

June 2, 2017
Tokuron-1/IPADS Development Studies(2017)

Agricultural Engineering-

Production system, Infrastructure, Irrigation-

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Graduate school of Agricultural and Life Sciences
The University of Tokyo

What is this?



TOYOTA is leading Japan ?



Before the Project

1) Frequent droughts

With no perennial river to draw water from, farmers would depend on unpredictable rainfall and numerous ponds.



13,000 ponds in 33,000 ha of the project area



Watching on the night



Watering with a dipper



Scooping water from a well

Question-1

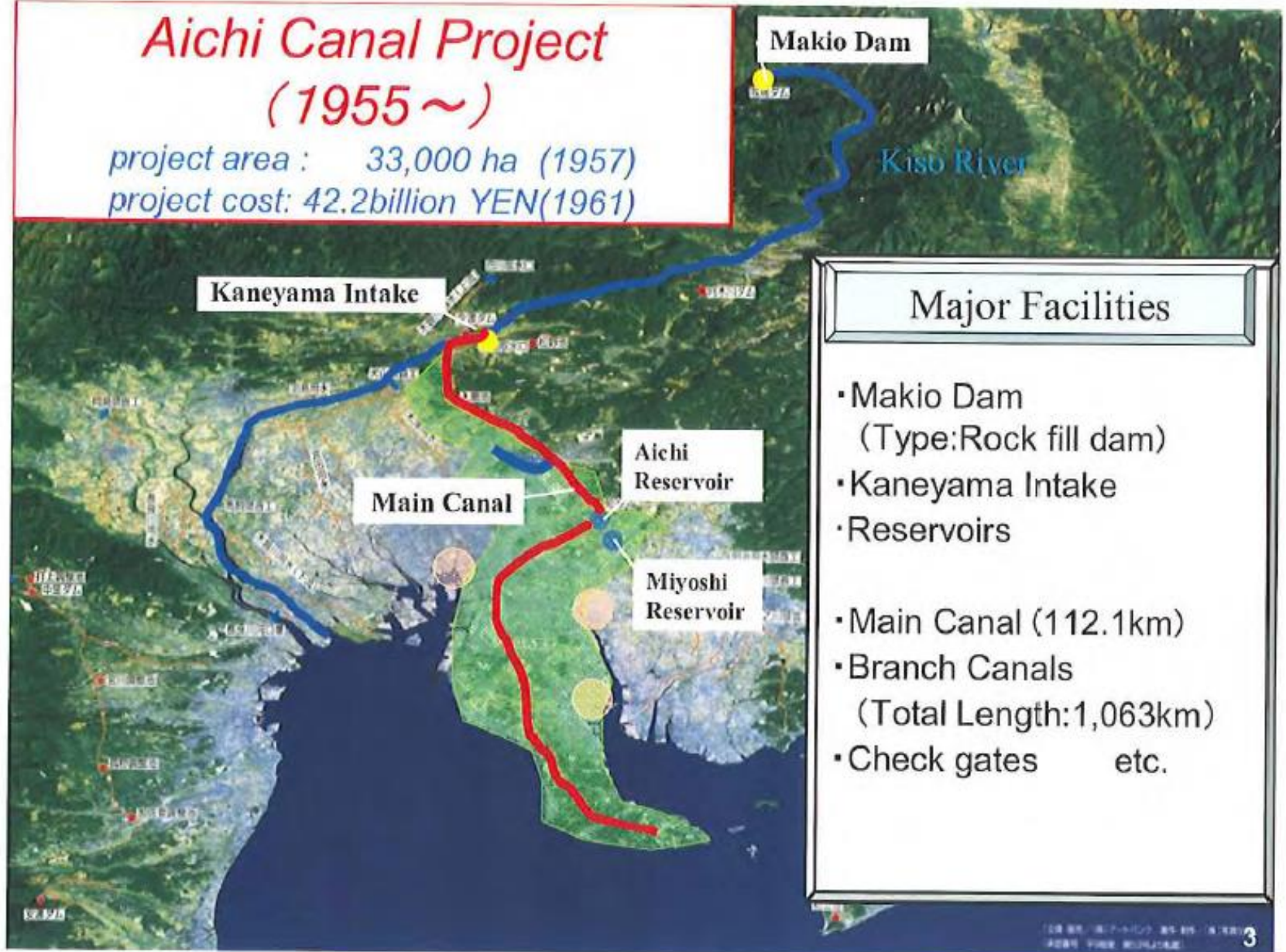
Why did this area develop?

Who developed this area?

- Group discussion (5 min)-

Aichi Canal Project (1955~)

project area : 33,000 ha (1957)
project cost: 42.2billion YEN(1961)



Major Facilities

- Makio Dam
(Type: Rock fill dam)
- Kaneyama Intake
- Reservoirs
- Main Canal (112.1km)
- Branch Canals
(Total Length: 1,063km)
- Check gates etc.

Project-X

Water of life: conquer the wild river,
Aichi Canal Project
(2002.11)

The Kiso-river is one of three biggest rivers in Japan. 300 ton/sec water crushes rocks and cut the cliffs. The Kiso-river is called a rampage river. 45 years ago, a Japan's largest project began which damming the river and build a dam. Destination to send the water is the Chita Peninsula far away of 120km where was the parched earth. There was no river watering the fields, a large drought struck at a frequency of once every three years. Water was life for 220,000 people who lived in this area.

Two men struggled to change this area in lush earth : one was a teacher who returned from China after world war second and the other was a kind-hearted man who is called the Buddha.

It became to unprecedented flame construction. Poisonous volcanic gas was ejected. By cave and landslide, many construction workers died one after another. This is the moment that the rampage river peeled fangs.

This film is a fierce drama of men who threw all out and bet their lives to get "the water of life".

Theme music of this film

地上の星

歌: ERIC MARTIN 作詞: 中島みゆき/英
語詞: Joe Inoue 作曲: 中島みゆき

A Glimpse of Pleiades in the breeze
In the wind is a sandy universe
All of our heroes have disappeared
Never had the chance to get what they deserve
Out in the field is a Pegasus
Venus on the corner of a street
Tell me where have all the people gone
Never had the chance to get what they deserve
All of us have seem to forgotten
The stars that we have on earth
None of us can help but gaze into the sky
Tell me, swallow (A)
What do you see from above?
Where is the light? The stars we have on our land
Tell me, swallow
Where have the glory gone?
Where have all the stars
On earth, on our planet gone?

