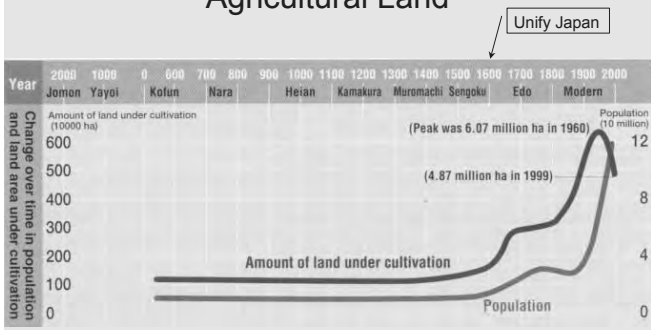
Map of Agricultural Land and Water in Kanto Region

Agricultural and Rural Development Project

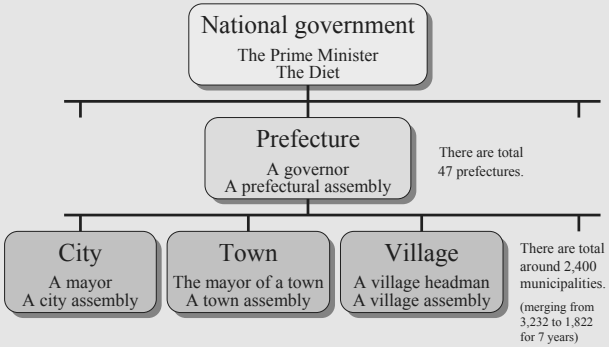


Construction of MANNO IKE (-reservoir)

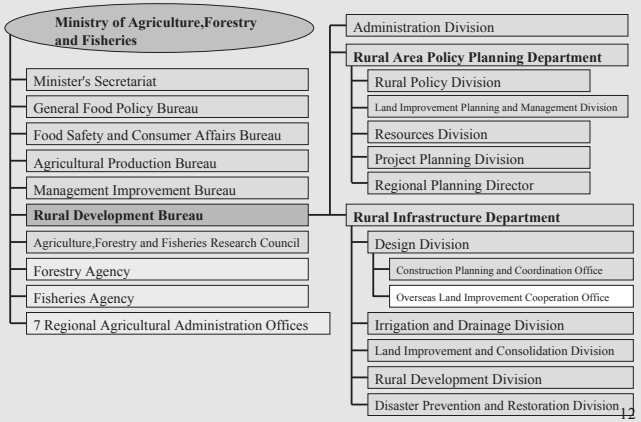
Historical Development of Agricultural Land



Organization of Japanese National System



Organization Chart of MAFF



Command area of the Regional Agricultural Administration Office

Agricultural and Rural Development Project

Classification of the Project

Agricultural and Rural Development Project

675 Billion yen (National Expenditure, 2007FY)

(Total project cost, 1.1 Trillion yen)

Around 25% of the total budget of MAFF

64 % (429 Billion yen)

1. Development of Agricultural Production Infrastructure (to increase agricultural productivity)
   - ○ Development of Irrigation and Drainage Facilities
   - ○ Farmland Consolidation

20 % (132 Billion yen)

2. Development of Rural Areas (to improve the living environment)
   - ○ Development of Agricultural Roads
   - ○ Development of Rural Sewerage Facilities
   - ○ Integrated Development of Rural Areas
   - ○ Integrated Development of Hilly and Mountainous Areas

17 % (114 Billion yen)

3. Conservation and Maintenance of Rural Areas (to prevent disasters in rural areas)
   - ○ Disaster Prevention and Conservation of Farmland
   - ○ Maintenance and Management of Facilities

1. Development of Agricultural Production Infrastructure
1-1. Development of Irrigation and Drainage Facilities

To increase agricultural productivity through constructing irrigation and drainage facilities

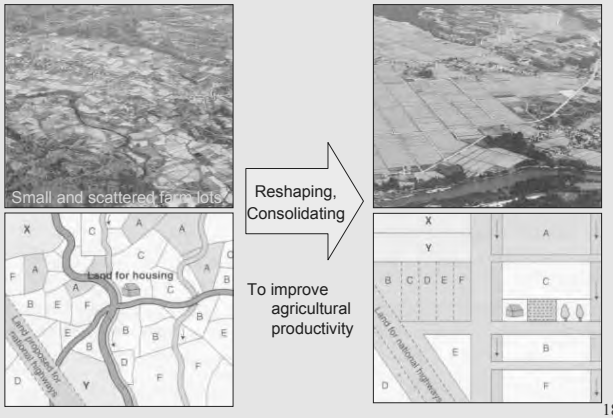
1-1. Development of Irrigation and Drainage Facilities (cont.)

Basic cost-sharing for Irrigation and Drainage Project

Implementing body	Cost-share (percentage)			
	National	Prefecture	Municipality	Farmers
National government	66.6	17.0	6.0	10.4
Prefectural government	50.0	25.0	10.0	15.0

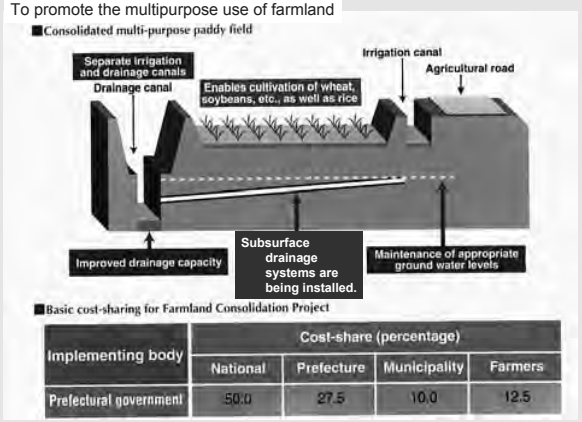
In case of National government implemented project, National government bears 66.6%, Prefectural Government bears 17.0% …

1-2. Farmland Consolidation



1-2. Farmland Consolidation (cont.)

To promote the multipurpose use of farmland



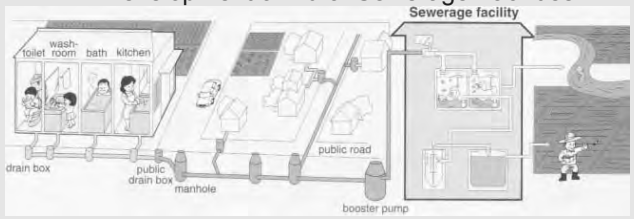
Basic cost-sharing for Farmland Consolidation Project

Implementing body	Cost-share (percentage)			
	National	Prefecture	Municipality	Farmers
Prefectural government	50.0	27.5	10.0	12.5

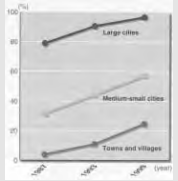
2. Development of Rural Areas
2-1. Development of Agricultural Roads

To improve the efficiency of transportation of agricultural products between farm, village and market

2-2. Development of Rural Sewerage Facilities



To improve water quality of irrigation and drainage canals by treating the sewerage and wastewater

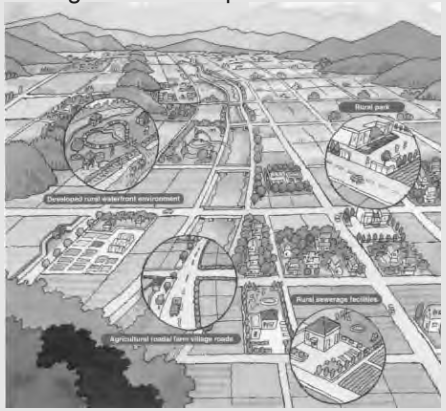


Change in availability of sewerage facilities

Bodies for constructing sewerage facilities

- ✓ Ministry of Land, Infrastructure and Transport
- ✓ Ministry of Health, Labor and Welfare
- ✓ Ministry of Agriculture, Forestry and Fisheries

2-3. Integrated Development of Rural Areas



To promote the integrated development of infrastructure together with the improvement of living environments through development of parks, sewerage facilities

2-4. Integrated Development of Hilly and Mountainous Areas

To vitalize agriculture and rural life in the hilly and mountainous areas because the condition of production and living are less favorable in these are

3. Conservation and Maintenance of Rural Areas
3-1. Disaster Prevention and Conservation of Farmland

To protect farmland and agricultural facilities from natural disasters

3-2. Maintenance and Management of Facilities

To support the LID undertaking the O&M of facilities

Percentage of major agricultural water use facilities by managing agency

	Dam and Reservoir	Head works	Pumping station	Irrigation canal	Drainage canal
National	5.9	2.4	0.3	0.8	-
Prefecture	24.1	20.3	10.4	4.3	1.2
Municipality	24.1	10.1	14.8	13.1	64.1
LID	45.9	64.2	74.2	81.4	34.5
Others	-	3.0	0.3	0.4	0.2
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Photographs

Facilities Developed by Agricultural and Rural Development Project

Rock Fill Dam

28

Diversion Dam

29

Medium Scale Barrage

30

Large Scale Barrage
- Tone Barrage –

"Tone" means the name of river which has the largest basin area in Japan.

31

Tone Barrage (close-up)

32

Prior to Installation of Surface Drainage Facilities

Around
50 years ago

33

After Installation of Surface Drainage Facilities

34

Pumping Station

35

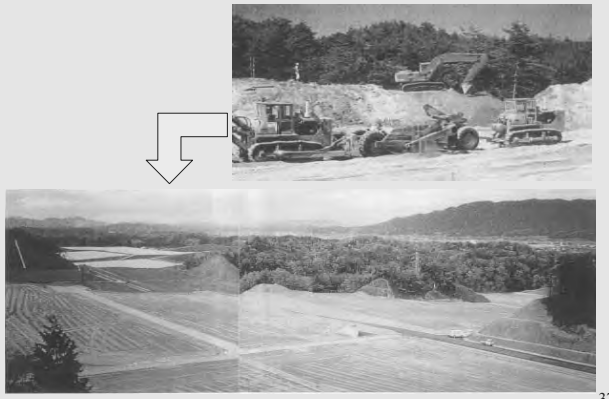
Farmland Consolidation

Before

After

36

Farmland Reclamation



37

Sea Bottom Reclamation

Before

After

38

Embankment Repair

Before

After

39

Development of Rural Waterfront Environment

40

Result of the Project

41

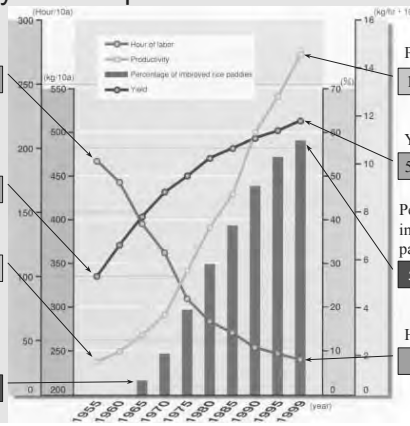
Relationship between Paddy Field Improvement and Productivity

Hour of labor
190 hour/10a

Yield
325 kg/10a

Productivity
1.8 kg/hr·10a

Percentage of improved rice paddies
(1 plot >3,000m²)
3 %



Productivity
14.6 kg/hr·10a

Yield
512 kg/10a

Percentage of improved rice paddies
58 %

Hour of labor
35 hour/10a

42

High Productivity by Agricultural Machinery

High Productivity

Agricultural machinery

Paddy Field Improvement

after

Agricultural and Rural Development Project

Transplanting of paddy rice seedlings

Harvesting

43

Land Improvement Law

Agricultural and Rural Development Project

Land | Improvement | Law

Agricultural land

Enhancement of land productivity and labor productivity

→ Law for the enhancement of agricultural land productivity and agricultural labor productivity and so on.

44

Bodies which can execute the Agricultural and Rural Development Project

Agricultural and Rural Development Project

(1) **Land Improvement District**
(Including a union of land improvement districts)

(2) **National government**

(3) **Prefecture**

(4) **Municipalities (city, town and village)**

(5) **Agricultural co-operative association**
(Including a union of agricultural co-operative association)

Land Improvement Law

45

Legal Procedure for the Project

Making a group as petitioners (15 persons or more of farmers)

↓

Determination of certain boundaries for the project

↓

Public notice of outline of the Project Plan

↓

Obtaining the consent of two-thirds or more of qualified persons

↓

Petition for approval of execution of the Project

↓

MAFF (in case of Government-operated Project)

↓

Determination, Public notice and Decision of the Project Plan

↓

Implementation of the Project by MAFF

↓

Facility Management by LID

46

Operation and Maintenance by Land Improvement District

47

Origin of LID

water users' organization
around 300 years ago

↓

Water Users' Association
based on the Irrigation Association Law
A.D.1909～

Land Consolidation Association
based on the Land Consolidation Law
A.D.1900～

↓

Agricultural Land Reform
A.D. 1946～

↓

Land Improvement District
based on the Land Improvement Law
A.D. 1949～

48

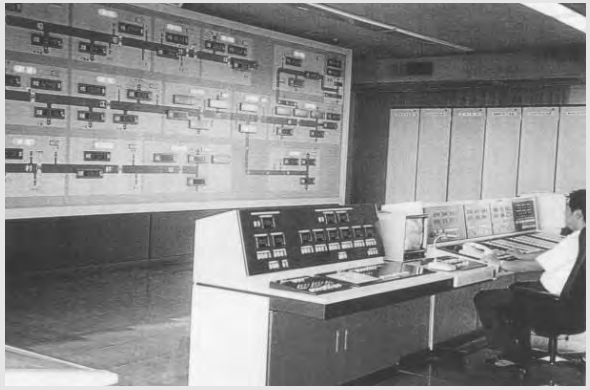
LID Headquarters

49

Inside of LID Headquarters

50

Control room in LID Headquarters



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LID General Meeting

The proposal is decided by a majority vote (a show of hands).

52

Canal maintenance by LIDs

53

Creation of a biotope (a kind of park) through combined efforts of LID, residents, etc.

54

Present Land Use in Japan

The farmland area is limited to 52,000㎢ or 14% of the total land surface due to steep and mountainous topographical features.

Land use	Farmland			Forest	Natural grassland	Water surface	Roads	Building land	Others	Total
	Cultivated land		Grazing land							
	Paddy field	Upland field								
Area(1,000km²)	28.0	23.6	1.0	252.2	2.7	11.9	13.2	16.3	28.8	377.7
Ratio(%)	7.4	6.2	0.3	66.8	0.7	3.2	3.5	4.3	7.6	100.0

(source: White paper of land use, National Land Agency)

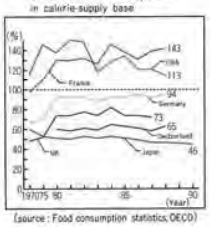
Agricultural Features in Japan

Agricultural Features in Japan

The agricultural features in Japan are summarized as below:

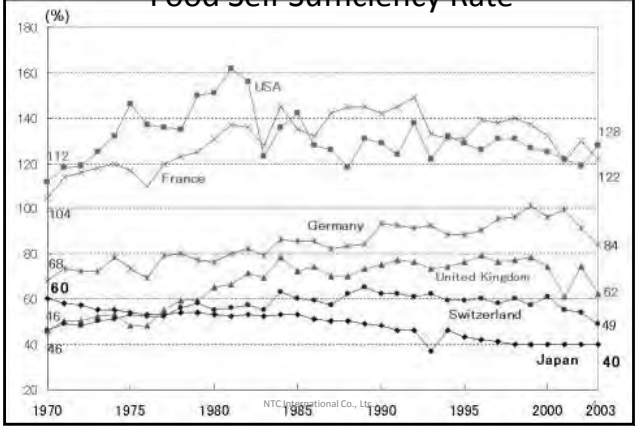
① The cultivated areas account for about 5.2 million ha in 1990, which figure has declined by 13% since 1960.
② Paddy cultivation is the main feature of the agriculture in Japan.
③ Farming scale is considerably small at 1.2ha/household on average.
④ The 80% of total farming households are part-time or side-work farming households.
⑤ Japan has become the biggest country in the imports of agricultural products and its calorie self-sufficiency has declined from 79% in 1960 to 46% in 1990.

Trend of self-sufficiency ratio in calorie-supply base



(source : Food consumption statistics, OECD)

Food Self Sufficiency Rate



Agricultural and Rural Development Project in Japan

Objectives

The objectives of this Project are to increase agricultural productivity, to accelerate the reorganization of agricultural production according to the tendency of demand, enlargement of farm management and the promotion of securing and training of next generations devoted to agriculture. The Project is also aimed at promoting the improvement of the rural living environment together with conservation and management of the farmlands and villages.

The major objectives of this Project can be identified in the following three categories.

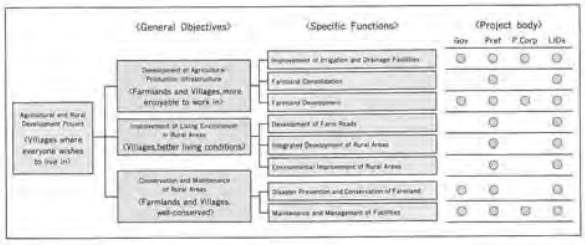
1) 〈Farmlands and Villages, more enjoyable to work in〉 within the framework of "Development of Agricultural Production Infrastructure"
Agricultural production infrastructures are improved and provided to secure the farmland and water resources necessary for agricultural production and to increase the agricultural productivity.

2) 〈Villages, better living conditions〉 within the framework of "Improvement of Living Environment in Rural Areas"
Living conditions together with production infrastructures are improved for creation of a beautiful and comfortable village.

3) 〈Farmlands and Villages, well-conserved〉 within the framework of "Conservation and Maintenance of Rural Areas"
To maintain the stable agricultural production and to protect the life and property of the villagers, the Project is aimed at providing facilities for the prevention of farmland disaster and conservation of agricultural facilities.

Classification of the Project

The Project is classified by the above-mentioned three objectives. The Project is implemented by bodies such as the government, prefectures, public corporations, municipalities and Land Improvement Districts (LIDs) in accordance with the scale and objectives of each project. The relationship of classification and project bodies are shown below.



Major Projects

① Irrigation and Drainage Project

This project is to improve water resource facilities and irrigation/drainage facilities such as dams, head works, pump stations, barrages and irrigation/drainage canals for development of water resources in agricultural use and promotion of rationalization of various water uses.

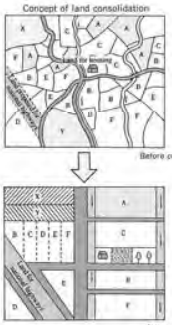
Chikugo barrage (Fukuoka pref.)

Agigawa dam (Kiso river system)

② Farmland Consolidation Project

This project is to secure fine farmlands collectively through the application of the substitute lot method (including transfer of land ownership within the project area) for stabilization of agricultural income with reduction of production cost and systematization of land use. Furthermore, the recent target has shifted to promote extra large scale land consolidation (several hectares) in view of the establishment of low-cost paddy production.

Concept of land consolidation



Land consolidation plot of 30 a (upper)

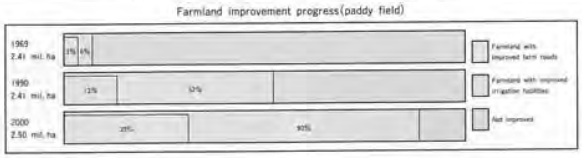
Large scale land consolidation plot (lower)

Farmland Reclamation and Development Project

③ Farmland Reclamation and Development Project

This project is not only to enlarge farmlands but also to improve synthetically developed and less developed farmlands together with the creation of non-farm public area by land consolidation. This contributes toward social development in rural areas.

Farmland improvement progress (paddy field)



Farm Road Improvement Project

④ Farm Road Improvement Project

This project is to improve farm roads for efficient transportation of agricultural machinery and inputs and products between village and farmland or market. Moreover, it is focused as a helping maneuver to promote 'Rural Tourism' making the most of the characteristics of rural areas.

Village Sewerage Project

⑤ Village Sewerage Project

This project is to treat waste water generated at village level by means of small-size decentralized system in one or several rural communities for conservation of water environment. The target of this project is to achieve improvement of the facilities in the rural communities of 45% (13 million inhabitants) till the year 2000.

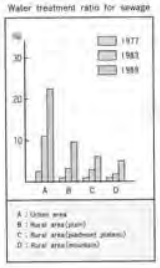
Rural communities

Item	Rural community (×1,000)	Household (×1,000)	Population (×1,000)	Percentage of the farmland (%)	Household per rural community (person)
Total numbers of rural communities	142.4	16,419	67,230	28.0	115
Rural communities in agricultural production areas	121.7	9,384	36,430	42.1	77
Target numbers of rural communities covered by the Project	113.7	7,249	29,690	50.9	64

Actual performance and target of the Village Sewerage Project

Year	~1990	1991	1995	2000	Total
Percentage of the improvement (%)	1	2	10	45	100
Target numbers of rural communities	1,200	2,100	9,800	41,700	137,000
Target numbers of beneficial inhabitants (×1,000)	330	570	2,700	13,090	31,170

Water treatment ratio for sewage



Integrated Rural Development Project

⑥ Integrated Rural Development Project

This project is to promote integrated infrastructure development for both agricultural production and living environment. A large number of project menus are included in this project. The Rural Water Environment Project, one of the menus, is focused on the space utilization of water front beside irrigation facilities such as dams, canals and reservoirs for creation of rural landscape and living amenities.

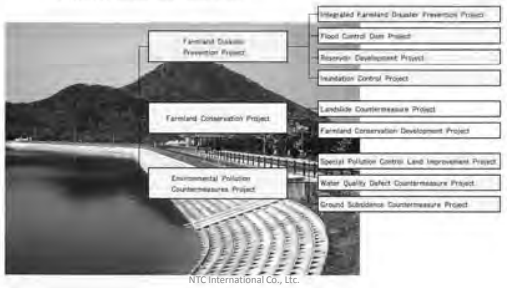
Kora district (Shiga pref.)

NTC International Co., Ltc. Space in water front

Disaster Prevention and Conservation Project for Farmland

⑦ Disaster Prevention and Conservation Project of Farmland

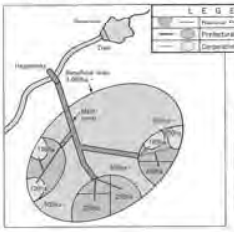
This project is to protect the farmlands or agricultural facilities from natural disasters and to stabilize the agricultural production and farm management. It is also important from the viewpoint of national land conservation.



Project Body

4 Project Body

The Agricultural and Rural Development Project has various characteristics or targets according to the project scale, the technical level and the publicity, and is implemented by a combination of several project bodies formed by the government, prefectures, corporations (municipalities and LIDs). Furthermore, the irrigation and drainage projects based on Water Resources Development Basic Plan and the large-scale farmland development projects are implemented by Water Resources Development Corporation and Japan Agricultural Land Development Agency, respectively. The typical project implementing model by a combination of project bodies is mentioned as follows:



Project body	Beneficial area (ha)	Terminal Management area (ha)
Government	3,000 ≦	~500
Prefecture	200 ≦	~100
Corporation	20 ≦	~5

Land Improvement District (LID):
Made up of 15 or more farmers according to the Land Improvement Act. LID is established as a farmers' organization for land improvement projects. LIDs in 1991 numbered 8,240 districts, 3.6 million ha and 5.2 million members. The main affairs are not only to act as the project body for small scale project but also to operate, maintain and manage agricultural facilities and to collect water fees.

Subsidy System for Agricultural and Rural Development Project

The subsidy system by the government or prefectures is stipulated in detail and the conditions are as follows.

Subsidy System for the Agricultural and Rural Development Project

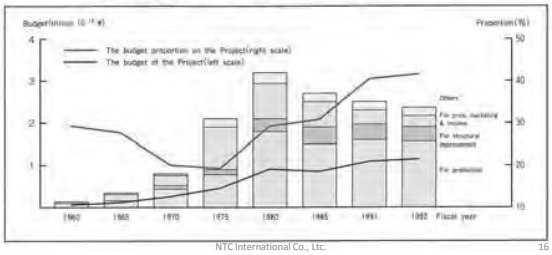
Project category	Project body	Beneficial area	Cost sharing(%) Gov. (subsidy)	Pref. (subsidy)	Beneficiary	Condition of loans Return rate	Redemption term
Irrigation and drainage project	Gov. Pref. Corp.	3,000ha ≦ 200ha ≦ 20ha ≦	2/3, 70 50 45	(rest of subsidies) 25 2~10	 25 55~45	5% •Conform to national project •Decided by corporations	15(3) years
Farmland consolidation project	Pref. Corp.	60ha ≦ 20ha ≦	45 45	(rest of subsidies) (rest of subsidies)		5% •Decided by corporations	approx. 15years
Farmland development project	Gov. Pref. Corp.	800ha ≦ 40ha ≦ 40ha ≦	70~60 50 50	(rest of subsidies) (rest of subsidies) (rest of subsidies)		5% •Conform to national project •Decided by corporations	15(3) years
Farmland improvement project	Pref. Corp.	50ha ≦ 20ha ≦	45~50 45	(rest of subsidies) (rest of subsidies)		approx. 5% •Decided by corporations	approx. 15years
Village sewerage project	Pref. Corp.	approx. 20 households ≦	50 50	(rest of subsidies) (rest of subsidies)		approx. 5% •Decided by corporations	approx. 15years
Disaster prevention and conservation project of farmland	Gov. Pref. Corp.	3,000ha ≦ 100ha ≦ 40ha ≦	2/3 50~55 55~60	(rest of subsidies) (rest of subsidies) (rest of subsidies)		5% •Conform to national project •Decided by corporations	17(2) years
Land improvement facilities operations and maintenance project	Gov. Pref. Corp.	Based on other standards	55 40 30	(rest of subsidies) (rest of subsidies) 30	 40	•Based on other standards	

( ) : Grace period

Budget Tendency

The governmental budget in the agriculture sector has been increasing yearly until 1980 but is diminishing recently. On the other hand, the importance of the Agricultural and Rural Development Project has been recognized, and its percentage within the overall agricultural budget has an increasing tendency.

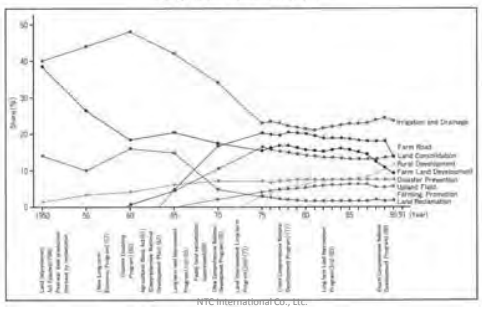
Changes of the budget proportion on the Agricultural and Rural Development Project



Changes in Budget share

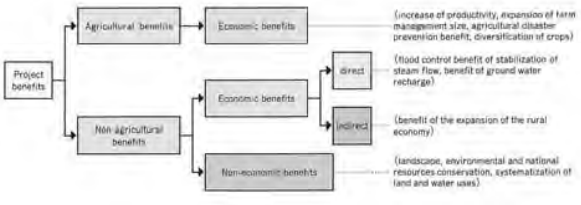
The Agricultural and Rural Development Project has been diversified to meet the needs of the times and the breakdown of budget have been changing too. Recently, the budget for environmental improvement in rural area has rapidly increased.

Changes in the share of various projects



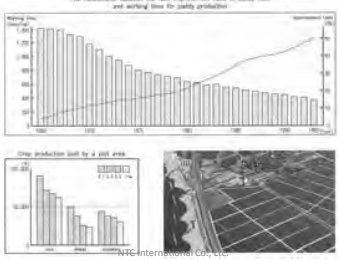
Effects of Agricultural Development Project

1 Effects Achieved by the Project



Improvement of Agricultural Production Infrastructure

2 Improvement of Agricultural Production Infrastructure



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Operation, Maintenance and Management of Agricultural Facilities

The system of the operation, maintenance and management of agricultural facilities after completion of the project is divided into three forms i.e., ①trust, ②transfer and ③direct management, and is determined from the characteristic, scale and social conditions of the project. In general, the operation, maintenance and management of the agricultural facilities are done by LIDs. From the viewpoint of perspective of self reliance and long term operation and management, LIDs collect systematically water fees from the members as well as operate, maintain and repair the facilities.

① Management by Trust
In case the direct maintenance by those who live in the district is more rational and appropriate, the maintenance is entrusted to the prefectures or the corporations by the project body.

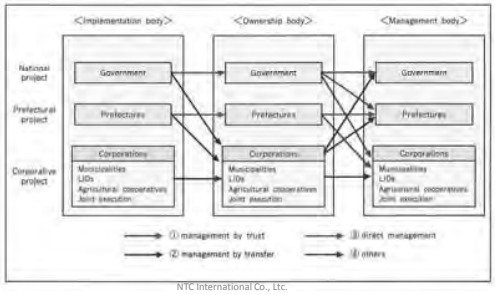
② Management by Transfer
In case entrusting the maintenance autonomously to the direct users such as LID is anticipated to be more appropriate, the property rights of the facilities are transferred to the LID and operation, maintenance and management are carried out by LID.

③ Direct management
Restricted to large-scale facilities such as dams and head works, the project body makes direct management based on a request of the users.

NTC International Co., Ltc. 20

Organization of Project Implementation to Maintenance

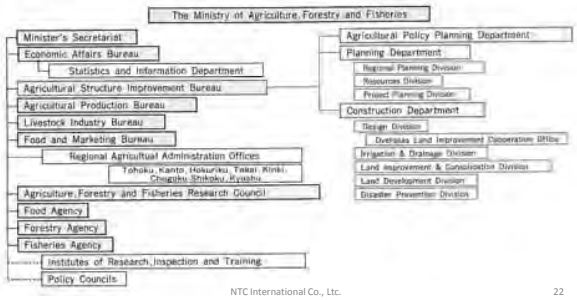
The relationship of the implementation body, ownership body and management body of the project is as follows:



NTC International Co., Ltc. 21

MAFF Organization Chart

1 Organization Chart of MAFF



NTC International Co., Ltc. 22

NTC International Co., Ltc. 23

Underground Dam

① Technological Development

Drilling for construction of cutoff wall — Pumping groundwater in aquifer stored by cutoff wall

Sub-surface dam

NTC International Co., Ltc. 24

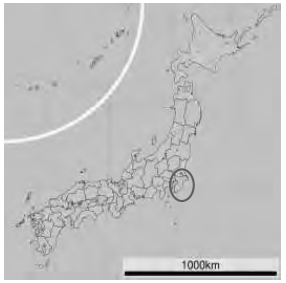
Irrigation Water Management by a Land Improvement District

Ryoso Land Improvement District

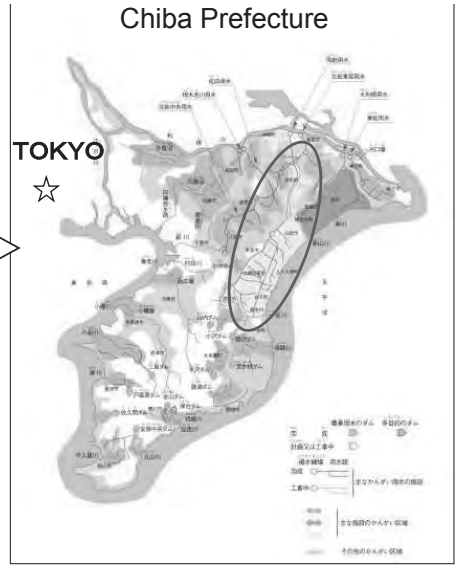
Ryoji Koyasu

Location of the Ryoso Land Improvement District

Japan

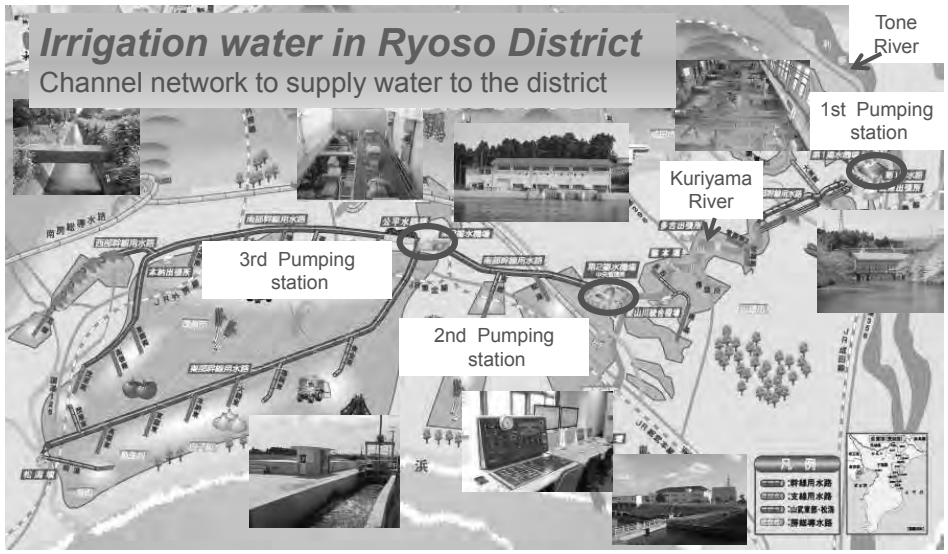


Chiba Prefecture



Beneficiary areas
Related municipalities: 7 cities, 6towns, and 1 village
Paddy fields : 13,380ha
Upland fields : 4,233ha
Total : 17,613ha
Number of members : 21,230
(as of April 1, 2013)

Water supply system



Organization chart

Member

Opinions of members are collected in each village community and area

General Assembly

Fixed number of representatives: 201

Executive board

・Fixed number of board members: 21

Administrative committee

・Fixed number of committee members: 15

Managing committee

・3 construction areas

Engineering Committee

・19 branches and one land improvement district

Audit committee

Fixed number of committee members: 4

Secretariat

General affairs division

Research administration division

Sawara branch

Tako branch

Togane branch

Honno branch

Flow of decision making

- Opinions expressed in each village community are collected at each area meeting. Representatives selected from each area make decisions at a general meeting.

