Chair Land and Water Resources Management

2.5.10 Laboratory : Irrigation, Drainage and Hydrological Environment Engineering

Member :	Professor	Kawashima, Shigeto, Dr. Agric. Sci.
	Senior Lecturer	Nakamura, Kimihito, Dr. Agric. Sci.
	Assistant Professor	Hama, Takehide, Dr. Agric. Sci.
	Doctor's program	3
	Master's Program	9
	Undergraduate	7

A. Research Activities (2010.4-2011.3)

A-1. Main Subjects

a) Early detection and prediction of climate warming based on the long-term monitoring of alpine ecosystems on the Tibetan Plateau

The global warming observation system was constructed in the center part and the northern part of the Tibet plateau for the early detection of effects of global warming on ecosystem using the extremely high plateau and we started the long-term monitoring. The continuous meteorological observation at multi points in special high region with holding wide range in observation altitudes like this research is the first attempt in the Tibet plateau which is called the third pole of the earth. The meteorological data obtained by our observation network offers information on the reality how the status of global warming and the influence appear.

b) Development of the methodology for forecasting the hybridization mating rate of wind pollination crops

In order to promote the development and the popularization of GMO products, the establishment of a scientific technique to evaluate the influence of GMO on conventional crops is indispensable. The forecasting model of the pollen dispersal and the hybridization mating for wind pollination crops such as corn and rice plants is constructed based on the atmospheric diffusion equation and the ecological information of crops. The result of this research quantifies the cultivation conditions of GMO and conventional crops, and contributes to the establishment of the policy criterion to coexist of both.

c) Development of an automatic measurement method for airborne pollen

In recent decades, the allergy problem by airborne pollen had become a serious social concern. Especially in the wind pollination plants, the pollen diffuses distantly, and there is a possibility to induce many pollinosis patients in a wide area. It is important to develop the technique for measuring the amount of airborne pollen correctly and speedily in order to assess the health effect problems of pollen that causes the allergic rhinitis. However, conventional measurement method for airborne pollen in the past require much labour and long amount of time. Then, we develop the technique for automatically measuring the amount of airborne pollen. This method is able not only to decrease the amount of labor but also to catch a detailed change in the concentration of airborne pollen.

d) Hydrological evaluation enhancement of multipurpose functions of agricultural lands and forest area

Evaluation of flood control of a basin (Oshinohara, Shiga). Evaluation of hydrological and meteorological characteristics in forested catchments (Oshinohara, Shiga and Kamigamo, Kyoto). Evaluation of purification function of air pollution by a forest basin and measurement of pH and EC of rainfall and stem flow (Oshinohara, Shiga).

e) Eco-friendly water and soil management in agricultural area.

Agricultural land accumulation is necessary for sustainable agriculture. Merits of plot-to-plot irrigation system are investigated from standpoints of farming, water use amount and water quality (Takashima, Shiga). Development of methane fermentation manure liquid application design for sustainable paddy agriculture (Nantan, Kyoto). Water quality formation process in a basin (Hino River Basin, Shiga). Groundwater flow model for sustainable groundwater resourse in an alluvial fan (Tedori River Fan, Ishikawa). Soil nitrogen behavior in a winter-flooded rice field (Echi River Basin, Shiga). Effect of rotational irrigation system on water-saving in lake water irrigation area near Lake Biwa (Hino River Basin, Shiga). Arsenic uptake characteristics by Vetiver grass. Soil temperature and moisture environments and lot-management water requirement associated with soil solarization (Minabe, Wakayama). Measurement of continuous air content in soil and air conductivity using acoustic wave.

f) Evaluation of effect of cyclic irrigation on reducing nutrients effluent loads and characterization of nutrients dynamics in a agricultural drainage canal

Cyclic irrigation system, in which drainage water from paddy-field district is reused as irrigation water, can reduce effluent loads of nutrients from the district. Our laboratory has researched the effect of cyclic irrigation system on nutrients effluent loads. However, cyclic irrigation may also cause nutrients accumulation in the agricultural drainage canal because the drainage canal functions as a water reservoir. Our laboratory has regularly sampled the bottom sediment and quantified seasonal variation of nutrients in the sediment.

A-2.Publications and presentations

a) Publications

Original Papers

- Shigeto Kawashima, Arihiro Nagasawa, Haruhiko Nozaki, Keiichi Koinuma, Takahiro Hamazaki, Satoshi Sakata, Takehide Hama, Kimihito Nakamura, 2010, Probability of long-distance hybridization of maize and the effects of weather on spatial variation in hybrid percentages, Japanese Journal of Palynology, 56, 1, 13-22.

