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Recent Changes and Their Implications for the Long-Term Transformation of the Region
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Rural Northeast Thailand in Transition: Recent Changes and Their Implications for the Long-Term Transformation of the Region

Introduction

Kono Yasuyuki,* Arunee Promkhambut,** and A. Terry Rambo***

The eight articles in this special issue are revised versions of papers that were presented at an academic conference on the agrarian transformation in Northeast Thailand, held at Khon Kaen University in September 2014. The conference was jointly organized by the Center for Southeast Asian Studies (CSEAS) of Kyoto University and the Program on System Approaches in Agriculture of the Faculty of Agriculture, Khon Kaen University (KKU). The first day of the conference was sponsored by the Thailand Research Fund as part of its Basic Research Seminar series, and the second day was sponsored by CSEAS and KKU.

It is widely recognized that Northeast Thailand (Isan) is undergoing a major agrarian transformation that involves a restructuring of agriculture from being subsistence oriented to market oriented. It also involves concomitant changes in all components of the agricultural system, including technology, economic orientation, social relations, and cultural values. Fukui Hayao (1996) may have been the first to apply the term "transformation" to agricultural change in the region. More recently, the broad outlines of this transformation have been described by Terry Grandstaff *et al.* (2008), Jonathan Rigg and Albert Salamanca (2009; 2011), and Charles Keyes (2014); but many aspects of this complex process have not yet received detailed attention or even been recognized as topics for study. Moreover, despite the recognition it has received in academic circles, the extent to which all aspects of rural Northeast Thailand have been changed as a consequence of this transformation has yet to be fully assimilated by the broader Thai public, including political and administrative elites and the media.

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Given this background, we thought it would be useful to organize a conference that would bring together researchers from many disciplines to share their knowledge of the current situation in Northeast Thailand. We sought contributions from well-known senior scholars as well as younger scholars and graduate students who were currently engaged in field research in Isan. Participants represented many different disciplines (anthropology, agricultural science, area studies, medicine, and public health) and were associated with a wide range of Thai and foreign institutions, including several regional universities in the Northeast.

After rigorous peer reviews, eight papers were selected for inclusion in this special issue. The first paper, by A. Terry Rambo, presents an extensive review of recent research on multiple dimensions of the agrarian transformation in Northeast Thailand. It highlights the contributions to our understanding of the transformation made by each of the papers in this issue. The second paper, by Chai Podhisita, relates agricultural changes to household dynamics and expansion of the capitalist economy in rural Thailand. In the third paper, Shirai Yuko and A. Terry Rambo describe changes in household structure and sources of income in a single rice-growing village in Khon Kaen Province.

The fourth paper, by Watanabe Kazuo, describes changes in the rice production system in a single village in Khon Kaen Province. In the fifth paper, Watanabe Moriaki *et al.* examine changes in the trees in the paddy field agroecosystem, also in a single village in Khon Kaen Province. The final three papers examine different aspects of agricultural intensification, diversification, and specialization by smallholder Isan farmers. In the sixth paper, Arunee Promkhambut and A. Terry Rambo present the results of a survey of multiple cropping after rice in all the subdistricts in Khon Kaen Province. In the seventh paper, Chalee Gedgaew *et al.* describe the expansion of contract farming to produce hybrid tomato seed in multiple sites in the region. In the eighth paper, Sorat Praweenwongwuthi *et al.* examine land use changes in two districts along the Mekong River in Nakhon Phanom Province.

As the editors of this special issue, we would like to acknowledge the invaluable assistance we have received from Shirai Yuko, who helped to organize the conference and coordinate the complex editing process, and John S. Parsons, who skillfully edited several of the papers. We also want to express our appreciation to the anonymous referees who greatly helped to improve the quality of the papers in this issue. We are grateful to the Thailand Research Fund and the JSPS Grants-in-Aid for Scientific Research (22241058) for their generous support of the research of many of the contributors to this special issue.

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References

Fukui, Hayao. 1996. Transformation of Agriculture in Northeast Thailand: Preface. *Southeast Asian Studies* 33(4): 521–522.

Grandstaff, Terry B.; Grandstaff, Somluckrat; Viriya Limpinuntana; and Supanchaimat Nongluck. 2008. Rainfed Revolution in Northeast Thailand. *Southeast Asian Studies* 46(3): 289–376.

Keyes, Charles F. 2014. *Finding Their Voice: Northeastern Villagers and the Thai State*. Chiang Mai: Silkworm Books.

Rigg, Jonathan; and Salamanca, Albert. 2011. Connecting Lives, Living, and Location: Mobility and Spatial Signatures in Northeast Thailand, 1982–2009. *Critical Asian Studies* 43(4): 551–575.

————. 2009. Managing Risk and Vulnerability in Asia: A (Re)Study from Thailand, 1982–83 and 2008. *Asia Pacific Viewpoint* 50(3): 255–270.

The Agrarian Transformation in Northeastern Thailand: A Review of Recent Research

A. Terry Rambo*

Rural Northeast Thailand has been undergoing rapid change in recent years, a process that can be referred to as an "agrarian transformation." This transformation involves a major restructuring of agriculture from being subsistence oriented to market oriented. It also involves concomitant changes in all components of the agricultural system, including technology, economic orientation, social relations, and cultural values. This paper presents a review of a large volume of recent research on several key dimensions of the agrarian transformation: (1) agricultural intensification, diversification, and specialization; (2) technological change and the continuing role of traditional technology in rural life; (3) the epidemiological transition and changes in health and disease risks; and (4) social system changes, including in the nature of rural-urban interactions, population structure, household composition and livelihood systems, community social organization, and cultural values and aspirations.

Keywords: rural development, agricultural intensification, social change, globalization, post-peasant society

Introduction

Rural areas in Northeast Thailand (Isan) have been undergoing rapid change in recent years, a process that can be referred to as an "agrarian transformation." This transformation involves a major restructuring of agriculture from being subsistence oriented to market oriented. It also involves concomitant changes in all components of the agricultural system, including technology, economic orientation, social relations, and cultural values. These changes are so profound that Terry Grandstaff *et al.* (2008) have referred to them as constituting the "rainfed revolution." Despite the magnitude of these changes, however, the perceptions of the region held by academics, policy makers, members of the mass media, and the urban public in Thailand have tended to lag behind actual changes

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on the ground (Dayley 2011; Keyes 2011; 2014; Mills 2012) so that many still conceptualize the situation of the rural Northeast according to an outmoded model (which I will henceforth refer to as the "conventional model") that depicts the region as it used to be before it entered into a period of rapid development beginning in the late 1980s and early 1990s.

According to this conventional view, Northeast Thailand is a poor and backward region because rainfed rice farming is intrinsically unproductive. Yields are low and unstable due to the poor resource base (e.g., infertile sandy soils, limited availability of surface water supplies) and unfavorable environmental conditions (e.g., limited and erratic rainfall) (KKU-Ford Cropping System Project 1982; Rambo 1991; Viriya 2001). Intensification is inhibited by the high risk of crop failure, lack of capital and knowledge, and cultural conservatism (Rigg 1985). Despite these severe constraints, rural people survive by employing a number of time-tested environmental adaptations, especially reliance on having a highly diversified livelihood portfolio (Grandstaff 1988). This portfolio includes low-input subsistence-oriented production of glutinous rice to meet household consumption needs; growing of low-value upland crops (e.g., cassava and sugarcane) to earn cash income; heavy reliance on wild resources that can be collected from fields, forests, and streams; out-migration to find new sources of income by working outside the region; and reliance in times of scarcity on a local safety net provided by kinsfolk and fellow villagers. Until the closing of the land frontier in the late 1970s, migration of people from overpopulated villages to create new settlements in forest areas (*ha na di*) helped to maintain a balance between population and resources (Fukui 1993). The rural social system associated with this model is characterized by a relatively high degree of egalitarianism, with little economic differentiation among households, low educational levels, limited integration into the larger national social and economic systems, and high levels of community solidarity (Sukaesinee *et al.* 1988). The adaptive strategy of employing diversified livelihood portfolios must be judged as a successful one in that it ensures that rural people are almost always able to procure enough resources to meet their basic survival needs, but at the cost of being locked into low-productivity farming and persistent poverty.

Although the conventional model provided a useful framework for understanding the Northeast until the end of the 1980s, the situation has changed so rapidly and profoundly in the past two decades that it no longer accurately reflects reality on the ground. The stereotypes of a poor and backward rural economy based on low-productivity subsistence-oriented agriculture are now largely obsolete (Fukui 1996b). A new model, which I will refer to as the "transformational model," is needed to more accurately represent current realities. Table 1 presents a comparison of the conventional and the

Table 1 Conventional and Transformational Models of the Agricultural System of Northeast Thailand

	Conventional Model (1980s–early 1990s)	Transformational Model (Mid-1990s to present)
	Mode of production	
Type of agricultural system	Survival-oriented "peasant" agriculture	Profit-oriented "semi-capitalist" agriculture
Objectives of production	Production of glutinous rice for household consumption with supplementary production of cash crops	Production of cash crops, including non-glutinous rice, for market with production of glutinous rice for household consumption
Household adaptive strategy	Reliance on a diversified portfolio of primarily local sources of income	Increasing reliance on specialized sources of income, both local and extra-local, with more than half of household income from off-farm sources
	Productive technology	
Type of agricultural technology	Traditional technology with some use of modern technology	Mostly modern technology
Mechanization	Two-wheel hand tillers replacing buffalo-drawn plows	Four-wheel tractors, combine harvesters, water pumps, pickup trucks
Rice varieties	Many different local varieties adapted to specific conditions in different types of fields	RD6 and KDML105 are dominant varieties.
Chemicals	Limited use of chemical fertilizer	Heavy use of chemical fertilizers and pesticides
	Livelihood system	
Rainfed rice	Low and unstable yields, traditional glutinous varieties, limited use of chemical fertilizer, hand tillers used for plowing	Higher and more stable yields, improved glutinous and non-glutinous varieties, increased use of chemical fertilizer and pesticides, mechanization of all steps of cultivation, supplementary irrigation
Cash crops	Low-value kenaf and cassava in upland fields	High-value sugarcane, rubber, and specialty crops in upland fields, gardens, and upper paddy fields
Wild products	Heavy reliance on edible wild plants and animals collected from forests, water bodies, fields	Decreased reliance on wild products, specialization in collection for urban markets
Local off-farm employment	Very limited	More than half of household income obtained from off-farm sources
Extra-local off-farm employment	Short-term circular migrants bring back savings to improve living standard of rural households.	Long-term migrants send back remittances to help support rural households and invest in agricultural production
Emergency welfare assistance	Reliance on help from kin and neighbors in village	Reliance on help from extended extra-local social networks and government agencies
	Social system	
Demography	Young population with low dependency ratio	Aging population with high dependency ratio
Family structure	Nuclear households are dominant form.	Increased number of skipped generation and truncated households
Cultural values	Shared poverty within village community. Limited aspirations for upward social mobility. Low value placed on formal education. Children expected to become farmers like parents.	Individualistic struggle for wealth. Greatly expanded aspirations for upward mobility with formal education of children seen as main means for improving status. Children expected to obtain jobs in urban centers.
Equitability	Relatively little economic differentiation among households. Most households own sufficient land to meet subsistence needs.	Increasing economic differentiation with a few wealthy households owning large land areas and the majority of poorer households having insufficient land to meet needs
Solidarity	Numerous local-level institutions (temple, formal and informal social groups, labor exchanges, food-sharing with kin and neighbors) bind together village households.	Declining role of local-level integrative institutions and growing importance of incorporation of individual households into extra-local social networks
Autonomy	Households capable of meeting most subsistence needs from local resource base with limited dependency on inputs from extra-local sources	Households heavily dependent on extra-local sources of income, production inputs, and information

transformational models: Key changes in agricultural technology include the widespread adoption of the RD6 glutinous rice variety, which replaced the many hundreds of traditional varieties previously planted in the region (Trébuil and Hossain 2004; Rambo 2006). The adoption of motorized hand tillers allowed preparation of land for planting without having to wait for water to accumulate in the fields. This, together with the use of diesel pumps to provide supplementary irrigation using water from newly dug farm ponds, helped to stabilize rice yields in years of low rainfall. Thus, the adoption of RD6 combined with mechanization of cultivation and small-scale supplementary irrigation has largely solved the problem of rural food security while allowing farmers to plant a larger share of their land to non-glutinous KDML105; the latter is raised as a cash crop, providing rural households with a new source of income. Sale of non-glutinous rice to the market is now the largest single source of agricultural income of farm households (Grandstaff *et al.* 2008).

Agricultural intensification, diversification, and specialization have begun to occur to an extent unimaginable just a few years ago. Relying on remittances sent back to their families by migrant workers as well as cash earned by engaging in off-farm employment in new factories and service jobs in local urban centers, Isan farmers have been rapidly adopting modern agricultural technology, including new varieties, chemical fertilizers, and farm machinery. Multiple cropping and specialized growing of high-value crops to supply urban markets are also now common, further helping to raise farm incomes (Arunee and Rambo, Chalee *et al.*, and Sorat *et al.*, this issue). It can be argued that a new pattern of adaptation is emerging as a central feature of this agrarian transformation (Grandstaff *et al.* 2008). Households continue to rely on a diversified livelihood portfolio but one that is increasingly based on agricultural intensification, diversification, specialized production of cash crops (e.g., rubber, high-value niche crops) and livestock, increased dependence on off-farm employment as the main source of income, and growing dependence on extra-local social networks and government assistance to provide a safety net to make up for weakening village solidarity (Rigg and Salamanca 2009). As also seems to be the case in Northern Thailand (Walker 2012), the rural social system has been undergoing rapid change, with declining rates of poverty, increasing levels of economic differentiation, improving levels of education, declining community solidarity, and ever-deepening integration with national and global social and economic systems (Barnaud *et al.* 2006; Keyes 2011; 2014).

The ongoing agrarian transformation involves every dimension of rural existence, including demography (out-migration, declining fertility, population aging), social organization (increased economic stratification, emergence of new types of household structures, expansion of extra-local social networks, weakening of village solidarity), culture

(erosion of indigenous knowledge base, adoption of cosmopolitan cultural patterns), health (increased prevalence of obesity and diabetes, drug addiction, and alcoholism), education (raising of age of mandatory schooling, increased valuation of education as a route to upward mobility), employment (scarcity of agricultural labor, off-farm employment as main source of income), to mention only some of the most evident types of change.

Despite the magnitude of these and other changes, and the major implications they have for agricultural and rural development policy making, there has been relatively little systemic research on the agrarian transformation of Northeast Thailand. However, there have been numerous more narrowly focused studies by both Thai and foreign scholars, including those contributing papers to this special issue, on a wide variety of specific aspects of Isan's changing agrarian system. These studies provide many of the pieces needed to assemble a more comprehensive model of the agrarian transformation, but so far no one has attempted to put them all together. Therefore, in this paper I will review recent research, much of it done by faculty members and graduate students in the Program on System Approaches in Agriculture of Khon Kaen University, on the following key dimensions of the agrarian transformation: (1) agricultural intensification, diversification, and specialization; (2) technological change and the continuing role of traditional technology in rural life; (3) the epidemiological transition and changes in health and disease risks; and (4) social system changes, including in the nature of rural-urban interactions, population structure, household composition and livelihood systems, community social organization, and cultural values and aspirations. The objective of this review paper is to present a broad overview of some of the main characteristics of the agrarian transformation in Northeast Thailand.

Agricultural Intensification, Diversification, and Specialization

In the past, growing rainfed glutinous rice was the main agricultural activity in most of the Northeast. A single crop was grown in the rainy season from June to October, with the paddy fields lying fallow for the rest of the year and serving only as pasture for livestock and as the source of some wild foods (e.g., snails, edible insects, wild vegetables) consumed by the villagers. The yield of rice was generally low, less than 1.5 t/ha, which kept many small farmers trapped in poverty (KKU-Ford Cropping System Project 1982). Intensifying rice production and engaging in multiple-cropping before or after rice, diversifying from glutinous rice into other, more profitable crops, and shifting to growing high-value specialty crops (e.g., vegetables, fruit) have all been proposed by development specialists as ways to overcome the intrinsic constraints on the productivity of rainfed

rice agriculture. Until recently, few farmers in the Northeast adopted such strategies. In the past two decades, however, many farmers have begun to intensify their rice growing, do multiple-cropping of alternative crops before or after rice, replace rice with higher-value crops, and plant high-value specialty crops.

Intensification of Rice Production

Historically, rice production in the Northeast was increased entirely through extensification—the bringing of new land into cultivation on the forest frontier (Fukui 1993). It was this gradual expansion in the area planted to rice, rather than intensification of production on existing fields, that accounted for virtually all of the increase in the total quantity of grain produced in the region until the mid-1990s. Even after the construction of new paddy fields ceased at the end of the 1980s, the total rice production of the region continued to rise as the result of intensification, with average yields increasing from around 1.6 t/ha in 1995 to almost 2 t/ha by 2005 (Grandstaff *et al.* 2008, 323, Fig. 4C). It has been suggested by Grandstaff *et al.* (2008) that it was the widespread adoption of the RD6 rice variety beginning in the late 1980s that triggered the intensification of rainfed rice production in the Northeast. In their view it led to a cascading series of self-amplifying changes in the entire agricultural system (Fig. 1). Following the widespread adoption of RD6, average rice yields increased because of the much heavier application of chemical fertilizers and pesticides by the farmers and the widespread adoption of diesel pumps to provide supplementary irrigation during dry spells. Farmers were willing to use expensive inputs because thanks to these new technologies the year-to-year stability of rice production greatly increased. For example, in Don Daeng village, yields in the 1980s varied from a low of 367 kg/ha in 1982 to a high of 1,967 kg/ha in 1983, whereas in the early years of the twenty-first century the amount of annual variation had fallen to less than 100 kg/ha (K. Watanabe, this issue).

Digging of farm ponds, which permitted small-scale supplemental irrigation using pumps, and consolidation of paddy fields into larger units were important factors contributing to this increased yield stability. Although digging of community ponds was undertaken as part of the military-initiated Green Isan rural development program in the 1980s, it was only in the 1990s that individual farmers began to dig their own ponds near their paddy fields. By the end of the decade there were 65,000 farm ponds in the Northeast (Sawaeng and Nongluck 2002), a number that the government planned to increase by 450,000 by supporting farmers with a revolving loan fund launched in 2004. The ponds contributed to stabilization of rice yields because their water could be used to keep the rice plants alive during the periods of drought that often occurred in the middle of the rainy season. They also contributed to diversification of agriculture since the water could

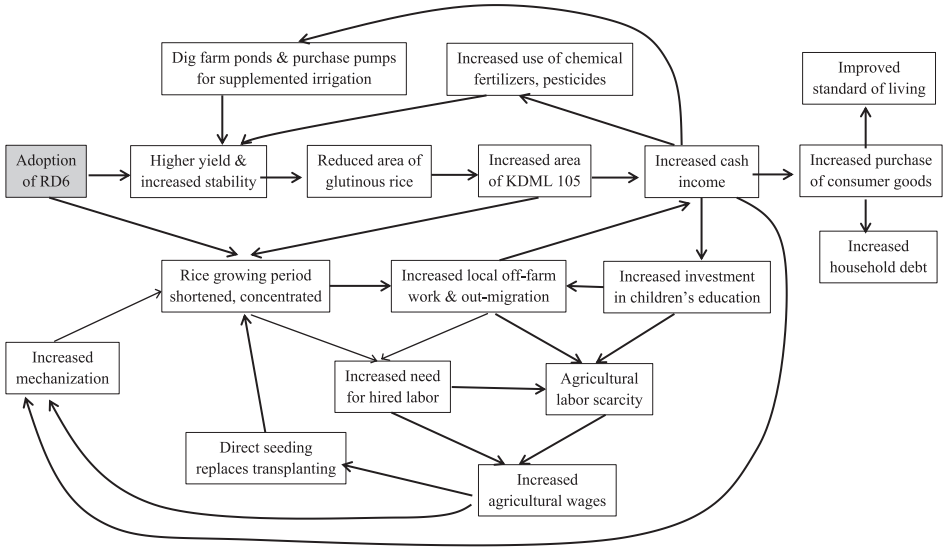

Fig. 1 Adoption of RD6 and Consequent Changes in the Agrarian System of Northeast Thailand
Source: Based on information in Grandstaff *et al.* (2008).

be used to grow dry season vegetables as well as support the rearing of fish and livestock (Ando 2003; Penning de Vries and Sawaeng 2010). Consolidation of small paddy fields into larger units has been occurring in many villages since the 1990s. Thus, in Don Daeng village near Khon Kaen city, the number of rice fields declined by one-third but the area of individual plots increased by three times between 1981 and 2005. Heavy machinery was used to level the land in these larger fields, which improved water control and increased the stability of production (K. Watanabe, this issue).

With less fear of crop failure and higher average yields, farmers reduced the area planted to glutinous rice raised for home consumption and increased the area planted to KDML105 (jasmine rice), which has become a major source of cash income (Grandstaff *et al.* 2008). Since both RD6 and KDML105 are medium-duration and photoperiod-sensitive varieties, the length of time from planting to harvest has been shortened compared to the traditional late varieties that were dominant before, and the labor-intensive cultivation operations of field preparation, rice planting, and harvesting have been concentrated into relatively brief and predictable periods. Use of hand tractors to plow the fields, adoption of broadcast seeding, and employment of combine harvesters also decreased the amount of human labor time needed to grow rice. These changes allowed farmers to spend more time doing local off-farm jobs or to engage in short-term migration to other areas to seek employment. Increased household income gained from the sale

of non-glutinous rice and off-farm wages and remittances from migrants was used to buy fertilizer, hire wage laborers, and buy or hire agricultural machinery to replace increasingly scarce and expensive agricultural labor. Rural households also began to invest more in educating their children, which increased their propensity to leave the villages to seek employment in urban centers, further worsening the shortage of farm labor in the countryside. But remittances sent back to their families by migrant children increased household income, permitting the purchase of more expensive consumer goods. This improved the quality of life in the villages but also led to increased indebtedness of many rural households. A survey of more than 2,000 rural households in Buri Ram, Ubon Ratchathani, and Nakhon Phanom Provinces found that 81% were in debt in 2010, with the average amount of debt equal to one-half of annual income (Chichaibelu and Waibel 2012, 3, Table 2).

Interestingly, households that diversified their farming systems to include crops other than rice, especially cash crops, were found to be less likely to have migrant members than households that grew only rice. This was presumably because crop diversification reduces the risk of crop failure and cash crops provide locally earned income, thus decreasing the need to rely on remittances (Piotrowski *et al.* 2013).

Multiple Cropping in Paddy Fields before or after Rice

Multiple cropping by planting alternative crops before or after rice has often been suggested as a way to increase productivity and boost rural incomes. In past years, numerous experiments and field trials to test different multiple cropping systems were carried out by Khon Kaen University (KKU) researchers, but although they were often agronomically successful, farmers failed to adopt these systems because of a lack of markets for their produce and low economic returns (Terd *et al.* 1976a; 1976b; 1978a; 1978b). However, in recent years, growing of catch crops after the rice harvest has become much more widespread in the Northeast and farmers are employing a variety of locally developed multiple cropping systems (Anan 2001; Prapatsorn and Wareerat 2010; Thongkamkaew *et al.* 2010; Patcharaporn and Orawan 2011). A survey carried out in 2012–13 found that multiple cropping after rice was practiced in 90% of the 198 subdistricts in Khon Kaen Province. The land area used for multiple cropping was relatively small, only 3% of the total paddy area, but the practice was carried out by 11% of all rainfed rice farmers (Arunee and Rambo, this issue). Most of the multiple cropped area is devoted to low-value field crops (e.g., cassava, sunn hemp), but in areas with favorable soil and water conditions, higher-value vegetables are planted. For example, in Lad Na Piang village, Mueang District, Khon Kaen Province, many farmers grow hybrid tomatoes after rice under contract to seed companies (Chalee *et al.*, this issue). Growing hybrid

tomato seed can generate as much as USD50,000/ha compared to a value of less than USD1,000 for rice grown in the first crop. Of course, growing tomatoes for seed is extremely labor intensive, so in actuality, individual farmers cultivate only small plots that generate only a few thousand dollars of extra income. Despite the evident benefits of multiple cropping, however, only some farmers in some areas engage in such intensification—for reasons that remain poorly understood.

Replacement of Rice with Higher-Value Crops

In some areas, especially on land along the banks of the Mekong River in Nong Khai and Nakhon Phanom, farmers have converted upper paddy fields to rubber plantations because rubber produces much higher net value per hectare than rice (Sorat *et al.*, this issue). Recently, however, since the price of rubber went into steep decline, some of these farmers have begun to replace their rubber trees with oil palms, although the expansion of oil palm plantations is presently limited by the lack of processing facilities. In other areas, such as the village in Khon Kaen Province studied by M. Watanabe *et al.* (this issue), farmers have begun to plant sugarcane in lower paddy fields in place of rice. Thai Vietnamese farmers in a village in Nakhon Phanom have recently stopped growing rice in their paddy fields in order to concentrate limited household labor supplies on growing vegetables in the gardens around their houses, which gives much higher returns per labor hour than rice cultivation. The paddy fields are either rented out to Thai neighbors or left fallow (Nguyen Dang Hoc *et al.* 2016).

Diversifying Production into Higher-Value Specialty Crops

In many parts of the Northeast, farmers have shifted from growing cassava and sugarcane to rubber, which is favored because it generates high incomes (Patarapong *et al.* 2011). In locations with favorable soil and water conditions along with good market access, farmers have been diversifying their production by raising high-value specialty cash crops such as vegetables, fruit, and flowers along with fish and livestock. Examples of successful adoption of high-value specialty crops are Chinese radish cultivation in Nong-Ngong village, Baanhad District (Patcharaporn and Orawan 2011) and growing of organic vegetables in Samsung village in Khon Kaen Province to sell to urban consumers seeking pesticide-free food (Mondal *et al.* 2014). An analysis of data collected in 1995–96 from 174 randomly sampled non-irrigated farms in 49 subdistricts in Khon Kaen Province found that 37% cultivated only rice and/or field crops while 63% practiced more diversified agriculture that combined rice and field crops with horticulture and/or livestock rearing. The agricultural income of the most highly diversified farms, which combined cultivation of rice, field crops, vegetables, and fruit and in some cases livestock rearing,

was 60% higher than the average for all farms in the sample, even though the size of their landholdings was much smaller than the average (Caldwell *et al.* 2007).

In mountain areas in the Northeast, especially in Loei and Nakhon Ratchasima Provinces, farmers are engaging in "value intensification" by switching from growing low-value rice and field crops to planting higher-value specialty crops such as grapes, strawberries, temperate vegetables, and flowers. Integration of such specialty agriculture with tourism ("agro-tourism") appears to be a successful form of value intensification in scenic mountainous areas, notably in Phu Ruea District in Loei Province, which specializes in temperate flowers and mushrooms, and Wang Nam Kieo District in Nakhon Ratchasima, which specializes in grapes and temperate vegetables grown in direct association with tourist resorts, homestays, and restaurants (Sukanlaya *et al.* 2014; 2016). The limiting factors on the adoption of high-value specialized cropping systems and agro-tourism are not yet well understood, however, so the potential for wider expansion of these systems remains uncertain.

An interesting characteristic of specialty crop production in the Northeast is the apparent tendency for each of these different crops to be geographically clustered into one or a few centers of production rather than being randomly dispersed in villages across the whole region. For example, growing of hybrid tomatoes under contract to seed companies is concentrated in only a few small clusters (Chalee *et al.*, this issue). In some cases, such as growing of temperate flowers or vegetables in the mountains, this clustering may reflect environmental constraints that limit the spread of these crops to small areas with suitable soils and temperatures and good road connections to markets (Sukanlaya *et al.* 2014). In other cases, however, clustering seems to be primarily a reflection of historical accident. For example, a single farmer first began growing jujube fruit (*Ziziphus mauritiana* Lam.) about 15 years ago in Ban Meng Subdistrict, Nong Ruea District, Khon Kaen Province. Now, jujube is grown by 13 households in five villages in this subdistrict. However, because growing jujube requires a substantial initial capital investment, an adequate water supply, use of expensive inputs including fertilizers, hormones, pesticides, and hired labor, and learning of specialized skills by farmers, only wealthier farmers with suitable land can adopt this high-value crop (Waewdaw *et al.* 2013). Mushroom growing is another highly profitable specialty that requires start-up capital and learning of special skills. A successful mushroom farmer whom my students and I interviewed in Phu Ruea District in Loei Province in September 2014 said that he first learned to grow mushrooms from an aunt who had mastered the specialized skill to produce the spores. Now a dozen farm households in the same village, all closely related by kinship, grow this highly profitable crop. They all still obtain the spores from their kinswoman who initiated mushroom production in the village.

Technological Change and the Continuing Role of Traditional Agricultural Technology

In recent years, Northeastern Thai farmers have adopted new technologies at an ever-accelerating rate. Two-wheel hand tillers displaced buffalo for plowing in the 1980s and 1990s and are now in turn being displaced by four-wheel tractors. Improved rice varieties, notably RD6 and KDML105, have replaced thousands of traditional local varieties (Trébuil and Hossain 2004; Rambo 2006), while use of chemical fertilizers and pesticides has increased exponentially. So it is evident that Isan farmers are not innately conservative or resistant to change. However, while quick to adopt useful new technology, they have not mindlessly discarded all traditional technology. Instead, they appear to have selectively retained traditional technologies that are effective and serve their needs, often at lower cost than newer methods. Like farmers everywhere in the world, Isan farmers have developed a valuable pool of local knowledge and indigenous technology that they rely on to ensure their survival (Rambo 2009). For example, they have an elaborate body of knowledge about rainfall prediction (Nongluck and Wilaiwat 1987) and also know about a number of methods to maintain soil fertility using locally available resources (Craig 1988). Traditional technologies that continue to play important roles in the livelihoods of Isan villagers include collecting wild resources, growing home gardens, maintaining trees in paddy fields, using cross-stream earthen weirs (*tham nop*) for irrigation, and relying on charcoal and other biofuels for household cooking.

Mechanization

It had long been assumed that mechanization of rainfed rice farming in the Northeast was unlikely to occur rapidly or proceed very far. Adoption of modern machinery was constrained by the subsistence orientation, low productivity, and abundance of cheap labor that characterized traditional farming. In recent years, however, mechanization of rice agriculture in the Northeast has been occurring at an ever-accelerating rate. Adoption has been spurred by the growing shortage of agricultural labor and consequent increases in the cost of hiring workers. Beginning in the 1980s, two-wheel hand tillers began to replace buffalo for plowing. In 1983 there were only a few thousand hand tillers in use in the Northeast, but by 2003 there were 1.25 million of these machines, which are now in turn being displaced by four-wheel tractors. In the 1990s, combine harvesters began to replace harvesting by hand. In 1993 only 1% of households used these machines, but by 2003 they were employed by 14% of farm households (Grandstaff *et al.* 2008, 336, Table 10C). In Tung Kula Rong Hai, most farmers now rent the services of combine harvesters to harvest their rice. The main exceptions are those farmers who raise a lot

of livestock and need good-quality straw to use as fodder. The machines cut the straw into short pieces, which are not suitable for use as fodder—so these farmers continue to do hand harvesting (Sorat *et al.* 2009; 2010). In recent years, farmers in irrigated areas have begun adopting transplanting machines. Some landowners even make contracts with machine operators to carry out virtually the entire process of rice cultivation, from plowing to transplanting to harvesting. Extensive use of farm machines considerably reduces production costs: A study of farm mechanization in Kok-Si Subdistrict, Mueang District, Khon Kaen Province found that the cost of production of rice for farmers using four-wheel tractors, transplanting machines, mechanical pesticide sprayers, and combine harvesters was 9.4 baht/kg compared to 11.4 baht/kg for farmers relying on two-wheel hand tillers for plowing and human labor for other tasks (Atthasat and Suchint 2014b). Farmers say that four-wheel tractors are superior to hand tillers for plowing paddy and sugarcane fields and for land leveling. The working speed of four-wheel tractors is much faster than that of hand tillers: a four-wheel tractor can plow 3.6 rai/hour compared to 0.31 rai/hour for a hand tiller (Atthasat and Suchint 2014a). Hand tillers are now mostly used to prepare the land to plant cassava as an intercrop between young rubber trees, as mobile water pumps, and to pull small carts (Atthasat and Suchint 2013).

A number of interacting factors appear to be driving the process of mechanization, including a shift from subsistence production of glutinous rice for home consumption to the production of non-glutinous rice for sale to the market; higher prices for rice due to government support programs; the out-migration of workers seeking jobs in urban centers and the movement of rural laborers into non-agricultural employment with a consequent sharp decline in the size of the agricultural labor pool and a steep rise in wages paid for farm work; the decline in use of labor exchange arrangements among neighbors; and the increased access of farm households to capital due to the cash remittances they receive from members engaged in off-farm employment (Grandstaff *et al.* 2008). Interestingly, in a village close to the Mekong River border with Laos, farmers hire cheap Lao migrant laborers and thus avoid the need to invest in mechanization (Soimart 2014).

Many village households have also invested in purchasing motor vehicles. Motorbikes have become virtually a necessity of life in the countryside, while better-off households often own pickup trucks, which they use for personal transportation and also to earn income by hauling their neighbors' crops to market. A longitudinal survey of investments over a three-year period by more than 2,000 households in three provinces in the Northeast found that while only 28% made any investments related to agricultural inputs, purchase of transport and farm machinery accounted for one-third of their investments (Hohfeld and Waibel 2013). The wealthy entrepreneurial farm households in Ban Hin

Lad village in Khon Kaen Province studied by Barnaud *et al.* (2006) derived a considerable share of their income from hiring out their trucks to neighbors to transport their crops to market.

The Role of Wild Resources in Rural Household Livelihood Systems

Wild products collected from forests, farm fields, and aquatic systems have traditionally played an important role in the livelihoods of Isan villagers (Prapimporn *et al.* 1988; 1998; Moreno-Black and Prapimporn 2000). However, ongoing changes in agricultural systems are having important impacts on the biodiversity of wild plant and animal species. Adoption of new technology (e.g., irrigation, mechanization, intensification) may directly affect populations of useful wild species in the fields, as in the case of trees being cut down in paddy fields converted to growing sugarcane described in the paper by M. Watanabe *et al.* in this issue. Changes in family structure as well as agricultural activities also affect the availability of household labor and increase the opportunity cost of collecting wild products. Those households enjoying increased cash incomes are able to purchase commercial substitutes in place of spending time collecting wild species, whereas poorer households with limited land resources may be becoming even more reliant on wild products to survive. At the same time, the expansion of urban markets has created new incentives for rural people to engage in collection of high-value wild products and to bring formerly wild species into domesticated status (Shirai and Rambo 2008; 2014).

Home Garden Agroecosystems

Although cultivation of home gardens to provide vegetables, fruit, medicinal plants, and other useful products is a widespread practice in Northeast Thailand (Grandstaff 1988; Rambo 1991), this indigenous technology has received little attention from researchers, and even basic descriptions of the structure and species composition of the gardens are unavailable. However, a recent survey of seven ethnic groups (Phu Thai, Kalaeng, Lao, Yoy, Nyaw, So, and Vietnamese) in the Sakon Nakhon Basin found that the gardens of each group had a distinctive overall structural pattern and no two groups had identical modal patterns (Pijika 2014; Pijika and Rambo 2015). However, the gardens of all the Tai-speaking groups except the Phu Thai share a common overall plan in that a wide variety of different species are interplanted in an essentially random pattern with irregular and ill-defined boundaries. In the case of the Phu Thai, traditional species are still planted in this pattern but temperate vegetables grown for sale are planted as monocultures in rectangular plots that resemble those of Thai Vietnamese market gardeners (Pijika 2014; Pijika and Rambo 2015; Nguyen Dang Hoc *et al.* 2016). That the different groups largely retain their own distinctive garden structures while changing so many

other aspects of their agricultural system raises interesting—but currently unanswerable—questions about the interplay between economic and cultural factors in the rural development process (Pijika and Rambo 2015).

Trees in Paddy Fields

The northeastern region is well known for its unique "trees in paddy fields" agroecosystem. This is a locally evolved system in which farmers deliberately retain numerous large trees in their rice fields (Pendleton 1943). Shading reduces rice yields to some extent under the tree canopies, but the improvement of soil fertility resulting from the recycling of tree leaf litter increases the overall yield of the field. In addition, the trees provide many valuable benefits to farmers (e.g., firewood, fruit, shade for people and livestock) (Patma 1993). In recent years, however, the density of trees in the paddy fields appears to be declining, especially in the northern central provinces (Khon Kaen, Udon Thani, Nong Khai) of the northeastern region (Watanabe *et al.* 2014). In part this decline is simply the consequence of the length of time since fields were originally reclaimed from the forest, with older fields having fewer trees. But the rate of decline may have accelerated lately because farmers are cutting down trees that present obstacles to the efficient use of tractors and combine harvesters. Trees are being cut down also because shading reduces yields of sugarcane, which in some villages is being planted in lower paddy fields in place of rice because of its much higher profitability (M. Watanabe *et al.*, this issue). However, in other villages farmers are increasing the number of trees in their rice fields by planting rows of eucalyptus trees on the paddy bunds. The Double A paper company even promotes its Khan Na brand of copier paper as being an environmentally friendly product because it is made, at least in part, from eucalyptus trees grown on paddy bunds.

Traditional Irrigation Technologies

Construction by Isan villagers of earthen dams (*tham nop*) across streams to raise the water level high enough to overflow the stream banks and spread across the paddy fields to irrigate the rice is a well-developed indigenous technology. Although many *tham nop* have fallen into disuse in recent years, or been replaced with concrete weirs, this technology is still employed in some areas (Fukui and Chumphon 1998; Fukui *et al.* 2000). A recent study of the factors influencing abandonment or retention of this type of traditional irrigation found that this system persists in areas where: (1) the topography is favorable for distributing the water to a wide area so that many farmers benefit from it; (2) the *tham nop* are reinforced with bamboo to make them more durable and less likely to break during floods; and (3) farmers have greater dependency on rice and lower dependency

on upland crops for their livelihoods so are willing to invest more effort in maintaining the weirs. Factors leading to abandonment of *tham nop* irrigation include: (1) frequent failure of the structure, requiring extensive repair work by the farmers; (2) poor distribution of water to the paddy fields, causing losses in the harvest due to prolonged flooding; and (3) government projects to replace the earthen weirs with concrete weirs and canals (Prapatsorn 2014). Adoption of mechanized plowing and direct seeding in place of transplanting have also reduced the need to have the paddies flooded at the beginning of the cropping season, which decreases the value of the *tham nop*.

Irrigation using locally constructed waterwheels, although never widespread in the Northeast, was formerly common in villages located near mountains with swift-flowing streams in Chaiyaphum, Loei, and Nakhon Ratchasima Provinces. At present, there are only about a dozen waterwheels still in use in Mueang District of Chaiyaphum Province. A comparative cost-benefit analysis found that irrigation using the waterwheels was four to five times cheaper than using mechanical pumps. However, the initial investment to construct new wheels was large, and maintenance required considerable attention from owners (Wichian 2008).

Reliance on Charcoal for Cooking

Despite the ready availability of alternative fuels in the form of electricity and bottled gas, charcoal is still the preferred fuel for cooking many foods, even in urban areas. A comparative study of biomass energy (firewood and charcoal) use in rural, suburban, and urban communities in Khon Kaen Province found that the quantity of biomass energy used per household was 21.7 GJ/yr in rural villages, 18.6 GJ/yr in suburban communities, but only 5.4 GJ/yr in urban settlements. Thus, even though urban households make much greater use of electricity and gas than do suburban and rural households, they still continue to use charcoal at one-third the level per capita compared to rural households (Analaya *et al.* 2011). Much of the demand for charcoal from rural and urban consumers is met by small-scale traditional earthen kilns operated by individual farmers or groups of farmers using a variety of local materials to convert into low-quality charcoal.

The Epidemiological Transition and Changes in Health and Disease Problems

The rural population in the Northeast is in the midst of an "epidemiological transition" (Pattanee 2013), in which traditional diseases and health problems such as malnutrition, anemia, and goiter are gradually declining but modern diseases and health problems such as obesity, type II diabetes, and alcoholism and drug addiction as well as traffic deaths

and injuries are rapidly increasing.

One traditional disease that shows no sign of declining is liver cancer resulting from the long-established custom of Isan villagers eating raw fish. This practice is a major source of infection with liver flukes (*Opithorchis viverrini*). In 2004 death from liver cancer and cholangiocarcinoma ranked fourth after HIV/AIDS, stroke, and traffic accidents as a cause of mortality in Thailand. The prevalence of liver flukes in the Northeast was much higher (18.6%) than the national average (8.7%) (Wongba *et al.* 2011).