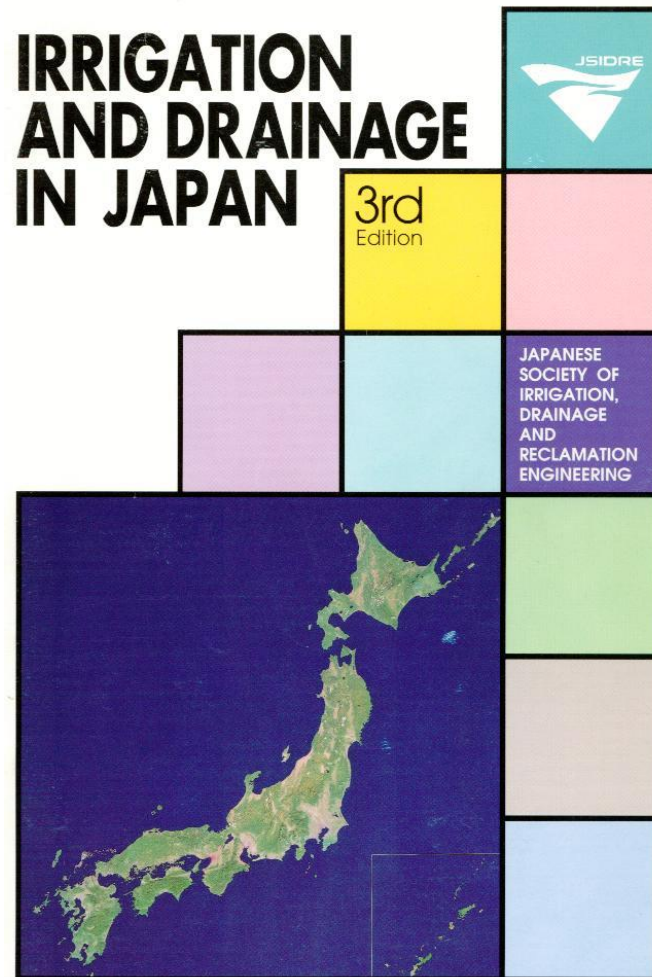
On a cliff I can see Jupiter
Under the water is a Sirius
All of our heroes have disappeared
Never had the chance to get what they deserve
Running after fame and glory
The result is a same old story
People and up grasping ice and they shiver
Tell me, swallow
What do you see form above?
Where is the lights? The stars of our planet
Tell me, swallow
Where have the glory gone?
Where have all the stars
On earth, on our planet gone?

Running after fame and glory
The result is a same old story
People and up grasping ice and they shiver
A Glimpse of pleiades in the breeze
In the wind is a sandy universe
All of our heroes have disappeared
Never had the chance to get what they deserve

(repeat A)

Land Improvement Projects

(土地改良事業／農業農村整備事業)



JSIDRE (1995)

Definition of land improvement projects in Japan

- MAFF(Ministry of Agriculture Forestry and Fisheries) is responsible for projects to cultivate virgin land, develop agricultural land, consolidate agricultural land plots or construct irrigation and drainage facilities
 - including reservoirs, barrages, pump stations, canals, etc. for improving agricultural productivity
 - constructing infrastructures in rural areas as community roads, domestic water supply systems, sewerage systems
- Such projects are called
 - (土地改良事業) “Tochi Kairyo Project Systems”= “Land Improvement Project Systems”
 - (農業基盤整備事業) “Nogyo Kiban Seibi Project Systems”= “Agricultural Infrastructure Improvement Systems”
 - (農業土木事業) “Nogyo Doboku Project Systems” = “Agricultural Civil Engineering Project Systems”

Land Improvement Project (1)

(土地改良事業)

- Land improvement projects are carried out under a law called **the Land Improvement Law**. (土地改良法)
- This law was initially enacted and enforced in **1949**.

Purposes and Benefits:

- (1) increase land and labor productivities (土地・労働生産性)
- (2) increase total agricultural production (収量)
- (3) improve the agricultural structure by diversification
(多様化による農業構造改善)

Land Improvement Project (2)

Menu of land improvement:

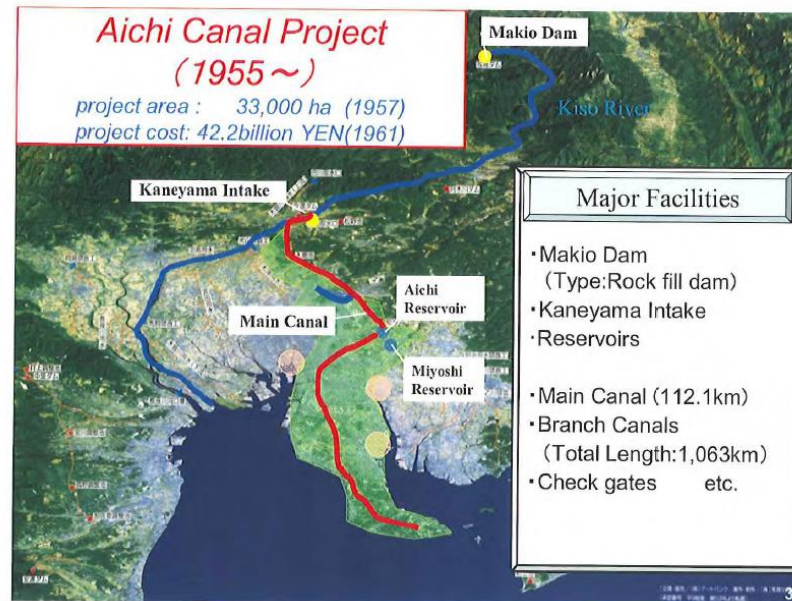
1. Irrigation and drainage (かんがい排水)
2. Agricultural land consolidation (圃場整備)
3. Farm and rural roads (農道)
4. Comprehensive development of non-paddy agricultural land (水田以外の農地総合開発)
5. Comprehensive development of rural areas (農村総合開発)
6. Disaster protection (防災)
7. Reclamation of agricultural land (開拓)
8. Reclamation from sea or lake bottom (干拓)

Characteristics of Land Improvement Project in Japan

- **Various menus** are provided in term of contents and benefits of facilities
- The main body to implement a land improvement project is either the national government, a prefecture, or a **Land Improvement District (土地改良区)**
- The costs of land improvement projects are paid by the **beneficiaries (受益者)**
 - Part of the costs is paid by **the farmers** who are the direct beneficiaries
- Facilities to be constructed by projects of the same type have to be **standardized** throughout the country
- "**Cost Benefit Ratio**" (BC Ratio) is used as the criterion to judge the economical feasibility of land improvement projects

Question-2

Why were not only “canals” but also Makio Dam constructed in Aichi Canal Project?



- Group discussion (5 min)-

Water rights

progress of urbanization and diversion of water rights

- The economic growth and progress of urbanization have caused diversion of a large number of paddy fields into housing, office or factory land lots.
 - As a result, it was thought best to divert some of the water for irrigation to water for the newly born cities.
 - In Japan an approval from the Ministry of Construction has to be obtained under the **River Law** to divert water rights.
- Diversion for irrigation prior to 1896 when the River Law was enforced was considered **a traditional water right (慣行水利権)**, already approved at the time of enforcement.
 - The water rights of irrigation groups with a long history have been legally recognized.
 - In view of the definition under the River Law that river water is a public asset, irrigation groups are prohibited to directly sell their water rights to cities



溝口勝
@msrmz

整然とした有明海の干拓水田。これも農業土木
の作品。着陸なう。



1

リツイート



13:25 - 2015年10月23日

Orderly Ariake Sea reclamation paddy. This is also work
of Agricultural Engineering. Landing Now. (2015.10.23)

Question-3

Why are Japanese paddy rectangle shape with same size?

- Group discussion (5 min)-

An aerial photograph of a rural landscape. A winding river flows through the center-left of the image. The surrounding area is a patchwork of green and yellow fields, likely agricultural land. There are some clusters of buildings and trees scattered throughout the landscape. The overall scene depicts a typical rural environment.

