

# Environment and Sustainable Agriculture in Monsoon Asia

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**Abstract:** Through generations of innovation, farmers in Monsoon Asia encompassing Northeast, Southeast and eastern South Asia have developed labor-intensive agricultural systems which have been adaptive to their respective natural, social and cultural conditions. Under the current situation of expanding globalizing economy, however, they are facing serious environmental issues derived not only from natural conditions but also from human and social factors. Taking case studies conducted in the Mekong delta in Vietnam, Lampung Province of Sumatra, northern mountain regions in Laos and a border region of Shan State of Myanmar as examples, the paper reconsiders the importance of implementing interdisciplinary approach and fieldworks from the viewpoint of Southeast Asian area-studies in order to seek ways for exploring holistic approach in agricultural studies.

**Keywords:** Monsoon Asia, Interdisciplinary approach, Area studies, Southeast Asia

## 1. Introduction

Being blessed with abundant precipitation and high temperature, a continual “green belt” consisting of forests (or potential forest vegetation) and agricultural lands has been formed from higher to lower latitudes in Monsoon Asia located at the east and southeast fringe of Eurasian continent. Labor- and land-use intensiveness is one of common characteristics of the region’s agriculture, and this can be observed particularly in wet-rice-based agricultural systems in the region. The “green belt” also provides the place of supplying various kinds of biological resources. Not only timber but also a number of useful biological resources, such as industrial materials and medicinal plants, have been extracted from both temperate and tropical forests from the very ancient times.

The intensive and diversified agricultural systems in Monsoon Asia, however, have undergone dynamic changes during the last two or three decades due to the rapid introduction of modern technologies and the expansion of commercial agriculture under the globalizing political and economic situations. These changes include the development of agricultural production through the intensification and diversification of crop growing on one hand and the environmental deterioration in various manners on the other. With regard to biological resource management, also, various issues have become obvious, such as conflict between stakeholders, declining of resource endowment and resource extinction. These changes have been taking place with complex interaction between natural, social and economic conditions.

In order to understand such complexity, a number of studies have been conducted in the field of agricultural studies. However, it has been a common tendency that the studies are conducted in the mode of specific subject-oriented approaches: disciplinary divisionism and sectional approach seem to be widely adopted despite increasing voice of emphasizing the need for interdisciplinary approaches. Since “area studies” is an academic arena where natural, social, and human sciences get together in order to understand the characteristics of “area” and principle of its formation, it might be worth introducing some case studies conducted in the field of “area studies” in order to reconsider the research approaches to the complexity of environmental issues and to explore possible ways for collaboration at this symposium entitled “Evaluation and Effective Use of Environmental Resources for Sustainable Agriculture in Monsoon Asia.”

## 2. Some Case Studies from “Area Studies”

It is not just in agricultural sciences that disciplinary field of studies is fractionized or fragmented. The same tendency can be observed in any field of studies, even in social sciences and the humanities. It is a matter of course that the differentiation of a discipline is inevitable because all disciplines focus their efforts on deepening and widening their own research purposes in accordance with their own academic interests. However, it is also necessary to prepare an integrated holistic view or approach. In this sense, “area studies,” which is not a disciplinary field of studies, seems to be an effective apparatus for integrating related disciplines. Since the “fieldworks” are the major mode of research activities in “area studies,” some case studies related to the subject are introduced in the following sub-sections.

## 1) Agricultural Transformation and Resource Management: A Case from the Mekong Delta

Rice cultivation in the Mekong delta has undergone major changes during the last three decades since the end of the Vietnam War. Keeping pace with changes in rice-growing techniques, rice-based cropping patterns have also experienced rapid changes: Single-cropping patterns of rice, which were dominant in the past, have been mostly converted to double-cropping systems since the introduction of modern rice varieties of short growing periods. This type of innovation in rice-growing techniques has been inducing an increase of cropping intensity and cropping diversity throughout the Mekong delta.

In particular, since the introduction of market economy, drastic changes in socio-economic conditions pushed forward the diversification of cropping patterns, consisting of multiple cropping of wet rice and market-oriented vegetables and fruits in wet-rice fields. Further, diversified multiple farming systems combining the crop-growing with fresh-water fish culture and animal raising such as pig and poultry also introduced in order to sustain rural economy of farm households. Although these diversified systems are recognized and promoted as a model of sustainable resource use within closed management system in farm household, the balance between intensified farming practices, which inevitably request higher input of farming materials, and environment capacity is an urgent issue yet to be considered under such a drastic drive as observed in the last three decades.

