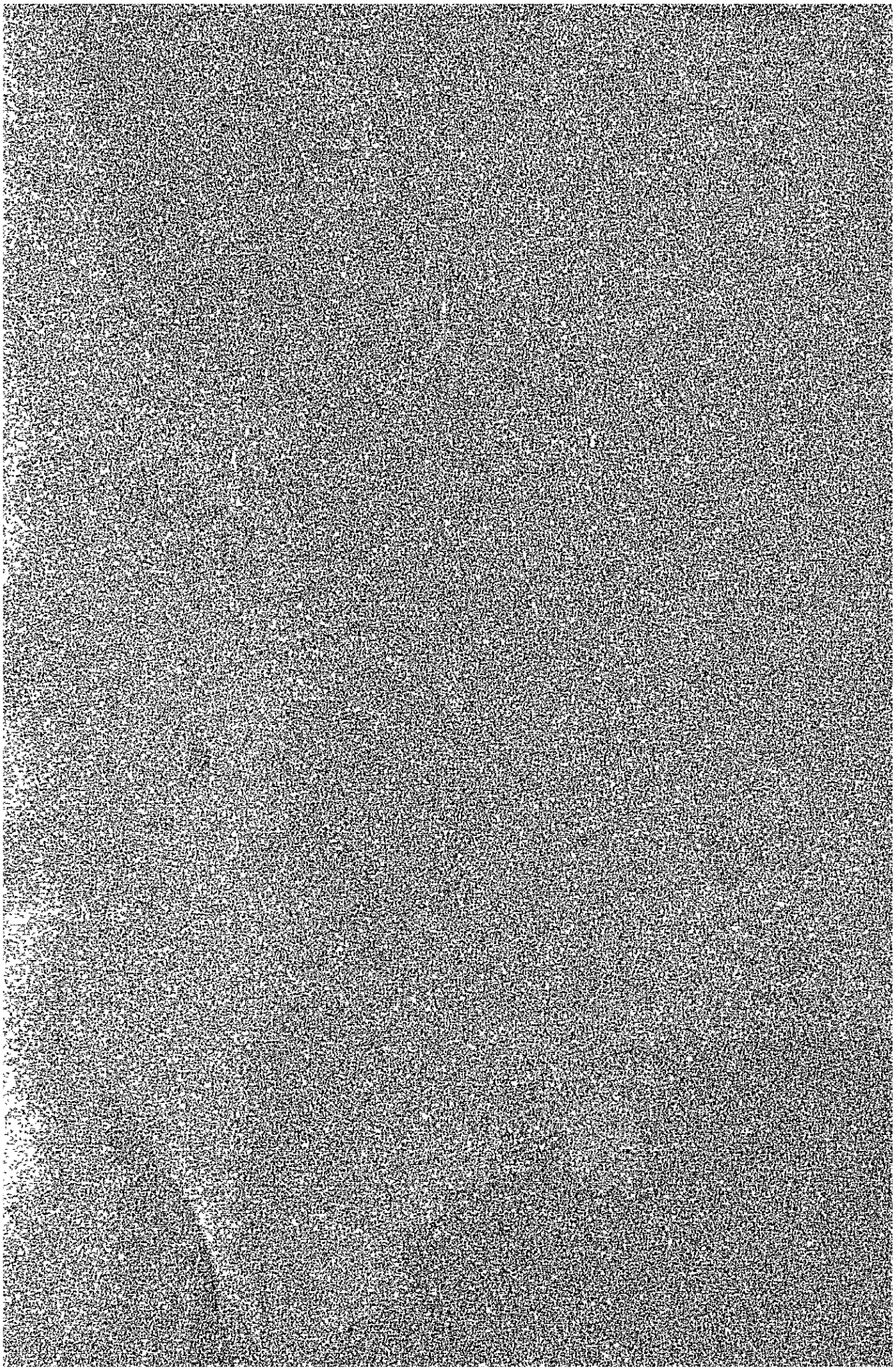
APPENDIX

1. LANDSAT Data Analysis

2. Soil Survey Data



1. LANDSAT DATA ANALYSIS

1.1 The Outline of LANDSAT Data

The first Earth Resources Technology Satellite, ERTS 1, was launched in July, 1972. The objectives of the launch of this satellite were:

(1) To evaluate the practical value of remote sensing of earth resources from the space.

(2) To compare the ability for the data collection of the earth resources between the spacecraft and the aircraft.

(3) To examine if it is necessary to have a practical earth resources search system from the space which could satisfy the intention of users, and if found necessary, examine the structure of the system.

(4) To determine the type of the remote sensor which would allow the most effective search of the earth resources.

(5) To develop and improve the management method of data.

(6) To clarify conditions and expenses necessary for the operation of a practical system.

ERTS was later renamed to LANDSAT and LANDSAT 2 was launched in February, 1975 and LANDSAT 3 in 1978, and LANDSAT 4 in July, 1982.

Each LANDSAT circles the earth roughly 14 times per day and the 15th orbital path takes the course 160 km to the west of the first path (Figure 1). In 18 days each LANDSAT can cover the entire globe and returns to the first path. Therefore, the earth's surface is covered by 14 x 18 - 1 = 251 paths. One LANDSAT image can cover an area of 185 km x 185 km (= 100 n.m. x 100 n.m.). The sidelap between adjacent orbits changes with latitudes.

a) Orbit:

Sun-synchronized orbit (Passes the equator at 9:42 a.m. local time)

b) Semi-axis major:

7,285.8 km

c) Altitude:

About 900 km

d) Inclination:

99.1°

e) Period:

104 min.

f) Number of revolutions per day:

14 cycles

g) Return period:

18 days (Returns to the starting path after 251 revolutions)

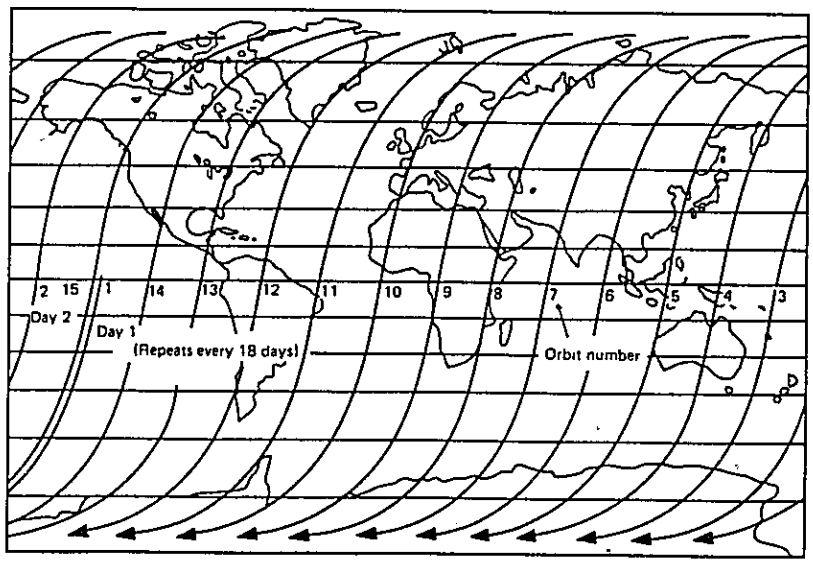


Fig. 1 LANDSAT Orbit Diagram

LANDSAT 1 through 3 carry two types of sensors, i.e., MSS (multispectral scanner) and RBV (return beam vidicon) camera (Table 1).

Table 1 LANDSAT-carrying sensors

Sensors	Band No.	Wavelength bands (micrometer)***	Resolution (m)
MSS	4	0.5 ∿ 0.6	80
	5	0.6 ∿ 0.7	
	6	0.7 ∿ 0.8	
	7	0.8 ∿ 1.1	
	8*	10.4 ∿ 12.6	240
RBV	1	0.475 ∿ 0.575	40
	2 **	0.580 ∿ 0.680	
	3	0.690 ∿ 0.830	
	1*	0.505 ∿ 0.750	

* : Carried by LANDSAT 3 only

** : Carried by LANDSAT 1 and 2

***: 1 micrometer is equal to 1/1,000 mm

The multispectral scanner scans the width of 185 km by the scan mirro which oscillates laterally. LANDSAT 1 and 2 have the multispectral scanner which acquires images in four spectral bands in the visible and near-infrared points (0.5-1.1 micrometers). In addition to the above four bands, LANDSAT 3 is able to obtain images in another band in the thermal infrared portion (10.4-12.6 micrometers). However, many mechanical troubles were encountered from the start by the tehrmal infrared sensor and the images are not available at all, although the thermal infrared data are actually transmitted to the earth. In addition to MSS, LANDSAT 4 is equipped with the thematic mapper (TM) which has a resolution of 30 m. However, this equipment is also out of order and the data are not available. It is expected, therefore, that a preliminary satellite carrying the same sensor will be launched around March 1984.

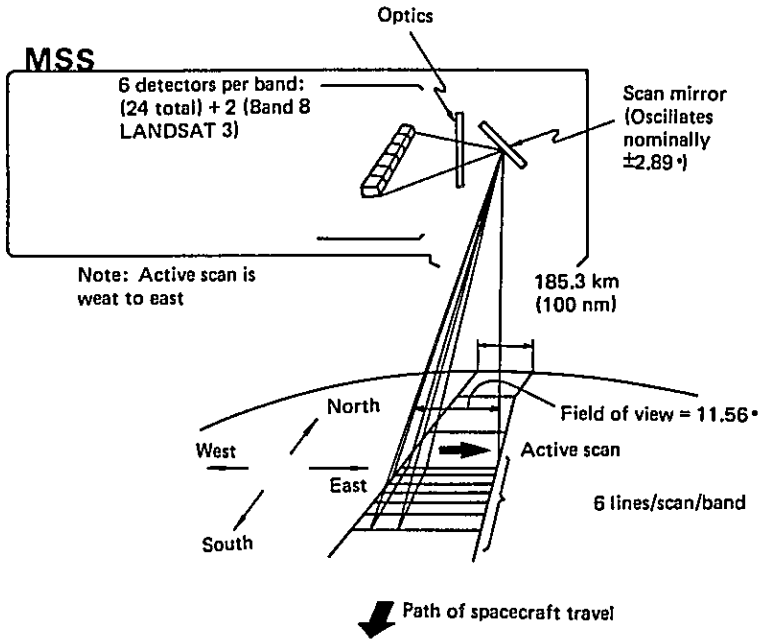


Fig. 2 LANDSAT MSS Scanning Arrangement

Two sets of RBV cameras which can cover about 98km-square surface were carried on both sides of LANDSAT 1 and 2. Each set is composed of three cameras, each sensitive to different spectral band (0.475-0.830 micrometers) (Figure 3). However, the one mounted in LANDSAT 1 became out of order 2 weeks after the launch and the one mounted in LANDSAT 2 did not become available. The RBV system mounted on LANDSAT 3 consists of two cameras, both taking a single band image in the spectral range between 0.505 and 0.750 micrometers with an emphasis of higher ground resolution (Figure 4). This system records an image of one fourth of the size of the LANDSAT MSS coverage.

