Resources Program

MOJI Kazuhiko | Program Director

The Resources Program examines global environmental issues related to the use and conservation of natural resources. Human beings have always made use of and changed the environments in which they live. Such change occurs as people appraise the qualities of the plants, animals, waters and soils that surround them, and develop the tools that allow them to make use of their surroundings. Perception and use of resources is therefore related to the individual or society's immediate needs for survival and their knowledge of the natural world. Resource use is also guided by cultural preferences originating from individual tastes and belief systems, as well as societal preferences resulting from a peoples' collective sense of its place and role within the larger world.

Human innovation in the natural world has led to the domestication of plants and animals and the control of water and energy. Paradoxically, humanity's great advances in environmental knowledge and resource control have led to environmental problems of unprecedented scale. Overall, humanity appears to be consuming many resources and taxing many ecosystems at a pace beyond their capacity of renewal or absorption.

Excessive resource use cannot simply be explained as a result of population or economic growth. Instead we must look to the roots of the interactions between humanity and nature. Identifying solutions to contemporary resource problems requires close attention to specific human-environmental interactions, for there are great disparities between and within individual societies that prevent equal access to the benefits of local and global environments. Projects in the Resources Program examine how human livelihoods are directly affected by natural resources and seek solutions that will positively affect communities and the global environment.

Completed Research	Leader	Title
R-03	KUBOTA Jumpei	Historical Interactions between Multi-Cultural Societies and the Natural Environment in a Semi-Arid Region in Central Eurasia

Full Research	Leader	Title
R-04	MOJI Kazuhiko	Environmental Change and Infectious Disease in Tropical Asia
R-05	NAWATA Hiroshi	A Study of Human Subsistence Ecosystems in Arab Societies
R-06	KADA Ryohei	Managing Environmental Risks to Food and Health Security in Asian Watersheds
R-07	TANAKA Ueru	Desertification and Livelihood in Semi-Arid Afro-Eurasia

Historical Interactions between Multi-Cultural Societies and the Natural Environment in a Semi-Arid Region in Central Eurasia

Project Leader **KUBOTA Jumpei** RIHN

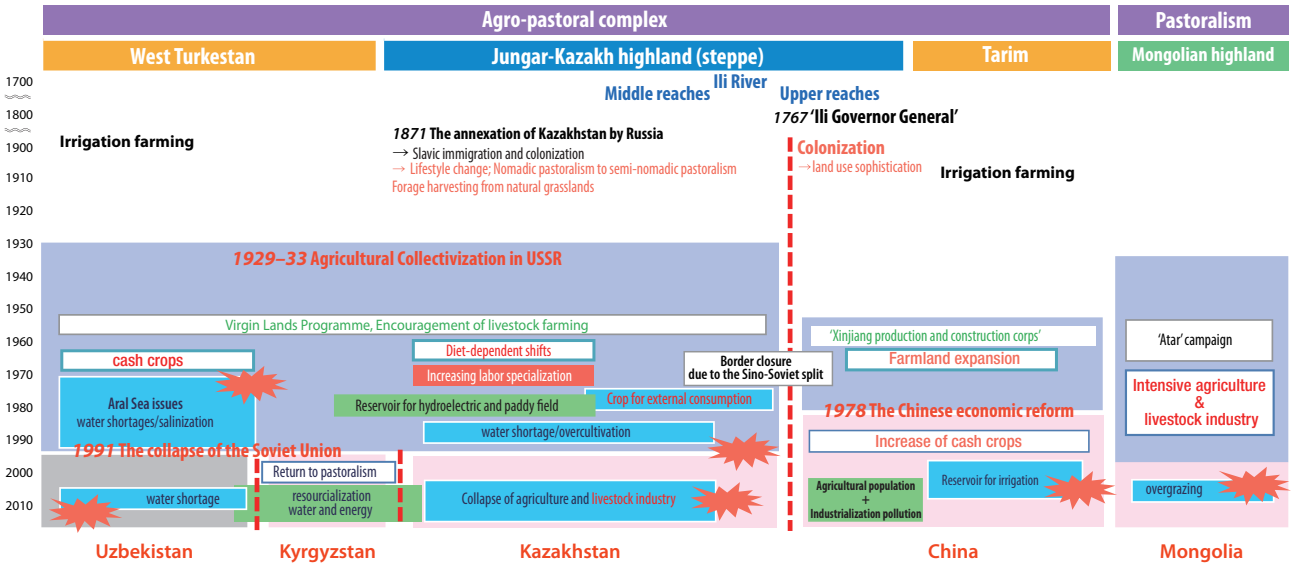
Nomads were once the principal inhabitants of semi-arid Central Eurasia. Following the rise and fall of various ethnic groups and empires, the Yuan Dynasty took nominal control of much of Eurasia in the 13th and 14th centuries. In the 18th century, however, a national border was drawn across the region, definitely distinguishing Russia from Qing China. The inhabitants of the area subsequently experienced a great change of lifestyle, as the border and national settlement policies forced nomadic peoples out of their traditional patterns of livelihood.

This project combined analysis of historical documents, archaeological remains and natural proxies such as ice cores, lake sediment samples, tree rings and wind-blown deposits in order to describe how nomadic peoples and nation-states affected the natural resources and climatic conditions in the Ili River watershed. Project researchers also investigated human activities on both sides of the Russia/China border in order to describe the likely impact of these activities on contemporary environmental conditions.

