Resources

Program Director ■ **AKIMICHI Tomoya** RIHN

This program aims to demonstrate various facets of problems deriving from humans' use and conservation of renewable and non-renewable resources on earth. Since prehistoric time, humans have utilized plant and animal species for food procurement and then succeeded in domesticating some of these wild resources. Through this historical process, humans were able to gain more food products, and this resulted in population increase. At the same time, however, the exploitation of land for agricultural production and for pasture has inevitably decreased forest cover and reduced biodiversity. In general, food used to be produced and consumed locally; but this norm has been drastically changed by the development of transportation technology, which has made long-distance trade possible. At the same time, long-distance trade eventually increased energy consumption in accordance with the product of distance between production and consumption areas and weight of food, namely, food mileage. This has imposed serious environmental loads through the emission of CO_2. Increasing refuse has also become a serious threat to the environment.

If the amount of water used for producing agricultural crops and meat can hypothetically be estimated as virtual water, we can understand how much water is consumed and how much water is transported through international trade. As is also clear from widespread disputes over water, the appropriate governance of water management is absolutely important. On the other hand, food and water are incorporated into the human body as a source of life maintenance, but it must be noted that they also cause disease and health problems. In other words, food-borne and water-borne diseases due to poverty and pollution, like sexually transmitted HIV, must be eradicated, as these are primarily linked with human security and rights. Also, the traceability of food resources should be examined in terms of food safety and security and for the betterment of human health.

Completed Research	Leader	Theme
R-01 (CR2)	WATANABE Tsugihiro	Impact of Climate Changes on Agricultural Production System in the Arid Areas
R-02 (CR1)	AKIMICHI Tomoya	A Trans-disciplinary Study on Regional Eco-history in Tropical Monsoon Asia: 1945-2005.
Full Research	**Leader**	**Theme**
R-03 (FR2)	KUBOTA Jumpei	Historical Interactions between Multi-cultural Societies and the Natural Environment in a Semi-arid Region in Central Eurasia
R-04 (FR1)	MOJI Kazuhiko	Environmental Changes and Infectious Diseases in Tropical Asia
R-05 (PR)	NAWATA Hiroshi	A Study of Human Subsistence Ecosystems among Arab Societies: To Combat Livelihood Degradation for the Post-Oil Era

R-01 (CR2)

Resources

Project Homepage ● http://www.chikyu.ac.jp/iccap/

Impact of Climate Changes on Agricultural Production System in the Arid Areas

This research project aimed at identifying the direction and dimensions of the potential impacts of climate changes and ensuing adaptations in the agricultural production systems of arid regions, where water resources are limited, based on the projection of future regional climate changes on the eastern coast of the Mediterranean Sea, the case study region. While the relationship between climate and agriculture in the past and present was analyzed, the impacts of climate changes, including rise in air temperature, decrease in precipitation and sea-level rise, on agricultural production systems were assessed. The project was implemented as an international joint project in cooperation with the Scientific and Technological Research Council of Turkey.