Land Consolidation Project (圃場整備事業)

Standard Plot Size (標準区画)

- From around 1965, a plot of 0.3 ha (3反区画) has been considered a standard size for paddy land consolidation projects.
- Basic size is 100 meter long and 30 meter wide. With a farm ditch, farm drain and farm road along the shorter side.
- However, land consolidation projects have started to make plots of at least 0.5 ha in order to use farming machinery more effectively and also in order to improve capital and labor productivities.

Standard Paddy Field Layout after Consolidation

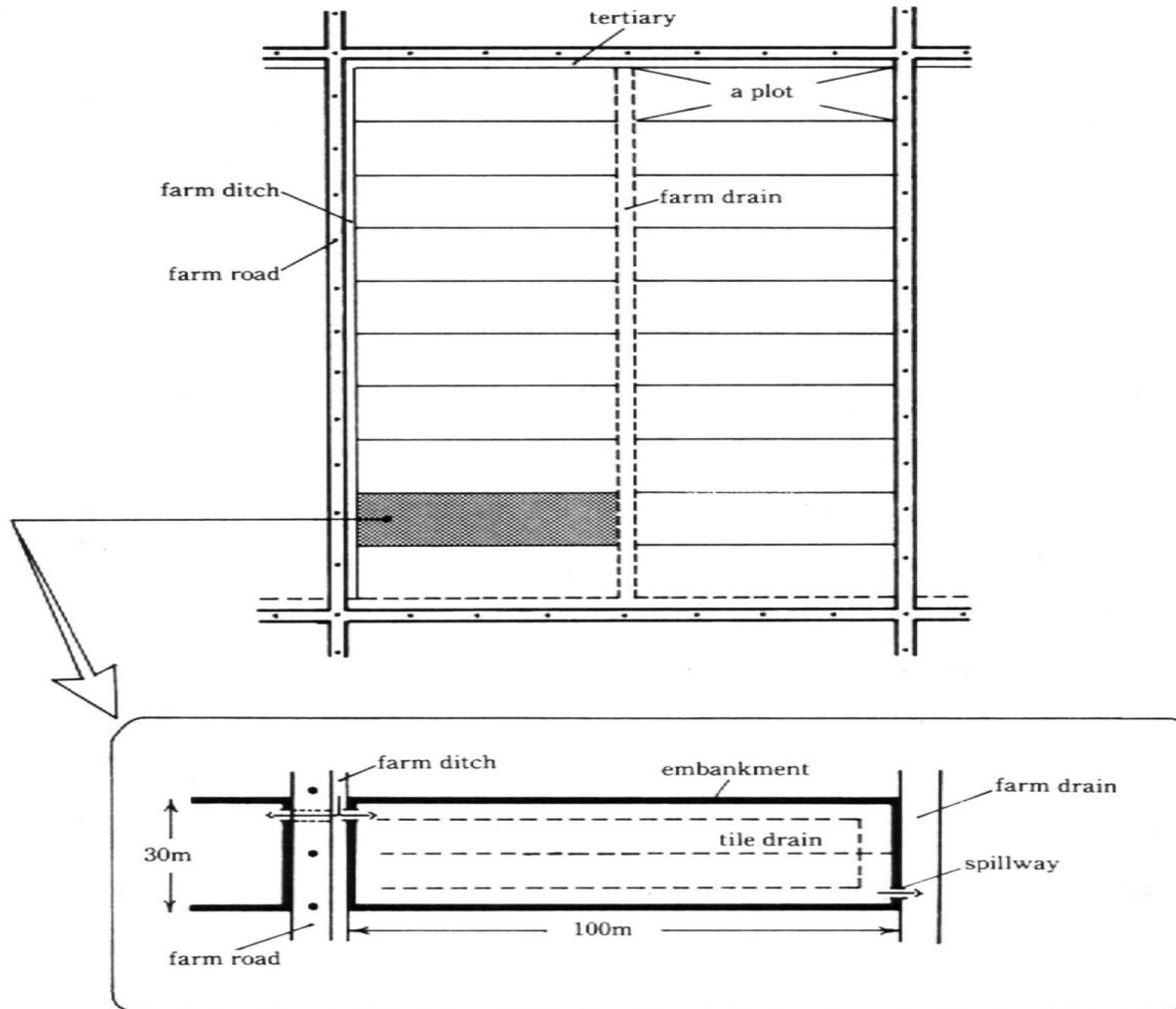


Figure 7 Standard paddy field layout after consolidation.

Conclusions

- Agricultural Infrastructure Improvements are public work projects 農業基盤整備は公共事業
 - Application projects 申請事業
 - Need Consensus building 合意形成
 - Take a long time 時間がかかる
- The Spirit of Agricultural Engineering 農業土木の神髄
 - Comprehensive agricultural development technology 総合的な農業開発技術
 - Management of soil and water 水土の管理
 - Improvement of QOL supported by the technology 生活の質の向上
 - Interaction between urban and rural areas 都市と農村の交流

There are a lot of human dramas behind our improved land.

Project-Z for Fukushima

Agricultural Infrastructure has been accomplished by unknown Challengers!

(2013.12.19) [Decontaminating Fukushima: Cleaning up Farms](#)(NHK WORLD)

(2015.3.3) The Rebirth of Fukushima ([D](#), [H](#), [S](#))



Question-4

What do you do if you are forced to evacuate from your hometown suddenly?

- Group discussion (5 min)-



2017.5.23

JpGU-AGU Joint meeting 2017
@Makuhari Messe, Chiba, Japan

Challenges of Agricultural land Remediation and Renewal of Agriculture in Iitate Village by a collaboration between scholar and NPO