Many other traditional diseases, however, are in decline. Malnutrition, which was widespread in the 1980s, with close to half of school-age children in the Northeast classified as having protein-energy malnutrition, has declined rapidly (Pattanee 2013). However, specific nutrient deficiencies, especially those associated with anemia, remain common, reflecting inadequate intakes of iron and vitamin A in the diet as well as the prevalence of abnormal hemoglobins—e.g., thalassemia and hemoglobin E—in the Isan population. A study of a large sample of primary school children from poor farm households in Ubol Ratchathani Province found that 31% had anemia (Thurlow *et al.* 2005), while another study of teenagers in Mukdahan and Roi Et Provinces found that 21% and 17% of individuals in the respective provinces had anemia (Anupong *et al.* 2011). A study found that 77% of elderly people in a village in Northeast Thailand had anemia compared to only 14% in a city in Japan (Ishine *et al.* 2006). High levels of zinc deficiency have also been reported for rural Northeasterners, with as many as two-thirds of schoolchildren tested having this deficiency, reflecting the low amount of this element present in glutinous rice grown in the zinc-deficient soils in the region (Woravimol *et al.* 2006; Thurlow *et al.* 2006). It has been suggested that application of zinc fertilizers to paddy fields could solve this problem (Gibson *et al.* 2007).

While malnutrition and the incidence of underweight and stunted children have greatly declined over the past 20 years, recent changes in diet and exercise levels have led to an explosion of the obesity rate in Northeast Thailand. A diet that formerly contained only small amounts of fats and sugar has been transformed by greatly increased consumption of fast foods by villagers. Village shops sell many high-calorie packaged snacks and soft drinks. Recently, when visiting in a village in Khon Kaen Province I observed three shops selling slices of white bread spread with margarine and jam as snacks. At the same time as consumption of calories is rising, energy expenditure in farm labor is declining as machines replace human muscle power in many operations. Instead of walking, villagers now use motorbikes to visit neighbors' houses, even those close by. Children spend much more time sitting in school and watching TV or playing computer games and less time helping their parents doing chores than in the past. Thus, it is hardly surprising that a survey of 12- to 18-year-old students in secondary schools

in Khon Kaen Municipality found that 5.3% were overweight and 13.7% were obese (Phouvang *et al.* 2010), while another survey of a large sample of grade 6 children in primary schools in a district in Sakon Nakhon Province found that 9% were overweight and 9% were obese (Pipop *et al.* 2005, 830, Table 2).

Associated with the increase in the number of overweight people is a rapid increase in the incidence of diabetes mellitus. A recent study comparing the health of elderly people in Northeast Thailand and Japan found much higher rates of glucose intolerance, which is an indicator of diabetic tendencies, in old people living in both urban (38.3%) and rural (34.3%) communities in Thailand than in Japan (4.4%) (Ishine *et al.* 2006). A study of diabetics receiving treatment at a district hospital in Sakon Nakhon Province found that 60% were in the 45–64-year age group and that the direct and indirect costs of caring for these patients were high, averaging USD881/year in 2008, which was 21% of the average per capita GDP of the country (Chatterjee *et al.* 2011). One factor that may contribute to the high incidence of diabetes among Isan villagers is their traditional preference for eating glutinous rice, which has a much higher glycemic index (144) than ordinary long-grain non-glutinous rice (91) (Ranawana *et al.* 2009, 104, Table 4).

The great increase in average life span and the consequent increase in the number of elderly people is changing the health profile of both urban and rural Northeasterners and presenting the public health system with new challenges that it is not fully prepared to meet. Problems associated with menopause and andropause, and a whole range of diseases associated with old age, including the need for specialized care institutions for the elderly who lack family support, will become more important in the next decade.

Other "modern" health problems that have become more prevalent in recent years include alcoholism, drug addiction, and traffic-related deaths and injuries. The Northeast reportedly has the highest number of drug users in the country (Somjit *et al.* 2005). In 2000 there were an estimated 600,000 drug users in the region, including 200,000 school-children. Methamphetamines (*yaa ba*) and marijuana were the most commonly used substances (Office of the Narcotics Control Board 2003). Excessive consumption of alcohol is favored by permissive Isan social norms, which see drinking as part of everyday life. Consumption is common at village social events and festivals, where alcohol is believed to help people feel happy and have a good time. A study in one village near Khon Kaen city found that 90% of males drank alcohol at least once a year, with more than half drinking at least one or two times a week. Females drank at a lower rate, with 40% of adult women drinking alcohol at least once a year. Most women were only occasional drinkers (Jirawat and Siriporn 2012).

Ownership of motor vehicles in Thailand has increased greatly in the past decade. There are 12 million registered motor vehicles in the kingdom, mostly motorcycles,

of which 3.5 million are newly registered (Ministry of Transport Information and Communication Technology Centre 2013). Not surprisingly, there is a high level of accidental deaths and injuries caused by motor vehicles. There are 13,000 deaths and more than one million injuries annually, with several hundred thousand people disabled. Eighty percent of fatalities are male (Wattanavadee *et al.* 2013). In Khon Kaen Province in 1999, the death rate was 26 per 100,000, with nearly 40% of road accidents involving drunk driving (Sirikul 2004). More recent data are unavailable, but if anything, the problem has worsened as more and more inexperienced drivers take to the road with minimal driving skills and knowledge of traffic rules.

Social System Changes

Along with changes in agriculture technology and practices, the agrarian transformation involves multiple changes in the Isan rural social system, including the nature of rural-urban interactions, population structure, household composition and livelihood systems, community social organization, cultural values, aspirations, and sense of identity.

Changes in the Nature of Rural-Urban Interactions

The tighter integration of rural villages into larger economic and social systems has led to a form of "rural urbanization," in which many goods and services that were formerly available only within large cities are now readily accessible within the villages. Shops modeled on 7-Eleven convenience stores are found in many villages, selling soft drinks and packaged snack foods. Extension of the coverage of mobile phone networks in Thailand has made telephone service available everywhere except in the remote mountains. Today, almost every villager in Isan has a mobile phone. One reason that villagers are willing to move out of the villages to live in isolated houses on their farms is because mobile phones allow them to stay in touch with friends and neighbors and receive notification of parties and social events organized within the village (Patarapong 2010).

At the same time as their villages are urbanizing, rural people are developing closer relations with regional cities, which play an ever-increasing role in their lives. Until recently, cities in the Northeast were quite small and had a relatively limited influence on agricultural activity in their hinterlands. In recent years, however, there has been rapid growth of urban populations and expansion of urban settlements into the surrounding countryside. Urban sprawl is causing changes in land use in the peri-urban zone surrounding the cities (Sorat *et al.*, this issue). Expansion of the area of urban settlement is pushing up the value of agricultural land in the peri-urban zone, leading many farmers

to sell their land to developers for quick profits (Rigg and Ritchie 2002). Some invest their capital by buying land farther away from the city, where they continue farming; but others spend the windfall on immediate consumption and end up as landless laborers. Much of the land held by commercial developers lies unused or is planted to eucalyptus trees while the developers wait for prices to rise before building new housing estates. The growth of the urban market also creates new opportunities for those peri-urban farmers who are able to switch from growing rice to producing high-value specialty crops (e.g., organic vegetables, flowers) and meat and dairy products desired by affluent city people (Shirai 2006). Urban demand for biomass fuels (firewood and charcoal) remains surprisingly high (Analaya *et al.* 2011), providing a valuable market for eucalyptus farmers and rural small-scale charcoal makers. Access to urban employment opportunities may also be facilitating the development of a new type of farm household that might be called "weekend farmers," i.e., rural households whose members work urban jobs on weekdays but carry out agricultural activities in the evenings and on holidays.

Population Structure, Household Composition, and Livelihood Systems

Thailand as a whole has already passed through the demographic transition from high birth and death rates to low birth and death rates. Consequently, the rate of population growth has slowed and the population is rapidly aging, with the share of children and young adults declining and the share of those over 60 growing. However, total fertility rates in the Northeast have fallen more slowly than in other regions. It has been suggested that this reflects the influence of rural household structure and agricultural employment on the risk that having children poses to the income-earning potential of young women of childbearing age. Skipped generation extended-type households allow young married females who migrate to work in Bangkok to still have children: the children are sent to live with their grandparents in the mothers' home villages in Isan, while the women can continue to engage in wage labor in the city (Shirai and Rambo, this issue). Women of childbearing age who remain in the villages can have children while continuing to earn income through agricultural work, which has more flexible hours than non-farm employment.

In the Northeast, the effects of changes in fertility and mortality on population structure have been accentuated by the high rate of out-migration. In 1986 one-quarter of rural households in the whole Northeast had at least one member working outside of their home subdistrict, a share that had increased to 35% by 1992 (Nagata 1996) and has now reached 50% or more. A recent survey of 61 sample households in Nong Ben village in Khon Kaen Province found that 57% of households had one or more migrant members (Shirai and Rambo, this issue). A survey of 22 villages in Nang Rong District in Buriram

Province found that in 2000 the migration prevalence rate ranged from 38% to 68% (Garip and Curran 2009). A longitudinal panel study of 509 individuals living in two villages in Mahasarakham Province in 1982–83 found that 49% of these individuals had moved away from their native villages by 2008, with the majority having relocated to other provinces (Rigg and Salamanca 2011). Migration has always been a common practice in the Northeast, both the movement of people from overpopulated villages to find new land on the forest frontier—the practice of *ha na di* described by Fukui Hayao (1993)—and seasonal migration of people to Bangkok to work as construction laborers or maids after the rice harvest and returning back to the villages in time to help plant the new crop at the start of the rainy season. Such seasonal migration is a long-established practice, with Robert Pendleton (1943) reporting that people from the Northeast walked down to the Central Plain to earn cash working in the rice harvest there, which did not begin until after the harvest in the Northeast was already finished. After the railroad reached Khorat around 1900, Isan farmers could also use the train to reach the Central Plain. Such seasonal migration greatly expanded after the construction of the Friendship Highway made travel to Bangkok much quicker and cheaper, at least for people living in areas close to the road. Migrants would leave their villages in the Northeast immediately after the end of the rice harvest in order to take temporary jobs as construction workers or maids in Bangkok, but then return to their villages in time to help their families plant the next crop at the start of the rainy season. Beginning in the late 1980s, however, there was a shift toward long-term migration, with migrants taking permanent jobs in factories in the Central Region and often returning to their home villages only for short visits at holidays, especially for the Thai New Year in April. Such long-term migrants rarely return home to help with the rice harvest, as was shown by a survey of migrants from Nang Rong District during the period 1984–94, which found that only 10% assisted with the harvest (Rindfuss *et al.* 2012, Table 1).

As a result of out-migration, the population of the northeastern region suffered a net loss of more than 900,000 people between 1985 and 2000 (Huguet and Aphichat 2011, 15, Table 1.9). Most of the long-term migrants were young adults, with a 2000 study in Nang Rong District finding that 87% of migrants were between the ages of 15 and 39 (Piotrowski 2009). The massive out-migration of young adults, combined with the increasing tendency of those who remain in the villages to work in nearby factories or service industries, has led to a severe agricultural labor shortage (Funahashi 1996). This has led to a rapid rise in wages for farm workers, which has been an incentive for farmers to adopt labor-saving machinery. It has also caused many farmers to shift from transplanting to broadcast seeding of rice (Pandey *et al.* 2012).

The agricultural labor force is also aging rapidly. The share of the population com-

posed of people over 60 years of age in the Northeast increased from just under 9% in 2000 to 12% in 2010, and is projected to reach 17% by 2020 and 20% by 2025 (Thuttai 2012, 161, Table 6.1). In many rural villages the population seems to be composed mostly of young children and their grandparents (Funahashi 1996; Aree *et al.* 2012; Shirai and Rambo, this issue), with the share of elderly people living in skipped generation and truncated households having increased from 22% in 1990 to 41% in 2007 (Thuttai 2012, 170, Table 6.3).

Given the shortage of younger adults, more than 40% of people over the age of 60 in the Northeast remain active in the labor force, mostly engaged in agriculture, compared to less than 20% in Bangkok (Fujioka and Sopon 2009). This is reflected in a major upward shift in the average age of Isan farmers. A longitudinal study of two villages in Mahasarakham Province found that the median age of farmers had increased from 35 in 1982 to 58 in 2008 (Rigg and Salamanca 2011). These demographic shifts are likely to have profound impacts on Isan agriculture. It has been suggested, for example, that elderly farmers are less likely than younger ones to adopt new technology, including new crop varieties and chemicals, which may serve to retard the pace of innovation in agriculture (Bryant and Gray 2005). On the other hand, because older people lack the physical strength to plow using two-wheel hand tillers, they are motivated to switch to using small four-wheel tractors themselves or contracting with tractor owners to do the plowing for them (Atthasat and Suchint 2013).

Demographic changes have been accompanied by changes in the structure of rural households (Shirai and Rambo, this issue). Although studies of village households in the 1960s found that the majority (>70%) were of the nuclear type (Lux 1962; Keyes 1975), a 2013 survey in Nong Ben village in Khon Kaen Province found that only 31% of households were nuclear (parents and children only), while 38% were extended, 11% were skipped generation extended (grandparents and grandchildren), and 19% were truncated-type households (elderly couples or individuals living alone) (Shirai and Rambo, this issue). These changes in household structure have a strong impact on the welfare of children and elderly people. Thus, a study of the nutritional status of children living in different types of households in two rural districts in Khon Kaen Province found that those living in nuclear households with both parents present fared best, while those living with their grandparents in skipped generation households fared less well, except in cases where the parents sent back remittances exceeding THB8,000/year. However, children living in extended households with both parents present also fared less well than those in nuclear households (Cameron and Lim 2007). Although the largest share of old people in the Northeast still live in extended-type households, where they can depend on the support of their adult children, two-fifths of the elderly are now living on their own

in skipped generation and truncated households (Thuttai 2012, 170, Table 6.3). A detailed study on the living arrangements of elderly people in Nang Rong District found that those living in households with migrants were more likely to live alone (Teeraphong 2001).

Accompanying changes in household composition are profound changes in sources of household income, including a growing share of income coming from non-agricultural sources. For the region as a whole, more than half of rural household income now comes from non-agricultural sources (Grandstaff *et al.* 2008; Rigg and Salamanca 2009). In Nong Ben village in Khon Kaen Province, in 2013 an average of 80% of household income came from non-agricultural sources, including local non-farm wage labor, government salaries, self-employment, government assistance, pensions, and remittances from migrant members (Shirai and Rambo, this issue). The greatly increased dependence of rural people, especially the elderly, on remittances sent back by migrants working in non-farm jobs outside of the region is noteworthy. Government statistical data show that the share of income from remittances increased in the Northeast from 3.8% in 1981 to 15.9% in 2004 (Grandstaff *et al.* 2008, 301–306). Although a national sample survey of internal migrants in 1992, of which the largest share were Northeasterners, found that only 27% sent remittances back to their families (average THB763/month) (Osaki 2003), another study on migrants from Nang Rong District found that 57% sent back money and 39% sent back in-kind goods (Rindfuss *et al.* 2012). A recent survey of rural households in Nong Ben village in Khon Kaen found that more than half received remittances. Skipped generation households (grandchildren living with their grandparents) had the highest share of receiving remittances (88.9%), followed by extended family households (65.2%) and truncated family households (60%), while only 31.6% of nuclear family households received remittances (Shirai and Rambo, this issue).

Also affecting rural livelihoods are changes in patterns of landownership. Although the majority of farm households in the Northeast still own their own land, with only a small proportion either renting land or working as sharecroppers, and concentration of landownership in the hands of a few large owners is not as advanced as in the rest of the country (Chai, this issue), the mean size of farms has declined over the past 30 years, falling from 4.5 ha in 1980 to 4.3 ha in 1990 and 3.6 ha in 2000. Surprisingly, however, the mean farm area per capita has remained almost the same as it was in the 1980s, reflecting the concurrent decline in average family size (Grandstaff *et al.* 2008, 320–321). There is great variation in the size of holdings farmed by rural households in the Northeast. Thirty percent of households have small holdings of less than 1.6 ha that occupy only 9% of the total agricultural area, and 60% have medium-sized holdings of 1.6 to 6.4 ha that occupy 60% of the total area. However, the 10% of households with farms larger than 6.4 ha occupy 32% of all agricultural land (Grandstaff *et al.* 2008). Few recent stud-

ies have been published on landholding patterns in specific villages, but a detailed investigation in Ban Hin Lad in Khon Kaen Province found that three-quarters of village households had very small farms of less than 2 ha, with less than 5% having large farms (Barnaud *et al.* 2006). Because the available data on landholding size include both paddy fields and upland crop fields, they provide only a crude indicator of the extent to which Isan households are able to be self-sufficient in rice production to meet their consumption needs; but it is evident that many households have too little land to provide a decent standard of living from agriculture alone.

Changes in Community Social Organization

The conventional view of rural villages in the Northeast is that they are cohesive moral communities with limited economic differentiation among households and a high level of solidarity based on kinship ties and participation in community social activities, often centered on the temple (Sukaesinee *et al.* 1988; Keyes 2014). Research in the 1980s in Ban Hin Lad in Khon Kaen Province found that villagers were linked together through participation in many different formal and informal associations and groups (Wilaiwat *et al.* 1986). Informal labor exchange groups played a critical role in agricultural activities at times of peak labor demand for rice transplanting and harvesting. Households that encountered short-term economic difficulties due to crop failure or illness could rely on their fellow villagers to assist them with gifts or loans of food (Rigg and Salamanca 2009). In recent years, however, village solidarity has declined markedly. Exchange labor has virtually disappeared, with farmers relying on hired workers to assist them at peak periods in the rice production cycle. Village households increasingly depend for social support on government assistance and their own extended extra-local networks and rely much less on assistance from neighbors or village welfare institutions (*ibid.*).

One major social change that may contribute to the decline in community solidarity is the increasing tendency for households to move out of densely populated nucleated villages to live independently on their own farmsteads, where they are quite isolated from neighbors. This type of relocation happens most frequently in villages with high population densities, where keeping of livestock in houses within the settlement is prohibited and social conflicts among neighbors are more likely to occur. Households that have moved to live on their farmsteads have more time to devote to agriculture, so they farm more intensively and practice better soil management than those who remain in the villages (Patarapong 2010). Another factor that has weakened community social solidarity is the massive out-migration of young adults to work in Bangkok, the Eastern Seaboard, and abroad. Although many migrants continue to provide assistance to their families remaining in the villages, and occasionally return for short visits, the horizontal

ties with other villagers in their own generation tend to atrophy since they are no longer continually reinforced by daily face-to-face interactions and joint participation in community activities and ritual affairs.

Cultural Values, Aspirations, and Sense of Identity

The prevalent image of Isan people in the Thai mass media is of tradition-bound, village-centered peasants having only limited involvement with or knowledge of the larger world (Keyes 2014), the Isan equivalent of American hillbillies or country bumpkins. This image is almost the opposite of reality. Rural people in Isan may well be the most dynamic and receptive to change of any people in the kingdom (Fukui Hayao, personal communication). Although often referred to in the social science literature as "peasants," the people of Isan were never fully incorporated into the absolutist Siamese "feudal" (*sak din na*) system. Instead, until the administrative reforms of Rama V in the 1890s, they had lived in relatively autonomous villages that were under the rule of local chiefs (*chao muang*) who had only limited coercive power to control the lives of their rural subjects (Keyes 2014). Consequently, Isan villagers never developed the social atomism and lack of individual initiative that characterized peasants in highly developed feudal societies in Europe (Banfield 1958), Mesoamerica (Foster 1965), or central Siam (Jit 2007).

Since the 1970s they have eagerly embraced globalization, both by finding employment in export-oriented factories in Bangkok and the east coast and by migrating in large numbers to live and work abroad. Isan laborers are employed in large numbers in construction, agriculture, and factory work in the Middle East, Taiwan, and South Korea. The Thai diaspora, mostly migrants from Isan, in the United States numbers over 300,000 people (Wikipedia contributors 2015). Thai Town in Los Angeles has become a major tourist attraction. Many Isan village women have married foreigners and live abroad with their spouses, mostly Western Europeans and Americans. According to a 2004 survey by the National Economic and Social Development Board (cited in Sirijit 2013), these women, who then numbered 15,000, sent back remittances to their families totaling more than USD44 million per year (about USD2,930 per person). In many other cases, which seem to replicate the traditional Isan custom of postmarital matrilocality, the foreign husbands have moved to Northeast Thailand to reside in their wives' home villages. No official data are available on the number of foreigners involved, but according to one journalistic source they number more than 100,000 (Frensham 2014). In one village, 84 out of 334 adult females had married foreigners (Rattana 2005). Although in Thai elite discourse women who marry foreigners are commonly viewed pejoratively as being little better than prostitutes who are immoral seekers after material wealth (although they are also sometimes presented as naive victims of neocolonialist sex trafficking), an alternative

view is that these women, who are mostly widows or divorcees with little chance of finding a Thai husband (Orathai 2012), have found an innovative way to expand the diversified portfolios of their families, by tapping new extra-local resources (Chai Podhisita, personal communication). This view is supported by research by Leonora Angeles and Sirijit Sunanta, who found that the women themselves viewed their transnational marriages ". . . as a way to gain social and spatial mobility for themselves and their families" (Angeles and Sirijit 2009, 553). It has even been suggested that the phenomenon of transnational marriage "contributes to the village scale-jumping to global space, thus bypassing the Thai nation-state" (Sirijit 2009).

The willingness to use spatial mobility as a way to gain access to more resources is, of course, hardly a new characteristic of Isan farmers. The Thai-Lao of Isan are descended from Lao migrants from Lan Xang who, beginning in the 1400s, had gradually trickled down into this sparsely populated frontier zone (Keyes 2014), which, until the 1940s, was 90% covered by forest (Pendleton 1943). Historically, when villages became overpopulated and the size of landholdings declined, some households would set off in search of unoccupied lands. Wherever they found suitable land for making new rice paddies, they would settle down and form a new village, often 50 or 100 kilometers from their natal communities (Fukui 1993).

The underlying character of Thai-Lao people has not changed, with the willingness to take risks to find and exploit new resources still being highly valued. Recently, however, there has been a major shift in the attitude toward education, which is reflected in the investment preferences of rural households. Until recently parents favored investment in land, hoping to increase their holdings to have a sufficiently large area to be able to give each of their children a farmstead when they became too old to work it themselves. Thus they tended to pull their children out of school as early as was legally allowed, so they could augment household labor resources; now, parents are not interested in accumulating larger landholdings but instead choose to invest capital in educating their children in order to prepare them to take non-farm employment in the cities that will allow them to support the elderly parents with remittances (Fukui 1996a; Grandstaff *et al.* 2008; Wanichcha and Dusadee 2013). In Khon Kaen University, where I teach, there are quite a number of graduate students from Isan farm families, including three of my own doctoral students. Their parents, most of whom have only a few years of primary education, definitely do not want them to return to farming after getting their degrees, and they themselves do not expect to do so. The value placed on higher education is shown by the fact that the parents of a doctoral student of one of my colleagues have even mortgaged part of their farmland in order to finance completion of her degree.

Perhaps the most important recent change in the culture of Isan villagers is in the

way they perceive themselves and their role in the world. Although they were never the servile peasants that the urban elite imagine them to be, their participation in mass political movements—first the Communist mobilization of villages in the 1960s–1980s, then the organizational work by NGO community development activists in the 1990s, and most recently the Red Shirt movement and the formation of "Red villages"—has affected the sense of self of many villagers (Keyes 2014).

Conclusion

The agrarian system of Northeast Thailand is changing in multiple ways at unprecedented speed. But perceptions of the rural Northeast held by many members of the Thai urban elite lag far behind present realities. The stereotypical view is that rural Isan people are poor, uneducated, and ignorant, resembling the buffalo they formerly used to plow their paddy fields (Chairat 2013). In this view, these backward peasants must ceaselessly struggle using antiquated technology to scratch a bare living out of a harsh environment. They live their lives within the confines of their native villages with their time horizon limited to the next crop and their only aspiration for the future being to produce sufficient food to keep their families alive. This stereotypical view seems impervious to empirical disconfirmation. Indeed, what is remarkable is that despite the massive social transformation of the rural Northeast over the past half-century, the conventional elite view has changed so little from that described by the late American anthropologist A. Thomas Kirsch in a paper published in 1966:

> Both popular discussions of Northeast Thailand and its problems and more programmatic statements defining development aims seem to be rooted in certain conceptions about the "kind" of people Northeasterners are. Northeasterners are conceived, for example, as people with strong commitments to a particular mode of life, that of rice farmer; to a traditional set of village based social relations and customs; and to particular localities, whether native villages or the northeastern region in general. That is, Northeasterners are seen as "typical peasants." Given this conception of the way that Northeasterners are, and the massive fact of the economic underdevelopment of the Northeast, solutions to the region's problems have been seen largely in economic terms. . . . The assumption seems to be that by raising income levels, by making life more comfortable for the Northeastern peasant population, the central government will lessen the appeal of "subversive elements." In return for a better standard of living, peasants apparently are expected to give political support, or at least to remain politically apathetic. (Kirsch 1966, 370)

Kirsch goes on to say:

> I would suggest that far from solving the problems of the Northeast, such measures are likely to

> aggravate the specifically political dimensions of the problem. By raising villagers' income levels within the traditional economic framework, by making life easier and more comfortable for the rural villager, the levels of aspirations among young men are also likely to rise, and the means of achieving such aspirations—e.g., freedom from poverty, better educational facilities—will be available. Thus, more young men are likely to want to achieve social status outside of the rural village and outside of the peasant style of life. But most plans for development of the Northeast do not seem to take into account the possibility of such an increase in aspiration, for Northeastern villagers are viewed as an undifferentiated mass with common commitments to a peasant style of life. Unless efforts are made to keep channels of mobility open, and to expand them, we are likely to find a crucial segment of the Northeastern population thwarted in their aspirations—perhaps an easy prey to those who might offer alternative commitments and alternative opportunities for status achievement. (*ibid.*, 377–378)

I doubt it would have surprised Kirsch to learn that it was in the villages of the Northeast that the Red Shirt movement first arose after the 2006 coup, or that the majority of the core participants in the Red Shirt demonstrations in Bangkok in 2010 were members of the newly emerging Isan rural middle class. Most of these demonstrators were what Naruemon Thabchumpon and Duncan McCargo (2011) have called "urbanized villagers," rural people who gained considerable education and became entrepreneurial farmers, using newly gained access to capital provided by village development funds to modernize their farming and establish small businesses. As Kirsch so presciently recognized, the potential for the agrarian transformation that is currently reshaping rural society in the Northeast was already there in the 1960s—but it was invisible to most observers who were blinded by their preconceptions about the Isan people being a tradition-bound peasantry.

Because the agrarian transformation of Northeast Thailand is still very much a work in progress, it would be foolhardy to try to predict in detail how it will turn out in the future. What is already evident, however, is that the traditional subsistence-oriented agricultural system has largely been replaced by a capitalist market-oriented one inextricably linked to the national and global markets, just as the old village-centric social system has been subsumed into a multiplicity of extra-local networks that tie Isan villagers ever more closely into the larger world. Barring a catastrophic meltdown of the global system, it can reasonably be expected that Northeast Thailand will become more deeply integrated into national, regional, and global economic and social systems.

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References

Analaya Nansaior; Aran Patanothai; Rambo, A. Terry; and Suchint Simaraks. 2011. Climbing the Energy Ladder or Diversifying Energy Sources? The Continuing Importance of Household Use of Biomass Energy in Urbanizing Communities in Northeast Thailand. *Biomass and Bioenergy* 35(10): 4180–4188.

Anan Polthanee. 2001. Rice-Based Farming Systems in the Korat Basin of Northeast Thailand. In *Natural Resource Management Issues in the Korat Basin of Northeast Thailand: An Overview*, edited by S. P. Kam, C. T. Hoanh, G. Trebuil, and B. Hardy, pp. 19–26. Proceedings of the Planning Workshop on Ecoregional Approaches to Natural Resources Management in Korat Basin, Northeast Thailand.

Ando, Masuo. 2003. Potential and Constraints for Intensive Land Use with Pond Irrigation in Northeast Thailand. Paper presented at international symposium on "Alternate Approaches to Enhancing Small-scale Livelihoods and Natural Resources Management in Marginal Areas," October 29–30, United Nations University, Tokyo.

Angeles, Leonora C.; and Sirijit Sunanta. 2009. Demanding Daughter Duty. *Critical Asian Studies* 41(4): 549–574.

Anupong Pansuwan; Goonnapa Fucharoen; Supan Fucharoen; Boonmee Himakhun; and Samrit Dangwiboon. 2011. Anemia, Iron Deficiency and Thalassemia among Adolescents in Northeast Thailand: Results from Two Independent Surveys. *Acta Haematologica* 125: 186–192.

Aree Jampaklay; Patama Vapattanawong; Kanchana Tangchonlatip; Richter, Kerry; Nipat Ponpai; and Charita Hayeeteh. 2012. *Children Living Apart from Parents due to Internal Migration (CLAIM)*. Nakhon Pathom: Institute for Population and Social Research, Mahidol University (Publication/ Institute for Population and Social Research, Mahidol University; No. 397).

Atthasat Wiseansart อรรถศาสตร์ วิเศียรศาสตร์; and Suchint Simaraks สุจินต์ สิมารักษ์. 2014a. Middle Size Tractors and 2-Wheel Tractors Utilization and Services Break-even Point of the Farmers in Kok-si Sub-district. *Khon Kaen Agricultural Journal* 42(1): 55–64.

———. 2014b (2557). *Ponlawat khong kan chai kruang chak kon nai kan pluuk khao: Koranee sueksa nai tambon Khoksi amphoe Muang changwat Khonkaen* พลวัตของการใช้เครื่องจักรกลในการปลูกข้าว: กรณีศึกษาใน ตำบลโคกสี อำเภอเมือง จังหวัดขอนแก่น [Dynamics of rice farming mechanization: Case study in Kok-Si Subdistrict, Mueang District, Khon Kaen Province]. *Nakhon Phanom University Journal* (September): 258–264.

———. 2013 (2556). *Padjai thii mii phon tor kan tadsinjai chai borikan rot thraektor khanaadklang*

khong kasetrakon nai tambon Nam-om amphor Kra-nuan changwat Khonkaen ปัจจัยที่ผลต่อการตัดสินใจใช้บริการรถแทรกเตอร์ขนาดกลาง ของเกษตรกรในตำบลน้ำอ้อม อำเภอกระนวน จังหวัดขอนแก่น [Factors influencing decision making on middle-size tractor utilization of farmers in Nam-aom Subdistrict, Kranuan District, Khon Kaen Province]. *KKU Research Journal* 13(4): 14–26.

Banfield, Edward G. 1958. *The Moral Basis of a Backward Society*. New York: Free Press.

Barnaud, G.; Trebuil, G.; Dufumier, M.; and N. Suphanchaimart. 2006. Rural Poverty and Diversification of Farming Systems in Upper Northeast Thailand. *Moussons* 9(10): 157–187.

Bryant, John; and Gray, Rossarin. 2005. *Rural Population Ageing and Farm Structure in Thailand*. Bangkok: FAO.

Caldwell, John S.; Chumsri Pomlet; Mayura Prabpan; and Somsak Sukchan. 2007. Assessment of Spatial Variability of *Tambons* Based on Farming Systems Characteristics for Scaling-up of Diversification in Khon Kaen Province, Thailand. *Japan Agricultural Research Quarterly* 41(4): 333–340.

Cameron, Michael; and Lim, Steven. 2007. Household Resources, Household Composition, and Child Nutritional Outcomes. Paper presented at the Australian Agricultural and Resource Economics Society Conference, Queenstown, February 13–16. ageconsearch.umn.edu/bitstream/10371/1/cp07ca02.pdf, accessed June 1, 2017.

Chairat Charoensin-o-larn. 2013. Redrawing Thai Political Space: The Red Shirt Movement. In *Cleavage, Connection and Conflict in Rural, Urban and Contemporary Asia*, edited by T. Bunnell, D. Parthasarathy, and E.P. Thompson, pp. 201–222. Dordrecht, Heidelberg, New York, and London: Springer.

Chatterjee, S.; Riewpaiboon, A.; Piyauthakit, P.; Riewpaiboon, W.; Boupaijit, K.; Panpuwong, N.; and Archavanuntagul, V. 2011. Cost of Diabetes and Its Complications in Thailand: A Complete Picture of Economic Burden. *Health and Social Care in the Community* 19(3): 289–298.

Chichaibelu, Bezawit Beyene; and Waibel, Hermann. 2012. Financial Vulnerability and Indebtedness of Poor Households in Thailand and Vietnam. Paper presented at Tropentag 2012, Göttingen, September 19–21.

Craig, Ian. 1988. Agronomic, Economic and Socially Sustainable Strategies for Soil Fertility Management in Northeast Thailand. In *Sustainable Rural Development in Asia*, edited by T. Charoenwatana and A. T. Rambo, pp. 153–166. Khon Kaen: KKU-USAID Farming Systems Research Project and the Southeast Asian Universities Agroecosystem Network.

Dayley, Robert. 2011. Thailand's Agrarian Myth and Its Proponents. *Journal of Asian and African Studies* 46(4): 342–360.

Foster, George M. 1965. Peasant Society and the Image of Limited Good. *American Anthropologist* 67: 293–315.

Frensham, Mike. 2014. Thai Women & Western Men Seeking Romance. London FCOL News. January 31. http://fcolnews.com/thai-women-western-men-seeking-romance/1210, accessed February 20, 2015.

Fujioka, Rika; and Sopon Thanphet. 2009. *Decent Work for Older Persons in Thailand*. Bangkok: ILO Regional Office for Asia and the Pacific.

Fukui, Hayao. 1996a. Expansion of Arable Land and Its Cessation: The Case of Northeast Thailand. *Southeast Asian Studies* 33(4): 675–702.

————. 1996b. Transformation of Agriculture in Northeast Thailand: Preface. *Southeast Asian Studies* 33(4): 521–522.

————. 1993. *Food and Population in a Northeast Thai Village*. Monographs of the Center for Southeast Asian Studies, Kyoto University. Honolulu: University of Hawaii Press.

Fukui, Hayao; and Chumphon Naewchampa. 1998. Weir Irrigation in the Upper Mun River Basin: A Field Trip in March 1998 with Some Preliminary Discussions. *Southeast Asian Studies* 36(3): 427–434.

Fukui, Hayao; Chumphon Naewchampa; and Hoshikawa, Keisuke. 2000. Evolution of Rain-Fed Rice Cultivation in Northeast Thailand: Increased Production with Decreased Stability. *Global Environmental Research* 3(2): 145–154.

Funahashi, Kazuo. 1996. Farming by the Older Generation: The Exodus of Young Labor in Yasothon Province, Thailand. *Southeast Asian Studies* 33(4): 625–639.

Garip, Filiz; and Curran, Sara. 2009. Increasing Migration, Diverging Communities: Changing Character of Migrant Streams in Rural Thailand. *Population Research and Policy Review* 29: 659–685.

Gibson, R. S.; Winichagoon, P.; Pongcharoen, T.; Thurlow, R.; Krittaphol, W.; Bailey, K.; and Anderson, V. 2007. The Feasibility of Using Zinc Fertilizers to Improve the Adequacy of Zinc Intakes of Children Consuming Rice-Based Diets in NE Thailand. Paper presented at the Zinc Crops 2007 International Conference, Istanbul, May 24–26.

Grandstaff, Terry B. 1988. Environment and Economic Diversity in Northeast Thailand. In *Sustainable Rural Development in Asia*, edited by T. Charoenwatana and A.T. Rambo, pp. 11–22. Khon Kaen: KKU-USAID Farming Systems Research Project and the Southeast Asian Universities Agroecosystem Network.

Grandstaff, Terry B.; Somluckrat Grandstaff; Viriya Limpinuntana; and Nongluck Supanchaimat. 2008. Rainfed Revolution in Northeast Thailand. *Southeast Asian Studies* 46(3): 289–376.

Hohfeld, Lena; and Waibel, Hermann. 2013. Investments of Rural Households in Northeast Thailand and the Future of Small Scale Farming. *Quarterly Journal of International Agriculture* 52(3): 217–236.

Huguet, Jerrold W.; and Aphichat Chamratrithirong. 2011. *Thailand Migration Report 2011*. Bangkok: International Organization for Migration.

Ishine, Masayuki; Sakagami, Teiji; Sakamoto, Ryouta; Wada, Taizo; Khampitak Kovit; Fushida, Mutsuko; Kawakita, Toshiko; Okumiya, Kiyohito; Kita, Toru; and Matsubayashi, Kozo. 2006. Comprehensive Geriatric Assessment for Community-Dwelling Elderly in Asia Compared with Those in Japan: VII. Khon Khen [*sic*] in Thailand. *Geriatrics & Gerontology International* 6: 40–48.

Jirawat Moolasart; and Siriporn Chirawatkul. 2012. Drinking Culture in the Thai-Isaan Context of Northeast Thailand. *Southeast Asian Journal of Tropical Medicine and Public Health* 43(3): 795–807.

Jit Phumisak จิตร ภูมิศักดิ์. 2007 (2550). *Chom na sakdina Thai* โฉมหน้าศักดินาไทย [The face of Thai feudalism]. Bangkok: Samnskphan Sripanyaa.

Keyes, Charles F. 2014. *Finding Their Voice: Northeastern Villagers and the Thai State*. Chiang Mai: Silkworm Books.

————. 2011. From Peasant to Cosmopolitan Villagers: Refiguring the "Rural" in Northeastern Thailand. Paper presented at the joint conference of the Association for Asian Studies and the International Conference of Asian Scholars, Honolulu, April.

————. 1975. Kin Groups in a Thai-Lao Community. In *Change and Persistence in Thai Society: Essays in Honor of Lauriston Sharp*, edited by G. William Skinner and A. Thomas Kirsch. Ithaca: Cornell University Press.

Kirsch, A. Thomas. 1966. Development and Mobility among the Phu Thai of Northeast Thailand. *Asian Survey* 6(7) (July): 370–378.

KKU-FORD Cropping System Project. 1982. *An Agroecosystem Analysis of Northeast Thailand*. Khon Kaen: Faculty of Agriculture, Khon Kaen University.

Lux, Thomas E. 1962. The Thai-Lao Family System and Domestic Cycle of Northeastern Thailand. *Journal of the National Research Council of Thailand, Part II, Social Science*: 1–17.

Mills, Mary Beth. 2012. Thai Mobilities and Cultural Citizenship. *Critical Asian Studies* 44(1): 85–112.

Ministry of Transport Information and Communication Technology Centre. 2013. *Transtat 2013*. Bangkok. www.news.mot.go.th/motc/portal/graph/transtat13.pdf, accessed October 12, 2015.

Mondal, Shimul; Theerachai Haitook; and Suchint Simaraks. 2014. Farmers' Knowledge, Attitude and

Practice toward Organic Vegetables Cultivation in Northeast Thailand. *Kasetsart Journal (Social Science)* 35: 158–166.

Moreno-Black, Geraldine; and Prapimporn Somnasang. 2000. In Times of Plenty and Times of Scarcity: Nondomesticated Food in Northeastern Thailand. *Journal of Ecology of Food and Nutrition* 38(6): 563–586.

Nagata, Yoshikatsu. 1996. Mapping the Village Database: The Spread of Economic Growth to Rural Areas of Northeast Thailand. *Southeast Asian Studies* 33(4): 138–156.

Naruemon Thabchumpon; and McCargo, Duncan. 2011. Urbanized Villagers in the 2010 Thai Redshirt Protests. *Asian Survey* 51(6): 993–1018.

Nguyen Dang Hoc; Pijika Timsuksai; and Rambo, A. Terry. 2016. Cost-Benefit Analysis of Vegetable Production in Thai-Vietnamese Homegardens in Northeast Thailand. *Khon Kaen Agricultural Journal* 44(3): 527–536.

Nongluk Suphanchaimat; and Wilaiwat Grisnaputi. 1987. Traditional Knowledge of Rainfall Prediction of the Khon Kaen Rice Farmers in Thailand. In *Impact of Development on Human Activity Systems in Southeast Asia: Selected Papers from the First SUAN/EAPI Regional Research Symposium*, edited by O. Soemarwoto and A. T. Rambo, pp. 178–182. Bandung: Padjadjaran University Institute of Ecology and the Southeast Asian Universities Agroecosystem Network.

Office of the Narcotics Control Board, Ministry of Justice. 2003. Thailand Narcotics Annual Report, 2003. Bangkok: Ministry of Justice, Government of Thailand.

Orathai Piayura. 2012. Thai Women, Cross-cultural Marriage and Sexuality. *International Journal of Social Science and Humanity* 2(2): 156–158.