- Decisions made at a general meeting are transmitted to members through each area or community meeting.

Community level meeting

Opinions and requests

Report and notification

Zonal meeting

Report and notification

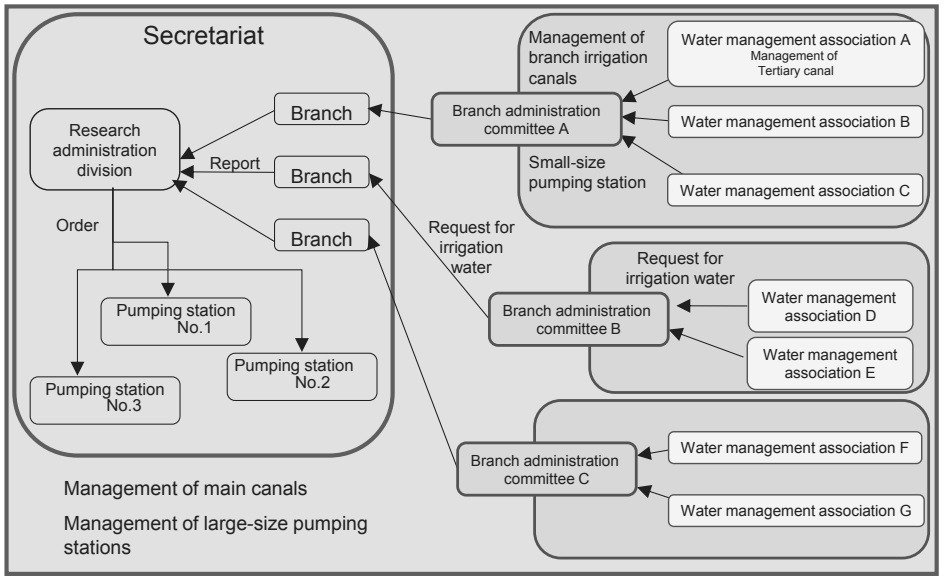
Opinions and requests

General Assembly

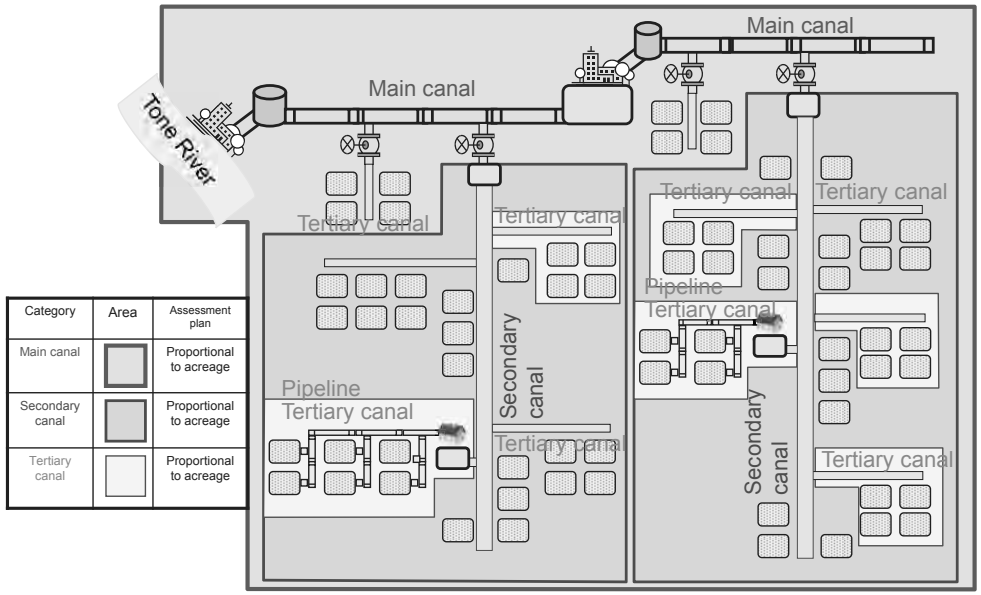
Services of the Ryoso Land Improvement District

- Coordination of water supplies
- O&M of facilities
- Coordination among administrative organs
- Collection of the assessment
- Instruction and supervision of branch committees' lower organizations

Coordination of water supplies



Facility zoning



O&M of facilities (daily management)

O&M work includes monitoring of facility functions, maintenance of security, facility operations, reporting at the time of flooding, patrolling, alarm handling, flood countermeasures, weeding on the premises, and cleaning. It aims to ensure a safe and secure water supply.

Monitoring of functions of a main canal

Operation of a separation inlet

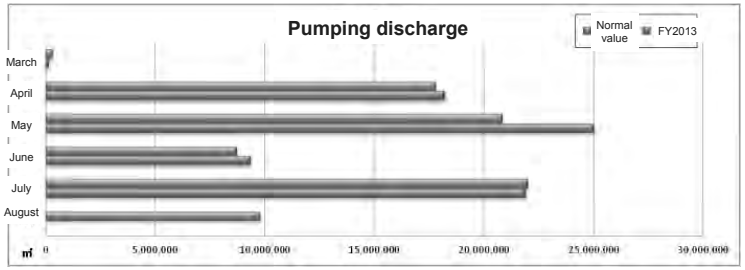
Monitoring of functions of a pumping station

Operation of a pump

Managing committee meetings

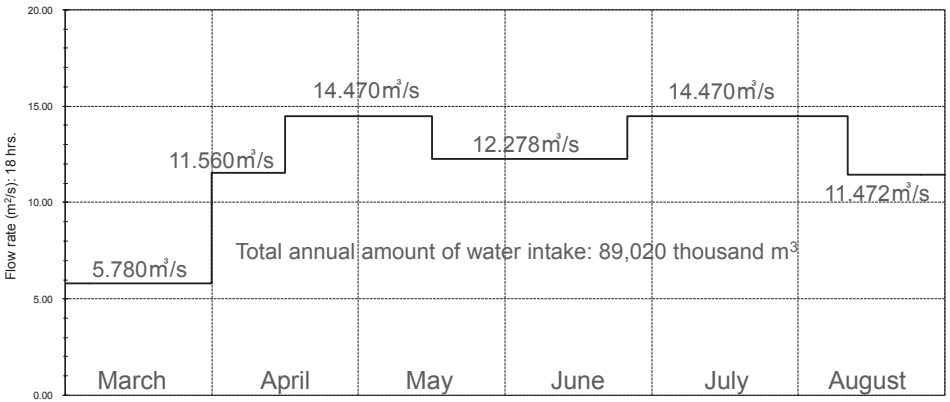
In order to adjust the water supplement plan and water intake, and discuss drought control measures (restrictions on water intake), the Ryoso Land Improvement District has established an administration committee for coordination within the land improvement district.

Managing committee



Materials for the managing committee: The committee discusses various matters, including the water-intake volume, water intake period, mid-term drying period, and water intake stop date, by comparing with the average water intake in usual years.

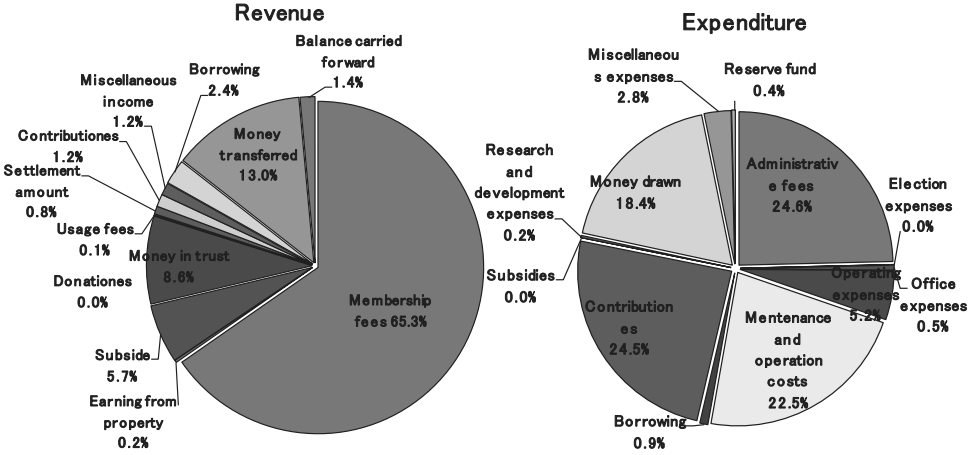
Coordination among administrative organs



● When the water right is renewed or when the water volume permitted under the right to take water may be used up, the Ministry of Agriculture, Forestry and Fisheries, Chiba Prefecture, and the Ryoso Land Improvement District coordinate response through trilateral dialogues, and then the Ministry of Agriculture, Forestry and Fisheries consults with the Ministry of Land, Infrastructure, Transport and Tourism.

Collection of the assessment

General account revenue and expenditure budget for FY2013



The collection rate of membership fees is about 98%.

The amounts of both income and expenditure are 1,039,168,969 yen.

For proper water management

Due to the mixture of new settlers and old inhabitants together with urbanization, non-farmers account for a higher proportion of the population than before. Therefore, it is necessary to make the general public aware of the importance of water for agricultural use.

- Install a screen in a canal to prevent dirt from flowing down the canal.
- Conduct water quality tests periodically, and widely publicize the results.
- Make efforts to familiarize the public with activities conducted by the Ryoso Land Improvement District by utilizing school education and on-site visits.

Periodic water quality tests

Description of the Ryoso Land Improvement District in school textbooks

Facility inspection tour for children

Kohei Aqueduct Bridge (Togane City)

THE PROJECT ON
IRRIGATION SCHEME DEVELOPMENT IN CENTRAL AND EASTERN UGANDA
(PISD)

Training for Project Management System

- DATE : 23rd 24th October 2014
- PLACE : City Royal Hotel

NTC INTERNATIONAL CO., LTD
IRRIGATION ADOVISOR /MAAIF
UNDER JICA ASSISTANCE

1

Contents

1. Proposed Demarcation of Irrigation Development in Wetland Area
2. Agriculture in Japan and Type of Project Management System
3. World Atlas of Irrigated Agriculture for Sustainability Science (WAIASS)
4. Land Improvement Law and Roles of WUA (LID) and Establishment and Registration of Water Users Association (WUA)
5. Operation and Maintenance of irrigation systems in Tanzania

2

Time schedule

Time	Contents	Lecturer
10:00	Review of Yesterday	Mr.Negishi
10:10	**Lecture 3:** World Atlas of Irrigated Agriculture for Sustainability Science (WAIASS)	Mr.T.Kobayashi
11:00	Coffee break	
11:30	**Lecture 4**: Land Improvement Law and Roles of WUA (LID) and Establishment and Registration of Water Users Association (WUA)	Mr.T.Kobayashi
13:00	Lunch break	
14:00	**Lecture 4**: Discussion for how to Apply Registration System in Ugandan Water Users Association	Mr.T.Kobayashi
14:30	**Lecture 5**: Operation and Maintenance of irrigation systems in Tanzania	Mr.K.Sato
16:30	Review of training activity and Comment from participants	
17:00	Closing remark and Issuance of Completion Certificate	Mr.Negishi

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Review of Yesterday

Lecture1
Lecture2

4

Review of Yesterday

- Proposed Demarcation of Irrigation Development in Wetland Area
  - Protection Dike to identify the boundary between protection zone and development area
  - Demarcation for 10 candidate sites
- Agriculture in Japan and Type of Project Management System
  - Project Type
  - Project Body

5

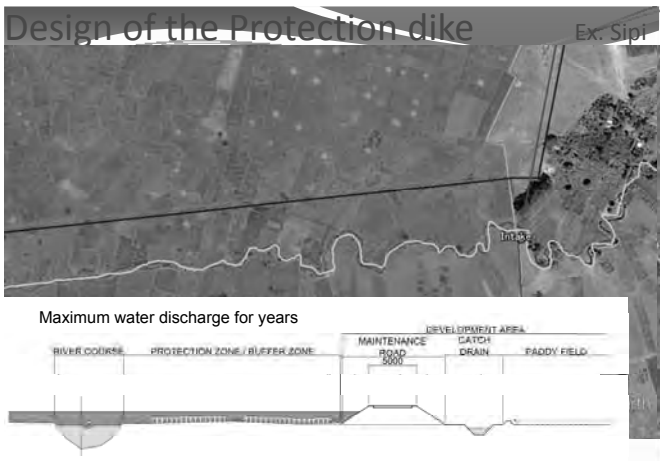
Zoning

Ex. Bulo site

6

Design of the Protection dike

Ex. Sipi



Maximum water discharge for years

Classification of the project

- Development of Agricultural Production Infrastructure
- Development of Rural Areas
- Conservation and Maintenance of Rural Areas

Basic cost-sharing for Irrigation & Drainage Project

	National MAFF	Prefecture	Municipality	Farmers LID
Large scale > 3000 ha	66.6	17.0	6.0	10.4
Medium, small scale	50.0	25.0	10.0	15.0
Putting otherwise in Uganda	MAAIF	District	-	WUA

8

Project Body

Ex. National Project

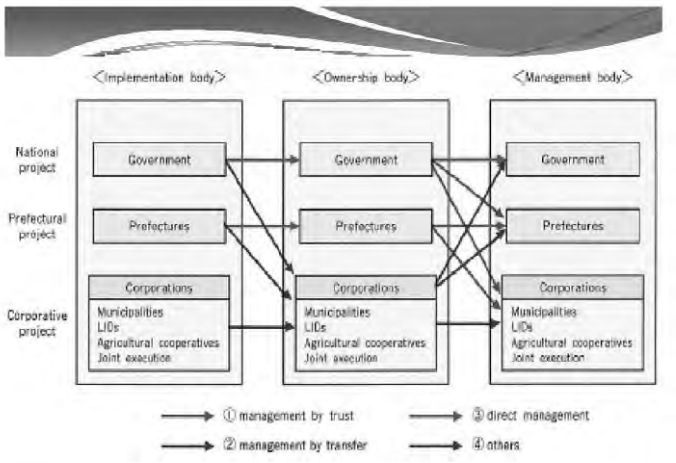
Implementation Body	Ownership Body	Management Body
MAFF	MAFF	MAFF
Prefecture/District	Prefecture/District	Prefecture/District
Cooperatin - LID (WUA) - Agricultural Cooperative…	Cooperatin - LID (WUA) - Agricultural Cooperative…	Cooperatin - LID (WUA) - Agricultural Cooperative…

9

Lecture 3

World Atlas of Irrigated Agriculture for Sustainability Science (WAIASS)

10



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Land Improvement Districts

February 22, 2007

Land Improvement Planning Division, Rural Development Bureau
Hisashi Hasegawa

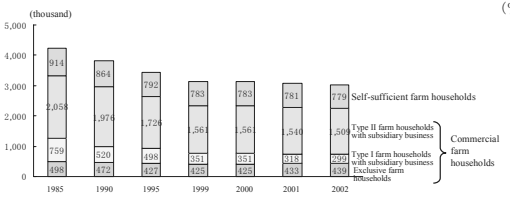
Contents

I. Circumstances of Rural Villages

1. Change in rural communities

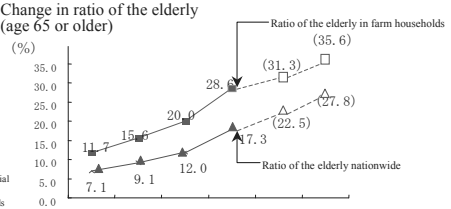
- While the number of farm households is decreasing, the number of persons who newly engage in agriculture is showing an increasing tendency.
- Aging of the population of farm households has been progressing, and the rate of the elderly is about 30%.
- Urbanization and mixed residence are progressing in agricultural communities, and 60% of communities have farm household rates of 50% or less.

○Change in numbers of farm households



Data: Ministry of Agriculture, Forestry and Fisheries, "Agricultural Census"

○ Change in ratio of the elderly (age 65 or older)

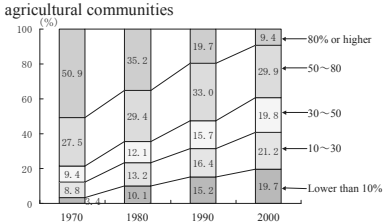


Data: Ministry of Agriculture, Forestry and Fisheries, "Agricultural Census"; Ministry of Public Management, Home Affairs, Posts and Telecommunications, "National Census"; National Institute of Population and Social Security Research, "Estimated Population of Japan for the Future" (Jan. 2002)
Note: The ratio of the elderly is the ratio of persons of age 65 or older, and figures in parentheses indicate estimated figures.

○Change in numbers of persons who newly engage in agriculture

Data: Ministry of Agriculture, Forestry and Fisheries, "Agricultural Census," "Agricultural Structure Dynamic Survey"
Notes:
1) The number of young persons who newly engage in agriculture is the total of new graduates who newly engage in agriculture, and persons who left a job and newly engage in agriculture at age 39 or younger.
2) New graduates who newly engage in agriculture are persons who engage mainly in independent agriculture from among new graduates. The numbers are for all farm households for 1990, and for commercial farm households for 2000.
3) People who left a job and newly engage in agriculture are persons whose employment state changed due to leaving a job from "mainly working for a company" to "mainly agriculture (regardless of living in the same house, or "U turn").

○ Change in composition by the ratio of farm households in agricultural communities

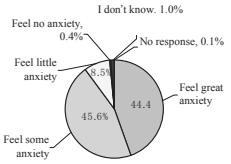


Data: Ministry of Agriculture, Forestry and Fisheries, "Agricultural Census"
Note: Agricultural communities are regional societies that are formed based on agriculture in some parts of municipality areas.

2. Change in the national consciousness

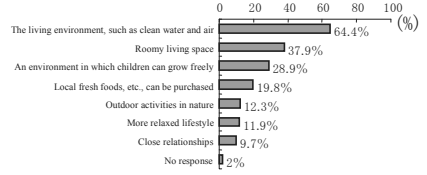
- While agricultural land, which is a foundation of domestic agricultural production, is decreasing, about 90% of consumers have anxiety about the food supply, and interest in food safety and security has been recently increasing.
- Urban residents highly evaluate rich nature, beautiful scenery, and a healthy living environment in rural villages. They also strongly recognize that nature gives peace of mind and relaxation, and it is good for children's growth and learning.

○Consumers' consciousness about the food supply



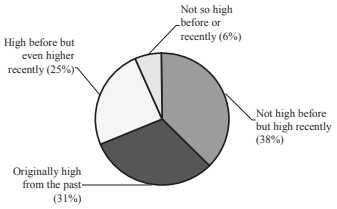
Data: Ministry of Agriculture, Forestry and Fisheries, "Survey on Consciousness and Ideas on the Food Self-Sufficiency Ratio Target" (Feb. 2004)
Note: The results of this survey are from a questionnaire survey of 1,480 persons who provided consumption information, among the results of a survey conducted on farmers and persons who cooperated in providing consumption information (collection rate, 87.4%).

○Attractiveness of rural villages that urban residents feel



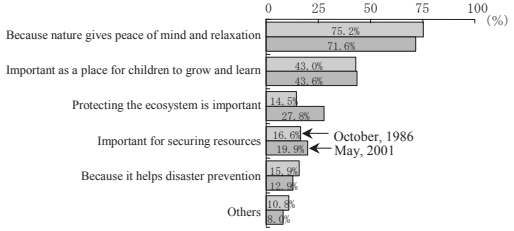
Data: Nippon Agricultural Research Institute, "Survey on Ideas of Urban Residents and Farmers on Coexistence, Interaction, etc., between Cities and Rural Villages" (2002)
Note: Results of a questionnaire survey of 1,500 persons who live in the urban areas of Tokyo and three other prefectures in Kanto

○Degree of consumers' interest in food safety



Data: Agriculture Forestry and Fisheries Finance Corporation, "Survey on Consumer Trends, etc." (survey conducted in Nov. and Dec. 2000)
Note: Results of a mail survey of 2,300 households that reside in prefectural capitals, except for Okinawa prefecture (collection rate, 35.0%)

○Reasons protection of nature is necessary



Data: Cabinet Office, "Survey on Public Opinion on Protection and Use of Nature" (surveyed in May 2001)

II. Land Improvement Districts

1. Land improvement districts and "'water' (agricultural water) and 'land' (agricultural land)"

○ In the Food, Agriculture, Rural Village Basic Law, "securing necessary agricultural land and agricultural water" (Article 4), "promotion of rural villages" (Article 5), and "effective use of agricultural land and agricultural water" (Articles 23 and 24) are provided. Land improvement districts are public organizations that manage "water" and "land," which are regional resources, through developing agricultural land and managing agricultural irrigation facilities, while possessing abundant experience and knowledge in water use management, agricultural land use adjustment, etc.

<Ideas of the new basic law>

(1) Securing stable food supply
- Appropriate combination of import and reserve, with the basic aim to increase domestic agricultural production
- Food security in the event of an emergency
- Stable supply of good-quality foods at reasonable prices

(2) Displaying multifaceted functions
- Protection of national land, cultivation of water sources, protection of the natural environment, formation of favorable scenery, passing on culture, etc.

(3) Sustainable development of domestic agriculture
- Securing production elements, such as agricultural land, water, and farmers, and establishment of a desirable agricultural structure
- Maintenance and promotion of natural circulation functions

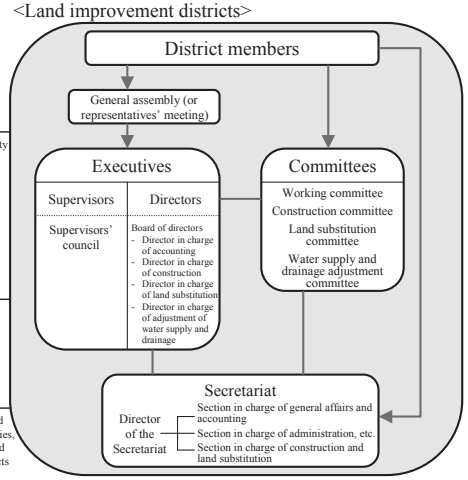
(4) Promotion of rural villages
As foundations for agricultural development
- Establishment of production conditions for agriculture
- Improvement of welfare, such as improvement of the living environment

Community service water

Agricultural land and agricultural water

Management of land improvement facilities, and agricultural field improvement projects

<Land improvement districts>



Activities of Land Improvement Districts

Representative's meeting (the top decision-making body)

Board of directors

Dry field irrigation

Cleaning of water channels, with participation by local residents

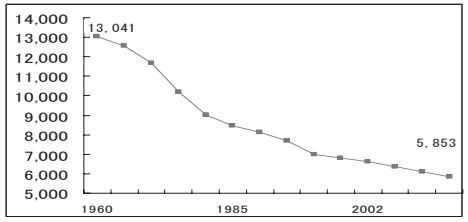
2. Positioning of land improvement districts in the Land Improvement Law

○ Land improvement districts are farmers' organizations established through approval of respective prefectures' governors, based on the provisions of the Land Improvement Law (established in 1949), for the purpose of implementing construction, improvement, and management of agricultural irrigation facilities, and land improvement projects, such as land readjustment, in a certain region.

<Procedures until establishment of a land improvement district>

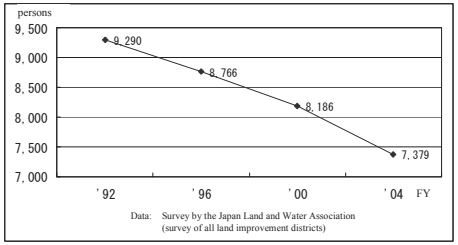
Farmers' proposal
↓
Preparation of a plan outline
↓
Acquiring consent by a two-thirds margin
↓
Preparation of a plan
↓
Application / decision on appropriateness / inappropriateness
↓
Lodging of objections
↓
Approval
↓
Implementation of construction
↓
Facility management

<Change in numbers of land improvement districts>



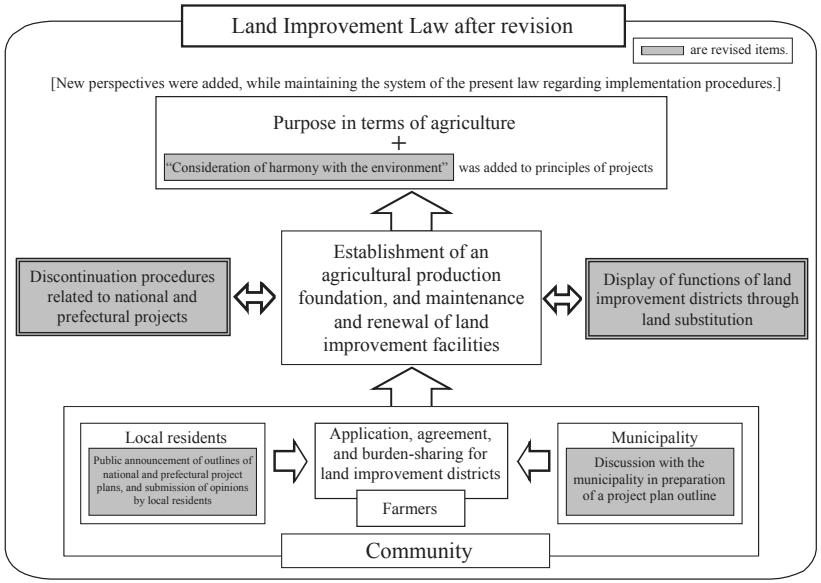
Data: Survey on the State of Establishment, etc., of Land Improvement Districts

<Change in numbers of full-time personnel of land improvement districts>



Data: Survey by the Japan Land and Water Association (survey of all land improvement districts)

○ The Land Improvement Law was partially revised, regarding "consideration of harmony with the environment in project implementation," "establishment of project plans based on the region's intention," etc., in 2001, in response to the change of circumstances surrounding land improvement projects.



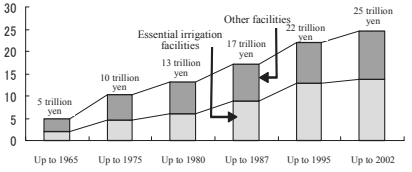
III. Present States of Water (Agricultural Water) and Land (Agricultural Land) Managed by Land Improvement Districts

1. Present state of water (agricultural water)

(1) Stock of agricultural irrigation facilities

○ Stock of agricultural irrigation facilities, including essential agricultural irrigation and drainage channels extending 45,000 km nationwide, represents national assets totaling 25 trillion yen. These facilities form food supply foundations, and also cultivate clean water and rich nature in rural regions.

● Change in stock formation of agricultural irrigation facilities



Note) Assessment based on reconstruction cost for agricultural irrigation facilities. Essential irrigation facilities are agricultural irrigation facilities that benefit areas of 100 ha or more.

● Essential agricultural irrigation and drainage channels in Japan

Classification	Extension
Essential agricultural irrigation and drainage channels	About 45,000 km

Note) Essential agricultural irrigation and drainage channels are water channels with terminal coverage areas of 100 ha (20 times the size of Tokyo Dome) or more.

(Reference)

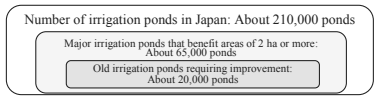
General national roads	21,441km
First-grade rivers	10,541km
Railways	20,059km

Sources) Construction Ministry's Road Bureau, "Road Pocketbook 2000" (March 1999) for general roads
Construction Ministry's River Bureau, "River Handbook 2000" (Apr. 1999) for rivers
Transport Ministry's Railway Bureau, "Railway 2000" (2000) for railways

○Present state of irrigation ponds

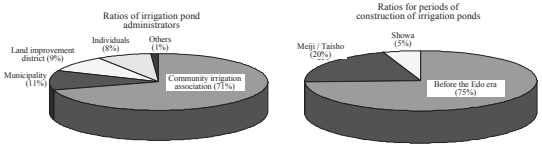
○Seventy percent of major irrigation ponds are managed mainly by communities and irrigation associations.
○In Japan, many irrigation ponds have been built to secure agricultural water since even before the Edo Era, and they are scattered at 210,000 places nationwide.
○Also, irrigation ponds are valuable assets preserving the rich natural environment, through displaying multifaceted functions, including protection of ecosystems and formation of favorable scenery. In recent years, various efforts to protect and use irrigation ponds, also involving participation by urban residents, etc., have begun.

○Old irrigation ponds requiring improvement



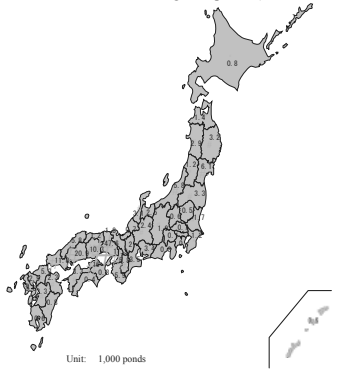
Data: Ministry of Agriculture, Forestry and Fisheries, "Survey on the Quantity of Long-Term Disaster Prevention Projects" (March 1997)

○Ratio of irrigation pond administrators



Data: Ministry of Agriculture, Forestry and Fisheries, "Survey on the Quantity of Long-Term Disaster Prevention Projects" (March 1989)
Data on about 65,000 irrigation ponds that benefit areas of 2 ha or more

○National distribution of irrigation ponds (about 210,000 ponds)



Unit: 1,000 ponds

Data: Ministry of Agriculture, Forestry and Fisheries, "Survey on the Quantity of Long-Term Disaster Prevention Projects" (March 1997)

○Maintenance of irrigation ponds to display multifaceted functions

In Nagaike (K town, O prefecture), local residents cooperate in picking up trash and weeds, to make irrigation ponds into oases of water and greenery in the urban region.

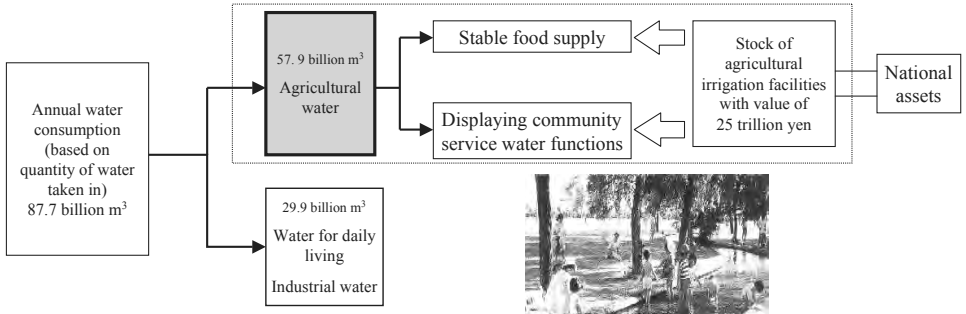
Formation of valuable waterside space for urban residents

As part of regional general study, children pick up trash at an irrigation pond, to make irrigation ponds clean.

(2) Formation of agricultural irrigation facilities and sustainable agricultural production activities

○ Since rice cultivation was introduced to Japan, agricultural irrigation facilities have been established, at great effort, in various places.
Today, about 58 billion tons, which is two-thirds of Japan's annual water consumption, is used as agricultural water.
○ In Japan, regional and wide-area water circulation has been formed, centered on agricultural irrigation channels, through repeated use of water, the water purification and underground water cultivation functions of paddy fields and water channels, etc.; and, sustainable agricultural production with a low environment burden has been conducted.