Project Leader ■ **WATANABE Tsugihiro** RIHN

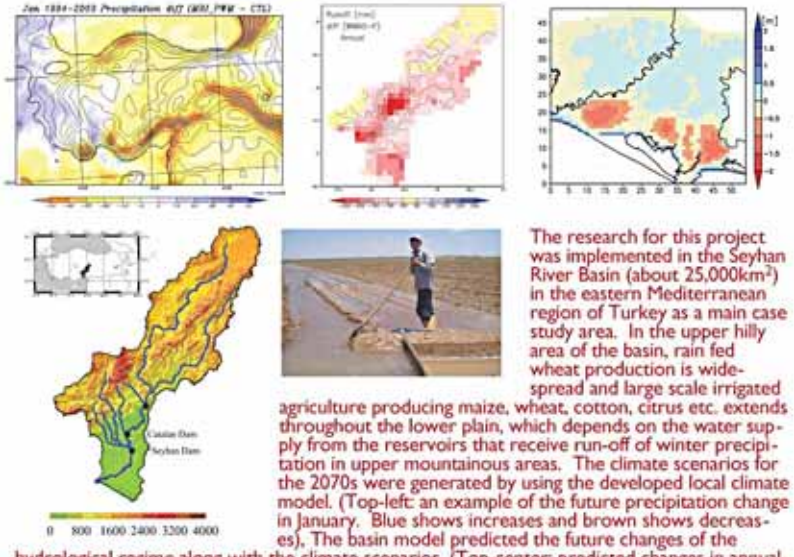
Summary of Research Outcomes

Climate change in the 2070s in the Seyhan River Basin was projected by using the latest climate model, and impacts of climate change on the condition of the river basin and agricultural production were assessed through generated climate change scenarios. The state-of-the-art GCMs and pseudo global warming experiments for the 2070s project temperature increase by 2 to 3.5 in all seasons and precipitation decrease by about 20% except for the summer season.

Field experiments and crop models proved that in the future there could be the regions both of increased yield and decreased yield of wheat, since wheat yield may increase with raised air temperature and CO_2 concentration, while it may decrease with less precipitation. Natural vegetation also would be affected and the areas of steppe and evergreen broad-leaved forest might increase in the 2070s while sub-alpine plant area would decrease. Decreases in snow and rainfall will reduce available water resources. The expansion of vegetables and fruits of highly profitable crops and the irrigated area might result in water shortage and less yield in the irrigated area.

The projections and predictions are the discussions, which could be recognized as a sort of inference experiment based on the probable conditions and available information. An adaptive management approach is to be essential in the future against the global warming.

Figure Assessment of Global Warming Impacts in the Seyhan River Basin of Turkey



The research for this project was implemented in the Seyhan River Basin (about 25,000km²) in the eastern Mediterranean region of Turkey as a main case study area. In the upper hilly area of the basin, rain fed wheat production is widespread and large scale irrigated agriculture producing maize, wheat, cotton, citrus etc. extends throughout the lower plain, which depends on the water supply from the reservoirs that receive run-off of winter precipitation in upper mountainous areas. The climate scenarios for the 2070s were generated by using the developed local climate model. (Top-left: an example of the future precipitation change in January. Blue shows increases and brown shows decreases). The basin model predicted the future changes of the hydrological regime along with the climate scenarios. (Top-center: predicted changes in annual runoff yield. Blue shows increases and red shows decreases). The future crop growth and water balance in the farmland were predicted based on these conditions. (Top-right: change of average groundwater table in the lower basin. Blue shows future rise and red shows decline).

Contribution to Better Solutions for Global Environment Problems

Climate change due to global warming will affect the natural conditions for agriculture like land and water resources and consequently impacts agricultural production. With these impacts, humans may act to adapt to the changes or to mitigate the damage caused by climate change. These human reactions may result in other changes in the environmental problems. Therefore, for better solutions to the problems, it is essential to understand and project the impacts of climate change on agricultural production, and to let local knowledge and systems react to the changes. In this project, a method to diagnose the problems of land and water use and identify the crucial points was developed. In Turkey, where the case study area was located, the project provided the opportunity to establish new research organizations and a cross-disciplinary approach to the problem, and promoted enhanced consciousness of the importance of impact assessment of global warming on basin hydrology and agriculture.

Disseminations of the Project Outcomes

The project outcomes are distributed through books, lectures, and reports inside and outside of Japan. Many scientific papers are published in academic journals and presented in international conferences. The report in Turkish language was published. In Turkey, the international symposium was held toward sustainable agriculture, and the project outcomes were broadcasted on TV programs. The outcomes contributes to tackling with global warming disseminating the developed methodology and results to the international organizations such as ICID, International Committee on Irrigation and Drainage.

Resources

Project Homepage ● http://www.chikyu.ac.jp/ecohistory/top_jp.htm

A Trans-disciplinary Study on Regional Eco-history in Tropical Monsoon Asia: 1945-2005.

This research project completed a holistic analysis of eco-historical consequences in tropical monsoon Asian region during the past several decades since WW II. In line with the changing process of the political regimes, devastating wars, infiltration of modernization, economic globalization, and population growth that swept this region, both local environment and human populations have had serious impacts. The processes were illustrated as about 80 flow charts in which regional eco-historical consequences have emerged. This eco-historical model can be expected to extensively be applied for the analysis of local-and-global environmental problems.