Masaru MIZOGUCHI^{1,2}

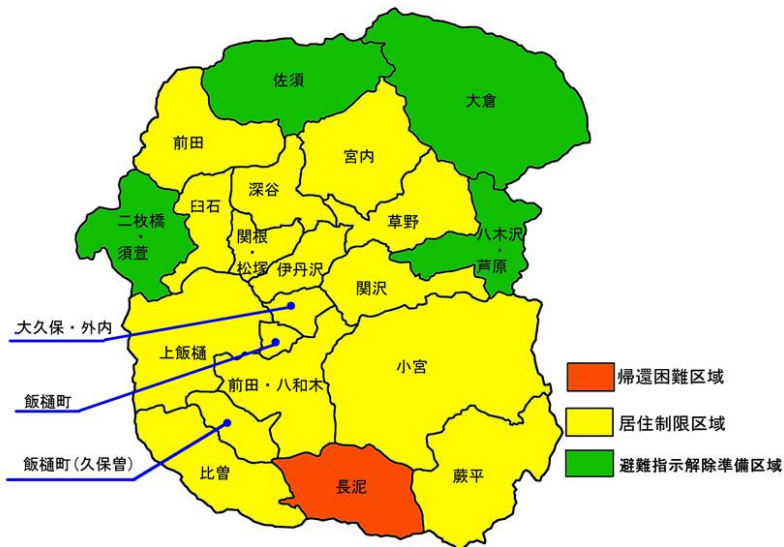
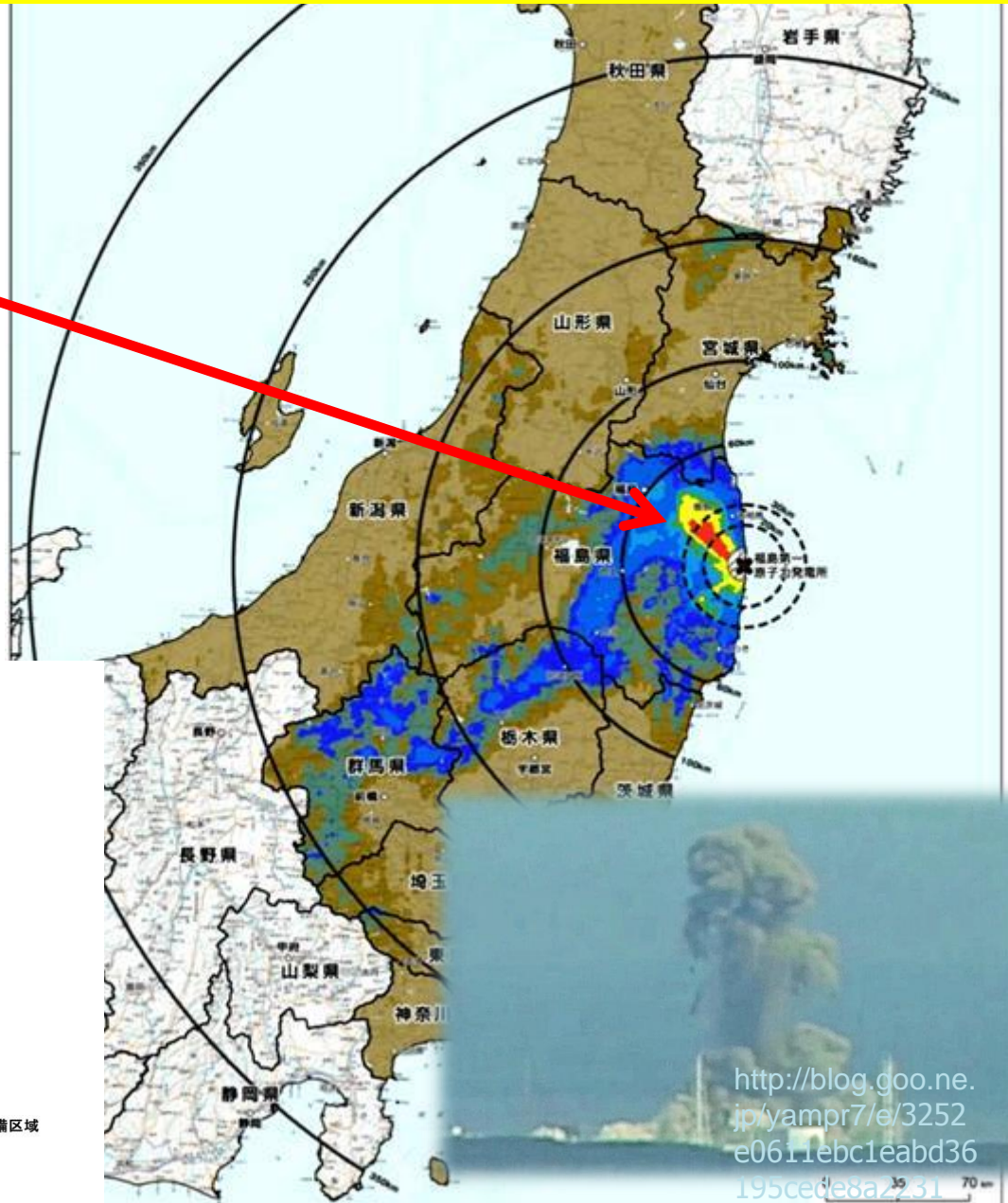
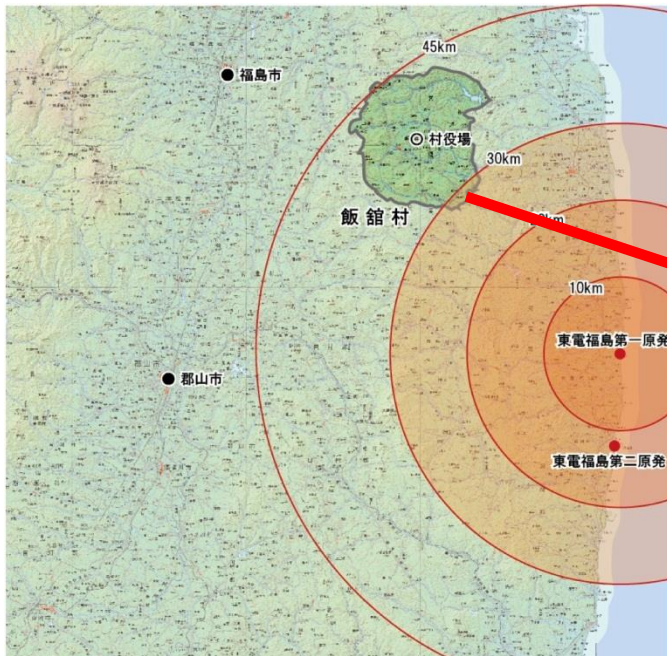
Yoichi TAO² and Muneo KANNO²