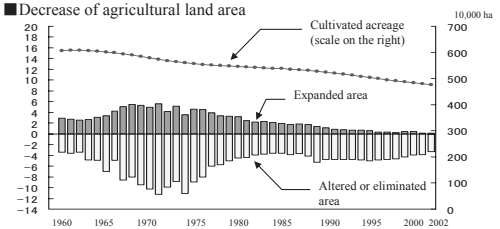
○Annual consumption of agricultural water



2. Present state of land (agricultural land)

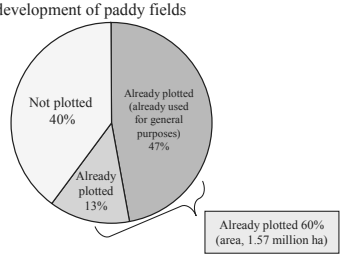
○The area of agricultural land, such as paddy fields and dry fields, decreased yearly from a peak of 6.09 million ha in 1961, to be 4.76 million ha in 2002.
○About 60% of paddy fields are plotted lots of about 30 ha or larger each, out of the nationwide total paddy area of 2.62 million. Among dry fields totaling 2.16 million ha, about 70% is agricultural land directly connected to farm roads, and about 20% is dry fields where water is supplied.

■Decrease of agricultural land area



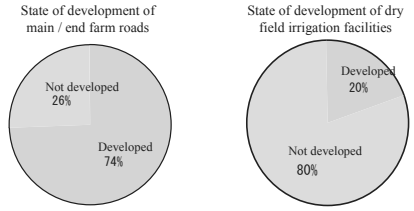
Data: Ministry of Agriculture, Forestry and Fisheries, "Survey on Cultivated Acreage and Planted Acreage"
Note: Numbers from August 1 last year to July 31 this year for expanded / altered or eliminated areas

■State of development of paddy fields



Data: Ministry of Agriculture, Forestry and Fisheries, "Statistics on Cultivated Acreage and Planted Acreage" (as of July 15, 2002)
"Third Basic Survey on Establishment of the Land Use Foundation" (1993), "Statistics on Agricultural Land Construction Work" (1993 to 2002)

■State of development of dry fields



Data: Ministry of Agriculture, Forestry and Fisheries, "Statistics on Cultivated Acreage and Planted Acreage" (as of July 15, 2002)
"Basic Survey of Establishment of the Land Use Foundation," "Statistics on Agricultural Land Construction Work"

(Reference) Efforts of the 21st Land Improvement District Creation Movement

○Since 2001, the 21st Land Improvement District Creation Movement has been promoted through combined efforts, based on a common recognition of land improvement-related personnel, aiming to aggressively play new roles for land improvement districts, which roles national citizens expect.

○The nickname of land improvement districts was decided to be "Midori Net," selected from over 20,000 suggestions publicly solicited nationwide, in fiscal 2002.

○21st Land Improvement District Creation Movement

Background

○Depopulation, urbanization, etc., of rural villages are causing problems in operating land improvement districts

○The roles of land improvement districts are even more important than before.

○Much is expected from development of land improvement districts' activities in response to the new age.

Concept

○Each land improvement district is the leading character.

○It is important for all land improvement districts to advance toward their goals, according to their respective scales and activity states.

○Combined efforts should be made to aggressively play the new roles expected by national citizens, as a common recognition of land improvement-related personnel.

○Meaning of "Midori Net"

"Mi" represents "Water": Agricultural water, community service water, etc.

"Do" represents "Land": Land, agricultural land, soil, etc.

"Ri" represents "Homeland": Rural space. Living space where farmers and local residents are integrated, etc."

"Midori": Means a rich natural environment and beautiful scenery, and expresses a clean image, such as clean water and clean air.

"Midori Net": Implies the following meanings, and expresses the roles and image of land improvement districts toward the future.

○ **A water channel network equivalent to the distance of ten trips around the earth (Water Net)**

Land improvement districts are in charge of building a foundation for safe and secure foods and agriculture, by forming sound water circulation for rural villages and providing water to agricultural land, through a network of water channels, etc., that extend 0.4 million km nationwide, which foundation is also the basis of beautiful rural villages, which are assets common to all national citizens.

○ **Network for resources circulation (Land Net)**

To tackle construction of a recycling-oriented society, through circulation of resources, by recycling of waste, such as using organic resources generated in rural villages (wastewater and sewage from communities) for agricultural land.

○ **Network of farmers, local residents, etc. (Homeland Net)**

To promote coexistence of and interaction between cities and rural villages, by creating "Water," "Land," and "Homeland," through collaboration (network) with not only farmers but also local residents and urban residents, via connection of people, things, and information.

(Efforts in and results of the 21st Land Improvement District Creation Movement)

Midori Net Saga Land (Saga prefecture)

○ Large-scale cleaning of main water channels by farmers, which began in 1967
○ Large-scale cleaning of fiscal 2002 involved participation by 5,000 residents, including 2,000 non-farmers, through collaboration with administration, etc.

Midori Net Asuwa River Dam Association (Fukui prefecture)

○ Creation of biotope using agricultural water through combined efforts of schools, the residents' association, and an NPO.
○ Experience of agriculture and the natural environment, through stocking and observation of animals and plants in general study at elementary schools.

Midori Net Ohkiku (Kumamoto prefecture)

○ Surface water of Aso penetrates into the downstream paddy field zone, and it has been used as drinking water in Kumamoto city.
○ As a result of appealing the underground water cultivation function of paddy fields, through initiative by Midori Net, which manages water for paddy fields, Kumamoto city, located downstream, decided to support farmers who put water in paddy fields.

Midori Net Tachibai Water (Mie prefecture)

○ Midori Net takes initiative in promoting community improvement, through collaboration with administration, the commerce and industry association, tourist agencies, JA, etc.

IV. Roles of Land Improvement Districts

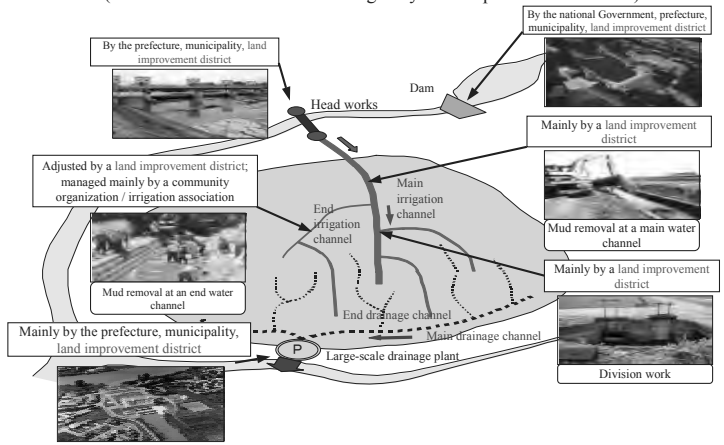
1. Management of water (agricultural water)

(1) Management of land improvement facilities

1) Facilities managed by land improvement districts

○ Land improvement districts conduct detailed management, such as operation of dams, irrigation ponds, head works, pumping plants, irrigation channels, etc., to stably supply agricultural water to paddy rice and field crops.

(An aerial view of facilities managed by land improvement districts)



2) State of maintenance of agricultural irrigation facilities

○Most of agricultural irrigation facilities, such as agricultural irrigation and drainage channels, are managed by land improvement districts, etc., composed of agricultural irrigation users (farmers).

●Management of agricultural irrigation facilities

Land improvement districts manage over 60% of essential government-built facilities.

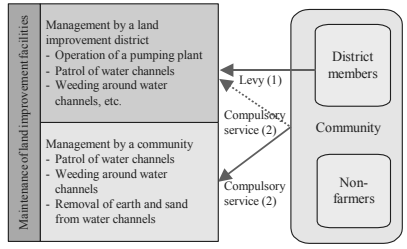
Numbers of government-built facilities according to managing entities (the end of fiscal 2004)

Managing entity	Essential facilities		Agricultural irrigation and drainage	
	No. of facilities	Ratio	Extension	Ratio
National Government	20	1.2 %	94 km	0.4 %
Prefecture	266	15.8 %	584 km	2.8 %
Municipality	299	17.8 %	7,694 km	36.3 %
Land improvement district	1,086	64.6 %	12,793 km	60.3 %
Others	10	0.6 %	53 km	0.2 %
Total	1,681	100.0 %	21,218 km	100.0 %

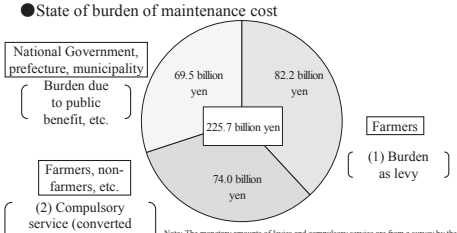
Data: Survey by the Land Improvement Facilities Management Office, Irrigation and Drainage Division, Rural Development Bureau

●General maintenance system by a land improvement district

As to maintenance by a land improvement district, levies are collected from district members when the district itself conducts improvement, repair, etc., of a water channel; and, weeding, etc., around a water channel is done by the community as compulsory service.



●State of burden of maintenance cost

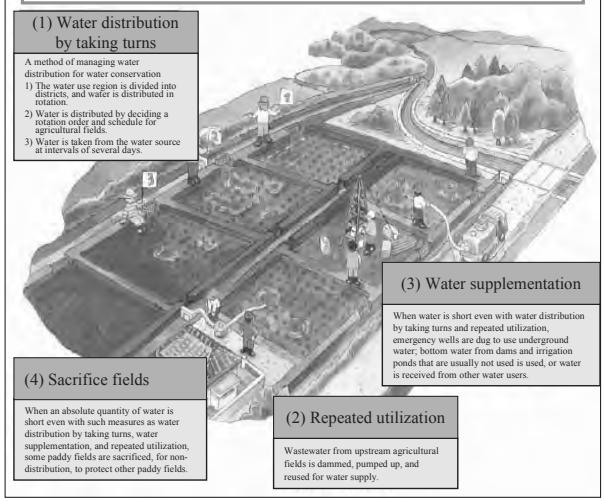


Note: The monetary amounts of levies and compulsory service are from a survey by the Ministry of Agriculture, Forestry and Fisheries (fiscal 2000)

(2) Response to drought and cold weather damage

○ Land improvement districts work to conserve water in the event of a drought through strengthening operation of water distribution by taking turns; patrolling water channels, and repeated use of service water.

Land improvement districts work to conserve water in the event of a drought through strengthening operation of water distribution by taking turns; patrolling water channels, and repeated use of service water. Water saved through such efforts is used for water supply. As such, water users take cooperative measures against water shortage.



○Support for urban areas during a drought

Part of agricultural water is provided to urban residents suffering from a drought as water for daily living, by using agricultural irrigation facilities.

● From August to October 1994, a daily volume of 17,000 m^3 of city-use water, for about 50,000 persons, was supplied as an urgent measure, to Kurashiki city, Okayama prefecture, which was suffering from a drought, by using Lake Kojima, which is a source of agricultural water, and agricultural irrigation channels.

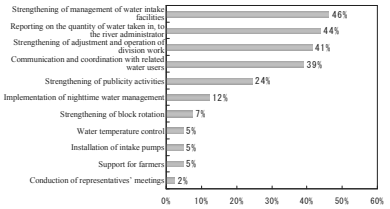
○Measures against cold weather damage

Land improvement districts work to "strengthen management of water intake facilities," to "strengthen adjustment and operation of division work," and for "communication and coordination with related water users, etc.," so that farmers can conduct water management, such as deep water irrigation, as measures against cold weather damage.

<Example of cold weather damage in 2003>

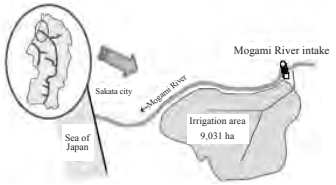
Many land improvement districts in Hokkaido and the Tohoku area worked to extend the irrigation water intake period, upon request from farmers, through cooperation by agriculture improvement diffusion centers, JA, etc.

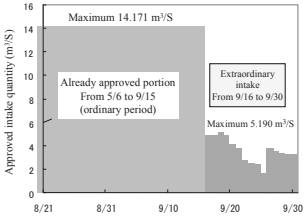
As to large-scale land improvement districts with district areas of 3,000 ha or more, about 70% of the land improvement districts extended the water intake period by 11 days, on average.



Examples of extension of the irrigation water intake period :
Mogami River land improvement district (Tachikawa town and four other towns, Yamagata prefecture)

History, such as of adjustment
Aug. 22: The Mogami River land improvement district applied for extension of the water intake period, to Yamagata prefecture.
Aug. 25: The prefecture applied for extension of the water intake period, to the river administrator (Ministry of Land, Infrastructure and Transport).
Aug. 29: A Mogami River water system drought information liaison council was convened, and approval for extension of the water intake period was obtained from related agencies.
The river administrator notified the prefecture that the Ministry approved extension of the water intake period as an extraordinary emergency intake.
The prefecture notified the land improvement district regarding extension of the water intake period.
Sept. 16: Extraordinary water intake started.
Sept. 30: Extraordinary water intake ended (intake for a total of 15 days).





(3) Promotion of dry field irrigation

Land improvement districts not only newly engage in dry field irrigation but also work for stability and quality improvement of agricultural production, through collaboration with farming instruction by JA and agriculture improvement diffusion centers.

(Example 1: Outline on the Hitotsuse River district (Miyazaki prefecture))

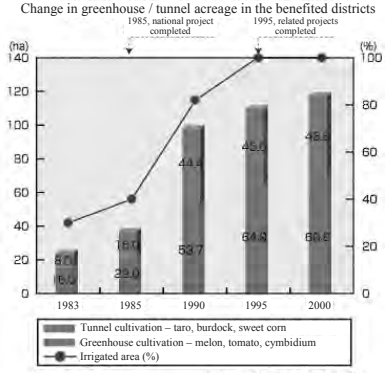
Project name:	National irrigation and drainage project
Project period:	Fiscal 1972 to fiscal 1985
Project cost:	16,530 million yen
Project content:	Higashibaru regulating reservoir (total pondage, 998,000 m^3), intake works at one place, head works at one place, pumping plant at one place, pipeline (44.3 km), etc.
Benefited area:	A total of 3,547 ha, consisting of 764 ha of paddy fields and 2,783 ha of dry fields
No. of farm households:	3,500 households
Related municipalities:	Saito city, Takanabe city, Shintomi town, Kijo town
Related projects:	Prefectural rural foundation general establishment pilot project (fiscal 1973 to fiscal 1995)

○Increase of greenhouse and tunnel cultivation

Since this project was implemented, greenhouse cultivation of melon, tomato, cymbidium, etc., has been increasing yearly, and for melon in particular, cultivation was switched to a breed with improved water-utilization efficacy, aiming to enhance quality and grade. In addition, tunnel cultivation using irrigation water has become diffused, and cultivation using water tubes, and frost-prevention water spraying, have enabled earlier harvesting of taro, burdock, sweet corn, etc. As a result, the planted acreage and the production volume have been steadily increasing.

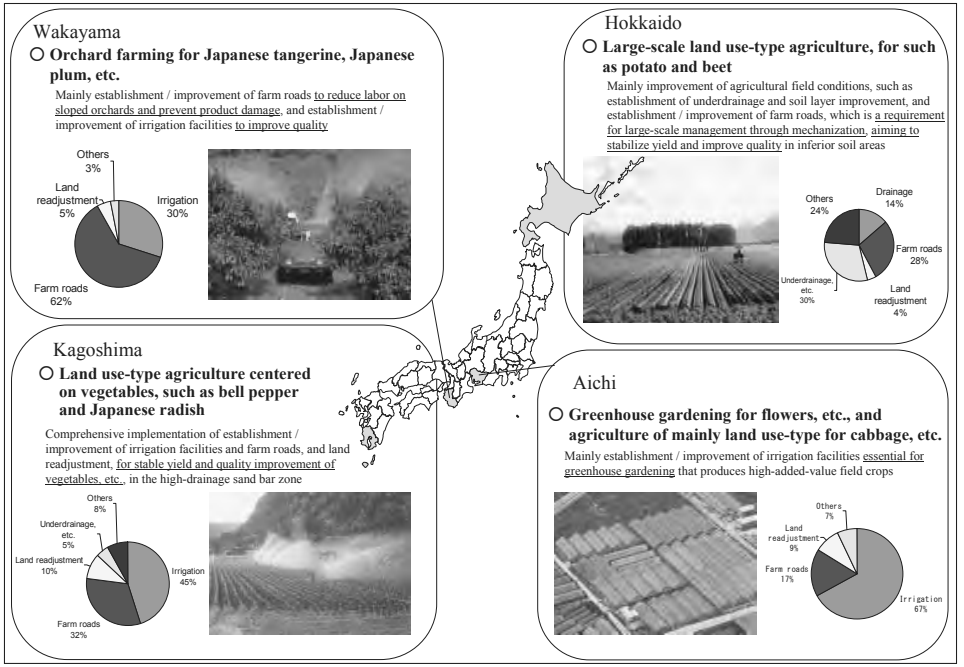
Tunnel cultivation of sweet corn
(Water is sprayed into the tunnel by sprinklers, to prevent frosting.)

Change in greenhouse / tunnel acreage in the benefited districts



Data: Survey by the Hitotsuse River land improvement district

Selective and intensive implementation of establishment / improvement of irrigation facilities and farm roads, land readjustment, etc., according to regional characteristics, such as farming states and natural conditions

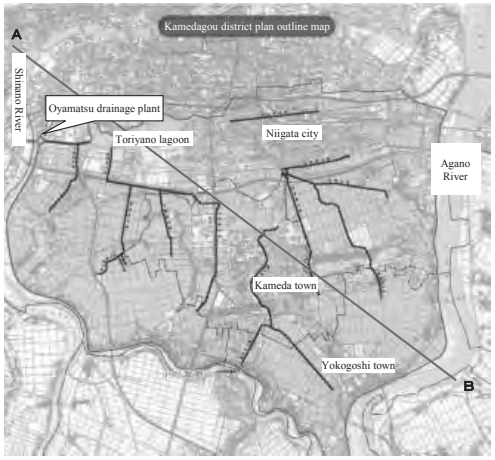


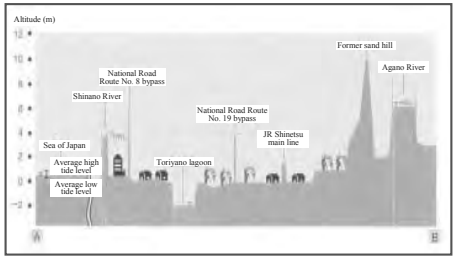
(4) Prevention of flood damage

○Drainage plants managed by land improvement districts on low-lying areas prevent / reduce flood damage of the entire region, including not only agricultural land but also communities and urban areas.

(Example 2: Reinforcing of the drainage plant in the Kamedagou land improvement district (Niigata prefecture))

- ○ In Kamedagou (Niigata city, Kameda town, Yokogoshi town) in Niigata prefecture, drainage facilities for agriculture, such as pumping plants, have been established by irrigation and drainage projects, and agricultural land disaster-prevention projects, etc.
- ○ Establishment of these drainage facilities for agriculture reduced flood damage in the region by about 50%, and by 36% in the urban area.





(5) Community service water functions of agricultural water

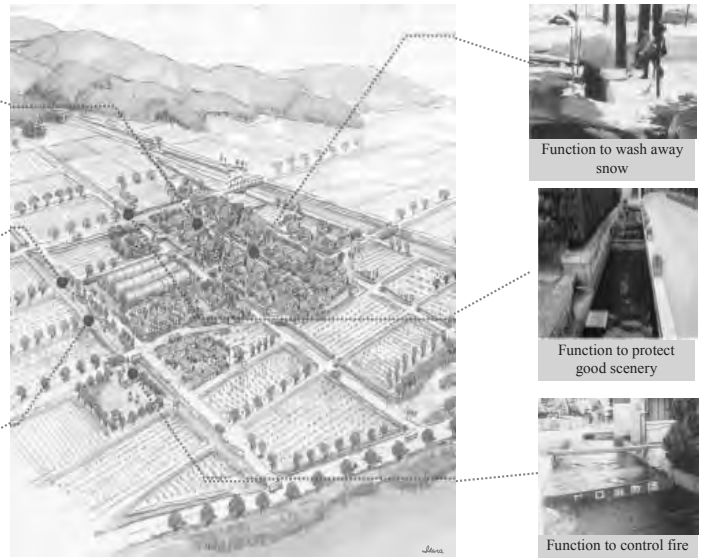
○Agricultural water managed by land improvement districts is also used for daily living, fire control, washing away snow, and protecting the ecosystem, as it runs in communities. This agricultural water is supplied also considering the formation of a waterside environment in the rural area.

● Image of community service water functions of agricultural water


Function for daily living (wash place)


Function to protect the ecosystem


Function to enjoy water



Function to wash away snow

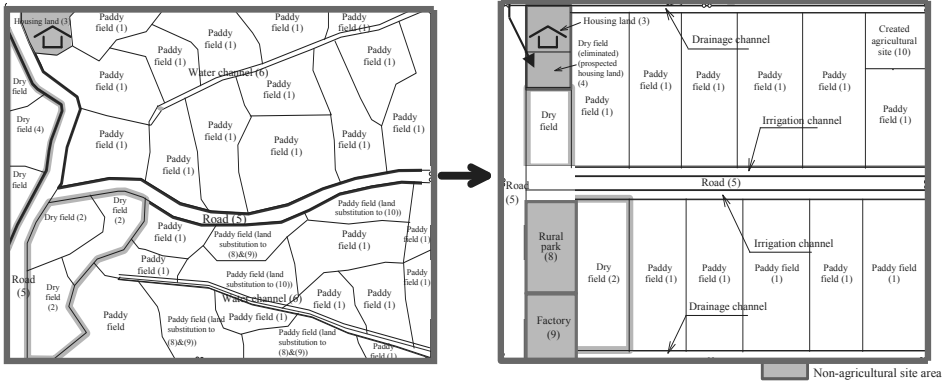
Function to protect good scenery

Function to control fire

2. Management of land (agricultural land)

- ○ Land improvement districts are well versed in adjustment of land use, through accumulated experience related to agricultural land development, and they function as central entities that promote adjustment of land use in the region, in collaboration with related agencies.
- ○ Land improvement districts contribute to productivity improvement and establishment of a desirable agriculture structure, through grouping and mobilization of agricultural land based on agricultural field development projects.
- ○ Land improvement projects display great ability in adjusting interest related to maintenance and formation of land use order, such as developing good agricultural land and securing residential sites.

Mechanism of land substitution based on the Land Improvement Law (image)



(Example 3: Integration of use of agricultural land and fostering of entities that manage agricultural land, based on agricultural land development)

○ In the Ohmi district, Sakai, Fukui prefecture, the land improvement district adjusted land use through land substitution, based on a prefectural agricultural field development project, and established four production organizations, thus integrating about 90% of the district agricultural land of 104 ha.

○ Change in the management structure from before to after project implementation

Before project implementation (1992)

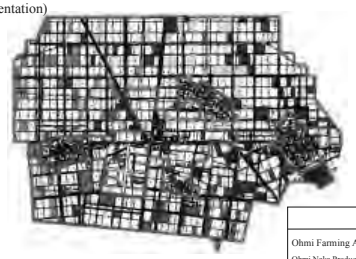
○Expansion-oriented farm households
25 households, 36.5 ha
(1.5 ha per household)
○Downsizing-oriented farm households
48 households, 53.3 ha
(1.1 ha per household)
○Farm households maintaining the present state
48 households, 18.3 ha
(0.4 ha per household)

After project implementation (1999)

○Production organizations
4 organizations, 93.2 ha
(23.3 ha per organization)
○Self-sufficient farm households
33 households, 10.6 ha
(0.3 ha per household)

○Integrated use of agricultural land by production organizations

(Before project implementation)



Standard lot: 10 a
（18m×55m）

Legend
Ohmi Farming Association
Ohmi Naka Production Association
Ohmi Shita Production Association
Higashi Nakano Production Association

(After project implementation)

* The map of before project implementation shows the places where operators of respective production organizations conducted management before project implementation.

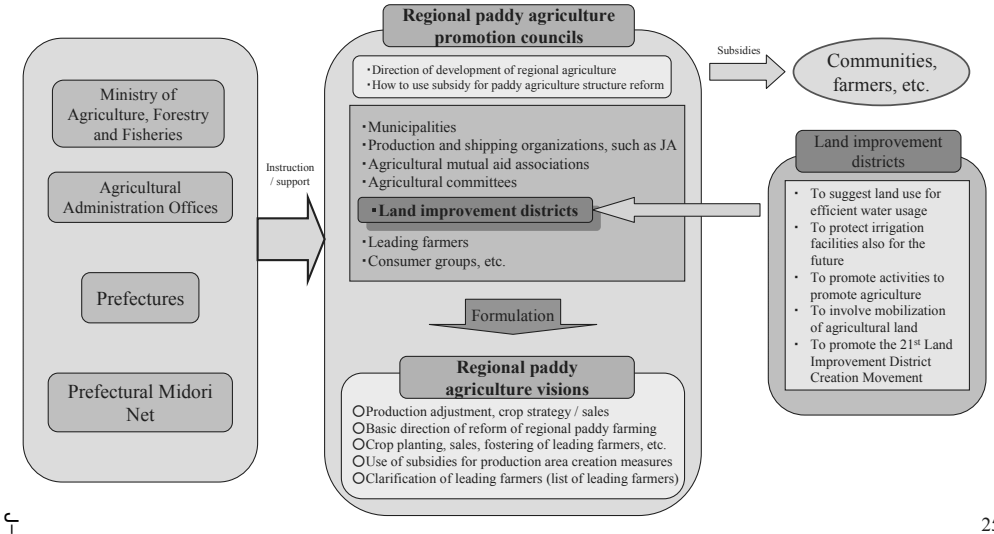
Standard lot: 3.4 ha
（125m×270m）

3. Contribution to promotion of regional agriculture

(1) Efforts for rice policy reform

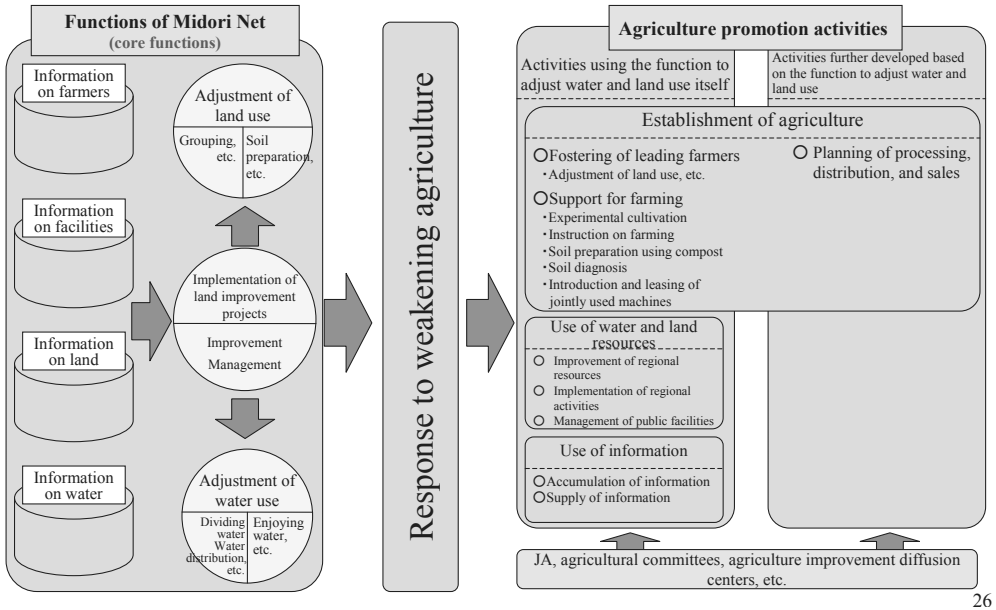
Land improvement districts aggressively participate in regional paddy agriculture promotion councils that provide direction for regional agriculture, and prepare regional paddy agriculture visions, thus positively contributing to the promotion of rice policy reform.

～Establishment of new roles of land improvement districts in rice policy reform ～



(2) Various efforts to promote agriculture

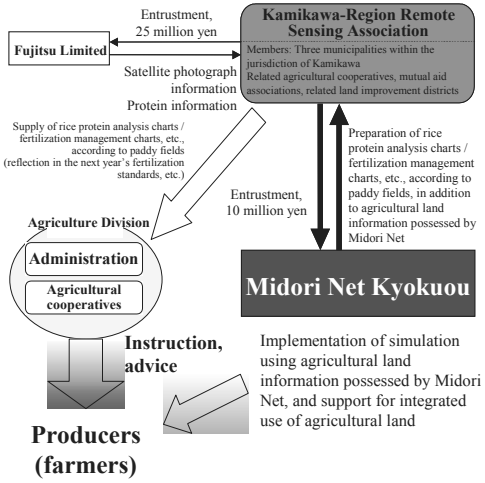
○In recent years, an increasing number of land improvement districts, whose main activities are to implement land improvement projects and manage land improvement facilities, have been tackling activities toward promoting regional agriculture, including fostering of leading farmers and instruction to improve farming by using agricultural water.

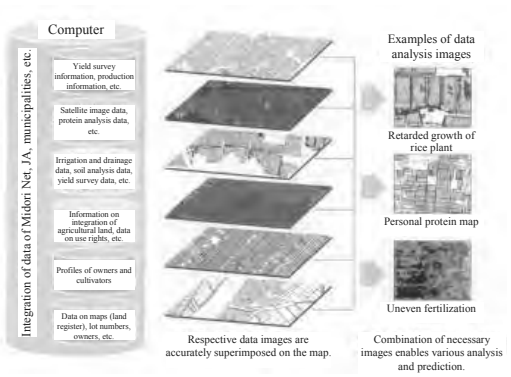


(Example 4)

Midori Net Kyokuou (Hokkaido)

Frequent use of agricultural land GIS (agricultural land geographic information system): Integrated use of agricultural land using agricultural land GIS and efforts toward production of high-quality rice

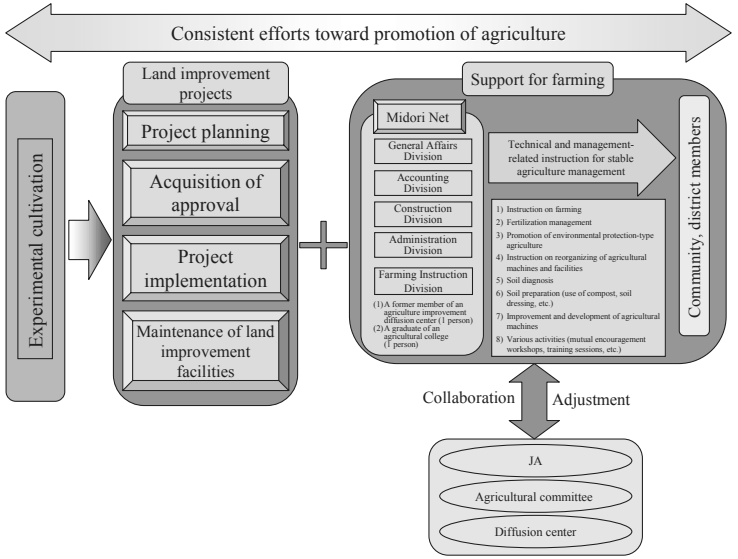




(Example 5)

Midori Net Gunma Irrigation (Gunma prefecture)

Promotion of improvement of farming:
Two persons were posted to be in charge of farming in the Midori Net, to provide instruction on farming, such as regarding experimental cultivation, planting, disease and pest control, problems in continuous cropping, and fertilization method.




Installation of an exhibition field to promote dry field irrigation


Gunma irrigation new-type, two-hole system
Development of a long onion fixed-planting machine (Naomi-chan)


Field examination of a long onion mutual encouragement workshop

4. Issues

(1) Maintenance of land improvement facilities

The issues that land improvement districts are facing regarding maintenance of land improvement facilities are as follows.

1) Issue of maintenance accompanying progress of urbanization and mixed residence
- Deterioration of the quality of agricultural water due to inflow or littering of waste into water channels and inflow of household miscellaneous wastewater.
- Flooding of irrigation channels at the time of concentrated heavy rain (inflow of urban wastewater into water channels)
- Increase of wastewater management work due to the above, and the need for construction of a new water management system

● Outline on maintenance of a land improvement district

Outline on a land improvement district organization

○ Present state
Number of members: 8,562 persons
District area: 4,386 ha
Number of personnel: A director and nine other persons
○ Change in waste disposal cost
From about 4.5 million yen (1998) to about 7.4 million yen (2001)

●State of maintenance of water resources

Progress of urbanization

○ Increased quantity of wastewater from households and rainwater received
・ Inflow of wastewater from households and rainwater into main water irrigation channels
・ Inflow from rainwater sewage lines to main irrigation channels

Progress of urbanization and mixed residence

Occurrence of issues

○ Change in waste disposal quantity
・ The quantity of waste littered and flowing into water channels has been increasing every year.
(Estimated to have increased 1.5-fold in the past five years)
・ Especially at a time of heavy rain, a large quantity of waste flows in.
○ Flooding, etc., of irrigation channels occur due to inflow of urban wastewater at times of concentrated heavy rain.