Project Leader ■ **AKIMICHI Tomoya** RIHN

Major Research Findings

In scrutinize eco-historical consequences that have occurred in tropical monsoon Asia during the past several decades, our project aimed to synthesize an eco-linkage model by choosing about 80 parameters for tracing them in historical interactions between local environment, human populations, and external forces. Interactions and events that have been genuinely illustrated as flow charts in which relevant factors, drivers and a chain reaction were identified in a complex whole. For implementing flow charts, eco-sensitive factors such as natural and domestic resources, human nutrition and health, and access rights and eco-policies were chosen, based on fieldworks in the relevant topics.

From our analytical inquiries, not only state policies but also local community's decision provides a key to understand historical consequences that have occurred in tropical monsoon region.

Rapid modernization and globalization has apparently given impacts on local environment, mode of life and human health depicted as increase of cash crop land use, frequent migration, and intake of sugar and fat. Yet, despite these changes, food habits to consume glutinous rice, raw animal meat, particularly of freshwater fish remain the same as before, that are manifested as high incidence of paragonimiasis and liver fluke.

Besides these findings, our project compiled database on material culture and photographs collected by Japanese scholars during the past several decades in this region. Eco-chronicle database in Yunnan, China has also been completed for public use.

Outcomes and Database

Besides articles and papers, we have published sixteen books on various themes and topics (10 Japanese, 4 English and 2 Chinese). Meta database on our findings and collected materials is now ready for public use through RIHN's archives (http://db1.chikyu.ac.jp/archives/).

Photo Rural Landscape in Southern Laos

Paddy field, fish trap and water buffalo in rice producing forest.

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

This project highlights man-made trans-boundary problems between countries or ethnic groups, religions, agriculture and nomadism, or between cities and the surrounding areas. People in the semi-arid region of Central Eurasia once lived a nomadic lifestyle in a symbiotic relationship with agriculture in oases. After a long transition which saw the rise and fall of various ethnic groups and countries, a tight and well-defined border divided the region between Russia and Qing. Both sides of the border, once the same, have developed differently. This project aims to study and clarify the historical interaction between human activities and natural systems in the semi-arid region of Central Eurasia, with particular emphasis on such trans-boundary issues. This project should provide important keys not only for evaluating the effects of projected human activities on ecosystems in semi-arid regions, but also for elucidating fundamental perspectives from which to examine a desirable mode of living in multi-cultural regions.

Project Leader ■ **KUBOTA Jumpei** RIHN

Core Members ■ **UYAMA Tomohiko** Slavic Research Center, Hokkaido University
MATSUYAMA Hiroshi Faculty of Urban Environmental Sciences, Tokyo Metropolitan University
TAKEUCHI Nozomu Graduate School of Science, Chiba University
FUJITA Koji Graduate School of Environmental Studies, Nagoya University
SUGIYAMA Masaaki Graduate School of Letters, Kyoto University
FUNAKAWA Shinya Graduate school of Agriculture, Kyoto University
SOHMA Hidehiro Faculty of Letters, Nara Women's University
KONAGAYA Yuki National Museum of Ethnology
YOSHIKAWA Ken Graduate School of Environmental Science, Okayama University
YOSHIDA Setsuko Department of Applied Sociology, Shikoku Gakuin University
KATO Yuzo RIHN
CHENGZHI RIHN

Background and objectives

With the exception of the inhabitants of oasis areas, people of the semi-arid region that extends across Central Eurasia once lived a predominately nomadic lifestyle. After a long transition marked by the rise and fall of various ethnic groups and countries, the Yuan Dynasty came to govern the whole of Eurasia as a loosely controlled unity during the 13th and 14th centuries. In the 18th century, however, a tight and well-defined border divided the region between Russia and Qing. At the same time, the people of this area experienced a great change in their lifestyle, caused by the migration of farmers, settlement of nomads and development of agriculture in association with the expansion of Russia and Qing. Settlement policies and borders have prevented these people from following their former way of adaptation. Man-made trans-boundary issues, between countries or ethnic groups, religions, agriculture and nomadism, or between cities and the surrounding areas, commonly lie behind the various environmental problems in the world. This project aims to study and clarify the historical interaction of human activities and natural systems in the semi-arid region of Central Eurasia. This project should provide important keys not only for evaluating the effects of projected human activities on ecosystems in semi-arid regions, but also for elucidating fundamental perspectives from which to examine a desirable mode of living in multi-cultural regions.