Osaki, Keiko. 2003. Migrant Remittances in Thailand: Economic Necessity or Social Norm? *Journal of Population Research* 20(2): 203–222.

Pandey, Sushil; Nongluck Suphanchaimat; and Velasco, Ma. Lourdes. 2012. The Patterns of Spread and Economics of a Labor-Saving Innovation in Rice Production: The Case of Direct Seeding in Northeast Thailand. *Quarterly Journal of International Agriculture* 51(4): 333–356.

Patarapong Kroeksakul. 2010. Padjai thi tham hai kasetrakon yaai ook ma asai yuu nok muu baan pheua tham gan kaset ปัจจัยที่ทำให้เกษตรกรย้ายออกมาอาศัยนอกหมู่บ้านเพื่อทำการเกษตร [Factors causing villagers moving to live on their own farmland for agricultural activities]. Doctoral dissertation, Systems Agriculture, Khon Kaen University.

Patarapong Kroeksakul; Aree Naipinit; and Thongphon Promsaka Na Sakolnakorn. 2011. The Economic and Social Effects of Farmers Growing Para Rubber in Northeast Thailand: A Case Study of Sapsomboon Village, Dun Sad Sub-District, Kranoun District, Khon Kaen Province. *Journal of Business Case Studies* 7(1): 113–117.

Patcharaporn Phumchantuk. 2014. The Impact of Urbanization on Agricultural Land Use in Khon Kaen City. Paper presented at the TRF Seminar Series in Basic Research: The Agrarian Transformation in Northeast Thailand, Faculty of Agriculture, Khon Kaen University, September 15.

Patcharaporn Phumchantuk; and Orawan Kanchat. 2011. Factors Influencing the Sustainability of the Chinese Radish Production System at Baan Nong-Ngong, Tambon Baanhad, Amphoe Baanhad, Changwat Khon Kaen. Unpublished case study report. Program on System Approaches in Agriculture, Faculty of Agriculture, Khon Kaen University.

Patma Vityakon. 1993. The Traditional Trees-in-Paddy-Fields Agroecosystem of Northeast Thailand: Its Potential for Agroforestry Development. *Regional Development Dialogue* 14(1): 125–148.

Pattanee Winichagoon. 2013. Thailand Nutrition in Transition: Situation and Challenges of Maternal and Child Nutrition. *Asia Pacific Journal of Clinical Nutrition* 22(1): 6–15.

Pendleton, Robert L. 1943. Land Use in Northeastern Thailand. *Geographical Review* 33(1): 15–41.

Penning de Vries, F.; and Sawaeng Ruaysoongnern. 2010. Multiple Sources of Water for Multiple Purposes

in Northeast Thailand. Colombo: International Water Management Institute (IWMI Working Paper 137). doi:10.3910/2010.208.

Phouvang Sengmeuang; Upa Kukongviriyapan; Orapin Pasurivong; Chulee Jones; and Wilaiwan Khrisanapant. 2010. Prevalence of Obesity among Thai Schoolchildren: A Survey in Khon Kaen, Northeast Thailand. *Asian Biomedicine* 4(6): 965–970.

Pijika Timsuksai. 2014. A Comparative Ecological Study of Homegardens of Different Ethnic Groups in the Sakon Nakhon Basin, Northeast Thailand, and Some Related Groups in Vietnam. Doctoral dissertation, Systems Agriculture, Khon Kaen University.

Pijika Timsuksai; and Rambo, A. Terry. 2015. A Comparative Study of the Ecological Structures of Homegardens of Different Ethnic Groups in Northeast Thailand. *Khon Kaen Agricultural Journal* 43, Supplement 1: 62–68.

Piotrowski, Martin. 2009. Migrant Remittances and Skipped Generation Households: Investigating the Exchange Motive Using Evidence from Nang Rong, Thailand. *Asian and Pacific Migration Journal* 18(2): 163–196.

Piotrowski, Martin; Ghimire, Dirgha; and Rindfuss, Ronald R. 2013. Farming Systems and Rural Out-migration in Nang Rong, Thailand and Chitwan Valley, Nepal. *Rural Sociology* 78(1): 75–108.

Pipop Jirapinyo; Narumoon Densupsoontorn; Supinya Kongtragoolpitak; Renu Wong-arn; and Nuchnoi Thamonsiri. 2005. Increasing Risks of Becoming Obese after 6 Years in Primary School: Comparing the Relative Risks among Some Schools in Bangkok, Saraburi and Sakolnakorn. *Journal of the Medical Association of Thailand* 88(6): 829–832.

Prapatsorn Wongsalee. 2014. Factors Influencing the Decline of Traditional Cross-Stream Earthen Weir (*Thamnop*) Irrigation in Northeast Thailand. Master's thesis, Systems Agriculture, Khon Kaen University (in Thai with English abstract).

Prapatsorn Wongsalee; and Wareerat Pannarat. 2010. Tomato Seed Production by Contract Farming in Lad Na Piang Village, Savatee Sub-district, Muang District, Khon Kaen Province. Unpublished case study report. Program on System Approaches in Agriculture, Faculty of Agriculture, Khon Kaen University.

Prapimporn Somnasang; Moreno, Geraldine; and Kusuma Chusil. 1998. Indigenous Knowledge of Wild Food Hunting and Gathering in North-east Thailand. *Food and Nutrition Bulletin* 19(4): 359–364.

Prapimporn Somnasang; Pagarat Rathakette; and Sumalee Rathanapanya. 1988. The Role of Natural Foods in Northeast Thailand. In *Rapid Rural Appraisal in Northeast Thailand: Case Studies*, edited by G. W. Lovelace, S. Subhadhira, and S. Simaraks, pp. 78–103. Khon Kaen: Khon Kaen University Farming Systems Research Project.

Rambo, A. Terry. 2012. The Agrarian Transformation in Northeast Thailand. Invited presentation at the 8th National Agricultural Systems Conference, Nakhon Phanom University, Nakhon Phanom, September 5.

————. 2009. Are the Farmers Always Right? Rethinking Assumptions Guiding Agricultural and Environmental Research in Southeast Asia. *AsiaPacific Issues*, No. 88. Honolulu: East-West Center.

————. 2008. The Interface between Social Science and Agricultural Science. Invited lecture presented at a joint session of the sections on agricultural science and social science and humanities at the 9th RGJ-Ph.D. Congress, Pattaya, April 4–6.

————. 2006. Book Review of *Le Riz: Enjeux ecologiques et economiques* by Guy Trebuil and Mahabub Hossain. *Southeast Asian Studies* 44(2): 267–270.

————. 1991. *The Human Ecology of Rural Resource Management in Northeast Thailand*. Khon Kaen: Farming Systems Research Project, Khon Kaen University.

Ranawana D. V.; Henry, C. J.; Lightowler H. J.; and Wang, D. 2009. Glycemic Index of Some Commercially Available Rice and Rice Products in Great Britain. *International Journal of Food Science and*

Nutrition 60, Supplement 4: 99–110.

Rattana Bunmattaya. 2005. Summary Report on "Farang's Wife: Relationship between Thai Women and Foreign Men." Bangkok: Princess Maha Chakri Sirindhorn Anthropology Center. ftp://smc.ssk.ac.th/intranet/sac.or.th/Subdetail/seminar/sum_of_seminar/seminar53_E.html, accessed June 2, 2017.

Rigg, Jonathan. 1985. The Role of Environment in Limiting the Adoption of New Rice Technology in Northeastern Thailand. *Transactions of the Institute of British Geographers* N.S. 10: 481–494.

Rigg, Jonathan; and Ritchie, Mark. 2002. Production, Consumption and Imagination in Rural Thailand. *Journal of Rural Studies* 18: 359–371.

Rigg, Jonathan; and Salamanca, Albert. 2011. Connecting Lives, Living, and Location: Mobility and Spatial Signatures in Northeast Thailand, 1982–2009. *Critical Asian Studies* 43(4): 551–575.

————. 2009. Managing Risk and Vulnerability in Asia: A (Re)Study from Thailand, 1982–83 and 2008. *Asia Pacific Viewpoint* 50(3): 255–270.

Rindfuss, Ronald R.; Piotrowski, Martin; Entwisle, Barbara; Edmeades, Jeffrey; and Faust, Katherine. 2012. Migrant Remittances and the Web of Family Obligations: Ongoing Support among Spatially Extended Kin in Northeast Thailand, 1984–94. *Population Studies* 66(1): 87–104.

Sawaeng Ruaysoongnern; and Nongluck Suphanchaimart. 2002. Land Use Patterns and Agricultural Production Systems with Emphasis on Changes Driven by Economic Forces and Market Integration. In *Natural Resource Management Issues in the Korat Basin of Northeast Thailand*, edited by S. P. Kam *et al.*, pp. 67–77. Manila: IRRI.

Shirai, Yuko. 2006. The Urban Agricultural System of Khon Kaen. In Proceedings of the SAFE DANIDA Regional Workshop on Sustainable Agriculture held in Pathumthani Province, July 28, pp. 18–23.

Shirai, Yuko; and Rambo, A. Terry. 2014. Urban Demand for Wild Foods and Rural Biodiversity in Northeast Thailand: A Survey of Edible Wild and Semi-Domesticated Species Sold in the Khon Kaen Municipal Market. *Ethnobotany Research and Applications* 12: 113–129.

————. 2008. The Economic Value of Edible Wild and Semi-Domesticated Species Sold in an Urban Market in Khon Kaen Municipality in Northeast Thailand. *Khon Kaen Agriculture Journal* 36: 69–78.

Sirijit Sunanta. 2013. Gendered Nation and Classed Modernity: The Perceptions of Mia Farang (Foreigners' Wives) in Thai Society. In *Cleavage, Connection and Conflict in Rural, Urban and Contemporary Asia*, edited by T. Bunnell, D. Parthasarathy, and E. P. Thompson, pp. 183–199. Dordrecht, Heidelberg, New York, and London: Springer.

————. 2009. Global Wife, Local Daughter: Gender, Family, and Nation in Transnational Marriages in Northeast Thailand. Doctoral dissertation, University of British Columbia.

Sirikul Kuleab. 2004. Drinking and Driving Don't Mix. *WHO Lifeline* (March–April): 14–15.

Soimart Rungmanee. 2014. The Dynamic Pathways of Agrarian Transformation in the Northeastern Thai–Lao Borderlands. *Australian Geographer* 45(3): 341–354. doi: 10.1080/00049182.2014.930002.

Somjit Daenseekaew; Somsak Srisontisuk; Earmporn Thongkrajar; and Pirasak Sriruecha. 2005. Mobilizing Communities to Combat Illicit Drug Use in Northeast Thailand. *Thai Journal of Nursing Research* 9(3): 141–154.

Sorat Praweenwongwuthi; Suwit Laohasiriwong; and Rambo, A. Terry. 2010. Impacts of Rice Combine Harvesters on Economic and Social [*sic*] of Farmers in a Village of the Tung Kula Ronghai Region. *Research Journal of Agriculture and Biological Sciences* 6(6): 778–784.

————. 2009. Impacts of Adoption of Rice Combine Harvesters on the Economic and Social Conditions of Farmers in Tung Kula Ronghai. *Khon Kaen Agriculture Journal* 37: 349–356.

Sukaesinee Subhadira; Suchint Simaraks; Manthana Samart; and Viriya Limpinuntana. 1988. Changes in Systems Properties of Ban Hin Lad, a Village Agroecosystem in Northeast Thailand. In *Agro-*

ecosystem Research for Rural Development, edited by K. Rerkasem and A. T. Rambo, pp. 79–102. Selected papers presented at the Third SUAN Regional Symposium on Agroecosystem Research, Chiang Mai University Multiple Cropping Centre and SUAN.

Sukanlaya Choenkwan; Arunee Promkhambut; Fukui, Hayao; and Rambo, A. Terry. 2016. Does Agro-tourism Benefit Mountain Farmers? A Case Study in Phu Ruea District, Northeast Thailand. *Mountain Research and Development* 36(2): 162–172.

Sukanlaya Choenkwan; Fox, Jefferson M.; and Rambo, A Terry. 2014. Agriculture in the Mountains of Northeastern Thailand: Current Situation and Prospects for Development. *Mountain Research and Development* 34(2): 95–106.

Teeraphong Somkhaoyai. 2001. Elderly Living Arrangement in the Rural Villages of Nangrong District, Thailand. Master's thesis, Mahidol University Institute for Population and Social Research, Bangkok.

Terd Charoenwatana; Aran Patanothai; and Anan Polthanee. 1976a. Growing Field Crops after Rice in Upper Paddy Field. In *Annual Report for 1976 of the KKU-FORD Cropping System Project*, pp. 64–49. Khon Kaen: Faculty of Agriculture, Khon Kaen University.

————. 1976b. Double Cropping of Field Crops with Rice in Lowland Paddy Field. In *Annual Report for 1976 of the KKU-FORD Cropping System Project*, pp. 69–71. Khon Kaen: Faculty of Agriculture, Khon Kaen University.

Terd Chareonwatana; Viriya Limpinuntana; Aran Patanothai; Attachai Jintawet; K. Bontob; V. Sornwat; V. Pimsawadi; and T. Ubonkerd. 1978a. Growing Field Crops before Rice in Upper Paddy Fields. In *Annual Report for 1978 of the KKU-FORD Cropping System Project*, pp. 74–85. Khon Kaen: Faculty of Agriculture, Khon Kaen University.

————. 1978b. Planting of Field Crops before Rice in Lowland Paddy Fields. In *Annual Report for 1978 of the KKU-FORD Cropping System* Project, pp. 94–96. Khon Kaen: Faculty of Agriculture, Khon Kaen University.

Thanakorn Lattirasuvan; Tanaka, Sota; Nakamoto, Kenji; Hattori, Daisuke; and Sakurai, Katsutoshi. 2010. Ecological Characteristics of Home Gardens in Northern Thailand. *Tropics* 18(4): 171–184.

Thongkamkaew, U.; Mahasan, J.; Chasiriyingyong, S.; and Sopheap, U. 2010. Farmer Management on Corn Production: A Case Study at Baan Nongboa, Nongboa Sub-district, Baan Phang District, Khon Kaen Province. Unpublished case study report, Program on System Approaches in Agriculture, Faculty of Agriculture, Khon Kaen University.

Thurlow, R. A.; Winichagoon, P.; Pongcharoen, T.; Gowachirapant, S.; Boonpraderm, A.; Manger, M. S.; Bailey, K. B.; Wasantwisut, E.; and Gibson, R. S. 2006. Risk of Zinc, Iodine and Other Micronutrient Deficiencies among School Children in North East Thailand. *European Journal of Clinical Nutrition* 60: 623–632.

Thurlow, Rosanne A.; Pattanee Winichagoon; Green, Timothy; Wasantwisut Emorn; Tippawan Pongcharoen; Bailey, Karl B.; and Gibson, S. Rosalind. 2005. Only a Small Proportion of Anemia in Northeast Thai Schoolchildren Is Associated with Iron Deficiency. *American Journal of Clinical Nutrition* 82: 380–387.

Thuttai Keeratipongpaiboon. 2012. Population Ageing: Changes in Household Composition and Economic Behaviour in Thailand. Doctoral dissertation, SOAS, University of London.

Trébuil, Guy; and Hossain, Mahabub. 2004. *Le riz: Enjeux écologiques et économiques* [Rice: Ecological and economic challenges]. Paris: Belin.

Viriya Limpinuntana. 2001. Physical Factors Related to Agricultural Potential and Limitations in Northeast Thailand. In *Natural Resource Management Issues in the Korat Basin of Northeast Thailand: An Overview. Limited Proceedings No. 7*, edited by S. P. Kam, C. T. Hoanh, G. Trebuil, and B. Hardy, pp. 3–17. Los Banos: International Rice Research Institute.

Waewdaw Nambutra; Chung, Bonhee T.; Attasart Wiseansart; and Rambo, A. Terry. 2013. The Jujube

Production System in Ban Meng Sub-district, Khon Kaen Province, Northeast Thailand. *Khon Kaen Agriculture Journal* 41(2): 199–208.

Walker, Anthony. 2012. *Thailand's Political Peasants: Power in the Modern Rural Economy*. Madison: University of Wisconsin Press.

Wanichcha Narongchai; and Dusadee Ayuwat. 2013. Intergenerational Transfers of Economic Capital in Northeast Rural Households, Thailand. In *Proceedings of International Conference on Information and Social Science* (ISS2013), pp. 926–936. Nagoya: Graduate School of Information Science, Nagoya University, International Academy Institute.

Watanabe, Moriaki; Patma Vityakon; and Rambo, A. Terry. 2014. Can't See the Forest for the Rice: Factors Influencing Spatial Variations in the Density of Trees in Paddy Fields in Northeast Thailand. *Environmental Management* 53(2): 343–356.

Wattanavadee Sriwattanapongse; Sukon Prasitwattanaseree; Surin Khanabsakdi; and Supreeya Wongtrangan. 2013. Mortality Rate Model due to Transportation Accidents in Thailand. *Silpakorn University Science & Technology Journal* 7(1): 9–18.

Wichian Koetsuk วิเชียร เกิดสุข. 2008 (2551). *Rai ngan wichai ruang rahad wit nam phumpanya thongthin lam nam Pathao amphoe Muang changwat Chayaphum* รายงานวิจัยเรื่องระหัดวิดน้ำภูมิปัญญาท้องถิ่น ลำน้ำปะทาว อำเภอเมือง จังหวัดชัยภูมิ [Research report on local knowledge of waterwheels, Pa Thao Stream, Mueang District, Chaiyaphum Province]. Khon Kaen: Khon Kaen University Research and Development Institute.

Wikipedia contributors. 2015. Thai American. *Wikipedia, The Free Encyclopedia*. http://en.wikipedia.org/w/index.php?title=Thai_American&oldid=639933263, accessed January 6, 2015.

Wilaiwat Krisanyaphud วัไลวิจน์ กฤษณะภูติ *et al.* 1986 (2529). *Rai ngan vichai ruang "klum" seuksa chapho karanee baan Hin Laad tambon Bankho amphoe Muang changwat Khonkaen* รายงานการวิจัยเรื่อง "กลุ่ม" ศึกษาเฉพาะกรณีบ้านหินลาด ตำบลบ้านค้อ อำเภอเมือง จังหวัดขอนแก่น [Research on "groups": A case study of Hin Lad village, Ban Khor Subdistrict, Mueang District, Khon Kaen Province]. Khon Kaen: Khon Kaen University Farming Systems Research Project.

Wongba, N.; Thaewnongiew, K.; Phathee, K.; Laithavewat, L.; Duangsong, R.; Promthet, S.; and Tangsawad, S. 2011. Liver Fluke Prevention and Control in the Northeast of Thailand through Action Research. *Asian Pacific Journal of Cancer Prevention* 12: 1367–1370.

Woravimol Krittaphol; Bailey, Karl B.; Tippawan Pongcharoen; Pattanee Winichagoon; and Gibson, R. S. 2006. Low Zinc, Iron, and Calcium Intakes of Northeast Thai School Children Consuming Glutinous Rice-Based Diets Are Not Exacerbated by High Phytate. *International Journal of Food Science and Nutrition* 57(7–8): 520–528.

Household Dynamics, the Capitalist Economy, and Agricultural Change in Rural Thailand

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Agriculture in Thailand is undergoing significant change. The present paper addresses this change from a social perspective, focusing on the role of household dynamics and expansion of the capitalist economy into rural areas. It draws upon data from different sources. Changes in household dynamics over the past decades have resulted in not only unprecedented below-replacement fertility levels and small households on average but also labor and land constraints in most rural areas. In this environment, rural households are under pressure to modify their farming practices. Meanwhile, the expansion of the capitalist economy brought about by the Green Revolution and new socioeconomic policies since the early 1960s has opened up new opportunities and choices for rural households to participate in market-oriented production. It is the response of households to this environment that is leading to agricultural transformation in rural Thailand.

Key aspects of agricultural change identified in this analysis include a shift from subsistence production to market-oriented production; widespread agricultural mechanization and adoption of other new technologies; emergence of agribusiness and large-scale commercial farming; and structural change in land use and land-holding, resulting in land concentration.

Changes in agriculture are likely to alter other aspects of rural life. It is, therefore, important to have a short-term safety net as well as long-term policy that will lead to a holistic agricultural reform.

Keywords: demographic transition, mode of production, mechanization, agribusiness, land concentration, rural society

Introduction

In Thailand, as in most countries of Southeast Asia, agriculture is not only the main source of livelihood but also the foundation of the economic, social, and cultural life of rural people, who form the largest part of the national population. As such, changes in agriculture have significant impacts not only on the national economy but also on social and

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cultural aspects of rural life. Due to their great significance, agriculture and many aspects of agricultural communities in Thailand have been a focus of investigation by social scientists since the middle of the twentieth century. Notable among these are early studies by American researchers under the Cornell-Thailand Project initiated by Lauriston Sharp in 1947 at Cornell University. The program's groundbreaking study was conducted by Sharp himself at Bang Chan (บางชัน), a farming community on the outskirts of Bangkok, to collect baseline data on farming villages in Thailand (Sharp 1953). Following Sharp, many researchers conducted their studies at Bang Chan, looking at different aspects of village life: the village economy (Janlekha 1955), interpersonal behavior of Thai peasants (Phillips 1965), and agricultural ecology—particularly the interface between sociocultural and agricultural aspects of peasant life (Hanks 1972). In the following decades, several investigators looked at diverse issues related to sociocultural and agricultural aspects of village life in other parts of the country. To mention just a few, the issues studied included the relationship between peasants in rural communities and the state (Keyes 1966), agricultural change and how choices were made by the peasants (Moerman 1968), land tenure and social organization (Lefferts 1974), and family structure in rural Thai communities (Foster 1975).

Perhaps the most comprehensive and long-term study focusing on social and agricultural aspects of a rural community was carried out by a team of Japanese scholars from the Center for Southeast Asian Studies, Kyoto University. This ambitious project built on the pioneering ethnographic work of the late anthropologist Mizuno Koichi (1933–79), who looked at the social system and social organization at Don Daeng village (บ้านดอนแดง), near Khon Kaen city, an urban center of the Northeast region, in the 1960s (Mizuno 1971). In the early 1980s, a large project was launched to carry out comprehensive studies at the same village. This project involved a team of Japanese and Thai researchers from different disciplines, including sociology, economics, geography, and environmental and agricultural sciences. The project culminated in a number of publications by agricultural scientists, including Fukui Hayao's seminal volume *Food and Population in a Northeast Thai Village* (Fukui 1993). This monograph presents a microscopic examination of agriculture as practiced by the people of Don Daeng village, which is believed to share key characteristics with most villages in the Northeast region of Thailand. The author explores possible links between agriculture on the one hand, and key demographic behaviors—family formation, inheritance, migration, fertility, and mortality—on the other. Fukui also provides a thorough analysis of how key aspects of social organization—kinship relations, inheritance, and pattern of migration—are in turn shaped by the requirements of rice production and other environmental conditions.

Despite the past investigators, few studies have adequately addressed agricultural

change from a socioeconomic perspective. This paper is an attempt to fill this gap. It proposes that the interplay of key social and economic factors, taken here to include household dynamics and expansion of the capitalist economy into rural areas, can shed light on changes in Thai agriculture. This is important because household dynamics strongly influence shifts to new agricultural practices and the adoption of new farming strategies, while the expansion of the capitalist economy into rural areas makes it possible for rural households to participate in new economic opportunities characterized by market-oriented production. This process has resulted in a transformation of agriculture where a growing number of rural farm households are increasingly moving away from traditional subsistence production toward production for the market.

Agricultural change here is understood as transformations at both the practical and structural levels. At the practical level, this change involves the transition in farming practice from the traditional method, relying mainly on human labor and simple technology, to an increasing use of machines and modern technology—hence capital intensive. At the structural level, the locus of change lies in a steady shift in the mode of production from subsistence- to market-oriented agriculture. Along with this, there is the emergence of agribusiness and commercial farming, which has transformed the agricultural profile in many areas. Structural change is also associated with patterns of land use and landownership that, in the absence of appropriate measures for regulating land tenure, have led to a state of land concentration. Such structural transformation is ongoing in many parts of the country.

The following exposition begins with a brief account of different theoretical perspectives on agricultural change to provide a background for subsequent discussions. This is followed by a comprehensive overview of household dynamics and expansion of the capitalist economy into rural areas with a special emphasis on how these new socioeconomic circumstances facilitate agricultural change. The next section examines key aspects of agricultural change in rural Thailand. The final section recapitulates and discusses the future prospects of agriculture and rural farm households. Some short-term and long-term policies for agricultural development in rural Thailand are also discussed.

Perspectives on Agricultural Change

Previous studies have employed different theoretical perspectives on agricultural change. For our purpose here, agricultural change will be discussed under the concepts of involution, evolution, and revolution.

Agricultural Involution

According to Clifford Geertz in his well-known study on Javanese peasants of Indonesia, "agricultural involution" refers to an internal elaboration of the existing pattern of farming practices (Geertz 1963). This is an "inward-turning type of change" (White 1983) and, as such, not a shift from an existing pattern to a different one. There is no new form emerging to replace the old one; rather, the existing pattern is rigidified or elaborated so that its yields are increased. The key characteristic of agricultural involution lies in intensification in the use of labor, land, and crop variety. Put simply, this is a strategy to get the most out of limited land by investing more labor without having to invent an entirely new farming method. Geertz interpreted this farming practice as a strategy that Javanese peasants employed to increase production on their limited land in order to meet tax demands from the Dutch colonial rulers in the past.

Agricultural involution has been observed also among peasants in other parts of the world. A. V. Chayanov (1966), for example, reported that among Russian peasant households in the early twentieth century, those with high consumer-laborer ratios were more likely to increase labor inputs by working harder or working longer hours (i.e., labor intensification) in order to get enough food to meet their consumption needs. Another form of agricultural involution is found in the complex farming practice of northeastern Thailand (Grandstaff 1988). This practice, according to Terry Grandstaff, is the farmers' response to the variation and uncertainty of natural resources and environment. It is characterized by diversification of crops and farming methods, which often vary from year to year or even from season to season, depending on land types and rainfall situation. Where possible, farmers often supplement this strategy by engaging in other economic activities outside subsistence agriculture, such as growing cash crops, cottage industry, and temporary off-farm employment in the local area or elsewhere. In this type of farming practice, the specific composition of the "diversified livelihood portfolio" of rural households constantly changes, but the basic farming pattern persists. This strategy is viewed as an effective adaptation to the physical environment of the Northeast, which is characterized by diverse terrain and uncertain rainfall.

The "mixed farming" strategy currently adopted among some small farmers in Thailand may also be included as a form of agricultural involution. In this farming strategy, farm households allocate their lands into a variety of farm activities—growing rice, fruit trees, vegetables, and other crops as well as raising animals. This practice is operated predominantly on a small scale based on land, labor, and resources available to the farm household, with the primary aim of achieving food security. Although modern agricultural technologies may be utilized by some households, the pattern of farming remains traditional and subsistence-oriented rather than market-oriented production.

Agricultural Evolution

Evolutionary change in agriculture is characterized by a gradual shift from an extensive farming practice to a more intensive one in order to achieve higher yields. Like involution, agricultural evolution is driven by some kind of pressure, particularly the need for more food to feed the growing population. When the population pressure on food supply reaches a high level, change in agricultural practice is necessary. Conceivably, people in the past responded to this need by relying first on working harder to produce more food (i.e. labor intensification or involution). When such a strategy was no longer effective, new farming methods were invented, perhaps after several acts of trial and error. Over time, the old practice gave way to a new innovative one that could produce higher yields. In Boserup's view, population pressure is the key condition leading to agricultural development (Boserup 1965). In this perspective, global agricultural evolution gradually proceeded from the stage of a simple method requiring high labor investment to a complex one involving greater use of technology.

In some contexts, the pressure that leads to agricultural evolution comes also from market demand in addition to the consumption needs of farm households. According to anthropologist Lucien Hanks (1972), this is how rice production in Thailand evolved. Based on his study of a rice-growing community in the Lower Chao Phraya Delta of Central Thailand, Hanks found that the method of rice production evolved in three stages: from shifting cultivation to broadcasting to transplanting. This evolution took place over the course of 100 years or so since the mid-nineteenth century. In each stage of the evolution, farming practice became increasingly complex, involving not only more use of technology but also greater attention to water management and crop care. Hanks attributed this evolution to the need of households for consumption and their response to the growing rice trade that Siam (Thailand) had with some Western countries.

Agricultural Revolution

Toward the end of the twentieth century, agricultural practices in most regions of the world underwent a rapid transformation characterized by an increasing role of technology and market-oriented production. This process of transformation, which will be referred to here as an agricultural revolution, was driven by research and development and subsequent transfer of new technology to farmers to increase food production. The best-known revolutionary change in agriculture is the Green Revolution, initiated in the 1940s with the coordinated efforts of scientists in agricultural, biological, and social sciences. The effort was a response to the perceived need to produce more food to feed the increasing world population (Hazell 2009). However, it was not until the 1960s and thereafter that farmers in most developing countries were able to benefit from it. Indeed, since the

emergence of the Green Revolution, development of agricultural technology has been the key force transforming agricultural practice in many parts of the world, including Thailand.

The Farm Household as the Key Actor in Agricultural Change

Although the concepts of involution, evolution, and revolution can provide an understanding of agricultural change, they deal largely with change at the macro level. The three concepts focus mainly on the role of external factors driving agricultural transformation. As such, not enough consideration is given to the micro level, namely, individual farm households that are the real actors and the locus of change in the context of the environment within which they operate. In many societies, while external factors such as population pressure, market demand, and technological development are still operative, they are not sufficient to account for change in agricultural practice at the level of farm households. After all, it is the individual farm household that makes decisions affecting agricultural practices. Therefore, in order to have a better understanding of agricultural change, it is important to look at the rural households that operate under their own circumstances within the larger system.

This paper addresses how household dynamics and expansion of the capitalist economy are together influencing agricultural practice at the household level in rural Thailand. It is argued that labor and land constraints resulting from the long-term process of household dynamics associated with expansion of the capitalist economy into rural areas have resulted in changes not only in agricultural practice among farm households but also in the structural transformation of agriculture. This process of agricultural change has been under way for some time, but the nature of the change has become clearer since Thailand entered a new era of socioeconomic development in the early 1960s.

The underlying idea for argument here is very much in line with the perspective of the system approach in agriculture, which views farm households as the locus of change. According to this approach, the farm household operates within a system consisting of physical, biological, and socioeconomic environments. In its operation, the household draws upon a set of well-defined existing practices while taking into consideration its goal, preferences, and available resources (Shaner *et al.* 1982). In view of this perspective, agricultural change is an outcome of the response of farm households to the changing environment within which they exist. As such, switching from one crop to another is not only an act influenced purely by physical and biological conditions (soil type, rainfall condition, crop type, etc.) but also a response to household needs and goals. Thus, switching from a staple crop such as rice to a cash crop such as sugarcane is caused not only by availability of land suitable to the crop of interest (e.g., the land being better for

sugarcane than for rice) but also by the household's need for cash income. Similarly, switching from a labor-intensive method to a technology-intensive method of cultivation reflects not only the availability and accessibility of new technology but also the resources and labor at the disposal of the household. Moreover, in making such a choice the farm household also takes into consideration its preferences and goals. Over a long period of time, such changes in practice by individual households constitute agricultural transformation at the macro level. It is from this perspective that agricultural change in rural Thailand is discussed below.

It is important to be clear at the outset about the environment within which rural households in Thailand have been hitherto operating. This environment consists of two components: one is the social environment defined in terms of household dynamics, and the other is the economic environment characterized by expansion of the capitalist economy into rural areas. As will be seen below, household dynamics bring about constraints in labor and resources (land), which leads to the need to modify agricultural practices on the part of farm households, while expansion of the capitalist economy into rural areas brings with it new agricultural technology and economic opportunities. Both these forces underlie agricultural change in rural Thailand.

Household Dynamics and the Expansion of the Capitalist Economy

Household Dynamics

Put simply, household dynamics is a change in size and structure that occurs as the household develops through different stages in its life course. The size of the household expands and contracts as new members are born or move in and some members die or move out to other places. Along with the change in size, the age-sex composition of the household also changes, thereby affecting the household structure. This, in turn, results in different consumer-worker ratios at different stages of household development. In the context of rural Thai society, the process of household dynamics develops in a cycle of expansion and contraction that extends beyond the lifetime of the founding couple's household. The cycle of expansion and contraction repeats in the households of the children, who perpetuate it in successive generations. Some anthropologists refer to the cyclical development of households in this fashion as a "developmental cycle in domestic groups" (Goody 1958). In rural Thailand, this developmental cycle is often associated with the breaking up of the household's resources, particularly farmland, to allocate to all children when they start independent households of their own.

Change in household size and structure over the household's life course is closely

associated with the demographic transition brought about by changing patterns of fertility and mortality. In Thailand, the decline in fertility rate was a result of the successful National Family Planning Program (NFPP) established in the early 1970s. About three to four decades after the establishment of the NFPP, the widespread use of modern contraceptive methods for family planning significantly brought down the average number of children per woman to a very low level. Before the NFPP was implemented, a Thai woman had an average of 6 children throughout her reproductive age. Now the average number of children per woman is only 1.6, that is, well below the replacement level of 2.1 children. The below-replacement fertility rate of the Thai population is likely to continue in the coming decades (Patama and Pramote 2014). During the same period, the average family size also reduced significantly, from 6 to about 3 persons at present. Indeed, family size in Thailand now is virtually as small as in most developed countries.

The prolonged decline in the birth rate associated with increasing longevity as a result of improved nutrition and public health services over the past decades has led to growth in the number and proportion of old persons in both urban and rural areas. At present, it is estimated that 16.5% of the total Thai population is aged 60 and older (*Mahidol Population Gazette* 2016). With this proportion of old people, Thailand is becoming an aging society. In 2009, nearly one-third of the total 19.8 million households had at least one old person. It is worth noting that as the proportion of old people increases, there is also a tendency for the number of households consisting of only old persons to increase. In 1988, there were 260,969 old-person-only households; the number increased rapidly to about 1.1 million in 2009, an increase of more than three times over a period of 21 years. In relative terms, old-person-only households accounted for 5.6% of the total number of households (Mingsan and Natthakorn 2013). The increase of this type of households in rural areas is due partly to the demographic transition noted above and partly to the high rate of out-migration of working-age adults to seek employment in urban areas. The impact of a growing number of old people on Thai agriculture has not been thoroughly investigated. Yet, it is conceivable that since many old people need caretakers, who are often household members of working age, this could result in a labor constraint in many farm households.[1)]

The mass outflow of rural workers to urban areas over the past several decades reflects, among other things, a relative decline in the importance of agriculture as a source

1) The reverse could also be true for some households where old people help free nursing parents from child care and hence enable them to engage more fully in farm work. Nevertheless, the impact of an old population on labor supply is largely negative.

of income, while off-farm employment is becoming more important. This has been an outcome of the economic and social development policy initiated in the early 1960s. The policy gives considerable importance to industrial development. That in turn opens up employment opportunities in the industrial and service sectors, which are available largely in urban areas. This has had a significant impact on the availability of labor for agriculture, as will be discussed below.

The growing proportion of old people in the population and the continued outflow of rural workers have two related consequences that bear directly on agricultural change. First, a peculiar form of household, often referred to as "skipped generation household," has emerged. This is a household where old grandparents and their young grandchildren (below age 15) live by themselves most of the time without the presence of adult members in working age. According to an analysis by the Thailand Development Research Institute, there were more than 1.3 million skipped generation households in 2009, a substantial increase from 267,380 in 1986. In 2009 skipped generation households accounted for 7% of the total 19.8 million households, compared to only 2% in 1986 (Nibhon 2011). In relative terms, the annual rate of increase of this type of household was the highest of all. For example, between 1986 and 1998, the rate of increase of skipped generation households was 7.5%, and between 1998 and 2009, it decreased slightly but was still at a high level of 6.9%. Four out of five skipped generation households were in rural areas, with the largest share in the North and Northeast, where the rural exodus was most prominent (Mingsan and Natthakorn 2013; UNFPA and National Economic and Social Development Board 2015).

Second, the increase of the old population and mass outflow of rural workers over the past decades have caused a labor constraint in rural areas. In the period of 25 years from 1985 to 2010, for example, the proportion of agricultural labor as a percentage of the total labor force decreased substantially, from 67.6% to 40.7%. During the same period agricultural workers were getting older: their average age rose from 32 to 43 years (Fig. 1). There was also a substantial decline in the percentage of young adults aged 15–34 in the agricultural sector: their proportion substantially decreased from 60.5% in 1985 to 30.1% in 2010. This is in contrast to older adults aged 35–54 and 55 years and older, whose proportions increased slowly but steadily (Fig. 2). While other factors may have also contributed to this change, rapid aging of the population and the constant outflow of rural workers undoubtedly played a significant role.

At a certain stage in the household's life course, farmland is divided up and allocated to children who are married and starting their own independent households. Typically, the division of household property such as farmland is based on customary practice by which all children, regardless of sex and birth order, are entitled to equal (or fair)

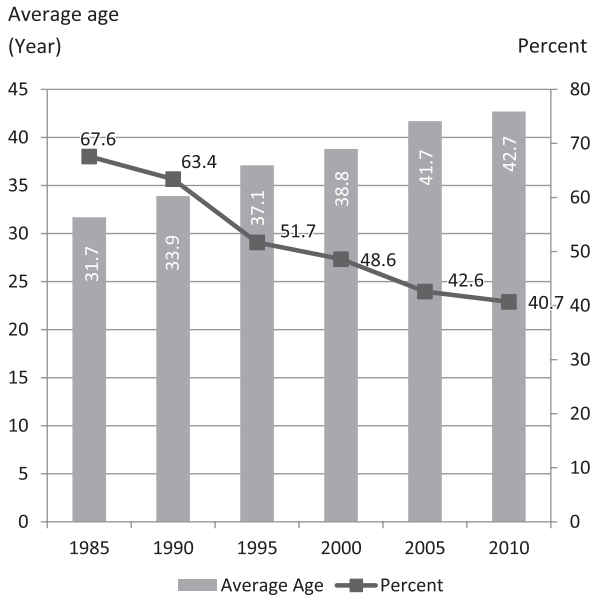

Fig. 1 Percentage of Agricultural Laborers as Proportion of the Total Labor Force and Their Average Ages, Selected Years 1985–2010

Source: Calculated by the author based on data from National Statistical Office (1985; 1990; 1995; 2000; 2005; 2010).

shares.[2] Fair and reasonable as it may be, in the long term this partible inheritance system has led to an increasing fragmentation of the household's farmland. Since land is constantly divided in this manner from generation to generation, land constraints could particularly affect those whose land is already limited. Indeed, the constraint has already become serious for many households of the younger generation.

Unless farmland is acquired through a possible means, some households may have to seek a livelihood outside agriculture. However, buying new farmland is extremely difficult, if not impossible, for most farm households nowadays. Until recently, encroaching into the frontier lands was a common strategy that many farm households used to acquire new farmland. For example, among farmers in the Central Chi River areas of the Northeast, where farmers experienced land problem (quantity and quality) more than other parts of the region, moving to the frontier areas within and across the region was prevalent during the 1950s (Keyes 1976). This practice is also documented in the anal-

2) The law regarding right to inheritance also follows this custom. However, when possible most parents prefer keeping a part of the land for themselves for "old age security." This part usually goes to the child (most often a daughter) who stays with the parents and takes care of them in their old age.

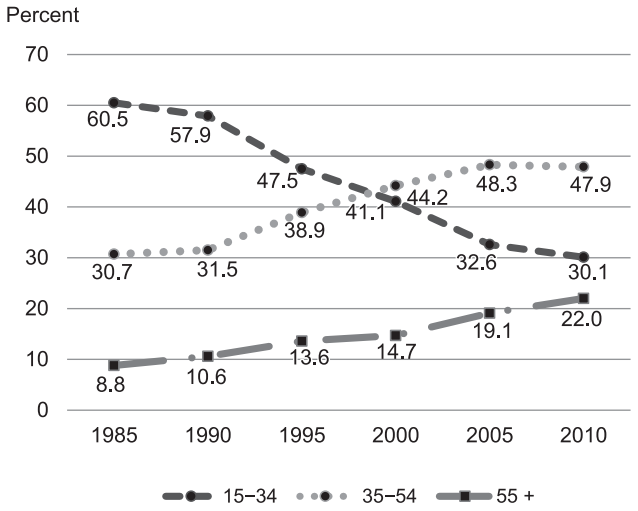

Fig. 2 Percentage of Labor Force in Agriculture by Age Group, Selected Years 1985–2010
Source: Calculated by the author based on data from National Statistical Office (1985; 1990; 1995; 2000; 2005; 2010).

ysis of internal migration in Thailand around the mid-twentieth century (Pramote 1977). The analysis has demonstrated that the dominant stream of migration was movement of people from one rural area to another less-populated area across provincial borders. Most of the migrants were rural people who moved in search of new and/or better farmlands in the frontiers. However, the "golden age" of migration in search of farmland is now virtually over as there is little unclaimed land left and legal penalties for encroachment on protected forestlands are severe.