We used a number of proxies to reconstruct climate and environmental change in the past one thousand years. Reconstructing temperature and precipitation allowed us to estimate river flow and extent of grasslands. We developed a chronological database of archaeological monuments, showing the appearance and duration of settlements. Nomadic populations and their key sites were identified with historical documents. This analysis showed that in medieval times, agricultural and nomadic peoples lived in separate, yet complementary, communities making full use of environmental variation.

We found that climate change had both negative and positive effects on agricultural and nomadic production. Relocation and change in subsistence pattern were major adaptations. After a clear political border was drawn between Russia and Qing China, patterns of human-environmental interaction in the region shifted dramatically. In Kazakhstan, natural grasslands for nomadic pastoralism were transformed into agricultural farms. The socialist planned economy, including the division of labor, not only prevented the accumulation of agricultural knowledge, but also caused the loss of traditional knowledge of nomadic pastoralism. As a result, the area suffered a severe economic crisis, and recovery after the collapse of the USSR was very difficult. In China, on the contrary, modern development in the area was delayed and the traditional nomadic pastoral system has been well preserved in the mountains.

Outcomes of the project were compiled and published as a series of books (four volumes, in Japanese). An international scientific workshop and a public seminar in Almaty, Kazakhstan were organized. In the scientific workshop, we invited local planners and discussed present problems in the area. In the public seminar, we presented our outcomes to public, especially university students. We look forward to continued dialogue with local researchers, NGO activists, and researchers in international organizations.



Transition of social systems, subsistence and environmental conditions in Central Eurasia

Environmental Change and Infectious Disease in Tropical Asia

Project Leader **MOJI Kazuhiko** RIHN

Kazuhiko Moji has been at RIHN since 2007. He received his MA (1978) and Ph.D. (1987) in Health Sciences at the University of Tokyo. He was Research Associate at the Department of Human Ecology at the University of Tokyo (1983–1987). In 1987 he moved to Nagasaki University, where he served as Associate Professor in the Department of Public Health (1987–1999) and Professor in the School of Allied Medical Sciences (1999–2001), Faculty of Health Sciences (2001–2002), and Research Centre for Tropical Infectious Diseases of Institute of Tropical Medicine (2002–2007). He was a visiting Takemi Fellow of International Health at Harvard School of Public Health (1991–1992) and a visiting researcher in the Department of Bio-anthropology, Cambridge University (1998–2000).

The health profile of a human population can be seen as a product of both biophysical and human elements. The field of ecohealth examines this relationship between human health, livelihood and environmental conditions. From this perspective, construction and conservation of sound human ecosystems is essential to the survival of human populations.

The RIHN Ecohealth Project examines the effect of climate/environmental and social change on the ecology of human infectious disease in tropical monsoon Asia. Key drivers of ecological change in this area include climate change, population increase, deforestation, resettlement, urbanization, expansion of wet rice cultivation, changes in water management, economic development and changes in livelihood or lifestyle. Diseases associated with such change include malaria, liver fluke infection, and diarrhea. The study will offer new ecologically based insights for the evaluation and control of infectious disease in relation to both local and global environmental change.

Progress to date

Liver fluke in Laos

In Savannakhet Province, Laos, we examined the patterns of liver fluke infection of Opisthorchis viverrini (Ov), a parasitic infection associated with the consumption of raw freshwater fish. We identified habitats of snails and fish that serve as intermediate hosts in disturbed environments. In particular, we studied the relationship between Ov infection and increased conversion of forest to rice paddies, finding that paddy fields increased habitat of first intermediate host snails and fish. Using the Lahanam Health and Demographic Surveillance System (HDSS), 7000 residents were surveyed to determine use of toilets and open defecation. Over 3000 feces were collected and examined; DNA was analyzed and GPS coordinates and distribution of outdoor defecation sites were recorded to generate a predictive map of Ov egg accumulation (Fig. 1). A combined, educational, behavioural, and environmental Ov control program successfully reduced the infection rate.

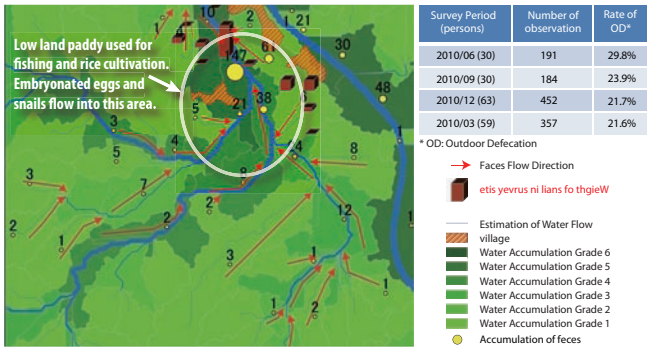


Figure 1 Flow distribution and accumulation sites of human feces potentially releasing embryonated eggs and snails serving as intermediate host

Malaria in Laos

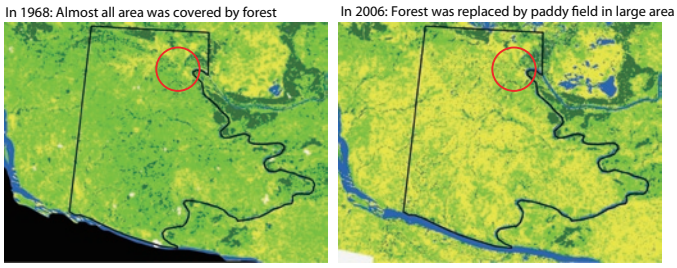
The team assessed malaria prevalence in Sepone district. Using a mobile phone-based health information network, a survey among village health volunteers reported 1217 cases of malaria. Higher malaria infection rates were found only in small sized communities, irrespective of forest coverage, and in proximity to watering holes created from bomb craters, suspected as ideal breeding habitats for the mosquito vector (Fig. 2). Anthropological study in the area revealed high rates of birth and infant mortality.

