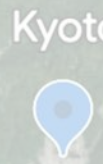
Center for Frontier Natural History
Kyoto Prefectural University

Creating Sustainable Future from the Eternal City, Kyoto

Kyoto is Japan's former capital and has many historical and touristic places, and is the ninth biggest city in Japan having nearly 1.5 million residents.
Nevertheless, Kyoto maintains nature environments such as native forest, ancient pond inside of the city area for over thousand years.
Thus, Kyoto area is a fine model system for thinking sustainable environment of the earth.

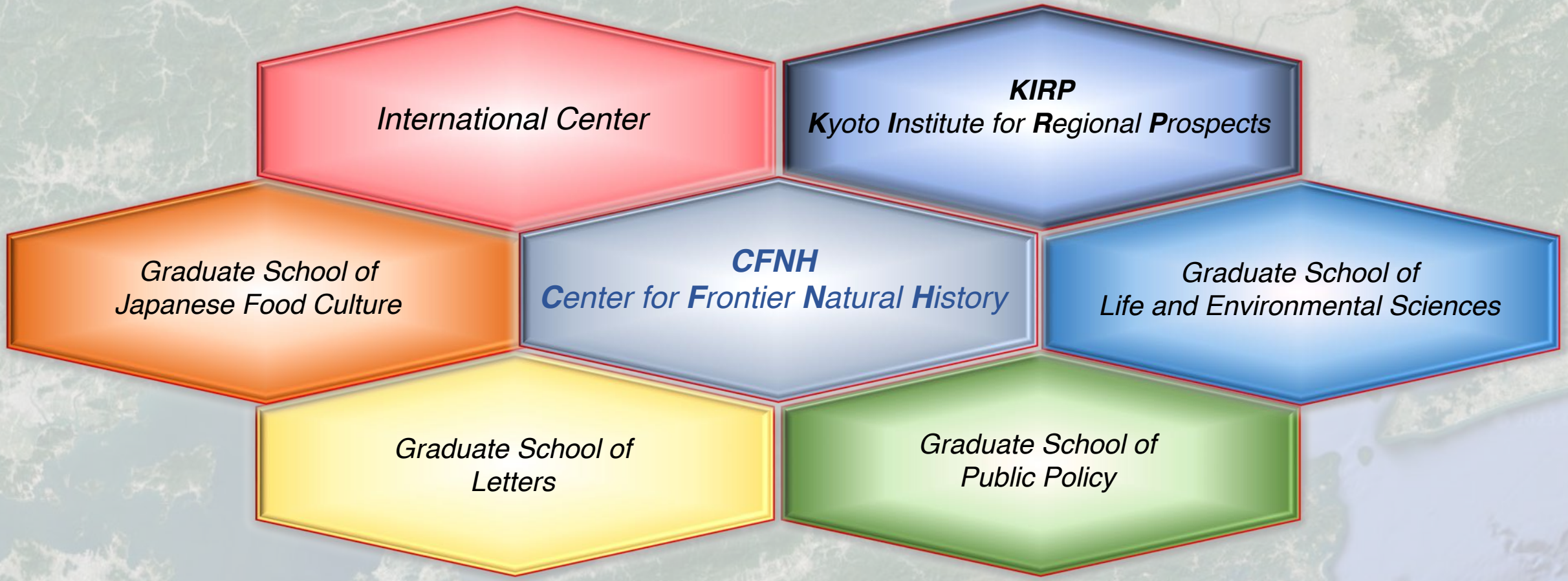


Midorogaike pond
An ancient pond originated from the last ice age.

Tadasunomori forest
A native forest protected from the Jomon period (over 10,000 years!!)

Bamboo forest
An old bamboo forest
Maintained over thousand years

Our mission is to pioneer the frontier of natural history science, which is a novel research system for the natural history of the Earth's ecosystem by using traditional and cutting-edge technologies.



We conduct researches across a wide variety of academic fields
to collaborate with related facilities in Kyoto Prefecture.