1 Faculty of Agriculture, The University of Tokyo, Japan

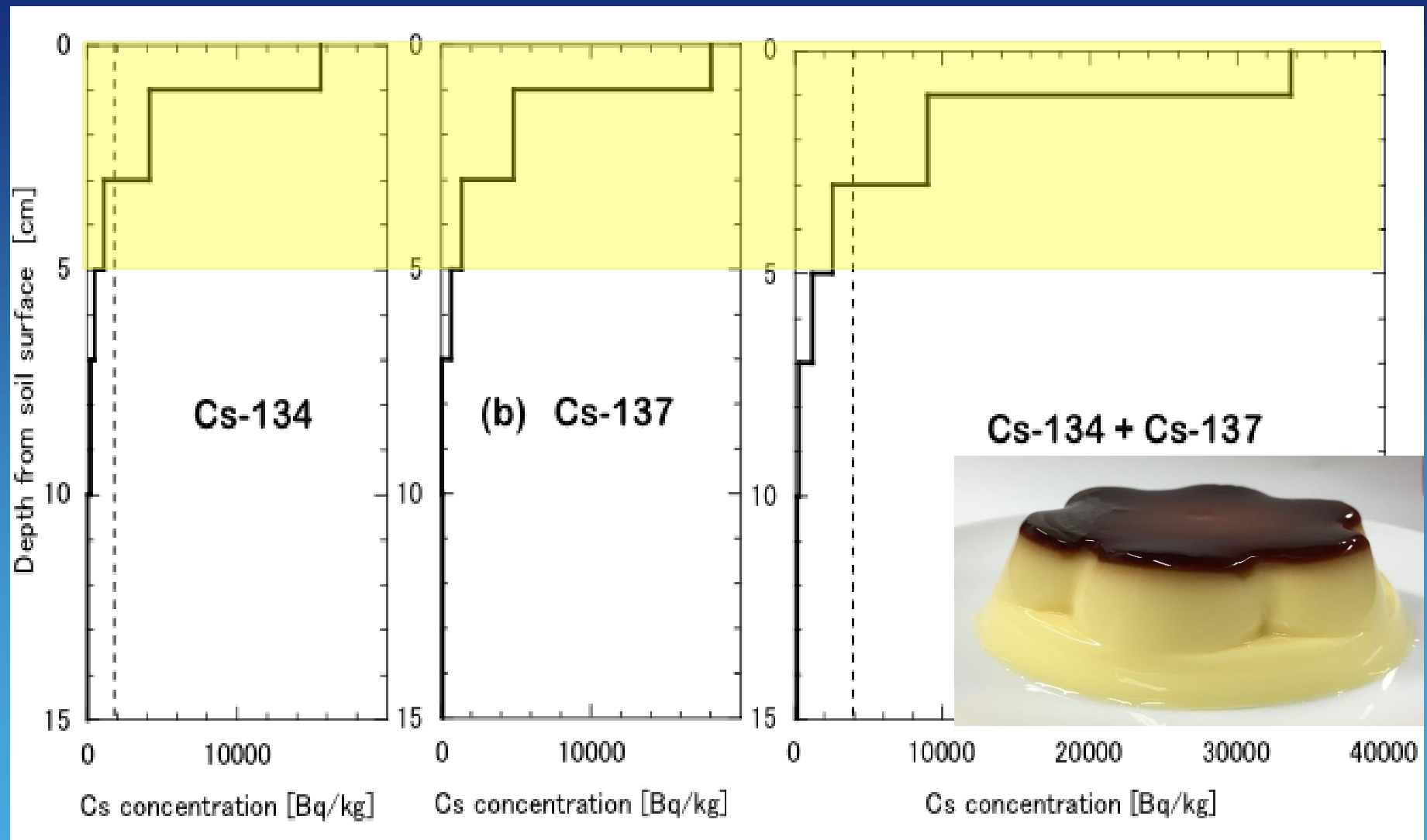
2 NPO:Resurrection of Fukushima

Iitate Village in Fukushima Prefecture



<http://blog.goo.ne.jp/yampr7/e/3252e0611ebc1eabd36195ced8a2231>

Vertical distribution of Cs in soil (24/5/2011)



Shiozawa et al. (2011): Vertical concentration profiles of radioactive cesium and convective velocity in soil in a paddy field in Fukushima. *Radioisotopes* 60 : 323-328



Stripping topsoil method



Soil puddling method



Deep plowing method

農林水産省

Official decontamination methods by Government

MAFF

Ministry of Agriculture, Forestry and Fisheries

From August, 2012

Reality of narrow agricultural field

Wild boars



Heavy Weed



Disturbed agricultural field



Development of decontamination method farmers can do by themselves in paddy contaminated by radiocaesium in Fukushima



Prof. Masaru *Mizoguchi*

Dept. of Global Agricultural Science

Univ. of Tokyo

Empathy & Collaboration

The Resurrection of Fukushima: Characteristics & Keywords

Goal: Recovery of the area
Collaboration
Independent Volunteers
Vitality from the varieties of participants
Knowledge, technics, work experience, network
Breadth of vision
Flexible handling
Detailed care

Specialists
Science & Technology
**Universities/
Research Institute**
Interdisciplinary
Collaboration

Power for Recovery
Experience, knowledge,
Tradition, culture, wisdom

Villagers

Collaboration against
Scattering

**Empathy
& Collaboration**

Resurrection of Fukushima



Non-Profit Organization



Members



(Nov. 2013)

Public Service
**National
Prefectural
Local**

Overcome Sectionalism
& Bureaucratism

Practices utilizing the properties of cesium and clay (2012)



decontamination method by
stripping frozen soil
(2012.1.8)



Rotary weeder method
(2012.4.1)

Made-method-1 (Sasu method)

Stripping topsoil + Deep plowing method



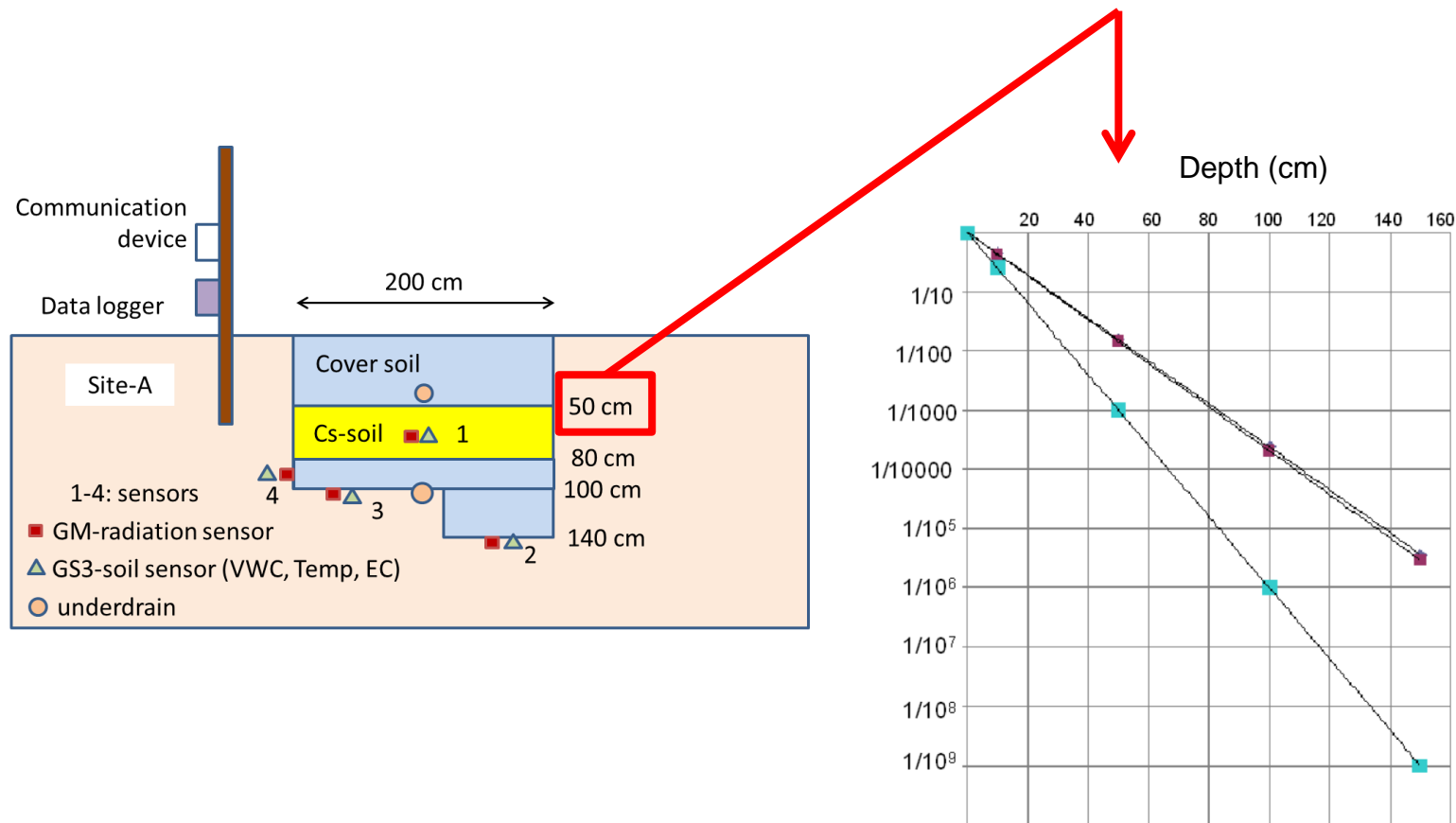
Burial of contaminated soil

Compaction of soil

2012.12.1

Contaminated soil should be buried in the bare hole!

