

## Chair      Agro-ecosystem Science

### 2.5.5      Laboratory : Soil Science

Member : Professor	Funakawa, Shinya, Ph. D.
Assistant Professor	Shinjo, Hitoshi, Ph. D.
Assistant Professor	Watanabe, Tetsuhiro, Ph. D.
Doctor's program	3
Master's Program	6
Undergraduate	4
Other	1

#### **A. Research Activities (2010.4-2011.3)**

##### **A-1. Main Subjects**

a) Soil characterization, development of the soil management and environment conservation in the tropics and arid regions

The laboratory of soil science widely concerns soil management strategies for sustainable use and conservation of environment in the tropics and the arid regions. In Central Asia (Kazakhstan), research on soil degradation due to continuous cereal cropping in the steppe region were conducted. In Southeast Asia (Thailand and Indonesia), soil processes under conventional cultivation systems were investigated with special reference to soil organic matter dynamics and the agro-ecological degradation due to excessive land use under increasing population pressure was also analyzed to establish a sustainable land use system there. In Sub-Sahara Africa (Tanzania, Zambia, Niger and Cameroon), human-environment relationship was investigated through the research on the response of soils to the soil management practices under conventional farming systems by small-scale farmers.

b) Dynamic pedology on the soil acidification processes

Soil forming and mineral weathering processes are investigated on soils derived from various parent materials in the cool and warm temperate forests in Japan and in the tropical forests in Southeast Asia. Especially, pedogenic acidification as an important driving force of elemental dynamics in ecosystems, and conditions for formation of clay minerals that affect the dynamics are studied.

c) Studies on dynamics of organic matter and soil microbes under different soil ecosystems

The dynamics of organic matter and soil microbes in ecosystems are key processes in terms of different environmental problems such as global warming and nutrient leaching. The soil organic matter-decomposing characteristics and microbial activities were analyzed for soil collected from different environments (Thailand, Indonesia, Kazakhstan, etc).

## A-2.Publications and presentations

### a) Publications

#### Original Papers

- Funakawa, S., Shinjo, H., Kadono, A. and Kosaki, T. 2010: Factors controlling in situ decomposition rate of soil organic matter under various bioclimatic conditions of Eurasia. ペドロジスト, 53, 50-66

- Ikazaki, K., Shinjo, H., Tanaka, U., Tobita, S., Funakawa, S., and Kosaki, T. 2010: Performance of an aeolian materials sampler for the determination of amount of coarse organic matter transported during wind erosion events in the Sahel, West Africa. ペドロジスト, Vol. 53, 126-134

- Kadono, A., Funakawa, S., and Kosaki, T. 2010. Factors controlling potentially mineralizable and recalcitrant soil organic carbon in humid Asia. ペドロジスト, Vol. 53, 135-142

- Nakamura, S., Hayashi, K., Omae, H., Ramadjita, T., Dougbedji, F., Shinjo, H., Saidou, A. K., and Tobita, S. 2010. Validation of soil organic carbon dynamics model in the semi-arid tropics in Niger, West Africa. Nutr. Cycl. Agroecosyst. DOI 10.1007/s10705-010-9402-4

- Sugihara S, Funakawa S, Kosaki T. 2010: In situ short-term carbon and nitrogen dynamics in relation to microbial dynamics after a simulated rainfall in croplands of different soil texture in Thailand. Soil Science and Plant Nutrition. 56: 813-823

- Fujii, K., Hayakawa, C., Van Hees, P.A.W., Funakawa, S., Kosaki, T. 2010. Biodegradation of low molecular weight organic compounds and their contribution to heterotrophic soil respiration in three Japanese forest soils. Plant and Soil, 334, 475-489

- Fujii, K., Hartono, A., Funakawa, S., Uemura, M., Sukartiningsih, Kosaki, T. 2011. Acidification of tropical forest soils derived from serpentine and sedimentary rocks in East Kalimantan, Indonesia. *Geoderma*, 160, 311-323

- Fujii, K., Hartono, A., Funakawa, S., Uemura, M., Kosaki, T. 2011. Fluxes of dissolved organic carbon in three tropical secondary forests developed on serpentine and mudstone. *Geoderma*, 163, 119-126

- Sawada, K., Funakawa, S., and Kosaki, T. 2010: Simulating short-term dynamics of non-increasing soil respiration rates by a model using Michaelis-Menten kinetics. *Soil Science and Plant Nutrition*. 56: 874–882

- Yanai, J., Nakata, S., Funakawa, S., Nawata, E., Katawatin, R., and Kosaki, T. 2010: Effect of NPK application on growth, yield and nutrient uptake by sugarcane on a sandy soil in Northeast Thailand. *Tropical Agriculture and Development*, 54, 113–118.

#### Reviews

- Sawada, K., Funakawa, S., and Kosaki, T. 2011: Factors controlling efficiency of glucose utilization by soil microbes, *Soil microbiology*, 65, 41-48 (in Japanese)

#### Reports,others

- Shinjo, H. 2011. Report for Granted Study of Japan International Research Center for Agricultural Sciences on "Development and validation of soil fertility management technologies based on resource dynamics in the Sahel region of West Africa"

- Funakawa, S., Kadono, A., Morioka, K., Pachikin, K., and Wang, G. 2010: Distribution patterns of soils and vegetation in the foothills of the Tianshan and Altai Mountains in Central Eurasia. In *Reconceptualizing Cultural and Environmental Change in Central Asia: An Historical Perspective on the Future*, Eds. M. Watanabe and J. Kubota, p.29–48. Ili Project, Research Institute for Humanity and Nature.