Because of constant land division and limited opportunities to acquire additional land, the sizes of farms bequeathed to the next generation are increasingly smaller. The rate of farm size reduction is determined by three factors: the amount of land available in the parental generation, the number of children in each successive generation, and the household's ability to acquire additional land. Thanks to the decline in the birth rate and outmigration of many young people to work and, for many cases, settle in the cities, the number of children remaining in the village to share their parental farmland has been reduced. These processes must have helped to relieve land pressure at the household level to some extent so that the average holding size per agricultural household is reducing slowly. Calculations based on a series of household socioeconomic survey data reveal that during the nearly 40 years from 1976 to 2013 the average size of agricultural land decreased from 27 rai (4.3 ha) to 20 rai (3.2 ha) per holder (Fig. 3). Note that the holding size in this case includes all the land that the holder used for agricultural purposes regard-

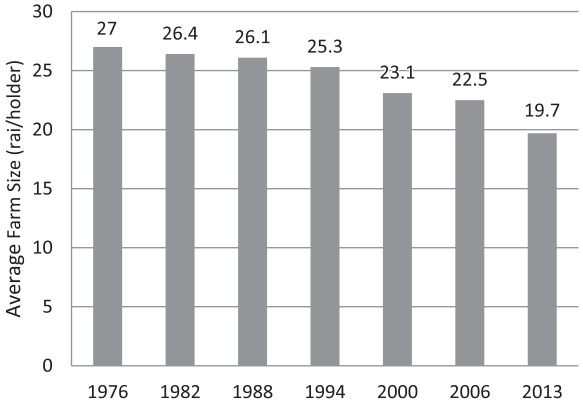

Fig. 3 Declining Farm Size, 1976–2013

Source: Calculated by the author based on data from the following sources: 1976–2006, data from *Agricultural Statistics of Thailand* (Office of Agricultural Economics 2009), selected years; 2013, data from *Agricultural Census 2013* (National Statistical Office 2013).

less of whether it was owned, rented, or acquired by other means.

Because of the shrinking farm size, more and more farm households have to supplement their income with off-farm employment available in the local area or elsewhere in the urban centers. Availability of off-farm employment makes it possible for members of the younger generation to find alternative livelihoods either as a supplement or as the main source of income. Indeed, a short visit to rural villages today is enough for an outside observer to notice how important off-farm employment is for most of the farm households. For some, off-farm employment, mostly in the urban areas, may be only a source of supplementary income, but for others it is the main source, without which it would be difficult to make ends meet. As such, the proportion of farm households with agriculture as the major source of income has declined steadily since 1986, when nearly 4 in 5 (78.5%) of farm households relied predominantly on agriculture, to just a little more than one-third (37.5%) in 2013. The decline was greater in the past 20 years or so (Fig. 4).

The transformation that resulted from the household dynamics described above has become a condition for rural households to act in ways that are suitable given their preferences, goals, and resources. It is this condition that makes a number of households willing to modify their agricultural practices, or even adopt a new farming strategy, when possible.

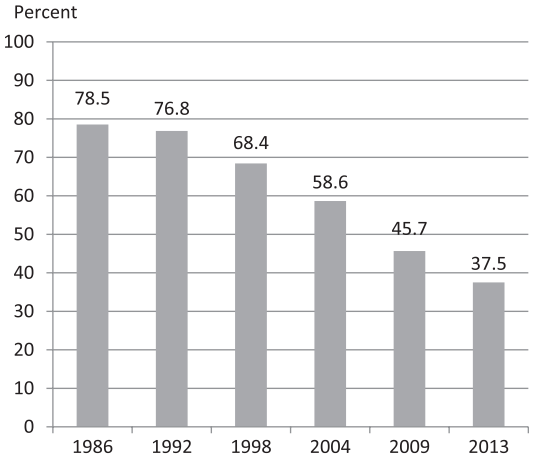

Fig. 4 Percentage of Farm Households with Agriculture as the Main Source of Income
Source: Calculated by the author based on data from household socioeconomic surveys, selected years, 1986–2013.

Expansion of the Capitalist Economy

The capitalist economy is one where the market and money play important roles in production, consumption, and maintenance of the day-to-day life of households. Throughout the largest part of its history, Thailand's economy was based on subsistence agriculture carried out by small farm households. Although trade with foreign countries dates back to at least the fourteenth century, in the early Ayutthaya period (Breazeale 1999), it was not until the mid-nineteenth century that the country was brought into close contact with world capitalism after the signing of the Bowring Treaty with the British government in 1855. This treaty opened the door for trade relation with the Western powers. After that rice exports increased substantially. However, only a minority of rice farmers, largely in the Chao Phraya Delta, benefited from the rice trade at that time. The great majority of farmers in other parts of the country remained subsistence producers. A historical study of village economy by Chattip Nathsupa and his colleagues revealed that subsistence agriculture remained a dominant mode of production in rural Thailand at least up to the early twentieth century. Although rice production, and consequently rice trade, increased substantially from the late nineteenth to the early twentieth century, the increase was largely a result of expansion in the Chao Phraya Delta. In other areas, expansion of the market economy and trade in agricultural produce were limited; subsistence agriculture remained the dominant means of livelihood during the first half of the twentieth century. Indeed, even after World War II market-oriented agriculture in most parts of the country was still poorly developed and by no means the principal element of

the rural economy (Chattip *et al.* 2010; cf. Ingram 1971, 36ff.).

It is the National Economic and Social Development Plans,[3] initiated in the early 1960s and continuing until the present, that have been strengthening the market economy in the rural setting. With a clear policy for agricultural and industrial development, the plans have been instrumental in driving the national economy toward export of both agricultural and industrial products as a means of raising national income. From the 1960s there was a substantial expansion of domestic and overseas markets for agricultural products. This opened up new opportunities to which farm households actively responded in many ways. Important among these were: (1) adoption of new cash crops (e.g., sugarcane, cassava, maize, and rubber trees) and animal husbandry, especially swine, poultry, shrimp, and fish, all directly responding to market demands; and (2) widespread use of modern farm technology to improve production. In the process of expansion of the capitalist economy, farm households were active recipients of the government policy and assistance; they were "innovators" who actively took advantage of the new opportunities while the government played a secondary role, mainly providing agricultural infrastructure.[4] This was especially notable during the first seven or eight five-year development plans (1960s–1990s), when the adoption of cash cropping and the use of modern farm technology were widespread in all parts of the country. This was possible mainly because of the entrepreneurship of individual farmers.

As a consequence, agriculture in rural Thailand has undergone an unprecedented change. There has been a tremendous increase not only in the production of cash crops but also in the use of modern technologies among most rural households, while an increasing number of them have changed their farming strategy to produce largely for the market. Details of these changes are examined in the next section.

Agricultural Change in Rural Thailand

Although the process of transformation from traditional subsistence production to market-oriented production is far from being complete, there is some evidence that a significant shift from traditional to modern agriculture has been taking place in most parts of the country. Key aspects of changes currently taking place in rural Thailand include shifts

3) There has been a series of five-year development plans, with the first one initiated in 1961. In 2016 Thailand was in the 11th plan (2012–16).

4) It must be pointed out that the provision of agricultural infrastructure such as irrigation dams is far from being adequate everywhere in the country. Farmers in the Chao Phraya Delta of the Central region receive the largest share of benefit compared to those in other regions.

in the mode of production and farming method, the emergence of agribusiness/commercial farming, and changes in land use and landholding. Changes in these key aspects are likely to alter the agricultural profile of rural Thailand.

Mode of Production

Agriculture in Thailand is becoming predominantly market oriented. The market plays an increasingly important part not only in the sale of farm products but also in the process of farming. In some areas, such as the Lower Chao Phraya Delta, where rice farming is relatively more advanced, a majority of farmers sell virtually all the grain that they produce; they simply buy what is needed for their own consumption. This is particularly the case with the "off-season rice" (*khao naa prang*), which is grown in the dry season for the market. Similarly, in many areas a large number of farmers engage in growing only cash crops such as sugarcane, maize, cassava, oil palm, and rubber and fruit trees. Involvement in production for the market is so common nowadays that households that produce exclusively for consumption hardly exist. A survey in the 2001–02 crop year revealed that only about one-third of all farm households in the country used most, but not all, of their produce for consumption, while the rest sold most of it for cash (Office of Agricultural Economics 2009). The market also plays an important part in the production process. Most, if not all, farmers depend on the market not only for seeds but also for agricultural machines, fertilizer, and pesticides.

Farming Method

Another notable aspect of change is the farming method that involves widespread use of machines and other modern technologies. Most rice farmers, for example, regardless of farm size, now use machines in all activities ranging from land preparation to harvesting. Farmers also use improved seeds and chemicals to increase yields. A small number of farmers who practice organic farming ("alternative agriculture") may not rely on chemicals, but their farming practices are no longer the same as in the past; at least many of them do not turn their backs on using farm machines. And like most "chemical" farmers, these organic farmers too are involved in production for the market.

It would not be an overstatement to say that mechanization is a dominant aspect of farming today. Traditional farming using simple plows pulled by water buffalo or oxen, so common in the recent past, has been nearly, if not completely, replaced by farming using petroleum-powered machines of different types. As of November 2015, the cumulative number of registered tractors and farm vehicles countrywide was reported to be 586,537 (Department of Land Transport 2015). This, however, seems to be too low an estimate; the actual number of machines used for farming purposes is believed to be

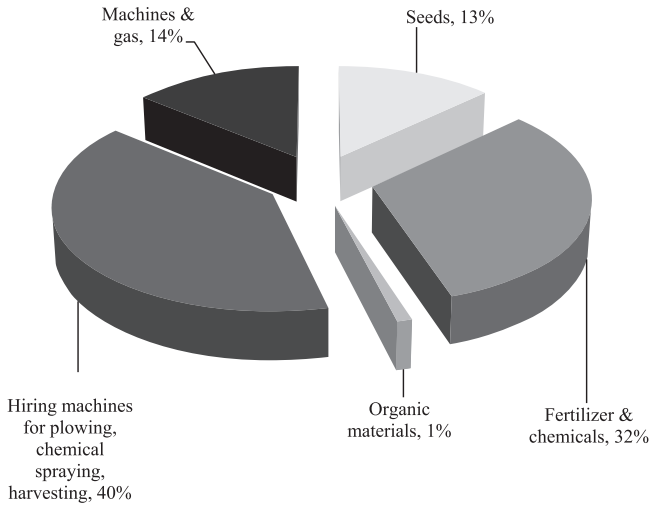

Fig. 5 Percentage of Financial Investment by Farm Households in a Community of Supan Buri Province, Lower Chao Phraya Delta, 2002–03 Crop Year

Source: Witoon and Suriyon (2008).

much greater if all kinds of farm machines are counted. For example, the number of "two-wheel hand tractors" alone must be in the millions; they are common among low-budget farmers and typically are not registered. Widespread use of farm machines is a direct response of farmers to two things: labor shortage in rural areas due to the continuing outflow of rural workers associated with demographic change and household dynamics discussed above; and the availability and accessibility of farm machines that can work better and faster. Whatever the reason behind this, the outcome is a change in farming method.

Increasing mechanization and the use of other modern technologies means that farming nowadays requires more financial investment and hence becomes more capital intensive. A case study of farming in a community in Supan Buri Province in the Lower Chao Phraya Delta revealed that the largest proportion (86%) of financial inputs was for buying/hiring machines, gasoline, and fertilizer and other chemicals, as shown in Fig. 5 (Witoon and Suriyon 2008). In terms of mechanization, small farmers in rural Thailand seem to share some characteristics with large commercial farmers in developed countries with advanced capitalist economies, although on a different scale.

Emergence of Agribusiness/Commercial Farming

Unlike in the past, key players in Thai agriculture now are not only small farmers who produce both for consumption as well as the market, but also entrepreneurs and large

corporations that produce exclusively for the market. In the past, the business sector's involvement in agriculture was typically limited to acting as intermediaries who made a profit through the buying and selling of agricultural products. Under global capitalism, where food has become an important commodity from which large profits can be made, agriculture becomes an attractive opportunity to more and more entrepreneurs and corporations at both the local and national levels.

At the local level there are entrepreneurs who may be wealthy individuals or retired government officers. They rent as much farmland as they can manage and then hire local "farming experts" or "contractors" to do all the farm work, ranging from preparing the land to harvesting the crops (Suriyon *et al.* 2010). One can say that these are a new type of farmers (or farm managers), who do the job without having their hands and feet dirty. They run the business solely for profit. Some of them may also act as brokers in contract farming, another form of agribusiness that is growing slowly but steadily in many rural areas. At the national level there are large business corporations that focus on food production. Of particular interest is that these large corporations (local, national, even multinational) engage in all stages of the food production process (or, rather, food industry)—from upstream crop growing to midstream food processing and all the way to downstream food marketing. Conceivably, these large corporations are in direct competition with small rural farm households, most of whom also produce for the market.

Meanwhile, there seems to be some prospect for change among the farmers themselves toward becoming entrepreneurs or "business farmers" of some kind. This is indicated in a survey of rice farmers in the Lower Chao Phraya Delta, where rice production for the market is the most advanced in the country. The survey asked respondents about their self-perception at three different points in time—at the time of the survey (i.e., in 2009–10), 5 years in the future, and 10 years in the future—whether they perceived themselves as traditional farmers, progressive farmers, or business farmers. At the time of the survey virtually all respondents (98%) perceived themselves as either traditional farmers or progressive farmers who routinely used modern farm technology; only 2% reported that they were business farmers. This was in sharp contrast to their self-image in the future. In the next 10 years, for instance, the proportion of farmers who perceived themselves as traditional and progressive farmers decreased to 75% (13% traditional and 62% progressive farmers respectively), while those who thought they would become business farmers in the next 10 years increased to 25% (Fig. 6). It remains to be seen whether the self-perceptions of rice farmers in Central Thailand are going to be realized. Fig. 6 does indicate the direction in which Thai agriculture may be moving in the future.

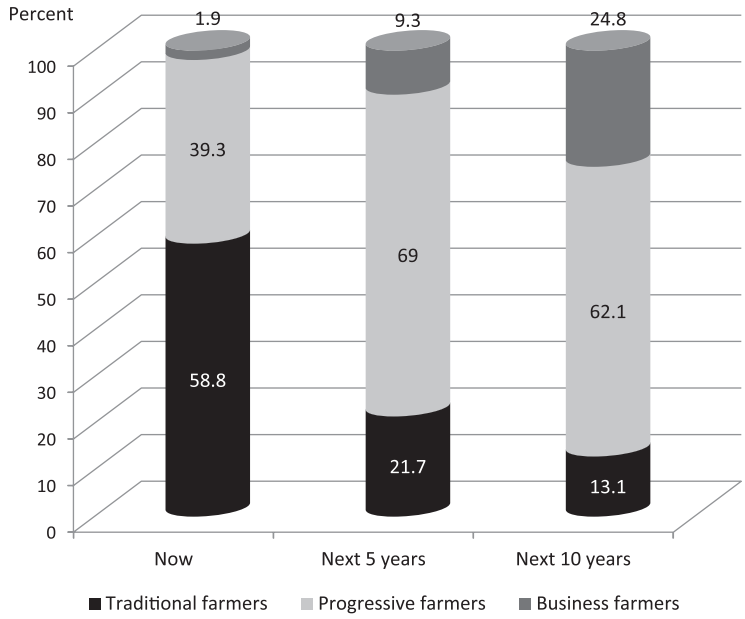

Fig. 6 Self-perception of Rice Farmers in Selected Provinces of the Lower Chao Phraya Delta, Central Region, 2009/2010

Source: Suriyon *et al.* (2010).

Changing Land Use and Landholding

The land areas used for different crops vary from year to year. This change has been reported annually in *Agricultural Statistics* over the past 30 years or so. Of course, variation in agricultural land use may be influenced by numerous factors; common among these are rainfall, land type, capital, technology, and household's consumption needs. However, in the context of the expansion of the capitalist economy into rural areas, change in agricultural land use is closely linked to the farmers' response to market prices, domestic as well as international. In addition to rice, this is the case for cash crops such as baby corn, oil palm, rubber tree, mung bean, soybean, onion and tomato (Table 1). Such variation in the land use is a form of agricultural change since it is a result of changing strategies and practices on the part of the farmers.

During the past decades there has been substantial urban and industrial development, often at the expense of agricultural land. While accurate data on agricultural land loss due to the process of urban and industrial expansion are yet to be compiled, a plain observation can give some idea of this loss. With increasing urban and industrial growth, much agricultural land around large urban centers such as Bangkok and other big cities has been converted to housing estates, commercial complexes, and industrial areas.

Table 1 Change in Land Areas Planted with Selected Crops, 2000–09 (area in thousand rai, * except for baby corn, onion, and tomato)

Year	Rice	Baby Corn (rai)	Oil Palm	Rubber Trees	Mung Bean	Soybean	Onion (rai)	Tomato (rai)
2000	66,492	153,895	1,660	11,651	1,845	1,396	19,922	67,897
2001	66,272	232,372	1,827	12,144	1,892	1,154	17,448	68,649
2002	66,440	233,630	1,956	12,430	1,831	1,130	15,143	50,729
2003	66,404	217,905	2,057	12,619	1,520	961	17,672	49,362
2004	66,565	244,802	2,405	12,973	1,170	945	12,161	50,991
2005	67,677	217,638	2,749	13,617	1,015	929	9,456	48,791
2006	67,616	181,856	2,968	14,359	954	886	11,726	38,737
2007	70,187	225,483	3,228	15,362	951	816	12,099	39,591
2008	69,825	231,544	3,676	16,717	906	753	10,131	38,229
2009	71,542	230,724	3,888	17,254	900	758	11,076	38,741

Source: Office of Agricultural Economics (2009).
Note: * 1 rai = 0.16 ha or 1,600 m^2

Table 2 Distribution of Landholding, by Quintiles of Owners, 2012

Quintile	Number of Owners	Land Areas (rai)*	Average Area per Owner (rai)*	Percent of Total Land Areas
Q1—smallest landowners	3,181,406	232,790	0.07	0.25
Q2	3,180,094	860,042	0.27	0.91
Q3	3,178,480	3,351,173	1.05	3.53
Q4	3,180,085	14,597,194	4.59	15.39
Q5—largest landowners	3,179,982	75,827,412	23.8	79.93
Total	15,900,047	94,868,611	5.97	100

Source: Duangmanee (2014).
Note: * 1 rai = 0.16 ha or 1,600 m^2

About 40–50 years ago, for example, much of the land on the outskirts of Bangkok was used for growing rice, vegetables, and fruit trees; now virtually all of it has been turned into housing estates and commercial centers. The same has happened in other big cities throughout the country: Chiang Mai, Khon Kaen, Nakhon Ratchasima, Chonburi, Rayong, and Hat Yai, to mention just a few. Similarly, expansion of industrial areas has taken up large areas of agricultural land in many provinces in the Lower Chao Phraya Delta and along the east coast. Needless to say, most of the land lost to urbanization and industrialization is among the best-quality land for rice, vegetables, and fruit trees.

Perhaps the most important change that can have a long-term impact on farm households, and on the agricultural landscape in general, is change in the structure of landholding. A recent analysis of national landownership based on data from the Department of Lands revealed a very high degree of land concentration in Thailand, as shown in Table 2. In this analysis, people who owned land of any kind in 2012, agricultural and non-

Table 3 Change in Number and Proportion of Agricultural Landholders* by Size of Land, 1993, 2003, and 2013

Size of Landholding (rai)**	Number of Landholders			Percent of Total Landholders			Change (%)	
	1993	2003	2013	1993	2003	2013	1993–2003	2003–13
<6	1,114,038	1,372,215	1,377,499	19.7	23.6	23.3	23.2	0.4
6–9	745,982	816,588	817,473	13.2	14	13.8	9.5	0.1
10–39	3,064,632	2,970,571	3,000,043	54.3	51.1	50.7	–3.1	1
40–139	694,292	625,917	688,825	12.3	10.8	11.7	–9.8	10.0
140+	28,547	29,388	27,727	0.5	0.5	0.5	2.9	–5.7
Total	5,647,491	5,814,679	5,911,567	100	100	100	3	1.7

Source: National Statistical Office (2013).

Notes: * Agricultural landholders include all farmers, individuals, and legal entities who farm the land that they own, rent, or have access to by other means.

** 1 rai = 0.16 ha or 1,600 m^2

agricultural, were divided into five groups (i.e., quintiles), with Group 1 having land of the smallest size and Group 5 having the largest-sized holdings. It was found that 80% of the total owned land area was in the hands of the wealthiest people, individuals, and legal entities, including politicians and "powerful" persons, who constituted only 20% of the total landholders (Q5 in Table 2). Only 20% of the land area was shared by 80% of the owners in Groups 1–4 (Q1–4 in Table 2), who were less wealthy (Duangmanee 2014). Note that landownership in this analysis is limited to ownership with title deed (*chanode*) only and does not include ownership with other kinds of documents.[5] Among the largest landowners, there were 837 cases (359 individuals or families and 478 legal entities) who owned land of 1,000 rai (160 ha) or more. The largest land area owned by individuals of a single family was 631,263 rai or about 101,002 ha, which is nearly two-thirds of the total area of Bangkok metropolis of 980,461 rai or 156,874 ha. (Data are not shown in the Table.) These data clearly show that there is indeed land concentration in Thailand.

In agriculture, land concentration is difficult to estimate due to a lack of data. For our purpose here, an inference is made from the 2013 Agricultural Census data as shown in Table 3, which displays changes in the number and proportion of agricultural landholders over a period of 20 years, from 1993 to 2013. A closer look at these changes gives the idea that agricultural land tenure in Thailand in the past two decades underwent a shift toward large landholders. In Table 3, landholders are divided into five groups according to the sizes of land used for farming: (1) smallest holders with land less than

5) In Thailand, there are several types of land documents. Except for a "title deed" (*chanode*) that gives full right of legal ownership to the holders, others are of secondary importance and relatively less secure. Although holders of these other documents have the right to use their lands, some of them are prohibited from participating in land transactions. Data on landownership with other types of documents are not available.

6 rai; (2) small holders with 6–9 rai; (3) medium-size holders with 10–39 rai; (4) large holders with 40–139 rai; and (5) the largest holders with 140 rai or more. In the first period, 1993–2003, there was a substantial increase in the first two groups (smallest and small landholders): 23.2% and 9.5% respectively. However, in the second period, 2003–13, the increase for these two groups dropped drastically to 0.4% and 0.1%, i.e., virtually no growth. This is in contrast to Groups 3 and 4 (medium-size and large landholders), whose growth rates were negative— –3.1% and –9.8% respectively—in the first period but rose to a positive growth of 1% and 10% in the second period. The change from –9.8% to 10.0% among the large landholders is notable. As for Group 5 (the largest holders, with 140 rai or more), its growth rate was 2.9% in the first period but dropped considerably to a negative growth rate of –5.7% in the second period (National Statistical Office 2013).

In the absence of adequate data, it is difficult to assess the direction in which agricultural land tenure will develop in the future. If the conditions observed in the past decade or so remain, and if the capitalist economy continues to expand in rural areas, concentration of agricultural land could be intensified unless effective countermeasures are taken.

Summary and Discussion

This paper addresses agricultural change in contemporary rural Thailand. It demonstrates how household dynamics and expansion of the capitalist economy into rural areas are changing the landscape of agriculture. In most rural areas today, farm households are facing labor and land constraints due to sustained demographic change and constant division of farmland associated with household dynamics. These constraints make it necessary for rural households to modify their farming practices by changing farming methods and strategies. These changes have been enhanced by expansion of the capitalist economy into the rural setting and widespread use of modern farm technology. Within three to four decades, there have been prominent changes in key aspects of agriculture. These include the following:

(i) a gradual but steady shift from subsistence- to market-oriented production;
(ii) a rapid increase of farm mechanization: a significant shift from traditional labor-intensive production to production methods involving substantial technological and capital investment;
(iii) the emergence of agribusiness and commercial farming, which has brought in

"new farmers"—entrepreneurs and corporations that are fully involved in the agricultural business;

(iv) changing structure of land use and landholding: land use is responding to the market price, and landholding is shifting toward large holders, resulting in a high degree of land concentration.

The changes outlined above are likely to alter not only the economic situation but also the social profile of the rural population. Indeed, many rural households have already felt the consequences of these changes, some of which are positive while others are negative. On the positive side, mechanization makes farm work less laborious so that the farmers now have more time for other activities. In addition, producing for the market is an opportunity to earn cash income, which is crucial for day-to-day life of household. Improved income has raised the quality of life of many farm households. Of course, all this is possible only if prices of farm products are favorable and relatively stable.

On the negative side, mechanization and use of other agricultural technologies, particularly chemical fertilizer and pesticides, require substantial financial investment, which is less affordable for many small farm households with limited resources. Many of them have to borrow money from financial institutions or local moneylenders, often at a high interest rate. The result is a household debt, which is rising at the national level (KU–OAE Foresight Center 2014). In the worst case, many households lost their farmlands, as they could not repay the debt. The use of farm chemicals, on the other hand, needs knowledge and skill, which are limited among small farmers. Thus, their health and environment are at risk.

Although the emergence of agribusiness and commercial farming appears to be positive for long-term agricultural development, it is not without negative consequences. With increasing agribusiness and commercial farming, small farm households are now in direct competition with large-scale "commercial farmers" who have the advantage in nearly every aspect—capital, technology, and bargaining power. In the modern capitalist economy, driven by free competition with only a weak regulation as existing today, those who lose out hardly have a place in the system. Consequently, economic and social inequality in agricultural sector is difficult to avoid.

So, where is agriculture in Thailand heading to? What is the future of small farm households? The answer to the first question has already been hinted at in the evidence presented above. There is little doubt that Thai agriculture is moving toward commercialization, although to a lesser extent compared to agriculture in the developed world today. If the current transformation continues, it is likely that subsistence-oriented farming will completely give way to market-oriented or commercial farming. In the past,

subsistence agriculture in Thailand was carried out by small farm households. It is possible that as agriculture becomes more commercialized, these small farm households will remain the key players for some time and then be completely overtaken by large-scale farm corporations. Until then, agriculture in Thailand may be "commercial" while much of the farm business is household based. Indeed, what is observed now seems to suggest this direction of agrarian change in rural Thailand.

The answer to the second question is complex and difficult. What is attempted here is based on the simple scenario that commercial farming continues to grow. Until farming is fully commercialized, small farm households face a choice between trying to persist within agriculture and giving it up altogether to seek other livelihoods. Whatever the choice is, the farmers are not without risk since each of these choices needs strategic adaptation, and the process is often complicated. To date, many farm households have opted for a "dual strategy" by trying to persist in agriculture while also seeking income from off-farm activities. One common strategy is to send selected members of the household (especially those who have potential for success) to earn income elsewhere in the industrial or service sector while other members carry on farm work mainly for food security or as a safety net at times of economic crisis. Another strategy, also common today among rural farm households, is to prepare children for other livelihoods in the future so that when they start their own families they do not have to rely on agriculture. This is a long-term strategy involving the allocation of household resources to children's education and training to as great an extent as the household can afford. With this strategy, many households have succeeded resulting in their children's settling permanently outside agriculture. How many of these young people are successful outside agriculture is another question, but the point here is that this is an aspect of agricultural change that is transforming social life of the rural people.

Agriculture, once considered the backbone of the country's economy and the main source of income for rural households, has become less important. It is no longer the main source of income for the majority of rural households. There is good reason to believe that this decline will continue in the future. Despite agriculture being the major source of food production, it contributes only a relatively small proportion to the national income, with its share in GDP of only 7.4% in 2015 (Office of the National Economic and Social Development Board 2015).

Nevertheless, it would be an overstatement to conclude that small farm households are going to disappear entirely from the agricultural landscape in the near future. For decades to come, small farm households are likely to persist—but of course not in the condition that they are in today. The key questions are: How much can they adapt to the changing environment within which they will be operating? What are the options or

interventions available for them to survive? This leads to the question of what should be done if small farmers in rural Thailand are to survive, at least in the near future.

Assuming that commercialized farming continues to expand and competition between small farm households and large-scale commercial farmers is most likely inevitable, there should be a policy to tackle this problem. The policy should include both short-term and long-term measures. For the short term, there need to be realistic and feasible measures to keep prices of agricultural tools and equipment affordable for most farm households. There is also a need to keep prices of agricultural products at a level that is fair for both farmers and consumers through effective mechanisms. Among these, farmer-initiated cooperatives should be encouraged and strengthened in order to reduce the role of the intermediaries who often take advantage of small farmers. Meanwhile, farmers should be empowered such that they have more collective power to negotiate and protect their own interests.

The long-term policy should give priority to measures that will result in structural reform to tackle the problem of access to agricultural resources, i.e., land. Concentration of agricultural land should not be encouraged, and preferably it should be reduced in the long term. Land reform as a measure toward this aim has been discussed in public for many years now (see, for example, The Reform Committee 2011), yet it has not been realized. Under this policy, measures such as taxation should aim for a fair distribution of agricultural land so that it is not concentrated in the hands of the rich minority and speculators.

Land use also needs to be well planned in order to avoid conflicts among different sectors—agriculture, industry, and urban development. One measure for this that has attracted some public interest is agricultural zoning. For Thailand, this is new. If it is to be implemented, it needs a well-informed policy and public scrutiny. Its potential positive and negative impacts should be carefully weighed taking into account not only desirability and feasibility but also suitability in terms of its potential impacts on cultural practices, natural resources, and ecology. Above all, such policy must not lead to more social and economic inequality among sectors of the population.

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References

Boserup, Ester. 1965. *The Conditions of Agricultural Growth: The Economics of Agrarian Change under Population Pressure*. Chicago: Aldine.

Breazeale, Kennon. 1999. Thai Maritime Trade and the Ministry Responsible. In *From Japan to Arabia: Ayuthaya's Maritime Relations with Asia*, edited by Kennon Breazeale, pp. 1–54. Bangkok: Text-

books Project, Foundation for the Promotion of Social Sciences and Humanities.

Chattip Nathsupa ฉัตรทิพย์ นาถสุภา; Churairat Saenrak จุไรรัตน์ แสนรัก; and Sakchai Kiatnakin ศักดิ์ชัย เกียรตินาคิน. 2010. *Setthakit muubaan Thai nai adiit* เศรษฐกิจหมู่บ้านไทยในอดีต [Thai village economy in the past]. Bangkok: Sangsan Publishing.

Chayanov, A. V. 1966. *The Theory of Peasant Economy*, translated by Basile Kerblay and O. Thorner. Homewood: Smith.

Department of Land Transport กรมการขนส่งทางบก. 2015. *Chamnuan rot thii chod tabian sasom na wanthii 30 prussajikayon 2558* จำนวนรถที่จดทะเบียนสะสม ณ วันที่ 30 พฤศจิกายน 2558 [Cumulative number of registered vehicles as of November 30, 2015]. http://data.go.th/DatasetDetail.aspx?id=008902df-34c5-4770-8e24-5333032c0f1b, accessed on January 4, 2016.

Duangmanee Laowakul ดวงมณี เลาวกุล. 2014. Karn krajuktua khong khwaam mang khang nai sangkom Thai การกระจุกตัวของความมั่งคั่งในสังคมไทย [Wealth concentration in Thai society]. In *Suu sangkom Thai samer nah* สู่สังคมไทยเสมอหน้า [Toward equality in Thai society], edited by Phasuk Pongpaichit ผาสุก พงษ์ไพจิตร, pp. 36–59. Bangkok: Matichon Press.

Foster, Brian L. 1975. Continuity and Change in Rural Thai Family Structure. *Journal of Anthropological Research* 31(1): 34–50.

Fukui, Hayao. 1993. *Food and Population in a Northeast Thai Village*, translated by Peter Hawkes. Honolulu: University of Hawaii Press.

Geertz, Clifford. 1963. *Agricultural Involution: The Process of Ecological Change in Indonesia*. Berkeley and Los Angeles: University of California Press.

Goody, Jack, ed. 1958. *The Developmental Cycle in Domestic Groups*. Cambridge Papers in Social Anthropology, No. 1. New York: Cambridge University Press.

Grandstaff, Terry B. 1988. Environment and Economic Diversity in Northeast Thailand. In *Sustainable Rural Development in Asia: Selected Papers from the Fourth SUAN Regional Symposium on Agroecosystem Research*, edited by Terd Charoenwatana and A. Terry Rambo, pp. 11–22. Khon Kaen: Farming System Research Project and Southeast Asian Universities Agroecosystem Network.

Hanks, Lucien M. 1972. *Rice and Man: Agricultural Ecology in Southeast Asia*. Honolulu: University of Hawaii Press.

Hazell, Peter B. R. 2009. The Asian Green Revolution. IFPRI Discussion Paper 00911. http://books.google.co.th/books?id=frNfVx-KZOcC&pg=PA1&redir_esc=y#v=onepage&q&f=false, accessed on November 20, 2014.

Ingram, James C. 1971. *Economic Change in Thailand 1850–1970*. Stanford: Stanford University Press.

Janlekha, Kamol Odd. 1955. A Study of the Economy of a Rice-Growing Village in Central Thailand. PhD dissertation, Cornell University.

Keyes, Charles F. 1976. In Search of Land: Village Formation in the Central Chi River Valley, Northeast Thailand. *Contributions to Asian Studies* 9: 45–63.

————. 1966. Peasant and Nation: A Thai-Lao Village in a Thai State. PhD dissertation, Cornell University.

KU–OAE Foresight Center (KOFC) ศูนย์ติดตามและพยากรณ์เศรษฐกิจการเกษตร. 2014. *Sathaanakarn paawa niisin khruareuan kaset nai patjuban* สถานการณ์ภาวะหนี้สินครัวเรือนเกษตรในปัจจุบัน [Current situation of agricultural households' debt]. http://www.oae.go.th/ewt_news.php?nid=17495&filename=index, accessed on December 29, 2015.

Lefferts, Horace L. 1974. Baan Dong Phong: Land Tenure and Social Organization in a Northeastern Thai Village. PhD dissertation, University of Colorado.

Mahidol Population Gazette, Vol. 25. 2016. January. http://www.pr.mahidol.ac.th/ipsrbeta/en/Gazette.aspx, accessed on September 10, 2016.

Mingsan Khaosa-art มิ่งสรรพ์ ขาวสะอาด; and Natthakorn Liamcharaskul ณัฏฐากรณ์ เลียมจรัสกุล, eds. 2013.

Chiiwit khon Thai nai song thosawat khong karn phattanaa ชีวิตคนไทยในสองทศวรรษของการพัฒนา [Life of Thai people in two decades of development]. Chiang Mai: Thai University for Healthy Public Policy Program, Institute for Public Policy Study, Chiang Mai University.

Mizuno, Koichi. 1971. Social System of Don Daeng Village: A Community Study, Northeast Thailand. Discussion Papers. Kyoto: Center for Southeast Asian Studies, Kyoto University.

Moerman, Michael. 1968. *Agricultural Change and Peasant Choice in a Thai Village*. Berkeley and Los Angeles: University of California Press.

National Statistical Office. 2013. *Agricultural Census 2013, Whole Kingdom*. Bangkok: National Statistical Office, Ministry of Information and Communication Technology.

————. 2010. *Report of the Labour Force Survey Whole Kingdom, Round 3*. Bangkok: National Statistical Office, Ministry of Information and Communication Technology.

————. 2005. *Report of the Labour Force Survey Whole Kingdom, Round 3*. Bangkok: National Statistical Office, Office of the Prime Minster.

————. 2000. *Report of the Labour Force Survey Whole Kingdom, Round 3*. Bangkok: National Statistical Office, Office of the Prime Minster.

————. 1995. *Report of the Labour Force Survey Whole Kingdom, Round 3*. Bangkok: National Statistical Office, Office of the Prime Minster.

————. 1990. *Report of the Labour Force Survey Whole Kingdom, Round 3*. Bangkok: National Statistical Office, Office of the Prime Minster.

————. 1985. *Report of the Labour Force Survey Whole Kingdom, Round 3*. Bangkok: National Statistical Office, Office of the Prime Minster.

Nibhon Puapongsakorn นิพนธ์ พัวพงศกร. 2011. *Rai ngaan chiivit khon Thai nai song thasawat khong karn phattanaa* รายงานชีวิตคนไทยในสองทศวรรษของการพัฒนา [Report on the life of Thai people in two decades of development]. Bangkok: Thailand Development Research Institute.

Office of Agricultural Economics. 2009. *Agricultural Statistics of Thailand, 2009*. Bangkok: Office of Agricultural Economics, Ministry of Agriculture.

Office of the National Economic and Social Development Board สำนักงานคณะกรรมการพัฒนาการเศรษฐกิจและสังคมแห่งชาติ. 2015. *Phali Haphan ruam nai prathet, Tarang tii 6* ผลิตภัณฑ์มวลรวมในประเทศ, ตารางที่ 6 [Quarterly gross domestic product (QGDP), Table 6]. http://www.nesdb.go.th/Default.aspx?tabid=317, accessed on January 2, 2016.

Patama Vapattanawong ปัทมา ว่าพัฒนวงศ์; and Pramote Prasartkul ปราโมทย์ ประสาทกุล. 2014. Sathaanakarn karn kerd nai chuang krung satawat สถานการณ์การเกิดในช่วงครึ่งศตวรรษ [The situation of births during the past half-century]. In *Karn kerd kab khwaam mankong nai prachakorn lae sangkom* การเกิดกับความมั่นคงในประชากรและสังคม [Births and population and social security], edited by Yupin Vorasiriamorn ยุพิน วรศิริอมร; Jongjit Rittirong จงจิตต์ ฤทธิรงค์; Sutthida Chuanwan สุทธิดา ชวนวัน; and Pojjana Hunchangsith พจนา หันจางสิทธิ์, pp. 3–22. Nakhon Pathom: Institute for Population and Social Research, Mahidol University.

Phillips, Herbert P. 1965. *Thai Peasant Personality*. Berkeley: University of California Press.

Pramote Prasartkul. 1977. Patterns and Determinants of Internal Migration in Thailand. PhD dissertation, Cornell University.

Shaner, W. W.; Philipp, P. F.; and Schmehl, W. R. 1982. *Farming Systems Research in Development: Guidelines for Developing Countries*. Boulder: Westview Press.

Sharp, Lauriston. 1953. *Siamese Rice Village: A Preliminary Study of Bang Chan 1948–1949*. Bangkok: Cornell Research Center, Thailand.

Suriyon Thanyakijjanukij สุริยนต์ ธัญกิจจานุกิจ; Jirawat Panpeng จิราวัฒน์ ปานเพ็ง; Nattharee Tangyongtrakool ณัฐรี ตั้งยงตระกูล; and Nawarot Parakkamsith นวรถ ปะรักมะสิทธิ์. 2010. Withii chiiwit chaonaa phaak klaang: Naew nayobai suu phaap sutthai khong karn phattanaa วิถีชีวิตชาวนาภาคกลาง: แนวนโยบายสู่ภาพ

สุดท้ายของการพัฒนา [Life of farmers in the Central region: Policy toward the final scene of development]. *Warasarn Setthakit lae Sangkom* วารสารเศรษฐกิจและสังคม [Journal of Economy and Society] 47(2): 15–19.

The Reform Committee คณะกรรมการปฏิรูป. 2011. *Naewthaang patiruup prathet Thai: Khor saner tor phakkarnmuang lae phuu mii sit leuak tang* แนวทางปฏิรูปประเทศไทย: ข้อเสนอต่อพรรคการเมืองและผู้มีสิทธิเลือกตั้ง [Approach to Thailand reform: A proposal for political parties and voters]. Bangkok: Reform Office.

UNFPA กองทุนประชากรแห่งสหประชาชาติประจำประเทศไทย; and National Economic and Social Development Board สำนักงานคณะกรรมการพัฒนาการเศรษฐกิจและสังคมแห่งชาติ. 2015. *Chom naa khrobkkrua Thai yuk kerd noi aayu yeun* โฉมหน้าครอบครัวไทย ยุคเกิดน้อย อายุยืน [Profile of Thai family in the age of low birth and long life expectancy]. Bangkok: UNFPA and National Economic and Social Development Board.

White, Benjamin. 1983. "Agricultural Involution" and Its Critics: Twenty Years after Clifford Geertz. Working Papers Series No. 6. The Hague: Institute of Social Studies.