Summary of our researches related to sustainability study

Takeshi KAWAKATSU, Ph.D. in Economics

Professor, Faculty of Public Policy

Director, Kyoto Institute for Regional Prospects

Senior Fellow, Center for Public Service (Portland State University, USA)

Served in Japan on several government advisory councils

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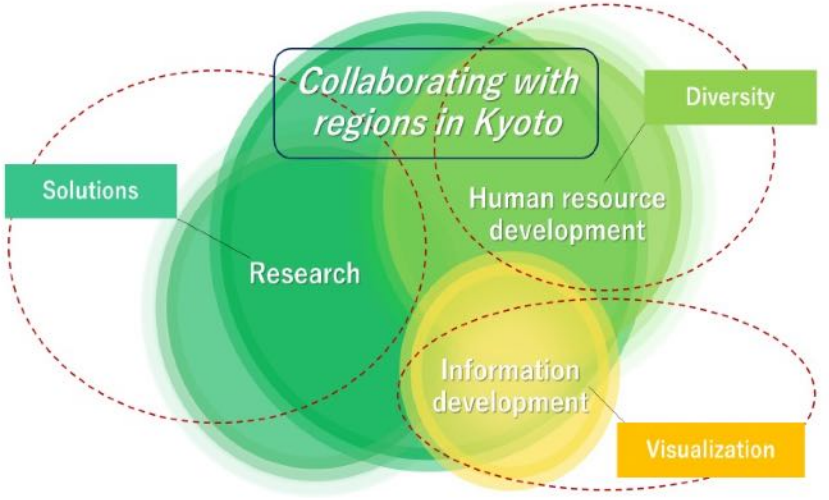
My academic expertise is in environmental economics and public finance with a special focus on urban sustainability, sustainable transportation and Multi-governed carbon pricing in North America, EU countries and Japan.

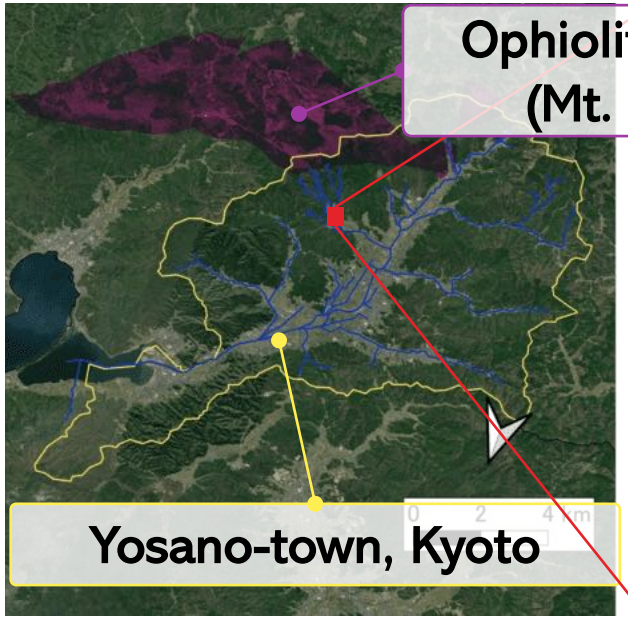
I am also recently focusing my research on public administration and finance management (e.g. budgetary process, administrative/policy evaluation systems) in Kyoto that improves sustainability of a local commons (forest, mountain, groundwater..) and civic quality of life.

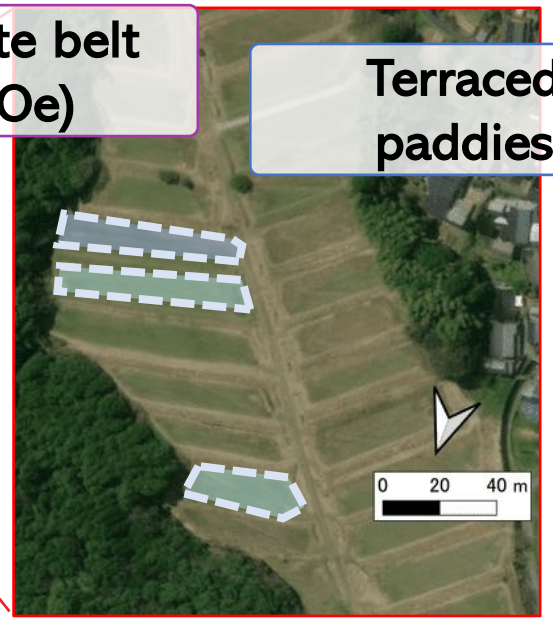
Kyoto Institute for Regional Prospects (KIRP)