Malaria at the Vietnam–Lao border

Surveyes conducted at the Vietnam–Lao border in collaboration with the Khanh Phu Malaria Research Center, Quang Tri Provincial Health Office, Nagasaki University, and Savannakhet Provincial Health Office revealed higher malaria incidence and presence of malaria mosquito vectors inside homes on the Lao side of the border. We documented the first case of Plasmodium knowlesi in Laos, only the fifth Plasmodium species known to infect humans, as this malarial parasite is normally transmitted between non-human primates.

Diarrhoeal diseases in Bangladesh

The Bangladesh Study Group worked in collaboration with the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR, B) to study the relationship between the Indian Ocean Dipole and the incidence of cholera in Dhaka. This group studied the long-term effects of flood on morbidity and mortality. Results were contrary to expectations, as its work showed the 2004 flooding had relatively little impact on mortality rates related to diarrhoeal diseases. Nevertheless, as Bangladesh is highly vulnerable to diverse climate effects, we suggest that a sensitive health survey system devised by the government is vital to a comprehensive plan for vector control.



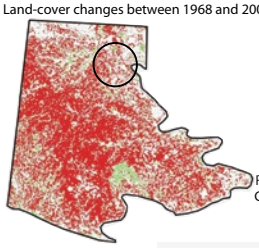


Figure 2 Land-cover changes in Songkhone District, Lao PDR
Circled area represents study site.
Over a period of nearly 40 years, population growth and environmental changes of converting forests to paddy fields have resulted in increased risk of Liver fluke infections in the area (Tojo, Komano 2011).

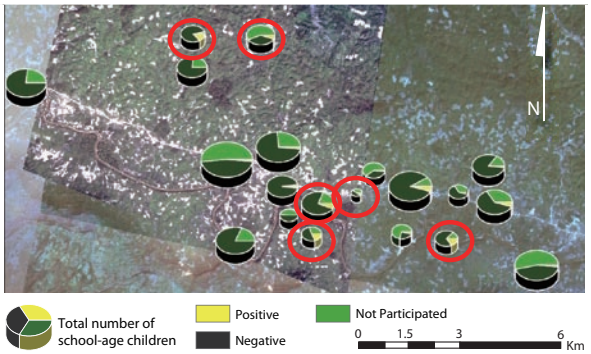


Figure 3 Malaria positive rate of school-age children in Xepon village, Lao PDR (June, 2011)
Red circles show villages of small population size with high malaria positive rates.

JINGJIANG RIVER & DONGTING LAKE IN

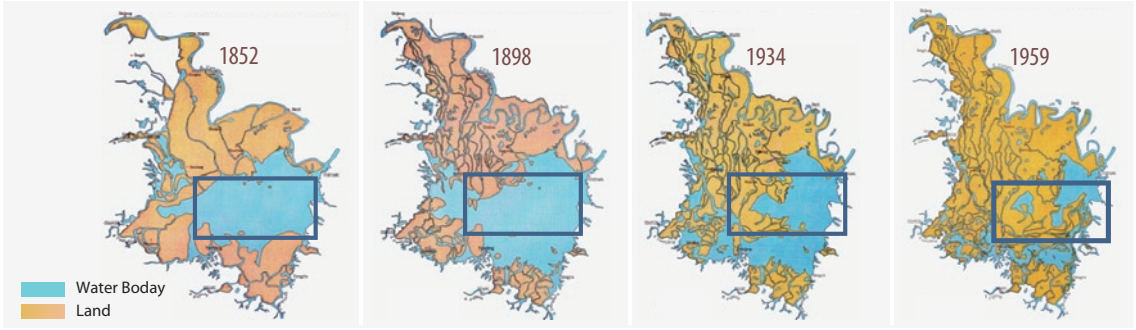


Figure 4 Changes in the Yang-zi River Basin affecting schistosomiasis endemicity
Since the 17th century, introduction of cattle, increased human migration, cultivation practices, and changes in river ecology due to flooding, segmentation and collapse of embankments have impacted the level of endemic schistosomiasis in the Yang-zi River Basin.
Yuan Jiang 沅江 (West shore of Dongting Lake, Hunan Province) 1850s–1950s

Infectious disease in Southwest China

Applying a traditional historical approach, the China Study Group investigated how social and environmental changes led to the reduction of malaria and schistosomiasis. Current problems addressed in the study focus on the health impacts of social changes since the late 1980s and prevalence of HIV/AIDS, tuberculosis, and sexually transmitted disease. In collaboration with Yunnan Health and Development Research Association, ecohealth focused monitoring continues in 10 villages (Fig. 3).

Future tasks

In its final year, the RIHN Ecohealth project will synthesize its findings in order to develop approaches to governance and management of disease that are appropriate to each study area. In Laos, an ecohealth text book will be published to engage communities and advance practice and knowledge of the links between environment and health. We will organize an international symposium as an initial platform for experts in ecohealth and in order to build a lasting network of individuals and groups for ecohealth research and practice.

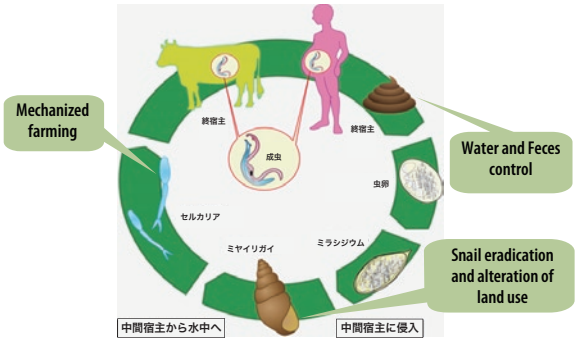


Figure 5 Schistosomiasis control and changes in agricultural activities (Yunnan)
Beginning in the 1950s, the Chinese Government implemented a project to increase food production.
Along with changing agricultural activities, several schistomiasis control measures were implemented, including a program to control feces by producing fertilizers, mechanization of some farming practices, and land-use change.