Deterioration of water quality


Removal of waste discarded into irrigation channels


Flooding of an irrigation channel

(2) Issues of maintenance in the intermediate and mountainous area
- Farmers are decreasing due to depopulation, resulting in an increased maintenance cost per member of a land improvement district
- Decline of maintenance ability due to aging
- Weakening of the facility management system due to the above

●Outline on maintenance of a land improvement outline

Outline on a land improvement district organization

○ Present state
Number of members: 285 persons
District area: 100 ha
Number of personnel: A director and seven other persons
○Outline on the region
An intermediate and mountainous area with precipitous terrain
Irrigation channels are along the mountainside.

Progress of depopulation and aging

○ Aging of farmers (age 60 or older)
From 35.2% (1990) to 49.6% (2000)
(Because the geography is precipitous, work for proper irrigation management is difficult.)

○ Number of members of the land improvement district
From 324 persons (1981) to 285 person (2000)

●State of management of water resources

○ Decrease of managing persons due to depopulation
○ Decline of management ability due to aging

Occurrence of issues

○ Increased maintenance cost per member
○ Decline of management ability
○ Weakening of the facility management system


Part of the benefited area


State of maintenance (weeding) of the road for management along the mountainside


Irrigation channel restored by an emergency measure

(2) Strengthening of the organizational operation foundation

○ Strengthening of the organizational operation foundation is promoted, through integrated improvement, etc., so that land improvement districts, which are the main entities that implement land improvement projects and mange land improvement facilities, can play their roles efficiently and fully.

○ During the ten years from 1996 to 2005, an annual average of 109 land improvement districts were dissolved, due to mergers with other districts, and an annual average of 18 land improvement districts were newly established.

Land improvement district general strengthening measures

Strengthening measures

<Prefectures> integrated improvement basic plan

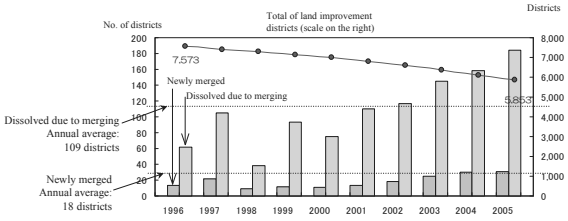
<National / local joint associations> Development of and instruction on a merger-simulation system

<Land improvement districts>
- Merging of land improvement districts
- Rational water distribution adjustment
- Promotion of municipality discussion
- Maintenance integrated with local residents and NPOs

Establishment of an activation plan

Promotion of various measures

○Trend of merging of land improvement districts



Data: Survey on the State of Establishment, etc., of Land Improvement Districts

○Examples of merging

Item	Example of merging at an irrigation system unit (Ohsaki Seibu Land Improvement District, Miyazaki prefecture)	Example of merging at a municipality unit (Oyabe City Land Improvement District, Toyama prefecture)
Impetus for merging	- Start of a maintenance project accompanying completion of the national Osaki Seibu land improvement project - Promotion based on a Miyagi prefecture integrated improvement basic plan	- Promotion of rationalization of administrative work (opinions were in agreement also in the related administrative directors' conference) - Promotion activities by the land improvement project organizations' joint association
Number of related land improvement districts	3 land improvement districts	18 land improvement districts
Date of merging	April 1, 1997	April 1, 2001
District area after merging	5,067 ha	5,376 ha
Change in number of full-time personnel	From 13 persons to 13 persons	From 5 persons to 5 persons
Change in the ordinary levy per 10 a	From 2,800 yen to 3,310 yen to 2,044 yen	From 1,719 yen to 1,270 yen, on average

V. Roles Expected from Land Improvement Districts in the 21st Century

1. Securing of the agricultural foundation, such as agricultural land and agricultural water, that supports fostering of farmers

○ The roles of land improvement districts are even more important than in the past, for integrated use of agricultural land among leading farmers, and for strengthening of community functions, in the progress of depopulation, urbanization, and mixed residence, of rural villages.

《Integrated use of agricultural land among leading farmers, and protection by the community》

○The management scale has become larger, to be 10 to 50 ha, accompanying progress of foundation establishment.

○Actually, however, agricultural land managed by large-scale leading farmers is scattered in many communities, and maintenance of community functions is essential.

State of K town in S prefecture

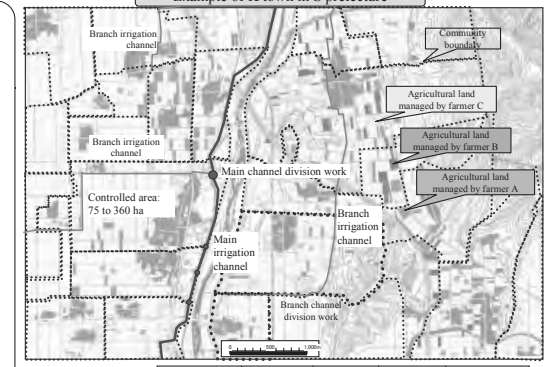
■ State of agricultural land of leading farmers

- The management scale has become larger, to be 10 to 50 ha.
- However, use of agricultural land is scattered into smaller scales in 6 to 13 communities (74 to 221 related lots).

■ Present state of protection of agricultural land, agricultural water, etc.

- Actually, agricultural land managed by large-scale leading farmers is scattered in many communities. As such, it is difficult for these farmers to participate in joint work by different communities, such as mud removal from water channels and weeding; and, agricultural work conducted by a group, such as puddling and leveling, and control of insect pests, is also influenced.
- In recent years, the number of persons who travel to participate in joint work has been decreasing, due to aging, and there is concern that proper protection of resources, such as agricultural land and agricultural water, will become increasingly difficult.

Example of K town in S prefecture



Legend: Community boundary

	Farmer	Area	No. of related lots	No. of related communities
	Farmer A	45.1 ha	221 lots	13 communities
	Farmer B	17.3 ha	74 lots	9 communities
	Farmer C	22.6 ha	111 lots	6 communities

2. Contribution to local residents

○It is important for land improvement districts to contribute to local residents, by displaying multifaceted functions of agriculture through management of “water” and “land.”

Prevention of flooding

Prevention of mud slides and soil erosion

Health promotion and relaxation

Cultivation of aesthetic sentiment

Cultivation of water sources

Formation of favorable scenery in a rural village

Passing down of culture unique to the rural village

Protection of the ecosystem

○ State of display of multifaceted functions of agriculture

○ Monetary assessment of multifaceted functions of agriculture

Type of function	Assessed value
Function to prevent flooding	3,498.8 billion yen / year
Function to stabilize river flow	1,463.3 billion yen / year
Function to cultivate underground water	53.7 billion yen / year
Function to prevent soil erosion (runoff)	331.8 billion yen / year
Function to prevent mud slides	478.2 billion yen / year
Function to dispose of organic waste	12.3 billion yen / year
Function to moderate climate	8.7 billion yen / year
Function to promote health, rest, and relaxation	2,375.8 billion yen / year

Data: Mitsubishi Research Institute, Inc., “Report of Research on the Assessment of Multifaceted Functions of Agriculture and Forests Related to the Global Environment and Human Living,” (Nov. 2001)

Reference: Science Council of Japan, “Assessment of Multifaceted Functions of Agriculture and Forests Related to the Global Environment and Human Living (Reply),” (Nov. 2001)

Notes: 1) Monetary assessment based on the content of discussion of the special committee, etc., of the Science Council of Japan, regarding some functions that can be assessed monetarily, centered on physical functions, among multifaceted functions of agriculture.

2) Total value is not presented because assessment methods are different among functions, and only some of the multifaceted functions were assessed, and for other reasons.

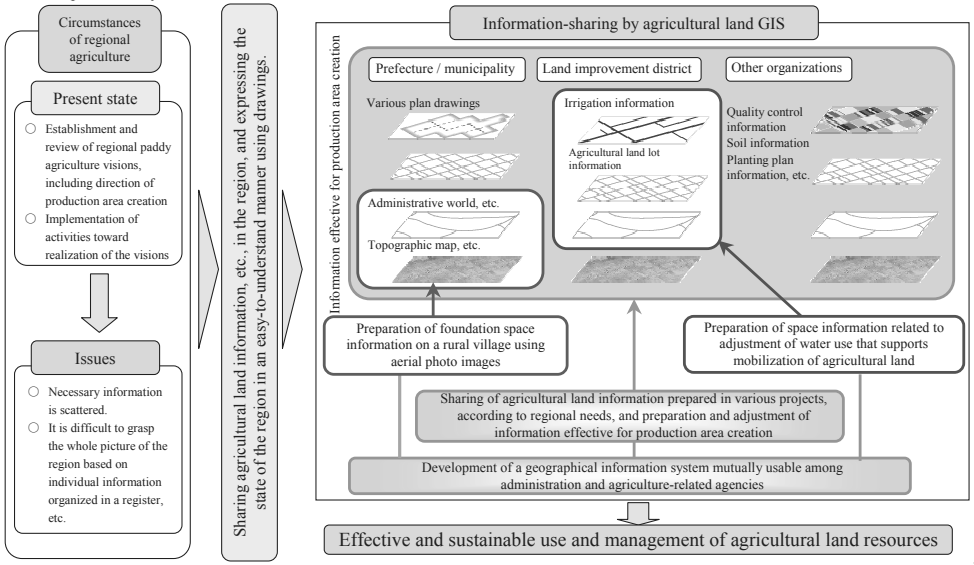
3) As to the function to promote health, rest, and relaxation, only a very limited part of functions were trial-calculated.

3. Possession, accumulation, and use of various information

○ Many land improvement districts have general information related to farmers, agricultural land, agricultural water, and land improvement facilities. It is important to efficiently and effectively provide this information to farmers in the region.

○ Promotion of integrated use of agricultural land among leading farmers, through adjustment of land use and water use, using the systematized agricultural land GIS (agricultural land geographic information system)

○ Use of agricultural land GIS also for various agricultural activities, such as efforts toward high-quality rice production by rice protein analysis



Midori Net is responsible for passing down beautiful rural villages, which are national citizens’ common assets, to the next generation, through protecting and cultivating “water,” “land,” and “homeland.”

Yabe town, Kumamoto prefecture

Miyama town, Kyoto prefecture

Muraoka town, Hyogo prefecture

Shirakawa town, Gifu prefecure

“Water and Land” submission form

Received on / Month / Date / 2002 (No.)

Title				Date of submission	
				Month / Date / 2002	
	Name in alphabet letters Full name	Place of employment	Telephone number	Manuscript	
				Text	pages
				Chart	charts
				Table	tables
				Photograph	prints
Presentation division	1. Planning / design division 2. Design / construction division (circle either one)		Offprint (fee-charged)	Unnecessary / necessary (copies)	

Introduction of content (within 200 characters)	

3. Training in Tanzania

Itinerary of Tanzania training (February 2015)

Date		Time	MAAIF, MWE, Busitema and JICA Experts			Farmers and JICA staff			Main topics
			Activity	Venue	Stay in	Activity	Venue	Stay in	
6th	F		Orientation	JICA office		Home → Kampala		Kampala	Orientation) Schedule of the study tour Purpose of the tour Action plan of the tour Follow up of the Action plan
7th	S					Kampala → Eldoret (Kenya) (Orientation in car)		Eldoret	
8th	S		Entebbe → Dar es Salaam		DSM	Eldoret → Southern Kenya		Southern Kenya	
9th	M	8:30 - 9:30	JICA Tanzania Office	JICA office	Korogwe	Southern Kenya → Korogwe		Korogwe	JICA assistant plan and activity for Tanzania irrigation sector
		10:15 - 12:00	Ministry of Agriculture, Food Security and Cooperatives	MAFC					Outline of MAFC (mainly on the irrigation sector) Comprehensive Guidelines Irrigation Act and Irrigation Policy National Irrigation Commission Human Resource Development Plan for Irrigation Sector Coordination with MW Discussion
		13:30 - 14:30	Ministry of Water	MW					Outline of MW (mainly on the irrigation sector) Catchment area management Coordination with MAFC Discussion
		14:30 - 19:30	MW → Korogwe						
10th	T	8:30 - 11:30	Mombo Irrigation Scheme	Mombo	Moshi	Mombo Irrigation Scheme	Mombo	Moshi	O&M plan & activity Water management O&M fee collection & management Constitution (By-laws) Organizational structure & Roles Site observation Repair works Changes & Challenges Discussion
		14:00 - 17:00	Ndungu Irrigation Scheme	Ndungu		Ndungu Irrigation Scheme	Ndungu		
		17:00 - 18:30	Ndungu Irrigation Scheme → Moshi			Ndungu Irrigation Scheme → Moshi			

11th	W	9:00 - 11:00	Kilimanjaro Irrigation Zone Office	Zone office	Moshi	Kilimanjaro Irrigation Zone Office	Zone office	Moshi	Outline of Kilimanjaro Zone Office Support to Districts and IOs Technical issues Discussion
		13:00 - 16:00	KATC	KATC		KATC	KATC		Outline of KATC Training program Observation tour of the centre Discussion
12th	T	9:00 - 12:00	Arusha Technical College	ATC	Moshi	Lekitatu Irrigation Scheme	Lekitatu	Moshi	Outline of ATC Curriculum Facilities observation Collaboration with Busitema Discussion
		PM	Action plan making at Hotel			Action plan making at Hotel			Planning of activity after the tour
13th	F		Kilimanjaro → Entebbe			Moshi → Southern Kenya		Southern Kenya	
14th	S					Southern Kenya → Eldoret		Eldoret	
15th	S					Eldoret → Kampala		Kampala	
16th	M					Kampala → Home			

Program (general)

Welcome address
Introduction
Presentation by Tanzania side
Presentation by Uganda side
Site observation
Discussion
Conclusion

Ugandan presentation within 10 min at each meeting

by MAAIF at MAFC meeting
by MWE at MW meeting
by Cooperatives at irrigation scheme meeting (Doho at Mombo, Mubuku at Ndungu, Agoro at Lekitatu)
by MAAIF at KATC meeting
by Busitema at ATC meeting

4. Advance GIS Training

Time table of Advance GIS Training

Date : 1-2 September 2015

Venue: Nile Basin Initiative secretariat, Entebbe, UGANDA

Day 1	Time	Contents	Lecturer
	~9:15	Confirmation of attendance	
	9:15	Opening remark Outline of the training Self-introduction	Mr. Kobayashi
	9:30	Lecture 1: Introduction for GIS	Mr. Kobayashi
	10:30	Coffee break	
	11:00	Lecture2: Basic operation of QGIS	Mr. Kikuchi
	12:00	Lecture 3: Creating contours form DEM data using QGIS	Mr. Emmanuel
	13:00	Lunch break	
	14:00	Lecture 4: Land cover Map, Analzing Landsat8 image by Multispec	Mr. Kikuchi
	15:30	Lecture 5: Area calculation of land cover and layout	Mr. Kikuchi
	17:00	Close	

Day 2	Time	Contents	Lecturer
	9:15	Review of Yesterday	Mr. Kobayashi
	9:30	Lecture 6 Creating watershed using SRTM&QGIS	Mr. Emmanuel
	11:00	Coffee break	
	11:30	Lecture 7:Practical session	Mr. Emmanuel
	13:00	Lunch break	
	14:00	Lecture 8: How to use Drone	Mr. Kikuchi
	15:00	Lecture 9 Comprehensive evaluation of the analysis results	Mr. Kikuchi
	16:00	Lecture 10:Question and answer session	Mr. Kobayashi
	16:30	Review of training activity and Comment from participants	
	17:00	Closing remark and Issuance of Completion Certificate	Mr. Kobayashi
	17:15~	Coffee break & Demonstration a drone	

Outline of the Advanced GIS training

Training Object

- To enable analysis using GIS for intended purpose in participant's job.

Schedule Day 1

Time	Contents	Lecturer
9:15	Opening remark Outline of the training Self-introduction	Mr. Kobayashi
9:30	Lecture 1: Introduction for GIS	
10:30	Coffee break	
11:00	Lecture 2: Basic operation of QGIS	Mr. Kikuchi
12:00	Lecture 3: Creating contours form DEM data using QGIS	Mr. Emmanuel
13:00	Lunch break	
14:00	Lecture 4: Land cover Map, Analyzing Landsat8 image by Multispec	Mr. Kikuchi
15:30	Lecture 5: Area calculation of land cover and layout	
17:00	Close	

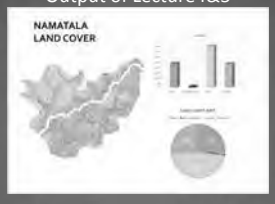
Schedule Day 2

Time	Contents	Lecturer
9:15	Review of Yesterday	Mr. Kobayashi
9:30	Lecture 6: Creating watershed using SRTM&QGIS	Mr. Emmanuel
11:00	Coffee break	
11:30	Lecture 7: Practical session	Mr. Emmanuel
13:00	Lunch break	
14:00	Lecture 8: How to use Drone	
15:00	Lecture 9: Comprehensive evaluation of the analysis results	Mr. Kikuchi
16:00	Lecture 10:Question and answer session	Mr. Kobayashi
16:30	Review of training activity and Comment from participants	
17:00	Closing remark and Issuance of Completion Certificate	Mr. Kobayashi

Outputs of Practices

Output of Lecture2

Output of Lecture4&5



Lecture 8

Output of Lecture3

Output of Lecture 6

Self-introduction

1 minutes Self-introduction

1. Name
2. Organization / Title
3. How do you use GIS softwear for your work?
4. What do you expect from this Training?

Until 9:30

Lecture 1 Introduction to GIS

Yukimitsu KOBAYASHI
JICA Study Team
Project on Irrigation Scheme Development in Central and Eastern Uganda (PISD)

Purpose of this section

- Brief explanation of the GIS and GIS software (Summary of the last training)

What is GIS?

- A Geographic Information System (GIS) is a computerized data management system used to **capture**, **store**, **manage**, **retrieve**, **analyze**, and **display** spatial information.

Spatial information : Information＋*Location*

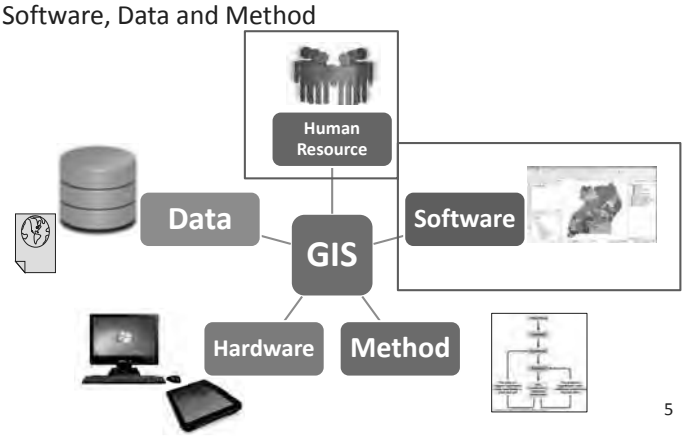
Display, Edit, Search, Analyzing, Store and Manage

Difference between Paper map and GIS

keyword	Paper Map	GIS	keyword
Storage and carrying	Difficult	Easy	Digital
flexibility of display area			Seamless (independent on the map border)
flexibility of scale			Flexibility of the scaling
Coordination adjustment among multiple layers			Geocoding, Projection transformation
collaboration with the database			Searching based on the attribute data, searching based on Spatial relationship
Spatial analysis			Geoprocessing
Data sharing			Online
Reusability			Mashup

Five Resources

Problem-solving by GIS is realized by the collaboration of the five elements such as Human resource(User), Hardware, Software, Data and Method



Desktop GIS Software

Commercial software

- ArcGIS for Desktop

Free software

- QGIS
- Google Earth Pro
- GRASS GIS
- ILWIS

What is QGIS

- **QGIS** (previously known as "Quantum GIS")
- QGIS is a user friendly Open Source GIS software.
- It runs on Linux, Unix, Mac OSX, Windows and Android and supports numerous vector, raster, and database formats and functionalities.

http://www.qgis.org/en/site/about/index.html

Advantage of QGIS

- Cost
  - QGIS is a freely downloadable open source GIS software
- Licensing
  - QGIS is FOSS (free and open source software), there are no licensing concerns.
- Platform
  - Esri's ArcGIS for Desktop only runs in a Windows PC environment
- Loading Time
  - QGIS has a faster startup time than ArcGIS

BASIC INFORMATION ON GIS

Vector data

- Expressed as Point, Line, polygon
- Referred to as a "Shape files"

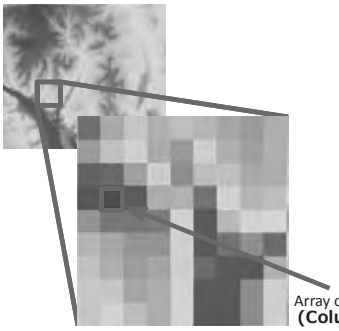
Source: http://help.arcgis.com

Consist of shape files

- Mandatory files
  - .shp : shape
  - .shx : shape index format
  - .dbf : attribute format
- Other files
  - .prj : projection format; the coordinate system and projection information
  - .sbn and .sbx : a spatial index of the features
  - .shp.xml : geospatial metadata in XML format
  - ...Etc

Same file name but different extension

Raster Data



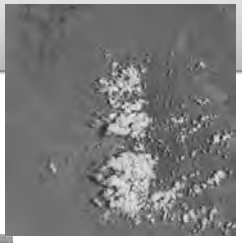
store a Value in each pixels
(Observed value, Elevation, Class value Etc.)

250	180	150	100
130	60	70	40
30	50	35	20

Array of cells / pixel
(Column, Row)=(2, 4)→ Value

Source: http://www.esrij.com/

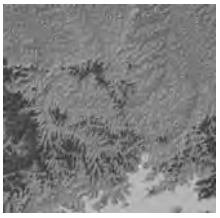
Raster Data



Satellite Image

Aerial photo

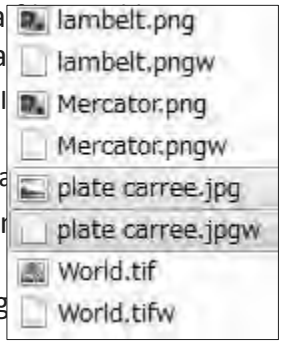
DEM: Digital Elevation Model



Source: http://www.esrij.com/

World file and GeoTiff

- **World file** is a plain text data georeference raster map ima
  - Ex) JPEG + .jpgw(.jpw) = JPEG I coordination
  - Ex) TIFF + .tifw(.tfw) = TIFF Ima
- **GeoTIFF** allows georeferenci embedded within a TIFF file. Ex) Geo TIFF(.tif) Only = Imag



File format for QGIS

Vector data

Format Name	Code	Creation	Geo-referencing
Arc/Info Binary Coverage	AVCBin	No	Yes
Arc/Info .E00 (ASCII) Coverage	AVCE00	No	Yes
Comma Separated Value (.csv)	CSV	Yes	No
ESRI Personal GeoDatabase	PGeo	No	Yes
ESRI Shapefile	**ESRI Shapefile**	**Yes**	**Yes**
GPX	**GPX**	**Yes**	**Yes**
KML	**KML**	**Yes**	**Yes**

Raster data

Format Name	Code	Creation	Geo-referencing
Arc/Info ASCII Grid	AAIGrid	Yes	Yes
Arc/Info Binary Grid (.adf)	AIG	No	Yes
Microsoft Bitmap (.bmp)	BMP	Yes	Yes
ENVI .hdr Labelled Raster	ENVI	Yes	Yes
Graphics Interchange Format (.gif)	GIF	Yes	No
TIFF / GeoTIFF (.tif)	**GTiff**	**Yes**	**Yes**
Erdas Imagine (.img)	HFA	Yes	Yes

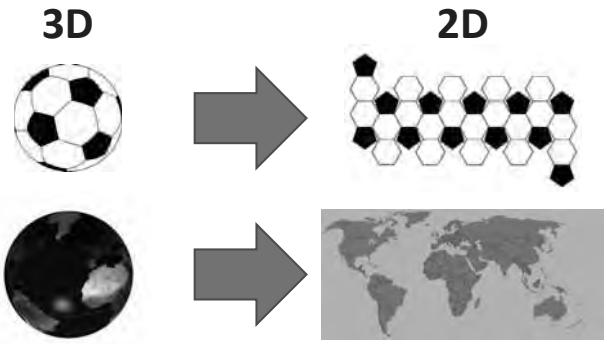
Coordinate Reference System (CRS)

- Geographic Coordinate System (GCS)
- Projected Coordinate System (PCS)

Geographic coordinate system

- **Geographic Coordinate System** uses a three-dimensional spherical surface to define locations on the earth.
- Coordination :Latitude, Longitude & Elevation.
- Parameters
  - Geodetic datum (based on a spheroid)
  - Angular unit of measure
  - Prime meridian
- Disable to major distance and Area

What is Projection



Able to major distance and Area
Distortion of map projection must occur!

Type of Projection

- 3 Elements
  - Equal-area
  - Equidistant
  - Conformal

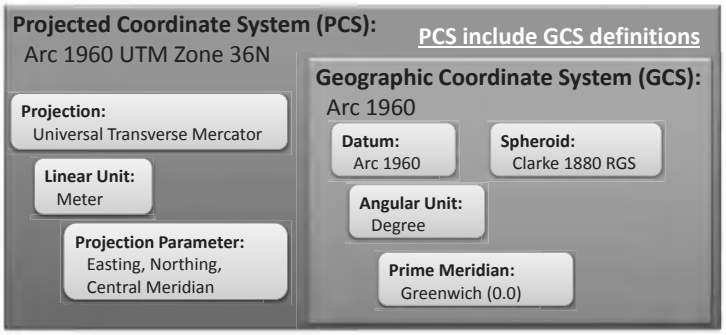
Equal-area
(Lambert Azimuthal Equal-Area EPSG:3408)

Conformal

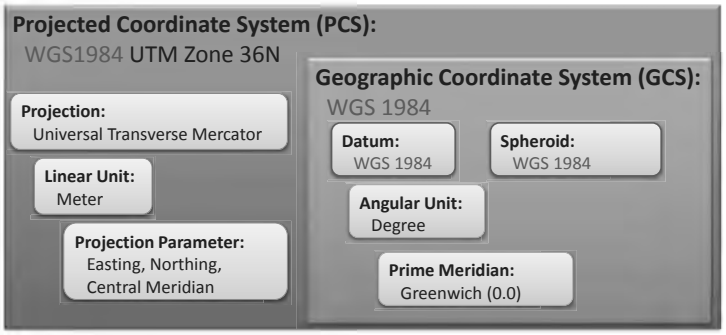
Equidistant
(Plate carree EPSG:4326)

Chose appropriate projection based on your purpose and Scale

Relationship between GCS and PCS



Relationship between GCS and PCS

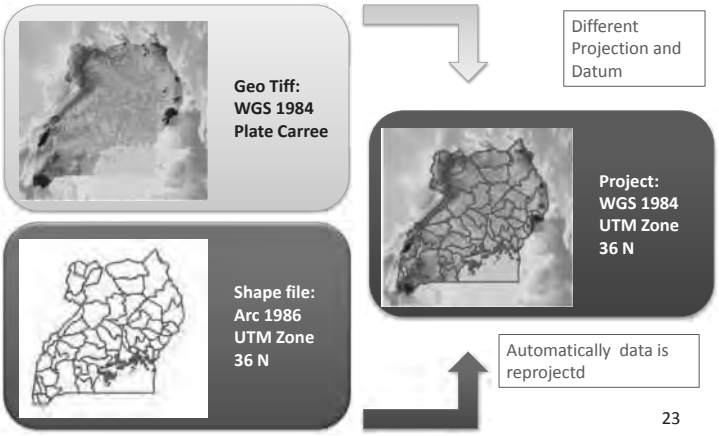


Difference between Arc 1960 UTM and WGS 1984 UTM

- Same location But different Longitude and latitude
- Same coordination But different location

☐Different CRS?
☐Different Datum (Earth ellipsoid) ?

On the fly projection (Real time projection)



Tips - Projection

- On the fly reprojection
  - Affect to the performance
- Justify to the same projection
  - Easy to utilize
  - More accurate editing and analyzing

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QUESTION AND ANSWER

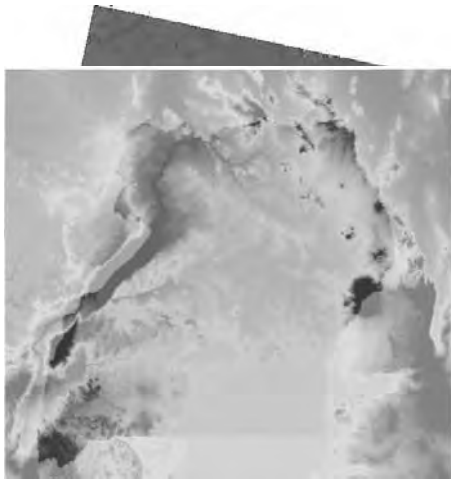
25

APPLICATION TO ACTUAL WORK

27

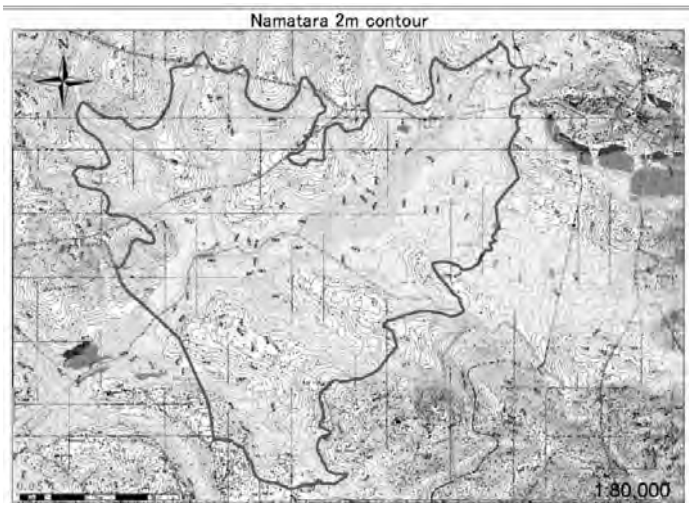
Satellite Image and DEM

- Landsat 8
- SRTM

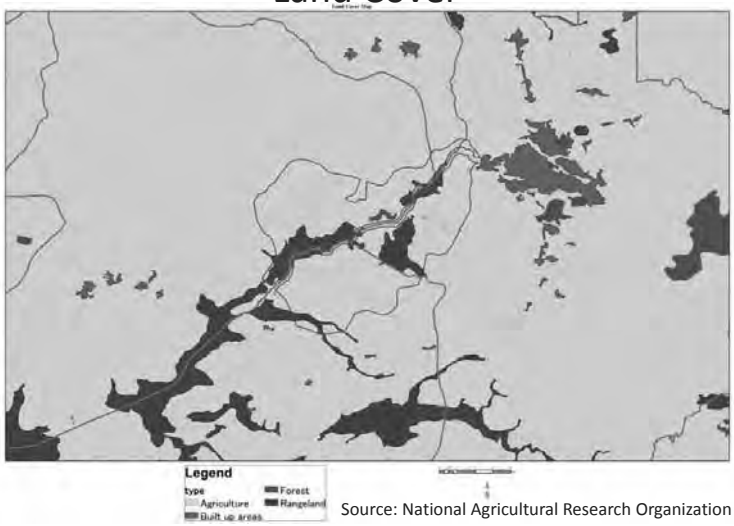


Road Network and Administrative boundary

Topographic map

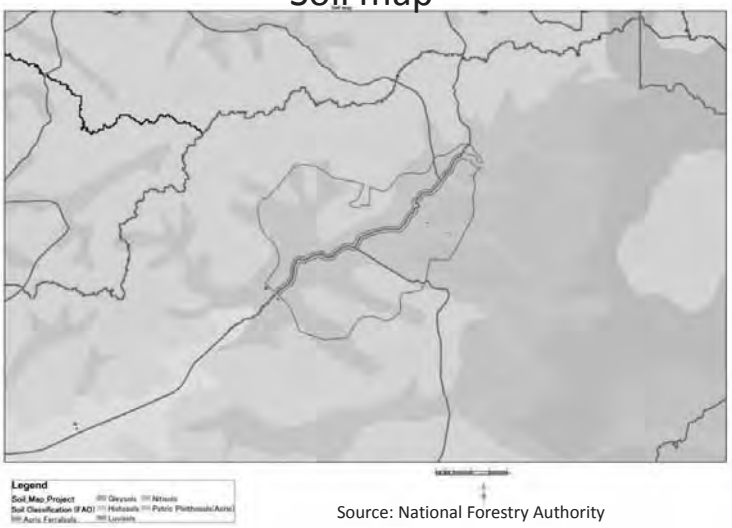


Land Cover



Source: National Agricultural Research Organization

Soil map



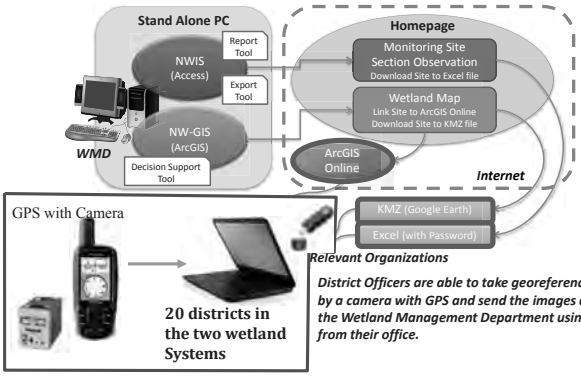
Source: National Forestry Authority

Examples of application

- NWIS: National Wetland Information System
- Land use map

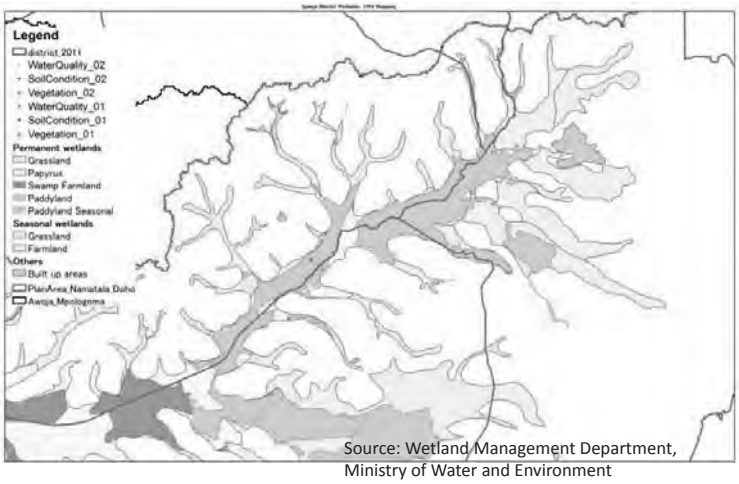
- Facility Data base for Maintenance in Doho Irrigation scheme

National Wetland Information System



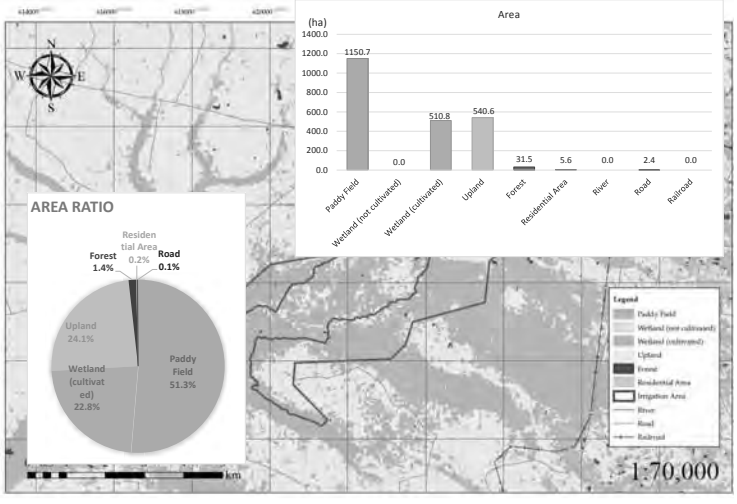
District Officers are able to take georeferenced field photos by a camera with GPS and send the images and reports to the Wetland Management Department using the internet from their office.