Environment issues arise not only as a consequence of intensified and diversified farming practices but also as a consequence of chains of social, economic and, in some cases, political affairs as the following case shows. Among various agro-ecological units in the Mekong delta, the Broad Depression and the Plain of Reeds had long remained unused for agricultural purposes due to adverse environmental conditions such as deep flooding, poor soil-nutrition and potential acid sulfate soil. Despite these conditions, rice cultivation expanded to a great extent in both areas after the end of Vietnam War.

Under the new postwar socialist regime in the South, the government promoted the exploitation of these areas. Excavation of canals and construction of canal networks provided migrants with a place for settlement and the fresh water from the Mekong river enabled them to reduce the potential acidity by washing away the active acid emerging after land reclamation. As this process proceeded, spontaneous pioneer farmers rushed to these areas to reclaim rice fields prior to the implementation of the government's socialist land reform program. As a result, the former grass-and-forest wetlands have been almost completely converted into rice fields.

Since the end of 1980s, however, a debate has arisen about wetland conservation. This coincided with the "privatization" of the agricultural production system, the introduction of "*doi moi*," new economic policy in Vietnam, and the partial success of rice growing in these areas. The government has enclosed wide areas as natural reserves where *Melaleuca*, an original species of vegetation in wetland, and secondarily emerged aqua flora and fauna are preserved. On the other hand, under the pressure of rapid population growth, both the pioneer settlers and new migrants still seek to extend and intensify rice cultivation in these areas. Although conflict between local people and the government are not visible because of strong governance of the central and local government, encroaching of lands and extraction of *Melaleuca* trees and biological resources such as bee honey and wild animals are reported. The goal of harmonious coexistence of state and individual property still seems remote.

## 2) Social Forestry and Management of Forest Area: A Case from Lampung Province

The "forest area" in Indonesia, which is defined as land with forest vegetation managed by the government and has been enclosed and monopolized for both conservation and production purposes by the Forestry Department, has been the much-disputed space bedeviling both central and local government agencies. Many problems, such as illegal logging, settlement of local people and extraction of non-timber forest products, have been reported. The borderland neighboring to agricultural lands, in particular, has posed serious issues related to land use and land ownership for many decades, even after the collapse of the Soeharto's centralized regime. The economic policies of the Indonesian government have been used to favor forest-based industrialization, and this caused the deforestation. It is also said that the main force behind deforestation is the expansion of agricultural lands into the "forest areas." Despite the increasing recognition of the importance of rehabilitating forests and involving local people into the public forest policies, the government has not been successful in managing rehabilitation of forest lands and implementation of social forestry programs.

Case studies conducted in a village in Lampung Province in 2005 and 2006 revealed that local people who illegally “penetrated” into the “forest area” has established a strong solidarity in order to obtain authorized rights of land use from the Department of Forestry. On the other hand of the government social-forestry programs, in which effort for organizing communication mechanism with local communities is paid in top-down mode, local people are organizing their own association to establish their rights for using the land “beyond boundary” in collaboration with NPO facilitators as well as local people in other villages.

Their agricultural lands, where a variety of useful trees have grown up after the “penetration,” have come to show a condition of mixed forests in appearance, from which the villagers gain most of their economic benefits. Through the negotiation processes with the government, the local people also came to empower themselves and understand the significance of their “forest” lands in terms of environment-conservation. Although the original forests were totally converted into artificially planted “mixed forests,” which consists of a variety of fruit trees, bamboos, rattans, rubber trees, and vegetables as under-growth, the local people claim that “our” lands have developed the functions of sustaining water sources, providing a place for wild animals just as the original forests did. Also, they said that they did not request the land title but the approval of the use of “forest land” without being anxious about their “illegality.” To what extent the local government compromises with local people to sustain the borderland as “forest area” will be the focal point of discussions among stakeholders.

### **3) Land Allocation Program and Stabilization of Shifting Cultivation: A Case from Northern Laos**

Stabilization of swidden agriculture is one of important national targets to be achieved through the land-allocation program in the northern mountain region of Laos. The agricultural sector in the northern mountain region is rapidly changing due to rapid expansion of market-oriented economy. Under such rapid changes, the land-allocation program has brought about various constraints to the local communities, who have been dependent on uplands and mountains for generations such as collection and gathering of non-timber forest products, in terms of sustainable agricultural practices, land-use development and natural resource management. Local communities are expected to improve their conventional agricultural systems, i.e., swidden agriculture, by introducing more intensive cropping techniques and more profitable export-oriented cash crops such as vegetables and fruit trees, or by establishing more intensive cropping systems. However, this is not such an easy task under the present socio-economic conditions of the northern mountain region because of its poor infrastructure, lack of market access and insufficient human resources for agricultural extension works.

