2.1.6 Laboratory: Plant Production Systems

Member:	Professor	Inamura, Tatsuya, D. Agric. Sci.
	Assistant Professor	Inoue, Hiromo, D. Agric. Sci.
	Assistant Professor	Moritsuka, Naoki, D. Agric. Sci.
	Doctor's program	2
	Master's Program	6
	Undergraduate	1

A. Research Activities (2009.4-2010.3)

A-1. Main Subjects

a) Evaluation of the land productivity for the clarification of the optimal land utilization and cropping systems.

The moisture condition of paddy soil after rice cropping is major impediments to the establishment, tillering and yield of winter wheat in rice-wheat (R-W) cropping system. Optimizing seedling establishment ratio, based on soil moisture at seeding, may provide an opportunity for maintaining the number of establishment and tiller density of winter wheat in such moisture conditions, and resulting in high yield. Field experiment was conducted in the farmer's fields with R–W cropping system in Western Japan. We use the path analysis to investigate the relationship between tiller density and nine soil/plant traits with the aim of evaluating strategy for improving tiller density by changing seedling establishment ratio. The clod size of surface soil, which showed significant positive correlation with soil moisture at seeding, had a significant negative direct effect on the seedling establishment ratio. The reduction in seedling establishment ratio, together with fewer tillers per plant, resulted in significant decrease in tiller density. The sum total of contribution of soil moisture contents to tiller density via clod size was smaller than that of seeding rate, and similar to that of amount of nitrogen (N) basal dressing. This data indicates that manipulating clod size based on soil moisture at seeding provides an opportunity for maintaining tiller density, as well as the changing of the amount of N basal dressing under soil moisture conditions after rice cropping. b) Evaluation and mitigation of the influence of intensive agriculture on environmental pollution in western part of inland China.

The quality of water in Dianchi Lake located in Kunming, Yunnan Province is one of the

typical examples showing how heavily lake water in China is and will be eutrophied by urbanization. In our laboratory, we have started a joint research with other scientists covering remote sensing, animal husbandry and plant nutrition for five years. The aim of our study is to propose an environmentally-sound way of agriculture for the study area by evaluating the spatiotemporal changes of land use patterns near Dianchi lake, the impact of agricultural intensification on water quality, the overflow of fertilizer nutrients from agricultural fields and the overall properties of agricultural soils in the study area.

c) Evaluation of biological nitrogen fixation in rice.

Rice cultivar Akihikari was cultivated in 1/5000a pot with Masa-soil and 15N labeled Ammonium sulfate (10.7 atm%) was applied as nitrogen fertilizer. The absorption of the applied nitrogen became biggest after 14 days from fertilizer apply and there was no nitrogen absorption after 14 days. Three rice cultivars, Kinuhikari (japonica type), Taichung 65 (japonica type) and C5444 (indica type), were cultivated in 1/5000a pot using Masa-soil. Ammonium sulfate labeled by 15N (10.7 atom%) was applied as nitrogen fertilizer (80 mgN/pot) at rice panicle initiation stage and in situ acetylene reduction activity (ARA) was measured in 14 days after fertilizer applying. After ARA measured, rice above-ground part, rice underground part and root area soil were sampled in every pot and total nitrogen content and 15N content rate were measured using the tracer mat. Using these values, amount of total nitrogen uptake from fertilizer and total nitrogen residue in the root soil were estimated. In all three cultivars the highest value of ARA showed at 14 days after fertilizer applying and the value of C5444 was highest among three cultivars. In the total nitrogen uptake of rice, nitrogen absorption from fertilizer were calculated to 61.8 - 66.9 mgN/pot and that from non-fertilizer were calculated to 6.2 - 15.0 mgN/pot, respectively. From their results, biological nitrogen fixation in rice may be estimated by using both in situ acetylene reduction method and 15N tracer method.

A-2.Publications and presentations

a) Publications

Original Papers

- Inamura T, Yoshikawa A, Ikenaga S, Iida M:

Path analysis of tiller density of winter wheat demonstrates the importance of practices that manupulate clod size based on soil moisture at seeding in the rice-wheat cropping system. Plant Prod. Sci. 13; 85-96. 2010

- Yuan Q, Saito H, Okumoto Y, Inoue H, Nishida H, Tsukiyama T, Teraishi M, Tanisaka T:

Identification of a novel gene ef7 conferring an extremely long basic vegetative growth phase in rice. Theor Appl Gent 119; 675-684. 2009

- Saito H, Yuan Q, Okumoto Y, Doi K, Yoshimura A, Inoue H, Teraishi M, Tsukiyama T, Tanisaka T:

Multiple alleles at Early flowering 1 locus making variation in the basic vegetative growth period in rice (Oryza sativa L.). Theor Appl Gent 119; 313-323. 2009

Reviews

- Inamura, T .

Paddy field. In Crop Science Society Japan (Ed.) Crop science glossary, Nobunkyo, Tokyo, 2010

Reports

- Inamura, T.

Nara funded research Surveillance study in Paddy rice field, 2010

b) Conference and seminar papers presented

- The 229th Ann Meet. of Crop Sci. Soc. of Japan: 2 presentations
- The 228th Ann Meet. of Crop Sci. Soc. of Japan: 2 presentations
- Ann Meet. of Japanese Society of Soil Science and Plant Nutrition: 1 presentation

A-3.Off-campus activities

Membership in academic societies

- Inamura, Tatsuya, D.Agric.Sci : The Crop Science Society of Japan (Editorial board member of Plant Production Science), The Society of Crop Science and Breeding in Kinki (Council member)

- Moritsuka, Naoki, D. Agric. Sci : Japanese Society of Soil Science and Plant Nutrition, Crop Science Society of Japan, Japanese Society of Soil Physics, Japanese Society of Pedology, Japanese Society of Root Research

Research grants

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

Scientific Research (B) : Inamura, Tatsuya, D. Agric. Sci : Analysis of the sources of variations of quality of wheat and soybean in the field, and variable rate management
Scientific Research (A) : Inamura, Tatsuya, D. Agric. Sci : Evaluation and mitigation of the influence of intensive agriculture on environmental pollution in western part of inland China
2.Other Research Grants

- Sponsored Research Funds: Inamura, Tatsuya, D. Agric. Sci: The effect of irrigating the treated wastewater on rice growth

A-4.International cooperation and overseas activities

International joint research, overseas research surveys

- Improvement of the water pollution in the agricultural irrigation system in southwest China, Inamura Tatasuya, (Kunming University of Science and Technology, Kunming, Yunnan Province of China)

B.Educational Activities(2009.4-2010.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level:	Outline of Bioresource Science 1(Inamura), Crop Production
	Techniques and Farm Practice (Inamura, Inoue, Moritsuka), Plant
	Production Systems I (Inamura), Plant Production Systems II
	(Inamura), Laboratory Work in Bioresource Science I, II
	(Inamura, Inoue, Moritsuka), Seminar in Agricultural Ecology
	(Inamura, Inoue, Moritsuka), Introduction to Research (Inamura,
	Inoue, Moritsuka).
- Graduate level:	Plant Production Systems (Advanced Course) (Inamura), Plant
	Production Systems-Seminar (Inamura), Special Laboratory Work
	in Plant Production Systems (Inamura).

B-2.Off-campus teaching etc.

Part-time lecturer

- Inamura, Tatsuya, D. Agric.Sci: Kyoto University of Education (Agriculture and Environment)

C.Other Remarks

- Inamura, Tatsuya, D. Agric.Sci:Committee for disaster prevention and environmental preservation in the southern Nara land improvement enterprise (Member)