Figure 1 The study area: The Tian Shan Mountains and Ili River

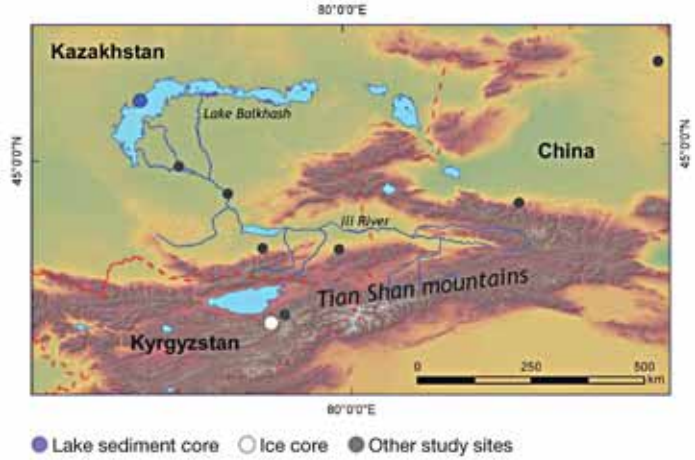


Figure 2 Outline of the project

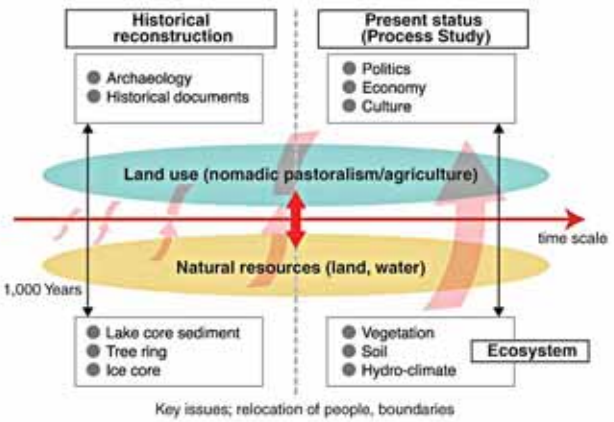


Figure 3 and 4 Comparison of glacier coverage in 1971 and 1999 in the Kungoy Ala-Too range and Zailiiskii Ala-Tau range in the Tian Shan Mountains.

Figure 3 Spatial distribution.

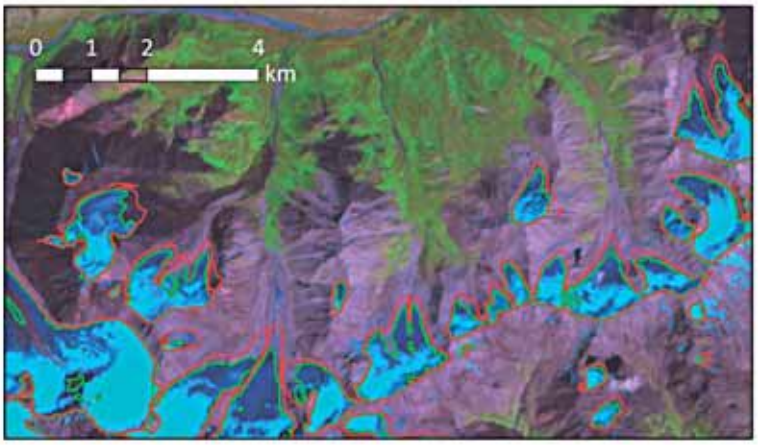
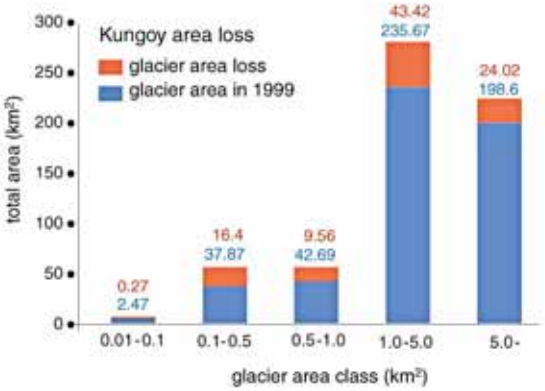


Figure 4 Relationship between glacier size and glacier area lost



Coverage decreased by 20% in the Kungoy Ala-Too range and 12% in the Zailiiskii Ala-Tau range.