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A Study of Human Subsistence Ecosystems in Arab Societies: To Combat Livelihood Degradation for the Post-oil Era

Project Leader **NAWATA Hiroshi** RIHN

Hiroshi NAWATA received his Ph.D. in Human and Environmental Studies (Cultural Anthropology) at Kyoto University (2003). He was assistant professor at the Division of Comprehensive Measures to Combat Desertification, Arid Land Research Center, Tottori University (2004–2007). His major fields of interests are camel pastoral systems, Muslim trading networks, and indigenous (traditional) knowledge for rural development in the Middle East and Africa.

Japan and the oil-rich countries of the Middle East have put excessive pressures on the earth's energy, water, and food resources. In prioritizing economic prosperity, these countries have exploited irreplaceable resources, such as fossil fuel and fossil water. Schemes to plant alien species have also placed stress on local ecosystems. This pattern of development has increased social and economic differences within the Middle East just as the region faces a turning point in modern oil-based industrial development. Fossil fuel–based interdependencies must now be transformed into new relations that can support viable future societies.

This project examines life support mechanisms and self-sufficient modes of production among Arab peoples who have survived in dryland environments for more than a millennium. It examines low energy-intensity life-support mechanisms and modes of production, such as hunting, gathering, fishing, herding, farming, and forestry. In doing so the study also reflects on the role of advanced technologies in economic development, and measures adopted thus far to combat desertification. Field research investigates keystone species, ecotones, and traditional knowledge and examines the sustainability of subsistence economies under site-specific conditions.

Research methods and organization

Field surveys are conducted in semi-arid lands between the Nile River and the Red Sea in Sudan, with the Red Sea coast, Butana area, and Nile River areas as the main survey areas. Additional surveys will be conducted at the Sinai Peninsula in Egypt, the Red Sea coast in Saudi Arabia, and a Saharan oasis in Algeria (Fig. 1).

Our research method combines two main approaches: (1) analysis of subsistence ecosystems, focusing on keystone species such as camels, date palm, dugong, mangrove, and coral reefs; and (2) examination of the sustainability and fragility of Arab societies, focusing on their dependence on ecotones such as wadi beds, riverbanks, mountainsides, and seashores. The members of this project include social and natural scientists, members of local NGOs and project managers who are divided into four study groups:

1) Alien invasive species control group
2) Coastal zone environmental impact assessment group
3) Support for local decision making group
4) Local ecosystems comparative studies group (Fig. 2).

Assessing the environmental effects of development in coastal arid tropical zones

Local peoples in coastal arid tropical ecosystems have historically depended on sea products (fish, shellfish, dugong, dolphin, and sea turtles), and harvesting from mangrove forests (dominant species: *Avicennia marina*) and coral reefs, two complex and interrelated ecosystems. Such coastal zones present a large—but fragile—frontier for development. Development can lead to environmental degradation through destruction of mangrove forests, coral reefs, and seagrass beds and the release of highly concentrated saline water into the sea (Fig. 3). Meanwhile,

Figure 1 Field survey areas

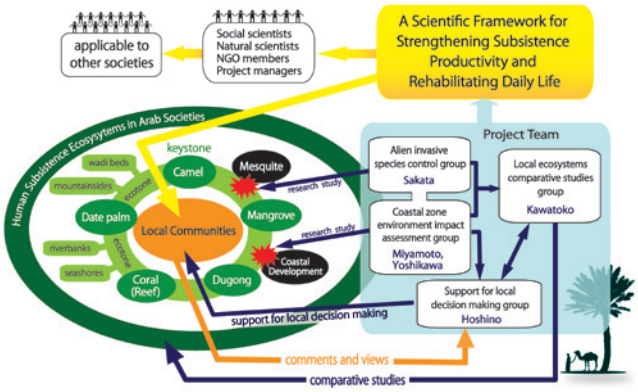

Figure 2 Research methods, approaches, and organization

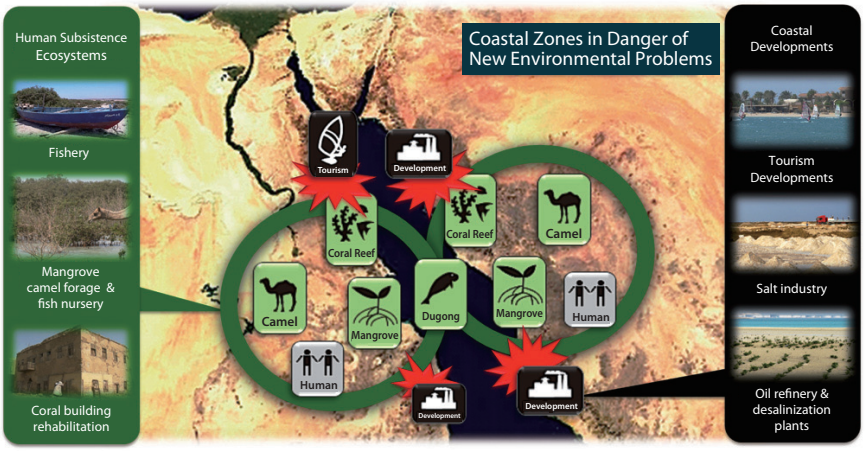

Figure 3 Coastal zones in danger of new environmental problems

Figure 4 Mangrove leaf sampling area

mangrove afforestation projects can provide fodder for domesticated animals such as camels while also serving as nurseries for nearby reef fish. In order to suggest frameworks for a new environmental assessment with community participation for prevention of environmental problems, we have conducted multi-principal studies focusing on coastal mangroves in Sudan, Egypt, and Saudi Arabia.