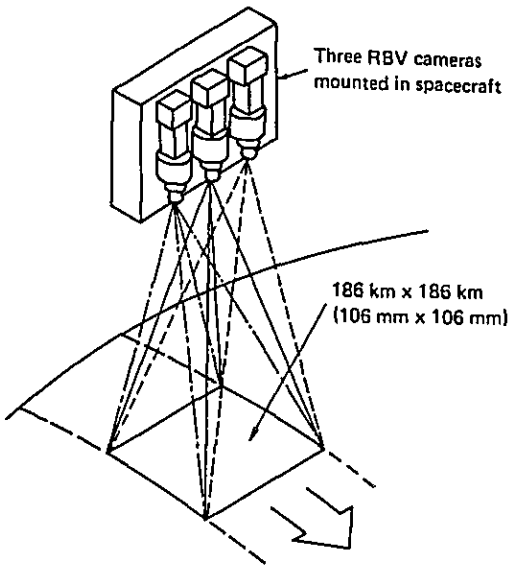


Fig. 3 LANDSAT 1 and 2 RBV Scanning Pattern

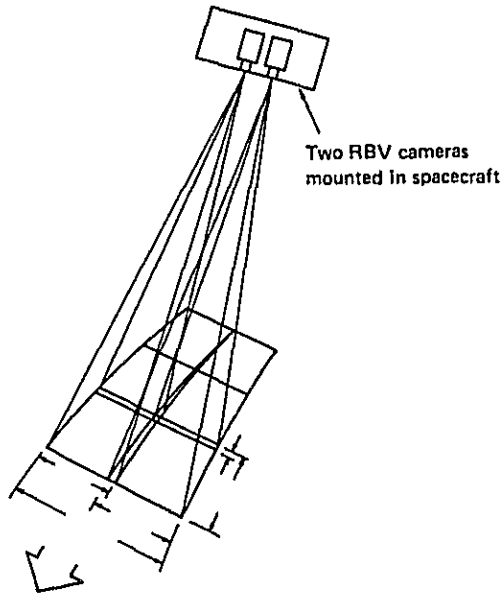


Fig. 4 LANDSAT 3 RBV Scanning Pattern

The LANDSAT data are received and handled in the system as shown in Figure 5.

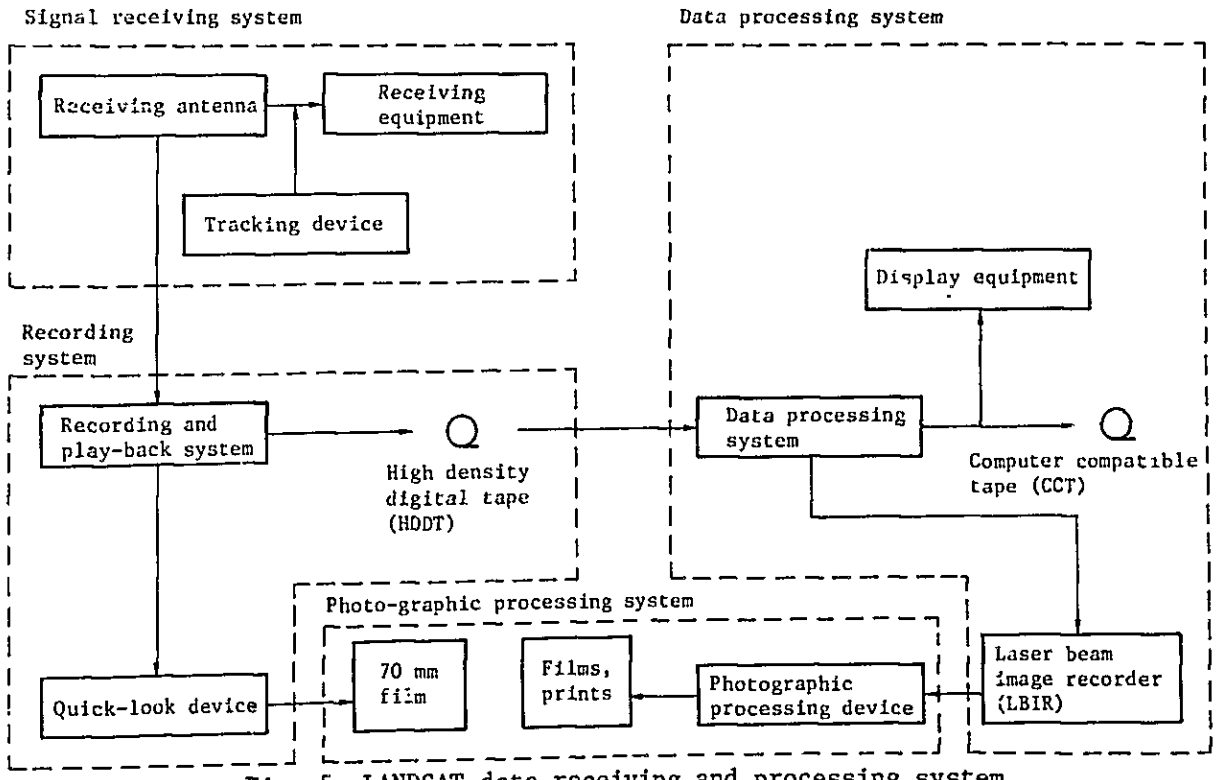


Fig. 5 LANDSAT data receiving and processing system

The data are transmitted from LANDSAT to the receiving station on the earth equipped with a parabola antenna of 10 m in diameter which is controlled by the automatic tracking system. The LANDSAT data received by the recording system are recorded on a high density digital tape (HDDT) in the recording and retrieving system and at the same time can be retrieved on CRT by the quick-look device.

Since the raw image information recorded on HDDT includes distortions caused by the change in the satellite position, dislocation of scan lines, inconsistent sensitivity, etc., they have to be corrected by the use of the computer. The data after the correction of distortions are recorded on CCT, which can further be converted to the print or film format by the lazer beam recorder.

A film recorded by the lazer beam recorder is exposed in the photographic processing system and various types of photographs, such as prints, color composites, and enlarged prints are produced.

Through this system the data becomes available to users in the following formats:

(1) Black and while

1) Film

70 mm negative/positive (1:3,369,000) band 4, band 5, band 6, band 7.

240 mm negative/positive (1:1,000,000) band 4, band 5, band 6, band 7

2) Print

240 mm positive (1:1,000,000)

(2) Color (positives only)

1) False color composite

240 mm film (1:1,000,000) band 4 and band 5, and band 6 or band 7

240 mm print (1:1,000,000) band 4 and band 5, and band 6 or band 7

2) Natural color composite

240 mm file (1:1,000,000) band 4 and band 5

240 mm print (1:1,000,000)

(3) CCT

Standard: 1/2-inch-wide, 9-track, 1600 BPI magnetic tape (2 tapes/scene)

Format: BSQ
BIL

In the first-year study, 1:500,000-scale false color composite images were made from 70 mm positive films. In the second-year study, a 1:250,000-scale ground cover classification image and a 1:250,000-scale map for the change in ponding conditions were prepared from the CCT data by the use of the digital image analysis system.

1.2 Characteristics of Each Band

LANDSAT MSS data consist of four bands, i.e., band 4, band 5, band 6, and band 7 (Table 1) and their spectral bands are given in Figure 6. Each of these bands has the characteristics as shown in Table 2.

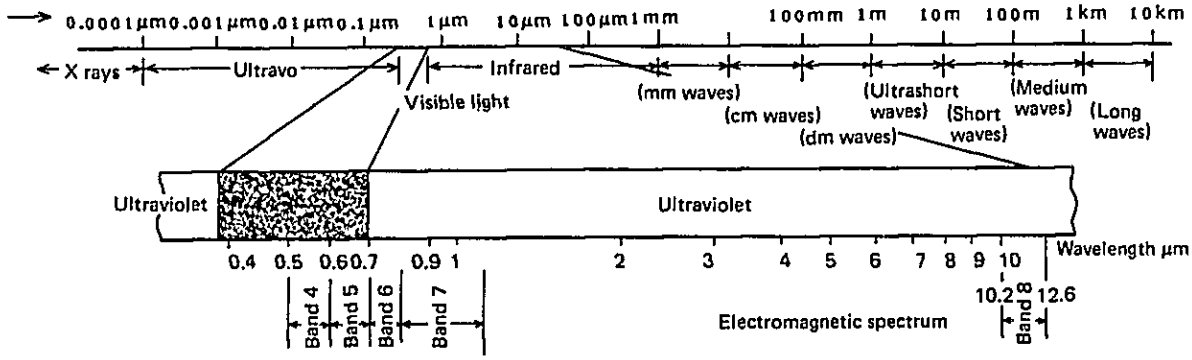


Fig. 6 Explanation of Electromagnetic Spectrum and LANDSAT MSS Bands

Table 2 Characteristics of each band

Band No.	Wavelength bands	Area in the electromagnetic spectrum	Use
Band 4	0.5 0.6	Visible light (green band)	Effective for the study of water quality, such as pllution and contamination of rivers and oceans.
Band 5	0.6 0.7	Visible light (red band)	Suitable for the study of water quality and delineation of urban areas, traffic systems, land use patterns, and vegetation distribution and identification of species of vegetation.
Band 6	0.7 0.8	Near-infrared	Suitable for the study of vigor of vegetation and conditions of irrigation water flow.
Band 7	0.8 1.1	Near-infrared	Emphasizes the boundary between land and water, such as the boundary between land and lakes, swamps and rivers.

1.3 Preparation of False Color Composite Images and their Use for the Study

For the preparation of false color composite images by the use of the 70 mm LANDSAT MSS positive films, the composition of colors will be made following the principle shown in Figure 7.