NWIS



Source: Wetland Management Department, Ministry of Water and Environment

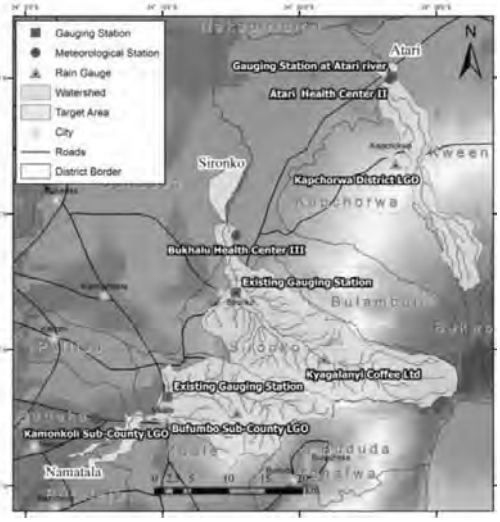
Land Use map



Hydr

- DEM → Wa
- Location of
- Location of

- Road netwc
- Administrat
- Location of



Facility Data base

- Prolonged life and Reduction of renewal cost by appropriate prevention and conservation measures of facility.
- In order to refer of strategic preservation and renew of facilities by Facility administrator, GIS data base is used for centralized management of information such as the repair history, service life and result of facility diagnosis.

Lecture 2
Basic Operation of QGIS

1ST SEPTEMBER 2015

SHOTARO KIKUCHI

Introduction

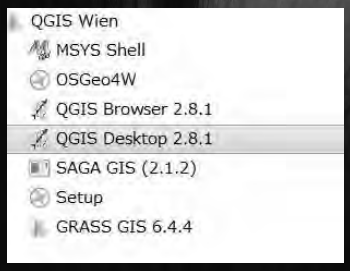
- QGIS (previously known as "Quantum GIS") is a cross-platform free and open-source desktop geographic information system (GIS) application that provides data viewing, editing, and analysis capabilities.[1]

Content

- Start up QGIS
- View and Add Data
- Layer Property
- Symbology
- Area Caluculation

Start up QGIS

Select QGIS Desktop



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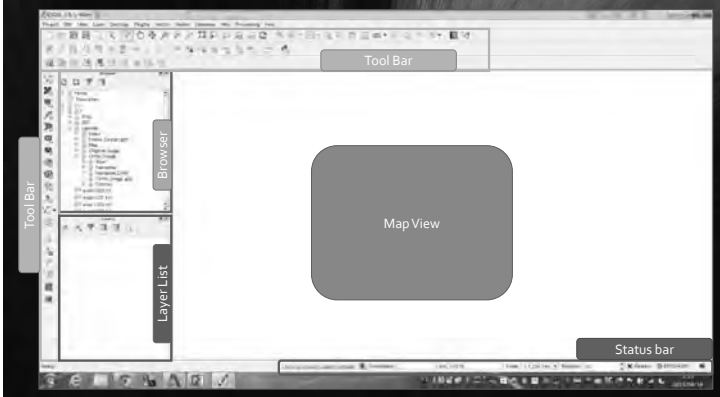
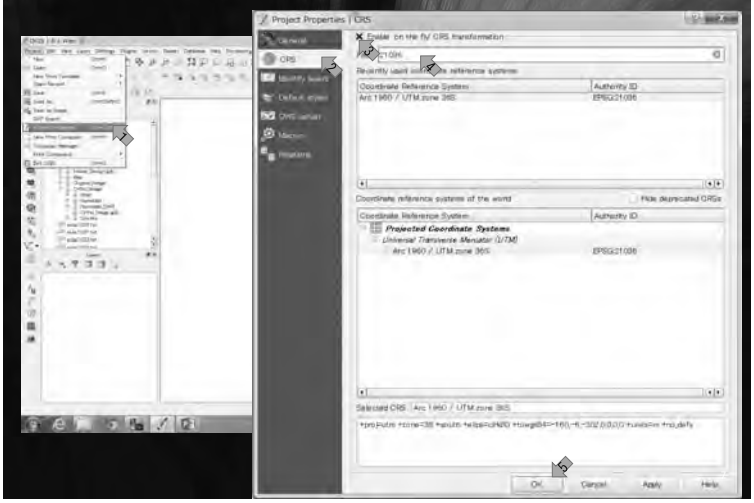
QGIS Window



6

Set up coordinate reference systems



Uganda Coordinate

ID	Name of Coordinate	AREA
21096	Arc 1960/UTM zoon 36 N	The Northern Hemisphere of Uganda
21036	Arc 1960/UTM zoon 36S	The Southern Hemisphere of Uganda
32623	WGS 84/UTM zoon 36N	The Northern Hemisphere of Uganda
32723	WGS 84/UTM zoon 36S	The Southern Hemisphere of Uganda
4326	WGS 84	World

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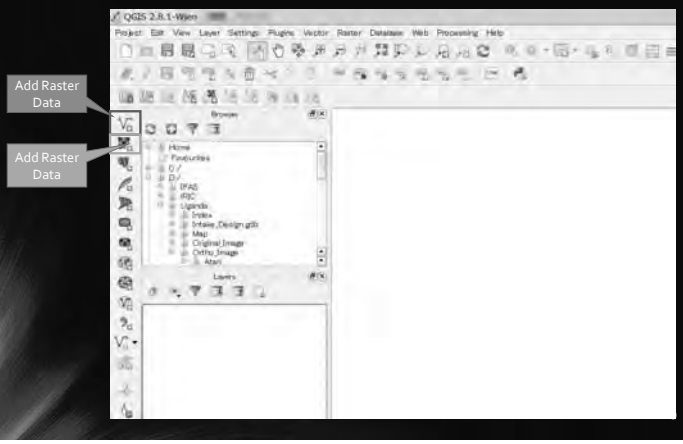
Add Data



Vector & Raster

Vector

- Expressed as Point, Line, polygon
- Referred to as a "Shape files"

Raster

Satellite Image

DEM

Aerial photo

- Expressed as a "colored cell"
- E.g. Digital photography

Source: http://help.arcgis.com

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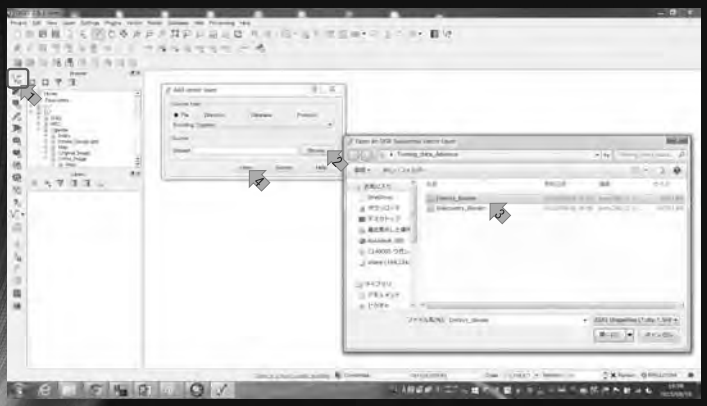
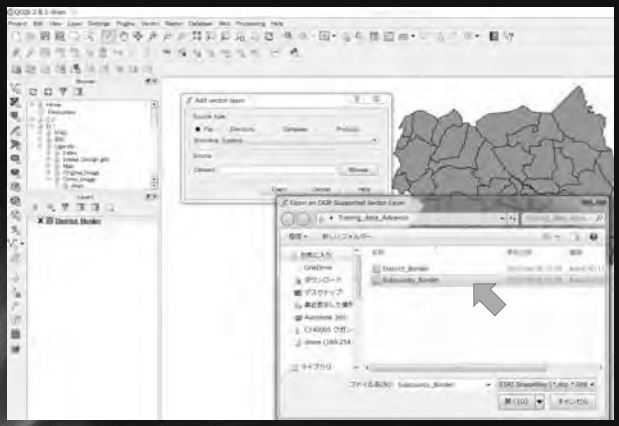
Add District Border



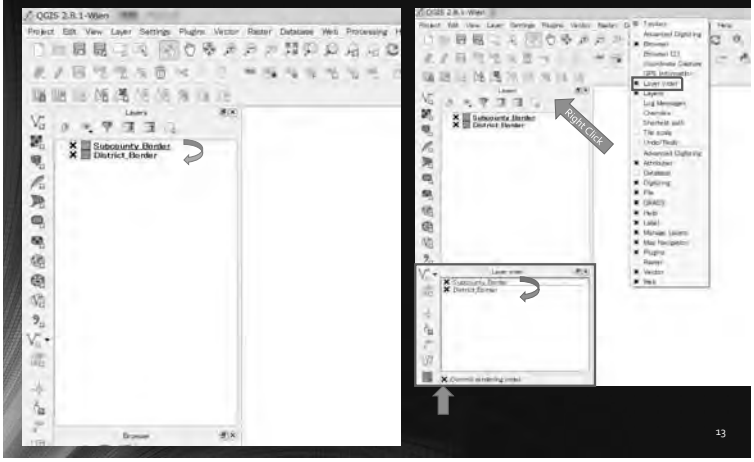
11

Add Sub-county Border



12

Change the layers order



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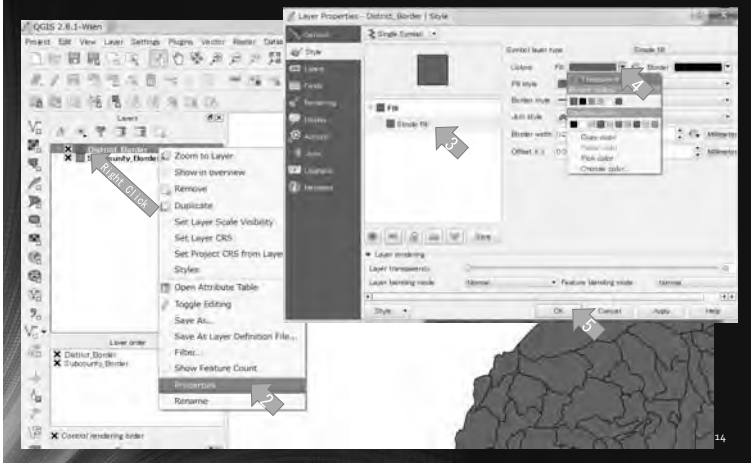
Layer Properties and changing style

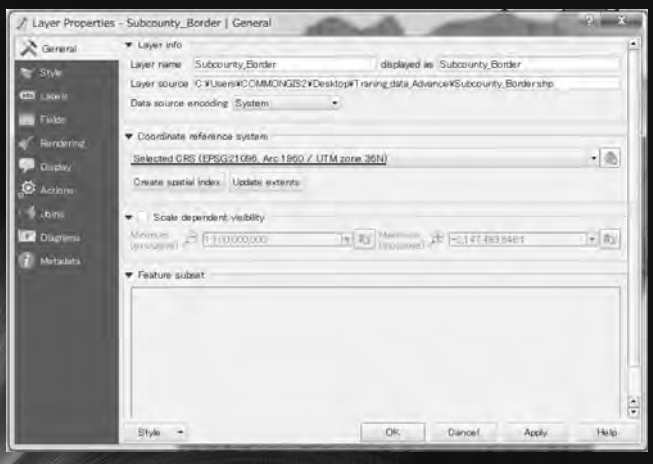


14

Layer of Sub-county style

15

Check Layer's Coordinate



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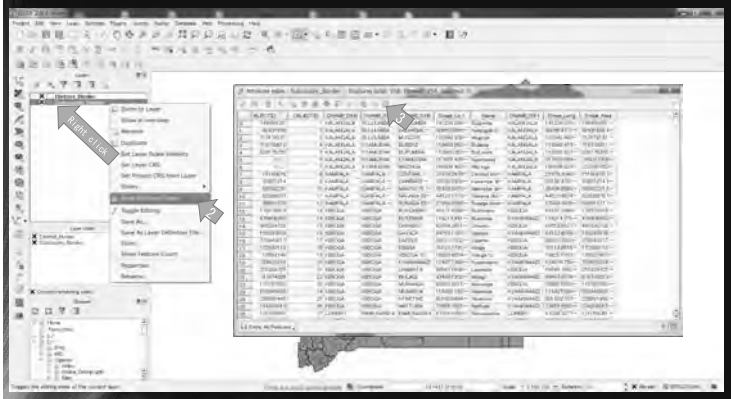
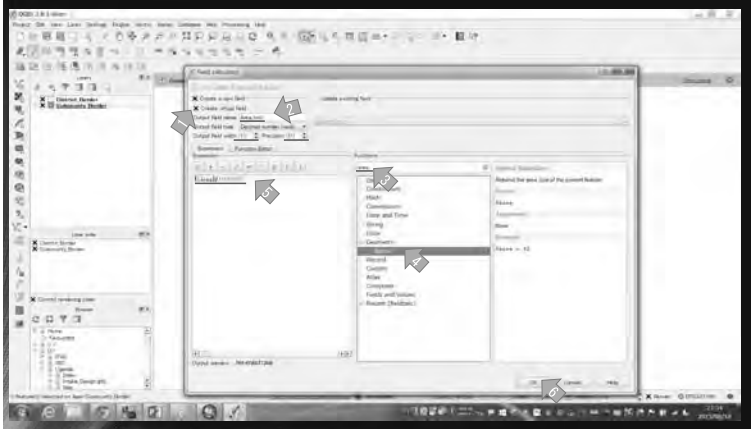
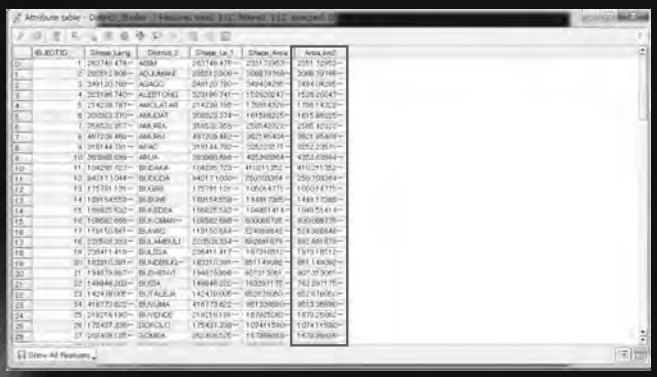
Area Calculation



Area Calculation

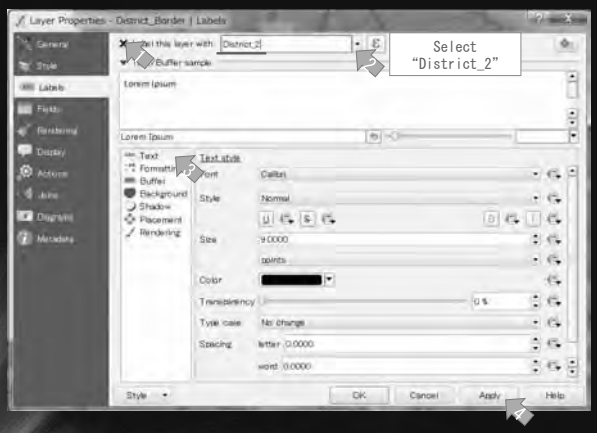


The result displayed

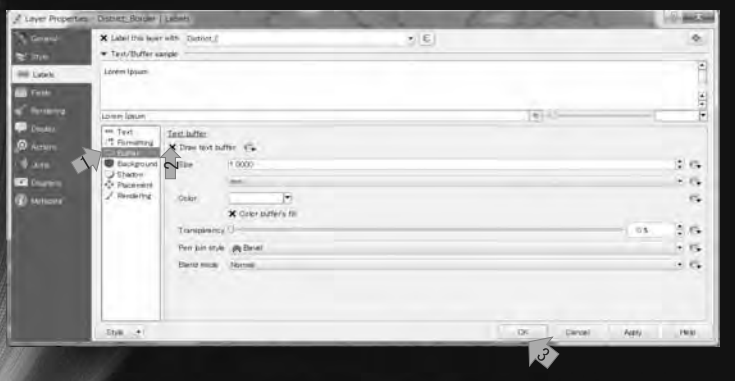


Practice: Please calculate sub-county Area (km2)

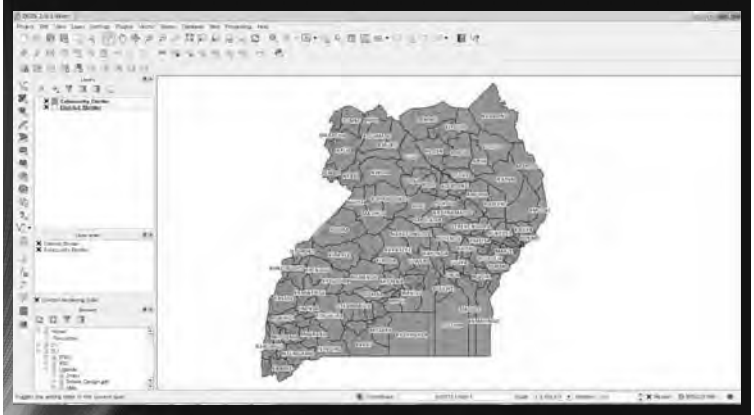
Labeling



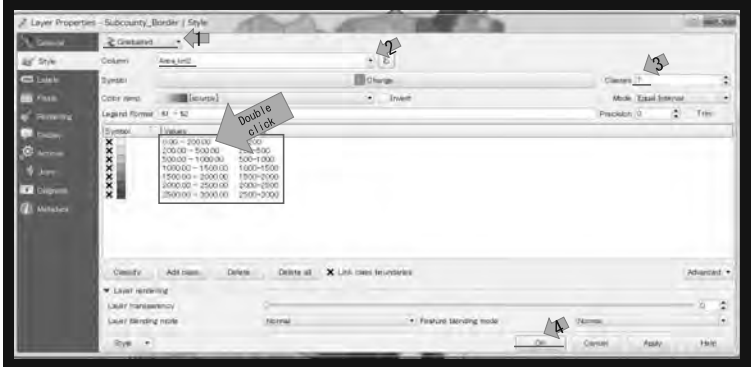
Labeling (extra)



Labels displayed



Labels displayed



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Map Layout

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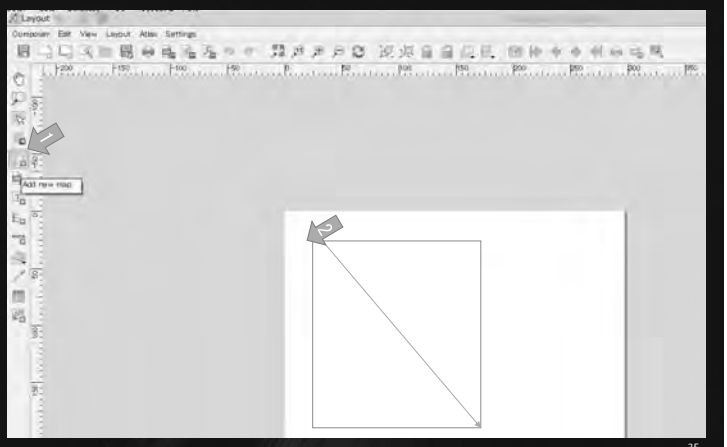
Map Layout



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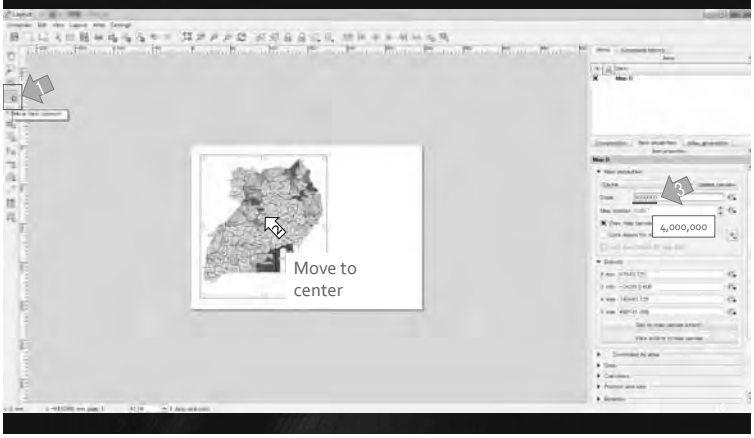
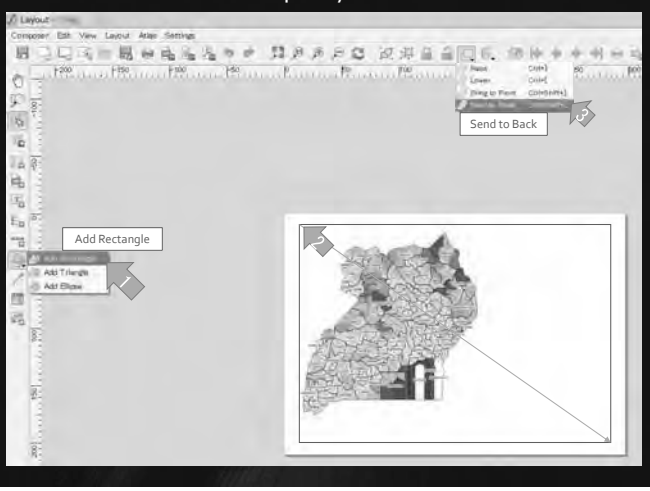
Map Layout



Map Layout



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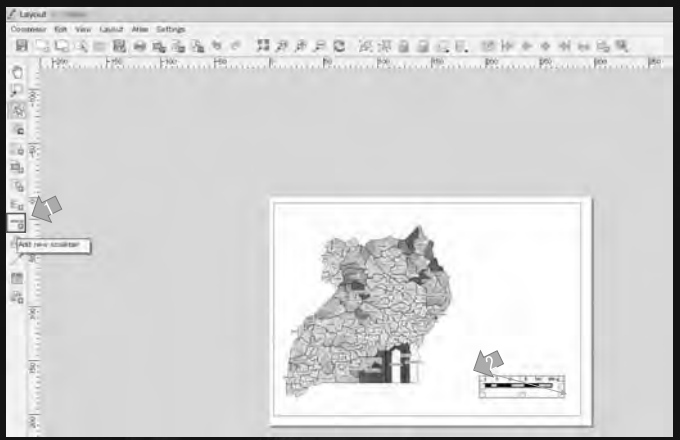
Map Layout



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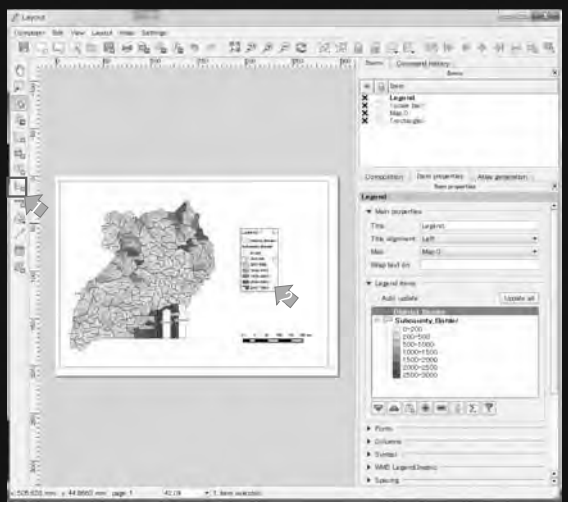
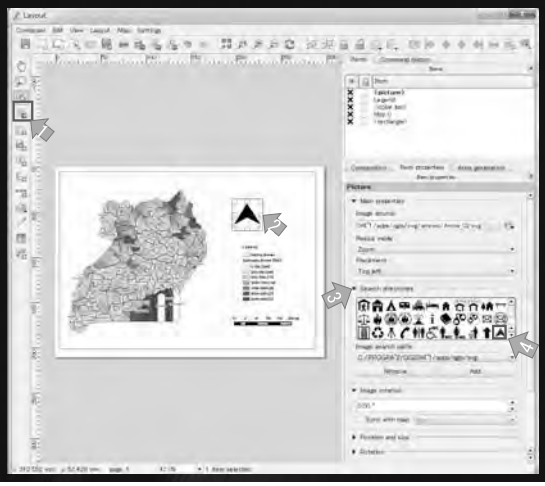
Map Layout



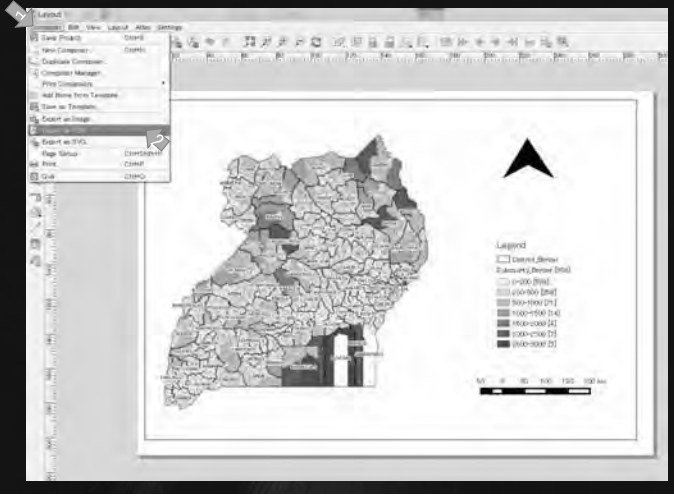
29

Map Layout



30

Map Layout



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Additional Practice

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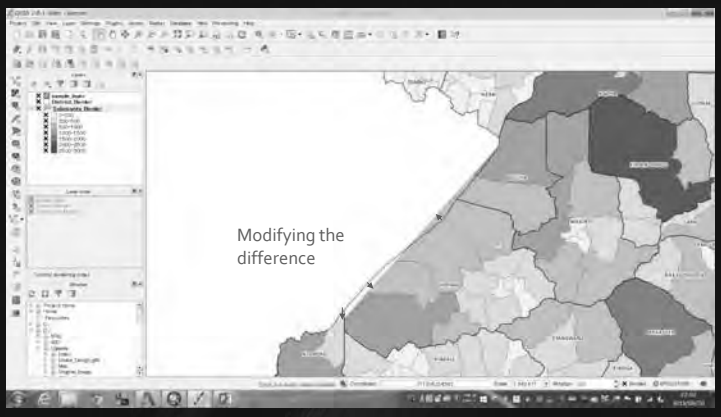
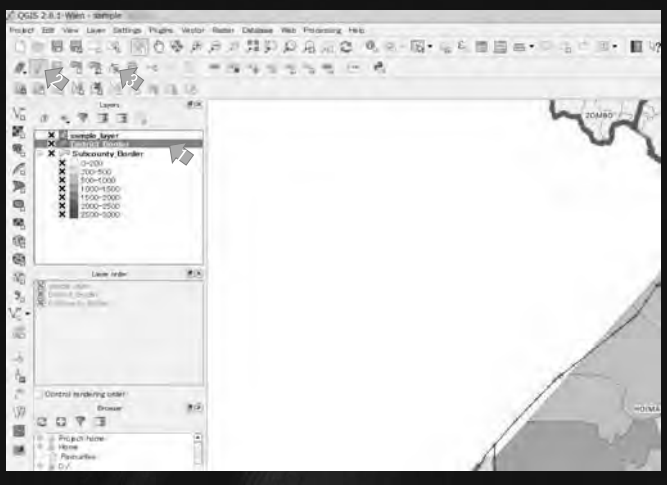
Modifying the border



33

Set up Editing mode



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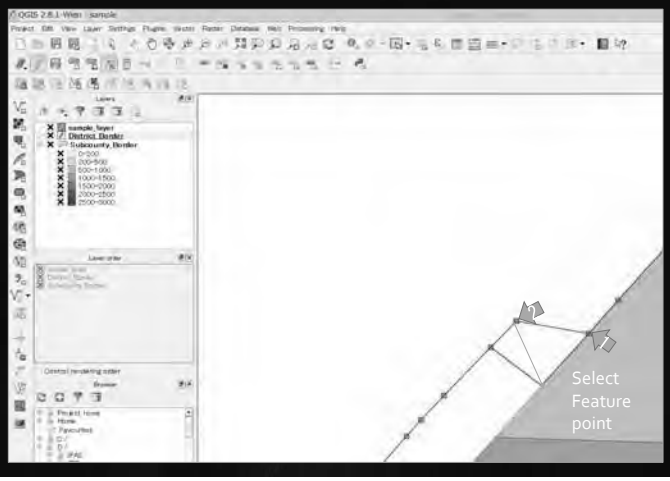
Select and move to correct place



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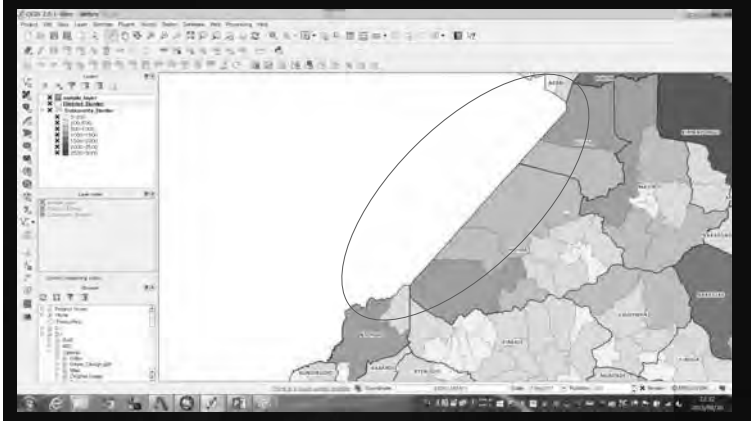
Modified



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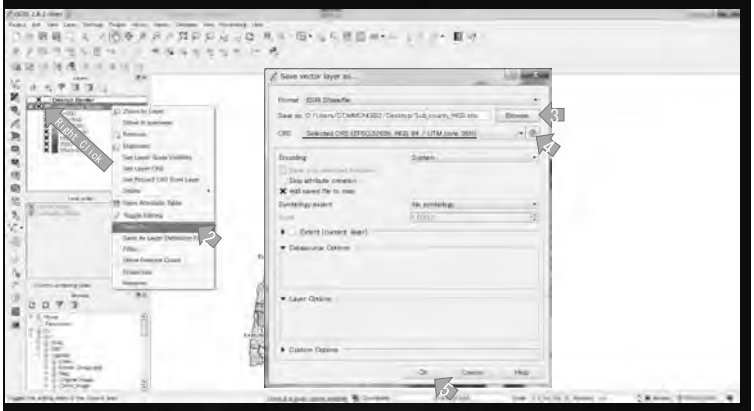
Changing the coordinate



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Thank you

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LECTURE 3: CREATING CONTOURS FROM DEM DATA USING QGIS

Project on Irrigation Scheme Development in Central and Eastern Uganda (PISD)

Emmanuel Pius OMONA
0785800741/0754792008

1

Contents

- Introduction
- Background on contours
- Creating contours from DEM
- Labelling contours
- Designing a map for printing

2

Introduction

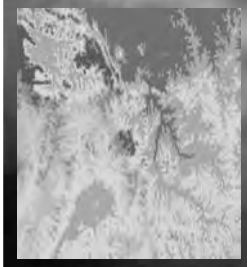
Contours are polylines that connect points of equal value such as:

- Elevation
- Temperature
- Precipitation
- Pollution
- Atmospheric pressure
- Population statistics
- Others

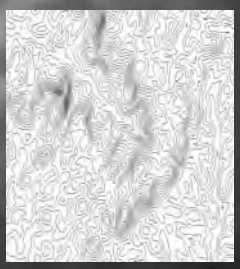
3

Introduction cont'd.....