#### b) Conference and seminar papers presented

- Annual meeting of Japanese Society of Pedology: 2 Presentaions

- Annual meeting of Japanese Society of Soil Science and Plant Nutrition: 13 Presentations

- The 108th conference of Japanese Society of Tropical Agriculture: 2 Presentations

- The 109th conference of Japanese Society of Tropical Agriculture: 2 Presentations

- Meeting for Kansai District of Japanese Society of Soil Science and Plant Nutrition: 1 Presentation

- 19th World congress of Soil Science: 3 Presentations

### **A-3.Off-campus activities 1**

#### Membership in academic societies

- Funakawa, Shinya : Japanese Society of Soil Science and Plant Nutrition (Associate Editor-in-Chief for English journal), Japanese Society of Pedology (Councilor), Japanese Society of Tropical Agriculture (Editor)

- Shinjo, Hitoshi : Japanese Society of Soil Science and Plant Nutrition (Member of Editorial Board for Japanese journal), Japanese Society of Tropical Agriculture (Managing Editor)

- Watanabe, Tetsuhiro : Japanese Society of Tropical Agriculture (Managing Editor)

### **A-3.Off-campus activities 2**

#### Research grants

##### 1. Grants-in-aid for Scientific Research(KAKENHI)

- Grants-in-aid for Scientific Research (A) : Funakawa (Watanabe, member) : What has agriculture destroyed in ecosystems? – Towards the recovery of homeostasis of soil ecosystems –

- Grants-in-aid for Scientific Research (A) : Kosaki, Takashi (Funakawa, member) : Identification of stress factors in soil organic matter dynamics in humid regions and its agricultural use
  
- Grants-in-aid for Scientific Research (B) : Kosaki, Takashi (Funakawa, member) : Spatio-temporal variability of ecological resources in tropical Africa and its agricultural use
  
- Grants-in-aid for Scientific Research (B) : Tanaka, Ueru (Shinjo, member) : South to south transfer of technology to combat desertification in inland semiarid region in West Africa
  
- Grants-in-aid for Scientific Research (A) : Araki, Shigeru (Funakawa, member) : Development of cassava production system for smallholders in savanna-forest transitional region of East Cameroon
  
- Grants-in-aid for Scientific Research (B) : Shinjo, Hitoshi : Agro-ecological study to realize "Green Revolution" based on the realities in semi-arid tropics of Africa
  
- Grant-in-Aid for Young Researchers (B) : Watanabe, Tetsuhiro : Influences of geological conditions on biogeochemical processes of forest ecosystems in Japan

## 2. Other Research Grants

- Japanese International Research Center for Agricultural Sciences : Shinjo, Hitoshi : Development and validation of soil fertility management technologies based on resource dynamics in the Sahel region of West Africa
  
- Research Grand Program, The TOYOTA foundation : Sabiham Supiandi (Funakawa, co-worker; Watanabe, co-worker) : Adaptive social entropy system -balance between economic activity and natural, social and ecological dynamics in oil palm plantation of Indonesia
  
- JST/JICA "SAPREPS" program : Araki, Shigeru (Funakawa, co-worker) : Establishment of sustainable livelihood strategies and natural resource management in tropical rain forest and its surrounding areas of Cameroon: Integrating the global environmental concerns with local livelihood needs

#### **A-4.International cooperations and overseas activities 1**

##### International joint research, overseas research surveys

- Study on agricultural ecosystems in tropical Asia, Funakawa, Thailand, Indonesia
- Study on agricultural ecosystems in tropical Africa, Funakawa, Tanzania, Cameroon
- Recent agro-environmental alteration in Central Asia, Funakawa, Kazakhstan
- Study on desertification in semiarid Africa, Shinjo, Niger, Namibia
- Study on social-ecological resilience in semi-arid Tropics, Shinjo, Zambia
- Study on weathering rate of soil minerals in humid Asia, Watanabe, Indonesia

#### **A-4.International cooperations and overseas activities 2**

##### Visiting Research Scholars

- Guest Professor 1 (Taiwan)

#### **B.Educational Activities(2010.4-2011.3)**

##### **B-1.On-campus teaching**

###### a) Courses given

- Undergraduate level Science of Biosphere (Funakawa), Environmental Science (Funakawa), Outline of Bioresource Science IV (Funakawa), Outline of Agricultural Science II (Funakawa), Soil Science- Part I (Funakawa, Shinjo), Soil Science- Part II (Funakawa, Watanabe), Introduction to Foreign Literature in Bioresource Science II (Shinjo), Agricultural Technology and Farm Practice (Funakawa, Shinjo, Watanabe), Introduction to Plant Investigations (Funakawa, Shinjo, Watanabe), Practice in University Forest III (Shinjo, Watanabe), Laboratory Course in Bioresource Science I・II (Funakawa, Shinjo, Watanabe), Fundamentals for the Laboratory Course in Bioresource Science (Funakawa), Seminar in Soil Science (Funakawa, Shinjo, Watanabe), Principle of Sustainable Agriculture (Funakawa, Watanabe), Pocket-seminar "palm and tropical forest" (Funakawa, Watanabe), Pocket-seminar "Field course to study the sustainable agriculture in Canada"
- Graduate level : Research in Soil Science (Funakawa, Shinjo, Watanabe), Seminar in Soil Science (Funakawa, Shinjo, Watanabe), Biogeochemistry (Funakawa, Watanabe)

#### **C.Other Remarks**

- Shinjo, Hitoshi : Global Environmental Forum "Advisory Committee for Dissemination Measures of Technologies Combatting Desertification"