We coordinate special research funds, "Academic Contribution To the Region: ACTR," about 20 research projects a year for sustainable Kyoto and also locally provide some academic or educational programs for public sector, nonprofit organization, local businesses and communities in order to improve governance, civic capacity and public management, especially in the underpopulated area, Kyoto.

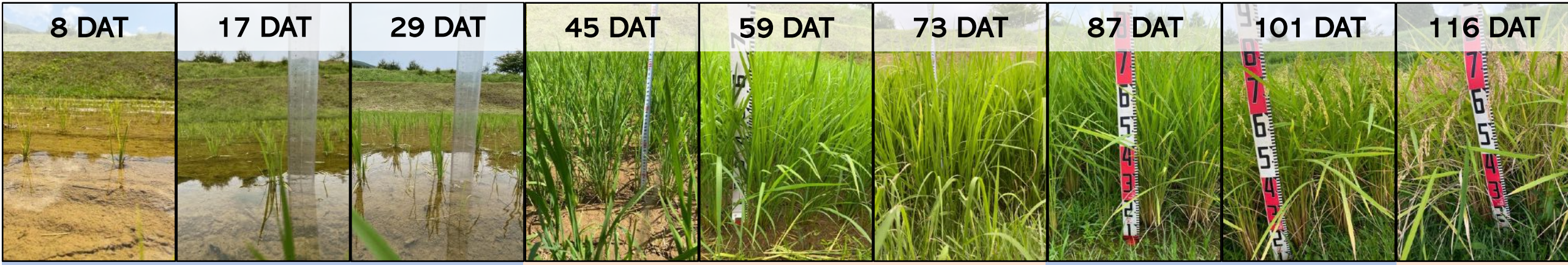


Biogeochemistry and human adaptation to “Ophiolite” ecosystem (Dr. Atsushi Nakao)

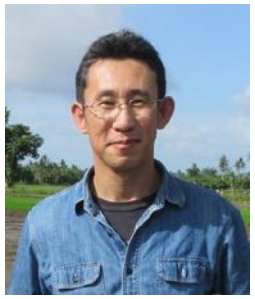




- Excess elements in ophiolite rocks (e.g. Ni, Cr) cause impact on soils, rice plants, and human health.
- Transfer mechanisms of these elements from soil to rice plants are being investigated at the ophiolitic terraces in Kyoto.



Sustainable use of soil resources based on their fertility status and carbon sequestration potential



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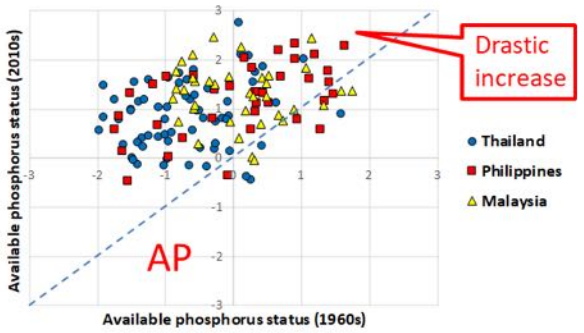
- **Prof. Junta Yanai (Soil Science)**
- **Local sustainability of food production and environmental conservation is addressed based on the rational management of soil resources in Asia**
  - **Proposal of balanced inorganic and organic fertilizer use based on long-term changes in fertility status of paddy soils in Asia**
  - **Optimization of soil organic matter accumulation in agricultural soils to improve soil fertility and to mitigate climate change**



Kyoto Biodiversity Center

"For the Conservation and Sustainable Use of Biological Diversity in Kyoto Prefecture"

Kyoto Biodiversity Center connects multiple organizations, citizen and others as a hub