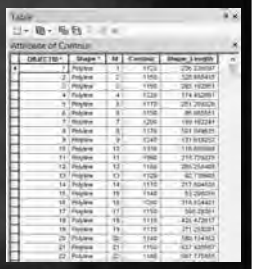
Contours are interpolated from a surface.



Input surface



Interpolated Contour



Attribute of Contour

4

Introduction cont'd.....

Various interpolation methods depending on application and data availability.

Methods include:

- Triangulated Irregular Network (TIN)
- Spline
- Inverse Distance Weighted (IDW)
- Kriging
- Natural Neighbor
- Trend

5

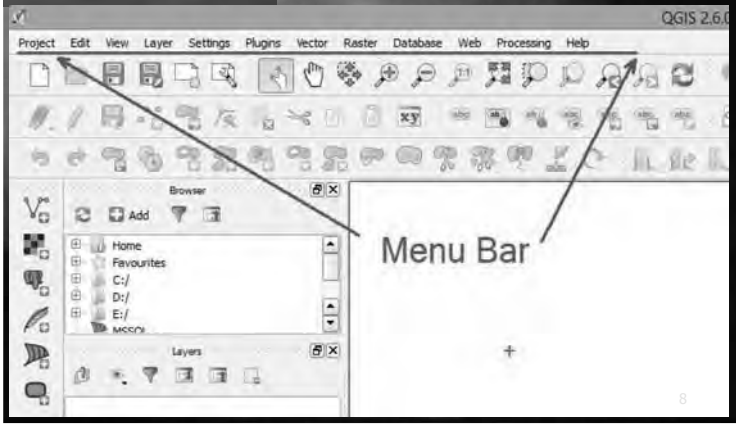
SOFTWARE DEMONSTRATION

6

Setting up the workspace

7

Workspace



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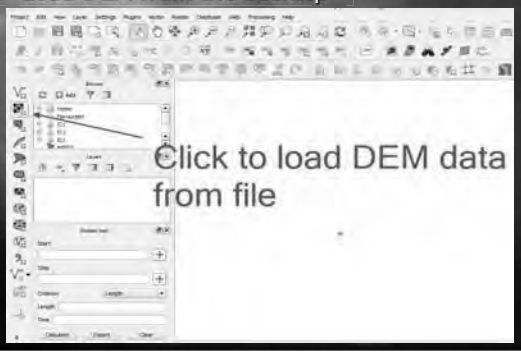
Creating contours from DEM

Steps:

1. Load DEM from the desktop



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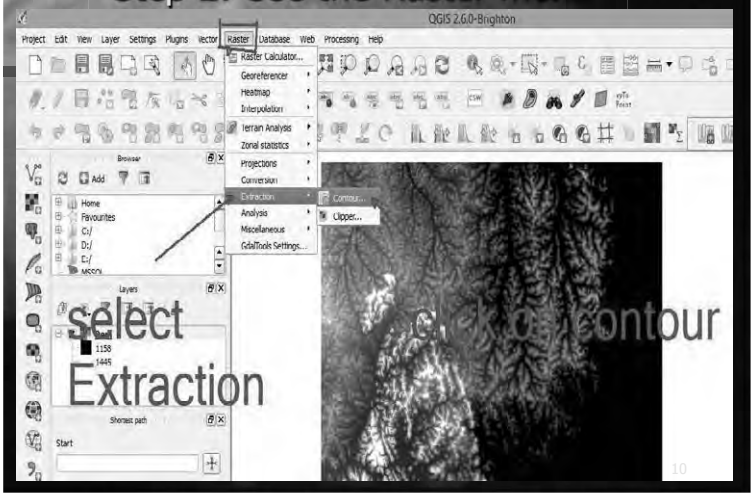
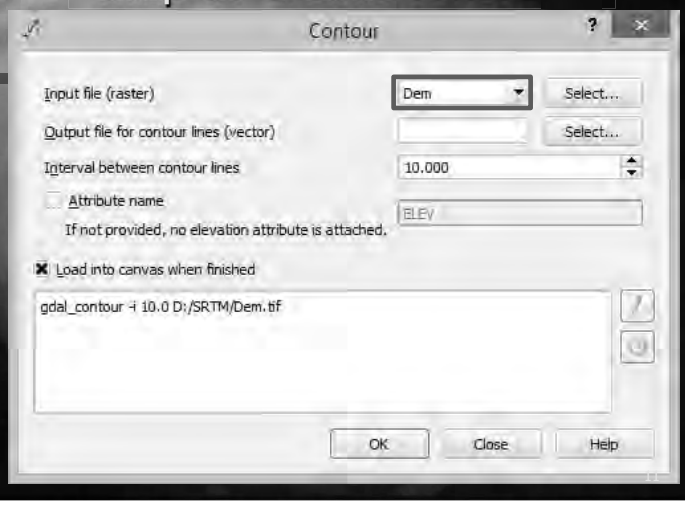
Step 2: Use the Raster menu



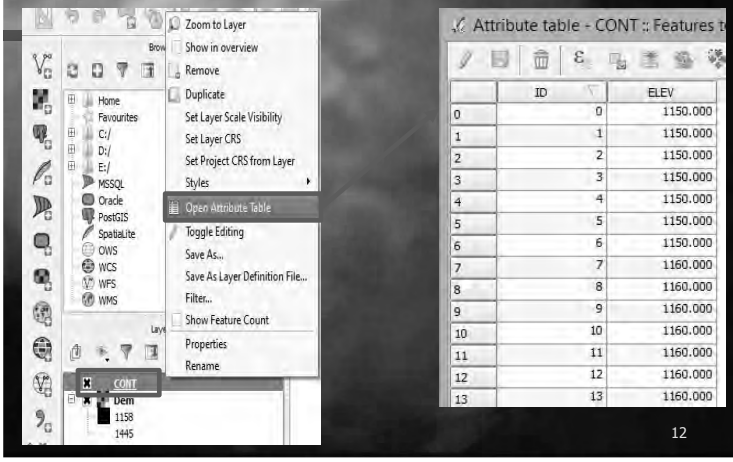
10

Step 3: Create contour



11

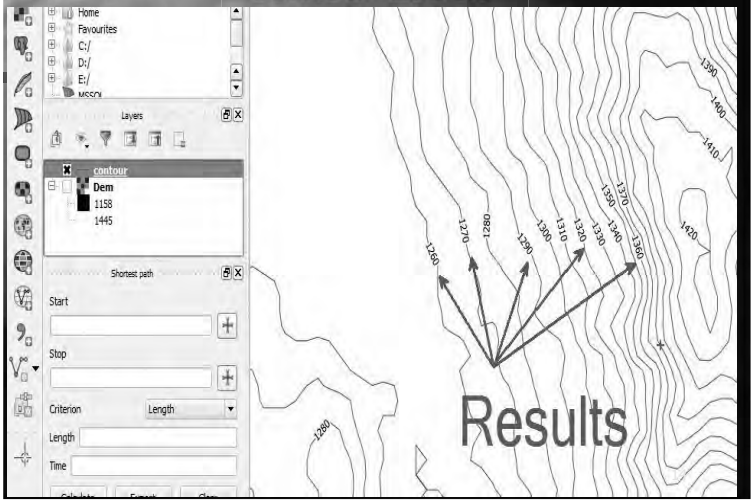
Step 4: View attribute table



12

Labelling Contours

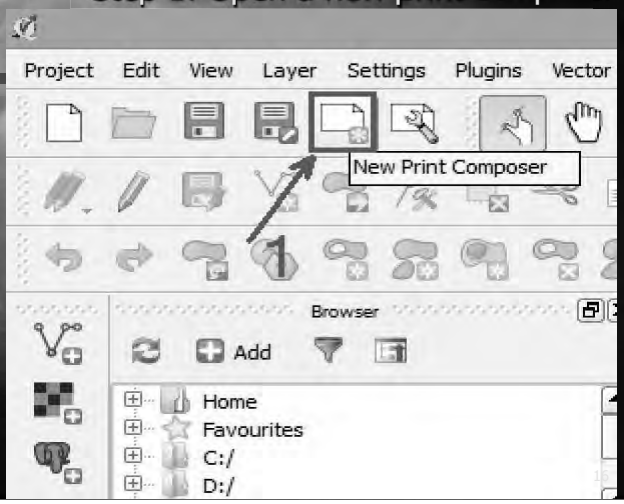
Contour Labels



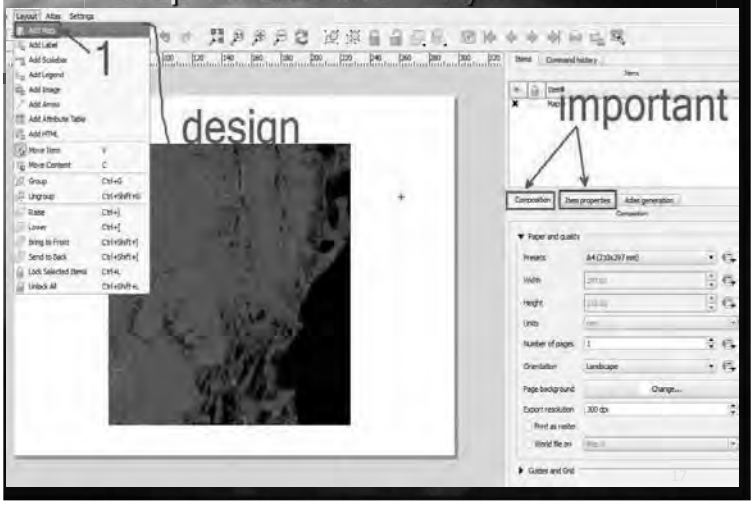
DESIGNING THE MAP FOR PRINTING

15

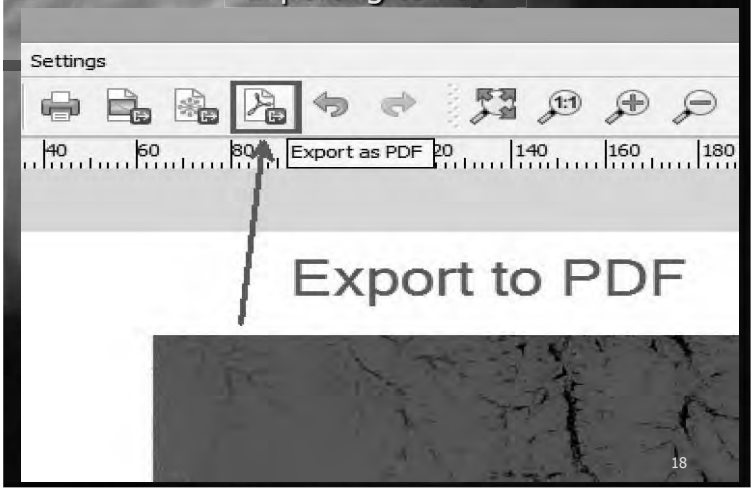
Step 1: Open a new print composer



Step 2: use the "Layout" menu



Exporting to PDF



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QUESTIONS AND ANSWER SESSION

19

THE END

Thank you for your attention!

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Lecture 4
Land Cover Map
Analyzing Landsat8 image

2ND SEPTEMBER 2015

SHOTARO KIKUCHI

Content

- Start up MultiSpec
- Supervised classification
- Unsupervised classification
- Area calculation

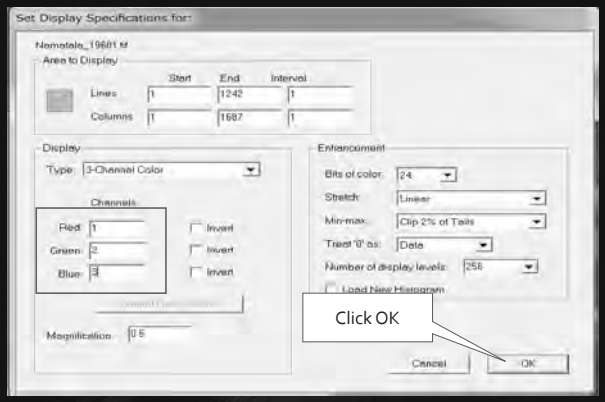
Multispec

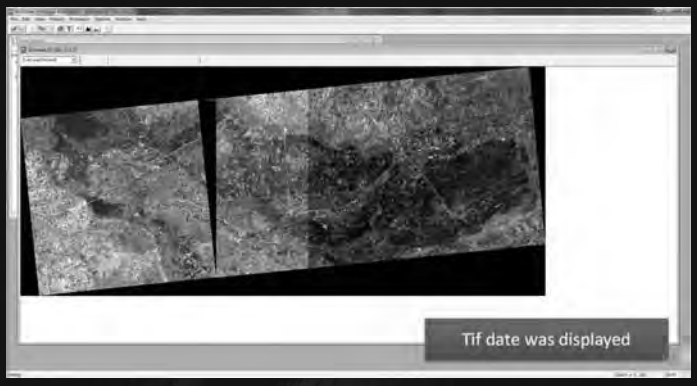
- MultiSpec is being developed at Purdue University in US and supported by NASA and NSF
- MultiSpec doesn't need a high spec computer
- MultiSpec is basically for creating land use map

Start MultiSpec

Open File

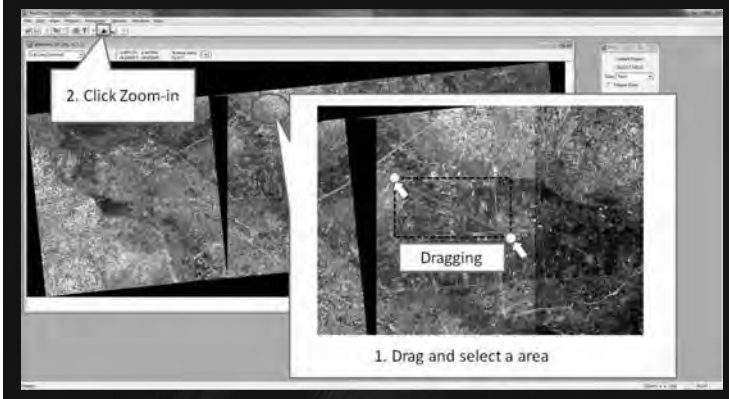
Set histogram specifications to be default values





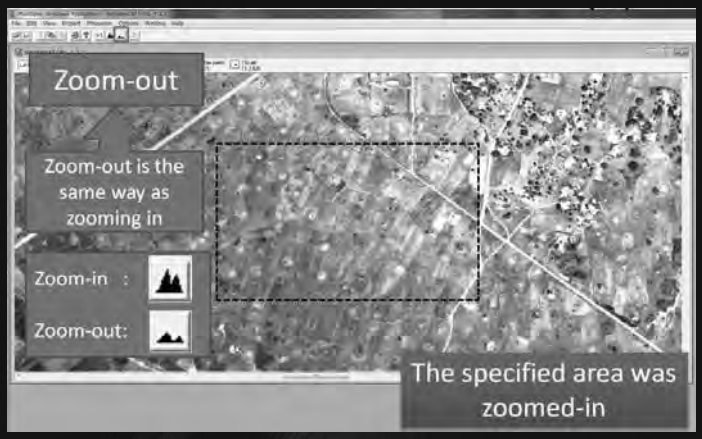
7

Zoom in and Zoom out (1)



8

Zoom in and Zoom out (2)

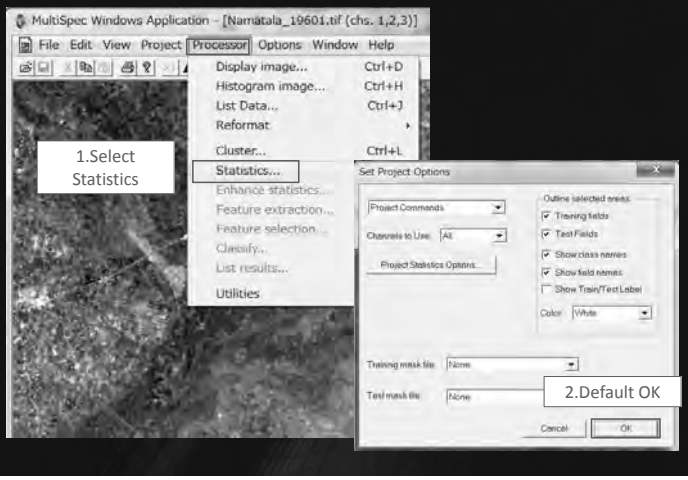


9

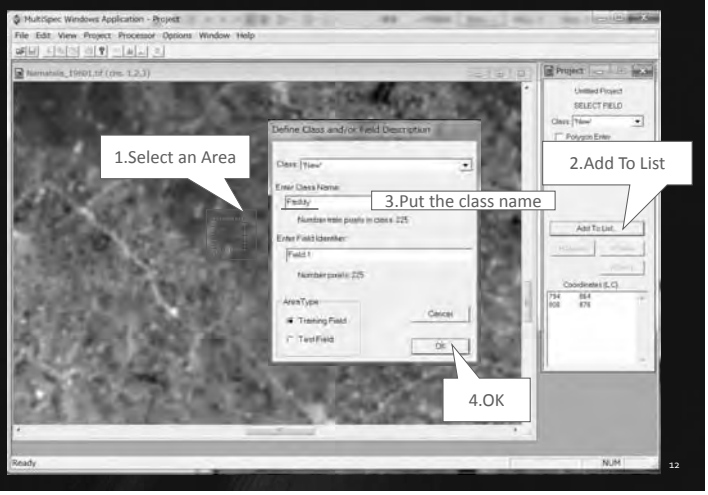
Supervised classification

10

Open Select Field

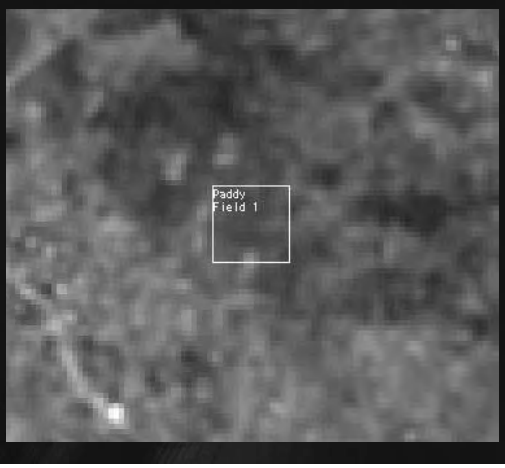


11



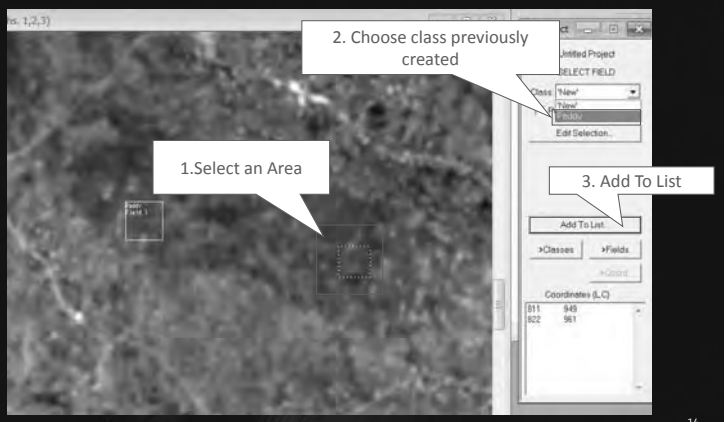
12

Name of class and field number were displayed



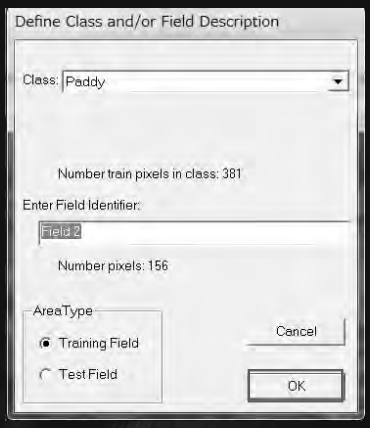
13

Select the same class



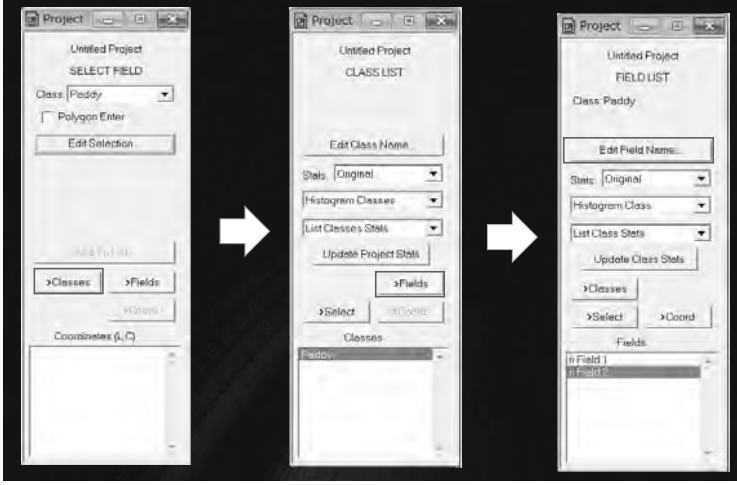
14

Confirm class and name Field

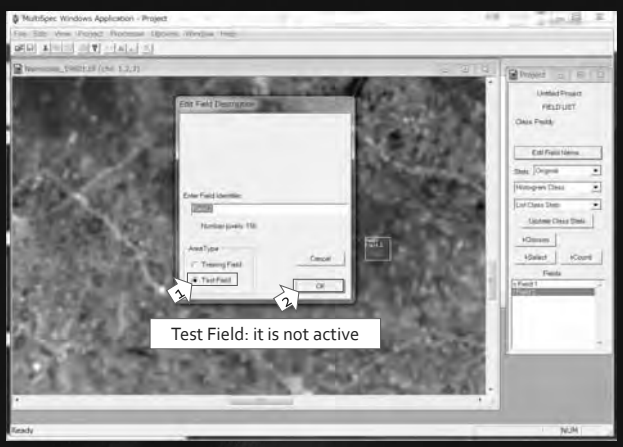


15

Edit Field



Remove the field



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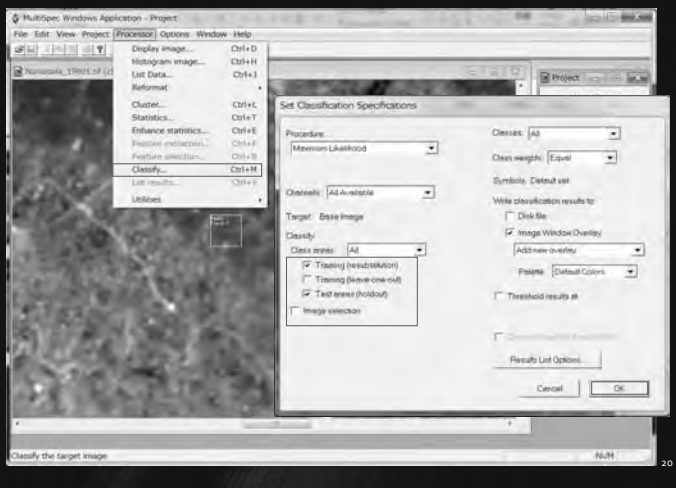
Google earth is good tool for making sure land use

18

Field survey and take Geotag Pictures for putting on Google earth

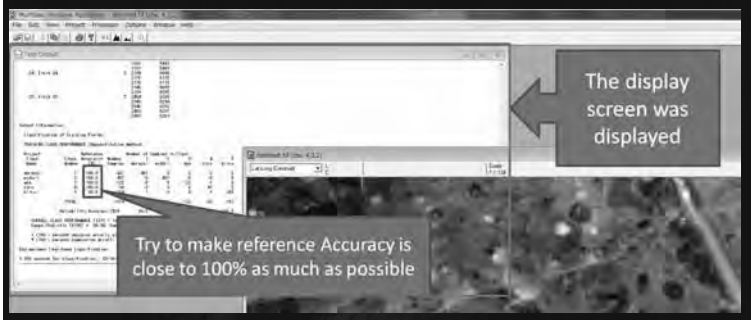
19

Set classification specifications for Text output



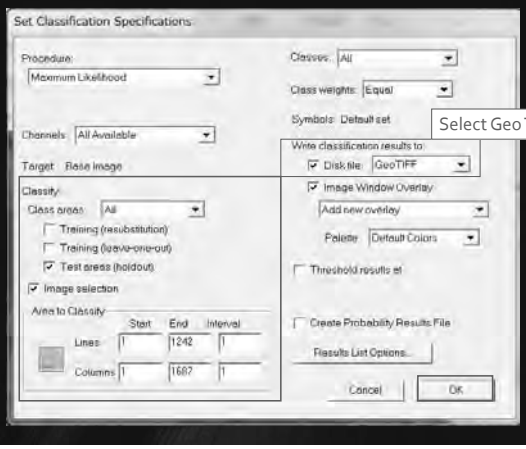
20

Text Output



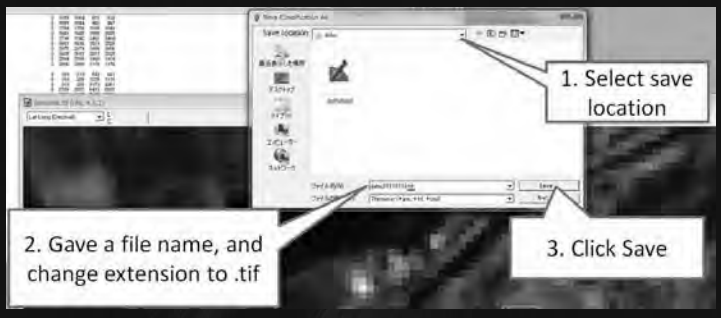
21

Set classification specifications for Image output

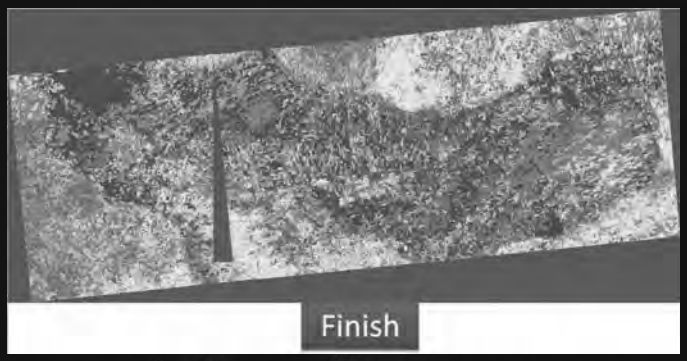


22

Save the TIFF file



23

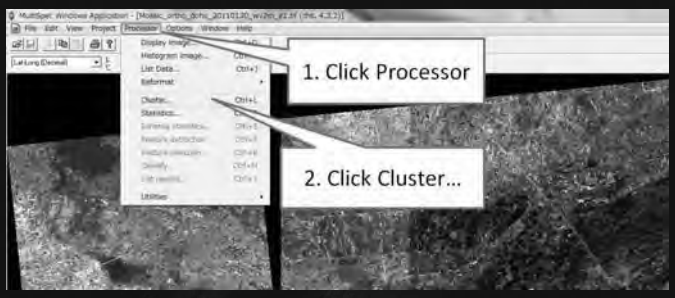


24

Unsupervised classification

25

Click Cluster



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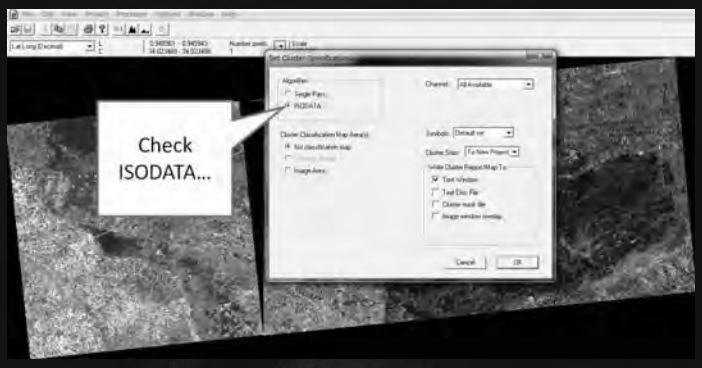
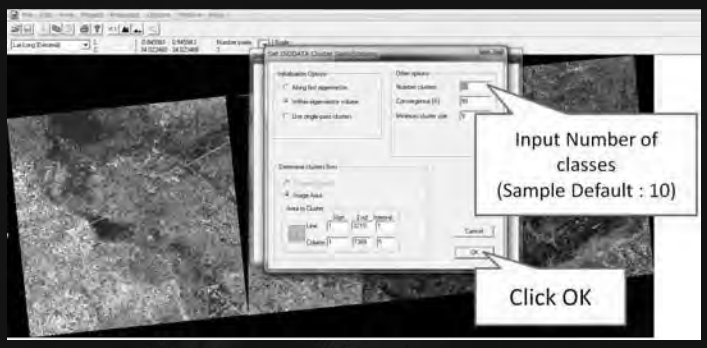
Check ISODATA to conduct ISODATA clustering unsupervised classification