Radiation dose is 1/100 to 1/1000 just bury 50cm deep!



Made-method-2 (Komiya method)

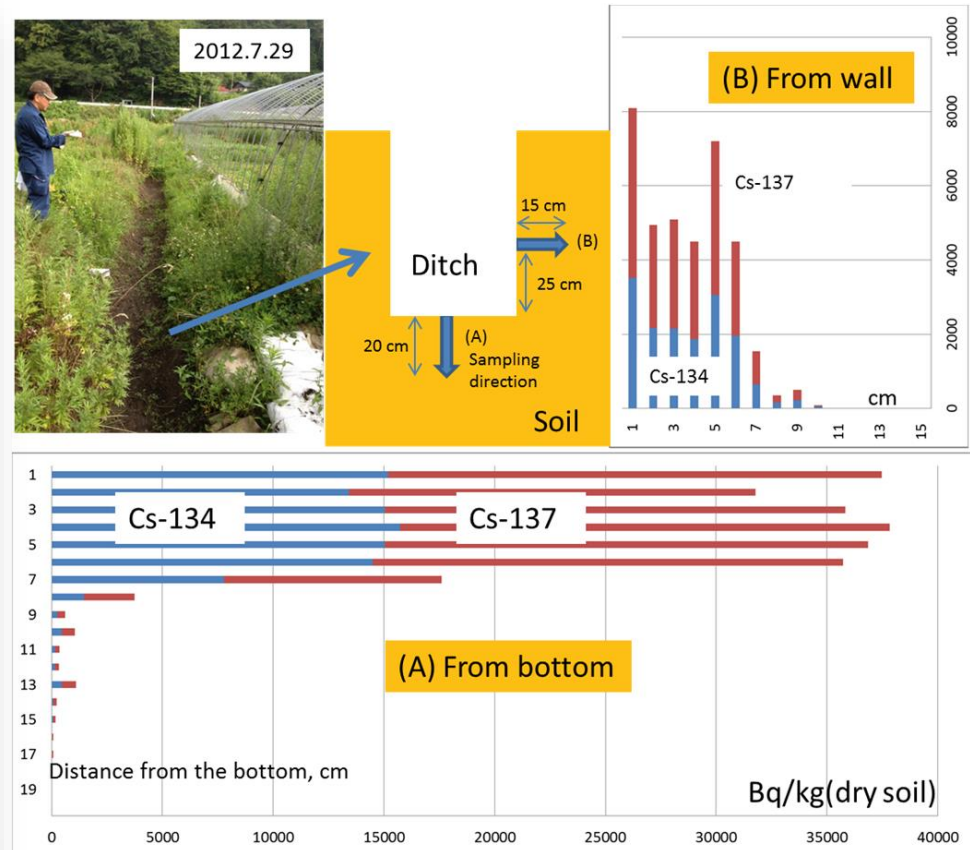
Soil puddling + Deep plowing method (2013)



(2013.5.18)



Pour contaminated muddy water into the drain



A result of the radioactivity measured at each depth by sampling the soil of the bottom and sides of the groove after a dried-up Cesium is not expected to immersion in the soil!

Rice cultivation test by NPO from 2012



Sharing of scientific knowledge

Water, Food, Energy & Innovation for a Sustainable World

ASA, CSSA, & SSSA International Annual Meetings
Nov. 3-6, 2013 | Tampa, Florida



American Society of Agronomy | Crop Science Society of America | Soil Science Society of America

Start

**Browse by
Section/Division of
Interest**

Author Index

141 Battles of Soil Scientists in Fukushima, Japan

Oral Session

SSSA Division: Soil Physics Soil scientists are working with cesium-contaminated soils by the accident of the Fukushima Daiichi Nuclear Power Plant in 2011. Large areas in Fukushima and vicinity prefectures were contaminated by high dose of radiocaesium scattered from the Fukushima Daiichi Nuclear Power Plant of TEPCO in March 2011. Many residents nearby the Plant have been forced to evacuate. Many evacuated areas with the annual precipitation of 1100-1400 mm are located in mountainous regions with patches of agricultural fields. Radiocaesium mostly was found in a top few centimeters of surface soil. Many soil scientists have been working to find appropriate removal procedures of radiocaesium and the mechanisms of its transport in soil and plants. Preliminary findings were shared with fellow scientists, and their insights and ideas on this matter are expected.

Cosponsor(s):

Soil Chemistry, Soil Mineralogy, Soils & Environmental Quality

Monday, November 4, 2013: 1:00 PM-4:00 PM

Marriott Tampa Waterside, Room 8

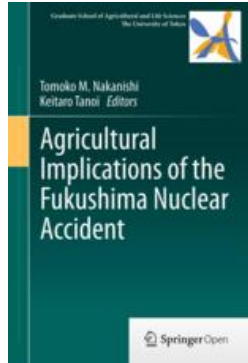
litate Village field tours by soil scientists



Japanese Society of Soil Physics
27 Oct. 2013



The 5th International Workshop of CAAM
6-8 March 2016



Activity reports can be downloaded from homepage



Collection of Mizo's works on Fukushima (in English)

Movie:

http://www.iai.ga.a.u-tokyo.ac.jp/mizo/edrp/fukushima/Fukushima_articles.html

1. (2015.3.3) The Rebirth of Fukushima ([D](#), [H](#), [S](#))
2. (2013.9.19) [Frozen soil shuts water flow](#)
3. (2012.11.20) [Filtration of muddy water using sand](#)

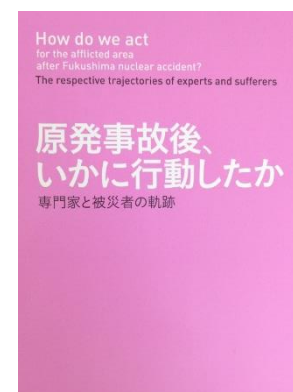
Fresh water comes out when muddy water is poured in the sand. When this operation is repeated, fresh water becomes slow to come out. Clay particles with radioactive cesium are also trapped in the sand by this principle.