Photo A stripe pattern at a depth of 85m in the ice core drilled in the Gregoriev Glacier in the Tian Shan Mountains, Kyrgyzstan.

Content and methods

1) Research area

The area of study is the watershed of the Ili River, which flows from China to Kazakhstan and terminates at Lake Balkhash, and its surrounding areas, including Kyrgyzstan and Uzbekistan. Historically, the Ili River watershed and its surrounding areas have been a key area of East-West interaction, and in which many ethnic groups and countries have risen and fallen. Today, parts of this area are experiencing environmental problems due to modern development under socialism.

2) Research groups

The project consists of two research groups: one will set out to clarify historical changes in both human activities and natural systems through the analysis of historical documents and a variety of natural proxies; and the other group will investigate the current processes of human activities and natural systems for the purpose of interpreting the historical information.

3) Objectives

A) To clarify historical changes, the rise and fall of nomadic groups and countries, their removal, changes in subsistence, the use of natural resources, and climate change through the analysis of historical documents and archaeological investigations as well as various natural proxies such as ice cores, lake sediment samples, tree rings and wind-blown deposits.

B) To investigate the present status of the area and the effects of human activities on the natural environment, with particular emphasis on their social, religious and cultural background.

C) To compare both sides of the border within the context of historical changes and their current status, examining areas that were previously similar but that have subsequently developed differently, to understand the meaning of boundaries in the context of environmental issues.

Present status of the project

(1) Progress to date

- The ice-core research group drilled two ice-core samples of 85.35m and 63.1m in depth at the Gregoriev Glacier in the Tian Shan Mountains of Kyrgyzstan. The deeper one reached the bottom of the glacier. Also, with the collaboration with the Kazakhstan Institute of Geology, a lake sediment core sample of 8m was taken at Lake Balkhash.
- A comparative analysis of Corona images of 1971 and a Landsat image of 1999 exhibits significant reduction of 12 to 20 % in the area or glaciers on the northern side of the Tian Shan Mountains.
- Several research groups, comprising researchers in various disciplines, including geography, hydrology, ecology, archaeology, sociology and anthropology, conducted fieldwork in Kazakhstan, focusing on the impact of human activities, especially the use of natural resources, on regional ecosystems, and its historical transition. A large amount of basic information on vegetation, soil, meteorological and hydrological conditions was gathered.
- Various historical documents and images were collected through cooperative studies with research institutions in Kazakhstan, China and Russia.

Expected results

This project should provide important keys not only for evaluating the effects of projected human activities on fragile ecosystems in semi-arid regions, but also for proposing fundamental perspectives from which to examine a desirable mode of living in multicultural regions.

Environmental Changes and Infectious Diseases in Tropical Asia

This project, The RIHN EcoHealth Project, is to clarify the relationship between various climate and environmental changes and changes in health profile of people living in tropical monsoon Asia through study of infectious diseases. The project studies the effects of human societal and environmental changes as well as climate changes on the ecology, endemiology and epidemiology of various infectious diseases such as vector-borne diseases (malaria, dengue fever, and filariasis), and food- and water-borne diseases (liver fluke infection, cholera and other diarrheal diseases). The study aims at offering an ecohealth insight for evaluating the relation of health profile with local and global environmental changes. The project synthesis report shall be published in 2012.