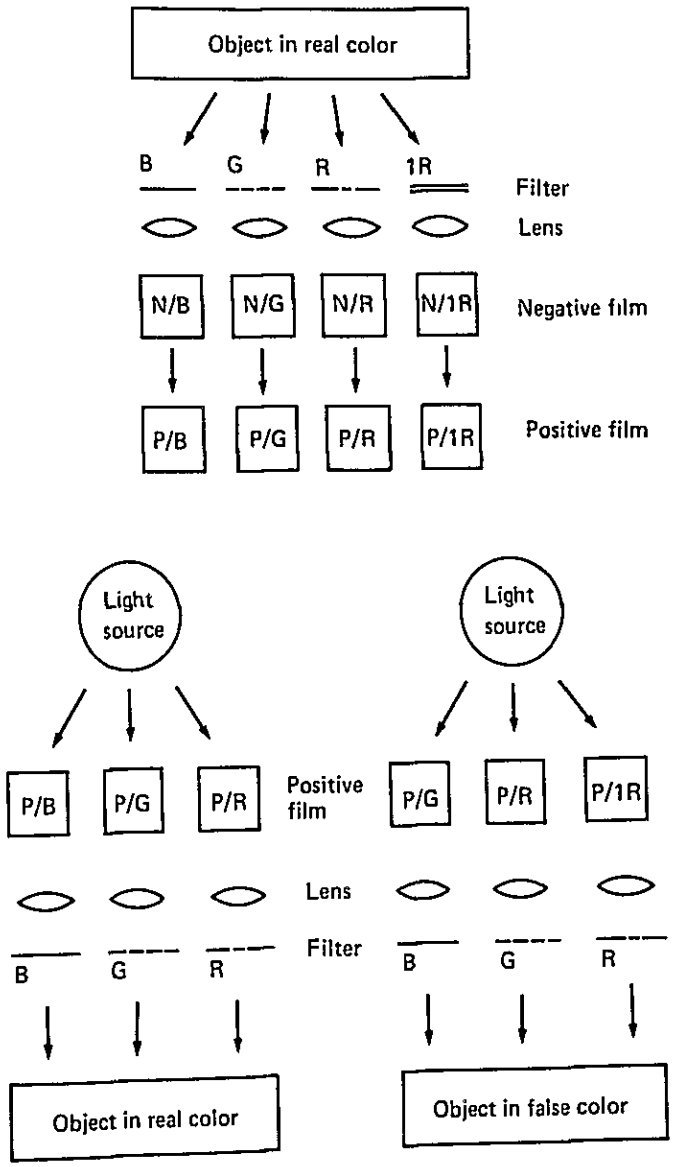


Fig. 7 Principles of the LANDSAT Color Composition

LANDSAT MSS gives different images in different bands depending on the spectral reflectance of an object. Each of these positive films is projected on a screen and a composite of an image in three bands will be made. Color composite images are classified into two types, a real color composite and a false color composite (Figure 7). The former is the one in which the image is produced as closely as the real color, with vegetation in green color, while the latter is obtained by the composition of different colors. In this study, colors were applied to three bands as shown in Figure 8, i.e., blue to band 4, green to band 5 and red to band 7 in the near-infrared portion of the spectrum. Therefore, vegetation strongly reflecting the infrared shows up in red.

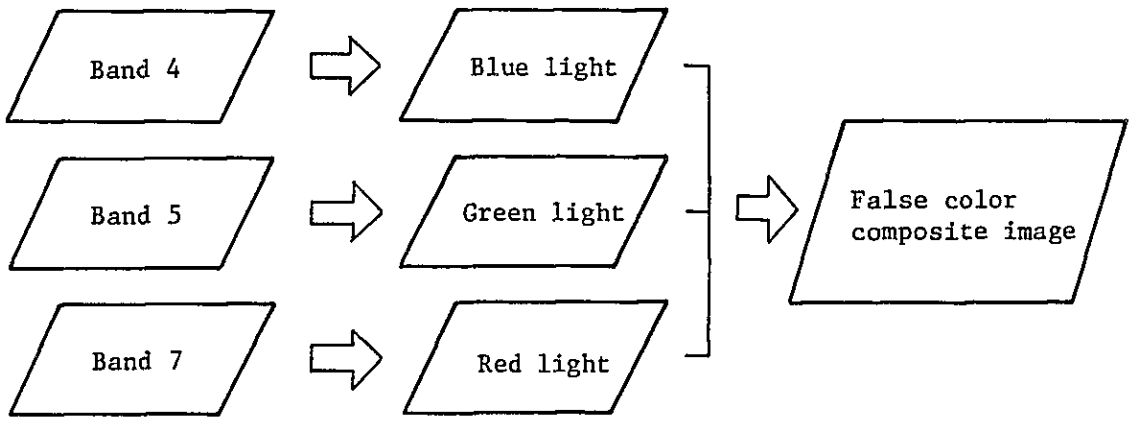


Fig. 8 Preparation of false color composite images

In the application of false color composite images to studies as this one, there are two ways:

(1) the use of a single-date image and

(2) the use of multi-date images (Table 3).

A single-date image can be used for (1) the understanding of hydrological conditions for the acquisition of service water and agricultural water, (2) the understanding of the general geomorphological structure, (3) the understanding of the present conditions of land use for the evaluation of the classification of land, (4) the overall zoning of landforms, etc. On the other hand, multi-date images can be used for the understanding of (1) the general seasonal change and (2) the temporal change of various ground features.

Table 3
Application of LANDSAT flase color composite images for various purposes

Format of use	Objectives of interpretation	Items of interpretation	Types of image	Others
Use of single-date images	Delineation of hydrological conditions for the security of service water and irrigation water	1) Delineation of water holding conditions of the ground surface (Estimation of the ground water level, etc.) 2) Delineation of stream patterns (Meanders, wadi, rivers, lakes and ponds) 3) Delineation of seasonal change in water area (Spreading of flooded water) 4) Depiction of snow-melt conditions (Change in seasonal snowlines)	Black and white (Band 7) Color composite	In case multi-date images are used
	Identification of macro-scale geological structure	1) Photographic lineament 2) Fault 3) Geologic boundary 4) Anticline and syncline	Black and white (Band 7) Color composite (Edge-sharpened image if necessary)	• Used as a macro-scale geological structure map for the entire study area • Used as basic data for the estimation of the ground water basin
Use of single-date images	Delineation of the land use conditions for the evaluation of land use classifications	1) Forest distribution 2) Agricultural land 3) Grassland 4) Urban area, settlement 5) Rivers, lakes, ponds, and swamps	Color composite (Particularly, false color composite)	
	Macro-scale zoning of landforms for the perparation of regional maps	1) Mountains 2) Hills, plateaus 3) Plain, lowland 4) Swamps 5) Desert, dry bare ground 6) Water	Color composite Black and white (Band 7)	
Use of multi-date images	Delineation of macro-scale seasonal change	1) Change in water area (Spreading and disappearance of flooded water, lakes and ponds) 2) Change in snow distribution (Change in snowlines) 3) Subdivision of vegetation and land use items	Black and white (Band 7) Color composite	Compared with single-date images, multi-date images can serve for the more detailed identification of ground features
	Detection of macro-scale secular change (Comparison of features in several years of interval)	1) Cahnge in land use 2) Change in settlement and oasis conditions 3) Change pattern 4) Movement of sand in desert areas	Color composite	

1.4 Digital Image Analysis and the Application for the Study

The digital image analysis was performed as shown in the flow chart in Figure 9. The ordinary digital image analysis also follows the similar procedure as this one.

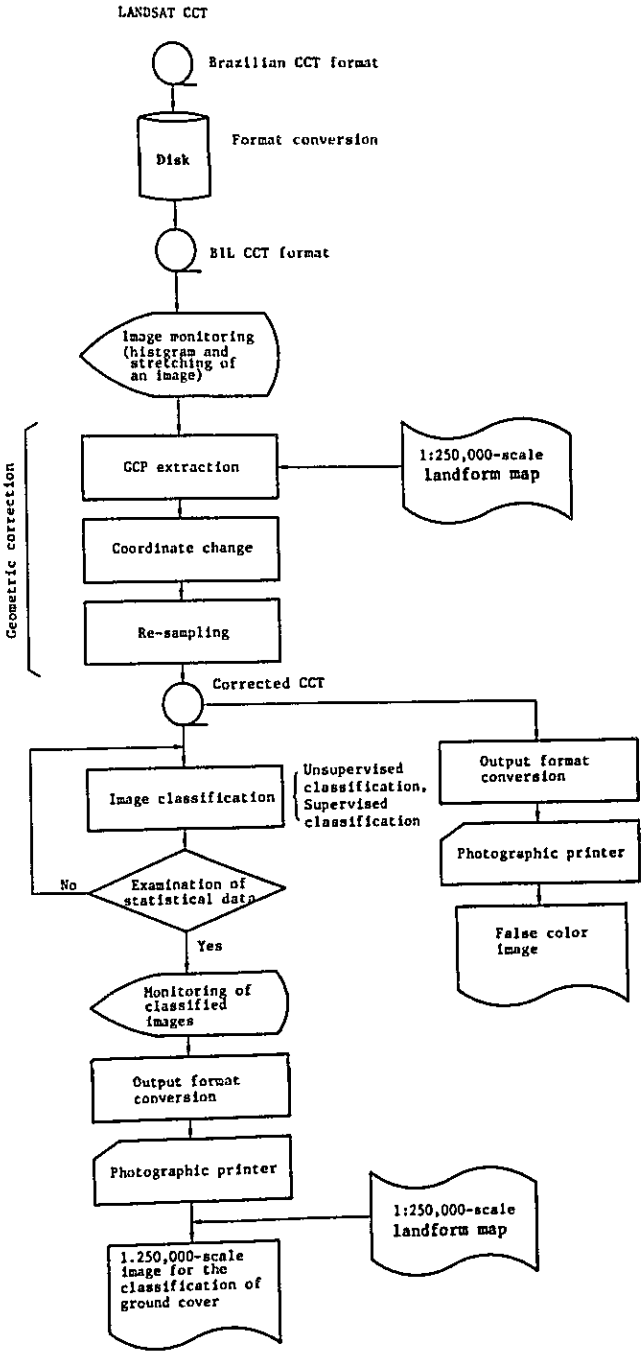


Fig. 9 Flow chart of the analysis of digital imagery

(1) Conversion of CCT format

The CCT used in the present study had a special format called the Brazilian CCT format. This format is different from the one used in Japan and presented some difficulties in the process when used in the ordinary digital image analysis system. Therefore, the Brazilian CCT format was converted to more popular BIL CCT format.