Witoon Lianchamroon วิฑูร เลี่ยนจำรูญ; and Suriyon Thanyakijjanukij สุริยนต์ ธัญกิจจานุกิจ. 2008. *Jark patiwat khiaw suu phanthuwisawaakam: Botrian samrap anaakot kaset Thai* จากปฏิวัติเขียวสู่พันธุวิศวกรรม: บทเรียนสำหรับอนาคตเกษตรไทย [From Green Revolution to genetic engineering: Lessons for the future of Thai agriculture]. Nontaburi: BIOTHAI Foundation.

Household Structure and Sources of Income in a Rice-Growing Village in Northeast Thailand

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As part of the agrarian transformation in Northeast Thailand, major changes have been occurring in the size, structure, and sources of income of rural households. This study, which is based on a survey of 303 households in a rice-growing village in Khon Kaen Province in Northeast Thailand, presents a detailed picture of contemporary rural households. Households have decreased in size while becoming more structurally diverse. Nuclear households, which were the most common structural type in the past, are increasingly being replaced by extended, skipped generation, and truncated households. Multiple factors, including the increased opportunity for earning income from local non-farm employment, provision of services within the village, prolongation of people's life spans, increased education levels, delayed age of marriage, and an increase in the number of people who never marry, have contributed to these changes. At the same time as they are becoming structurally more diverse, rural households have become increasingly dependent on non-agricultural sources of income. Even truncated households, which are the most reliant on agricultural income of any structural type, derive only one-third of their total income from farming. Non-agricultural income sources, which include local non-farm employment, self-employment, remittances, and government support and pensions, are of growing importance. Many households are in debt, with two-thirds of skipped generation households having debts exceeding 100% of their annual net income. Government rural development and poverty reduction policies and programs intended to improve the social and economic situation of people in the Northeast need to take the changed nature of their households into account if they are to achieve their desired results.

Keywords: household composition, local non-farm employment, remittances, rural livelihoods

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Introduction

As part of the ongoing agrarian transformation in Northeast Thailand (commonly called "Isan"), major changes of rural households have been occurring. For instance, the average size of households has decreased, and nuclear households, formerly the predominant type, have declined in number, and new household types have been emerging. Associated with changes in household structure are changes in sources of income, which are becoming increasingly diversified, with a decline in the contribution made by agriculture and a growing share of income coming from non-agricultural sources. So marked is this shift that contemporary Isan agricultural households have been called "part-time farmers" (Takeuchi 2004; Rigg 2005; Grandstaff *et al.* 2008).

Although many of these broad changes in rural households and their sources of income have been discussed by other researchers at a rather general level (Smith 1978; Grandstaff *et al.* 2008; Rigg and Salamanca 2009; 2011; Keyes 2010; Rigg *et al.* 2012; Chawanote and Barrett 2013), no detailed descriptions of the nature of changes occurring at the village level have been published. Moreover, many members of the general public, as well as academics, journalists, and policy makers, continue to cling to the old stereotype of rural Isan villagers as poor rainfed rice farmers and have not yet perceived the extent to which rural society and economy in the region have changed. Understanding the reality of rural people's livelihoods in Isan is essential in order to formulate more realistic development policies that will truly serve the interests of local people in the region. Therefore, we undertook this study in a village in Khon Kaen Province in Northeast Thailand in order to describe the current structure of rural households and identify their sources of income. In this paper, we seek to: (1) describe the composition of rural households and classify them into structural types; (2) examine changes that have occurred in the size and types of households over the past 50 years; (3) examine the relationship of household structures and age distribution, types of livelihoods, and agricultural activities; (4) identify the income sources of different types of households; and (5) examine the relationship of household structures with levels of income and debt.

Overview of Nong Ben Village

This research was carried out in Nong Ben village (16°37′12″N, 102°49′59″E) in Khon Kaen Province. The village is located approximately 20 kilometers northeast of Khon Kaen Municipality along National Highway No. 2 (Fig. 1). Nong Ben village is one of 10 villages in Non Thon Subdistrict (*tambol*). Nong Ben was a single village (*Muban*) until

Fig. 1 The Location of Nong Ben Village, Non Thon Subdistrict, Khon Kaen Province

2006, when it was divided into two administrative villages, each with its own headman.

The village area of Nong Ben is about 6,291 rai (1,007 ha) (Sunantha 2002). The total agricultural area was about 5,039 rai (806 ha) in 2005 but had declined to around 4,111 rai (658 ha) in 2011. Water for irrigation is supplied by a canal from the Ubolratana dam in Nam Phong District, which is around 30 kilometers from the village. After irrigation first came to the village in 1968, the household economy of the villagers changed dramatically because it became possible to plant a second rice crop in the dry season and to cultivate other valuable crops such as flowers and vegetables.

There are three different agricultural land-use in the village: (1) rainfed upland cash crop fields (cassava, sugarcane, and rubber); (2) irrigated fields used to grow rice and other crops (e.g., flowers and vegetables); and (3) rainfed paddy fields. The total area of paddy fields in 2002 was about 3,019 rai (483 ha), which had declined to 2,501 rai (400 ha) in 2011. In 2006, about 53% of village households had only irrigated paddy fields, 11% had only rainfed paddy fields, and 36% had both types of paddy fields (Shirai *et al.* 2007). The villagers plant glutinous rice (RD6 variety), mostly for self-consumption, and jasmine rice (KDML105 variety) for sale.

Nong Ben had a *de facto* population of 1,189 persons and 303 households in 2013. Its inhabitants belong to the Thai-Lao ethnic group. The majority (81.1%) of households are engaged in agriculture, of which around 96.7% cultivate rice; 39.8% cultivate field crops such as cassava, sugarcane, and rubber; and another 21.9% cultivate other crops such as flowers and vegetables. According to our village survey in 2006 (*ibid.*), about 70% of village households raised cattle and only three households raised buffalo, but these

numbers had declined by 2013, when only 14.1% of village households still raised any kind of livestock. Most households (79.2%) are owners of agricultural land and basically manage their lands by themselves, while 11.2% of households have no agricultural land and do not engage in any agricultural activities. In 2013, 27.6% of the total labor force in the village had some form of local non-farm employment such as casual hire wage work or regular wage work in factories near the village or in the service sector in the city of Khon Kaen.

The spread of farm mechanization that has been occurring throughout Isan can be observed also in Nong Ben. However, only 6.6% of households own large modern farm machines such as four-wheel tractors and combine harvesters, and the owners hire out their machines together with drivers to other villagers. Most villagers now hire agricultural machines to plow their paddy fields and harvest the rice.

Methodology

Data collection was carried out in the village in April 2013. At the beginning of the study, group discussions were conducted several times with around 20 villagers participating each time. Topics included village boundaries, land-use and history, the annual cycle of agricultural and cultural activities, previous and current situations of non-farm employment, use of remittances, and people's livelihoods both in the past and in the present. Secondary data for the village, such as area of agricultural land, types of agricultural crops, and household registration data—including names and ages of all household members—were obtained from several government offices in Khon Kaen, including the Provincial Office, Non Thon Subdistrict Office, Provincial Agricultural Office, and Community Development Office.

Detailed information on the composition and sources of income of each of the 303 households residing in the village were obtained in multiple extended interviews with the village headmen and confirmed when necessary by checking with the individual households. Data collected included the household members who stay together; household members who migrant to other places and locations they migrate; sex, age, education level, marital status, occupation, and relationship of all household members, including out-migrants; type of household income sources (both agricultural and non-agricultural); area of agricultural land they own and land-use, and types of agricultural activities. This information was used to classify the households that were used to select the sample households for a detailed survey.

The 303 village households were divided into four groups according to their types

Table 1 Number of Sample Households from Different Livelihood Groups

	Livelihood Groups				Total
	1. Only Agriculture	2. Both Agriculture and Non-agriculture	3. Only Non-agriculture	4. Economically Inactive	
Total number of households	24	222	41	16	303
Number of selected sample households	8	41	6	6	61
Percentage of all households in livelihood group	33.3	18.5	14.6	37.5	20.1

of livelihood: (1) only agriculture (24 households), (2) both agriculture and non-agriculture (222 households), (3) only non-agriculture (41 households), and (4) economically inactive (16 households). Random samples of households were selected from each group. Although the initial plan was to interview 20% of the households in each group, some groups had relatively small numbers of households so all of the households that were available for interviewing were included in the survey (Table 1).

Each sample household was interviewed to obtain detailed information about the household members who stay together; household members who migrant to other places and locations they migrate; sex, age, education level, occupation, marital status and relationship of all household members, including out-migrants; amount of remittances; types of agricultural and non-agricultural activities; engagement in agricultural and non-agricultural employment; area of agricultural land they own and land-use; ownership of agricultural tools including farm machines; household assets such as a TV or motor vehicle; monthly or annual household expenditure and individual and household cash income from agricultural and non-agricultural activities; and amount and reason of debt. Interviews with the sample households were carried out on May 5–11, 2013.

All data were entered into an Excel database. SPSS version 21 was used for analysis of data.

Household Composition

Households in Nong Ben are relatively small, with an average size of 3.9 persons in 2013, which is quite similar to the average size of households in Northeast Thailand of 3.5 individuals in 2010 (National Statistics Office of Thailand 2010). Although we do not have historical data on household size in Nong Ben, data from earlier village studies in several provinces in Isan show that the mean size of rural households has been declining since the 1960s (Table 2).

Table 2 Changes over the Past 50 Years in Mean Household Size and the Frequency of Occurrence of Different Types of Household Structures in Rural Villages in Northeast Thailand

	Year						
	1961[a]	1963[b]	1964[c]	1965[d]	1981[e]	2002[e]	2013[f]
Village	Ma Muang	Nong Tuen	Don Daeng	Saraphi	Don Daeng		Nong Ben
Province	Udon Thani	Mahasara-kham	Khon Kaen	Nakhon Ratchasima	Khon Kaen		
Mean household size	5.8	5.9	6.1	6.0	5.1	4.1	3.9
Type of household structure (%)							
Nuclear	71	76	68	78	64	43	29
Extended	17	24	28	22	29	40	40
Others	12	–	4	–	7	17	31

Sources: [a] Lux (1961); [b] Keyes (1975); [c] Mizuno (1981); [d] Janlekha (1968); [e] Funahashi (2006); [f] Village survey by the authors (2013).

Note: Each source uses different terms for the types of families and households. These have been adjusted to correspond to the classification employed in the present paper.

The 303 households in Nong Ben can be classified into four structural types: nuclear family household, extended family household, skipped generation family household, and truncated family household. Henceforth, these types are referred to as "nuclear household," "extended household," "skipped generation household," and "truncated household" respectively. These types were derived from a classification system devised by Ethel Nurge (1965) as modified by A. Terry Rambo and Neil Jamieson (1973). Nuclear households were defined by G. P. Murdock as typically consisting of "a married man and woman with their offspring" (Murdock 1949, 1). Households with only a single spouse present to care for the children are also included in the nuclear household type in this study (Funahashi 2006). Extended households can include both vertically and horizontally related family members. The most common vertical extended type is made up of a married couple, their children, and one or more of the parents of one of the spouses. Skipped generation households are composed of elderly persons, usually grandparents, and one or more of their own or someone else's grandchildren. Truncated households are composed of "isolated individuals such as a widow or widower or an elderly married couple living alone with no children present" (Rambo and Jamieson 1973, 20). Fig. 2 presents diagrams of each of the structural types.

The extended households are the dominant type of household in Nong Ben, with 40.3% of all households being of this type, followed by nuclear households (29.0%), truncated households (19.1%), and skipped generation households (11.6%). The rather large number of truncated households is noteworthy and it is probably the result of young people gaining higher education and taking non-farm jobs in the city rather than remain-

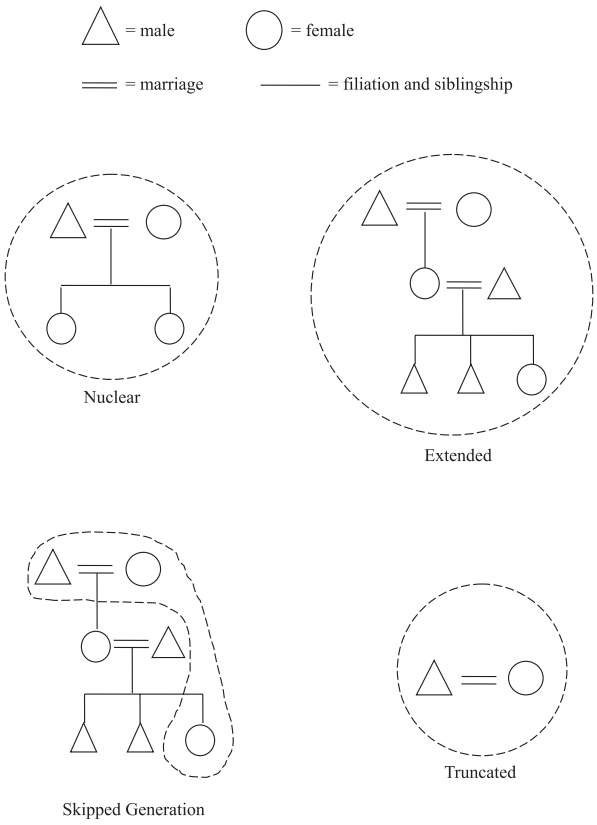

Fig. 2 Types of Household Structure in Nong Ben Village (The dashed lines surround household members who stay together under the same roof.)

Source: Modified from Hammel and Laslett (1974, 104).

ing with their parents in the village. The study by Mulubrhan Amare, Lena Hohfeld, Somchai Jitsuchon, and Hermann Waibel (2012) reported that migrants from Isan are generally more educated. As a result of such changes, rural households have become smaller and more fragmented.

Although longitudinal data are not available for Nong Ben, it is possible to compare the prevalence of different types of households at present with data on household types collected in earlier studies of similar rice-growing Isan villages in order to assess the extent to which household composition has changed over time (Table 2). Community studies in the 1960s in villages in Udon Thani, Mahasarakham, Khon Kaen, and Nakhon Ratchasima Provinces found that most households (>68%) were of the nuclear type (Lux 1961; Janlekha 1968; Keyes 1975; Mizuno 1981). A study of Don Daeng village in Khon Kaen Province in 1981 found that 64% of households were of the nuclear type, while a

follow-up study in 2002 showed that the share of nuclear type households had declined to 43%. During the same period the share of extended type households increased from 29% to 40%. Other household types such as lone person households and elderly married couples living in their own separate households (which we classify as "truncated") increased from 6% in 1981 to 12% in 2002 (Funahashi 2006). This is in agreement with the observation by Jonathan Rigg and Albert Salamanca (2009) that household structure in the Northeast has recently become more complex.

Multiple factors may have contributed to the decreasing prevalence of nuclear type households and the emergence of other types. Funahashi Kazuo (2006, 94) has suggested that Thai society might have a cultural predisposition toward diversity in the compositions of families, although he does not further develop this idea. In addition, expansion of the regional economy as a consequence of national economic development, which offered people more opportunities for local non-farm employment, thus reducing the need for young adults to migrate to other locales in search of employment, may have led to an increase in the number of extended households. The increase in the age of marriage and the rise in the number of individuals who never marry, both of which seem to be associated with increased education levels, may be possible factors contributing to the increased prevalence of non-nuclear type households. For instance, in cases where unmarried adults remain in the same house with their parents and married siblings, it becomes an extended type household, whereas in cases where unmarried adults live alone in separate houses, they become truncated type households.

Characteristics of Different Types of Households

Age Distribution of Members of Different Types of Households

There are clear differences in the age distributions of their members among different types of households. The survey of all 303 households in Nong Ben finds that nuclear households are composed mostly of working-age people between 18 and 59 years of age (70.1%), with 22% of their members being younger than 18 and 7.9% being 60 or older. The majority (56.5%) of members of extended households are also of working age, with 26.2% under 18 and 17.3% aged 60 or older. Skipped generation households have a much lower share of working-age members (37.3%) and larger shares of members under 18 (39.9%) and 60 or older (22.8%). In truncated households, 57% of members are of working age, 39% are 60 or older, and only 4% are under 18.

Types of Economic Activities of Different Types of Households

The 303 households in Nong Ben were classified into four types according to their economic activities: (1) do agriculture only; (2) do both agriculture and non-agriculture; (3)

do non-agriculture only; and (4) are economically inactive (Table 1). Of all the households, 7.9% are engaged only in agriculture, 73.3% are engaged in both agricultural and non-agricultural activities, 13.5% are engaged only in non-agricultural activities, and 5.3% are economically inactive. This finding is similar to that of earlier studies in Don Daeng village that reported the increasing importance of non-farm income sources for village households: the share of households with members receiving regular salaries was only 2.3% in 1964 but had increased to 7.1% in 1981 and 22.7% in 2002 (Kuchiba 1990; Funahashi 2006). According to the survey of 61 sample households in Nong Ben, about 24% had members who received a monthly salary.

The types of economic activities vary according to the structure of households. Extended households are most likely (85.1%) to be engaged in both agricultural and non-agricultural activities, with equal shares (6.6%) of these households doing agriculture only and non-agriculture only, and 1.7% being economically inactive. Nuclear households have the next highest share (80.8%) doing both agricultural and non-agricultural activities, 15.9% doing only non-agriculture, 2.2% doing agriculture only, and 1.1% being economically inactive. Skipped generation households are mostly (68.7%) engaged in both agricultural and non-agricultural activities, with equal shares (11.4%) of the households engaged in only non-agricultural activities and economically inactive, and 8.5% doing only agricultural activities. Truncated households display a very different pattern of economic activities from other types of households, with only 39.6% doing both agricultural and non-agricultural activities, 25.9% doing only non-agricultural activities, 19% doing only agriculture, and 15.5% economically inactive. This may reflect the fact that truncated households have the highest share of people aged 60 years or older, who are more likely to have retired from active life but may continue to engage in part-time agriculture on their own farms. Thus, the differences in economic activities among the different types of households presented above may reflect differences in their age structures and education levels, with household types having higher proportions of younger and better-educated working-age members being more likely to engage in non-agricultural activities.

Types of Agricultural Activities of Different Types of Households

Although at least some households of each structural type are engaged in agricultural activities, they differ in the specific types of agricultural activities in which they engage. Extended households have the highest share engaged in cultivation of rice (89.3%), cultivation of cash crops (38.5%), cultivation of other crops (24.6%), and livestock raising (21.3%). Nuclear households have the second-highest level of involvement in cultivation of rice (79.5%), cultivation of cash crops (34.1%), cultivation of other crops (14.7%), and

livestock raising (10.2%). Skipped generation households cultivate rice (77.1%), cultivate cash crops (31.4%), cultivate other crops (17.1%), and raise livestock (5.7%). Truncated households have the lowest engagement in cultivation of rice (55.2%), with 17.2% of households cultivate cash crops, 8.6% cultivate other crops, and 10.3% raising livestock.

The distinctions between the agricultural activities of the different types of households are more clearly revealed in data from the sample survey of 61 households. Extended households have the most diverse agricultural activities, including cultivation of rice, cassava, sugarcane, rubber, and other crops, and raising buffalo and swine. On the other hand, nuclear households engage in fewer kinds of agricultural activities, being limited to planting rice, cassava, rubber, and other crops. These differences do not appear to be related to differences in the size of landholdings but may reflect significant differences in the availability of labor in the different household types. The extended households have the largest average number of members (five persons per household), with almost half (49.2%) of their members being of working age. It should also be noted that most household members in extended households are still in their physical prime for work, with a median age of 38 years. Moreover, compared to other types of households, a greater proportion of extended households (60.9%) own farm machines, which augment their working capability for agricultural activities.

Income Sources of Different Types of Households

The results and discussions in the following part are based on the data from the sample survey of 61 households.

Agricultural Income

Truncated households earn 33.3% of their total annual gross income from agriculture, which is the highest share of any household type, and extended households gain 26.5% of their total annual gross income from agriculture. Skipped generation and nuclear households gain very low shares of their total annual gross income from agricultural sources, representing only 15.1% and 12.1% respectively.

Non-agricultural Income Sources

Non-agricultural sources contribute more than two-thirds of the total annual gross income of all household types. Nuclear households gain by far the greatest share of their total annual gross income (87.9%) from non-agricultural sources, followed by skipped gen-

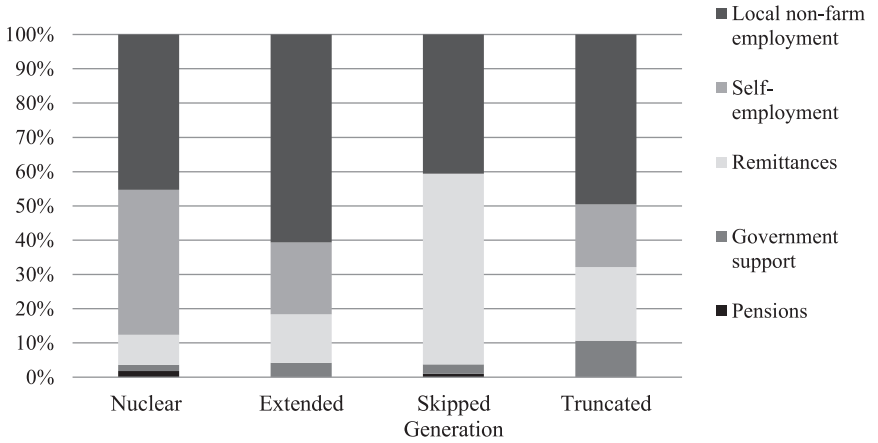

Fig. 3 Share of Income Derived from Different Non-agricultural Sources by Various Types of Households in Nong Ben Village

eration households (84.9%), extended households (73.5%), and truncated households (66.7%).

Non-agricultural income sources can be classified into five types: local non-farm employment, self-employment, remittances, pensions, and government support. Local non-farm employment includes: casual hire wage workers (e.g., construction workers who paid on a daily basis and workers doing piecework at home such as sewing pillowcases, mattresses or fishing net); (2) regular wage workers (i.e., those receiving a salary every week or month from a private sector employer); and (3) salaried government employees (i.e., those receiving a monthly salary from a government job). The types of self-employment are diverse, including running a beauty shop, clothing shop, grocery shop, an ice plant, noodle shop, or motorcycle repair shop, collecting vegetables from villagers and selling them in the market, selling daily goods, selling Isan food, renting out agricultural machines, collecting and selling recyclable goods, building and selling prefabricated pavilions, and exterminating a termite. The different types of households show major differences in the share of income they derive from various non-agricultural sources (Fig. 3).

Local Non-farm Employment

Overall, extended households are the highest in gaining non-agricultural income from local non-farm employment (60.7%), followed by truncated households (49.6%), nuclear households (45.3%) and skipped generation households (40.6%). Skipped generation households have the highest frequency (27.6%) of earning cash from casual hired wage

labor, followed by truncated households (17.6%), extended households (15.5%) and nuclear households (14%). Extended households are the highest in earning money from regular wage work (12.9%), followed by nuclear households (7%) and skipped generation households (3.4%). No truncated households report having members who are regular wage workers. The number of households having members who are salaried government employees is quite low (<6%) for all types of households. This small share of households having "salaried government employees" is probably related to the relatively low educational level of most older residents in the village and the tendency of better-educated younger people to leave the village to seek employment in the non-agricultural sector in the cities.

Self-employment

The share of non-agricultural income obtained from self-employment is the highest for nuclear households (42.3%), followed by extended households (20.9%) and truncated households (18.2%). No skipped generation households have self-employed members. Self-employment has been increasing over time in Isan villages. Earlier research in Don Daeng village in Khon Kaen Province showed that the share of households with income from self-employment was only 4.1% in 1981 but had increased to 8.3% in 2002 (Funahashi 2006). This study finds that the share of households with income from self-employment is 19.1%. The growth in self-employment may be propelled by the greater availability of cash in the villages, which allows villagers to purchase more goods and services from local enterprises. According to informal interviews with villagers, small shops and service enterprises are often opened by returned migrants who acquired capital and business experience while working in Bangkok. Many also prefer the freedom of being self-employed to working in a factory.

Remittances and Out-migrants

The skipped generation households obtain 55.6% of their total non-agricultural income from remittances and this is the highest share of any household type, followed by truncated households (21.5%), extended households (14.2%) and nuclear households (8.8%). Government statistical data show that the share of income from remittances expanded in Isan from 3.8% in 1981 to 15.9% in 2004 (Grandstaff *et al.* 2008, 301–306). In this study, more than half (57.3%) of the sample households receive remittances. According to group discussions, remittances are used first for improving houses, then to pay back loans, and finally for investing in agriculture.

The share of households of different types receiving remittances is related to the number of members who have left the village to work in other places. Skipped generation

households, which have the highest proportion receiving remittances (88.9% of total households), all have one or more out-migrants, with an average of 2.1 out-migrants per household. These can be referred to as "supported households" (i.e., households with income mainly from outside support) that are composed of aged people who often take care of their grandchildren whose parents work away from the home (*ibid.*; Rigg and Salamanca 2011, 564; Rigg *et al.* 2012, 1477). Truncated households receiving remittances, all of which also have out-migrants, show the second-highest number of out-migrants, with an average of 1.4 out-migrants per household. The mean numbers of out-migrants in nuclear and extended households are smaller than for the former types of households, 0.9 and 1.1 out-migrants per household respectively.

Surprisingly, the nuclear households, which have both the lowest share receiving remittances (31.6% of total households) and the lowest number of out-migrants per household, receive the largest median amount of remittances (48,750 baht ≈ USD1,405[1)]), although this figure is skewed by the very large remittances sent back to two of these households by migrants working abroad. Skipped generation households, which have the highest proportion receiving remittances, show the second-largest median amount of remittances (46,000 baht ≈ USD1,326). Migrants from nuclear households tend to send remittances on a regular basis, whereas migrants from the other household types tend to send remittances irregularly.

Government Support and Pensions

Due to their having the highest proportion of people aged 60 or older, truncated households receive the largest share of government support (10.7%) among all household types, followed by extended households (4.2%), skipped generation households (2.8%) and nuclear households (1.8%). Only nuclear and skipped generation households have members receiving pensions, but the share is quite low (<2%) for both types.

Shares of Income from Different Sources

As the results that have presented above, the total annual gross income from non-agricultural sources exceeds the income gained from agriculture for all types of households even though distinct differences among different types of households are evident. Thus, for all household types agricultural income contributes only a relatively small share of total household income. The shift from agricultural to non-agricultural sources of income for rural households that we have observed in Nong Ben appears to be a common pattern in the whole Northeast region (Kuchiba 1990; Chai 1991; Rigg 2005; Funahashi

1) The official exchange rate was US$1 = 34.7 baht on September 20, 2016.

2006; Grandstaff *et al.* 2008; Rigg and Salamanca 2009; 2011; Keyes 2010; Rigg *et al.* 2012; 2014). Indeed, rural households in Northeast Thailand are hardly unique in this shift from dependence on agricultural to non-agricultural income sources: worldwide the proportion of the labor force in agriculture and the contribution of agriculture to gross national product have both declined at all income levels (Bernstein 1992, 5) as employment opportunities in factories, offices, and the service sector have been growing, leading many rural villagers to move into the cities while many others stay in their villages but commute to local non-farm jobs. Consequently, the importance of non-farm income has been increasing even in farming households, in the developing world in general (Murray 2001; Deichmann *et al.* 2009; Owusu 2009).

Income and Debt

The different types of household also display considerable differences in levels of income and indebtedness. Nuclear households have the highest mean annual gross income per capita (94,207 baht ≈ USD2,715), followed by truncated households (66,429 baht ≈ USD1,914), extended households (55,084 baht ≈ USD1,587), and skipped generation households (54,941 baht ≈ USD1,583). The nuclear households also have the highest mean annual net income per capita (38,206 baht ≈ USD1,101), followed by extended households (23,344 baht ≈ USD673) and truncated households (17,453 baht ≈ USD503), while the skipped generation households have the lowest net income per capita (5,570 baht ≈ USD161).

Many households of all types are in debt to a greater or lesser extent, although the extent of indebtedness varies greatly among the different types. The sample household data shows that 60% of truncated households and 42.1% of nuclear households have no debts whereas 74% and 77.8% of extended and skipped generation households are in debt. In the case of skipped generation households, two-thirds (66.7%) have debts exceeding 100% of their annual net income, followed by extended households (47.8%), nuclear households (36.8%), and truncated households (20%) (Table 3). Most nuclear and extended households that are in debt borrowed money from a bank or a company that employs household members, while the majority of skipped generation and truncated households are indebted to their friends and a village fund. All household types except the truncated households borrow money mainly for their day-to-day living expenses, but there are some distinctions among different types of households. Extended households are the highest in borrowing money to invest in agriculture, whereas nuclear households are the highest in borrowing money to pay for their children's education. The truncated households have the lowest level of indebtedness, as most household members are elderly people who retired from active life after their children became independent. One

Table 3 Debt as a Share of Net Income of Different Types of Households in Nong Ben Village (n=61)

Debt as a Share of Net Income	Type of Household Structure			
	Nuclear (n=19)	Extended (n=23)	Skipped Generation (n=9)	Truncated (n=10)
No debt	8 (42.1%)	6 (26.1%)	2 (22.2%)	6 (60.0%)
1–50%	3 (15.8%)	4 (17.4%)	1 (11.1%)	1 (10.0%)
51–100%	1 (5.3%)	2 (8.7%)	0	1 (10.0%)
>100%	7 (36.8%)	11 (47.8%)	6 (66.7%)	2 (20.0%)
Total	19 (100%)	23 (100%)	9 (100%)	10 (100%)

truncated household borrowed money for their living expenses; another borrowed to buy stock for their small grocery shop; another borrowed to purchase inputs for a paddy field; and another borrowed to repay a loan on a motorbike. The majority (57.1%) of the skipped generation households incurred debt by borrowing money for their living expenses. The skipped generation households are in the worst economic situation, having the highest level of indebtedness and the lowest amount of income with which to repay their debts. This is in agreement with the study by Thuttai Keeratipongpaiboon (2012) that skipped generation households in Thailand facing the problem of financial difficulty since this household type has a serious concern for increasing the proportion of indebtedness.

Conclusion

Many important changes have been occurring in the types of rural households and their sources of income in Northeast Thailand as part of the agrarian transformation in the region. Households have declined in size while becoming more structurally diverse. Nuclear households, which were the most common structural type in the past, are increasingly being replaced by extended, skipped generation and truncated households. The latter two types, which are disproportionately composed of elderly people, are characterized by low levels of income and, in the case of skipped generation households, very high levels of indebtedness.

At the same time as they are becoming structurally more diverse, rural households have become increasingly dependent on non-agricultural sources of income. Even truncated households, which are the most reliant on agricultural income of any structural type, derive only one-third of their total income from farming. Non-agricultural income sources, which include local non-farm employment, provision of services within the village, remittances, and pensions and government support, are integral elements of the

modern rural economy.

The extent to which these major shifts in rural household structures and sources of income, especially the growing importance of non-agricultural income, have transformed rural society in the Northeast has not been fully recognized by the Thai media, the educated public in general, or government policy makers. Instead, the stereotype of Isan villagers as subsistence-oriented peasants who depend on family farming as their main source of income remains strongly entrenched, and the extent to which the livelihoods of villagers have become deeply integrated with the modern Thai economic system is still largely unrecognized. Government rural development and poverty reduction policies and programs intended to improve the social and economic situation of Isan villagers need to take the changed nature of household structures and sources of income into account if they are to achieve their desired results.

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References

Amare, Mulubrhan; Hohfeld, Lena; Somchai Jitsuchon; and Waibel, Hermann. 2012. Rural–Urban Migration and Employment Quality: A Case Study from Thailand. ADB Economics Working Paper Series No. 309. Manila: Asian Development Bank.

Bernstein, Henry. 1992. Introduction. In *Rural Livelihoods: Crises and Response*, edited by Henry

Bernstein, Ben Crow, and Hazel Johnson, pp. 1–9. Oxford and New York: Oxford University Press in association with The Open University.

Chai Podhisita. 1991. The Rural Thai Family: Some Observations and Research Needs. In *Report on a Thai Family and Household Survey*, edited by Bhassorn Limnanonda, Chai Podhisita, and Malinee Wongsith, pp. 6–29. Bangkok: Institute of Population Studies, Chulalongkorn University.

Chawanote, Chayanee; and Barrett, B. Christopher. 2013. *Non-farm Occupational and Earnings Dynamics in Rural Thailand*. Cornell University Charles H. Dyson School of Applied Economics and Management, Ithaca: New York. barrett.dyson.cornell.edu/Papers/NonfarmDynamics_ChawanoteBarrett%2025%20March%202013%20Revisions.pdf., accessed on March 27, 2017.

Deichmann, Uwe; Shilpi, Forhad; and Vakis, Renos. 2009. Urban Proximity, Agricultural Potential and Rural Non-farm Employment: Evidence from Bangladesh. *World Development* 37 (3): 645–660.

Funahashi Kazuo 舟橋和夫. 2006. *Don Den mura saisaiho: Tohoku Tai tensuiden noson ni okeru yonjunen kan no dotai kenkyu* ドンデーン村再々訪——東北タイ天水田農村における40年間の動態研究 [Revisit to Don Daeng village: Forty years of dynamic research on a rainfed rice-growing village in Northeast Thailand]. Final Report of Grants-in-Aid for Scientific Research (A), Ryukoku University.

Grandstaff, Terry B.; Grandstaff, Somluckrat; Limpinuntana Viriya; and Suphanchaimat Nongluck. 2008. Rainfed Revolution in Northeast Thailand. *Southeast Asian Studies* 46(3): 289–376.

Hammel, E. A.; and Laslett, Peter. 1974. Comparing Household Structure over Time and between Cultures. *Comparative Studies in Society and History* 16(1): 73–109.

Janlekha, Kamol. 1968. Saraphi: A Survey of Socio-Economic Conditions in a Rural Community in North-East Thailand. World Land Use Survey, Occasional Papers No. 8. London: Geographical Publications Limited.

Keyes, F. Charles. 2010. From Peasant to Cosmopolitan Villagers: Refiguring the "Rural" in Northeastern Thailand. Paper for a conference on "Revisiting Agrarian Transformations in Southeast Asia," Chiang Mai, May, pp. 1–23.

————. 1975. Kin Group in a Thai-Lao Community. In *Change and Persistence in Thai Society: Essays in Honor of Lauriston Sharp*, edited by G. William Skinner and A. Thomas Kirsch, pp. 274–297. Ithaca: Cornell University Press.

Kuchiba Masuo 口羽益生, ed. 1990. *Don Den mura no dento kozo to sono henyo* ドンデーン村の伝統構造とその変容 [Tradition and change in Don Daeng village]. Tokyo: Sobunshya.

Lux, E. Thomas. 1961. The Thai-Lao Family Systems and Domestic Cycle of Northeastern Thailand. Part II. *Social Science Asia: Journal of the National Research Council of Thailand* 5: 1–17.

Mizuno Koichi 水野浩一. 1981. *Tai noson no shakai soshiki* [Social structure in a Thai village]. Tokyo: Sobunshya.

Murdock, G. P. 1949. *Social Structure*. New York: Macmillan.

Murray, Colin. 2001. Livelihoods Research: Some Conceptual and Methodological Issues. Background Paper 5. Chronic Poverty Research Centre, Department of Sociology. University of Manchester.

National Statistics Office of Thailand. 2010. Number of Households and Household Size by Region. popcensus.nso.go.th/home.php, accessed on March 20, 2017.

Nurge, Ethel. 1965. *Life in a Leyte Village*. Seattle: University of Washington Press.

Owusu, Francis. 2009. Livelihoods. In *International Encyclopedia of Human Geography*, 12 vols., edited by Rob Kitchin and Nigel Thrift, pp. 219–224. Amsterdam: Elsevier.

Rambo, A. Terry; and Jamieson, Neil L. 1973. Cultural Change in Rural Vietnam. SEADAG Working Paper, Asia Society, New York.

Rigg, Jonathan. 2005. Poverty and Livelihoods after Full-time Farming: A South-East Asian View. *Asia Pacific Viewpoint* 46(2): 173–184.

Rigg, Jonathan; and Salamanca, Albert. 2011. Connecting Lives, Living, and Location: Mobility and

Spatial Signatures in Northeast Thailand, 1982–2009. *Critical Asian Studies* 43(4): 551–575.

————. 2009. Managing Risk and Vulnerability in Asia: A (Re)Study from Thailand, 1982–83 and 2008. *Asia Pacific Viewpoint* 50(3): 255–270.

Rigg, Jonathan; Promphaking Buapun; and Mare, Le Ann. 2014. Personalizing the Middle-Income Trap: An Inter-generational Migrant View from Rural Thailand. *World Development* 59: 184–198.

Rigg, Jonathan; Salamanca, Albert; and Parnwell, Michael. 2012. Joining the Dots of Agrarian Change in Asia: A 25 Year View from Thailand. *World Development* 40(7): 1469–1481.

Shirai, Yuko; Rambo, A. Terry; and Laohasiriwong Suwit. 2007. The Multifunctionality of Paddy Fields in Northeast Thailand. In Workshop proceedings on the Role of Paddy Fields in Nurturing Aquatic Ecosystems and Maintaining Agroecosystems Biodiversity, Mekong River Commission, Vientiane, August, pp. 39–42.

Smith, Harold E. 1978. Chapter II: The Thai Rural Family. In *The Family in Asia*, edited by Man Singh Das, Panos Demetrios Bardis, and Carle Clark Zimmerman, pp. 16–46. Delhi: Vikas Publishing House.

Sunantha Kotrchantra. 2002. An Evaluation of Village and Urban Community Fund: Case Study of Nong Ben Village, Tambon Non Thon, Muang District, Khon Kaen Province. Report for Graduation Diploma in Project Management and Evaluation, Graduate School, Khon Kaen University.

Takeuchi, Takao. 2004. An Overview on the Sustainability of a Rural Village Increasing Part-Time Farm in Northeast Thailand. *Annual Bulletin of Rural Studies* 40, Special Issue on The Rise of Part-Time Farming and Its Sustainability in Rural East Asia in 21st Century, pp. 155–186. Tokyo: Japanese Association for Rural Studies, Nosan Gyoson Bunka Kyokai.

Thuttai Keeratipongpaiboon. 2012. Population Ageing: Changes in Household Composition and Economic Behavior in Thailand. Dissertation for the Degree of Doctor of Philosophy in Economics in School of Oriental and African Studies, University of London, U.K.

Improvement in Rainfed Rice Production during an Era of Rapid National Economic Growth: A Case Study of a Village in Northeast Thailand

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Rainfed paddy fields cover a large area in Northeast Thailand. Rice production there is known to be highly variable, with generally low yields. With the Thai economy developing rapidly since the 1960s, an increasing number of farmers have sought employment in the non-farm sector. As a result, some worry that rice growing in this region might decline or even disappear. In reality, however, it continues to play an important role in ensuring basic food security to rural households. This study investigates technological advances in rice growing during this period of rapid economic growth in Don Daeng village using a dataset spanning approximately 50 years. The results indicate that farmers adopted small-scale agricultural machines, irrigation technologies, land consolidation, high-yielding varieties, chemical fertilizers, and the direct seeding method on their own initiative. These technologies and methods contributed to increasing rice yields and stabilizing production. They also appear to have substantially improved labor productivity, allowing farmers to procure their main food supply from their paddy fields while earning an additional income from the off-farm sector, which could then be reinvested in agriculture. Thus, the interaction between these sectors is currently supporting small-scale rice production in peri-urban villages in Northeast Thailand.

Keywords: rainfed paddy field, rice sufficiency, Don Daeng village, economic growth, fixed point village survey

Introduction

In Thailand more than 60% of the area planted with rainy season rice is in the Northeastern region, totaling approximately 6.3 million hectares (National Statistical Office of Thailand 2013, 93). Because most of the paddy fields in this region are rainfed, they produce only one crop per year, whose yield is greatly affected by fluctuations in precipitation. In the mid-twentieth century, the Royal Irrigation Department of Thailand undertook large-scale irrigation development projects in the region (such as the Ubol

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Ratana and the Lam Pao Reservoirs) to increase rice production (Floch and Molle 2009, 5). However, since the irrigable area makes up only 10–15% of the entire paddy area in the region, irrigation alone had a limited impact on the region as a whole.

In the remaining 85–90% of rainfed areas, farmers appear to have sustained agriculture by adopting small-scale technologies that are adapted to local environmental conditions. Therefore, an evaluation of these small-scale development initiatives is essential for gaining a new perspective on the sustainable development of rice production. In addition, the economic orientation of the Northeast is rapidly changing from agriculture to industry, which will have a great impact on the viability of agriculture in the region. Therefore, although this study aims to understand the development of rice production in one particular locality, consideration is also given to a variety of more macro-level socio-economic forces that the farmers are facing.

There is a paucity of information available to provide a detailed understanding of rice cultivation at a specific locality in Thailand, particularly at the village level. Such information can be obtained only through the collection of data over a long period.