The research was conducted in Luang Phabang and Oudomxay provinces in 2003 and 2004. In order to understand the effects of the land-allocation program, the changes in land-use patterns were mainly surveyed in sample villages. In every village, upland-rice cultivation was once widely practiced on the slopes of mountain sides for subsistence purposes under the shifting cultivation systems with long fallow periods. Fallows and forests were also important spaces for the villagers, where they could collect useful plants and animals for both subsistence purposes and as cash-gaining sources.

Through the sample surveys, both negative and positive aspects of the program implementation were observed. For example, the major crop grown in the village has totally changed from upland rice to Job’s tears after the program implementation. This change provided economic advantages to the villagers. In fact, the villagers have succeeded in increasing cash income owing to this change. On the other hand, the program did not succeed in decreasing swidden agriculture as slash-and-burn method was still applied to the cultivation of Job’s tears by rotationally using the allocated lands with three-year growing and six-year fallowing within three plots. The maintenance of soil fertility within such a short period of fallowing is another problem in relation to the sustainability of this rotation system. The market factor is also an important issue in relation to sustainability; the local price of Job’s tears was very unstable. Since almost all the products of Job’s tears are exported to Thailand, it is also difficult for the government to intervene in the market in order to stabilize the price of Job’s tears. Insofar as the current fallow system continues, it is inevitable for the government to provide the locals with alternative crops to Job’s tears.

As the case studies indicate, geographic location such as accessibility to local markets and availability of intermediate merchants might be more influential than the land-allocation program itself. The villagers in the mountainous area, such as our sample villages, have not been successful yet in identifying the appropriate commercial crops to be grown in the allocated farm lands. If they reached a negative conclusion that land-allocation program would not bring about positive development, but result in poverty, then they might easily return to swidden agriculture. Therefore, it is very necessary to understand that many villages located in the mountainous regions still remain in the immature condition to accept the land-allocation program which was implemented with the standardized and uniform manuals. In order to stabilize swidden agriculture in

mountain regions, more flexible and location-specific implementation should be taken into consideration instead of mechanical and uniform implementation.

#### **4) Inflow of Agricultural Technology and Outflow of Natural Resources: A Case from Shan State**

Rapid economic development of China brought about drastic changes in agricultural production and biological resource management in its neighboring countries, in particular, in its bordering regions. Main concern of conducting research in Myanmar was to understand why the former “periphery” of the nation state came to gain more economic advantage than the “center.” The central part of Myanmar, the Burma Proper, consisting of Divisions located in the Central Plain and the Irrawaddy delta, have stagnated in economic development, while the “periphery,” such as northern border region of Shan State, have experienced vital economic growth. In order to know such transboundary issues, research was conducted in Muse and Namkham townships in northern Shan State of Myanmar in 2001-2004. The research revealed the rapid increase of import and export commodities; inflow of agricultural production materials to Myanmar and outflow of natural biological resources from Myanmar.

Myanmar has experienced a long stagnation in rice production due to the planned cultivation and rice delivery systems implemented by the former and present government. The total cultivated area had stagnated at the level of about 12 million acres for long time since 1960s, because the farmer’s incentives have been depressed due to the lack of production infrastructure and low price to be delivered to the government. Despite this long stagnation, there were two momentums in which rapid increase in rice production was observed; the period from the late 1970s to early 1980s and the period after early 1990s.

The first increase was achieved by the introduction of “Green Revolution” technologies. The second jump was achieved by the increase of dry-season rice. In particular, after the Summer Rice Program started in 1992/1993 in combination with introduction of low-lift pumps, supply of diesel fuels and chemical fertilizers with lower prices and exclusion of summer rice from the delivery system, the cultivated area increased by two million acres, and the production by 3.5 million tons by 1994/1995. The border regions of northern Shan State was not exception. The introduction of summer rice was strongly introduced based on the supply of agricultural materials from China, such as hybrid varieties, polyethylene sheets for protected nursery, chemical fertilizers and pesticides. It was said that summer rice production started by local people’s initiatives long before the government program was implemented. Because of successful introduction and high productivity obtained, the cropping patterns of rice and land-use systems of wet-rice fields have been drastically changed in the border regions.