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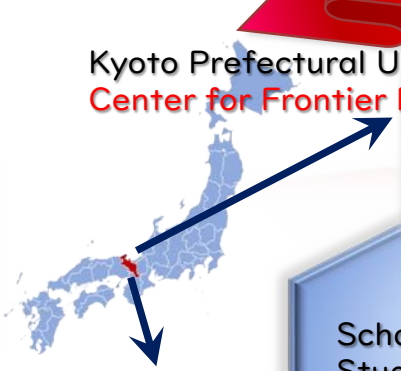
Kyoto Prefectural University
Center for Frontier Natural History



Institutes & Researchers

Local residents, Citizen-scientists

Schools & Students

Kyoto Biodiversity Center

Organized groups of local residents

Companies

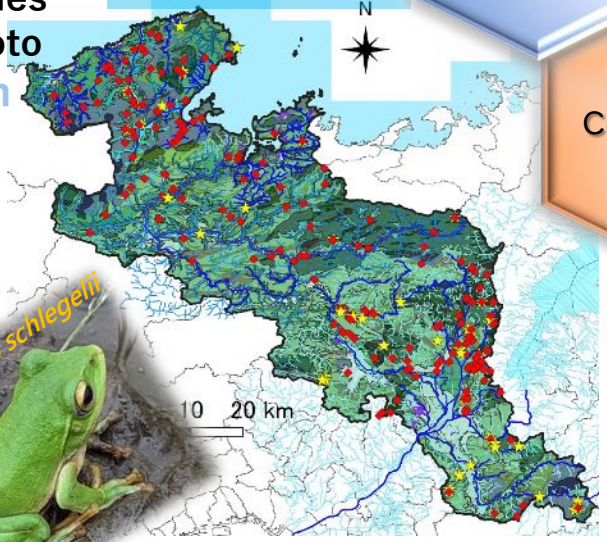
Local governments

Networks of conservation

Governments + University + Companies + participatory action research in Kyoto

Data base on biological information

Kyoto Prefecture



e.g. 1920 ～ 2020
Environmental changes
Habitat losses

Collection of distribution records
& academic papers on ecology and biogeography
& voucher specimen from Kyoto etc.

→ **Education and Researches** etc.

◆ : ***Zhangixalus arboreus***
★ : ***Zhangixalus schlegelii***

Visualization of biodiversity in Kyoto

Distribution of endangered insects, frogs, fishes, birds, plants, moss etc. → **Action Plan for Biological Conservation**

An archaeological study of acceptance and spread of equestrian culture in Japan

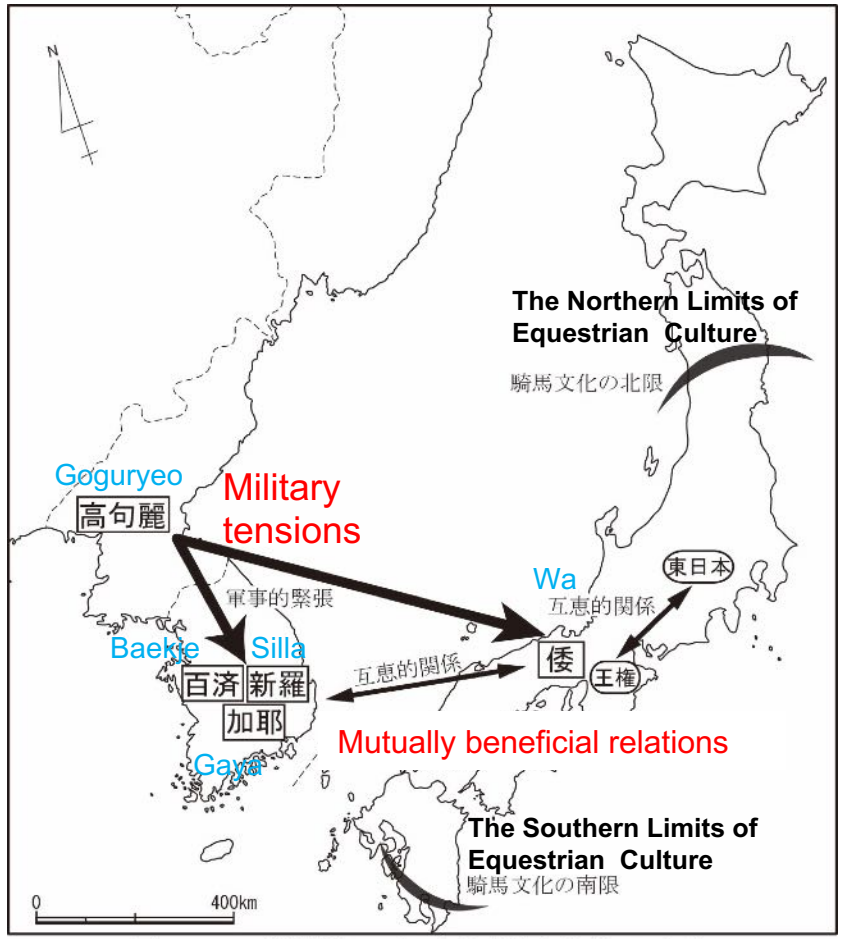
Fact: Japanese native horses are descendants of exotic animals transported by ship from Korea during the Kofun period (5th century A.D.).