(2) Image monitoring

The images obtained from the converted CCT by the use of the digital image analysis system were monitored. At this time, a histogram of the tonal range was constructed for the entire image, and the image was adjusted for the production of the more readable image. Actually, a very dark image is usually monitored first since the LANDSAT data is generally recorded at low level. Therefore, the image is stretched based on the histogram and a readable false color image is produced.

(3) Geometric correction

The geometric correction is also called the geographic correction, in which the distortion of the LANDSAT image is corrected so that the data will fit to the landform map. The GCP* (ground control point) is used for the geometric correction and the LANDSAT coordinates (pixels and lines) are converted to the coordinates of topographic maps (latitudes and longitudes). For the coordinate conversion the following linear functions were used:

$$u = aX + bY + c$$
$$v = dX + eY + f$$

where, u, v: image coordinate

X, Y: map coordinate

* GCP is the point used for the coordinate conversion and is the one which can be confirmed on both the LANDSAT image and the landform map.

Coefficients, a through f, were determined by the least square method by the use of GCP's. In this way, the skew of LANDSAT was corrected.

Next, the data was rearranged by the resampling, so that they would fit to the topographic map. Thus, the arrangement of the image data and the arrangement of the data in the map coordinate system, which would be used in the output, was adjusted. In this study, resampling at the interval of 80 m by the nearest neighbor method was used.

(4) Image classification

The CCT data after the geometric correction was used for the output of the false color image on the color display unit of the digital image analysis system. The result of the field study (ground truth) was used as an input on the image and the image classification was performed by examining the statistical values of the input data. This is called the supervised classification. In this study, the unsupervised classification was carried out before the field study and the supervised classification was conducted after the field study.

(5) Follow-up processing

The result of the image classification and false color images were converted to the output format and exposed on the negative film or positive film of 8 x 10 inches by the use of the photographic printer. By double-exposing this film and a 1:250,000-scale landform map the final image was obtained.

There are two methods, similar to ones for the interpretation of false color composite images, for the digital image analysis for the purpose of a study as this one:

(1) the interpretation of a single-date image, and

(2) the interpretation of multi-date images.

They are summarized in Table 4.

Table 4 Application of LANDSAT digital imagery for investigations

Use format	Objectives of interpretation	Items of interpretation	Method of analysis
Use of single-date images	Delineation of hydrological conditions for the security of service water and irrigation water	Delineation of water holding conditions of the ground surface	Emphasizes the water holding conditions of the ground surface by the calculation of ratio between given bands and so on.
	Delineation of the land use conditions for the land classification	Classification into as many as approximately 16 categories is possible	Performs both supervised and unsupervised classifications.
Use of multi-date images	Detection of macro-scale seasonal change	1) Cahnge in water area 2) Change in snow distribution 3) Subdivision of land use and vegetation	• Prepares CCT of overlapped multi-date data and CCT of three band composition. • Emphasizes the change in snowline for each landform type and elevation by overlaying the image on a topographic map.
	Detection of macro-scale secular change	1) Detection of the change in land use and its detailed amount of change 2) Change in settlement and urban area 3) Change pattern 4) Movement of sand in desert areas	• The amount of movement can be identified quantitatively in real time and can be displayed clearly in color. • Output results compatible to the map can be obtained.

1.5 Preparation of Grid-color Images

Grid color images were prepared, following the procedure as shown in Figure 10.

(1) Preparation of meshes of a thematic map

500 m x 500 m grids were laid on each 1:50,000-scale thematic map prepared in the present study and the data on each map were converted to the mesh information.

(2) Preparation of mesh MT

The mesh data read out in (1) above were stored in the disk of the computer and arranged on a magnetic tape in the format of 200 pixels x 100 lines.

(3) Color coding

The data on the mesh MT were converted to numerical values from the Aw format and the image tone for each of red, green and blue colors was applied for color coding. In this way, the magnetic tape for color meshes was prepared.

(4) Output of color mesh images

The input of data on the color mesh magnetic tape into the digital image analysis system gives the color mesh imagery.

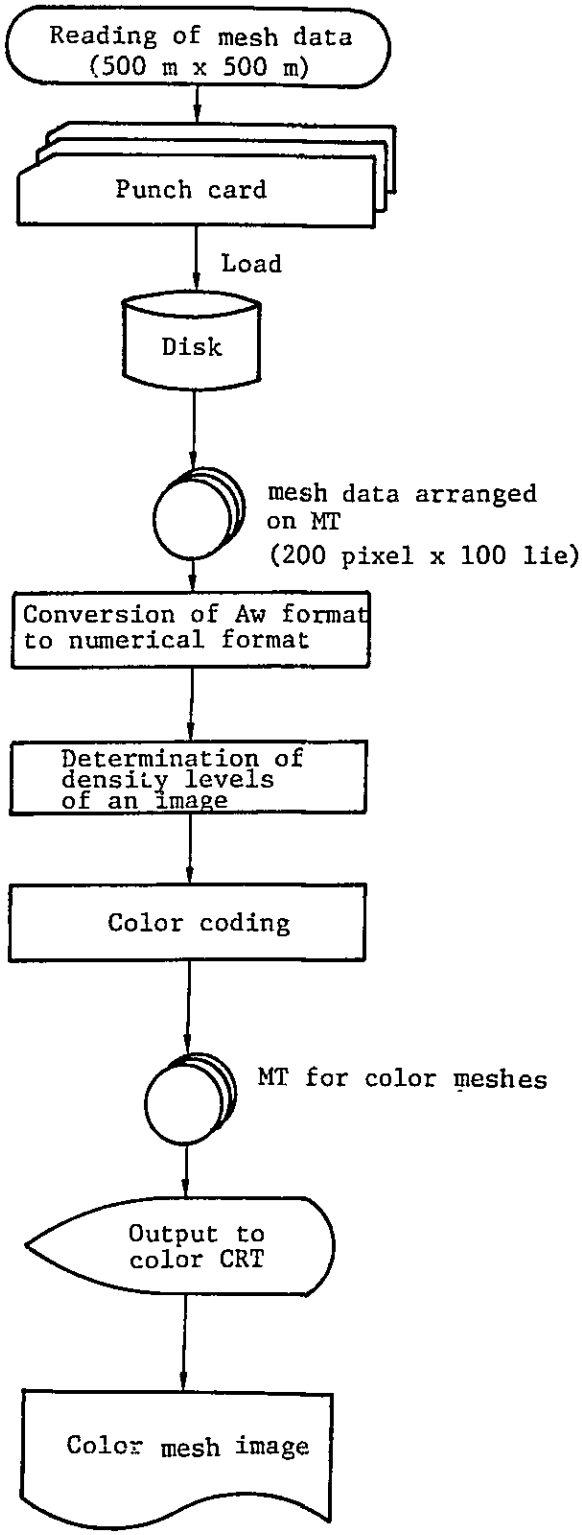


Fig. 10 Processes for the preparation of mesh color images

CRITERIA FOR FILLING OUT THE TRIAL PIT AND TRIAL BORING STUDY TABLE

Location No. : Each of the locations of the trial pit and boring is numbered. The location is marked on the soil map.

Soil horizons: They are numbered from above.

Depth : Each horizon is measured from the surface and expressed in cm.

Soil texture : The judgement by fingers at the site of the test pit is corrected by the particle size analysis. The result of the finger method applied at the test boring site is recorded. The classification is based on the soil survey manual of the USDA.

Soil color : The standard soil color chart is used and the Munsell nomination system is used.

Mottles : The amount of iron oxide deposits is classified and recorded as follows:

-: No, F: Yes (< 2%), C: Included, (2 ∿ 20%),
M: High (> 20%)

Gley : The degree of gleyzation is classified and recorded as follows:

-: No, wG: Weak, G: Strong

Humus : It is estimated by the soil color, etc., and classified and recorded as follows:

-: No, F: Yes, C: Included, M: High

Moisture : It is estimated by the finger method, and classified and recorded as follows:

D: Dry, M: Moderately dry, W: Wet, vW: Very wet

Viscosity : It is estimated by the cohesiveness when touched by hand and classified and recorded as follows:

-: No, W: Low, M: Intermediate, S: High,
vS: Extremely high

Hardness : It is measured by the use of the Yamanaka-type hardness instrument and classified and recorded in mm as follows:

vL: Very coarse (0 ∿ 10 mm), L: Coarse (11 ∿ 18 mm),
M: Intermediate (19 ∿ 24 mm), C: Hard (25 ∿ 28 mm),
vC: Very hard (> 29 mm)

Summaries of Profile Pit Survey

(No. 1)

Location No	Horizon	Depth	Texture	Matrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
1	1	0~15	SL	10YR 3/2	–	–	F	D	W	M23	Gl-c
	2	15~42	SL	7.5YR 4/2	F	–	F	M	M	M22	
	3	42~100	SL	10YR 5/2	C	wG	F	W	M	M23	
2	1	0~5	SL	7.5YR 3/1	–	–	F	D	M	Lt8	Gl-c
	2	5~26	SL	7.5YR 4/2	F	–	F	W	M	M20	
	3	26~60	SL	5YR 5/3	C	wG	F	GWL45cm	M	M24	
3	1	0~35	SCL	10YR 5/3	–	–	F	D	W	L13	Re-c
	2	35~45	SCL	10YR 6/4	–	–	–	D	W	M22	
	3	45~100	SCL	7.5YR 5/6	–	–	–	M	W	M21	
4	1	0~7	SL	7.5YR 6/3	–	–	F	D	M	M21	Re-c
	2	7~40	L	7.5YR 4/3	–	–	F	M	M	M22	
	3	40~90	SL	7.5YR 6/3	F	G	–	GWL80cm	M	Lt3	
5	1	0~13	SL	7.5YR 5/2	–	–	F	D	M	Lt5	Re-c
	2	13~24	SL	10YR 5/4	–	–	F	M	M	M21	
	3	24~100	SCL	7.5YR 6/4	F	–	–	W	M	M22	
6	1	0~20	L	7.5YR 2/1	–	–	C	W	W	vL10	Gl-c
	2	20~55	SL	10YR 6/3	–	wG	–	GWL40cm	W	L17	
7	1	0~10	SL	10YR 5/2	–	–	F	M	–	vL7	Re-c
	2	10~90	SL	10YR 6/6	–	–	–	GWL80cm	–	L13	
8	1	0~20	L	10YR 4/2	F	–	F	W	W	M20	Gl-c
	2	20~115	C	10YR 6/3	F	–	–	W	M	L13	
	3	45~80	C	10YR 7/3	C	–	–	GWL70cm	M	L13	
9	1	0~23	L	7.5YR 2/1	–	–	C	M	W	M23	Pl-h
	2	23~35	SL	10YR 4/1	F	–	F	W	M	L15	
	3	35~80	C	10YR 3/2	C	G	F	GWL70cm	S	L15	
10	1	0~25	SCL	7.5YR 3/1	–	–	C	W	W	M20	Pl-h
	2	25~42	SL	7.5YR 4/2	–	–	F	vW	–	vL8	
	3	42~50	SL	10YR 6/3	–	–	–	GWL42cm	–	vL5	