Based on studies on forest structure, morphological adaptation to environmental stresses, and isotope analysis of *Avicennia marina* water-use characteristics, we found significant impacts of soil salinity on tree height, leaf dry weight, internode length, and shoot length. We also found in some forests that appropriate camel feeding might promote the growth of *A. marina* leaves and shoots. Having begun DNA analysis of 3100 leaf samples collected along the Red Sea Coast (13 forests in Egypt; 25 forests in Sudan; 24 forests in Saudi Arabia) (Fig. 4) which will allow a regional-scale analysis of genetic diversity, mangrove forest dynamics and processes of change.

Since concluding a MOU with the Red Sea University, a principal institution of marine science in Sudan, several full-scale field surveys are now underway. These include a behavioral study using biologging of dugongs in seagrass beds, a GPS-based monitoring of camel grazing area and browsing pressure in *A. marina* forests, and continuing anthropological study on fishing villages.

Future activities

In the next year, we will synthesize our findings in order to propose a scientific framework to strengthen subsistence productivity and combat livelihood degradation in local Arab communities in preparation for the post-oil era. Several books are also in preparation, including *How Do We Live Without Oil?* (RIHN book series, in Japanese) and *Human Subsistence Ecosystems in Arab Societies* (9 volumes, in Japanese).

Photo 1 Mangrove leaf sampling (Saudi Arabia)

Photo 2 Camels eat mangrove leaves and branches (Sudan)

Photo 3 Japanese and Sudanese researchers discuss a mangrove plantation (Sudan)

Photo 4 Morphological study on *A. marina* (Sudan)

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Managing Environmental Risks to Food and Health Security in Asian Watersheds

Project Leader **KADA Ryohei** RIHN

Professor Kada joined RIHN as leader of the Food and Health Risk Project in July 2010. He also teaches at the Graduate School of Environment and Information Sciences, Yokohama National University since 2007. From 2001–2004 he served as Policy Research Coordinator at the Policy Research Institute, Ministry of Agriculture, Forestry and Fisheries (PRIMAFF), Japan. For nearly 25 years he researched and taught agriculture and food policy at University, and also held posts at Kasetsart University in Thailand and the University of Wisconsin–Madison. He received his Ph.D. from the University of Wisconsin–Madison in 1978.

This research project investigates the links between environmental change, ecological degradation, food availability and quality, and human health. Research is conducted at Sta. Rosa Watershed and other sites in the Laguna Lake region, a highly populated and variegated region in which rich ecological resources are threatened by rapid land use change, urbanization and industrialization. Study sites are representative of the challenges facing many other Asian watersheds.

This project combines social, medical and physical sciences in order to develop strategies of ecological risk management for sustainable food, health and environmental security planning in the Laguna Lake Watershed, Philippines. In addition to the dense population and urbanization, continuing deforestation, upsurge in inland fisheries, and unabated abuse of the land uses surrounding the lake have increased deposition of sediments and damaged water quality. With initial data indicating that such pollution is harming human health, Japanese and Filipino researchers have begun to build partnerships with locally organized leaders to put a Community-based risk communication and early warning system in place to ensure a sustainable resource base and food-health security.

The project has four principal objectives: 1) to document the current levels and pathways of heavy metals pollution in the aquatic resources of Laguna Lake; 2) to investigate the health condition of local residents and their perception of food risks; 3) to analyse the ecological effects of agrochemical inputs, and their cumulative impact on food production and relation to subsequent ecosystem deterioration; and 4) to describe land use change in the Laguna Lake area and its impact on water and material cycles, including impacts on sedimentation and groundwater level and quality.

Research organization

Five research teams are comprised mainly of researchers at RIHN, Yokohama National University and University of the Philippines; they work in collaboration with government agencies such as the Laguna Lake Development Authorities (LLDA) and local government units. The Environmental Risk Assessment Team identifies the exact sources of, and factors responsible for, particular pollutants in the food chain, utilizing stable isotope and other analytical techniques. The Socio-Economic Evaluation Team explores how market- and non-market-based