Question: Who and why transported large numbers of horses? How was this possible?

Archaeological evidences: Ancient horse remains, Harnesses, Horse-shaped haniwa, etc.

Hypothesis: Increased demand for horses due to military tension in Northeast Asia caused by Goguryeo's expansion and the formation of mutually beneficial relations between the southern countries in Korea and Japan（倭） were behind the smooth introduction of equestrian culture in Japan. (ISAHAYA 2010)

Next question: How did they achieve subsistence production in Japan, where grassland environments are scarce? (ISAHAYA ed. 2023)



Acceptance and spread of equestrian culture in Japan

Japanese native horses
（Taishu-ba **対州馬**）

Ancient horse remains （5th century）

CONTACT

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Archaeological Lab.

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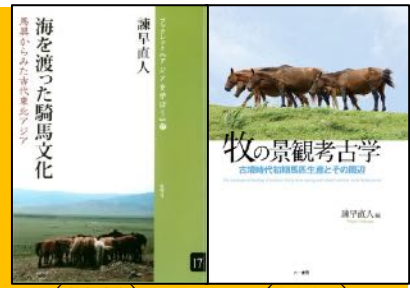


（2010） （2023）

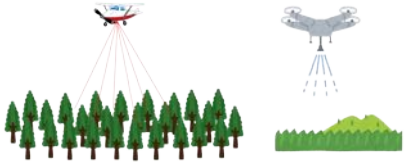
Forest Evaluation & Planning based on Remote Sensing

Objective

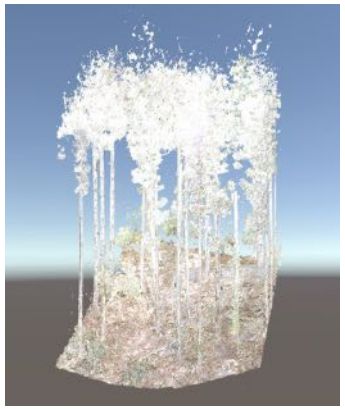
Search for new methods to provide useful information to stakeholders for decision making to achieve sustainable forest management

Data Collection

Airborne/UAV Laser Scanning



Terrestrial Laser Scanning



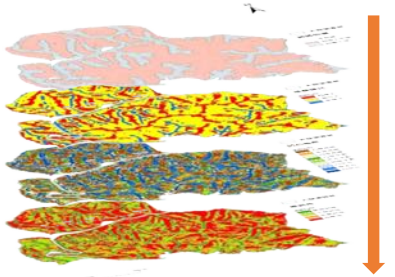
GNSS Positioning

Field Survey

Analysis

- Site Productivity
- Harvestability
- Damage by Deer grazing
- Seed dispersal possibility

etc.