Summaries of Profile Pit Survey

(No 2)

Location No	Horizon	Depth	Texture	Motrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
11	1	0~19	LS	5YR 3/1	—	—	C	W	—	L16	Re—c
	2	19~48	LS	7.5YR 3/2	—	—	F	W	—	M19	
	3	48~80	LS	10YR 6/4	—	—	—	GWL73cm	—	L13	
12	1	0~30	SCL	7.5YR 3/2	—	—	C	M	W	M22	Re—f
	2	30~70	SCL	7.5YR 4/4	—	—	F	GWL64cm	W	L18	
	3	70~80	CL	10YR 5/4	—	—	—	—	M	—	
13	1	0~14	SL	7.5YR 2/2	—	—	C	D	W	M19	Re—c
	2	14~40	SL	7.5YR 4/3	—	—	F	M	W	L17	
	3	40~65	SL	10YR 7/3	F	—	—	W	W	vL7	
14	1	0~35	SCL	7.5YR 4/3	—	—	F	M	M	C26	Re—f
	2	35~65	C	7.5YR 4/2	F	wG	F	W	S	M23	
	3	65~100	C	7.5YR 4/2	C	G	F	GWL100cm	S	C26	
15	1	0~17	SL	10YR 2/1	—	—	C	D	M	M22	Re—c
	2	17~45	SL	10YR 3/1	—	—	F	M	W	M20	
	3	45~70	SL	10YR 7/3	—	—	—	M	W	L18	
16	1	0~12	L	7.5YR 6/2	—	—	F	M	M	C25	Gl—c
	2	12~35	SL	7.5YR 5/3	—	—	F	M	M	C26	
	3	35~100	CL	7.5YR 5/4	F	wG	F	W	M	M23	
17	1	0~10	CL	7.5YR 2/1	—	—	M	W	S	L15	Gl—f
	2	10~22	CL	7.5YR 3/1	—	—	C	W	S	L18	
	3	22~60	SCL	11YR 5/2	—	G	F	GWL50cm	M	M22	
18	1	0~30	CL	5YR 4/2	—	—	C	M	M	M19	Gl—f
	2	30~60	CL	5YR 5/2	F	wG	F	W	M	M19	
	3	60~100	C	7.5YR 5/3	C	G	—	GWL70cm	S	M20	
19	1	0~19	S L	7.5YR 4/2	—	—	F	M	W	M22	Gl—c
	2	19~65	L	7.5YR 5/3	—	wG	F	W	W	M19	
	3	65~100	SCL	7.5YR 6/2	F	G	—	GWL85cm	W	M23	

Summaries of Profile Pit Survey

(No 3)

Location No	Horizon	Depth	Texture	Motrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
20	1	0~13	L	7.5YR 6/2	–	–	C	M	W	vC30	P I
	2	13~52	L	7.5YR 6/3	F	–	F	M	M	vC30	
	3	52~105	C	10YR 5/2	M	G	F	W	M	C26	
21	1	0~14	L	10YR 5/2	–	–	F	D	W	C25	G l – c
	2	14~37	SL	7.5YR 1/4	C	–	F	M	W	C25	
	3	37~58	SL	7.5YR 6/3	C	wG	F	M	W	M23	
	4	58~100	SCL	10YR 6/3	C	G	F	W	M	L18	
22	1	0~20	SCL	10YR 3/3	–	–	C	D	–	vL7	Re – c
	2	20~60	SCL	10YR 5/4	–	–	F	M	–	vL7	
	3	60~110	SCL	10YR 6/6	–	–	–	M	–	vL7	
23	1	0~15	SL	7.5YR 6/2	–	–	F	M	M	C25	P I
	2	15~50	SCL	7.5YR 4/2	–	–	F	M	M	M22	
	3	50~112	SC	7.5YR 4/1	M	G	F	W	S	M20	
24	1	0~20	SCL	7.5YR 4/1	–	–	F	W	M	M19	G l – f
	2	20~40	CL	7.5YR 4/2	–	–	F	GWl,32cm	M	L14	
25	1	0~40	SL	10YR 5/4	–	–	F	M	–	vL9	Re – c
	2	40~100	SL	10YR 6/8	F	–	–	M	–	vL4	
26	1	0~25	L	10YR 4/3	F	–	C	D	M	L15	G l – f
	2	25~40	C	10YR 5/2	C	wG	F	W	S	L18	
	3	40~95	C	25 Y 6/1	C	G	–	vW	S	M20	
27	1	0~30	SL	10YR 2/1	–	–	M	W	M	M19	G l – f
	2	30~70	C	5YR 4/1	C	G	F	GWl,30cm	S	L17	
	3	70~100	C	5YR 4/2	–	G	F	–	S	M22	
28	1	0~7	SCL	10YR 4/2	–	–	C	M	W	M20	G l – f
	2	7~30	SCL	10YR 4/2	–	–	F	W	W	M20	
	3	30~55	SCL	10YR 6/2	C	wG	–	GWl,45cm	W	L15	

Summaries of Profile Pit Survey

(No. 4)

Location No	Horizon	Depth	Texture	Matrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
29	1	0~5	SL	7.5YR 4/4	—	—	F	D	W	L12	Ac
	2	5~40	SL	5 YR 5/6	—	—	F	M	W	M20	
	3	40~100	SCL	7.5YR 5/6	—	—	F	M	W	L13	
30	1	0~8	L	7.5YR 5/1	—	—	F	M	W	M24	Gl-f
	2	8~48	SL	7.5YR 6/1	—	wG	F	W	W	vC30	
	3	48~90	SCL	10YR 6/1	C	G	—	W	M	M19	
31	1	0~17	SCL	7.5YR 3/2	—	—	C	D	W	M23	Re-c
	2	17~30	SCL	7.5YR 5/4	—	—	F	D	W	M21	
	3	30~63	SL	7.5YR 6/4	F	—	—	M	W	L17	
	4	63~100	SCL	10YR 6/3	F	—	—	M	W	M23	
32	1	0~17	L	10YR 4/2	—	—	C	D	M	M22	P1
	2	17~42	SL	10YR 6/2	—	—	F	M	M	M22	
	3	42~72	SCL	7.5YR 7/4	F	wG	—	W	M	L16	
33	1	0~13	LiC	10YR 2/3	—	—	C	D	M	M21	P1
	2	13~18	LiC	10YR 7/1	—	—	F	D	M	vC31	
	3	18~90	LiC	10YR 3/3	C	wG	F	M	S	L18	
34	1	0~13	SCL	7.5YR 4/3	—	—	F	D	W	C26	P1
	2	13~48	SCL	7.5YR 4/3	F	wG	F	D	W	M24	
	3	48~105	CL	7.5YR 5/2	—	G	-	M	M	M21	
35	1	0~7	SL	7.5YR 7/3	—	—	F	D	W	C26	P1
	2	7~45	SL	7.5YR 7/2	—	—	—	M	W	C27	
	3	45~100	SCL	7.5YR 4/2	C	wG	—	M	M	C26	
36	1	0~15	SL	10YR 5/3	—	—	F	D	M	M20	Re-c
	2	15~43	SL	10YR 4/3	—	—	F	M	M	L16	
	3	43~60	LS	10YR 4/6	—	—	—	W	—	L13	
	4	60~100	LS	7.5YR 4/6	—	—	—	GWL 93cm	-	L13	

Summaries of Profile Pit Survey (№ 5)

Location №	Horizon	Depth	Texture	Matrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
37	1	0~30	L	7.5YR 4/2	–	–	F	D	M	C25	P1
	2	30~80	L	7.5YR 6/1	–	–	–	D	M	M23	
	3	80~100	L	7.5YR 7/1	–	–	–	D	M	C26	
38	1	0~28	SCL	7.5YR 4/3	–	–	F	M	M	C26	G1-c
	2	28~50	SCL	10YR 5/3	F	wG	F	W	M	M20	
	3	50~100	CL	7.5YR 5/4	–	G	–	W	M	L17	
39	1	0~44	LS	10YR 4/2	–	–	F	M	–	L16	G1-c
	2	44~64	SL	10YR 5/1	–	wG	F	W	W	L15	
	3	64~100	SL	7.5YR 6/2	C	G	–	W	W	L12	
40	1	0~25	SCL	7.5YR 4/3		–	F	D	W	M19	G1-c
	2	25~58	SCL	7.5YR 5/3		–	F	M	W	L16	
	3	58~90	CL	7.5YR 6/1	F	G	–	GWL80cm	M	L17	
41	1	0~30	SCL	7.5YR 2/1	–	–	M	D	M	M21	P1
	2	30~48	L	10YR 6/6	F	–	–	M	S	M20	
	3	48~95	CL	10YR 5/4	–	–	–	M	S		
42	1	0~45	SCL	7.5YR 5/4	–	–	–	D	W	C27	P1
	2	45~70	C	7.5YR 5/3	F	–	–	M	M	M23	
43	1	0~10	SL	7.5YR 6/2	–	–	F	D	W	M23	Re-c
	2	10~61	SL	10YR 6/3	–	–	–	D	M	M19	
	3	61~110	SCL	7.5YR 5/3	–	–	–	M	M	L17	
44	1	0~16	SiL	7.5YR 5/3	–	–	F	M	M	C25	Re-f
	2	16~55	L	10YR 5/3	–	–	F	M	M	C25	
	3	55~75	C	7.5YR 7/2	F	–	F	W	S	M22	
45	1	0~15	SCL	10YR 2/2	–	–	M	M	M	L18	P1
	2	15~40	CL	10YR 5/3	–	–	F	W	M	L17	
	3	40~90	CL	25YR 6/1	C	G	–	GWL70cm	M	L14	