In addition to the introduction of summer rice technologies, many other agricultural technologies have been introduced from China. Watermelon cultivation is one of such examples. The seeds are all hybrid varieties imported from China, and most of the harvest is exported to China. Another example is maize cultivation, of which there are two types; seed production of hybrid maize and fresh-corn production. Fresh corn is grown in the dry season by using hybrid varieties and polyethylene sheets imported from China. Vegetable growing is also a typical example in which aggressive introduction of hybrid varieties is taking place. The vegetables for pickles are sold to producers in Muse city and the pickles are exported to China, as well as other regions in Shan State.

A new agro-business is also coming about in collaboration with Chinese merchants in the field of tropical fruits production and marketing. The merchants who are dealing with tropical fruits keep a close connection with Chinese counterparts and continuously get the market information and knowledge and techniques related to packing, export procedures, seeds and seedlings, and growing techniques. Large-scale fruit cultivation is another business in the border region. Those who got license from government authorities to reclaim the gardens grow lichee, longan, sunkist orange, passion fruit, mango, coffee, macadamia nuts and jujube to be exported to China.

As these cases show, great changes in agricultural production and marketing are taking place in the border region, and it is obvious that these changes have been materialized under the continuous economic influence from China.

It is needless to say that there are many “windows” and “gates” through which people cross the border and bring in and out commodities. Although the scale of transportation is small, many varieties of biological resources are transported from Myanmar to China through the “windows” and “gates.” It was almost impossible to see the actual amount of biological resource trading such as NTFPs. However, as the records obtained from an office of International Trade Bureau indicate, many kinds of biological resources

are exported through the check-post, located in Muse city. According to the records, the commodities are classified into two categories: agricultural products and other biological resources. With regard to NTFPs, many kinds of medicinal and industrial materials are indicated in the records. Although there are some unidentified commodities among them, they include seeds of *Oroxylum indicum* (medicine), leaves of Acanthus family (medicine), dried flower of *Michelia champaca* (perfume), catch tree (medicine), fruits of *Terminalia chebula* (medicine and dye), fruits of *Adenanthera pavonina* (ornament, cultivated), rattan, wood carvings made of tree roots, bamboo shoots, fruits of *Vitex negundo* (medicine), leaves of senna, Indian gooseberry, Indian long pepper and others. Commodities from animal origins are also exported, including live crab and eel, frozen sea fishes, snakes, turtles, dogs and reptiles. Chinese merchants directly deal in importing these commodities at a cargo station, and many small carts equipped with hand-tiller engine come to carry them to China.

Although they are not listed in the records of International Trade Bureau, tung-oil tree (*Alleurites montana*) and cinnamon (*Cinnamomum verum*) are also interesting commodities with regard to forest conservation and rehabilitation. Tung-oil trees have been widely grown in Muse district as a kind of shade trees for tea gardens and as a useful plant in the fallows of slash-and-burn fields. Dry oil contained in the seed is utilized as industrial materials, and there has been a continuous demand for the seeds in the Chinese side. Not only local middlemen but also Chinese merchants come to villages to directly purchase from farmers. Cinnamon barks were locally used as medicine. However, the villagers said, since cinnamon trees were diminishing, they faced a harder condition in which they have to enter remote forests with one-day walk distance to collect the barks; and timbers for furniture and wild orchids became extinct although they were sold to Chinese merchants in the former days.

As these cases indicate, it is assumed that the extinction of natural resources is rapidly taking place as a result of outflow of biological resources. Trade is simply a measure for acquiring commodities that are not available on the spot. In this sense, it is natural that such inflows and outflows as observed in the border region in Muse and Namkham townships came about. However, it seems to be important to pay more attention to which directions these commodities move downstream after crossing the border. We need to carefully watch the consequence, because we have experienced so many cases the demander's economic dominance over the natural resources led to the extinction of natural biological resources.

### **3. Concluding Remarks: Possible Collaboration for Studies on Monsoon Asia**

To respond the increasing voice of emphasizing the need for interdisciplinary approaches, it seems that Monsoon Asia provides us with appropriate and possible fields of various types of interdisciplinary studies, because the region shares a common history of agricultural modernization, such as "green revolution," intensification and diversification of agricultural production systems, and various constraints caused by social and economic globalization.

The "area" has been formed with complex interaction of natural, social, economic, and human factors. Agriculture is also the same. Why not the agricultural scientists step out to the fields in collaboration with scientists in other disciplines? Fieldworks at various levels of "areas," from the level of household farming to regional agricultural systems, may be the most possible way for establishing interdisciplinary approaches in agricultural sciences.