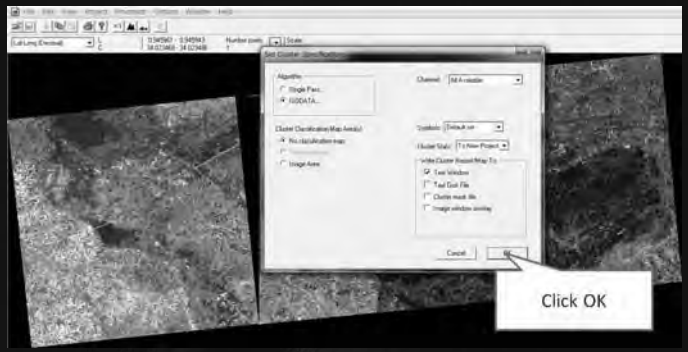
27

Input number of class



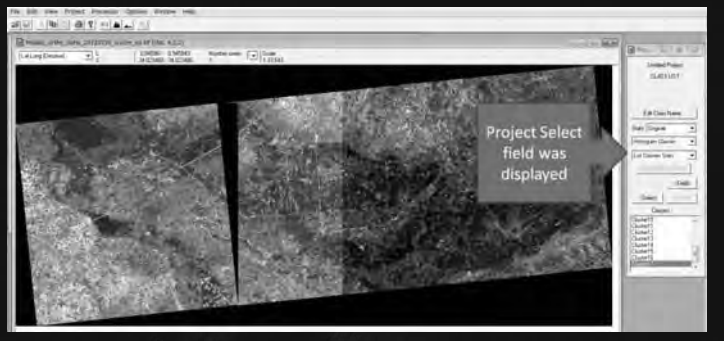
28

Proceed classification



29

Project select field



*Way to output is the same as supervise classification

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Area calculation

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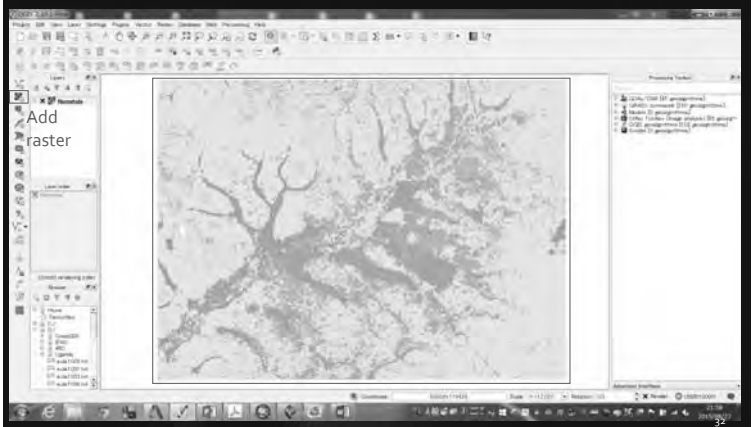
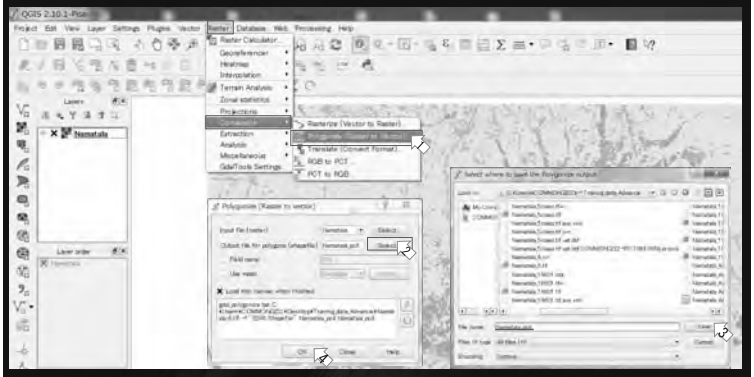
Add the raster image to QGIS



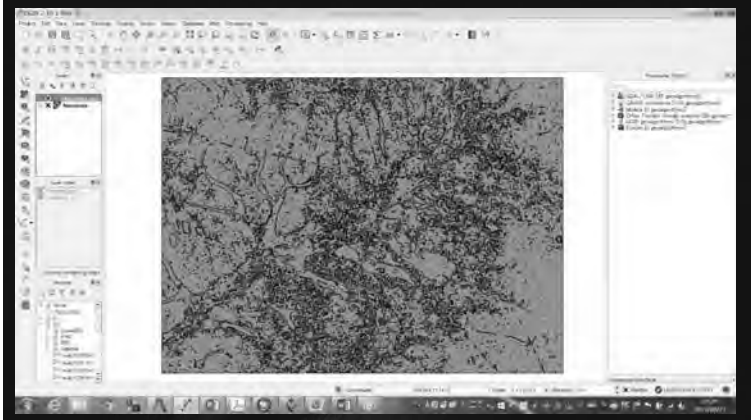
32

Raster to Polygon



33

Converted to Polygon



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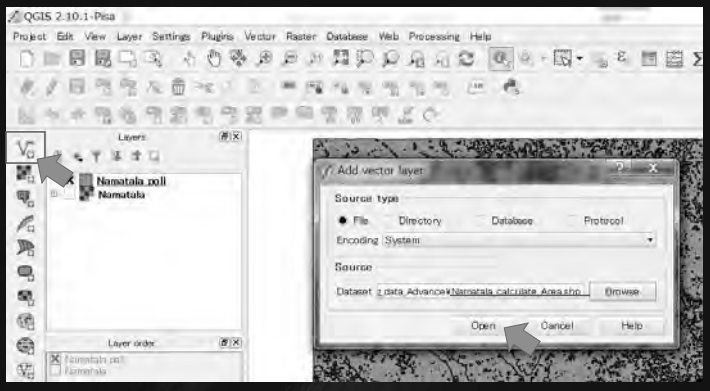
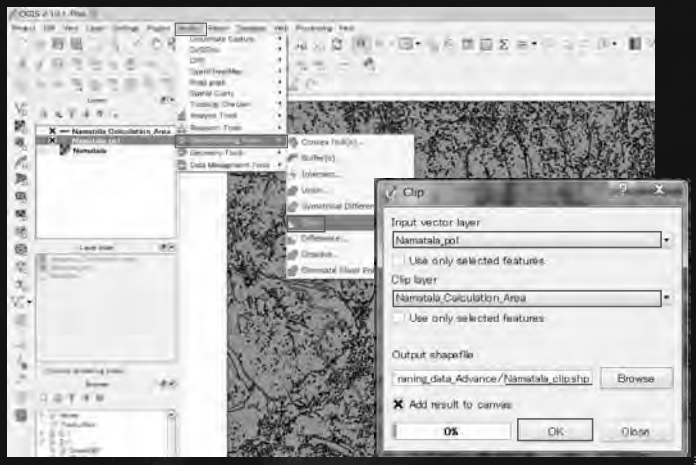
Add Calculation Area



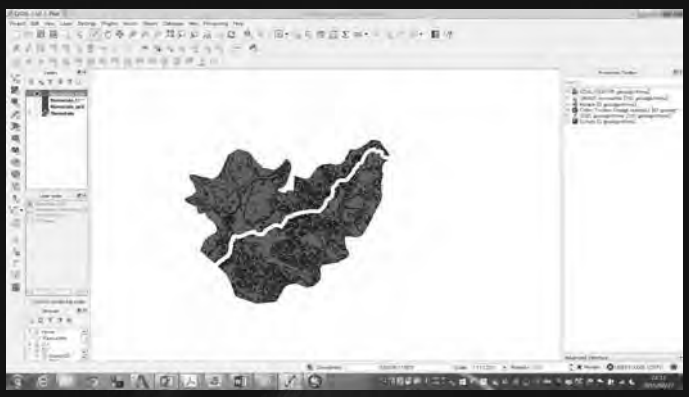
35

Clip the Land cover Polygon



36

The area was clipped



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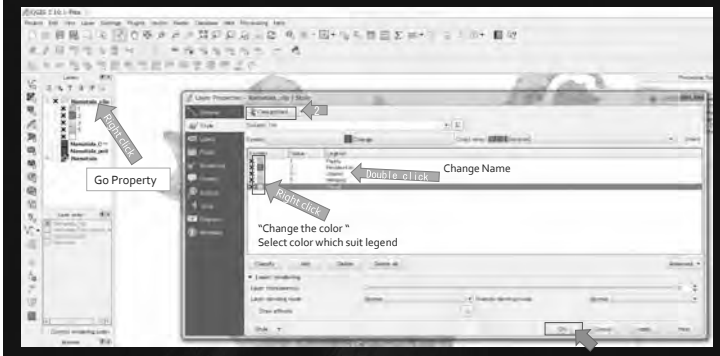
Change the style and confirm



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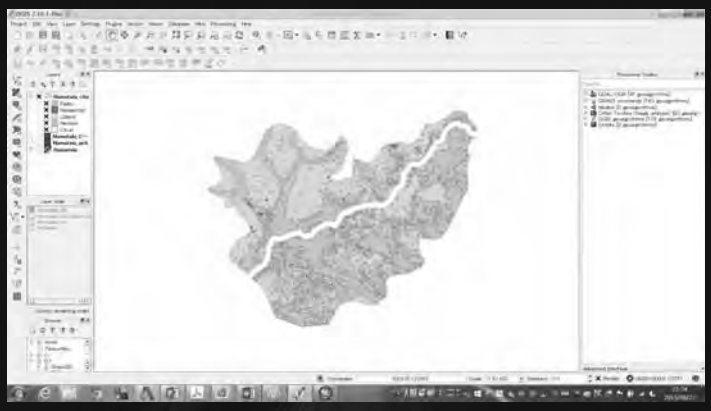
Land cover is now clear



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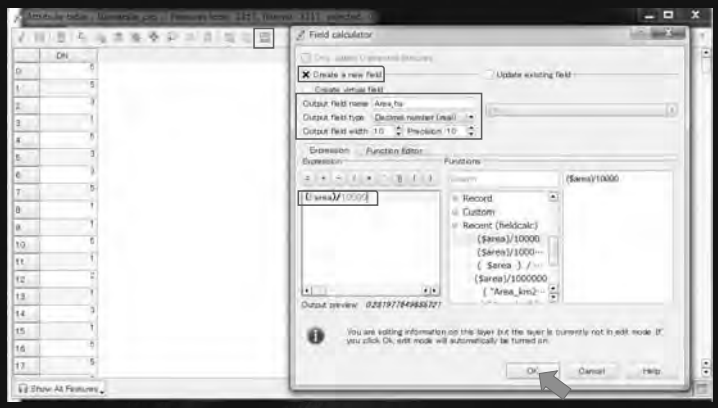
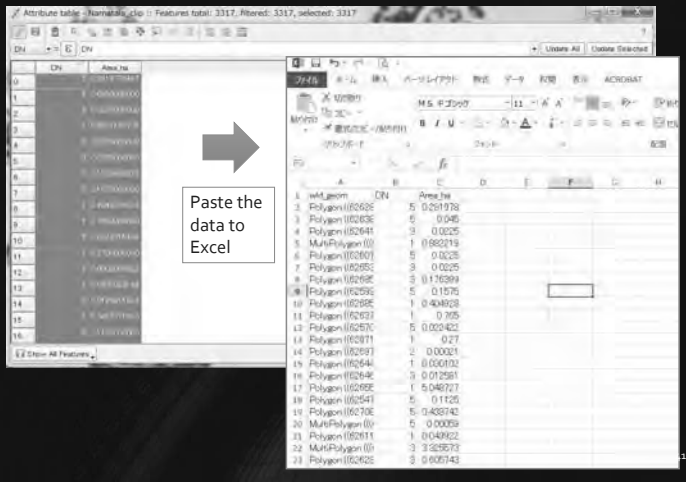
Calculate the areas



40

Copy the result to Excel



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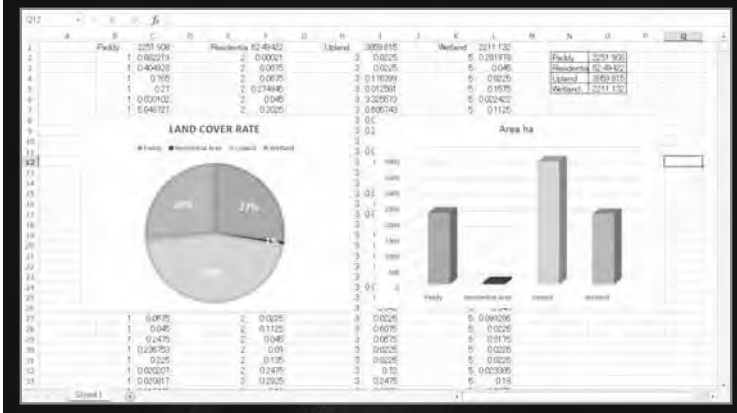
Make Graph using Excel



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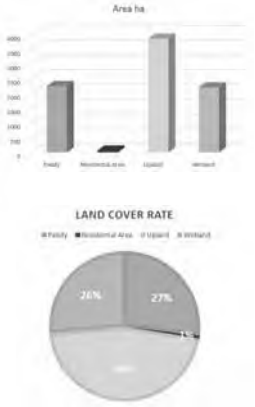
FINISH

NAMATALA LAND COVER



Thank you

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LECTURE 6: WATERSHED DELINEATION USING SRTM & QGIS 2.8

Project on Irrigation Scheme Development in Central and Eastern Uganda (PISD)

Emmanuel Pius OMONA
0785800741/0754792008

1

Contents

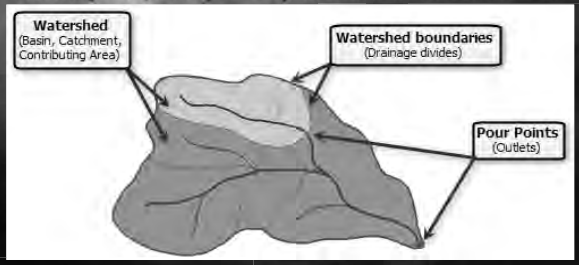
- Topics
  - Background on watershed
  - Sources of DEM
  - Steps in delineating watershed
  - Tools used in delineating watershed in QGIS
- Topics will be followed by Software Demonstration and questions and answer sessions.

2

Introduction

Watershed analysis: Areas that drain water and other substances to a common outlet.

- Modelling of run off processes
- Run off is controlled by surface forms thus Digital Surface Model (DSM/DEM) is very crucial in watershed analysis.

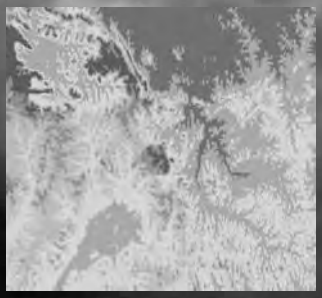


Source: http://help.arcgis.com

3

Introduction cont'd.....

Watersheds are delineated from DEM.



Digital Elevation Model

Watershed

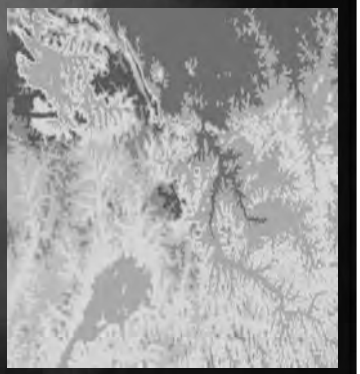
4

Sources of DEM

- Traditional land surveying
- Aerial Photography

5

- LiDAR
- RADAR



6

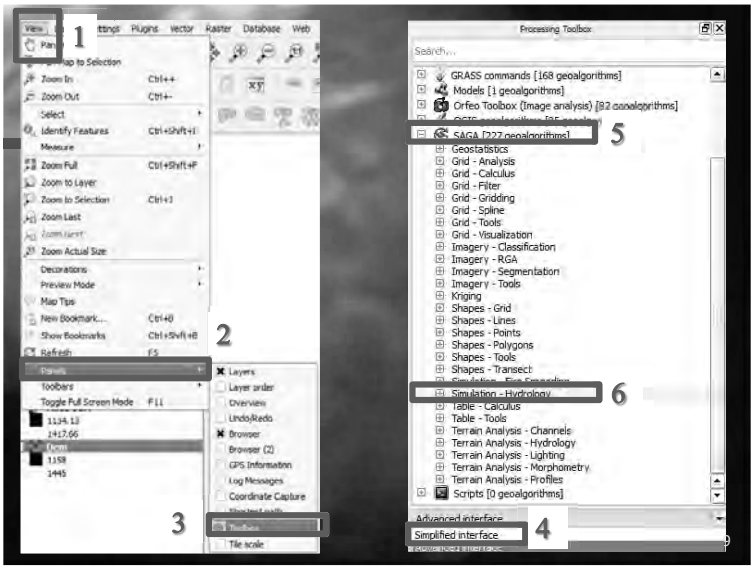
Steps in delineating watershed

1. Identifying target area for watershed analysis and preparing DEM data
2. Create a depressionless DEM (filling sinks)
3. Create flow direction raster
4. Create flow accumulation raster
5. Create stream Network
6. Create pour point
7. Delineate watershed
8. Converting raster to vector

7

Accessing tools used for Watershed Delineation in QGIS

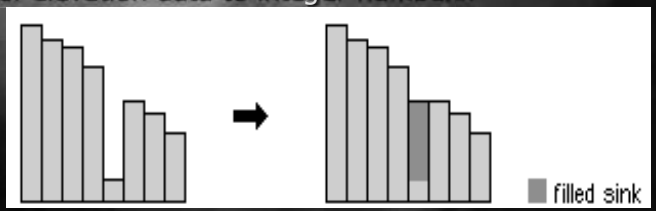
8



9

Sinks

- Sinks are errors in DEM.
- A sink is an area surrounded by higher elevation values. It is also referred to as a depression or a pit. Sinks prevent downslope flow routing of water.
- Errors are caused by sampling effects and rounding of elevation data to integer numbers.



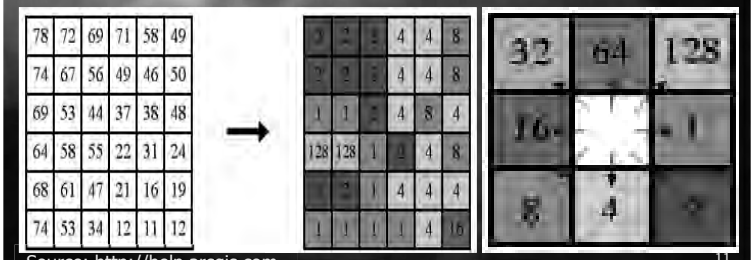
Profile view of a sink before and after running fill

Source: http://help.arcgis.com

10

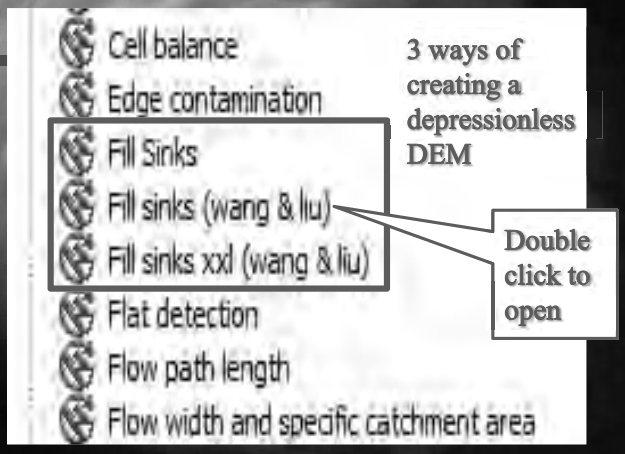
Flow direction

- Key to deriving hydrologic characteristics of a surface.
- Eight valid output directions relating to the eight adjacent cells into which flow could travel. (D8 flow model)

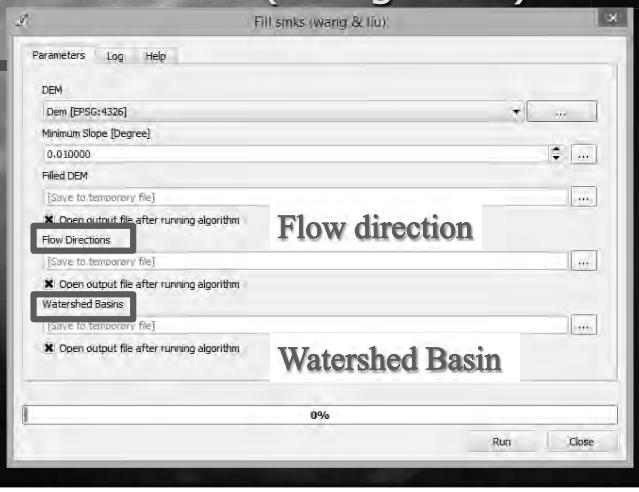


Source: http://help.arcgis.com

Creating a depressionless DEM(filling sinks)



Fill Sinks (Wang & Liu) tool



Output

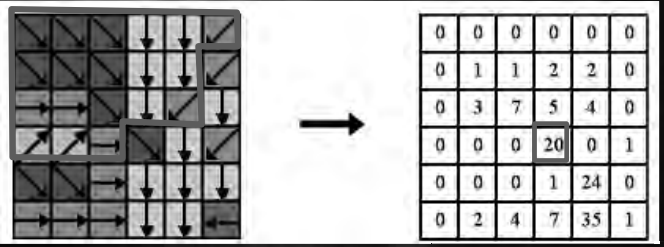

Filled DEM


Flow direction


Watershed Basins

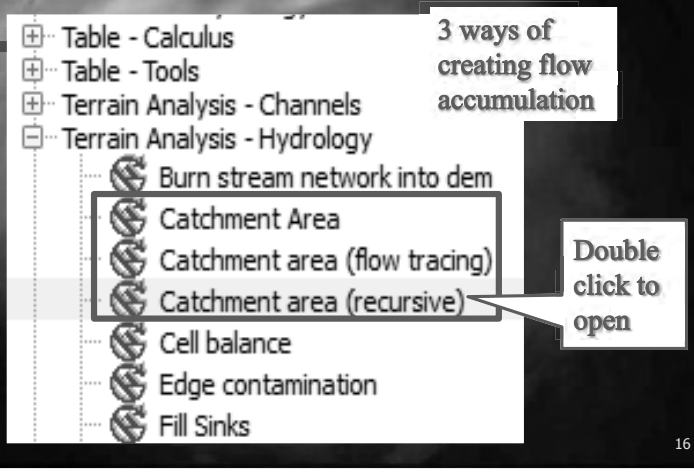
Flow accumulation

- Refers to the number of upslope cells that flow into each cell.
- Cells with a high flow accumulation are used to identify stream channels whereas areas with 0 flow accumulation are used to identify ridges.

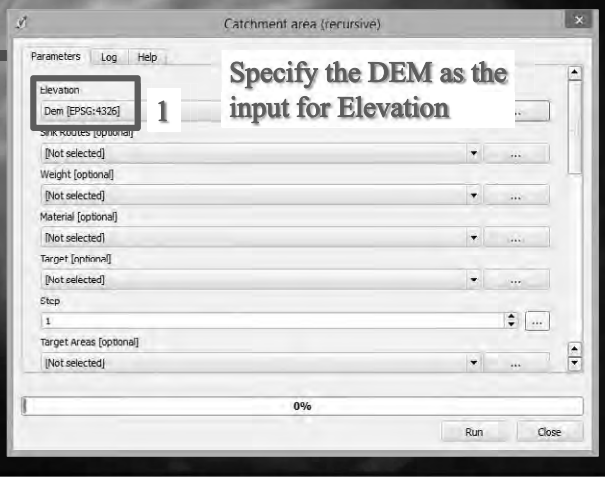


Source: http://help.arcgis.com

Flow accumulation and Catchment area



Catchment Area (recursive) tool



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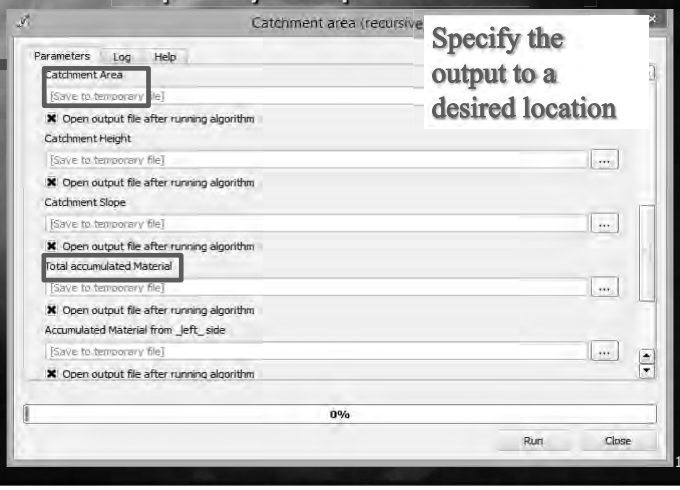
Specify output location



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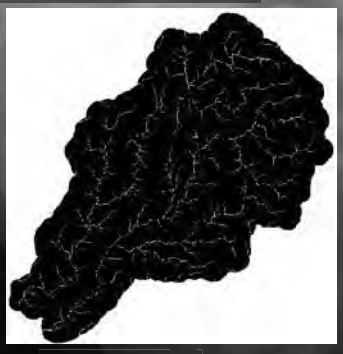
Output



Catchment Area

Flow Accumulation

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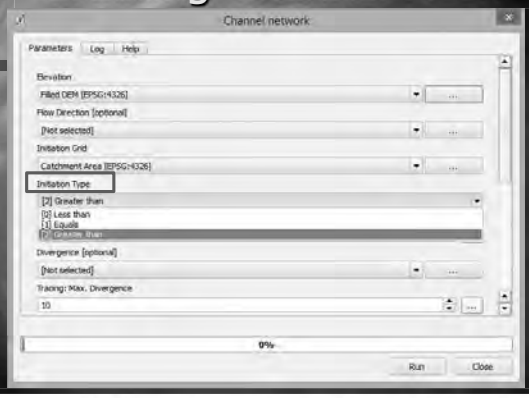
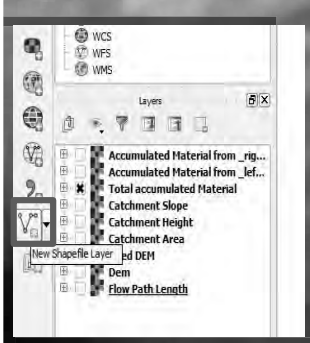
Creating Channel Network



Must specify flow accumulation threshold, default value is 0.00

20

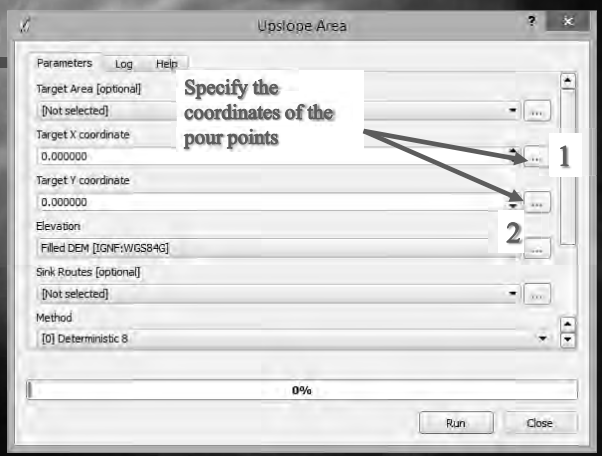
Creating Pour Point(s)



The coordinate system of pour point must be the same as that of filled DEM

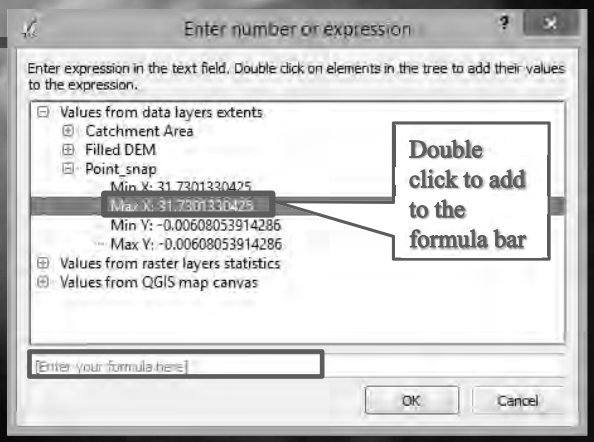
21

Creating contributing area

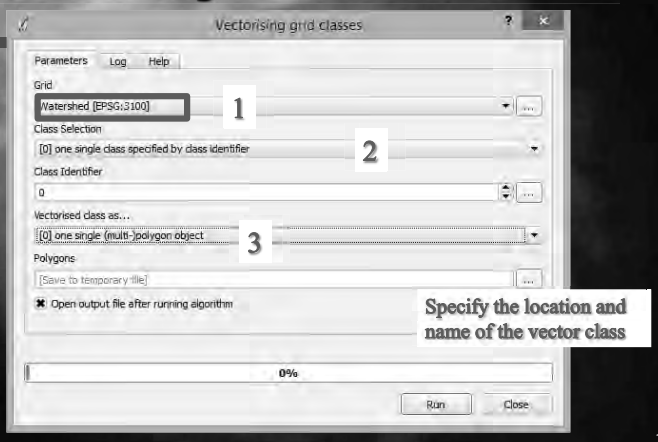


22

Specifying coordinates of pour point

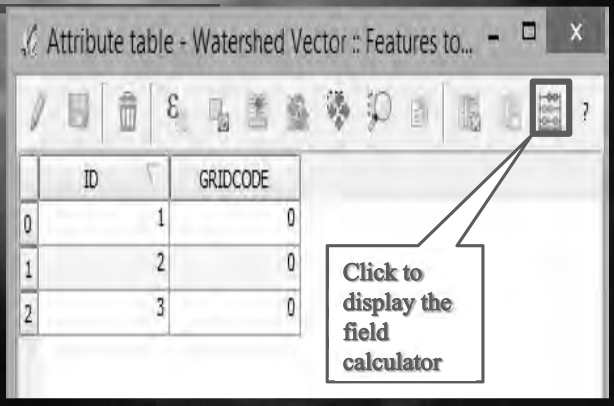


Converting from raster to vector

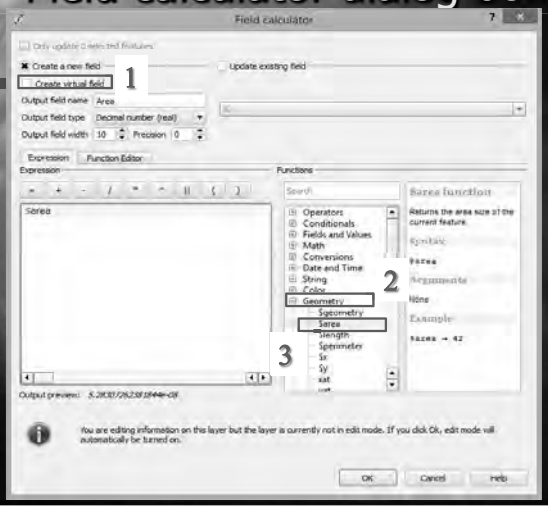


Calculating the watershed area

- Open the attribute table of the vector class.



Field calculator dialog box....



QUESTIONS AND ANSWER SESSION

THANK YOU

LECTURE 8
DRONE

2nd September 2015

Shotaro KIKUCHI

CONTENT

- What is Drone?
- Basic operation

WHAT IS DRONE ?

DRONE

- An unmanned aerial vehicle (UAV), commonly known as a drone, and also referred to as a remotely piloted aircraft (RPA) by the International Civil Aviation Organization(ICAO)
- They are usually deployed for military and special operation applications, but also used in a growing number of civil applications
- Google and facebook, Amazon, DHL, Some pizza company express to use drone for business
- Drone's economic effect estimated for ten years is **82 billion USD**

WHAT DIFFERENCE BETWEEN RADIO CONTROL HELICOPTER AND DRONE?

Radio control helicopter

Drone

Drone doesn't needs someone's control. If you gave the direction, it can go and back using GPS by itself

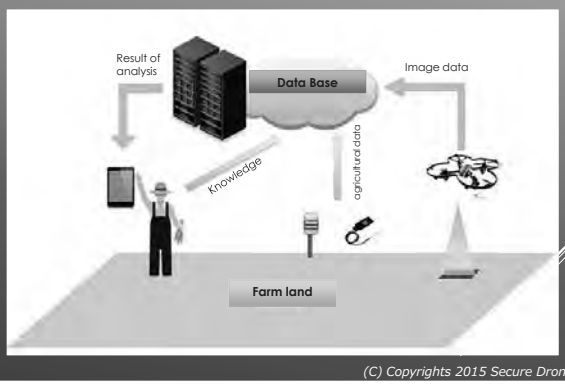
DRONE'S POSSIBILITIES

- Drone can go to disaster zone
- Monitoring for nature and environmental research
- Taking some movie for journalism
- Sport activity
- Delivery
- Agriculture

Agriculture has most potential of Drone
By AUVSI（Association for Unmanned Vehicle Systems International）

BENEFIT OF AGRICULTURE

- Spread agriculture chemical
- Monetarizing the crop growth



7

RISK OF DRONE

1. Using for terrorism
2. a breach of privacy
3. Misused by someone who doesn't know how to use safely

8

DRONE HAS MUCH POTENTIAL BUT,,, SAFETY FIRST!