Summaries of Profile Pit Survey (No 6)

Location No	Horizon	Depth	Texture	Motrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
55	1	0~17	SL	10YR 6/1	—	—	F	D	M	L16	P1
	2	17~50	SL	10YR 4/2	F	—	F	M	M	L13	
	3	50~80	SC	10YR 5/2	F	wG	F	GWL75cm	M	M19	
56	1	0~12	L	5 YR 4/3	—	—	C	D	M	L18	Ac
	2	12~50	L	5 YR 6/8	—	—	—	D	M	C25	
	3	50~90	C	2.5YR 4/6	—	—	—	M	S	C25	
57	1	0~30	SCL	10YR 3/3	—	—	C	D	W	C25	P1
	2	30~61	SCL	10YR 6/3	—	—	—	D	W	M23	
	3	61~100	C	7.5YR 5/2	C	wG	—	W	M	M23	
58	1	0~20	L	10YR 2/1	—	—	M	M	M	M20	G1-f
	2	20~50	SCL	7.5YR 6/2	—	wG	—	W	M	M23	
	3	50~105	C	10YR 5/2	C	G	—	W	S	L16	
59	1	0~12	CL	7.5YR 4/3	—	—	C	D	M	C25	P1
	2	12~30	CL	7.5YR 5/2	—	—	F	M	M	C26	
	3	30~42	SCL	7.5YR 6/2	—	wG	—	M	W	C28	
	4	42~80	SC	7.5YR 4/2	C	G	—	W	M	M23	
60	1	0~20	CL	7.5YR 5/3	—	—	F	D	M	C27	G1-f
	2	20~55	CL	7.5YR 5/3	—	G	F	W	M	M20	
	3	55~100	C	7.5YR 5/2	C	G		GWL85cm	S	M22	

Summaries of Profile Pit Survey (No 7)

Location No	Horizon	Depth	Texture	Matrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
46	1	0~32	SCL	7.5YR 3/2	–	–	C	M	W	C25	Gl–c
	2	32~54	SL	7.5YR 3/2	–	–	C	W	W	L17	
	3	54~65	SL	7.5YR 5/6	–	–	–	GWL60cm	W	L14	
47	1	0~34	CL	7.5YR 5/6	–	–	F	M	M	M20	Ac
	2	34~52	C	5 YR 4/8	–	–	–	M	S	M22	
	3	52~100	C	2.5YR 5/8	–	–	–	W	S	M21	
48	1	0~15	CL	5 YR 4/6	–	–	F	M	M	M24	Ac
	2	15~38	CL	5 YR 5/8	–	–	–	M	M	C26	
	3	38~95	C	5 YR 5/8	–	–	–	W	S	M21	
49	1	0~34	L	7.5YR 3/1	–	–	C	W	M	M20	Pl
	2	34~44	L	10YR 4/2	–	–	F	M	M	L12	
	3	44~80	LS	7.5YR 7/2	C	G	–	GWL25cm	W	vC31	
50	1	0~8	CL	10YR 3/2	–	–	M	W	M	L13	Gl–f
	2	8~25	CL	10YR 4/2	F	wG	C	vW	S	M20	
	3	25~40	CL	10YR 6/1	M	G	–	GWL25cm	S	L16	
51	1	0~23	SL	7.5YR 3/2	–	–	C	M	W	M23	Gl–c
	2	23~45	SL	7.5YR 5/3	–	wG	F	GWL40cm	W	L11	
52	1	0~5	SCL	7.5YR 4/3	F	–	F	M	M	L15	Gl–f
	2	5~12	SCL	7.5YR 4/4	F	–	F	W	M	L16	
	3	12~50	SCL	10YR 5/2	F	wG	–	GWL45cm	S	M20	
53	1	0~31	L	10YR 2/1	–	–	C	D	S	M24	Pl
	2	31~70	SCL	10YR 7/1	C	G	–	M	S	C28	
	3	70~120	SC	10YR 5/1	C	G	–	GWL120cm	M	M21	
54	1	0~28	CL	7.5YR 4/2	–	–	C	M	S	M19	Gl–f
	2	28~40	CL	10YR 5/2	–	wG	F	W	S	L13	
	3	40~60	C	10YR 6/3	C	G	–	GWL50cm	S	L15	

Summaries Stick Boring Survey

(M)

Location No	Horizon	Depth	Texture	Motrix-color	Mottles	Gley	Humus	Moisture	Sticki-ness	Compact-ness	Soil classifi-cation
1	1	0~50	LS	10YR 7/4	–	–	–	M	–		Fl
2	1	0~30	LS	10YR 5/3	–	–	F	D	–		Re-c
	2	30~50	LS	7.5YR 6/4	–	–	–	D	–		
3	1	0~32	SL	7.5YR 4/1	–	–	F	W	W		Gl-c
	2	32~50	CL	7.5YR 5/2	C	wG	F	vW	M		
4	1	0~15	SL	10YR 5/4	–	–	F	D	W		Re-c
	2	15~50	SL	10YR 5/3	–	–	F	M	W		
5	1	0~28	SL	7.5YR 3/2	–	–	F	D	W		Re-c
	2	28~118	SL	7.5YR 4/3	–	–	F	D	W		
6	1	0~26	SL	10YR 4/3	–	–	F	M	W		Gl-c
	2	26~48	SCL	7.5YR 5/2	F	wG	–	W	M		
7	1	0~30	LS	10YR 5/3	–	–	F	M	–		Re-c
	2	30~50	SL	10YR 6/5	–	–	–	M	W		
8	1	0~32	SL	10YR 5/3	–	–	F	M	W		Re-c
	2	32~50	SL	10YR 6/2	F	wG	–	W	W		
9	1	0~38	SL	10YR 5/2	–	–	F	D	W		Re-c
	2	38~50	SL	10YR 6/4	–	–	–	M	W		
10	1	0~15	SL	10YR 5/3	–	–	F	M	W		Re-c
	2	15~50	LS	10YR 6/4	–	–	–	W	–		
11	1	0~32	CL	10YR 2/2	–	–	M	M	M		Pl-h
	2	32~50	C	5 Y 4/1	C	G	F	vW	S		
12	1	0~29	CL	7.5YR 3/2	–	–	C	M	M		Pl-h
	2	29~50	C	7.5YR 4/3	C	wG	F	W	M		
13	1	0~20	L	10YR 2/2	–	–	M	M	W		Pl-h
	2	20~50	SL	10YR 3/1.5	–	–	C	W	W		
14	1	0~35	LS	10YR 5/4	–	–	F	D	–		Re-c

Summaries Stick Boring Survey (No 2)

Location No	Horizon	Depth	Texture	Motrix-color	Mottles	Gley	Humus	Moisture	Sticki-ness	Compact-ness	Soil classifi-cation
28	1	0~12	SL	10YR 4/4	–	–	F	M	W		Re-C
	2	12~50	SL	10YR 6/3	–	–	–	M	W		
29	1	0~18	CL	7.5YR 4/1	F	wG	F	W	M		Gl-f
	2	18~42	CL	7.5YR 5/1	C	G	–	vW	M		
30	1	0~30	SL	7.5YR 4/2	–	–	F	D	W		Re-e
	2	30~50	SL	7.5YR 5/3	–	–	–	M	W		
31	1	0~20	SL	7.5YR 4/3	–	–	F	M	W		Re-e
	2	20~45	L	7.5YR 5/3	–	–	–	W	W		
32	1	0~19	SL	10YR 5/4	–	–	F	M	–		Re-e
	2	19~49	SL	7.5YR 5/6	–	–	–	M	W		
33	1	0~26	CL	7.5YR 4/2	–	–	F	M	M		Gl-f
	2	26~50	C	7.5YR 5/3	F	wG	–	W	S		
34	1	0~18	L	7.5YR 4/3	–	–	F	M	W		Re-e
	2	18~50	SCL	7.5YR 6/4	–	–	–	W	M		
35	1	0~26	L	7.5YR 3/2	–	–	C	W	W		Gl-e
	2	26~50	SCL	7.5YR 5/2	F	wG	–	W	M		
36	1	0~24	CL	7.5YR 5/2	–	wG	F	W	M		Gl f
	2	24~48	C	7.5YR 4/3	F	G	F	W	S		
37	1	0~18	CL	7.5YR 4/2	–	–	F	M	M		Gl-f
	2	18~45	CL	7.5YR 5/3	C	wG	–	W	M		
38	1	0~21	CL	10YR 4/1	–	–	F	M	M		Gl-e
	2	21~51	C	10YR 5/2	F	wG	–	W	S		
39	1	0~18	SCL	7.5YR 3/2	–	–	C	W	W		Gl-f
	2	18~50	SL	10YR 5/2	F	wG	F	vW	W		
40	1	0~22	LS	10YR 5/4	–	–	F	M	–		Gl-e
	2	22~50	SL	10YR 6/4	–	–	–	W	W		

Summaries Stick Boring Survey

(No 3)

Location No	Horizon	Depth	Texture	Motrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
14	2	35~50	LS	10YR 5/4	—	—	—	M	—		Re-c
15	1	0~28	SL	7.5YR 4/2	—	—	F	M	M		Re-f
	2	28~45	C	7.5YR 5/2	—	—	—	W	M		
16	1	0~32	SL	7.5YR 5/3	—	—	F	M	W		Re-f
	2	32~52	CL	7.5YR 4/5	—	—	—	M	M		
17	1	0~21	SL	7.5YR 4/2	—	—	F	M	W		Re-c
	2	21~50	SL	10YR 5/4	—	—	—	W	W		
18	1	0~20	L	7.5YR 3/2	—	—	C	W	W		Gl-c
	2	20~50	SL	10YR 5/3	—	wG	—	W	W		
19	1	0~30	SCL	7.5YR 3/1	F	wG	C	W	M		Pl-h
	2	30~60	CL	10YR 5/3	—	G	F	W	M		
20	1	0~20	LS	10YR 4/3	—	—	F	D	—		Re-c
	2	20~50	LS	10YR 5/4	—	—	—	M	—		
21	1	0~35	LS	7.5YR 4/3	—	—	F	D	—		Re-c
	2	35~50	LS	10YR 6/4	—	—	—	M	—		
22	1	0~60	CL	10YR 2/1	—	—	M	GWL-5cm	W		Gl-c
	2	60~100	LS	10YR 6/3	—	—	F	—	—		
23	1	0~22	CL	7.5YR 4/2	—	—	F	M	M		Gl-f
	2	22~45	CL	7.5YR 5/2	F	wG	—	W	M		
24	1	0~28	CL	7.5YR 3/2	—	—	F	M	M		Re-f
	2	28~45	C	7.5YR 4/3	—	—	F	W	M		
25	1	0~10	LS	7.5YR 6/4	—	—	—	D	—		Re-c
	2	10~60	LS	7.5YR 5/6	—	—	—	D	—		
26	1	0~35	SL	10YR 5/3	—	—	F	W	W		Gl-c
	2	35~50	SCL	10YR 6/2	F	G	—	vW	M		
27	1	0~50	SL	10YR 6/3	—	—	—	W	—		Fl