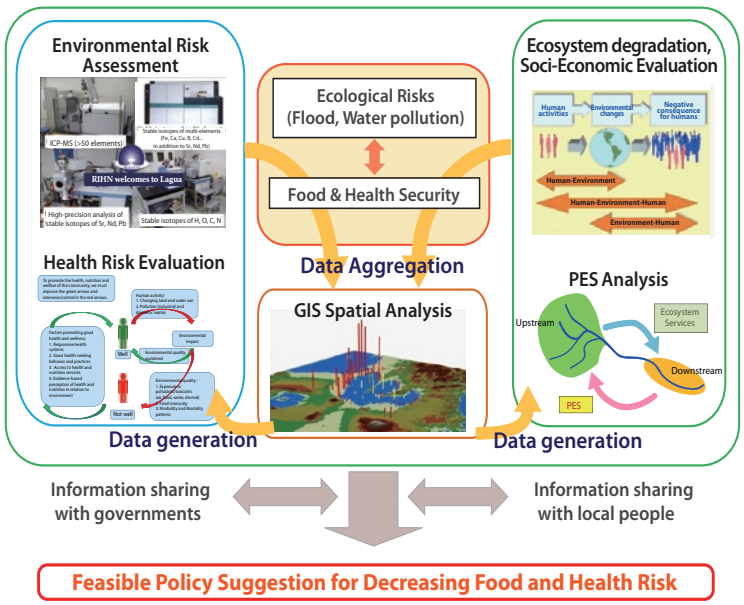

Figure 1 Overall research flow and organization

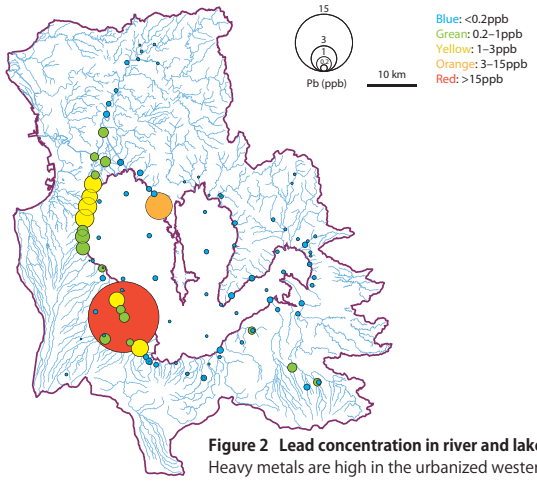

Figure 2 Lead concentration in river and lake waters
Heavy metals are high in the urbanized western region

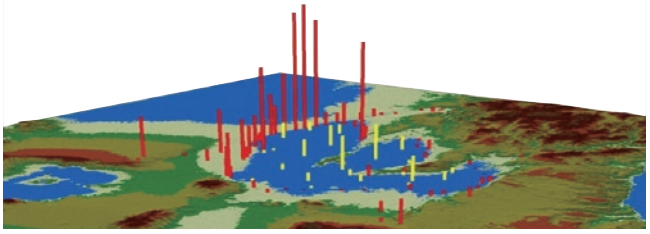

Figure 3 Spatial distribution of Zinc Red: river sample Yellow: lake sample

Upstream: Soil erosion easily occurs due to plantation (Silang, Cavite: Sta Rosa City)

Midstream: Less water than before; more flooding

Downstream (7km from lakeshore): Urban sprawl and housing development; the river turned to be a drainage

Photos Water quality is degraded by human activity as it flows downstream

instruments can be used to improve water quality, food security and public health. The Health Risk Evaluation Team describes human nutrition, history of disease, and life expectancy in the region, especially in relation to socio-economic dynamics. The Payment for Ecosystem Services Team (PES) investigates the design of ecosystem service payment programs. The GIS-based Risk Mapping Team supports the entire research project by creating a spatially-explicit database of key variables associated with risk in the food chain (Fig. 1).

Recent achievements and research issues ahead

The major research outcome in its first year of the Full Research can be summarized as follows:

The Environmental Risk Assessment Team has created water quality maps for the Laguna Lake and its watersheds. The maps show high presence of heavy metals in the western region, likely reflecting urbanization there (Fig. 2 and 3). The pathways of heavy metals from source to food will be traced by analyzing lead isotope compositions of water, sediment and samples from edible fish and water plants.

The Socio-Economic Evaluation Team will use statistical and econometric methods to address: (i) consumer behavior and perception of food & health risk; (ii) economic and environmental values by agricultural/agro-forest land use; (iii) waste management and community development; (iv) long-term comparison of food & health security. Several household and farm surveys have been conducted in the Sta. Rosa sub-watershed and control area since fall 2011.

The Health Risk Evaluation Team has completed the baseline evaluation to clarify the type and severity of environmental exposures affecting human health. Description of the health status of households and dietary diversity in the Santa Rosa sub-watershed area has also been completed. A pilot study assessing exposure to environmental pollutants among community residents near Laguna Lake area was completed. Further analysis of community exposure to environmental pollutants and risk communication strategies will be formulated.

The Payment for Ecosystem Services (PES) Analysis Team estimates farmers' decisionmaking in agroforestry and describes how agriculture contributes ecosystem services to the region. It also evaluates individual willingness-to-pay for enhanced ecosystem services. Combining these results, the team will eventually conduct policy simulations and derive a PES scheme that adequately reflects regional livelihoods and ecology.

The GIS Risk Analysis Team constructed a spatial analysis data map which aggregates spatial data (paper maps, satellite images), data contributed by other teams, and new variables such as land use and land change (Fig. 3). It will construct an efficient information-sharing structure in a local community in the current fiscal year.

The project is now in its third year of research. Through the field work, laboratory experiments, interviews and discussions with stakeholders, and household, farm, and biomedical surveys, each team is submitting rigorous preliminary research results. A community forum will be held in September 2012 in Laguna in order to communicate our research activities and findings to date. Feedback from the local stakeholders will be utilized for the interdisciplinary study next year.

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Desertification and Livelihood in Semi-Arid Afro-Eurasia

Project Leader **TANAKA Ueru** RIHN

Ueru TANAKA obtained a Doctorate in Agriculture from Kyoto University (1997). He has previously worked as lecturer of Jomo Kenyatta Collage of Agriculture and Technology, Kenya (1983–1987), assistant professor in the Faculty of Agriculture, Kyoto University (1990–1999), associate professor in the Graduate School of Agriculture, Kyoto University (1999–2002), and associate professor in the Graduate School of Global Environmental Studies, Kyoto University (2002–2011). His major fields of interests are soil science, agronomy, indigenous knowledge and techniques in terrestrial ecosystems management, and desertification and rural development assistance in West Africa, Southern Africa, India and Southeast Asia.