Don Daeng village in Northeast Thailand is a settlement that relies on rainfed lowland rice production. Continuous observations have been made here since 1961, yielding a unique set of information. Therefore, the present study attempts to describe changes in rice cultivation over more than 50 years by focusing on this village, making use of the accumulated dataset and the findings of previous studies. It has the following main objectives: (1) to describe land consolidation and modification; (2) to analyze the dissemination of new technologies, such as new rice varieties, fertilizers, agricultural machinery, and small-scale irrigation; and (3) to examine the effects of these new technologies on rice production in Don Daeng village.

The Study Area

Location, Population, and Livelihood

The village of Don Daeng is located in the central part of Northeast Thailand, approximately 10 km south of Khon Kaen city (16°20′42.70″N, 102°51′35.16″E). The Chi River, which is a tributary of the Mekong River, flows through the northernmost part of the village, and most of the agricultural land that is currently being cultivated by the villagers is situated in the floodplain of this river (Fig. 1). The scenery is typical of that found in the Northeast, with scattered trees and shrubs within the paddy fields. The village settlement is nucleated and located on an elevated site adjoining the floodplain, which is also typical of settlements in this region.

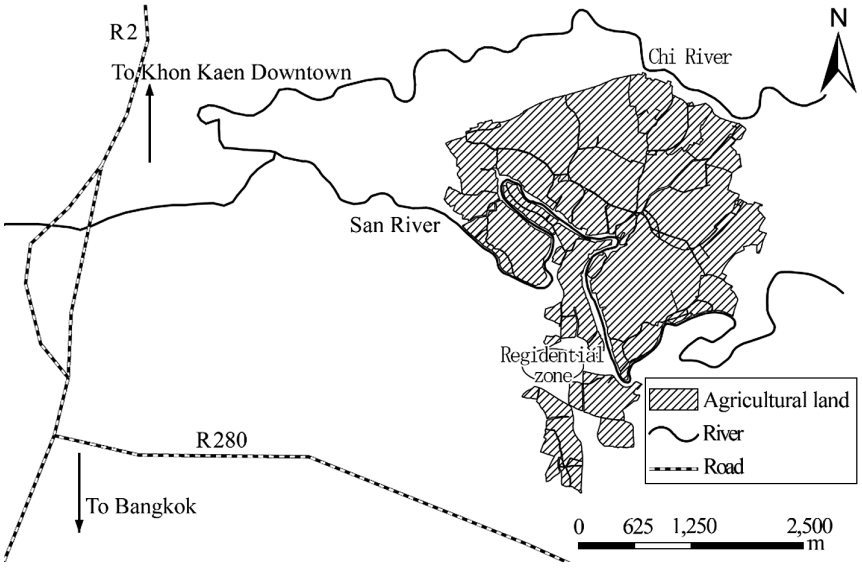

Fig. 1 Study Area

Fig. 2 summarizes changes in the size of the population and the number of households in the village between 1912 and 2002.[1)] This shows that there were 48 households in the village in 1912 but this number doubled over the next 30 years, resulting in a total population of 318. The number of households and population then further increased to 265 and 1,086, respectively, by 2002. Currently, 79% of all households are involved in rice production and the average paddy area per rice-cultivating household is 9 rai (1.44 ha).[2)]

When Don Daeng was first established in the mid-eighteenth century, farming was mostly for subsistence. By the 1960s the village economy was no longer wholly subsistence oriented, but off-farm activities still accounted for less than a quarter of average annual cash income (Fig. 3). However, after the 1980s the share of off-farm income began to increase, resulting in a wider gap between off-farm earnings and on-farm or rice cultivation earnings (Funahashi 2006, 132). Because Don Daeng is situated in the peri-urban zone of Khon Kaen city, since the 1980s its residents have had good opportunities for off-farm employment while residing in the village.

1) These were estimated by various means for the period before the 1960s, while the more recent figures are based on a household interview (Funahashi 2006, 84).
2) 1 rai = 0.16 ha.

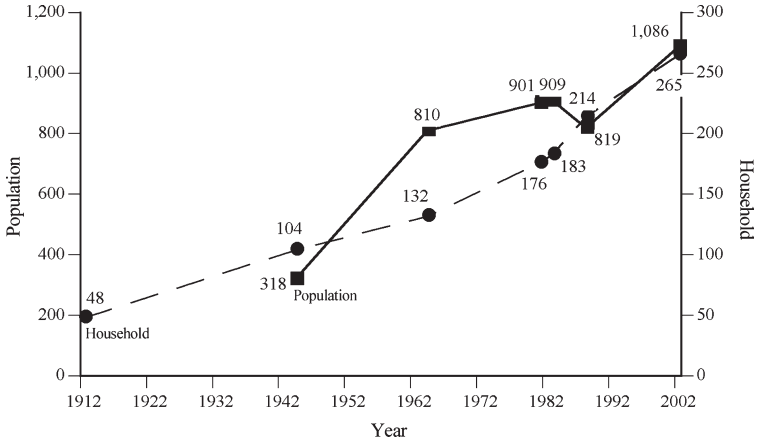

Fig. 2 Population Size and Number of Households in Don Daeng Village from 1912 to 2002
Source: Funahashi *et al.* (2006).

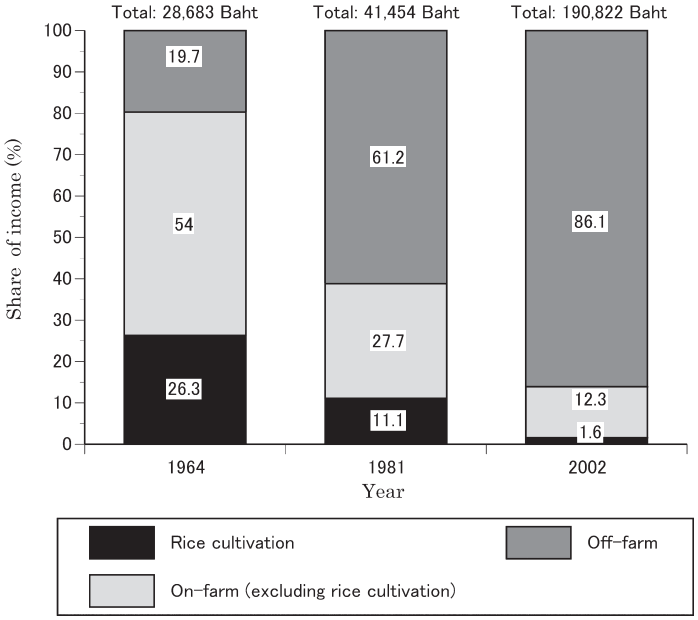

Fig. 3 Annual Average Income for Households in Don Daeng Village in 1964, 1981, and 2002
Source: Funahashi *et al.* (2006).

Paddy Field Environment and Traditional Rice Cultivation Systems

The undulating terrain of the Korat Plateau of the Northeast consists of a succession of small drainage basins. These basins or shallow saucer-shaped watersheds, which are

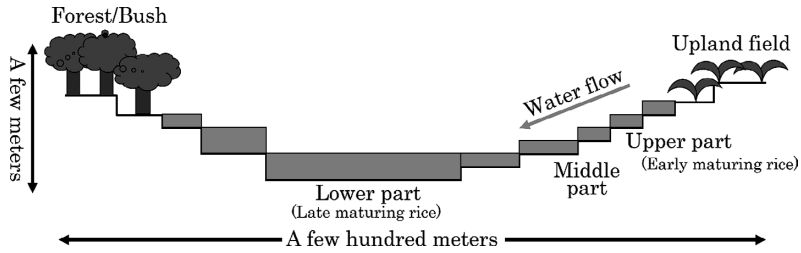

Fig. 4 A Schematic Cross-section of a Typical *Nong*

known as *nong*, exist in various shapes and sizes, and their bottom and lower slopes are occupied by paddy fields. The relationship between the micro-relief of a *nong* and the traditional rice cultivation system in Don Daeng was studied in 1981 and 1983 (Miyagawa *et al.* 1985). Fig. 4 presents a schematic diagram of a *nong*, showing the relief and land use. A *nong* can be divided into lower, middle, and upper parts. In the case of Don Daeng village, the lower part has the largest area and is relatively high yielding since the soils are most fertile. When the rainy season arrives, this part is planted first. By contrast, the upper part tends to be small, with terraced paddy fields on the slope; rainwater flows down the slope toward the middle and lower parts. Consequently, the upper part becomes ready for planting later than the lower part. In low-rainfall years the upper part may not be planted at all, or if it is planted, the rice may die during a dry period. On the other hand, during flood years, the lower parts are more susceptible to flood damage but the upper parts are able to produce a comparatively high yield. Farm households in Don Daeng village own fields that are distributed in all parts of a *nong*, from the lower to the upper parts (Fig. 4), meaning that they are likely to be able to successfully harvest at least a portion of the lands in the event of a drought or flood, minimizing the total overall risk (*ibid.*; Miyagawa 2006b).

Long-Term Field Survey and Data Integration

Don Daeng village was studied in the 1960s (Mizuno 1981) and 1980s (Kuchiba 1990; Fukui 1994), and a third village study was initiated in 2002 to update the earlier datasets. All of this information was input into a Geographical Information System (GIS) to integrate the previous research data, and a base map for the GIS database was constructed using paddy plot maps from 1981, 1992, and 2005 (Watanabe *et al.* 2008, 45–52).

Results

Introduction of New Rice Varieties and Chemical Fertilizer

Since the 1970s, there has been an expansion of areas planted with improved varieties of the non-glutinous rice Khao Dok Mali 105 (KDM105) and the glutinous rice Khao Niao Kho Kho 6 (RD6) in the Northeast (Kono and Nagata 1992, 241–271; Nakada 1995, 523–548). These new varieties have played an important role in transforming an area that was previously noted for its subsistence agriculture to one that undertakes commercial rice production.

Don Daeng villagers also replaced the local varieties with KDM105 and RD6. Table 1 shows the drastic change in the number of rice varieties planted in the village from the 1980s onward: 71 varieties were recorded in the village in 1983, while only 3 varieties occupied 100% of the total rice area by 2003. Use of the improved varieties spread as a result of interpersonal communications among farmers rather than information from government institutions (Miyagawa 1995; 1996).

According to the household interviews by Funahashi Kazuo (not published), 60% of the total production of the non-glutinous variety was sold to the market in 2001, with the remaining 40% being consumed domestically. Although people in Northeast Thailand do not customarily eat non-glutinous rice, in recent years some tend to prefer it, particularly the younger generation and old people who have difficulty eating hard rice and have diabetes. Therefore, growers do not sell all of it even though they could make a profit from doing so.

Chemical fertilizers were used only on nursery beds prior to the 1980s. Their use in the main paddy plots was first observed in this village in 1983 and has since become a common practice. The most popular was urea (46-0-0). By 2004, only 5% of the total area planted with rice did not have chemical fertilizers applied (Miyagawa 2006a).

Table 1 Number of Rice Varieties Planted in Don Daeng Village in 1983

	1983		2003	
	Number of Varieties	Area Planted (ha)	Number of Varieties	Area Planted (ha)
Late maturing rice (glutinous)	6	144 (43%)		(0%)
Middle maturing rice (glutinous)	37	137 (41%)	1	401 (80%)
Middle maturing rice (non-glutinous)	1	0.05 (0%)		(0%)
Early maturing rice (glutinous)	8	15 (4%)	1	5 (1%)
Upland rice	19	39 (12%)	1	95 (19%)
Total	71	335	3	501

Introduction of Irrigation

Individually owned small pumps were used to water vegetable gardens along the river in the early 1980s and were later used to irrigate paddy fields, too. The construction of an electric water-pumping facility with a canal network by a government agency belonging to the Ministry of Science, Technology and Environment[3] was also begun in the early 1980s, and the water distribution service started in Don Daeng village in the mid-1980s.[4]

Since then, farmers have used a variety of methods to bring water to their fields. As shown in Table 2, in 1981 only 8% of the total area was irrigated by water drawn from the river by small pumps, whereas in 2003 and 2004 almost 25% was irrigated by the electric pump/canal system and 13% by small pumps taking water directly from the river. However, the remaining 60% of land in 2003 and 2004 was wholly rainfed, and the irrigated land was irrigated only four times during the two-year period of the 2003 and 2004 seasons, indicating that irrigation for rainy season rice is basically supplementary. Nevertheless, the supplemental irrigation plays an important role in avoiding drought damage and allowing rice to be planted simultaneously throughout a *nong*.

Land Consolidation

The number of paddy plots, their total area, and their average size in 1981, 1992, and 2005 are shown in Table 3. In 1981 there were 8,401 plots with an average area of 663 m^2, while in 2005 the number of plots had fallen by two-thirds but their average area had

Table 2 Supplementary Irrigation for Rice in 1981, 2003, 2004, and 2005 (percentage of irrigated area in total rice area)

Types of Irrigation	1981	2003	2004	2005
Electric pump/canal	–	22.8	25.8	5.1
Small pumps from the river	8.4	13.4	13.6	2.9
None	91.6	63.8	60.6	92.0

Table 3 Number, Size, and Average Area of Paddy Plots in 1981, 1992, and 2005

	1981	1992	2005
Number of plots	8,401	7,312	2,885
Total area (ha)	557	637	572
Average size (sq. meters)	663	871	1,983

Source: Watanabe *et al.* (2008).

3) The present name is Ministry of Science and Technology.
4) When a farmer wishes to use irrigation water, he/she asks the irrigation office and the officer informs the farmer of the schedule. The charge for irrigation water ranges from 35 to 250 baht/hour, depending on the volume of water.

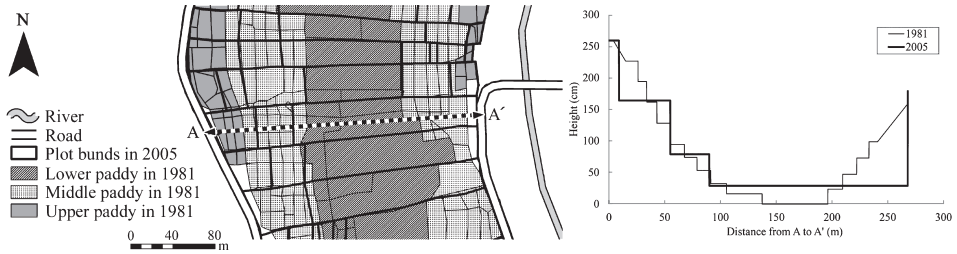

Fig. 5 A Cross-section of a *Nong* in 1981 and 2005
Source: Modified from Watanabe (2008).

become approximately three times larger. This was due to land consolidation, which became a common practice from the 1990s.

A cross-section of a *nong* was made in 1981 (Kuroda 1981). In 2006 a leveling survey produced another cross-section along the same line. These cross-sections allow us to assess changes over the 25-year period (Fig. 5). Fig. 5 shows that 31 plots had been integrated into three plots. On the left side, six plots in the upper part and two in the middle part had been integrated, and other plots in the middle and lower parts were also consolidated to create one large plot each. Also, the altitude of the bottom part increased over time.

Larger plots are desirable or required for agricultural machines such as power tillers, four-wheel tractors, and combine harvesters, which started to be introduced in the early 1980s. Trees along the bunds of paddy plots were also cut down to make cultivation by machines easier. This type of land modification and consolidation progressed with no financial support from the government.

Rice Production

Changes in Rice Crop Performance

The rice crop performance of each individual plot in Don Daeng village has been recorded every year since 1981 (Miyagawa 2006b). Crop performance was recorded by assigning each plot to one of four grades: "good," which means that the crop did not suffer any damage from flood/drought or pests/diseases and had a high yield; "poor," which means that the crop was harvested but the yield was low; "no harvest," which means that although the plot was planted, no yield was obtained; and "not planted," which means that the plot was not planted due to either drought or deep water. These observations and recordings were made by a volunteer from the village.

A plot capability classification was made based on the crop performance data (Watanabe *et al.* 2008). The capability classification was made for the three-year periods

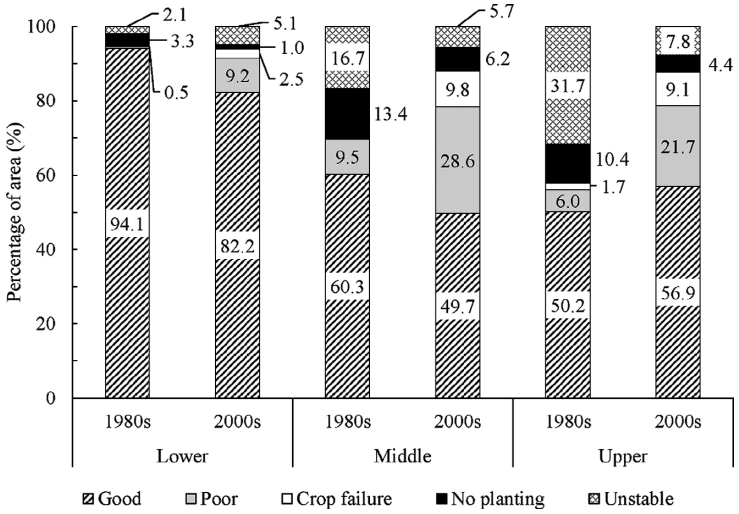

Fig. 6 Plot Capability Classification in the 1980s and 2000s

of 1981, 1982, and 1983 and 2003, 2004, and 2005, which represent the periods before and after the land consolidation and modification respectively. Plot capability was classified into the following five grades:

1. "Good plots": Crop performance was "good" for at least two of the three years.
2. "Poor plots": Crop performance was "poor" for at least two of the three years.
3. "Crop failure plots": Crop performance was "no harvest" for at least two of the three years.
4. "No planting plots": Crop performance was "not planted" for at least two of the three years.
5. "Unstable plots": Crop performance varied from one year to another.

As shown in Fig. 6, in the upper paddy the percentages of "good plots" and "poor plots" were higher in the 2000s than the 1980s, while the percentages of "unstable plots" and "no planting plots" were lower. The primary reason for the improved grade of upper paddy was land consolidation in the 1980s, where previously there had been many small plots with unstable water conditions. By providing irrigation water and consolidating these plots to create one large plot, instability of water condition was largely mitigated, resulting in an increased number of good plots and poor plots.

In the lower paddy, the crop performance was mostly good before land consolidation and modification because of a good water supply. The percentage of good plots there was

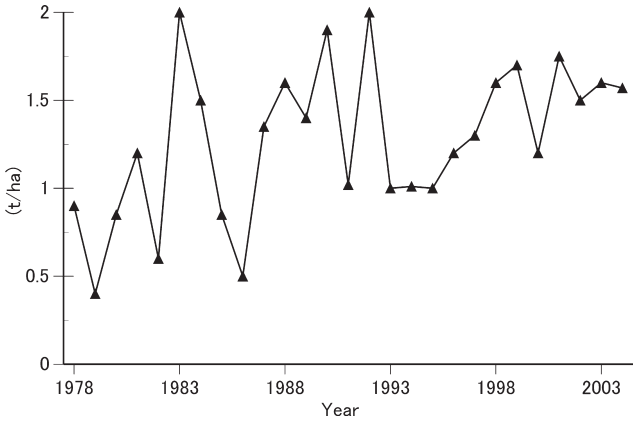

Fig. 7 Annual Average Yield (unhusked) in Don Daeng Village from 1978 to 2005
Source: Modified from Miyagawa (2006c).

lower in the 2000s than in the 1980s. As shown in Fig. 6, some of the middle part plots in the 1980s were merged into plots in the lower part, as part of land consolidation. This resulted in poor drainage and submergence of seedlings in the lower part, leading to a reduced proportion of good plots. Shifting from the transplanting to the direct seeding method also contributed to the lower grading of the lower paddy plots, because of the greater risk of low germination due to poor drainage.

Changes in Rice Yield

Rice production per harvested area from 1978 to 2005 is shown in Fig. 7. The most striking feature is the reduced gap between low-yield and high-yield years after the late 1980s. The highest yield of 2 t/ha did not change significantly over the 30-year period, whereas the lowest yield remained above 1 t/ha after 1988. Variable rainfall was the major determinant of yield variation in the early 1980s, with drought producing poor yields and the following periods of favorable precipitation producing record-high yields. However, the yield ranged from 1 t/ha to 2 t/ha, although precipitation was similarly unstable from the late 1980s. Furthermore, there was lower variation in yield, which increased the average yield. Thus, it appears that the adverse effect of unstable precipitation was largely mitigated by the introduction of new techniques such as irrigation and land modification, which stabilized water conditions.

Effects of Labor-Saving Techniques on Productivity

The types and numbers of agricultural machinery and the number of water buffalo were surveyed in 2001 by Funahashi K. and Shibata K. (2007). The results of this survey were

Table 4 Number of Water Buffalo, Power Tillers, and Four-wheel Tractors in 1981 and 2002

	1981	2002
Water buffalo	285	23
Power tillers	0	44
Four-wheel tractors	0	2

Table 5 Planting Methods Used in the Early 2000s (percentage of area)

Method	2003	2004	2005
Direct seeding	75.0	66.0	83.5
Transplanting	22.9	27.9	15.7
Both*	2.1	6.1	0.8
Total area surveyed (ha)	556	516	513

Source: Miyagawa (2006a).
Note: * Part of a plot was direct-seeded and the other part transplanted.

compared with an identical survey in 1981 (Kuchiba 1990). This showed that water buffalo were raised as draft animals for land preparation in 1981, whereas mechanical cultivators had assumed this role in 2001 (Table 4). In addition to reducing the need for human labor, these machines enabled rapid plowing and shortened the time needed for land preparation, allowing a larger area to be planted more quickly after a heavy rain than was possible using animals. As shown in Fig. 6, the number of "no planting plots" became much smaller in the early years of the twenty-first century, particularly in the upper part of the *nong*. This is the combined effect of improved water conditions and quick land preparation by machines.

Table 5 shows that the number of farmers in the village using the direct seeding method increased rapidly since the beginning of the twenty-first century (Miyagawa 2006a), and a similar trend was observed throughout the Northeast (Somkiat and Kono 1996; Hayashi *et al.* 2009). The adoption of this method, however, resulted in a lower yield because of increased competition with weeds. Farmers were once able to hire neighbors or relatives to transplant seedlings for less than 100 baht (USD3.50 at the 2016 exchange rate) per day. However, in the first decade of the twenty-first century this cost more than doubled due to labor shortages. Consequently, farmers have stopped trying to find the additional labor they need to transplant and instead resort to direct seeding, even though they know that this has lower productivity than the transplanting method. Households that still practice the transplanting method are rare, being restricted to those that have a large supply of family labor.

Discussion and Conclusion

The economy of Khon Kaen city has greatly expanded since the beginning of the 1970s (Glassman and Sneddon 2003). Don Daeng village has been caught up in the city's economic sphere, with the villagers benefiting from increased access to off-farm sources of income in the city. When job opportunities in Khon Kaen city were more limited, villagers had to seek work outside the Northeast, either in Bangkok or overseas.

As a consequence of the increased opportunities for employment in the city and the higher wages that were offered compared with the agricultural sector, labor became short in the village. Consequently, farmers started to employ labor-saving practices. The use of agricultural machinery saved time, which may have contributed to higher labor productivity. The direct seeding method also helped to save labor but led to a reduction in land productivity due to poor germination in the lower paddy fields and increased competition from weeds.

In the late 1980s, farmers in this village started trying to increase productivity by using new rice varieties and chemical fertilizers, and by developing new irrigation facilities (Tables 1 and 2). Furthermore, land consolidation and modification created larger and more level plots, which not only improved water management but also facilitated the use of mechanized equipment (Fig. 5; Tables 3 and 4). Thus, the area of unplanted plots decreased thanks to quick land preparation by power tillers and tractors.

In Don Daeng village these new technologies have led to a new system of rice farming. These approaches effectively raised the lower limit on crop yields and also stabilized production. However, although the total production of rice has been stabilized, if not increased, the income from rice production has not (Fig. 3). The maximum average yield (2 t/h) remains much lower than the national average (2.88 t/ha). This should not necessarily be considered a negative, however, as the farmers in this village, by adopting new technologies, have succeeded in producing enough rice to meet their own consumption needs; and the expansion of the nearby Khon Kaen urban area has allowed the villagers to diversify their sources of income and improve their own food security by investing that additional income in improving their agriculture.

High inter-annual variability in rice yield is a characteristic of rainfed rice cultivation, and it is seen also in Don Daeng. It is such short-term variation, rather than the low long-term average yield (Fukui 1994), that poses a threat to villagers' ability to meet their subsistence needs. This study clearly demonstrates that the new inputs and technologies that have been used since the 1980s have not increased maximum rice yields; however, they have certainly contributed to increasing the bottom line of rice yield and stabilizing production, which is more than sufficient to meet subsistence needs. The villagers have

good opportunities to earn wages while residing in the village, and this secured subsistence is prioritized rather than cash earnings from rice cultivation because it functions as a safety net.

The changes in rice cultivation that have occurred in this village since the 1980s reflect the characteristics of rainfed rice—that is, the need for stability rather than a higher yield—as well as the peri-urbanization of the village—that is, the need for self-sufficiency rather than the commercialization of rice. Farmers' investment in land consolidation, small pumps, and power tillers reflects these aspects. It would be interesting to compare these findings with those from a more remote and truly rural village where out-migration is virtually the only means to earn a non-farm income.

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References

Floch, P.; and Molle, F. 2009. Water Traps: The Elusive Quest for Water Storage in the Chi-Mun River Basin, Thailand. Working Paper on Mekong Program on Water, Environment and Resilience.

Fukui, H. 1994. *Food and Population in a Northeast Thai Village*. Honolulu: University of Hawaii Press.

Funahashi K. 舟橋和夫. 2006. Don Den mura hendo no kiseki ドンデーン村変動の軌跡 [Tracing Don Daeng village's dynamics]. In *Don Den mura saisaiho: Tohoku Tai tensuiden noson ni okeru 40 nenkan no dotai kenkyu* ドンデーン村再々訪——東北タイ天水田農村における40年間の動態研究 [Revisit to Don Daeng village: Forty years of dynamic research on a rainfed rice-growing village in Northeast Thailand], pp. 83–139. Final Report of Grants-in-Aid for Scientific Research (A), Ryukoku University.

Funahashi K. 舟橋和夫; and Shibata K. 柴田恵介. 2007. Tohoku Tai noson Don Den mura ni okeru sonraku keizai no hendo 東北タイ農村ドンデーン村における村落経済の変動 [Changes in economic conditions of Don Daeng village, Northeast Thailand]. *Ryukoku Daigaku Shakai Gakubu Kiyo* 龍谷大学社会学部紀要 [Bulletin of the Faculty of Sociology, Ryukoku University]: 55–71.

Glassman, J.; and Sneddon, C. 2003. Chiang Mai and Khon Kaen as Growth Piles: Regional Industrial Development in Thailand and Its Implications for Urban Sustainability. *ANNALS of the American Academy of Political and Social Science* 590(1): 93–115.

Hayashi, S.; Kamoshita, A.; Yamagishi, J.; Anuchart K.; and Boonrat J. 2009. Spatial Variability in the Growth of Direct-Seeded Rainfed Lowland Rice (Oryza sativa L.) in Northeast Thailand. *Field Crops Research* 111: 251–261.

Kono, Y.; and Nagata, Y. 1992. Occupational Structure and Village Type in Northeast Thailand: A Case

Study in Yasothon Province. *Southeast Asian Studies* 30(3): 241–271.

Kuchiba M. 口羽益生. 1990. *Don Den mura no dentokozo to sono henyo* ドンデーン村の伝統構造とその変容 [Traditional structure of Don Daeng village and its transformation]. Monographs of the Center for Southeast Asian Studies. Tokyo: Sobunshya.

Kuroda, T. 1981. Fieldwork data (not published).

Miyagawa S. 宮川修一. 2006a. Suito saibai no tokucho 水稲栽培の特徴 [Characteristics of rice growth]. In *Don Den mura saisaiho: Tohoku Tai tensuiden noson ni okeru 40 nenkan no dotai kenkyu* ドンデーン村再々訪——東北タイ天水田農村における40年間の動態研究 [Revisit to Don Daeng village: Forty years of dynamic research on a rainfed rice-growing village in Northeast Thailand], pp. 25–57. Final Report of Grants-in-Aid for Scientific Research (A), Ryukoku University.

————. 2006b. Long-term and Spatial Evaluation of Rice Crop Performance of Rain-fed Paddy Field in a Village of Northeast Thailand. *Tropics* 15(1): 39–49.

————. 2006c. Suito seisan no tokucho 水稲生産の特徴 [Characteristics of rice production]. In *Don Den mura saisaiho: Tohoku Tai tensuiden noson ni okeru 40 nenkan no dotai kenkyu* ドンデーン村再々訪——東北タイ天水田農村における40年間の動態研究 [Revisit to Don Daeng village: Forty years of dynamic research on a rainfed rice-growing village in Northeast Thailand], pp. 59–76. Final Report of Grants-in-Aid for Scientific Research (A), Ryukoku University.

————. 1996. Recent Expansion of Nonglutinous Rice Cultivation in Northeast Thailand: Intra-regional Variation. *Southeast Asian Studies* 33(4): 547–574.

————. 1995. Expansion of an Improved Variety into Rain-fed Rice Cultivation in Northeast Thailand. *Southeast Asian Studies* 33(2): 187–203.

Miyagawa, S.; Kuroda, T.; Matsufuji, H.; and Hattori, T. 1985. Don Daeng Village in Northeast Thailand: Typology of Rice Cultivation. *Southeast Asian Studies* 23(3): 235–251.

Mizuno K. 水野浩一. 1981. *Tai noson no syakai soshiki* タイ農村の社会組織 [Social organization of Thai village]. Monographs of the Center for Southeast Asian Studies. Tokyo: Sobunshya.

Nakada, Y. 1995. Surplus Rice and Seasonal Labor Migration: A Case Study at a Village in Yashothon Province, Northeast Thailand. *Southeast Asian Studies* 32(4): 523–548.

National Statistical Office of Thailand. 2013. Number of Holdings Reporting Land Use and Area of Holding and Region. *Agricultural Census Whole Kingdom 2013*. Ministry of Information and Communication Technology, Thailand.

Somkiat K.; and Kono, Y. 1996. Spread of Direct Seeded Lowland Rice in Northeast Thailand: Farmers' Adaptation to Economic Growth. *Southeast Asian Studies* 33(4): 523–546.

Watanabe, K.; Hoshikawa, K; and Miyagawa, S. 2008. Alteration of Paddy Plots in the Rain-fed Paddy Field and Their Influences on Rice Production in Don Daeng Village, Northeast Thailand. *Irrigation Drainage and Rural Engineering Journal* 253: 45–52.

Factors Influencing Variations in the Density, Extent of Canopy Cover, and Origin of Trees in Paddy Fields in a Rainfed Rice-Farming Village in Northeast Thailand

Watanabe Moriaki,* Patma Vityakon,** and A. Terry Rambo***

Paddy fields in Northeast Thailand are unusual in that they contain large trees. In recent years, however, in concert with major changes in the agricultural system of Northeast Thailand, including the shift from subsistence to cash crops, mechanization, use of chemical fertilizers, and increased reliance of rural people on manufactured consumer goods, the role of trees in paddy fields has also been changing, leading to a decline in tree densities. This study was conducted in Khok Kwang village, Khon Kaen Province, in order to examine factors influencing variations in density, canopy coverage, and origin of trees in paddy fields there. In recent years, the rate of tree cutting appears to have been increasing and the density of trees declining. This decline reflects many changes in agricultural practices in the village. Farmers now rely on chemical fertilizer rather than litter from the trees to maintain soil fertility. They no longer value any increase in rice yield during dry years in the parts of their fields that are close to the trees because they are now able to pump irrigation water to maintain productivity; and trees are seen as an impediment to the use of four-wheel tractors, which have difficulty working efficiently in paddy fields with many trees. In addition, several farmers have begun to plant their paddy fields with sugarcane, which is less shade tolerant than rice. The density of trees in paddy fields planted with sugarcane (5.7 trees/ha) is much lower than in fields where rice is cultivated (9.6 trees/ha). In upper paddies that are still planted with rice, the trees are retained because they provide valuable goods and services to the farmers and rice yields there are in any case low and unstable. This study illustrates at the micro level how changes in farmer goals, choice of crops, and production technology that are part of the agrarian transformation of Northeast Thailand are reshaping the rural landscape.

Keywords: agroforestry, traditional land use, landscape ecology, tree-crop interactions, farmer knowledge

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Introduction

Paddy fields in Northeast Thailand are unusual in that they usually contain large trees. These fields are not just rice paddies but multi-resource systems providing a wide variety of goods and services to the rural people (Heckman 1979; Grandstaff *et al.* 1986; Rambo 1991; Patma 1993; Buared 2000). The trees provide food and medicine, firewood, lumber, small timber, non-timber products, and shade (Grandstaff *et al.* 1986; Buared 2000). They contribute organic matter to the soil (e.g., Sunee *et al.* 1992), which serves as a nutrient reserve and leads to higher cation exchange capacity (Patma 1993). Trees also provide fodder and shade to livestock as well as serve as habitat for various wild species, including insects, birds, and other animals (Grandstaff *et al.* 1986).

In recent years, however, in concert with other major changes associated with the ongoing agrarian transformation of Northeast Thailand—including the intensification of rice production, shift from subsistence-oriented farming to raising cash crops, mechanization, use of chemical fertilizers, and increased reliance of rural people on manufactured consumer goods—the role of trees in paddy fields has also been changing, leading to a general decline in tree density. However, only a few surveys have been made of the density of trees in paddy fields in Northeast Thailand and central Laos (*ibid.*; Watanabe *et al.* 1990; Buared 2000; Kosaka *et al.* 2006; Matsushita *et al.* 2011). They found a wide variation in number of trees per hectare, ranging from none to more than 150. A recent survey of tree density in paddy fields for the whole of the Northeast region revealed the mean density of trees in paddy fields was 12.1 trees/ha (Watanabe *et al.* 2014). In general, the northern part of the region has much lower densities of trees than the southeastern part. Density was found to be influenced by multiple factors: (1) the history of land development, with older fields displaying lower densities than newer fields; (2) topography, with fields located at higher positions in the toposequence having higher densities than those located in lower areas; (3) access to natural forest resources, with areas close to forests having higher densities than areas farther away; (4) amount of annual rainfall, with areas of higher rainfall having higher densities than areas of lower rainfall; and (5) landholding size, with areas of larger-sized landholdings having higher densities than areas of smaller-sized landholdings (*ibid.*). The kinds of crops planted in the paddy fields (in the past almost always rice but recently sometimes sugarcane or cassava) also influence density since trees reduce yields of shade-intolerant crops. Rice is more tolerant than field crops such as cassava and sugarcane, which leads farmers to cut down trees if they plant these field crops (Patma 2001). Although the degree of shading in fields is related to the extent of the trees' canopy coverage, no studies have been published on this aspect of trees in paddy fields.

The trees in paddy fields in Northeast Thailand have different origins: (1) forest survivors that have persisted from the original forest; (2) volunteers that have naturally generated from seeds brought into the system through various means; and (3) trees that were intentionally planted by the farmers (Patma 1993; 2001). Because tree management in paddy fields gradually evolves from a state of high tree density with little human care to one of low tree density with intensive human intervention, forest survivors come to be replaced by volunteers and planted trees with the passage of time (Grandstaff *et al.* 1986; Kosaka *et al.* 2006).

Although some studies conducted in Laos have described spatial variability in the occurrence of trees in paddy fields at both the community and plot levels (Kosaka *et al.* 2006; Matsushita *et al.* 2011), no systematic surveys of variability in tree density, canopy coverage, and origins of trees in paddy fields have been done at the community and plot levels in Northeast Thailand. Therefore, we undertook this study to investigate the density, extent of canopy cover, and origin of trees in paddy fields and to identify factors influencing these variables in a single rainfed rice-farming community in Northeastern Thailand.

Methodology

Research Design

Of the five factors found by Watanabe Moriaki *et al.* (2014) to influence the density of trees in paddy fields, three factors (access to natural forest resources, amount of annual rainfall, and landholding size) are not differentiated in the study community of Khok Kwang village, so they cannot be a source of variation in tree densities in various parts of the village. Therefore, only two factors, i.e., the history of land development and topography, were examined in the present study. The paddy fields in the village were classified into three zones based on their history of clearance and their topographical position in the landscape. The density and canopy cover of trees in paddy fields were calculated in each zone by analyzing satellite images downloaded from Google Earth. The origins of the trees in selected plots in paddy fields in each zone were recorded based on information provided by the farmers. The effects on tree density of the recent change from growing rice to sugarcane in paddy fields was also investigated in the selected plots based on observation and interviews with farmers.

Study Site

Khok Kwang village, Khok Ngam Subdistrict, Ban Fang District, Khon Kaen Province

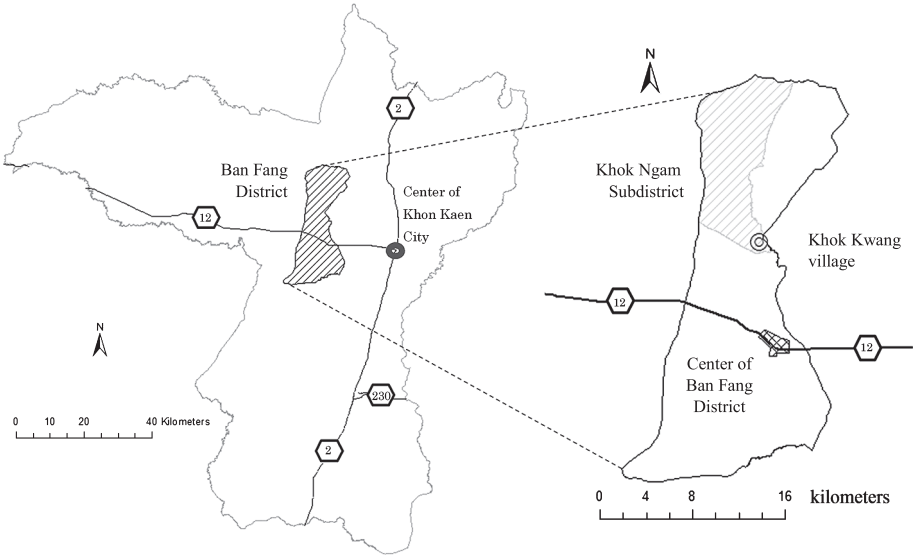

Fig. 1 Map Showing the Location of the Study Site of Khok Kwang Village in Khon Kaen Province

(Fig. 1), was selected for study for three reasons: the first author has a long-term relationship with the villagers, which facilitated the collection of reliable information; it is a community with a relatively low density of trees; and it is easily accessible.

Khok Kwang village (16°32′N, 102°38′E) was established in 1920 by seven households that moved there from other areas. An unpaved road to the village that was usable only in the dry season was constructed in 1967. Access to the village during the rainy season became easier after the road was paved in 2007. According to the basic village-level information database (NRD-2C) of the Community Development Department, there were 100 households and 448 people in the village in 2005.

There is a difference in elevation of about 30 meters between the highest (220 m above mean sea level) and lowest (190 m) points in the village. Fig. 2 shows the pattern of land use in Khok Kwang village. Forests are located in the northern and southern areas and on the top of hilly areas. Most of the lower areas have already been developed into paddy fields. All of the forests belong to the Royal Forest Department, which planted eucalyptus trees in both areas in 1977. The villagers are not allowed to cut trees without permission from the forest department but are permitted to collect firewood and graze cattle in the forests. The villagers like to collect mushrooms in the forests at the beginning of the rainy season. The main stream, Huay Yai, flows from the northeast to the southwest of the village. A Huay Yai weir, was constructed in 1975–76. However, the weir collapsed two years later and was reconstructed only in 1986. Since then, about

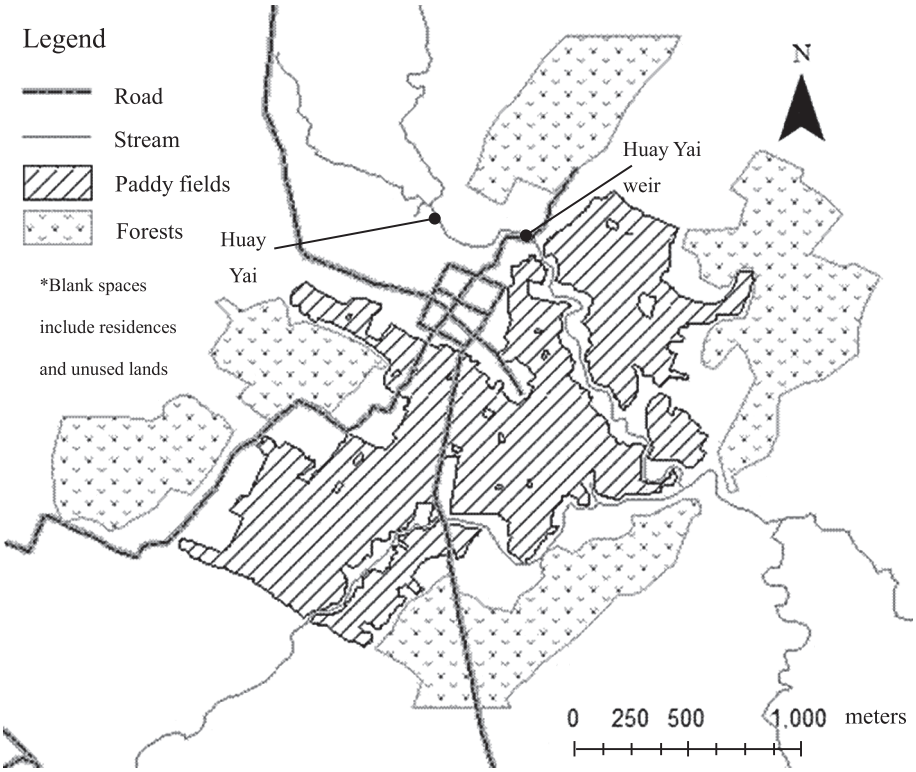

Fig. 2 Map of Land Use in Khok Kwang Village

67 ha (400 rai) of the lower paddies have been irrigated from the weir (Fukui and Hoshikawa 2009).