TV

1. (2013.12.19) [Decontaminating Fukushima: Cleaning up Farms](#)(NHK WORLD)
2. (2013.12.09) [Decontamination: Challenge of the Villagers](#)(NHK-WORLD,TOMORROW)
3. (2012.03.09) [Japan tsunami: Battling Fukushima radiation one year on](#)(BBC, UK)

Article:

1. (2013.12.12) FUKUSHIMA NEDFRYSNING SOM SKAPAR FRAGETECKEN
2. (2013.10.31) [How Engineers Use Ground Freezing to Build Bigger, Safer, and Deeper](#)(NOVA next, USA)



Academic meeting:

Current status of our activities in litate Village



After the decontamination in Iitate



Decontamination work (2014.10)



“Temporal-temporal” storage space in a paddy

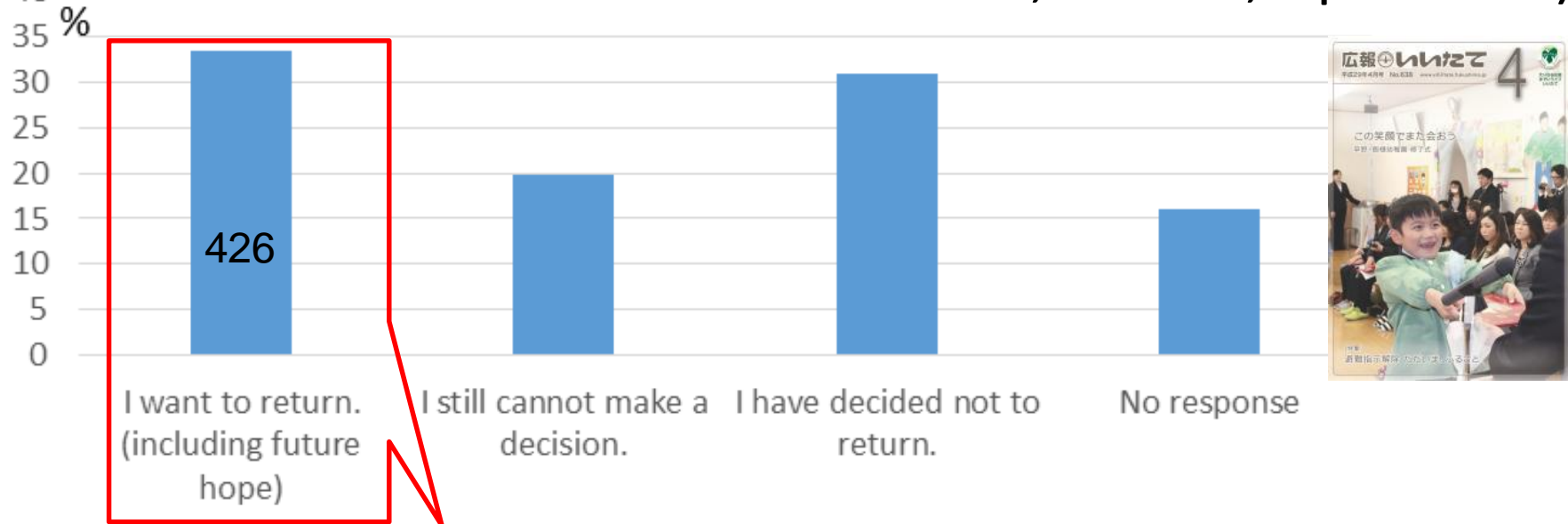


Soil dressing of farmland by sand (2015.3)

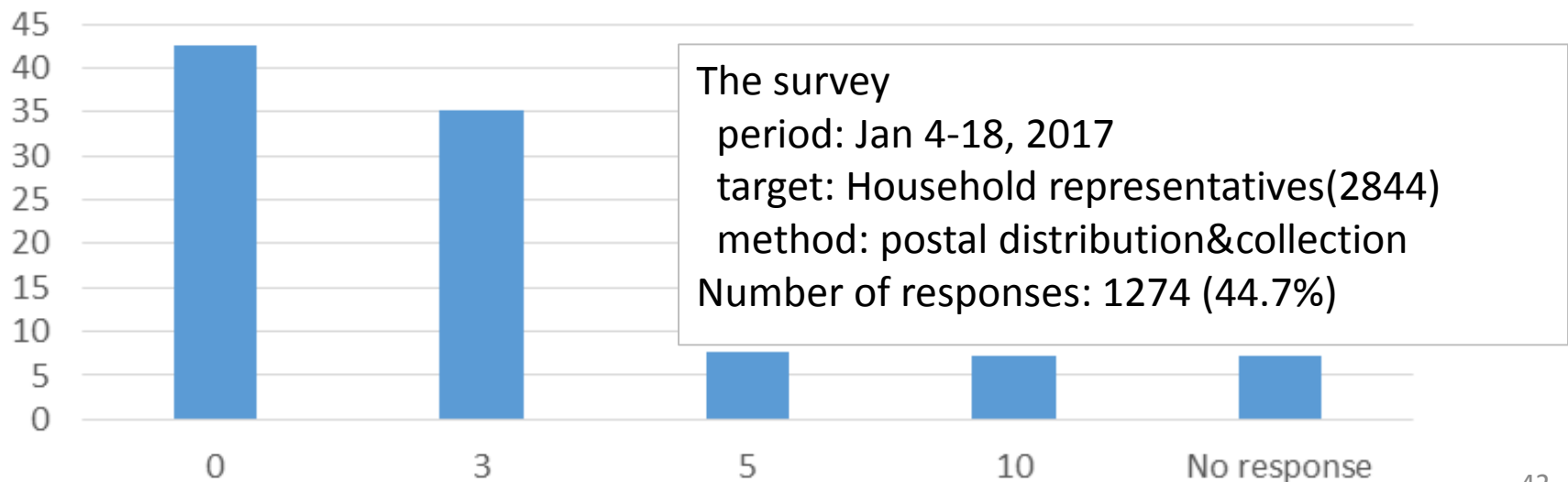


[Click to movie](#)

Present situation as seen from resident's intention survey (Extract from Public Information “Iitate”, issue 1, April 2017)



Period to return after cancellation of evacuation order



New challenges for the agriculture resurrection

Collaboration
among farmers,
NPO and UTokyo



Collaboration
between
Iitate Village and UTokyo



(案)

東京大学大学院農学生命科学研究科と福島県相馬郡飯館村との連携・協力に関する協定書。

東京大学大学院農学生命科学研究科（以下「甲」という。）と福島県相馬郡飯館村（以下「乙」という。）は、農業、畜産及びそれらに関連する産業の復興に関する研究、教育及び技術開発を進め、飯館村の課題解決のために連携・協力することで、被災地域全体の活性化に資するため、次のとおり協定を締結する。



Improvement of Drainage defective farmland

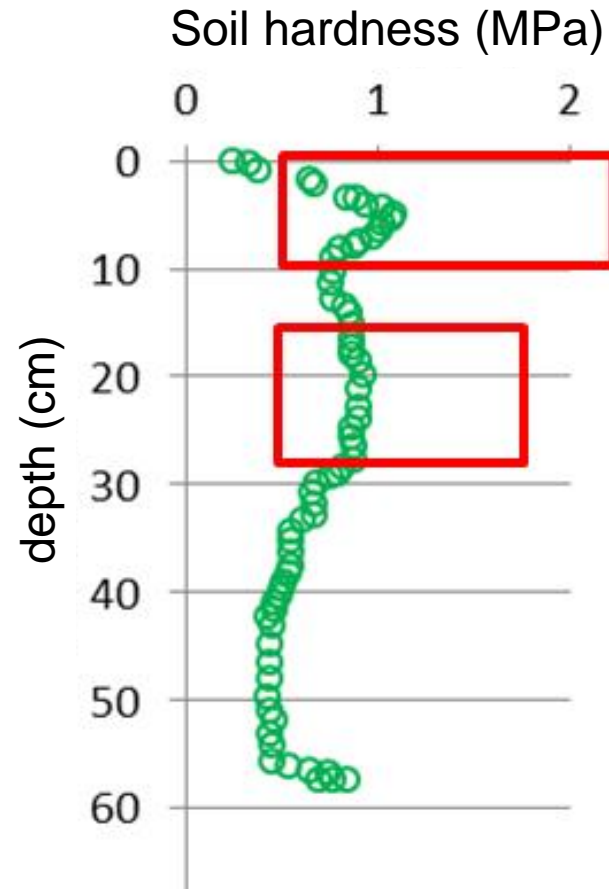


Fig.1 Drainage defective farmland immediately after decontamination.