Research backgrounds, objectives and study areas

Semi-arid Afro-Eurasia suffers from a vicious cycle of poverty and land degradation. It is one of the front-lines of desertification, a problem related both to climatic conditions and basic human survival and daily livelihood activities, such as cropping, animal husbandry, and gathering of fuel woods. Desertification remains a serious problem in the region despite commitments from the international community, including the United Nations Convention to Combat Desertification (1994), to address it. This project identifies the socio-ecological characteristics of, and adaptation strategies related to, desertification in several study areas, re-examines techniques and approaches to desertification control and rural development assistance, and seeks feasible and practical integrative or holistic solutions to encourage improved livelihood security for people living in such uncertain and fragile environments.

Project research takes place in the Sahel of West Africa (mainly Burkina Faso and Niger), Southern Africa (Namibia and Zambia), and Northwest India (Fig. 1), where socio-ecological condition and land resources are degraded due to demographic pressure and uncertain socio-economic conditions and rainfall. With progress, several additional study areas, perhaps in the Sahel or in China and Mongolia, will be considered.

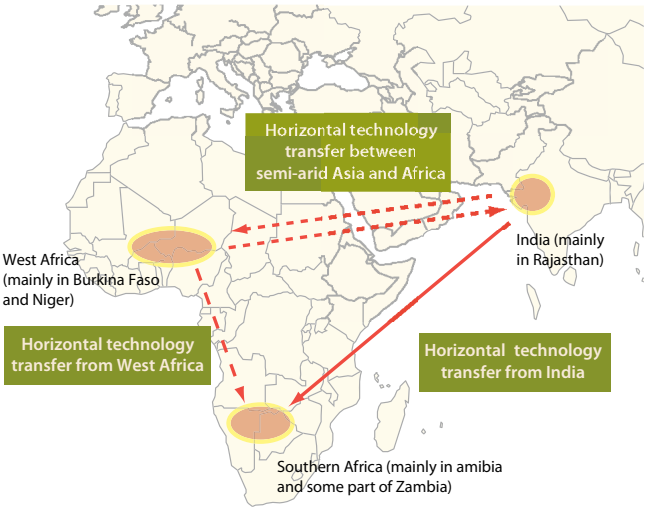

Figure 1 Targeted study areas in the project
circle: study area; rectangle: direction of technology transfer

Progress to date

Crisis years: Coping activities as socio-ecological adaptations

The Fakara area in Western Niger receives approximately 400mm of annual rainfall, and frequently suffers drought, irregular rainfall, and locust outbreaks. We asked cultivators and pastoralists to remember years of crisis since the 1970s, and the coping strategies they employed. Cultivators indentified 1973, 1984, and 1991 as years of crisis, while pastoralists named 1984, 1992, 1998 and 2005 (Fig. 2). Household vulnerability differed by ethnicity, as different ethnic groups typically rely on distinct livelihood strategies. Major coping activities were sale of livestock, food aid, seasonal migrant works, borrowing food and money, consumption of stored food, gathering of useful plants and insects, sale of fuel woods, and donation and remittance of money from family members working abroad. Pastoralists tended to manage within the range of their livelihood systems i.e. they would sell livestock, while, by contrast, cultivators tended to combine plural activities and depend on external support.

The fallow-band system

Project researchers developed the 'fallow-band system', a unique practical technique to reduce wind erosion and improve crop yield. This technique was endorsed by the JICA Grassroots Project "Formation and dissemination of practical techniques for mitigation of desertification and improvement of household income in Niger" (April 2010–March 2013). As of December 2011, the technique has been practiced by 381 households in 44 villages, 9 districts and 3 regions in Niger (Fig. 3), and continues

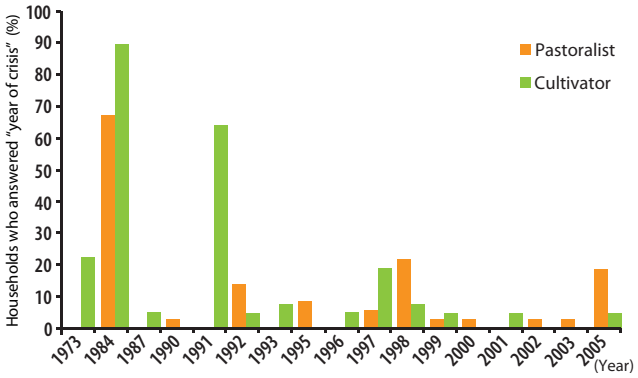

Figure 2 'Years of crisis' experienced since 1970s in Fakara area, Western Niger

Tillaberi

Year	District	Village	House hold
2010	Namalo	9	77
	Simili	5	55
	Say	1	26
2011	Handaye	2	20

Dosso

Year	District	Village	House hold
2010	Koigolo	14	40
2011	Logga	6	60
	Falweru	2	20
	Sokorbe	2	20

Maradi

Year	District	Village	House hold
2011	Tesshoua	3	54

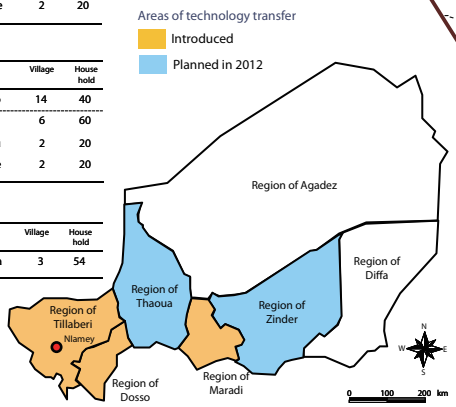

Figure 3 Areas in Niger in which the fallow band system will be introduced

to spread. We consider this system as the good fruit of collaboration between local households, academics, and development agencies.