The total area of agricultural land in the village is 165.4 ha. All of the arable land is paddy fields. The mean landholding size per household is 1.65 ha. According to the NRD-2C for 2005, there was little or no differentiation of landholding size among the villagers and no household had more than 3.5 ha. All households engage in rice cultivation and also raise cattle and buffalo. They can grow rice only once each year in the rainy season. All farmers plant the popular RD6 variety of glutinous rice and make use of chemical fertilizer and pesticides. According to the NRD-2C for 2005, only rice was then planted. However, since that time sugarcane cultivation in the paddy fields has been expanding. This is because growing sugarcane requires less labor and brings about much higher profits per hectare than rice. In recent years, shortage of agricultural labor has become a serious problem for the villagers because many younger adults have left the village to seek non-farm employment in the city.

Research Procedure

Obtaining Satellite Images

A high-resolution satellite image (QuickBird) obtained from Google Earth was used in this study. The resolution is sufficiently high to allow the identification of the boundaries of paddy fields and the location of trees within these fields using the naked eye. The satellite image covering Khok Kwang village was taken on November 7, 2004 and downloaded in October 2010.

Identifying the Boundaries of the Village and the Paddy Fields

The boundaries of the village and the individual paddy fields were identified by checking the satellite image with the help of key informants from the village.

Collecting Information on the History of Land Development

Key informants who were knowledgeable about the history of the village were interviewed about the history of land development, especially that of the paddy fields. They divided the agricultural area of the village into two types: (1) the area where most of the paddies were developed before 1945 (154.2 ha), and (2) the area where most of the paddies were developed after 1945 (11.3 ha). A map showing these two types was made using ArcView (Fig. 3).

Collecting Information on Topography

The elevation above mean sea level was determined using Google Earth. Based on their elevation, paddy fields of the village were divided into four areas—<195, 195–200, 201–205, and >206 meters—and the boundaries of these areas were mapped using ArcView (Fig. 4).

Delineating Zones Based on the History of Land Development and Topography

The paddy fields were divided into three zones based on information on the history of land development and topography (Fig. 5). Zone A includes the areas with an elevation of 200 m or less where the paddy fields were developed mostly before 1945. Zone B includes the areas with an elevation of 201 m or higher where the paddy fields were developed mostly before 1945. Zone C includes the areas developed after 1945 that have an elevation higher than 201 m above sea level.

Calculating Density and Canopy Cover of the Trees in the Paddy Fields in Each Zone

All of the trees inside the boundaries of the paddy fields, including those on the bunds around the fields, in the satellite image were counted using the naked eye. In a few cases,

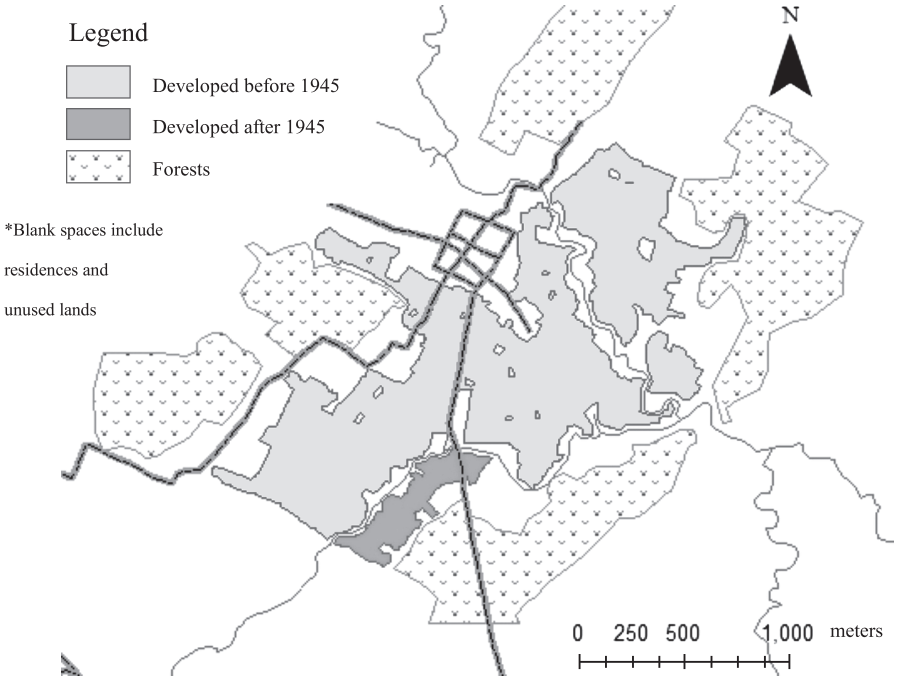

Fig. 3 Map Showing History of Development of Paddy Fields in Khok Kwang Village

when several trees formed a single cluster and it was not possible to count each tree individually, the whole cluster was counted as one tree.

The density, the share of the total area of the paddy fields covered by canopies, and the mean area of canopy cover per tree were calculated using ArcView with the following formulas:

Density of trees in paddy fields (number/ha) = Total number of trees in paddy fields/ area of paddy fields (ha) in each zone

Share of area occupied by canopy cover (%) = Total area of tree canopy cover (m^2)/ area of paddy fields (m^2) × 100 in each zone

Mean area of canopy cover (m^2) per tree = Total area of tree canopy cover (m^2)/total number of trees in paddy fields in each zone

Observing Paddy Fields in Each Zone and Interviewing Their Owners

Twenty-nine households were randomly selected from the 100 farm households in the

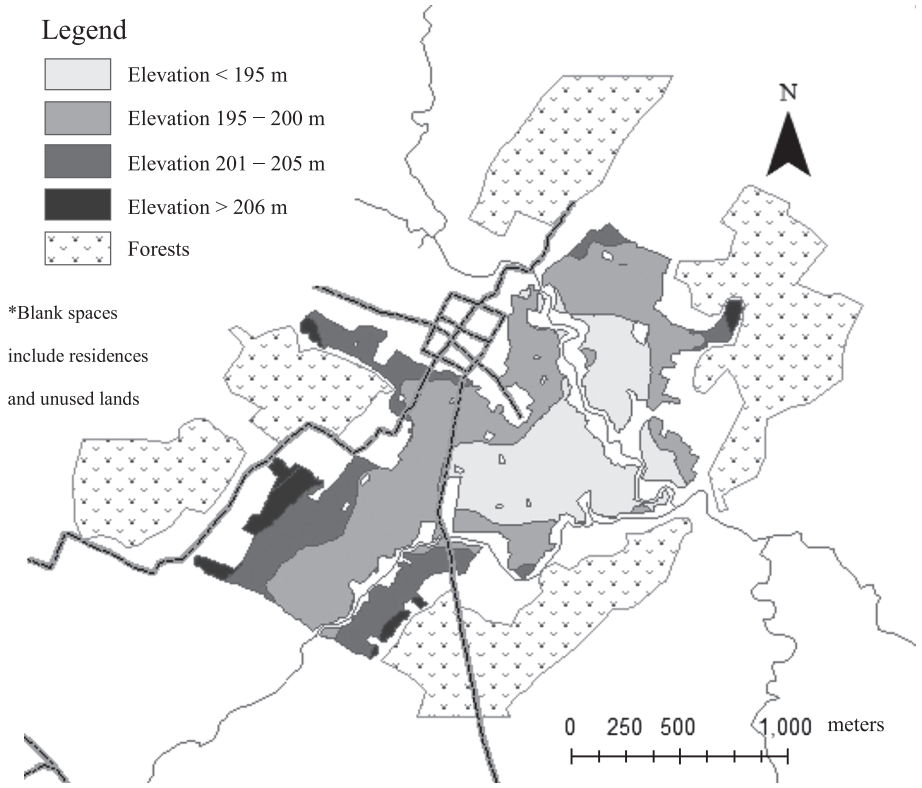

Fig. 4 Map Showing the Elevation of Paddy Fields in Khok Kwang Village

village, and one plot for each sample household was randomly chosen from their holdings. The 29 plots had a total area of 10.7 ha, accounting for 6.5% of the total area of paddy fields in the village. Of the 29 plots, 11 (3.1 ha) were in Zone A, 11 (5.6 ha) in Zone B, and 7 (2 ha) in Zone C. They were kept under observation from October 2010 to July 2011. Members of households who owned the plots were asked to identify the names and origins of all of the trees standing in their plots. They were also asked about the reasons they retained the trees and their future plans for them.

Results and Discussion

Characteristics of Trees in Paddy Fields in Different Zones

Density of Trees in Paddy Fields

The overall mean density of trees in paddy fields in Khok Kwang village was 7.3 trees/

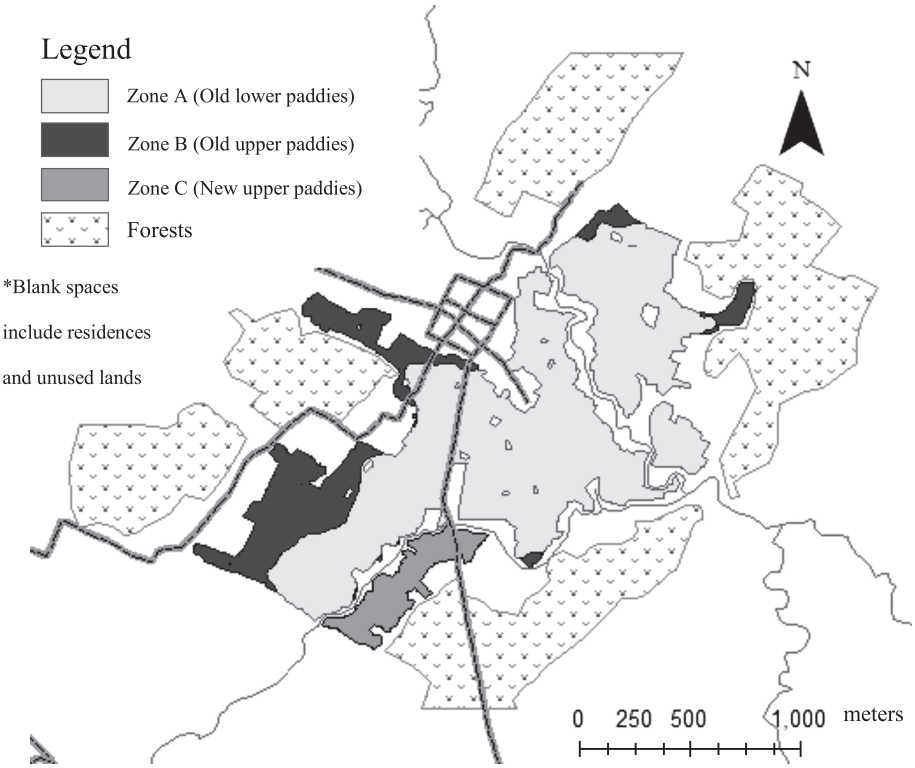

Fig. 5 Map of Zoning of Paddy Fields in Khok Kwang Village

ha. The densities in Zones A, B, and C were 5.1, 12.4, and 18.4 trees/ha respectively (Table 1). Photographs showing trees in paddy fields representing each zone are shown in Fig. 6.

Table 1 Density of Trees in Paddy Fields of Each Zone in Khok Kwang Village

Zone	Zone A (old lower paddies)	Zone B (old upper paddies)	Zone C (new upper paddies)	Total/Average
Time of reclamation	Before 1945	Before 1945	After 1945	
Elevation (m)	<200	>200	>200	
Area of paddy fields (ha)	123.6	30.5	11.3	165.4
Number of trees	627	378	208	1,213
Density of trees in paddy fields (trees/ha)	5.1	12.4	18.4	7.3
Share of total area of field under tree canopy (%)	2.6	7.3	10.0	4.0
Mean area of canopy per tree (m^2)	52.7	59.0	54.4	55.0

Fig. 6 Trees in Paddy Fields in Each Zone in Khok Kwang Village

Extent of Tree Canopy Cover in Paddy Fields

The mean area of canopy cover per tree was 55 m^2, and the total area under canopy accounted for 4% of the total area of the paddy fields. The share of the total field area occupied by tree canopies was much lower in old lower paddies in Zone A (2.6%) than in old upper paddies in Zone B (7.3%) or in newer upper paddies in Zone C (10%). Trees in Zone B had a higher mean area of canopy cover (59 m^2) than those in Zone A (52.7 m^2) or in Zone C (54.4 m^2) (Table 1). Table 2 shows variations in the area of the canopies of individual trees in paddy fields in each zone. The difference in the area of canopy cover in Zone B compared to Zones A and C is highly significant ($|p| \leq 0.01$) according to the Mann-Whitney U test.

Table 2 Area of Tree Canopies in Different Zones

Area of Canopy (m^2)	Zone A (old lower paddies) (%)	Zone B (old upper paddies) (%)	Zone C (new upper paddies) (%)	Total (%)
0.0–19.9	4.6	2.9	5.8c	4.3
20.0–39.9	42.7	32.8	38.9	39.0
40.0–59.9	23.8	28.3	26.4	25.6
60.0–79.9	12.6	16.4	13.0	13.8
80.0–99.9	7.2	7.4	6.3	7.1
>=100.0	9.1	12.2	9.6	10.1
Total	100.0	100.0	100.0	100.0

Origins of Trees in Paddy Fields

In 10.7 ha of the 29 sample plots, there were a total of 79 trees belonging to 27 species (Table 3). Of these trees, 13 (16.4%) were planted trees, 30 (38%) were volunteers, and 36 (45.6%) were forest survivors. The volunteers are supposed to be generated from seed provided by nearby forest. However, forest trees in this village have been replaced by eucalyptus. Therefore, the forest is not a source of seeds for trees in the paddy fields. The origin of trees in each zone seems to be different (although since the 29 plots were not selected in proportion to areas of the zones, testing for statistical significance is not possible). In Zone A, 38.9% were planted trees while the forest survivors were only 22.2%. On the other hand, in Zone C only 4.5% were planted trees and 54.5% were forest survivors (Table 4). Thus, it appears that multipurpose resource systems have been kept mainly in upper paddies. The villagers said that they expected to keep 72 of the existing 79 trees (91.1%) in their fields in the future.

Factors Influencing Density, Canopy Cover, and Origin of Trees in Paddy Fields

History of Land Reclamation

Details of the process of land reclamation cannot be reconstructed with precision because the villagers do not remember when each paddy plot was reclaimed. However, according to some key informants, the oldest paddies are located in lower-lying parts near Huay Yai Stream and were established around 1920. Many villagers agreed that they started reclaiming lower areas first and then expanded the area toward upper ground little by little. The process of paddy field reclamation in the village was quite similar to what has been reported elsewhere in Northeast Thailand (Takaya and Tomosugi 1972; Fukui 1993; Patma 1993; 2001; Buared 2000). Thus, we can say with some confidence that the villagers first developed the paddies in lower parts of Zone A and then expanded them into middle and upper parts of Zone B. The higher land in Zone C was only developed much later. The density of trees in paddy fields clearly reflects this history of land reclamation,

Table 3 Tree Species Observed in Paddy Fields in Khok Kwang Village (29 sample plots)

Origin of Trees	Scientific Name	Local Name	English Name	Number of Trees			Main Usage
				Zone* A	Zone* B	Zone* C	
Planted trees	*Bambusa arundinacea*	Phai	Bamboo	3	1	–	Food, materials
	Cocos nuicifera	Mak Phao	Coconut	1	–	–	Food
	Mangifera indica	Muang	Mango	1	3	–	Food, timber, shade
	Sesbania grandiflora	Kae		2	1	–	Food
	Tectona grandis	Sak	Teak	–	–	1	Timber
	Total			7	5	1	
Volunteers	*Azadirachta indica*	Sadao	Neem	2	–	–	Food, timber, shade
	Borassus flabeliifer	Taan		–	5	–	Food
	Cassia fistula	Khun		–	1	–	Timber
	Ceiba pentandra	Ngiu	Kapok	–	–	1	Food, fiber
	Samnea saman	Samsa	Rain tree	1	1	–	Shade, lac
	Schleichera aleosa	Kho		1	1	3	Food, shade, fuelwood
	Spondias pinnate	Makok		–	2	3	Food
	Strebluus asper	Ton Khoi		2	2	1	Medicine, shade
	Tamarindus indica	Makham	Tamarind	–	1	–	Food
	Unknown	Tunka		–	1	–	Timber, fuelwood
	Unknown	Iram		1	–	1	Timber, fuelwood, shade
	Total			7	14	9	
Forest survivors	*Dipterocarpus intricatus*	Sabaeng		–	1	–	Timber, fuelwood
	Dipterocarpus obtusifiius	Saad		–	4	3	Timber, fuelwood
	Dipterocarpus tuberculatus	Kung		–	2	1	Timber, fuelwood
	Ficus sp.	Pho		1	–	1	Shade
	Irvingia malayana	Kabok		–	2	–	Fertilizing trees, food, fodder
	Parinarium anamense	Phok		1	1	–	Fuelwood, shade
	Pterocarpus macrocarpus	Pradu		1	4	7	Timber, fuelwood, shade, fodder
	Shorea obtuse	Chik		–	1	–	Timber
	Teminalia alata	Seuak		–	1	–	Timber, fuelwood
	Xylia xylocarpa	Daeng		–	4	–	Timber, fuelwood
	Zizyphus jujube	Phud Saa		1	–	–	Food, shade
	Total			4	20	12	

Note: * Zone A: Old lower paddies; Zone B: Old upper paddies; Zone C: New upper paddies

Table 4 Origins of Trees in Paddy Fields in Different Zones (29 sample plots)

Zone*	Planted Trees		Volunteers		Forest Survivors		Total	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Zone A (11 plots, 3.1 ha)	7	38.9	7	38.9	4	22.2	18	100
Zone B (11 plots, 5.6 ha)	5	12.8	14	35.9	20	51.3	39	100
Zone C (7 plots, 2.0 ha)	1	4.5	9	40.9	12	54.5	22	100
Total	13	16.4	30	38.0	36	45.6	79	100

Note: * Zone A: Old lower paddies; Zone B: Old upper paddies; Zone C: New upper paddies

with the oldest paddies having much lower densities than the more recently developed ones (Table 1).

The history of land development is reflected also in differences in the origins of trees, the area under canopy cover, and mean canopy area per tree. Zone A has the lowest percentage of forest survivors (22.2%) and highest percentage of planted trees (38.9%). The share of the area under canopy cover is highest in Zone C—10%, compared to 7.3% in Zone B and only 2.6% in Zone A—but the mean canopy area per tree is larger in Zone B (59 m^2) than in both Zone A (52.7 m^2) and Zone C (54.4 m^2) (Table 1). Somluckrat Grandstaff *et al.* (1986) and Kosaka Yasuyuki *et al.* (2006) have pointed out that large-trunked trees have high lumber value so tend to be retained by the farmers, whereas smaller trees are cut down little by little. Therefore, it is likely that in old upper paddies in Zone B the small canopy trees were selectively cut down, leaving only clustered trees and individuals with larger canopies. In the oldest paddies in Zone A, however, the forest survivors have mostly been replaced with smaller canopied volunteer and planted trees, which are younger with smaller trunks.

Topography

Topography itself may be a direct determinant of the density of trees in paddy fields. Although more than 65 years have passed since the reclamation of paddy fields in Zone B, the density of trees there is still much higher than in Zone A, where the paddies were developed only slightly earlier. This difference may in part reflect the differences in native vegetation. It is likely, although it cannot be proven, that the lower-lying fields in Zone A were established by draining wetlands that had never supported very many trees.

It is probable that both topography and the history of land use influence the canopy cover and the origin of trees in paddy fields. Because topography and the history of land development of paddy fields tend to co-vary, it is difficult to separate the effects of one factor from the other. It is evident, however, that in the lower paddies in Zone A, many of the larger-canopied trees that have a negative impact on rice have been cut down and smaller-canopied ones have been planted in their place.

Positive and Negative Aspects of Trees in Paddy Fields

Every farmer interviewed stated that trees in paddy fields have a negative impact on rice yield. Although rice plants in the vicinity of trees may exhibit excellent vegetative growth, this rarely translates into improved grain yield since the increased plant height makes the rice plants susceptible to lodging. Moreover, the excessive vegetative growth produces fewer tillers and a smaller number of grains per panicle. These findings are in agreement with previous studies (Grandstaff *et al.* 1986; Craig 1988; Sunee *et al.*1992;

Patma 1993). Although some farmers in other parts of the region reportedly believe that the yield from rice plants close to the trees is higher than in other parts of the field in dry years (Grandstaff *et al.* 1986; Craig 1988; Patma 1993), the farmers in Khok Kwang village think that having no trees in paddy fields is the best option for rice production. Even if tree shading actually increases the yield in dry years, this is no longer important, at least in the lower paddies, because the lower paddies can be irrigated by the weir constructed in 1986.

Although farmers used to value trees because their litter fall helps improve soil fertility (Grandstaff *et al.* 1986; Patma *et al.*1988; Sunee *et al.* 1992; Patma 1993), most farmers now rely mainly on chemical fertilizer rather than litter from the trees. The use of four-wheel tractors and combine harvesters has become popular in the lower paddies in recent years. The machines have difficulty working efficiently in fields with many trees. As a result of these changes in technology, there are few incentives to keep trees in lower paddies anymore; consequently, these paddy fields are being shifted to single-purpose resource systems that just produce crops.

Farmers who have upper paddies also plant the RD6 rice variety, use hand tillers for preparing the land, and apply chemical fertilizer in the same way as they do in the lower paddies; but because soil fertility, nutrient retention capacity, and water availability in upper paddies are all inferior compared with the lower paddies, they do not expect to get a high yield of rice from the upper paddies. In spite of the negative impact of trees on rice yield, upper-paddy farmers tend to retain them because the value of the foregone rice yield is not so much as it is in the lower paddies. The benefits provided by the trees surpass the value that might be gained from the potentially higher rice harvest if they were cut down. Thus, the upper paddies are still kept as a multi-resource production system. The sustainability of the system, however, is questionable. Since the villagers can now purchase many of the goods that the trees in paddy fields provide, the value of such trees appears to be declining.

The difference in tree density between Zones A and B may be a reflection of differences in the relative rice-producing capabilities of the upper and lower paddies. The lower paddies are thought of as having more reliable water, more fertile soils, and better responsiveness to fertilizer inputs (Table 5). Consequently, farmers are less willing to tolerate reduction in rice yield caused by tree shading in the lower paddies than the less productive upper ones.

Changes in Cultivated Crops

In recent years, especially after the access road to the village was paved in 2007, farmers began to plant sugarcane instead of rice in both upper and lower paddy fields. This change

Table 5 Farmer Evaluations of Upper and Lower Paddies in Khok Kwang Village

Item	Upper Paddies	Lower Paddies
Zone*	B, C	A
Tree density	Higher	Lower
Rice variety	RD6	RD6
Land preparation	Use hand tractors	Use four-wheel or hand tractors
Fertilizer application	Chemicals	Chemicals
Water availability	Lower	Higher
Soil fertility	Lower	Higher
Nutrient retention capacity	Lower	Higher

Note: * Zone A: Old lower paddies; Zone B: Old upper paddies; Zone C: New upper paddies

Table 6 Comparison of the Density of Trees in Paddy Fields Planted with Different Crops in Khok Kwang Village (29 sample plots)

Zone*	Cultivated Crop	Number of Plots	Total Area of Plot (ha)	Number of Trees	Density of Trees in Paddy Fields (trees/ha)
Zone A	Rice	6	1.8	12	6.5
	Sugarcane	5	1.2	6	4.9
Zone B	Rice	4	1.2	13	10.6
	Sugarcane	7	4.3	26	6.0
Zone C	Rice	6	1.6	20	12.4
	Sugarcane	1	0.4	2	4.5
Total	Rice	16	4.7	45	9.6
	Sugarcane	13	6.0	34	5.7

Note: * Zone A: Old lower paddies; Zone B: Old upper paddies; Zone C: New upper paddies

was driven by their increasing need for cash income. Farmers could earn much more cash by selling sugarcane than rice. Because sugarcane is less shade tolerant than rice (Yaowalak *et al.* 1987), villagers tend to cut down trees in paddy fields when they start to grow sugarcane. They selectively cut down trees with larger canopies. Consequently, the density of trees in paddy fields where sugarcane is cultivated (5.7 trees/ha) is lower than in fields where rice is cultivated (9.6 trees/ha) (Table 6).

Summary and Conclusion

This study found that many factors affect the retention or cutting of trees in paddy fields in Khok Kwang village. The history of land development, topography, adoption of modern agricultural technology, and kind of crops grown are the main factors influencing

Table 7 Relationship between Agrarian Transformation and Decrease in Tree Density in Paddy Fields in Khok Kwang Village

Agrarian Transformation		Reason to Use	Benefit of Using	Change in Significance of Trees in Paddy Fields	Effect on Tree Density
Changes in technology of rice production	Use of chemical fertilizer	Low soil fertility	Higher yield of rice	Litter fall from trees is less important.	Cutting trees in paddy fields
	Use of irrigation pumps	Unstable rainfall	More stable rice production	Trees have a negative impact on rice yields.	
	Mechanization	Shortage of labor	Saving labor and time	Trees interfere with use of tractors and combine harvesters.	
Replacement of rice with cash crops		Farmers' increased need for cash to buy consumer goods	Higher cash income	Sugarcane and cassava are less shade tolerant.	

density, canopy cover, and origin of trees in paddy fields. In general, older, lower-elevation paddies have lower tree densities, a smaller share of the total field area covered by canopies, and smaller areas of canopy per tree, as well as a smaller percentage of forest survivors and a much larger share of planted trees than more recently developed upper paddies.

It was also found that recent changes in the production technology of rice, especially the use of chemical fertilizer, pumps for supplementary irrigation, and tractors and combine harvesters, as well as the replacement of rice with sugarcane in some fields, are leading to a decline in tree density. Farmers now rely on chemical fertilizer rather than litter from the trees to maintain soil fertility, and trees are seen as an impediment to the use of four-wheel tractors and combine harvesters. Moreover, sugarcane is a less shade-tolerant crop than rice. Because of all these factors, farmers think reducing the number of trees in paddy fields is the best option for increasing crop production (Table 7). Despite this negative view, trees in the upper paddies may be retained because they still provide valuable goods and services to the farmers and the resulting reduction in rice yield is not seen as critical because rice yields are in any case low and unstable. However, if farmers choose to plant shade-intolerant cash crops such as sugarcane and cassava in the upper paddies, even these trees may be cut down rapidly.

The recent decline in the density of trees in paddy fields in Khok Kwang village illustrates how changes in farmer goals, choice of crops, and production technology are reshaping the rural landscape. This is another aspect of the agrarian transformation in Northeast Thailand.

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References

Buared Prachaiyo. 2000. Farmers and Forests: Changing Phase in Northeast Thailand. *Southeast Asian Studies* 38(3): 6–178.

Craig, Iain A. 1988. Agronomic, Economic and Socially Sustainable Strategies for Soil Fertility Management in Northeast Thailand. In *Sustainable Rural Development in Asia: Selected Papers from the Fourth SUAN Regional Symposium on Agroecosystem Research*, edited by Terd Charoenwatana and A. Terry Rambo, pp. 153–165. Khon Kaen: Khon Kaen University Farming Systems Research Project and the Southeast Asian Universities Agroecosystem Network.

Fukui, Hayao. 1993. *Food and Population in a Northeast Thai Village*. Monographs of the Center for Southeast Asian Studies, Kyoto University. Honolulu: University of Hawaii Press.

Fukui Hayao 福井捷朗; and Hoshikawa Keisuke 星川圭介. 2009. *Tamunoppu: Tai, Kambojia no kietsutsu aru seki kangai* タムノップ——タイ・カンボジアの消えつつある堰灌漑 [The disappearing *thamnop* irrigation of Thailand and Cambodia]. Tokyo: Mekon-sha.

Grandstaff, Somluckrat W.; Grandstaff, Terry B.; Pagarat Rathakette; Thomas, David E.; and Thomas, Jureerat K. 1986. Trees in Paddy Fields in Northeast Thailand. In *Traditional Agriculture in Southeast Asia: A Human Ecology Perspective*, edited by Gerald G. Marten, pp. 273–292. Boulder: Westview Press.

Heckman, Charles W. 1979. *Rice Field Ecology in Northeastern Thailand*. The Hague: Dr. W. Junk.

Kosaka, Yasuyuki; Takeda, Shinya; Prixar Souksompong; Sithirajvongsa Saysana; and Xaydala Khamleck. 2006. Species Composition, Distribution and Management of Trees in Rice Paddy Fields in Central Lao, PDR. *Agroforestry Systems* 67: 1–17.

Matsushita Yuichi 松下雄一; Hoshikawa Kazutoshi 星川和俊; Miyagawa Shuichi 宮川修一; and Kosaka Yasuyuki 小坂康之. 2011. Buienchan heiya ni okeru sammairin bumpu no tokucho: Raosu, Don Kuwai mura o taisho to shite ヴィエンチャン平野における産米林分布の特徴——ラオス・ドンクワーイ村を対象として [Geographical distribution of tree-rice system in paddy fields in the Vientiane plain: A case study in Dong Khuai village of Laos]. *Kankyo Kagaku Nempo* 環境科学年報 [Annals of Environmental Science, Shinsyu University] 33: 89–97.

Patma Vityakon. 2001. The Role of Trees in Countering Land Degradation in Cultivated Fields in Northeast Thailand. *Southeast Asian Studies* 39(3): 398–416.

————. 1993. Traditional Trees-in-Paddy-Fields Agroecosystem of Northeast Thailand: Its Potential for Agroforestry Development. Honolulu: East-West Center Program on Environment Working Paper No. 34.

Patma Vityakon; Suriya Smutkupt; and Buared Prachaiyo. 1988. Trees in Paddy Fields: Their Contributions to Soil Fertility and Sustainability of the Paddy Rice System. In *Sustainable Rural Development*

in Asia: Selected Papers from the Fourth SUAN Regional Symposium on Agroecosystem Research, edited by Terd Charoenwatana and A. Terry Rambo, pp. 65–86. Khon Kaen: Khon Kaen University Farming Systems Research Project and Southeast Asian Universities Agroecosystem Network.

Rambo, A. Terry. 1991. *The Human Ecology of Resource Management in Northeast Thailand*. Khon Kaen: Faculty of Agriculture, Khon Kaen University.

Sunee Sae-Lee; Patma Vityakon; and Buared Prachaiyo. 1992. Effects of Trees in Rice Paddies on Soil Fertility and Rice Growth in Northeast Thailand. *Agroforestry Systems* 18: 213–223.

Takaya Yoshikazu 高谷好一; and Tomosugi Takashi 友杉孝. 1972. Tohoku Tai no "kyuryojo no suiden": Toku ni, sono "sammairin" no sonzai ni tsuite 東北タイの"丘陵上の水田"——特に，その"産米林"の存在について [Rice lands in the upland hill regions of Northeast Thailand: A remark on "rice-producing forests"]. *Tonan Ajia Kenkyu* 東南アジア研究 [Southeast Asian Studies] 10(1): 77–85 (in Japanese with English abstract).

Watanabe, Hiroyuki; Abe, Kenichi; Hoshikawa, Tomoyuki; Buared Prachaiyo; Sahunalu Pongsak; and Choob Khemnark. 1990. On Trees in Paddy Fields in Northeast Thailand. *Southeast Asian Studies* 28(1): 45–54.

Watanabe, Moriaki; Patma Vityakon; and Rambo, A. Terry. 2014. Can't See the Forest for the Rice: Factors Influencing Spatial Variations in the Density of Trees in Paddy Fields in Northeast Thailand. *Environmental Management* 53(2): 343–356.

Yaowalak Apichatvullop; Wipawee Grisanaputi; and Charoon Prohmchum. 1987. Household Use and Management of Trees: A Case Study of Don Chang Village, Khon Kaen. Khon Kaen: Khon Kaen University.

Multiple Cropping after the Rice Harvest in Rainfed Rice Cropping Systems in Khon Kaen Province, Northeast Thailand

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Cropping intensification in rainfed rice-based farming systems through multiple cropping after the rice harvest by using residual soil moisture and supplemental irrigation offers a way to increase agricultural productivity and boost rural incomes in Northeast Thailand. This study identifies localities, planted areas, types of crops, and number of households growing crops after rainfed rice in Khon Kaen Province; it also analyzes some of the physical and social factors associated with the occurrence of this system. A questionnaire survey was conducted in 2013 of 198 agricultural extension officers in each subdistrict (*tambol*) in the province to collect data on multiple cropping. An area of 10,384 ha (2.9% of the total rainfed rice area) was used for multiple cropping by 16,184 households (10.9% of all rainfed rice farming households). Both field crops (e.g., cassava, crotalaria, field corn) and vegetables (e.g., sweet corn, watermelon, Chinese radish) were grown. These crops generated USD414–49,072 per hectare per crop for a total revenue of USD32 million, which is three times higher than the value of rice grown in the same field area. However, the area that can be utilized for multiple cropping in different subdistricts may be limited by physical conditions, including availability of irrigation sources and soil texture, as well as social and economic factors such as availability of markets, institutional support, and farmer skills.

Keywords: agricultural intensification, diversification, crops grown after rice, spatial distribution of crops

Introduction

In rainfed rice fields in Northeast Thailand, only a single crop of rice is commonly planted in the rainy season. Moreover, the yield of rice is generally low, averaging 1.7 t/ha. The low productivity coupled with low and fluctuating prices and high input costs severely

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limits the profitability of rice production and keeps many farmers trapped in poverty. Cropping intensification through multiple cropping could be a way to increase productivity and boost rural incomes.

In the past, multiple cropping was rarely practiced in Northeast Thailand due to the limited biophysical resources (e.g., low and erratic rainfall, infertile sandy soils, limited availability of surface water supplies, serious problem of insect pests, long duration of the rice crop) (Terd *et al.* 1976a; 1976b; 1978a; 1978b; Aran *et al.* 1977a; 1977b; 1977c; KKU-Ford Cropping System Project 1982; Rambo 1991; Viriya 2001). Even when experimental multiple cropping systems were agronomically successful, farmers did not adopt them (Vichain and Aran 1990), mostly due to social and economic constraints, including limited markets for crops, labor competition, and lack of capital and knowledge (Rigg 1985; Vichain and Aran 1990). Although the factors limiting the adoption of multiple cropping were well understood in the context of rainfed agriculture in the 1980s, the situation in the Northeast has undergone rapid change since then. The context for multiple cropping is now quite different from what it was in the past. Key changes include the widespread adoption of the drought-tolerant RD6 glutinous rice variety and use of diesel pumps to provide supplementary irrigation water from newly dug farm ponds, which have helped to stabilize rice yields in years of low rainfall. The resulting higher and more stable yields of glutinous rice have allowed farmers to plant a larger share of their land with non-glutinous KDML105, which is raised as a cash crop, providing rural households with a new source of income. Agricultural intensification is occurring to an extent unimaginable just a few years ago. Relying on remittances sent back to their families by migrant workers, as well as cash earned by engaging in off-farm employment in new factories and service jobs in local urban centers, Isan farmers have been rapidly adopting modern agricultural technology, including increased use of chemical fertilizers, pesticides, and farm machinery (Grandstaff *et al.* 2008). Multiple cropping and cultivation of high-value crops to supply growing urban markets are also more commonly practiced (Rambo 2012).

In Khon Kaen Province, farmers now employ a variety of locally developed double cropping systems to grow cash crops after the rice harvest and thus raise farm incomes. Some farmers grow high-value vegetable crops after the rice harvest, such as Chinese radish (Patcharaporn and Orawan 2011), tomato for seed production (Prapatsorn and Wareerat 2010), glutinous corn (Uraiwan *et al.* 2010), and various green vegetables, which provided a net income of USD7,727–12,733 per hectare per season. Even though some examples of multiple cropping after rice have been reported, there have been no detailed studies on the localities, planted areas, types of crops, and number of households adopting these systems; nor has there been any detailed analysis of the factors associated with

the occurrence of each system of multiple cropping. This research, therefore, was undertaken in order to identify localities, planted areas, types of crops, and number of households growing crops after the harvest of rainfed rice in Khon Kaen Province and to identify physical, social, and economic factors associated with the occurrence of these cropping systems.

Methodology

Study Area

The study area was the whole of Khon Kaen Province, Northeast Thailand. It is located between latitude 15°40′ to 17°5′N and longitude 101°45′ to 103°45′E. The province has an area of 10,886 km^2 and had a population of 1,774,816 in 2013. It is divided into 26 districts and 198 administrative subdistricts (*tambol*) (Khon Kaen Provincial Office 2013).

The topography of Khon Kaen Province can be divided into two main types: lowlands and uplands (hills or mountains). Most parts, over 80%, are flat to gently undulating land 101–200 m above sea level and include the broad floodplain along the Chi River. This plain is dotted with inselbergs (isolated and flat-topped mountains with nearly vertical cliffs) and inselberg ranges as high as 900 m above sea level in the northern and western parts of the province (Geo-Informatics Center for Development of Northeast Thailand 2009).

There are 34 soil series in the province (IGES n.d.). Generally, the upland soils have been formed from parent material composed of fine-grained sandstone and shale. Soil groups distributed in the province are varied due to the topography. Tropaquepts with fine textures are found in the floodplain adjacent to the Chi River. Paleustults with sandy texture cover a large part of the northern and western parts of the province. Paleaquults are distributed mostly in the depression of undulating land and nonflood plain (Viriya 2001). The climate of Khon Kaen Province can be classified as Tropical Savannah according to the Koppen Climate Classification System. The average annual temperature is 27°C, and the mean maximum and minimum temperatures are 32.8°C and 22.4°C, respectively. The rainy season extends from May to October, with almost no rainfall in the remaining months. Rainfall is unevenly distributed within the year and varies from year to year (*ibid.*). Average annual rainfall during 2000–13 was 1,290 mm (Northeast Meteorological Center [Upper Part] 2014).

The total cultivated area of Khon Kaen Province is 699,047 ha (64.19% of total area), of which only 98,349 ha (14%) is irrigated. In 2012, wet season rice was the major crop grown, accounting for 58.9% of the agricultural area. Sugarcane and cassava were the

second- and third-most widely planted crops, covering 12.9% and 4.6% of the agricultural area, respectively (OAE 2014).

Data Collection

Data on the locality, planted areas, types of crops, and number of households practicing multiple cropping after the rice harvest during the 2012–13 growing season in every subdistrict (*tambol*) were collected using formal questionnaires distributed to the agricultural extension officers in each *tambol* in 2013. The questionnaires were pretested in three selected *tambol* in order to examine their reliability and validity. After the questionnaires had been revised accordingly, they were distributed by mail or e-mail to the agricultural extension officers in every *tambol*. Follow-up telephone calls were made to ensure that the questionnaires were completed and returned to the researchers. Ultimately, 100% of the questionnaires were returned. Field observations were also made in selected subdistricts to verify the information provided by agricultural extension officers, and follow-up interviews were done with 28 farmers. These farmers were asked about the yields of crops they obtained per unit area and the price they sold them for, in order to calculate income per unit area. Physical and social factors determining the types of crop they grew were also ascertained.

Provincial information about rice planted area, number of rice farming households, and the farm gate price of rice in the 2012/13 growing season were obtained from online databases of the Office of Agricultural Economics (2014) and Department of Agricultural Extension (n.d.), Thailand.