Summaries Stick Boring Survey (No 4)

Location No	Horizon	Depth	Texture	Motrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
41	1	0~15	SL	10YR 4/4	—	—	F	D	—		Re-c
	2	15~50	SL	10YR 5/4	—	—	—	M	—		
42	1	0~30	SCL	10YR 4/3	—	—	F	D	M		Ac
	2	30~56	CL	7.5YR 5/6	—	—	—	M	M		
43	1	0~18	CL	7.5YR 5/1	—	—	—	M	M		Pl
	2	18~48	C	7.5YR 4/2	F	wG	F	W	S		
44	1	0~21	CL	7.5YR 5/3	—	—	F	M	M		Pl
	2	21~150	CL	7.5YR 5/3	—	wG	F	W	M		
45	1	0~33	SL	10YR 5/3	—	—	F	M	—		Re-c
	2	33~50	LS	10YR 6/4	—	—	—	M	—		
46	1	0~32	SL	7.5YR 4/4	—	—	F	D	W		Ac
	2	32~50	CL	5 YR 5/6	—	—	—	M	M		
47	1	0~28	SL	7.5YR 3/2	—	—	F	M	W		Re-f
	2	28~50	CL	7.5YR 4/3	—	—	—	M	M		
48	1	0~24	CL	7.5YR 3/1	—	—	C	M	M		Pl
	2	24~52	C	7.5YR 4/4	—	—	F	W	S		
49	1	0~30	LS	10YR 4/5	—	—	F	D	—		Re-c
	2	30~50	LS	10YR 6/6	—	—	—	M	—		
50	1	0~16	CL	10YR 4/2	—	—	F	M	M		Gl-f
	2	16~50	C	10YR 5/2	F	wG	—	W	S		
51	1	0~30	CL	10YR 5/3	F	—	F	W	M		Gl-f
	2	30~51	CL	25YR 5/1	C	G		vW	S		
52	1	0~35	SL	10YR 5/4	—	—	F	D			Re-c
	2	35~50	SL	10YR 6/4	—	—	—	M	—		
53	1	0~20	SL	10YR 6/4	—	—	—	M	—		Re-c
	2	20~50	SCL	10YR 7/4	—	—	—	W	—		

Summaries Stick Boring Survey (№ 5)

Location №	Horizon	Depth	Texture	Motrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
54	1	0~26	CL	7.5YR 3/2	–	–	C	M	M		Re–f
	2	26~48	C	7.5YR 4/3	–	–	F	M	S		
55	1	0~18	CL	10YR 3/1	–	–	C	M	M		Gl–f
	2	18~39	CiC	10YR 4/2	–	wG	F	W	S		
56	1	0~16	CL	7.5YR 4/2	–	–	F	M	M		Gl–f
	2	16~46	C	7.5YR 6/2	F	wG	–	W	S		
57	1	0~12	SL	10YR 6/4	–	–	–	D	–		Re–c
	2	12~50	SL	10YR 7/4	–	–	–	D	–		
58	1	0~15	L	10YR 4/3	–	–	F	M	W		Re–f
	2	15~50	SCL	10YR 5/3	–	–	F	W	M		
59	1	0~28	SL	10YR 4/4	–	–	F	M	W		Re f
	2	28~50	SCL	10YR 5/5	–	–	F	M	M		
60	1	0~16	L	7.5YR 4/3	–	–	F	M	W		Gl–c
	2	16~45	CL	7.5YR 5/2	F	wG	–	W	M		
61	1	0~16	L	7.5YR 2/2	–	–	M	vW	–		Pl–h
	2	16~38	CL	10YR 6/3	–	–	–	vW	W		
62	1	0~24	SL	10YR 5/3	–	–	F	D	W		Re–c
	2	24~50	SL	10YR 6/4	–	–	–	M	W		
63	1	0~25	L	7.5YR 3/2	–	–	C	M	W		Gl–c
	2	25~50	SCL	7.5YR 5/3	F	wG	F	W	M		
64	1	0~31	CL	10YR 4/2	–	–	F	M	M		Pl
	2	31~50	C	7.5YR 4/6	–	–	–	M	S		
65	1	0~20	CL	10YR 4/3	–	–	F	M	M		Pl
	2	20~48	CL	10YR 5/4	–	–	–	M	M		
66	1	0~18	CL	10YR 3/3	–	–	C	M	M		Pl
	2	18~45	C	10YR 5/4	–	–	F	W	S		

Summaries Stick Boring Survey

(No 6)

Location No	Horizon	Depth	Texture	Motrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
93	2	14~42	L	7.5YR 6/2	—	wG	—	W	W		Gl—c
94	1	0~35	LS	10YR 4/4	—	—	F	M	W		Gl—c
	2	35~65	SC	2.5 Y 6/3	F	—	—	W	M		
95	1	0~22	CL	7.5YR 3/3	—	—	C	M	M		Gl—f
	2	22~46	CL	10YR 6/1	F	G	F	W	M		
96	1	0~20	SL	2.5 Y 4/4	—	—	F	M	W		Re—c
	2	20~50	SCL	2.5 Y 7/2	—	—	—	M	W		
97	1	0~18	SCL	10YR 2/3	—	—	M	M	M		Pl
	2	18~50	CL	10YR 5/3	—	—	F	W	M		
98	1	0~28	CL	7.5YR 3/2	—	—	C	M	M		Gl—c
	2	28~48	SCL	7.5YR 4/2	F	wG	F	W	M		
99	1	0~23	S	10YR 3/4	—	—	C	M	W		Gl—c
	2	23~50	SL	7.5YR 5/2	—	wG	F	M	W		
100	1	0~22	L	10YR 3/1	—	—	C	W	M		Pl
	2	22~50	SCL	2.5 Y 4/1	C	G	F	vW	S		
101	1	0~10	CL	10YR 3/2	—	—	C	M	M		Pl
	2	10~50	SCL	10YR 4/2	F	wG	F	W	M		
102	1	0~16	CL	7.5YR 3/2	—	—	C	M	M		Gl—c
	2	16~50	CL	7.5YR 5/3	F	wG	F	W	M		
103	1	0~30	L	7.5YR 5/5	—	—	F	M	M		Ac
	2	30~50	CL	5 YR 4/8	—	—	—	W	M		
104	1	0~20	C	10YR 3/2	—	—	C	M	S		Pl
	2	20~50	C	10YR 5/2	—	wG	F	W	S		
105	1	0~20	SCL	10YR 3/3	—	—	F	M	M		Pl
	2	20~50	CL	10YR 6/4	—	—	—	W	M		
106	1	0~16	L	10YR 2/1	—	—	C	M	M		Pl

Summaries Stick Boring Survey

(№ 7)

Location №	Horizon	Depth	Texture	Matrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
80	1	0~30	LS	10YR 4/2	–	–	F	M	–		Gl-c
	2	30~50	SL	10YR 5/3	–	wG	–	M	W		
81	1	0~18	LS	7.5YR 4/3	–	–	F	M	–		Re-c
	2	18~50	SL	7.5YR 5/3	–	–	–	M	W		
82	1	0~26	SL	10YR 5/3	–	–	F	D	–		Re-c
	2	26~48	CL	10YR 6/4	–	–	–	M	W		
83	1	0~28	CL	10YR 2/3	–	–	C	W	M		Gl-f
	2	28~52	LC	10YR 5/3	F	G	F	W	S		
84	1	0~45	SL	7.5YR 6/4	–	–	–	M	W		Re-c
	2	45~55	SCL	7.5YR 6/6	–	–	–	M	M		
85	1	0~38	SL	7.5YR 5/4	–	–	F	M	W		Re-c
	2	38~50	L	7.5YR 6/4	–	–	–	W	W		
86	1	0~50	LS	7.5YR 7/3	–	–	–	M	–		Fl
87	1	0~30	CL	7.5YR 3/2	–	–	C	M	M		Pl
	2	30~48	C	7.5YR 4/3	–	–	F	W	S		
88	1	0~38	SL	10YR 5/4	–	–	F	D	W		Re-c
	2	38~50	SL	10YR 6/5	–	–	–	M	W		
89	1	0~28	SL	10YR 4/3	–	–	F	M	W		Re-c
	2	28~50	SL	10YR 5/4	–	–	–	M	W		
90	1	0~18	CL	10YR 3/2	–	–	C	M	M		Re-f
	2	18~50	CL	10YR 4/4	–	–	F	M	M		
91	1	0~25	CL	7.5YR 4/2	–	–	F	M	M		Pl
	2	25~50	C	7.5YR 5/4	–	–	–	M	S		
92	1	0~28	CL	10YR 3/3	–	–	F	M	M		Pl
	2	28~45	C	10YR 4/6	–	–	F	M	S		
93	1	0~14	SL	7.5YR 4/3	–	–	F	M	W		Gl-c

Summaries Stick Boring Survey (№ 8)