- Tomoki Ushiyama, Mingyuan Du, Satoshi Inoue, Hiroyuki Shibaike, Seiichiro Yonemura, Shigeto Kawashima
and Katsuki Amano, 2010, Three-dimensional prediction of maize pollen dispersal and cross-pollination, and the effects of windbreaks, Environ. Biosafety Res., 8, 183-202.

- Sakata. S., T. Nodu, K. Tokutomi, S. Osakabe and T. Mitsuno : Estimation Method of Volumetric Water Content and Groundwater Level by Ground-penetrating Radar, Water, Land and Environmental Engneering, 78(4), 27-30, 2010

- Sakata. S., K. Nakamura and Y. Matsukawa : Case Study of Using Vetiver Grass (Vetiveria zizanioides) as Green Belt to Preserve Farm Land in Okinawa Prefecture, Agricultural Upland, 621, 10-17

- Fukada, K., T. Mitsuno, and K. Nakamura: Measurement of continuous air content and air conductivity for sand using sound resonance, Journal of the Japanese Society of Soil Physics, 115, 3-13, 2010

- Noto, F., T. Maruyama, Y. Hayase, H. Takimoto, and K. Nakamura: An evaluation of snow storage depth in the Tedori River Basin using tank model, JSIDRE, 268, 31-37, 2010

- Maruyama, T., F. Noto, T. Takahashi, K. Nakamura, and T. Onishi : Assessment of environmental nitrogen pollution load potential from sewage treatment water in the Tedori River Alluvial Fan Area, Japan, Paddy and Water Environment, DOI 10.1007/s10333-010-0248-9, 2011

- Maruyama, T., F. Noto, H. Takimoto, K. Nakamura, and T. Onishi : Assessment of the long-term variation in the nitrogen pollution load potential from farmland to groundwater in the Tedori River Basin, Japan, Paddy and Water Environment, DOI 10.1007/s10333-011-0254-6, 2011

Reviews

- Sakata. S. and K. Nakamura : Necessary Quantity of Supply Water to Upland Field at Nanki-Irrigational District, Wakayama Prefecture, Agricultural Upland, 624, 9-12, 2010

- Iida, M., C.S. Ryu, K. Ohdoi, K. Nakamura, and K. Suguri: Application of methane fermentation digested liquid to paddy plots, Report of J.of the Japanese Society of Agriculture Machinery, 42-46, 2011

Reports,others

- Seto, S, S. Kawashima, T. Hama, K. Nakamura, Model for estimating the flood mitigation function in mountainous district relating a temporal smoothing effect and a quantitative moderation effect. Annual report of "Research for water conservation function of a forest," 39-46, 2010

- Nakamura, K., S. Watanabe, S. Seto, and T. Hama, Temporal changes in water quality of mountain stream in the case of rainfall events in Oshinohara forest catchment, Annual report of "Research for water conservation function of a forest," 89-101, 2011

- Nakamura, K., Annual report of "Reserch for revise of desigh criteria for irrigation water in Nada and Nanki districts," 34p., 2011

b) Conference and seminar papers presented

- Annual Meeting of the Japanese Society of Irrigation, Drainage and Rural Engineering in 2010 (8 presentations)

- Annual Meeting of the Palynological Society of Japan in 2010 (2 presentations)

- Annual Meeting of the Japanese Society of Soil Science and Plant Nutrition in 2010 (1 presentation)

- Annual Meeting of the Japanese Society of Irrigation, Drainage and Rural Engineering Kyoto Branch (5 presentations)

- Annual Meeting of The National University Corporation Arid Land Research Center, Tottori University (1 presentation)

- INWEPF-PAWEES Joint symposium & steering meeting（1 presentation）

A-3.Off-campus activities 1

Membership in academic societies

- Kawashima, Shigeto, Dr. Agric. Sci. : Palynological Society of Japan, Japanese Society of Allergology, Meteorological Society of Japan, The Society of Agricultural Meteorology of Japan, Japanese Society of Irrigation, Drainage and Rural Engineering

- Nakamura, Kimihito, Dr. Agric. Sci. : Japanese Society of Soil Physics (Member of Editorial Board), Japanese Assiciation of Groundwater Hydrology (Member of Editorial Board), Japanese Society of Irrigation, Drainage and Rural Engineering (Member of research council, Member of subcommittee of annual meeting organization)

- Hama, Takehide : Japanese Society of Irrigation, Drainage, and Rural Engineering, Japan Society of Hydrology and Water Resources, Japan Society on Water Environment

A-3.Off-campus activities 2

Research grants

2.Other Research Grants

- Research fund of Shiga Prefecture：Kawashima, Shigeto, Dr. Agric. Sci.：Research on functions of forest for water environmental conservation.