Project Leader ■ **MOJI Kazuhiko** RIHN

Core Members ■ **MASCIE-TAYLOR, Nicholas C.G.** Cambridge University, UK
KOBAYASHI Shigeo Graduate School of Asian and African Area Study, Kyoto University
IIJIMA Wataru Aoyama Gakuin University
KAMMURDIN, Ahmed Oita University
HASHIZUME Masahiro Nagasaki University Institute of Tropical Medicine
SUNAHARA Toshihiko Nagasaki University Institute of Tropical Medicine
YAMAMOTO Taro Nagasaki University Institute of Tropical Medicine
OHBA Tamotsu Blue Ecology Research
BOUPHA, Boungnong National Institute of Public Health, Lao PDR
KOUNNAVONG, Sengchanh National Institute of Public Health, Lao PDR
PONGVONGSA, Tiengkham Savannakhet Malaria Centre, Lao PDR
ISLAM, Sirajul ICDDR, B, Bangladesh
HUNTER, Paul University of East Anglia, UK
RAHMAN, Mahmudur IEDCR, Bangladesh
HOSSAIN, Zakir NIPSOM, Bangladesh
LE, Khanh Thuan NIMPE, Vietnam
KOBAYASHI Jun International Medical Center, Japan
CAI, Gou Xi RIHN

Background and Objectives

The project aims at delineating the relation of environmental changes and rise and fall of infectious diseases among people living in tropical monsoon Asia, in order to offer a long-term insight on life and health of the people. To be studied includes 1) changes of health profile of people living in area of the Lahanam Demographic Surveillance System (DSS) Lao PDR with changes of their environment and lifestyle, 2) relation of climate and occurrence of diarrheal diseases in Matlab DSS, Bangladesh. In addition to these field studies, analysis of existing data on regional and national levels as well as analysis of historical data shall be conducted.

Tropical monsoon Asia can be characterized by clear rainy season and dry season. The area is vulnerable both to flood and drought. People were living in the tropical monsoon forest by doing slash and burn cultivation. Then, wet rice cultivation was introduced and towns and cities were constructed. Population increase, urbanization,

Figure 1 View of infectious diseases in the RIHN EcoHealth project

It is a component of the long-term human and his environmental security.

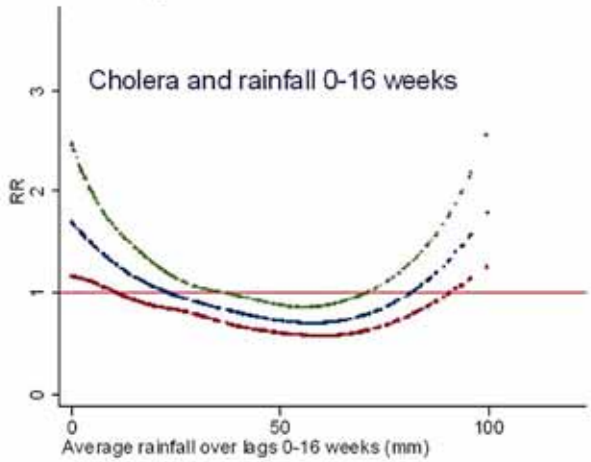
Photo 1 Malaria Survey in a village of ethnic minority in Sepone district, Savannakhet province, Lao PDR.

The slide positive rate was 62% (172 villagers out of 279 were parasitemia for malaria).

Photo 2 A village of ethnic minority, Sepone district, Savannakhet province, Lao PDR.

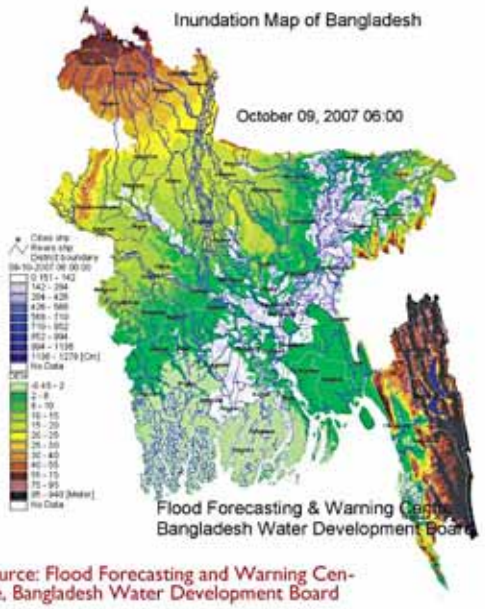
The village is surrounded by tropical monsoon forest.

Figure 2 Relation of cholera and rainfall: Relative risk of number of cholera patients in a hospital of Dhaka city is related with average rainfall over lags 0-16 weeks.