Social network in a Sahelian community

We examined the dissemination of the fallow band system within the commune of Finare, in Say District, Niger, as an expression of social networking. Figure 4 shows the location of households that practiced and did not practice the technique. Households using the technique, indicated in closed circle and triangle, are located in and near Finare sub-village, where the chief of the commune lives. A village chief is commonly designated as an access point in participatory approach by many rural development projects. Why was the introduced technique not disseminated throughout the entire commune despite its proven benefits? The reasons may be given by Figure 5, which shows the networks of information and confidence in the commune. The sub-villages of Finare and Gardje have relatively dense network of information. Some households in Winde Gaoude and Koma are, however, isolated from the network. In addition, the chief, though he is a point of access to the community, is not a converging point in the network of confidence. These facts mean that the common participatory approach has some shortcomings and room for improvement. Figure 5 further suggests that some persons or households who are points of convergence and confidence in the community may enable future adoption of introduced techniques. This project will investigate the further practical advantages of interweaving such analysis of social networks into agricultural extension and rural development services.

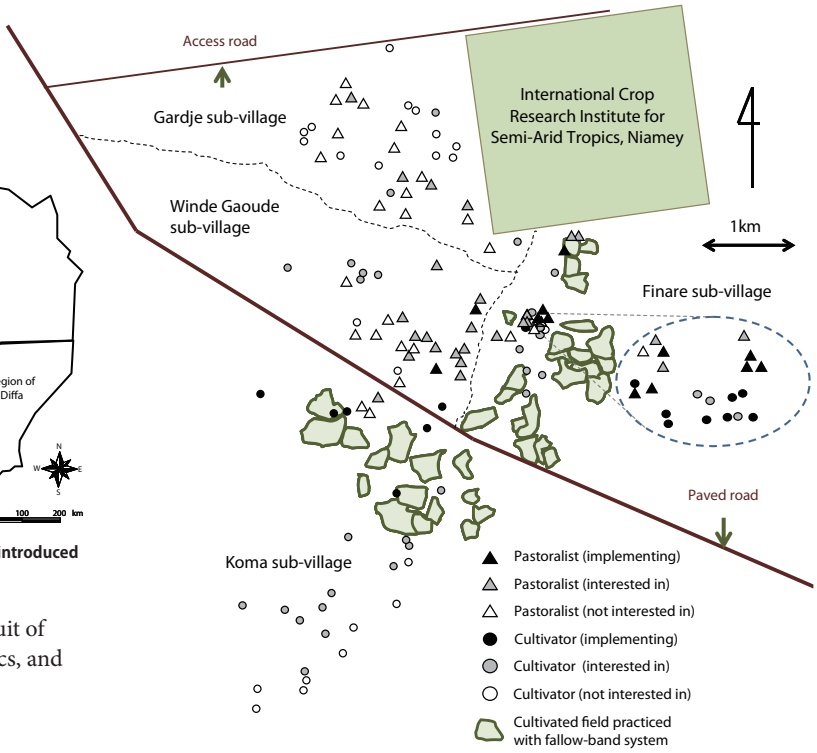

Figure 4 Cultivated fields using the fallow-band system and attitude of local people to the introduced technique in Finare commune, Western Niger

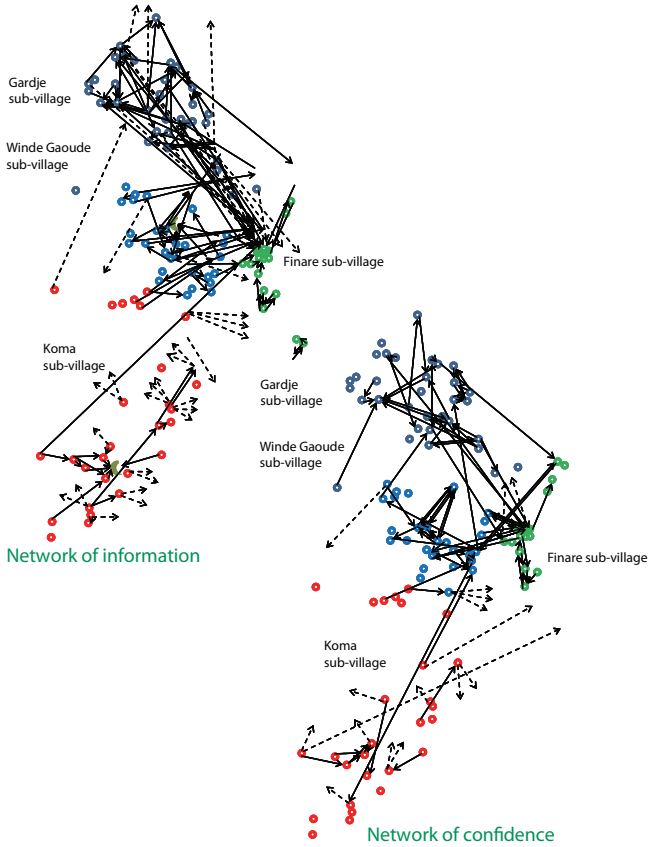

Figure 5 Network of information (left) and network of confidence (right) in Finare commune, Western Niger

Future tasks

Preliminary research was principally conducted in West Africa. In the year 2012–13, we expand our research in Southern Africa and India in relation to local livelihood, re-appraisal of indigenous knowledge, socio-ecological adaptation, desertification, and improvement of practical techniques and rural development approaches.

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