

【Grant-in-Aid for Scientific Research(S)】
Biological Sciences (Agricultural sciences)



Title of Project : Study on agricultural systems adapting fluctuating climates using agro-ecological resources management model in tropical Asia and Africa

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Research Area : soil science, environmental agronomy

Keyword : balance between resources and environment, fluctuating climates, management of agro-ecological resources, tropical agriculture

【Purpose and Background of the Research】

Global warming is now recognized as one of major threats for human beings. It is required to construct socio-economic systems to adapt such a change, as well as to decrease the impact itself. Although stable food supply is one of the major concerns under the situation, it is still hard to design agricultural production systems that adapt to fluctuating climates especially in Asian and African countries in tropics where socio-economic conditions are still fragile.

The present study is aiming at firstly solving individual ecosystem processes that bring weakness in tropical agriculture, and then integrating these analyses into technical solutions and sustainability management under fluctuating climates, which are further extended to regional or national scales using GIS techniques. By using these methodologies, we try to propose a technological package of agricultural production systems that could be applied in reality to tropical countries where socio-economic infrastructures are still insufficiently developed.

【Research Methods】

In the present study, field- and laboratory-based experiments will be conducted for achieving the objectives presenting above. Research sites will be installed in Northeast Thailand, West Sumatra province in Indonesia, Morogoro province in Tanzania and East province of Cameroon. The main research subjects are: 1) comprehensive management of C, N and mineral nutrients fluxes in agricultural ecosystems, 2) strategic utilization of soil microbial biomass through providing temporal ephemeral niches, 3) establishing countermeasures against soil erosion with special reference to mineralogical

properties, 4) breeding for crop varieties adapting low-fertilizer application, 5) establishing the management model for sustainable use of agro-ecological resources and 6) optimization of cropping techniques and establishing flexible crop management system (Figure 1).

【Expected Research Achievements and Scientific Significance】

- Ecological alterations after reclaiming natural ecosystems for agricultural uses, under different climatic and geological conditions, could be analyzed and evaluated comparatively using the ecosystem elemental kinetics model.
- Analyses for individual ecosystem processes involved in the subjects 1 through 4 could be integrated into technical solutions and sustainability management under fluctuating climates, which could be further extended to regional or national scales using GIS techniques. These analyses would allow us to establish actual countermeasures against fluctuating climates in reality.

【Publications Relevant to the Project】

- Funakawa S, Watanabe T, Kadono A, Nakao A, Fujii K, Kosaki T 2011: 4. Soil resources and human adaptation in forest and agricultural ecosystems in humid Asia. *In* World Soil Resources and Food Security. Eds. R. Lal and B.A. Stewart. p.53–167, CRC Press, Taylor & Francis Group, Boca Raton, London, New York.
- Funakawa S, Watanabe T, Nakao A, Fujii K, Kosaki T 2011: 5. Pedogenetic acidification in upland soils under different bioclimatic conditions in humid Asia. *ibid*, p.169–269.

【Term of Project】 FY2012-2016

【Budget Allocation】 155,600 Thousand Yen

【Homepage Address and Other Contact Information】

<http://rafale.kais.kyoto-u.ac.jp>

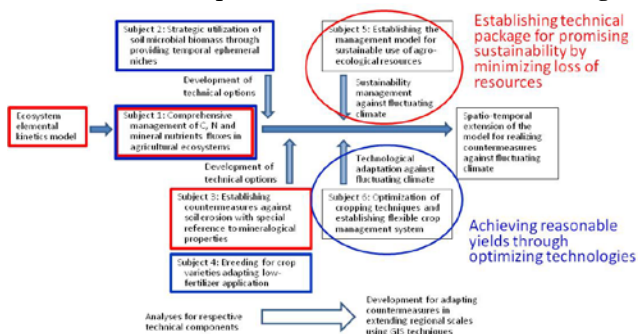


Figure 1 Respective subjects in the study