The effect of rainfall on the incidence of cholera in Bangladesh. Epidemiology. 2008 Jan; 19(1): 103-10.
From Hashizume M, Armstrong B, Hajat S, Wagatsuma Y, Faruque AS, Hayashi T, Sack DA.

Figure 3 Area of flood (under water) in Bangladesh at 6am of 9 of October, 2007.



Source: Flood Forecasting and Warning Centre, Bangladesh Water Development Board

deforestation, spread of wet rice cultivation, economic development, changes in lifestyle or so-called modernization, and population migration are the factors changing the ecological relationships among human beings, pathogens, and vectors. The project also investigates the relation between climate changes (temperature, rainfall, flood, and cyclone etc.) and health in tropical monsoon Asia.

Research Methods and Target Areas

The project applies several kinds of study methods. 1) Long-term observation of a local population in Lahanam area, Songkhone district, Savannakhet province, Lao PDR by establishing DSS. Since 2005 we are following about 4500 residents. In Bangladesh, we use data from the Matlab DSS and others. 2) Collection of community-based information on environmental changes and health profile from many communities of tropical monsoon Asia through group interviews. 3) Collection of information on environmental changes and health change in the district/provincial/national level.

The project team is divided into two groups; the field study group and the integration group. Field group can be further divided into two major groups (Lao and Bangladesh) and small groups. The Lao team collaborates with National Institute of Public Health (NIOPH) and other institutions in Lao and study liver fluke infection, malaria, and maternal and child health. The Bangladesh team collaborates with ICDDR,B, IEDCR, NIPSOM and UK universities, and study the relation between climate and health. The team study cholera and other diarrheal diseases, leishmaniasis, filariasis, malaria, and so on. In addition to these two countries, information on environmental changes and occurrence of infectious diseases will be collected in Vietnam, Myanmar, Indonesia, Sri Lanka, China, and The Philippines. The historical team will collect information on epidemiology and infectious diseases control policy in Asia and establish a database. The forest-agriculture team will analyze changes in vegetation and land use by satellite images, field observation and interview to people.

Achievement and Future Activities

The Laos team jointly organized the first National Health Research Forum with National Institute of Public Health (NIOPH) in September 2007 in Vientiane, Lao PDR. The plan of our study for the next five years as well as results of our study of the RIHN eco-history project for the last five years were presented. The detailed plan for the next five years was drafted.

The Bangladesh team published three papers on climate and diarrhea. Collaboration with Kyoto University Institute of Disaster Prevention has been promoted, and detailed research plan was discussed with ICDDR,B.

In the academic year of 2008/9. the project is planning the following activities:

1) In Lahanam DSS: renewal census, training of staff, introduction of the paperless DSS, introduction of bio-metric identification, establishment of the vital record, studies on liver fluke infection, studies of MCH.
2) Malaria study in Sepone district: Collection of malaria data in remote areas, urine examination for malaria epidemiology.
3) Bangladesh: collaboration with ICDDR,B on study of relation between climate and health, collaboration with IEDCR, NIPSOM, and Cambridge University, establishment of national database for infectious diseases, analyses of the data on malaria, filaria and other diseases, study the relation among vegetation, climate and diseases.

R-05 (PR)

FS 2007 PR 2008

Resources

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

This research project aims to promote basic studies to clarify human life support mechanisms and self-sufficient modes of production among Arab people who have survived more than a thousand years under a peculiar natural environment of drylands. Based on these research results, we intend to propose a scientific framework to strengthen their subsistence productivity and combat livelihood degradation in local communities of Arab people to prepare for the post-oil era.

Project Leader ■ **NAWATA Hiroshi** RIHN

Core Members ■ **KAWATOKO Mutsuo** Research Institute for Islamic Archaeology and Culture
KOBORI Iwao United Nations University
MIYAMOTO Chiharu Action for Mangrove Reforestation
SUGIMOTO Yukihiro Graduate School of Agricultural Science, Kobe University
SAKATA Takashi Faculty of Science and Engineering, Ishinomaki Senshu University
YOSHIKAWA Ken Graduate School of Environmental Science, Okayama University
HOSHINO Buhe Faculty of Environment Systems, Rakuno Gakuen University
ONUMA Hiroyasu Appropriate Agriculture International Co.
ABDEL GABAR, E. T. Babiker Sudan University of Science and Technology
ABDALLA, M. A. Abu Sin Gezira University
ABDEL BAGI, M. Ali Agricultural Research Cooperation, Sudan
ABDEL HADI, A. W. Agricultural Research Cooperation, Sudan
LAUREANO, Pietro Traditional Knowledge World Bank
BENKHALIFA, Abdrahmane University of Science and Technology, Algeria