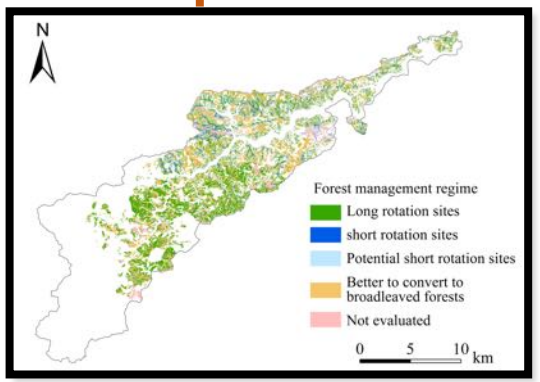


Overlaying by using GIS

Evaluation

- Sites suitable to continue forestry
- Sites better to convert to broadleaf forests
- Sites with heigh priority to restoring deciduous forests etc.

Propose Plans



Ex: Forest management regime map (Nagashima, 2017)

Contact

Prof. Keiko NAGASHIMA
Forest Management & Planning Lab.
Email: nagakei@kpu.ac.jp

Prof. Nakao Kubo, Lab. of Cell and Genome Biology

Genetic analysis of vegetable and tea plants.

- Detection of agronomic trait loci in carrot, turnip, tea, etc.

- Classification of plant cultivars and landraces based on molecular markers

- Evolutionary study of angiosperm mitochondria

Nakao KUBO, Ph.D.
Professor

Graduate School of Life and Environmental Sciences,
Kyoto Prefectural University

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Area-capability approach

Satoshi Ishikawa
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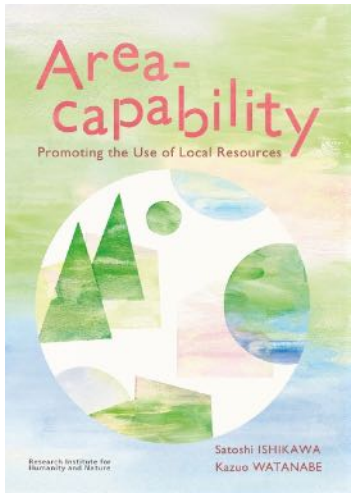
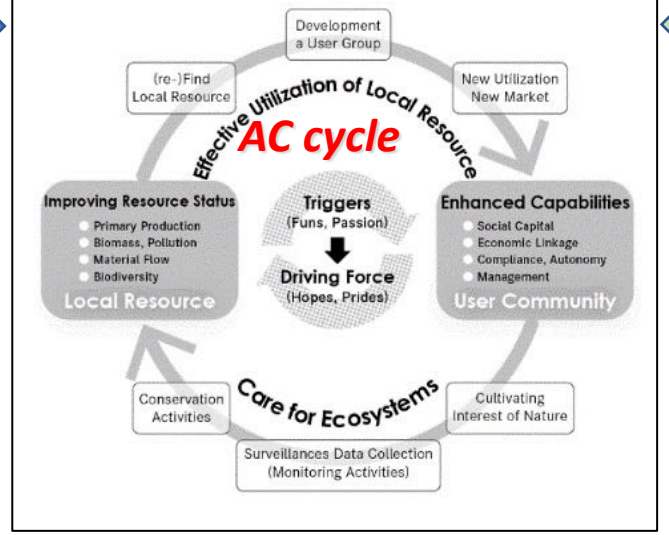


Academic Researchers — *Sharing Data and Info. Impact Evaluation* — Local Government

Local Community

Additional Values

Limited entry Licenses



"Many AC cycles" means
Many Resources
Many Communities
and
Many Choices of Lives

Area-Capability Cycle as a model for collaboration among local community, local government and academic researchers

[About AC | Coastal Area Capability Enhancement in Southeast Asia (chikyu.ac.jp)]

FUKUI Wataru
福 井 亘

Laboratory of Landscape,

Graduate School of Kyoto Prefectural University
京都府立大学大学院　ランドスケープ学研究室
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Our laboratory researches

"landscape planning and design" and " landscape ecology "

keyword : bird, urban and rural landscape, street tree, GIS, park, land use, Japanese garden, Chinese garden