Location №	Horizon	Depth	Texture	Motrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
67	1	0~32	SL	7.5YR 5/8	–	–	F	D	W		Ae
	2	32~50	SL	7.5YR 6/8	–	–	–	D	W		
68	1	0~20	SCL	7.5YR 4/2	–	–	F	M	M		I
	2	20~50	SiC	10YR 4/4	–	–	–	W	S		
69	1	0~22	CL	7.5YR 3/2	–	–	C	M	M		Pl
	2	22~46	C	7.5YR 5/5	–	–	–	M	S		
70	1	0~30	SL	10YR 4/2	–	–	F	M	W		Gl-e
	2	30~50	SL	10YR 5/3	–	wG	–	W	W		
71	1	0~45	SL	10YR 5/4	–	–	F	M	W		Re-f
	2	45~60	SCL	7.5YR 5/6	–	–	–	M	M		
72	1	0~32	CL	7.5YR 3/2	–	–	F	M	M		Pl
	2	32~50	C	7.5YR 4/3	–	–	–	M	S		
73	1	0~25	CL	7.5YR 4/2	–	–	F	M	M		Pl
	2	25~50	CL	7.5YR 5/3	–	–	–	W	M		
74	1	0~18	CL	7.5YR 5/3	–	–	F	M	M		Pl
	2	18~46	CL	7.5YR 4/4	–	–	F	M	M		
75	1	0~15	SL	10YR 4/3	–	–	F	D	–		Re-e
	2	15~50	SL	10YR 5/4	–	–	–	M	–		
76	1	0~18	SL	7.5YR 4/2	–	–	F	M	W		Gl-e
	2	18~48	SCL	7.5YR 5/4	–	–	–	W	M		
77	1	0~20	SL	7.5YR 5/3	–	–	–	D	–		Re-e
	2	20~50	SCL	7.5YR 5/4	–	–	–	M	W		
78	1	0~19	SCL	7.5YR 3/2	–	–	C	M	M		Gl-e
	2	19~50	SCL	7.5YR 5/3	F	wG	F	W	M		
79	1	0~40	SL	10YR 5/4	–	–	F	M	W		Re-e
	2	40~55	SCL	10YR 6/6	–	–	–	M	W		

Summaries Stick Boring Survey

(No 9)

Location No	Horizon	Depth	Texture	Motrix-color	Mottles	Gley	Humus	Moisture	Sticki-ness	Compact-ness	Soil classifi-cation
107	1	0~18	L	7.5YR 5/3	–	–	F	M	M		Re-f
	2	18~50	L	7.5YR 5/4	–	–	F	W	M		
108	1	0~12	L	7.5YR 5/4	–	–	F	M	W		Re-c
	2	12~50	SCL	10YR 6/3	–	–	–	W	W		
109	1	0~30	SL	7.5YR 4/2	–	–	F	M	W		Re-c
	2	30~50	SL	7.5YR 5/3	–	–	F	M	W		
110	1	0~15	CL	10YR 4/2	–	–	F	W	M		Re-f
	2	15~50	CL	10YR 5/3	F	wG	–	vW	M		
111	1	0~24	SL	7.5YR 3/2	–	–	C	M	W		Re-c
	2	24~45	L	7.5YR 5/2	–	–	F	M	W		
112	1	0~18	SL	7.5YR 4/2	–	–	F	M	W		Gl-c
	2	18~50	L	7.5YR 5/2	–	wG	F	W	W		
113	1	0~35	SL	7.5YR 8/4	–	–		vW	W		Pl
	2	35~50	SiC	10YR 4/1	C	G		vW	S		
114	1	0~22	CL	7.5YR 4/6	–	–	F	D	M		Re-f
	2	22~46	C	7.5YR 5/6	–	–	–	M	S		
115	1	0~20	SCL	7.5YR 6/4	–	–	–	D	M		Re-f
	2	20~50	CL	7.5YR 6/6	–	–	–	M	M		
116	1	0~16	CL	7.5YR 5/6	–	–	F	D	M		Ac
	2	16~38	C	5 YR 4/8	–	–	–	M	S		
117	1	0~45	CL	10YR 3/2	–	–	–	M	M		Re-f
	2	45~65	CL	2.5 Y 5/3	–	–	–	M	M		
118	1	0~15	CL	7.5YR 4/4	–	–	F	M	M		Re-f
	2	15~50	SCL	10YR 5/4	–	–	–	W	M		
119	1	0~33	CL	7.5YR 3/2	–	–		M	M		Pl

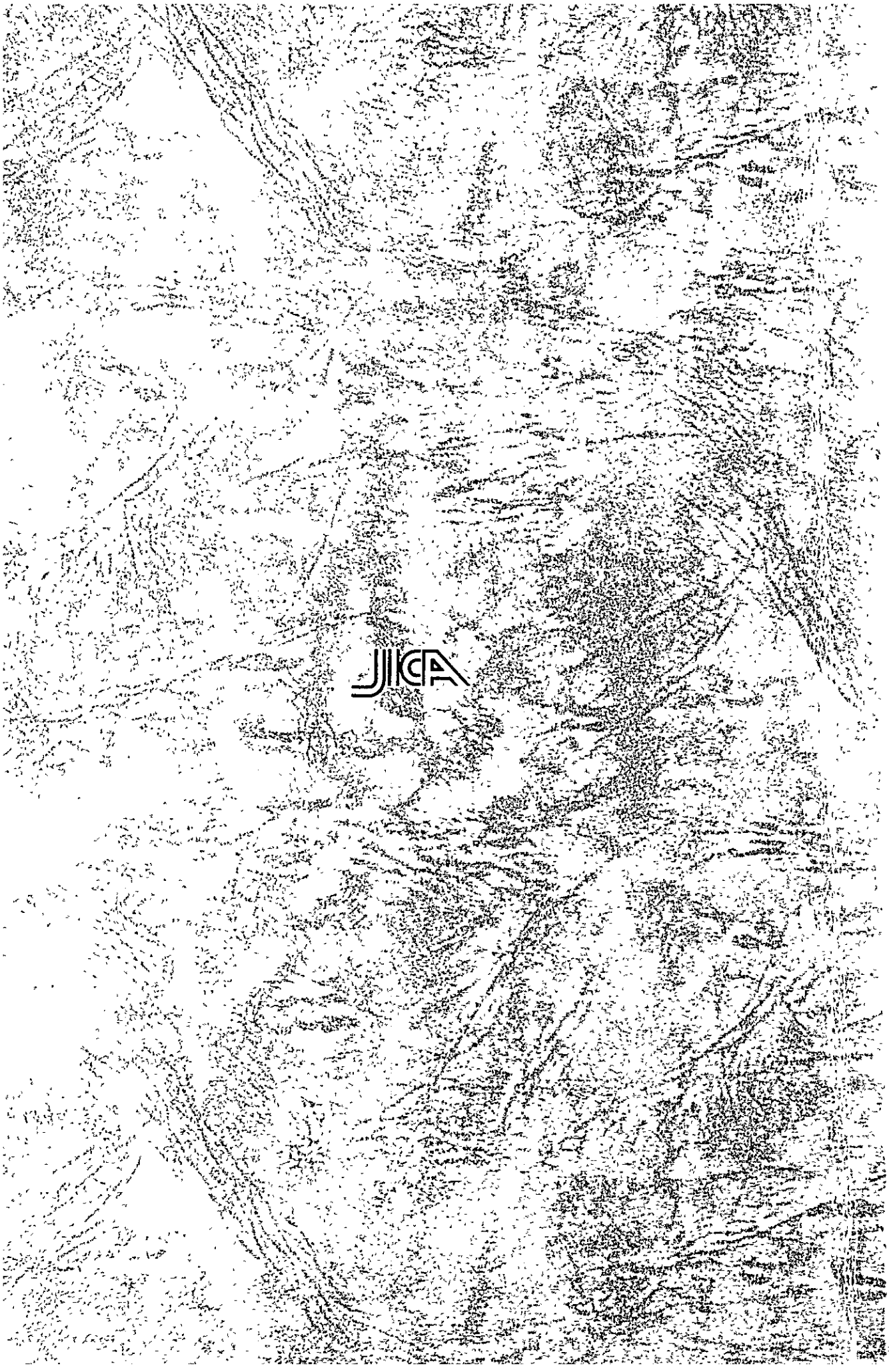
Summaries Stick Boring Survey (No 10)

Location No	Horizon	Depth	Texture	Motrix-color	Mottles	Gley	Humus	Moisture	Stickiness	Compactness	Soil classification
119	2	33~50	C	7.5YR 4/2	F	wG	F	W	M		P l
120	1	0~27	L	7.5YR 4/2	—	—	F	M	M		P l
	2	27~49	CL	7.5YR 5/3	—	—	—	W	M		
121	1	0~20	SL	7.5YR 3/3	—	—	C	W	W		G l - c
	2	20~50	SL	10YR 4/3	—	wG	F	W	W		
122	1	0~21	SiC	7.5YR 5/4	—	—	F	D	S		A c
	2	21~48	CL	7.5YR 6/6	—	—	—	D	M		
123	1	0~18	SiCL	5 YR 4/3	—	—	F	D	M		A c
	2	18~46	SiC	5 YR 5/8	—	—	—	M	S		
124	1	0~25	SL	10YR 3/3	—	—	C	M	W		P l
	2	25~50	CL	10YR 6/3	—	wG	—	W	M		
125	1	0~25	CL	7.5YR 3/3	—	—	C	M	M		G l - f
	2	25~55	LiC	10YR 6/2	F	wG	—	W	S		
126	1	0~16	SL	10YR 3/2	—	—	C	M	W		P l
	2	16~50	L	10YR 5/3	—	—	F	W	M		
127	1	0~18	CL	10YR 2/2	—	—	C	W	M		P l
	2	18~40	SeL	10YR 6/3	—	—	—	W	M		
	3	40~60	C	10YR 6/3	—	wG	—	W	M		
128	1	0~22	CL	7.5YR 3/2	—	—	—	M	M		G l - f
	2	22~50	CL	7.5YR 5/2	C	G	C	W	M		
129	1	0~21	SL	7.5YR 4/3	—	—	F	M	W		P l
	2	21~50	CL	10YR 4/3	—	—	F	M	M		
130	1	0~15	L	7.5YR 5/3	—	—	F	M	M		P l
	2	15~43	CL	7.5YR 4/4	—	—	F	M	M		
131	1	0~18	CL	7.5YR 4/4	—	—	F	M	M		G l - f
	2	18~45	CL	7.5YR 5/2	F	wG	—	W	M		

Summaries Stick Boring Survey

(No 11)

Location No	Horizon	Depth	Texture	Motrix-color	Mottles	Gley	Humus	Moisture	Sticki-ness	Compact-ness	Soil classifi-cation
132	1	0~22	SL	7.5YR 4/3	—	—	F	D	W		Pl
	2	22~45	L	7.5YR 6/3	—	—	—	M	W		
133	1	0~18	CL	7.5YR 4/3	—	—	F	M	S		Gl—f
	2	18~40	C	7.5YR 5/3	—	wG	F	W	S		
134	1	0~21	SL	7.5YR 4/2	—	—	F	D	W		Pl
	2	21~45	L	7.5YR 5/4	—	—	—	M	M		
135	1	0~23	CL	7.5YR 5/3	—	—	F	D	M		Re—f
	2	23~52	CL	7.5YR 5/4	—	—	F	M	M		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