Objectives

Japan and oil-rich countries of the Middle East have put excessive pressure on the Earth in terms of energy, water and food. As they have put first priority on economic prosperity for their own benefits, they have exploited irreplaceable resources such as fossil fuel and fossil water. Such attitudes have also pushed local ecosystems into an abnormal state by planting alien species, and furthered social differences among the people of the Middle East. As we are facing a turning point in oil-based modern civilization, our inter-dependency through trading fossil fuel must change drastically to a new inter-dependency to build a futurable society.

We focus on human subsistence ecosystems, which are human life support mechanisms and self-sufficient modes of production (hunting, gathering, fishing, herding, farming, and forestry) with low energy resource consumption. We also take another look at advanced technology and economic development, and reexamine the conceptual framework of comprehensive measures to combat desertification. Based on these research results, we intend to propose a scientific framework to strengthen subsistence productivity and to rehabilitate the daily life of general population among Arab societies for the post-oil era.

Research Methods and Areas

A study of human subsistence ecosystems among Arab societies will be advanced and implemented as three separate issues, such as **1)** comprehensive measures to control alien invasive species mesquites, **2)** an assessment of environmental effects by development programs in coastal zones of the arid tropics, and **3)** supporting peoples' decision making by sharing research results.

Our research methods consist of two main pillars: **(1)** analysis of subsistence ecosystems focusing on keystone species (camels, date-palm, mangrove, and coral (reef)), **(2)** inspection of sustainability and fragility of Arab societies focusing on ecotones (wadi-beds, river-side, mountain-side, and sea shore).

Field surveys will be conducted in semi-arid lands between the River Nile and the Red Sea in Sudan; Red Sea coasts, Butana area and the River Nile area, as the main survey area, and in other areas of three countries; Sinai peninsula in Egypt, Red Sea coasts in Saudi Arabia, and Sahara oasis in Algeria, as sub-survey areas, so that we can compare a combination of keystone species, ecotones and traditional knowledge and examine a difference in sustainability of subsistence economy particularly under site-specific conditions.

Expected Results

We are conscious of social reduction of research results making use of these for local peoples' decision making as well as nations' policy making, by information dispatch through printing and digital devices in Japanese (bridge between Japanese and Arab societies), English (scientific language for scientists communities) and Arabic (local common language for local communities).

In pre-research, we will hold an international symposium "Human subsistence ecosystems with mangrove and coral reef in drylands", compiling knowledge from various fields of science and backgrounds on this particular topic as the starting point of the project. Then, we will publish the results of this symposium in English and Arabic to distribute to local people in Arab societies. By obtaining their comments through interviews and questionnaires, we plan to feed their opinions back to our project targets and research activities, and hope to publish a revised version of the book, as a result of information sharing, when we have finished the project.

Photo Assessment of environmental affects by development programs in coastal zones of the arid tropics

The coastal zones, in which fresh water can be converted from seawater, became a big development frontier and may cause environmental degradation by releasing highly concentrated saline water into the sea. On the other hand, this area is rich in biodiversity, so it has high potential for seafood and pastoral food production through reforestation of mangroves as fish nurseries and forage safekeeping. We are compiling scientific knowledge to prevent a new outbreak of environmental problems in coastal area development.

During breaks in field surveys, a stroll through the market may reveal an astonishing variety of foods. Invitations to meals offer opportunities to experience unique regional food cultures. Biological and cultural diversity fosters a rich food culture.

1

2

4

3

Photographers (locations)

1 WATANABE Tsugihiro (Turkey)
2 UMETSU Chieko (India)
3 UCHIYAMA Junzo (Germany)
4 YUMOTO Takakazu (Okinawa)
5 UMETSU Chieko (India)
6 UCHIYAMA Junzo (Germany)

6

5