- Mitsui & Co., Ltd. Environment Fund：Kawashima, Shigeto, Dr. Agric. Sci.：Research on strategy for introducing various functions in water circulation of forest into valley management plan.

- The Ministry of Agriculture, Forestry and Fisheries, Research fund：Kawashima, Shigeto, Dr. Agric. Sci.：Integrated research on the safety of genetically modified organism crops.

- Research grant of core stage backup of Kyoto University：Nakamura, Kimihito, Dr. Agric. Sci.：Ion balance of discharge water from each land use in a basin

- The Ministry of Agriculture, Forestry and Fisheries Entrust Research (Kinki Regional Agricultural Administration Office)：Nakamura, Kimihito, Dr. Agric. Sci.：Research for revise of design criteria for irrigation water in Nada and Nanki districts

- Ishikawa Prefectural University：Maruyama, T. (Nakamura, Kimihito, Dr. Agric. Sci.: Member)：Research for groundwater flow analysis in Tedori river fan in the research project of “Studies on sound hydrological cycle based on agricultural water”

- The Agricultural Upland Development Association : Nakamura, Kimihito, Dr. Agric. Sci. : Lot-management water requirements assiciated with soil solarization

- Joint Research with Arid Land Research Center, Tottori University : Nakamura, Kimihito, Dr. Agric. Sci. (Fukada, K.: Member) : Development of in-situ measurement technique of continuous air content and air conductivity in soil using sound resonance

A-4.International cooperations and overseas activities 1

Membership in academic societies

- Shigeto Kawashima: International Association for Aerobiology

- Nakamura, Kimihito, Dr. Agric. Sci.: Paddy and Water Environment (Member of Editorial Board)

International joint research, overseas research surveys

- Kawashima, S.: A joint research on development of automatic measurement technique of airborne biological particles, with Meteo Swiss and Neuchatel University (Switzerland).

- Kawashima, S.: Early detection and prediction of climate warming based on the long-term monitoring of alpine ecosystems on the Tibetan Plateau, with Chinese Academy of Science (The People's Republic of China).

B.Educational Activities (2010.4-2011.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level : Atmospheric Environment (Kawashima), Environmental Hydrology (Kawashima), Irrigation and Drainage Engineering (Kawashima), Practice in Irrigation and Drainage Planning (Nakamura), Soil Physics (Nakamura), Laboratory Course in Soil Physics and Hydrological Environment Engineering (Nakamura), Seminar in Agricultural and Environmental Engineering (Kawashima, Nakamura, and Hama), Practice in Data Processing I (Nakamura and Hama)

- Graduate level : Environmental Hydrological Sciences and Technology (Kawashima), Seminar in Irrigation, Drainage and Hydrological Environment Engineering I (Nakamura and Kawashima), Seminar in Irrigation, Drainage and Hydrological Environment Engineering II (Kawashima, Nakamura, and Hama), Laboratory Course in Irrigation, Drainage and Hydrological Environment Engineering (Kawashima, Nakamura, and Hama)

B-2.Off-campus teaching etc.

Open lectures, etc.

- Nakamura, Kimihito, Dr. Agric. Sci.: Lecture of "Cyclic irrigation and lake water quality" in Integrated Basin Management for Lake Environment Course, International Lake Environment Committee and JICA, Lecturer

B-3.Overseas teaching 2

Lectures and seminars

- Shigeto Kawashima

Pollen dispersal and hybridization model for risk assessment of genetically modified crops(Topic speaker) : NATO (31st NATO/SPS International Technical Meeting on Air Pollution Modelling and its Application)(Italy)

- Takehide Hama

Impact of global warming on the regional climate adjacent to the great Lake Biwa(Topic speaker) : NATO (31st NATO/SPS International Technical Meeting on Air Pollution Modelling and its Application)(Italy)

C.Other Remarks

- Kawashima, Shigeto, Dr. Agric. Sci.：Ministry of the Environment, Committee member of the research committee concerning pollen dispersal., Kyoto prefecture, Committee member of the assessment group for river reclamation in water shed of Kizu river, Katsura river and Uji river.

- Nakamura, Kimihito, Dr. Agric. Sci.：Vice chairman of the committee of water environmental conservation (Division of water quality) (Shiga Prefecture)