A hard pan was formed at a depth of 5 cm by stepping on a heavy machine for decontamination in addition to conventional paddy field hard pan at a depth of 20 cm.

Heavy rain: <https://www.youtube.com/watch?v=AlTwmayfVtw>

Mysterious bubbling: <https://www.youtube.com/watch?v=1YlaKdTu8kg>

Forest decontamination



Windproof forest behind a house in Hiso, Iitate Village

2016-07-16 12:11:55 (JST)

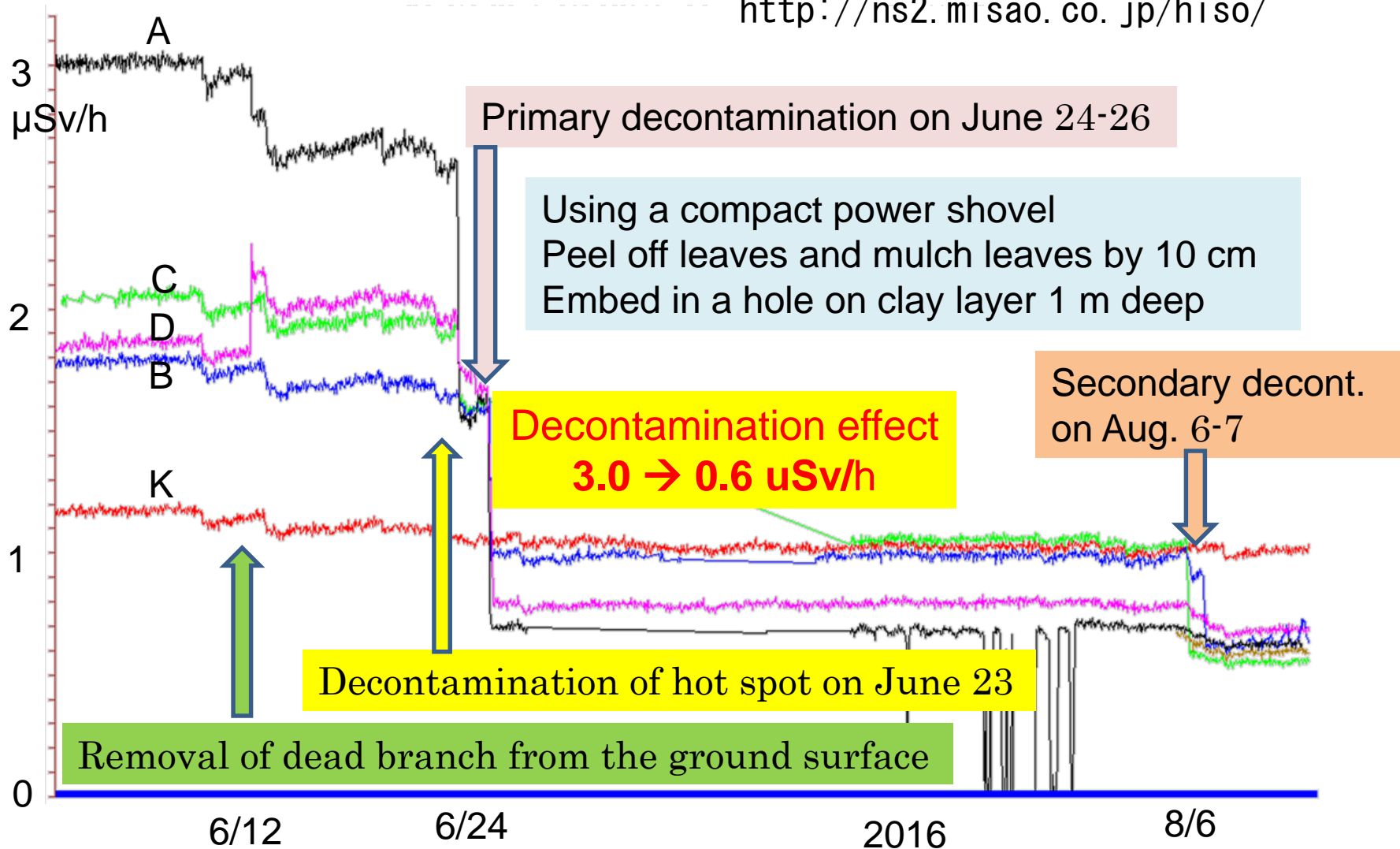


Fig.2 Changes in air dose rate in the process of embedding forest floor

[Click to poster](#)

Eradication of “harmful rumors” by connecting producers and consumers



A student at Felis Women's University reported on what she studied at the Iitate Village Study Tour.



Everyone exchanged opinions while eating cuisine made with Iitate village at a restaurant in Yokohama.

Conclusion

- Forest management
 - RCs circulation in forest
 - Forest fire risk
- After decontamination
 - Resumption of agricultural production
 - Regeneration of local community
- Eradication of harmful rumors, etc.

A lot of complex problems remain

- Relating to both nature and the humano-sphere on a scale close to human life (JpGU)

Agricultural engineering for Reconstruction

- Prof. Hidesaburo Ueno
 - Owner of Hachiko dog
 - Professor at Univ. of Tokyo
 - Law of Land consolidation(1900)
 - Lecture of Land consolidation (1905)
- **Agricultural engineering**
 - Infrastructure of food production
 - Barren land to fertile farmland
 - Land reclamation
 - Irrigation and drainage
 - **Farmland decontamination**
- **Land use after decontamination**
 - Rural plan after villagers return



(2015.3.8)

References 参考文献

- [http://www.water.go.jp/chubu/aityosui/a\(jyouhou-sub\)/06\(english\)/a_06.html](http://www.water.go.jp/chubu/aityosui/a(jyouhou-sub)/06(english)/a_06.html)
- [IRRIGATION AND DRAINAGE IN JAPAN \(3rd Edition\), International Affairs Commission of The Japanese Society of Irrigation, Drainage and Reclamation Engineering \(1995\)](#)
- [IRRIGATION AND DRAINAGE IN JAPAN PICTRAL\(3rd Edition\), International Affairs Commission of The Japanese Society of Irrigation, Drainage and Reclamation Engineering \(1995\)](#)
- <http://suido-ishizue.jp/>

Homework

レポート課題

- With reference to Web page, make a report about an agricultural infrastructure project near your hometown. **In addition**, write your impression of the lecture.
- 参考文献やWebページを参考にして、自分の生まれ故郷近くの農業基盤整備事業の事例について調べて報告しなさい。**また**、今回の講義に対する印象を述べなさい。

Deadline: June 9, Friday

To: report@iai.ga.a.u-tokyo.ac.jp

こりゃ映像！2017 —ミニ動画コンテスト—

**Wow! Good Viedo 2017
- Mini video contest -**

- <http://agrinfo.en.a.u-tokyo.ac.jp/minivideo/2017/indexe.html>

Thank you for your attention



Memorial seal for this session participant (special souvenir)