- The regulation is being made now, but it is taking long time.
- We have to think the safety first

9

BASIC OPERATION

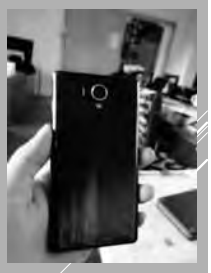
10

ITEMS

Controller

Drone

Smartphone



SET UP DRONE

1. Turn on switch of Drone, controller, and Wi-Fi
2. Drone's battery express power by four green lights

Attention!!
Propels are very dangerous!
When you push drone's switch, drone should be on stable flat place and hand should be under propels

CALIBRATION

1. Up and down the right hand stick
2. Drone's light become yellow.
3. Drone turn counterclockwise 360 ° (Green light →OK)
4. Stand drone and counterclockwise 360 °

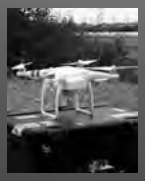
   (Green light →OK)

*Before you launch drone, you have to calibrate drone

CHECK THE CAMERA DIRECTION

If calibration is successful, the camera direction is fix if the drone leans

Controller sticks moves the direction



Propels start spinning

READY FOR TAKE OFF

1. Two stick place to under center
2. Propels spin
3. It is ready to fly

Check the sound of propels !
If there are some problems,
the sound should be different.
In the case, it needs maintenance

SAFETY REGULATION (1)

- **Operation system**
1. Safety Manager
2. Flight schedule Manager
3. Maintenance Manager

- **Flight management members**
1. Operation Manager
2. Maintenance
3. Operator
4. Monitor for Display
5. Monitor for Drone's direction
6. Security manager

6 people are needed

- **Emergency contact system**
1. Firefighting
2. Police
3. Hospital
4. Site supervisor
5. Operator
6. Order
7. Safety Manager
8. Business Manager
9. Ministry of Work

SAFETY REGULATION (2)

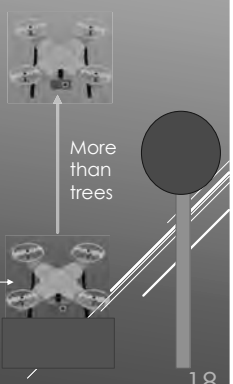
- **Way for safety implementation & Management**
1. Make communication system
2. Report System for Information of Accident
3. Correspond for accident
4. Follow the regulation
5. Education and training

- **Equipment needed for safe**
1. First aid kit case
2. Extinction
3. Tools for Emergency contact
4. Equipment for safety

- **Correspond of accident**
1. Rescue the injuries
2. Emergency treatment for the injuries
3. Stop second disaster
4. Report to emergency contact
5. Accident scene
6. Check eyewitness
7. Report your staff and organization
8. Contact to the injured family

TAKE OFF

1. Right stick slowly up
2. You have to take distance is 30 m
3. Rise more than tree height



How to Control

19

SMART PHONE'S DISPLAY

Position of drone

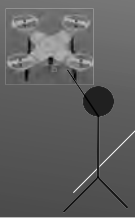
20

TOUCH DOWN

Catch the leg

1. Basically when drone touch down, another person catch the drone
2. Slowly down drone
3. When the person catch, stop the propels and turn off the power of drone

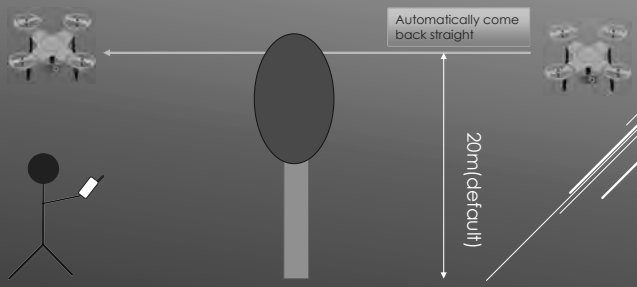
Stop propels



21

GO HOME

- If battery is low or lost connect to controller, drone automatically coming back to your place.(it calls "Go home")
- When "Go home", drone comes back to your overhead; the default attitude is 20 m (you can change the attitude)



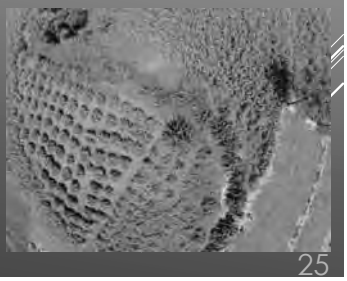
22

ATTENTION FOR OPERATION

- Attitude of drone which display shows has error with in 5m.
- When there are strong wind or raining, you should not launch
- Carefully check battery. If it is low, it must come back immediately.
- You must not launch drone near people living.
- You must care about people's privacy
- You should not put any items. The motor will be under load.
- It is difficult to take off and land on unstable area
- If battery swells bigger or smell of apple, it's very dangerous to explosion.
- The best condition to keep battery is 50% and shouldn't be put near flammable items.
- If it battery can't be charge, it means battery is broken and shouldn't be used. Please throw away after electric discharge.
- Motor lifetime is 100 hours.

RESULT

PICTURES



25

MOVIE

26

Pictures

3D MODEL

Possible to make 3D model form some pictures

Software

Agi soft
Photo scan
professional

27

THANK YOU

28

1

Comprehensive evaluation

2RN SEPTEMBER

SHOTARO KIKUCHI

2

After workshop…

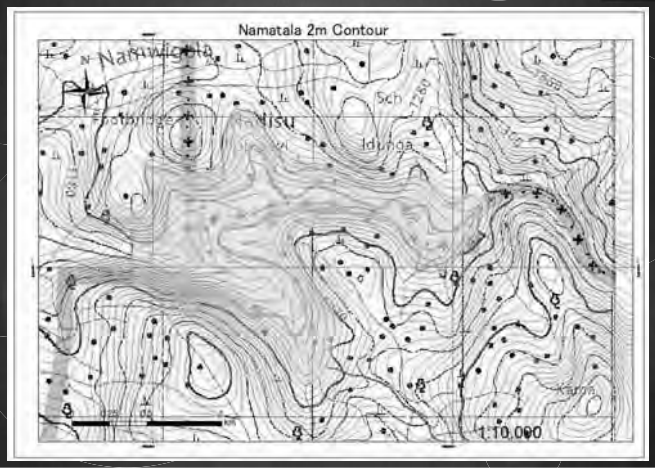
- What you can do and check point

Complement Map of 1/50,000

3

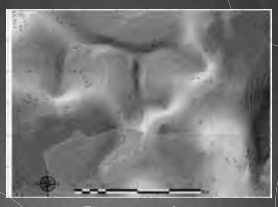
Select Dam site

4

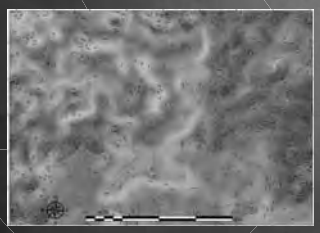


Compare DEM

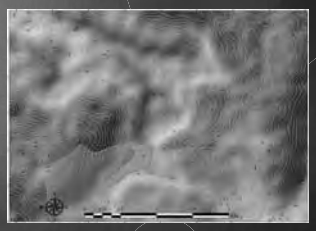
5



Topography



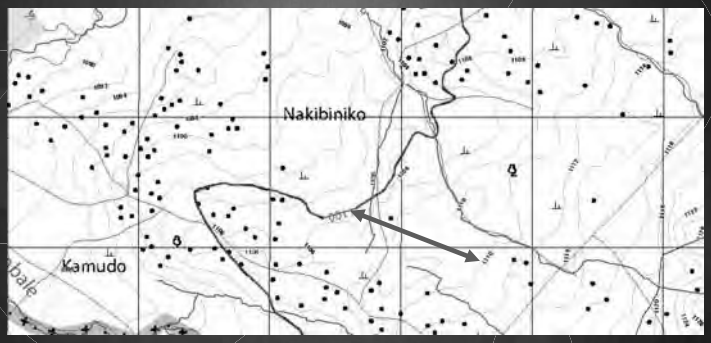
Aster-GDEM



SRTM

We have to trust Topography map

6



Check water resource

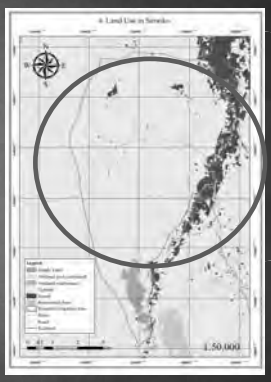
7

Grand truth is important

8

Check the land potential

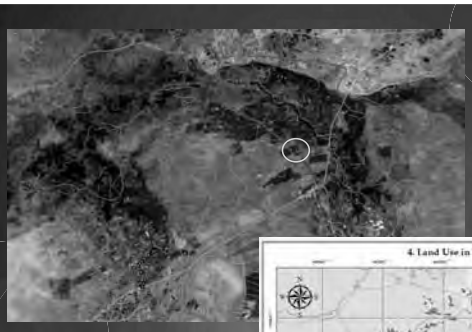
9



Big watershed and nucleated land is big potential

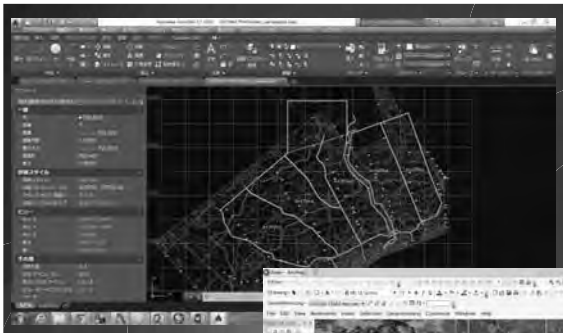
10

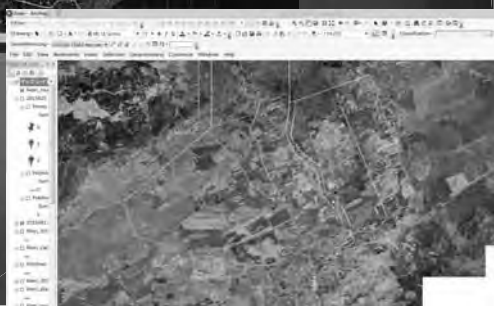
Using Geotag photo and confirm



The field photo

11





Communication between

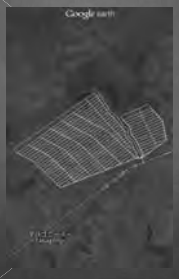
GIS and CAD

12

Grand thrush application

13

Google earth for smartphone



- Check your place on google earth and
- You can put shape file

14

Thank you

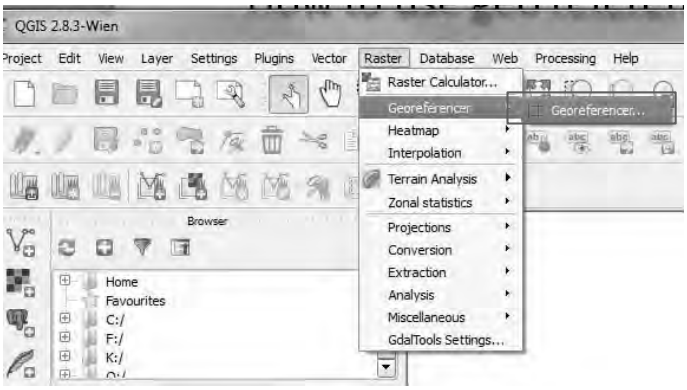
Lecture 10:
Question and Answer session

Yukimitsu KOBAYASHI
JICA Study Team
Project on Irrigation Scheme Development
in Central and Eastern Uganda (PISD)

FAQ

1. How to use Georeferencer
2. How to digitize the paper map
3. How to import GPS data to QGIS
4. How to import KML file to QGIS
5. How to save the data as relative reference and absolute reference
6. How to change the CRS
7. How to get the plug-in
8. How to use base map
9. How to edit attribution table
10. How to import XYZ data
11. How to extract target polygon

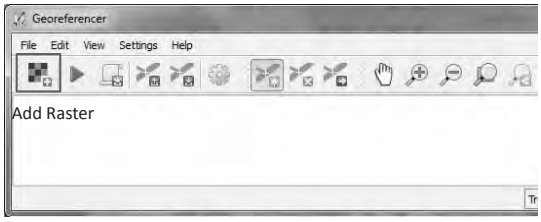
How to use Georeferencer



How to use Georeferencer

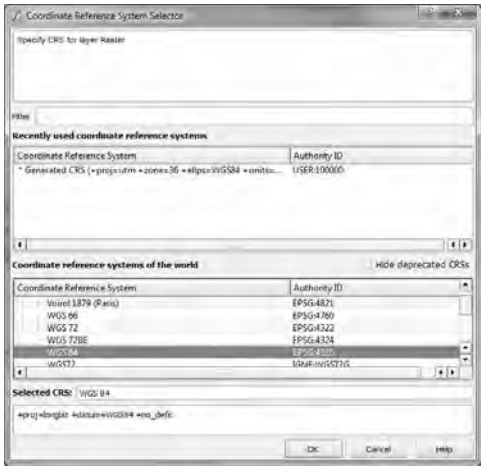
- **Georeferencing** is the process of scaling, rotating, translating and deskewing the image to match a particular size and position

How to use Georeferencer

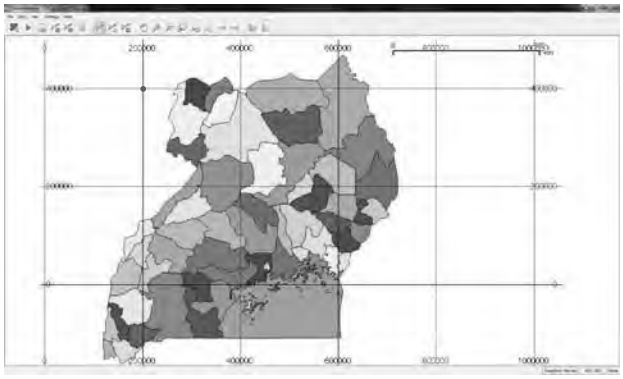


How to use Georeferencer

Identify the CRS of the added Raster

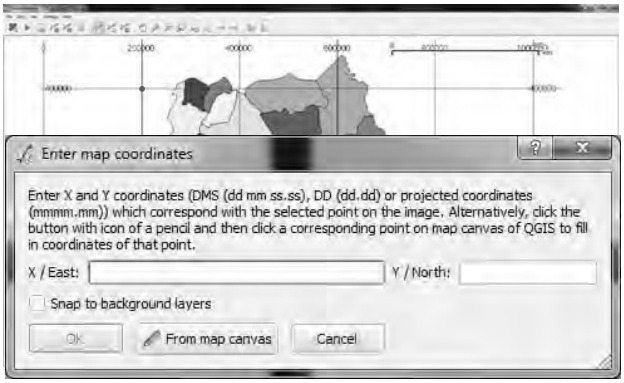


How to use Georeferencer



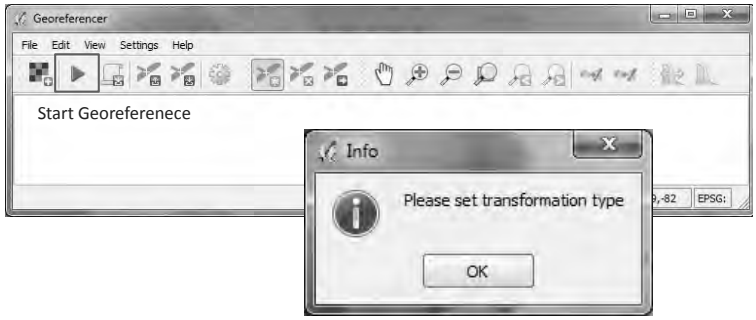
Raster data was imported to Georeferencer

How to use Georeferencer

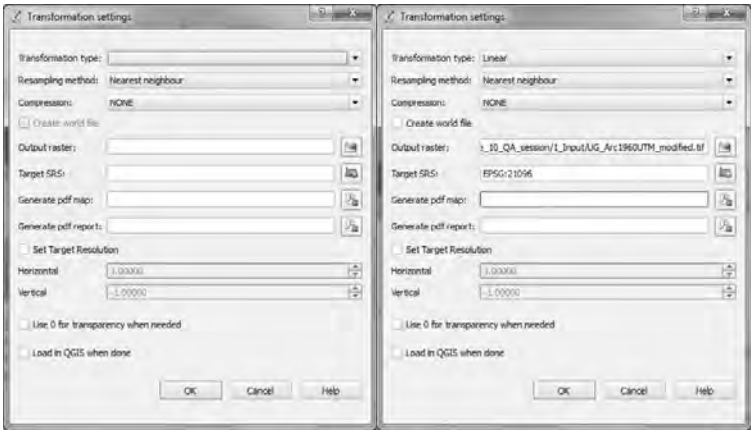


How to use Georeferencer

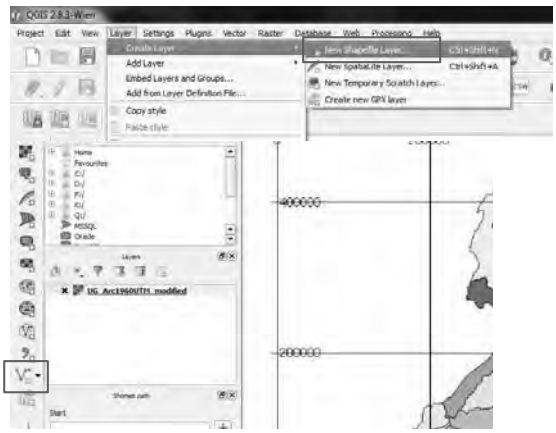
Select more than 4 GCP Then …..



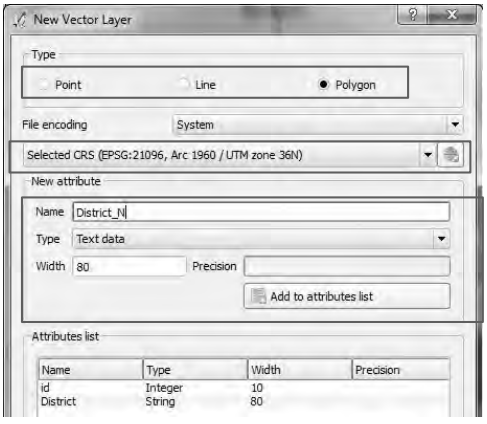
How to use Georeferencer



How to digitize the paper map (Make Shapefile)



How to digitize the paper map (Make Shapefile)



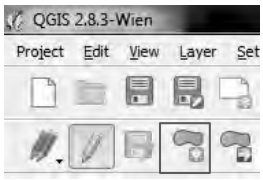
Select CRS as target Raster

Click OK
And save it

How to digitize the paper map (Make Shapefile)

2. Click Toggle editing

1. Click the Editing layer



3. Add feature

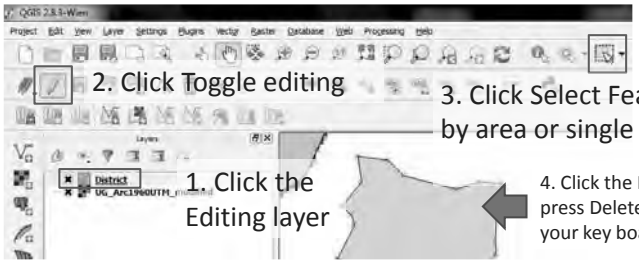
How to digitize the paper map (Make Shapefile)

- Left click: Add node
- Back Space key : Undo
- Right click: Finish editing

- Input ID and Other information

How to digitize the paper map (Make Shapefile)

- Correction of the Polygon
- Delete of the Polygon



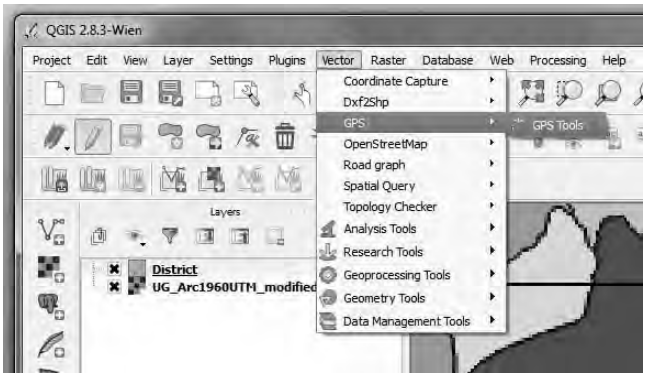
2. Click Toggle editing

3. Click Select Features by area or single click

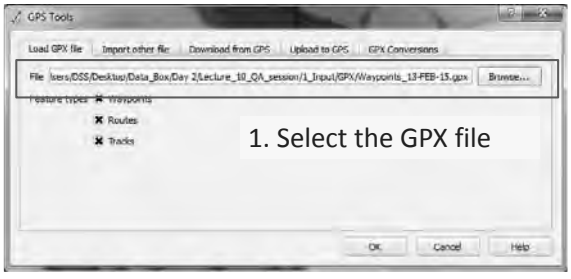
1. Click the Editing layer

4. Click the Feature and press Delete key on your key board

How to import GPS data to QGIS



How to import GPS data to QGIS

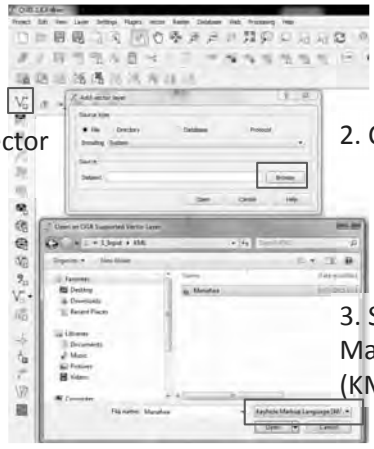


1. Select the GPX file

2.Click OK

How to import KML file to QGIS

1. Click Add Vector layer

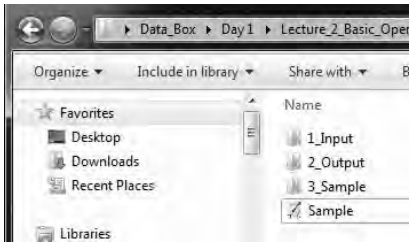


2. Click Browse

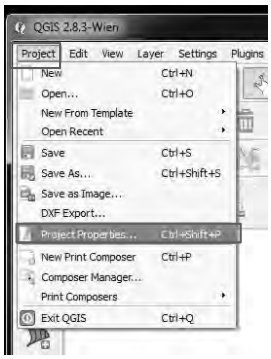
3. Select Keyhole Markup Language (KML)

How to save the data as relative reference and absolute reference

- Absolute reference
  - C:¥Users¥User¥Desktop¥Data_Box¥Day 1¥Lecture_2_Basic_Operation¥1_Input¥ District_border.dbf
- Relative Reference



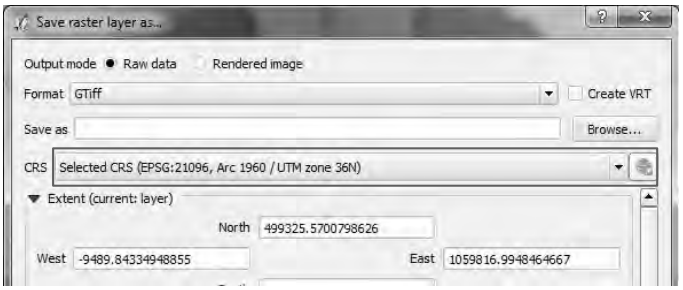
How to save the data as relative reference and absolute reference



How to change the CRS

- Right click to the target layer
- Click Save as

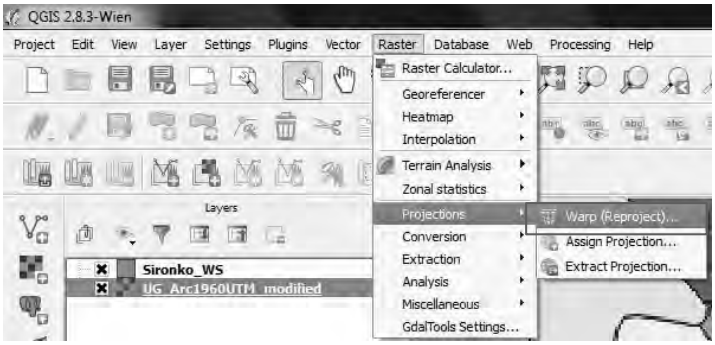
How to change the CRS



- Change CRS as you like

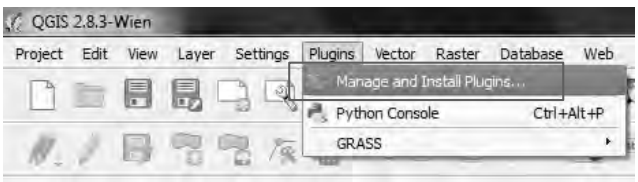
How to change the CRS

- In case of Raster layer

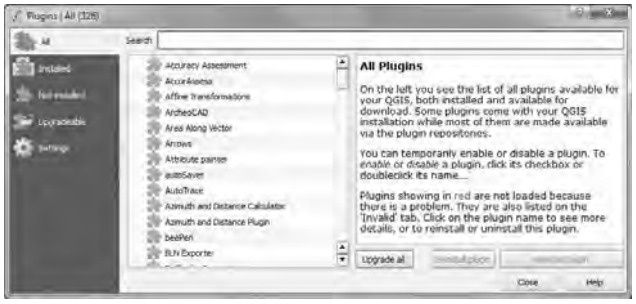


How to get the plug-in

- You need internet connection



How to get the plug-in

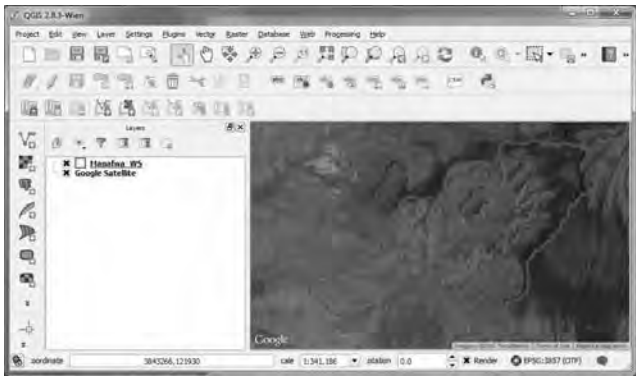


How to use base map

- Find OpenLayer Plugin,Install and reboot QGIS

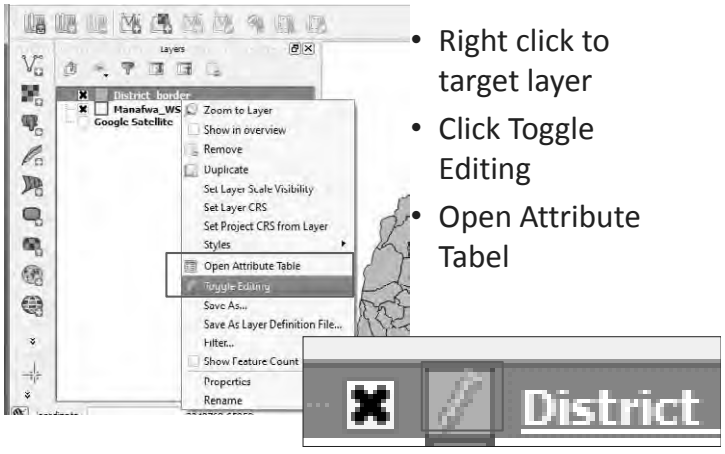
How to use base map

How to use base map



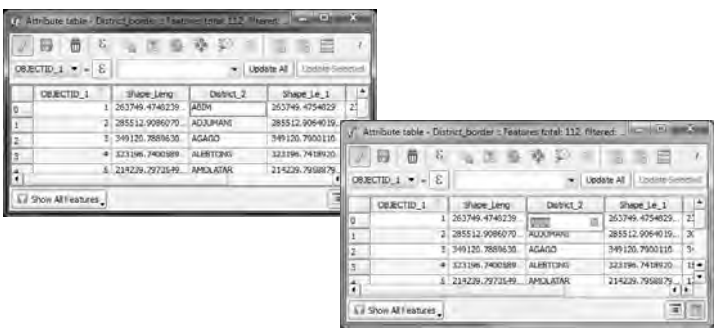
How to edit attribution table

- Right click to target layer
- Click Toggle Editing
- Open Attribute Tabel

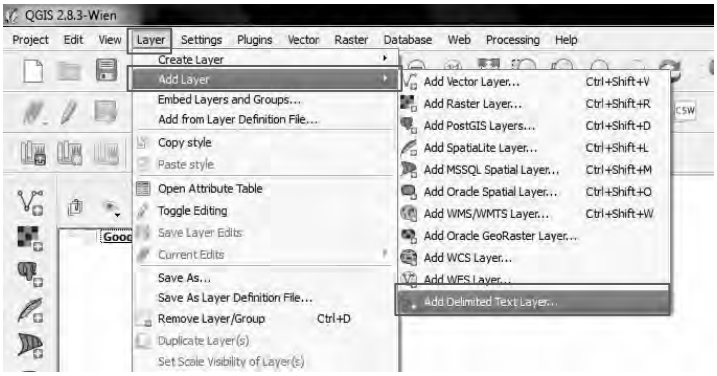


How to edit attribution table

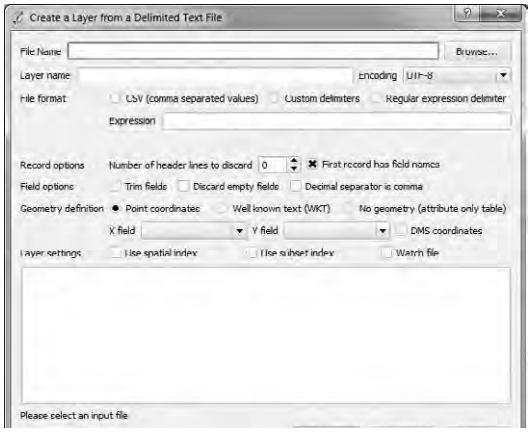
- Select target cell and Double click



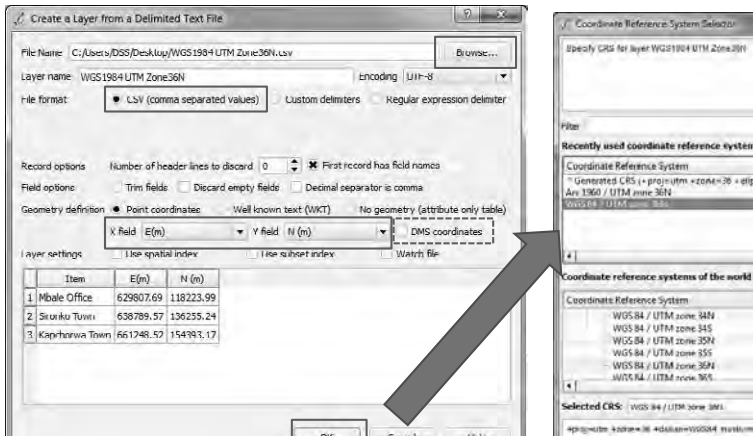
How to import XYZ data



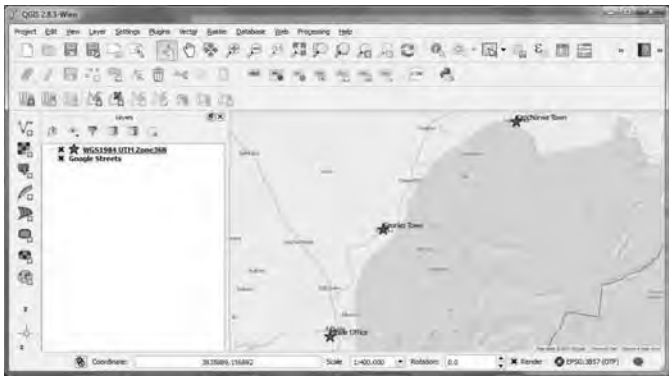
How to import XYZ data



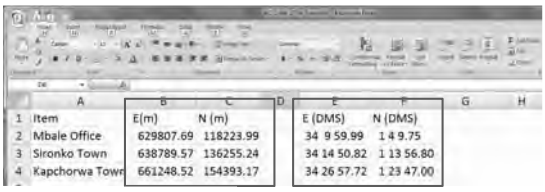
How to import XYZ data



How to import XYZ data



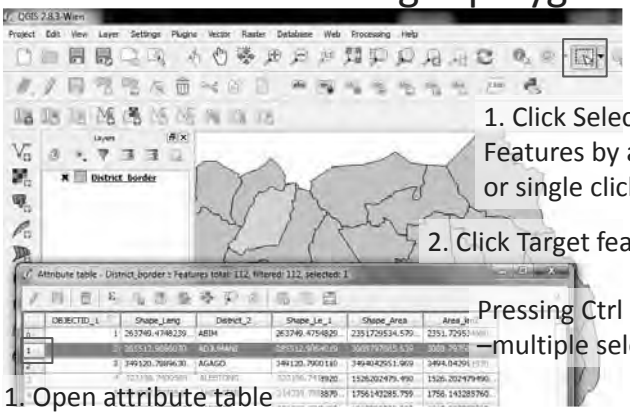
How to import XYZ data



UTM coordination

Degree Minutes Second

How to extract target polygon



1. Click Select Features by area or single click

2. Click Target feature

Pressing Ctrl key —multiple select

1. Open attribute table and click target row