Research on the history of food products in Kyoto and Kyoto MALUI collaboration

Prof. Noboru Higashi, Ph. D.（n-higashi@kpu.ac.jp）

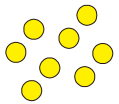
- Building the platform for learning about local history and culture by collaborating with local history study groups and local archives.
- Publishing a book, Kyoto's foods and products, describing of ancient food products, including Ayu (sweetfish), amberjack, paulownia oil, wild boar deer, matsutake mushrooms, plums, and kisen-tou (sweets souvenirs) from the Edo period to the present day, and the history of their succession and disappearance.
- MALUI Collaboration－ Creating a new cycle for community development by consolidating and sharing cultural resource information from Museums, Archives, Libraries, Universities, and Industry in Kyoto.

Development of a Peptide-type Bio Stimulant for Sustainable Agriculture

Dedifferentiation

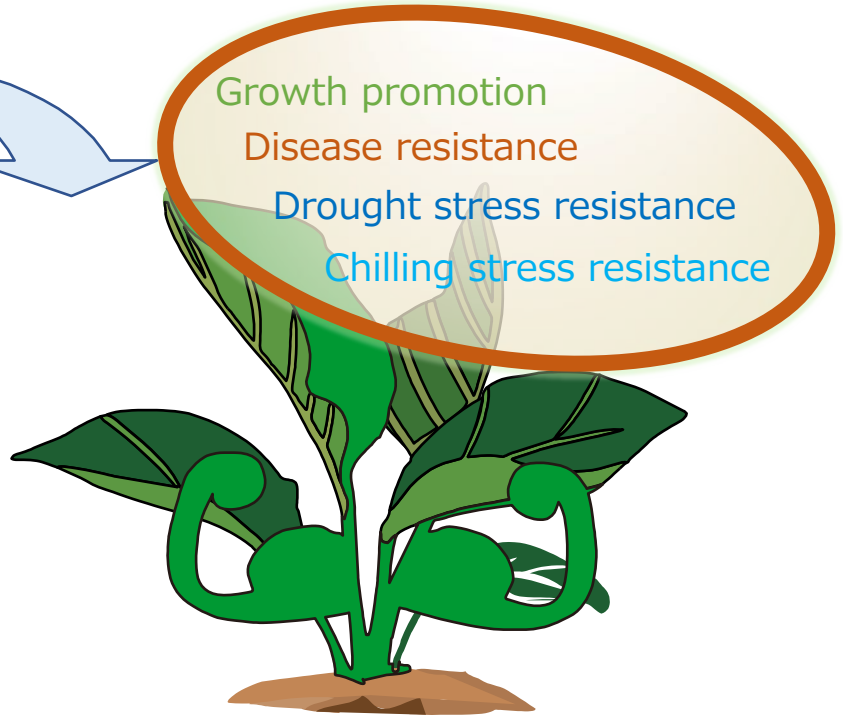
Regeneration

Gall-inducing insects



insect effecter peptide for gall induction

Novel-type
Bio stimulant



Contact

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Assoc. Prof. Tomoko Hirano, Ph. D.
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Simply soaking or spraying our novel peptide compound on various plants confers disease resistance, freezing tolerance, and desiccation tolerance to plants.

Still there are substantial undescribed (not yet scientifically named) insect species

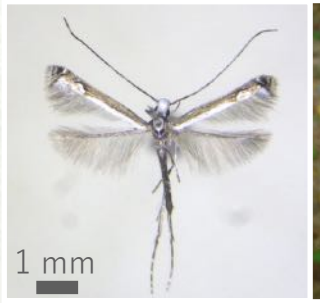
Example:
An undescribed
“leaf-mining” moth species
found in the forests Kyoto

Discover Unknown Biodiversity
&
Understanding “Why there are so many species?”

Toward the establishment of basic knowledge for thinking about sustainability

Issei Ohshima
issei@kpu.ac.jp

Example:
Do host-plant shifts
initiate insect speciation?



What is species?
What mechanisms and processes are involved in speciation?