Data Analysis

All of the *tambol* having multiple crops after rice were identified, along with the crop species grown, the area planted with each crop, and the numbers of households growing each of these crops. The crops were then classified into two groups according to their characteristics: (1) field crops (non-perishable products, low water and nutrient requirements, and extensive management) included peanut, field corn, cassava, crotalaria, and mung bean; and (2) vegetable crops (perishable products, high water and nutrient requirements, and intensive management) included sweet corn, chili, watermelon, cucumber, eggplant, yard-long bean, sweet potato, tomato, Chinese radish, Chinese cabbage, cabbage, and other green vegetables. Percentages of multiple cropping area to total rice area, and rainfed rice farming households planting multiple crops to all rice farming households were calculated using Excel spreadsheets. The spatial distribution of multiple cropping according to the percentage of total rice area planted with multiple crops in each *tambol* was mapped using the ArcInfo GIS program.

Results and Discussion

Types of Crops Grown after the Rice Harvest in Khon Kaen Province

Of the 198 *tambol* in Khon Kaen Province, 178 (90%) planted a crop after the harvest of rainfed rice. As shown in Table 1, the area devoted to multiple cropping after rice was relatively small; multiple crops occupied only 10,384 ha, which is 2.9% of the total rainfed rice area in the province. The share of farm households engaging in multiple cropping was considerably larger, however, with 16,184 households planting crops after rice, which is 10.9% of the total number of rainfed rice farming households in the province.

There is considerable variation among *tambol* in terms of the share of the rice area that is multiple cropped. Most of the *tambol* (84%) planted less than 5% of the total rice area with multiple crops. However, about 11% of the *tambol* planted multiple crops on 5.01–20% of their total rice area while about 5% planted multiple crops on more than 20% of their total rice area. The spatial distribution of the multiple crops planted after the rice harvest is shown in Fig. 1. *Tambol* having multiple crops on less than 5% of their total rice area are scattered throughout the province, while *tambol* having multiple crops on 5–20% of their rice area are located mostly in the southern part of the province and *tambol* with a higher proportion of multiple cropped area are in the northern part of the province.

Field crops and vegetable crops are planted after the rice harvest in rainfed paddy fields in Khon Kaen Province. Field crops occupied about 2% of total rice area. About 81% of the total multiple cropping area is planted with these crops, including cassava, crotalaria, field corn, peanut, and mung bean. Vegetable crops, including sweet corn, chili, watermelon, cucumber, eggplant, yard-long bean, sweet potato, tomato, Chinese radish, Chinese cabbage, cabbage, and other vegetables, occupied 19% of the multiple

Table 1 Characteristics of Multiple Cropping after the Rice Harvest in Rainfed Paddy Fields in Khon Kaen Province in the 2012–13 Growing Season

Characteristic	Amount
Total number of *tambol* in province[a]	198
Total number of *tambol* having multiple cropping[b]	178 (90%)
Total rainfed rice area (ha)[c]	360,641
Total multiple crop area (ha)[b]	10,384
Proportion of rainfed rice area planted with multiple crops after the rice harvest (%)	2.9
Total number of rainfed rice farming households in 2012–13[c]	147,779
Number of rainfed rice farming households planting multiple crops[b]	16,184
Proportion of households planting multiple crops to total number of rainfed rice farm households (%)	10.9

Sources: [a] Data are from the online database of Khon Kaen Provincial Office.
[b] Data are from our 2013 questionnaire survey.
[c] Data are from the online database of Office of Agricultural Economics (2014).

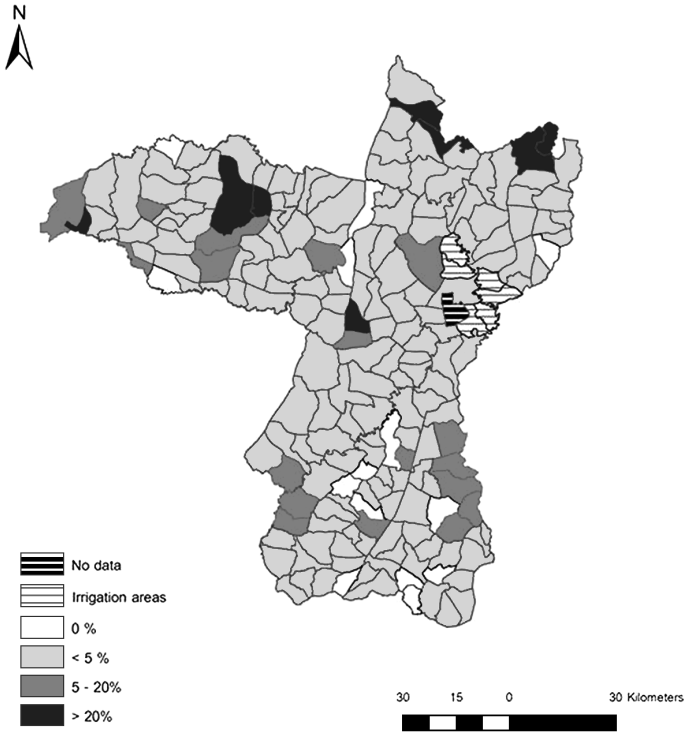

Fig. 1 Spatial Distribution of Multiple Crop Area to Total Rice Area Grown after Rainfed Rice in Each *Tambol* (subdistrict) in Khon Kaen Province during 2012–13

cropping area, or only about 0.5% of the total rice land (Table 2). Although the area occupied by field crops is much larger than that occupied by vegetable crops, the number of rainfed rice farming households growing vegetables is almost as large (7,374 households) as it is for field crops (8,810 households), with households growing vegetables as a multiple crop accounting for 45.6% of all farm households engaging in multiple cropping (Table 3).

Economic Value of Multiple Cropping

Data from Table 4 show that total gross income per area of multiple crops grown after rice varied according to type of crop. Field crops, except field corn and peanuts, provided income lower than USD1,000 per hectare. Vegetables generally had a much higher return than field crops, ranging from USD1,055 to USD49,072 per hectare. The variation in income per hectare of different crops depends not only on the yields and prices of the different crop species, but also on the purposes for which the crop is produced. Field corn, watermelon, tomato, and chili were mostly grown under contract to produce hybrid

Table 2 Planted Area of Multiple Crops Grown after the Rice Harvest during the Dry Season under Rainfed Conditions in Khon Kaen Province during 2012–13

Crop Types	Planted Area (ha)	% of Total Rice Area[a]	% of Total Multiple Cropped Area	Number of *Tambol* Planting Multiple Crops	% of *Tambol* Planting Multiple Crops
Field crops	8,398	2.08	80.86	174	97.76
Cassava	5,571	1.38	53.64	60	33.71
Crotalaria	2,254	0.56	21.7	43	24.16
Field corn	318	0.08	3.07	30	16.85
Peanut	169	0.04	1.63	38	21.35
Mung bean	86	0.02	0.83	3	1.69
Vegetable crops	1,986	0.48	19.14		
Sweet corn	466	0.11	4.48	109	61.24
Chili	410	0.10	3.95	70	39.33
Watermelon	338	0.08	3.26	31	17.42
Tomato	232	0.06	2.23	30	16.85
Sweet potato	97	0.02	0.94	6	3.37
Cucumber	89	0.02	0.86	53	29.78
Yard-long bean	89	0.02	0.86	74	41.57
Other vegetables[b]	77	0.02	0.75	14	7.87
Eggplant	69	0.02	0.66	46	25.84
Chinese radish	49	0.01	0.47	3	1.69
Cabbage	38	0.01	0.37	2	1.12
Chinese cabbage	32	0.01	0.31	3	1.69
Total	10,384	2.57	100	615	345.53

Notes: [a] Includes both rainfed and irrigated rice areas. Data on the area of only rainfed rice are unavailable at the *tambol* level.

[b] Other vegetables include Chinese kale, gourd, pumpkin, snake gourd, musk melon, and cowslip creeper.

seed. Hybrid vegetable seed production was first established by a few companies in a limited number of places in Northeast Thailand in the late 1970s but nowadays has spread to many additional places, with several competing local and international companies (Rosset *et al.* 1999). V. Benziger (1996) has indicated that contract farming is a program to help small farmers make a transition into high value-added crops. It provides revenues per area 6.5 times higher than those obtained by traditional farmers. In addition to contract farming, many other multiple cropping farmers engage in independent growing of vegetables such as yard-long bean, eggplant, Chinese radish, and cucumber to supply rapidly growing urban markets. These high-value crops give gross returns of USD7,023–14,180 per hectare.

When the total gross annual revenue generated by multiple crops after the rainfed rice harvest was calculated based on area planted to each species, it was found that about USD32 million was generated in 2013, which is three times higher than the value of rice grown in the same field area (Table 4). Table 5 shows the different amounts of revenue

Table 3 Number of Rainfed Rice Farming Households Growing Crops after Rice during the Dry Season under Rainfed Conditions in Khon Kaen Province during 2012–13

Crop Types	Number of Rainfed Rice Farming Households Growing Multiple Crops	% of Rice Farming Households Doing Multiple Cropping Growing This Crop
Field crops	8,810	54.44
Cassava	5,204	32.16
Crotalaria	2,282	14.10
Peanut	669	4.13
Field corn	564	3.48
Mung bean	91	0.56
Vegetable crops	7,374	45.56
Sweet corn	1,821	11.25
Chili	1,606	9.92
Yard-long bean	820	5.07
Cucumber	626	3.87
Tomato	555	3.43
Watermelon	504	3.11
Other vegetables[a]	477	2.95
Eggplant	469	2.90
Sweet potato	197	1.22
Chinese radish	127	0.78
Chinese cabbage	93	0.57
Cabbage	79	0.49
Total	16,184	100.00

Note: [a] Other vegetables include Chinese kale, gourd, pumpkin, snake gourd, musk melon, and cowslip creeper.

generated by various multiple crops. Field crops, particularly mung bean, generated only 30–65% more revenue compared to vegetable crops, which generated 65–98% more revenue than rice alone. The higher return per unit of land from crops grown after rice compared to rice mono-cropping has also been reported by G. Kar *et al.* (2006). The fact that growing vegetable crops provides the highest returns may explain the popularity among the farmers of vegetables as a multiple crop. Despite the high returns generated by vegetables, farmers still plant a much larger area with cassava, which provides lower returns per unit land.

Possible Factors Associated with Distribution of Multiple Crops Grown after Rice

Information from farmer interviews and field observation by the authors showed that physical factors, such as availability of irrigation sources, suitable soil texture, and having a shallow water table, are the most important factors determining the presence of multiple cropping in an area. It was found that all vegetable crops except sweet potato relied heavily on the availability of irrigation. Farmers indicated that hybrid seed production required having a farm pond for irrigation. However, the supply of water from farm ponds

Table 4 Economic Values of Multiple Crops Grown after Rainfed Rice Compared to Main Season Rice in Khon Kaen Province during 2012–13

Crop Types	Planted Area (ha)	Gross Income (USD/ha)[a]	Total Gross Value (USD)[b]
Field crops			
Cassava	5,571	788	4,389,948
Crotalaria	2,254	598	1,347,892
Field corn	318	4,614	1,467,252
Peanut	169	1,797	303,693
Mung bean	86	414	35,604
Vegetable crops			
Sweet corn	466	4,688	2,184,608
Chili	410	9,141	3,747,810
Watermelon	338	7,695	2,600,910
Tomato	232	49,072	11,384,704
Sweet potato	97	5,990	581,030
Cucumber	89	8,525	758,725
Yard-long bean	89	14,180	1,262,020
Other vegetables	77	7,023	540,771
Eggplant	69	14,063	970,347
Chinese radish	49	19,531	957,019
Cabbage	38	2,344	89,072
Chinese cabbage	32	1,055	33,760
Total	10,384	–	32,655,165
Main season rice grown on multiple cropped area	10,384	982[c]	10,197,088

Sources: [a] Calculated from farmers' interviews on crop production, farm gate price as of 2012.
[b] Calculated from gross income per area of each crop multiplied by planted areas.
[c] Calculated from the reports on rainfed rice yield and farm gate price from Office of Agricultural Economics (2014) and Department of Agricultural Extension (n.d.), Thailand, respectively.
Note: USD1 = 32 Thai baht

is very limited, so the area that can support intensive cultivation is restricted accordingly. Water from the ponds is used mostly for supplemental irrigation of the main season rice crop during short-term droughts and to grow small quantities of vegetables and fruit on the bunds around the ponds (Ogura and Somsak 2002). If the water storage capacity of the ponds could be increased, it might be possible to expand the area planted with high-value multiple crops.

Besides farm ponds, streams, rivers, public water bodies, and shallow wells are other sources of water that farmers rely on for multiple cropping. Growing peanuts after rice without irrigation depends on having a shallow water table and soil with good texture (Vichain and Aran 1990). Farmers also report that good soil texture is the main factor needed for growing sweet potatoes. Soil texture plays a significant role in the presence and availability of soil moisture and the availability of oxygen in root zone (Gines and

Table 5 Gross Income of Rice and Some Multiple Crops Grown after Rice under Rainfed Conditions in Khon Kaen Province during 2012–13

Crop Types[a]	Gross Income of Each Crop (USD/ha)	Total Income of the System (USD/ha)	% Increase from Rice Mono-cropping
Main season rice[b]	982	982	0
Cassava	788	1,770	44.53
Crotalaria	598	1,579	37.84
Field corn	4,614	5,596	82.46
Peanut	1,797	2,778	64.67
Mung bean	414	1,395	29.66
Watermelon	7,695	8,677	88.69
Tomato	49,072	50,054	98.04
Corn	4,688	5,669	82.68
Chili	9,141	10,122	90.30
Sweet potato	5,990	6,971	85.92
Cucumber	8,525	9,507	89.67
Yard-long bean	14,180	15,161	93.53
Eggplant	14,063	15,044	93.48
Chinese radish	19,531	20,513	95.21
Cabbage	2,344	3,325	70.48
Chinese cabbage	1,055	2,824	65.24
Other vegetables	7,023	8,602	88.59

Sources: [a] Multiple crops other than rice calculated from farmers' interviews on crop production, farm gate price as of 2012.

[b] Calculated from the reports on rainfed rice yield and farm gate price from Office of Agricultural Economics (2014) and Department of Agricultural Extension (n.d.), Thailand, respectively.

Note: USD1 = 32 Thai baht

Kaida 1982). Vichain Kerdsuk and Aran Patanothai (1990) found that soil type was one of the important factors affecting farmers' adoption of multiple cropping systems.

Availability of adequate labor supply is another important constraint on the adoption of multiple cropping. Only those households that have sufficient labor power are likely to engage in cultivation of intensive crops such as vegetables and hybrid seeds. Cassava, which requires relatively less labor, can be planted by more farmers.

Availability of markets and institutional support were the next most important factors contributing to the existence of multiple cropping. This is especially the case with regard to contract farming of hybrid seed. Farmer skills are also an important factor in high-value specialty crop production. For example, production of hybrid tomato seed requires a good supply of highly skilled workers to emasculate the flowers (Wareerat 2014).

In the case of cassava, there appear to be no especially important physical or institutional determinants; instead, farmers adopt this multiple cropping system as an adaptive strategy to cope with losses of rice yield caused by drought, as explained by A. M. S. Ali (1995).

Although individual factors may sometimes affect the existence of specific crops in multiple cropping systems, usually there are multiple factors involved. For instance, in the case of crotalaria, farmers are supplied with seed by the Land Development Department, which also provides them with a guaranteed market for their crop. But in addition to such institutional support, only rice fields located in the lower part of the toposequence with good soil moisture and relatively loamy soil are suitable for this crop. Therefore, in order to assess the possibility of extending multiple cropping systems into other areas, we need to identify all of the interrelated factors affecting each crop.

Conclusion

Although still practiced on only a small share of the total area of rainfed rice, multiple cropping after rice is now widespread in Khon Kaen Province. It is found in 90% of all subdistricts and is practiced by almost 11% of all rainfed rice farming households. The recent expansion of multiple cropping is part of the ongoing agrarian transformation that is reshaping the economy and society of rural Northeast Thailand (see Rambo, this issue). As part of this transformation, agriculture is simultaneously undergoing intensification and diversification. Farmers who formerly grew only a single low-yielding crop of glutinous rice in lowland paddy fields for home consumption, and cultivated cassava in upland fields to sell for cash, have greatly intensified their land use. They have intensified rice production by adopting new higher-yielding varieties of glutinous rice, using part of their paddy area to grow non-glutinous rice for sale, shifting from plowing with buffalo to plowing with tractors and from hand harvesting to the use of combine harvesters, and greatly increased their use of chemical fertilizers and pesticides, among other changes. At the same time, upland cropping has been diversified by the adoption of new crops, including sugarcane, eucalyptus, and rubber. The widespread adoption by farmers of multiple cropping after rice is part of this general trend to generate more cash income from their land. Although income earned from growing field crops after rice is relatively low, vegetable crops provide very high returns per hectare, making a substantial contribution to the economy of rural families.

Although multiple cropping after rice can be a successful strategy for improving the livelihoods of rainfed rice farmers, its further expansion in Khon Kaen Province appears to be limited by many physical and economic factors. For example, only certain restricted areas within the province appear to be suitable for growing high-value vegetable crops. Further investigation is needed to identify locally specific factors (e.g., soil moisture, soil fertility, availability of supplemental irrigation sources, household composition and labor

supply, and alternative local employment opportunities) that may facilitate or constrain the engagement of individual farm households in multiple cropping in different localities.

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References

Ali, A. M. S. 1995. Population Pressure, Environmental Constraints and Agricultural Changes in Bangladesh: Examples from Three Agroecosystems. *Agriculture, Ecosystems and Environment* 55: 95–109.

Aran Patanothai; Terd Chareonwatana; Attachai Jintrawet; Chaichan Wongsaman; Amnouy Wilairat; Tawatchai Ubonkerd; Kanay Boontop; and Vitaya Pimsawadi. 1977a. Growing Field Crop before Rice in Upper Paddy Field. In *The 1977 Annual Report of KKU-FORD Cropping System Project*, pp. 116–129. Khon Kaen: Faculty of Agriculture, Khon Kaen University.

————. 1977b. Double Cropping of Field Crops with Rice in Lowland Paddy Field. In *The 1977 Annual Report of KKU-FORD Cropping System Project*, pp. 133–143. Khon Kaen: Faculty of Agriculture, Khon Kaen University.

————. 1977c. Growing Field Crops after Rice in Upper and Lowland Paddy Fields. In *The 1977 Annual Report of KKU-FORD Cropping System Project*, pp. 144–151. Khon Kaen: Faculty of Agriculture, Khon Kaen University.

Benziger, V. 1996. Small Field, Big Money: Two Successful Programs in Helping Small Farmers Make the Transition to High Value-Added Crops. *World Development* 24(11): 1681–1693.

Department of Agricultural Extension กรมส่งเสริมการเกษตร. n.d. Baep rai ngarn thi 1.9: Rai ngarn khormun phawa karn palit peut (raw taw 01) baep rai pi แบบรายงานที่ 1.9 รายงานข้อมูลภาวะการผลิตพืช (รต. 01) แบบรายปี [Report no. 1.9: Annual report of crop production (RT01)]. Online Agricultural Production Information System, Information Technology and Communication Center, Department of Agricultural Extension. http://production.doae.go.th/report/report_main_land_01_A_new2.php, accessed October 10, 2014.

Geo-Informatics Center for Development of Northeast Thailand ศูนย์ภูมิสารสนเทศเพื่อการพัฒนาภาคตะวันออกเฉียงเหนือ. 2009. Pan tee cherng sathiti changwat Khon Kaen แผนที่เชิงสถิติจังหวัดขอนแก่น [Statistical map of Khon Kaen Province]. Department of Science, Khon Kaen University. http://gecnet.kku.ac.th/spatialdb/, accessed October 10, 2013.

Gines, H. C.; and Kaida, Y. 1982. Paddy Land Suitability Classification in Relation to Its Potential for Multiple Cropping Systems. *Southeast Asian Studies* 20(3): 435–449.

Grandstaff, T. B.; Grandstaff, S.; Limpinuntana, V.; and Suphanchaimat, N. 2008. Rainfed Revolution in

Northeast Thailand. *Southeast Asian Studies* 46(3): 289–376.

Institute for Good Environmental Strategies (IGES). n.d. Soil Management Guideline for Production of Sugarcane Cassava and Rice in KK. https://pub.iges.or.jp/system/files/publication_documents/pub/workingpaper/4459/Soil_Management_Guideline_for_Production_of_Sugarcane_Cassava_and_Rice_in_KK.pdf, accessed May 3, 2017.

Kar, G.; Verma, H. N.; and Singh, R. 2006. Effects of Winter Crop and Supplemental Irrigation on Crop Yield, Water Use Efficiency and Profitability in Rainfed Rice Based Cropping System of Eastern India. *Agricultural Water Management* 79: 280–292.

Khon Kaen Provincial Office สำนักงานจังหวัดขอนแก่น. 2013. Kor Moon Paeun Tharn changwat Khon Kaen ข้อมูลพื้นฐานจังหวัดขอนแก่น [Khon Kaen Province database]. http://www.khonkaen.go.th/khonkaen6/main.php?cont=download, accessed July 20, 2014.

Khon Kaen Rice Research Station ศูนย์วิจัยข้าวขอนแก่น. 2006. Karn jad khet sakkayaphaap karn phalit khao changwat Khon Kaen การจัดเขตศักยภาพการผลิตข้าว จังหวัดขอนแก่น [Zoning of potential rice growing area, Khon Kaen Province]. Bureau of Rice Research and Development, Rice Department. http://www.brrd.in.th/ricemap/data/Khon_Kaen/book.pdf, accessed July 20, 2014.

KKU-FORD Cropping System Project. 1982. *An Agroecosystem Analysis of Northeast Thailand*. Khon Kaen: Faculty of Agriculture, Khon Kaen University, 167pp.

Northeast Meteorological Center [Upper Part]. 2014. Annual Rainfall. Meteorological Department, Ministry of Information and Communication Technology, Thailand. www.khonkaen.tmd.go.th/it/rain_year.html, accessed July 19, 2014.

Office of Agricultural Economics (OAE). 2014. Basic Agricultural Information, Thailand. http://www.oae.go.th/ewt_news.php?nid=13577, accessed October 10, 2014.

————. 2012. Basic Agricultural Information of 2012. Ministry for Agriculture and Cooperatives, Thailand. http://www.oae.go.th/download/download_journal/commodity56.pdf, accessed October 10, 2014.

Ogura, Chikara; and Somsak Sukchan. 2002. Location and Function of the Reservoirs in Ban Nong Saeng, Northeast Thailand. In *Development of Sustainable Agricultural System in Northeast Thailand through Local Resource Utilization and Technology Improvement*, edited by O. Ito and N. Matsumoto, pp. 21–23. JIRCAS Working Report No. 30.

Orawan Kanchart อรวรรณ เคนชาติ. 2013. Phon khong karn phalit phakkaad hua baep praniit khong kasettakorn tor karn trueng raeng ngarn nai pheun thii baan nong ngong Ampheo Ban Head changwat Khon Kaen ผลของการผลิตผักกาดหัวแบบประณีตของเกษตรกรต่อการตึงแรงงานในพื้นที่บ้านหนองโง้ง อำเภอบ้านแฮด จังหวัดขอนแก่น [Effect of intensive Chinese radish production system on labor retention in Nong Ngong village, Ban Haet District, Khon Kaen Province]. Master's thesis, Graduate School, Khon Kaen University.

Patcharaporn Phumchantuk พัชราภรณ์ ภูมิจันทึก; and Orawan Kanchat อรวรรณ เคนชาติ. 2011. Patchai thii mii phon tor khwaam yang yuen khong rabob karn pluuk phakkaat hua thii baan Nong-Ngong, tambon Baanhad, amphoe Baanhad, changwat Khon Kaen ปัจจัยที่มีผลต่อความยั่งยืนของระบบการปลูกผักกาดหัวที่บ้านหนองโง้ง ตำบลบ้านแฮด อำเภอบ้านแฮด จังหวัดขอนแก่น [Factors influencing the sustainability of the Chinese radish production system at Baan Nong-Ngong, Tambon Baanhad, Amphoe Baanhad, Changwat Khon Kaen]. Program on System Approaches in Agriculture, Faculty of Agriculture, Khon Kaen University (mimeographed).

Prapatsorn Wongsalee ประภัสสร วงศ์สาลี; and Wareerat Pannarat วารีรัตน์ ปัณณราช. 2010. Karn pluuk makhuea theet pheua phalit malet baep mii phantha sannyaa baan Ladnapieng tambol Sawathee amphoe Mung changwat Khon Kaen การปลูกมะเขือเทศเพื่อผลิตเมล็ดพันธุ์แบบมีพันธะสัญญา บ้านลาดนาเพียง ต.สาวะถี อ.เมือง จ.ขอนแก่น [Tomato seed production by contract farming in Lad Na Piang village, Savatee Subdistrict, Muang District, Khon Kaen Province]. Program on System Approaches in Agriculture, Faculty of Agriculture, Khon Kaen University (mimeographed).

Rambo, A. T. 2012. The Agrarian Transformation in Northeast Thailand. Paper presented at the 8th National Agricultural System Conference, Nakorn Phanom University, September 5–7, 2012.

————. 1991. *The Human Ecology of Rural Resource Management in Northeast Thailand*. Khon Kaen: Farming Systems Research Project, Khon Kaen University.

Rigg, J. 1985. The Role of Environment in Limiting the Adoption of New Rice Technology in Northeastern Thailand. *Transactions of the Institute of British Geographers* 10 (4): 481–494.

Rosset, P.; Rice, R.; and Watts, M. 1999. Thailand and the World Tomato: Globalization, New Agricultural Countries (NACs) and the Agrarian Question. *International Journal of Sociology of Agriculture and Food* 8: 71–94.

Somkiat Konchan; and Kono, Yasuyuki. 1996. Spread of Direct Seeded Lowland Rice in Northeast Thailand: Farmers' Adaptation to Economic Growth. *Southeast Asian Studies* 33(4): 523–546.

Terd Charoenwatana; Aran Patanothai; and Anan Polthanee. 1976a. Growing Field Crops after Rice in Upper Paddy Field. In *The 1976 Annual Report of KKU-FORD Cropping System Project*, pp. 64–69. Khon Kaen: Faculty of Agriculture, Khon Kaen University.

————. 1976b. Double Cropping of Field Crops with Rice in Lowland Paddy Field. In *The 1976 Annual Report of KKU-FORD Cropping System Project*, pp. 69–71. Khon Kaen: Faculty of Agriculture, Khon Kaen University.

Terd Charoenwatana; Viriya Limpinuntana; Aran Patanothai; Attachai Jintawet; Kanay Bontob; Vinai Sornwat; Vitaya Pimsawadi; and Thawatchai Ubonkerd. 1978a. Growing Field Crops before Rice in Upper Paddy Fields. In *The 1978 Annual Report of KKU-FORD Cropping System Project*, pp. 74–85. Khon Kaen: Faculty of Agriculture, Khon Kaen University.

————. 1978b. Planting of Field Crops before Rice in Lowland Paddy Fields. In *The 1978 Annual Report of KKU-FORD Cropping System Project*, pp. 94–96. Khon Kaen: Faculty of Agriculture, Khon Kaen University.

Uraiwan Thongkamkaew อุไรวรรณ ทองแกมแก้ว; Juraluck Mahasan จุฬาลักษณ์ มหาแสน; Sunee Chatsiriyingyong สุนีย์ ฉัตรศิริยิ่งยง; and Ung Sopheap อุง โสเพียบ. 2010. Kanchatkarn pheunthii pluuk khaopod khong kasettakorn: Koranee sueksa pheunthii ban Nong Boua tambol Nong boua, amphoe Ban phang changwat Khon Kaen การจัดการพื้นที่ปลูกข้าวโพดของเกษตรกร: กรณีศึกษา พื้นที่บ้านหนองบัว ต.หนองบัว อ.บ้านฝาง จ.ขอนแก่น [Farmer management on corn production: A case study at Baan Nongbou, Nongboa Subdistrict, Baan Fang District, Khon Kaen Province]. Program on System Approaches in Agriculture, Faculty of Agriculture, Khon Kaen University (mimeographed).

Vichain Kerdsuk วิเชียร เกิดสุข; and Aran Patanothai อารันต์ พัฒโนทัย. 1990. *Botrian jark karn totsop lae khayaai phon karn pluuk thua li song lang na doi mai arsai namchollapratarn khong mahawittayalai Khon Kaen* บทเรียนจากการทดสอบและขยายผลการปลูกถั่วลิสงหลังนาโดยไม่อาศัยน้ำชลประทานของมหาวิทยาลัยขอนแก่น [Lesson learned from testing and extension of growing peanut after rice without irrigation of Khon Kaen University]. Farming System Research Project, Khon Kaen University. *Technical Report* 63(63): 24–35.

Viriya Limpinuntana. 2001. Physical Factors as Related to Agricultural Potential and Limitations in Northeast Thailand. In *Natural Resource Management Issues in the Korat Basin of Northeast Thailand: An Overview*, edited by S. P. Kam, C. T. Hoanh, G. Trebuil, and B. Hardy, pp. 3–17. Limited Proceedings No. 7. Los Banos, International Rice Research Institute, Manila.

Wareerat, P. วารีรัชต์ ปัณรราช. 2014. Karn jad karn raeng ngarn khong khreua ruean lae chumchon samrap karn phalit maletphan makhuea thet pai tai kaset phantasannyaa muu baan Lad Na Piang, tambol Savatee, amphoe Muang, changwat Khon Kaen การจัดการแรงงานของครัวเรือนและชุมชนสำหรับการผลิตเมล็ดพันธุ์มะเขือเทศภายใต้เกษตรพันธะสัญญา หมู่บ้านลาดนาเพียง ตำบลสาวะถี อำเภอเมือง จังหวัดขอนแก่น [Household and community labor management for tomato seed production under contract farming, Lad Napiang village, Savatee Subdistrict, Muang District, Khon Kaen Province]. Master's thesis, Graduate School, Khon Kaen University.

Trends in Hybrid Tomato Seed Production under Contract Farming in Northeast Thailand

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Hybrid tomato seed production after rice is a way of intensifying agriculture in rainfed areas in Northeast Thailand. Although this type of intensive high-value contract farming has been developing for the last 30 years, there has been little research on it. This study describes the historical development of this system and identifies factors influencing increases and decreases in the number of production sites and farmers producing hybrid tomato seeds. Although production of hybrid tomato seeds was initially adopted by a large number of farmers in many villages in both rainfed and irrigated areas, in recent years it has been carried out only in a smaller number of villages, mostly in rainfed areas. The decision of growers to continue or discontinue production is influenced by both the benefit they gain from production and their relations with the seed companies. The local availability of highly skilled hired workers also affects the concentration of production in certain sites.

Keywords: vegetable seed production, agricultural history, multiple cropping, intensification, skilled labor, farmer decision making

Introduction

The development of hybrid tomato seed production among small farmers in Northeast Thailand illustrates a key aspect of the agrarian transformation of the region in the form of increasing intensification and specialization. Over the last 30 years, Northeast Thailand has emerged as one of the most important locations in the world for hybrid tomato seed production under contracts between individual farmers and local or transnational seed companies. In 1995 US-based Asgrow, the world's largest seed company, obtained 90%

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of its hybrid tomato seed for global sales from Thailand. The majority of this was produced in Northeast Thailand, mostly by small farmers (Rosset *et al.* 1999).

Veerapong Saenjan (1998) reported that hybrid tomato seed production in Northeast Thailand showed signs of instability due to the uncontrollable cost of production and increasing labor costs. However, despite having some cost control problems, seed companies continued to produce newer and more popular varieties of hybrid tomato seed in the Northeast while shifting production of old varieties and easier-to-produce seeds, such as melons and other cucurbits, to China and Vietnam, where the cost of production was lower than in Northeast Thailand (Rosset *et al.* 1999).

Previous research on hybrid tomato seed production in Northeast Thailand focused on financial analysis, the socioeconomic implications, and environmental impacts but paid little attention to inter- as well as intra-village variations in sustainability of production. The present study focuses on this aspect of hybrid tomato seed production under contract farming in Northeast Thailand.

This study was undertaken with the following objectives: (1) to understand the historical background of hybrid tomato seed production under contract farming at various sites in Northeast Thailand; (2) to identify sites where the numbers of growers are increasing and decreasing, and where seed production has totally disappeared; and (3) to identify the factors influencing the dynamic of hybrid tomato seed production.

Background

Contract Farming as a Mode of Agricultural Production

Contract farming is "a contractual arrangement for a fixed term between a farmer and a firm, agreed verbally or in writing before production begins, which provides resources to the farmer and/or specifies one or more conditions of production, in addition to one or more marketing conditions, for agricultural production on land owned or controlled by the farmer, which is non-transferable and gives the firm, not the farmer, exclusive rights and legal title to the crop" (Prowse 2012). It is a form of vertical integration within agricultural commodity chains that gives the agribusiness firm great control over the production process and final product. Therefore, contract farming is a system or a mode of production that has considerable potential for governing the linkage between farmers and agribusiness firms, as a supply chain management strategy (Kirsten and Sartorius 2002; Da Silva 2005; Prowse 2012).

Contracts between firms and farmers were first recorded as an innovation more than 100 years ago (Prowse 2012). Nowadays, it has expanded and became a mode of produc-

tion that allows small-scale farmers to be integrated into the global agro-food system (Eaton and Shepherd 2001; Kirsten and Sartorius 2002; Prowse 2012). It offers an important way for smaller producers to farm in a commercial manner and also provides agribusiness firms with the opportunity to guarantee a reliable source of supply, in terms of both quantity and quality (Delforge 2007). In addition, small-scale farmers can also overcome capital constraints, lack of capacity to adopt technological innovations, and lack of ability to meet the required standards from agribusiness firms further down the value chain (Prowse 2012).

Contract Farming in Thailand

Compared to other Asian countries, by the early 1990s Thailand probably had the most extensive experience with contract farming for the widest range of crops (Glover and Lim 1992). Contract farming emerged in Thailand more than four decades ago, particularly for growing sugarcane and tobacco. In the 1970s it was practiced in poultry, pineapple, tomato, and vegetable production (Songsak and Aree 2008). Later it expanded to vegetable seed crops, i.e., hybrid tomato seeds. However, contract farming has generally not been well managed due to disagreements between companies and farmers and defaulting on the part of both agribusiness firms and farmers. The faults of the agribusiness firms have been related to timing, low buying prices, and refusal to purchase the produce, while the faults of farmers have been related to lack of reliability, irregularity, substandard produce, and untimely production. Another reason for the decline of contract farming is the uncontrollable cost of production and increasing labor cost in the case of poultry and seed production (Veerapong 1998).

Northeast Thailand is a plateau with poor soil conditions, erratic rainfall, and limited irrigation facilities. Reliance on rainfed agricultural production results in low incomes among small farm holders (Viriya 2001). During the 1960s and 1970s, the Thai government constructed irrigation facilities covering limited areas of the region and supported agricultural crop diversification. Under this scheme, high-value food commodities such as frozen and canned fruit and vegetables, vegetable seeds, and poultry, most of which were grown under contract farming, were promoted.

Taiwan used to be one of the core areas of hybrid vegetable seed production. In the 1970s, however, the cost of production started increasing, mainly due to higher wages paid by the manufacturing industry. At that time, Taiwanese and transnational seed companies from the United States and Japan started to search for alternative production sites (Rosset *et al.* 1999; Tay 2002). Northeast Thailand offered excellent prospects because it has cool dry weather for half the year, which lowers the risk of disease and pest problems. Its small farmers show loyalty as contractees and have the manual dex-

terity needed to do this work. By 1980, because of the high quality and low cost of its hybrid tomato seeds, Northeast Thailand was placed on the world map of seed production. Many transnational companies from the United States, Europe, Japan, and Taiwan rushed into Northeast Thailand to take advantage of the low cost of production and better quality of tomato seeds (Rosset *et al.* 1999; Lamyai 2002).

Methodology

Beginning in October 2013 and continuing until March 2014, field surveys were conducted in various parts of the Northeast. As the first step in identifying the sites of production, semi-structured interviews were conducted with agricultural officers at the provincial and subdistrict levels in Khon Kaen Province. Next, the purposive snowball sampling technique was used to identify the exact sites and select key informants who had knowledge about the history of hybrid tomato seed production at various sites. The key informants included 11 officers of the District or Provincial Agricultural Extension Offices, 6 staff of seed companies, 6 village headmen, and 77 growers under contract farming at 30 sites in 29 districts in 9 provinces of Northeast Thailand (Fig. 1).

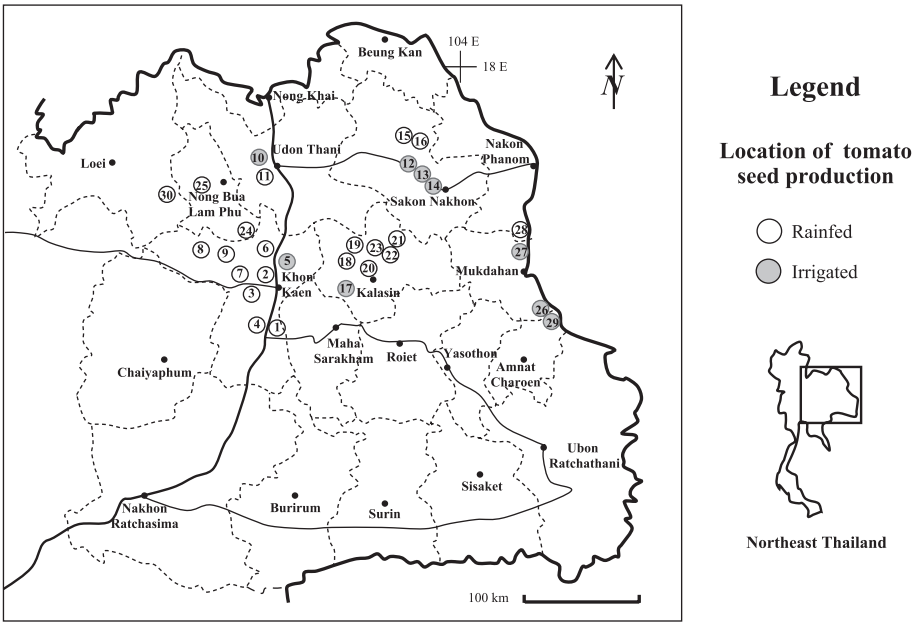

Fig. 1 Sites of Hybrid Tomato Seed Production in Northeast Thailand

Both individual and group semi-structured interviews were used to gather information from the key informants. The topics consisted of physical, biological, and socio-economic information including topography, natural resources, cropping calendars, history and evolution of hybrid tomato seed production, seed company operations and relationships with farmers, and the present situation.

Results and Discussion

General Information about Hybrid Tomato Seed Production under Contract Farming

F1 hybrid tomato cultivars are one of the most popular vegetable crops worldwide (Tay 2002). Two parental lines are developed for genetic crossing through pollination in order to create a hybrid cultivar. The production process is complex and relies upon intensive and dexterous manual labor for emasculation and hybridization of individual flowers (Benziger 1996; Rosset *et al.* 1999; Sudha *et al.* 2006). Hybrid tomato seed production is closely associated with the global agro-food complex and transnational seed companies that dominate seed production and distribution. Therefore, a high-intensity contractual relationship with small-scale farmers is required by the seed companies in order to control the seed quality and guard the proprietary germplasm (Rosset *et al.* 1999).

Normally, a written or oral contract with individual farmers for the production and supply of seed at a predetermined price is negotiated by the seed companies. In order to attract farmers, the seed companies provide a complete package of support and risk sharing. They provide advanced inputs on credit and loans for hiring labor subject to a given quota of production. The contract farmers (growers) provide their land and skilled labor. The cost of inputs, repayment of loans, and a service charge are deducted from the remuneration paid to the growers by the seed company. The value of the input credits and loans are usually forgiven by the company when the crop fails through no fault of the growers. In addition, as has also been reported by Vincent Benziger (1996), Veerapong (1998), and Niwat Martwanna and Kamol Lertrat (2007), some companies give a small payment to the growers in case of natural disasters in order to encourage them to continue production the following year.

Historical Development of Hybrid Tomato Seed Production in Northeast Thailand

Four phases can be recognized in the history of hybrid tomato seed production in Northeast Thailand. The sites of production changed from one phase to another as did the number of growers at each site. A comparison of the situation in the late 1990s and 2013–14 is summarized in Table 1.

Table 1 Characteristics of Hybrid Tomato Seed Production Sites in Northeast Thailand

Site (by district)	Province	Rainfed/ Irrigated	At the Time of Peak Production (late 1990s)			In the 2013–14 Crop Year		
			No. of Growers	No. of Villages	No. of Seed Companies	No. of Growers	No. of Villages	No. of Seed Companies
1. Ban Phai	Khon Kaen	rainfed	100–200	4–5	2–3	20–30	2	2
2. Mueang Khon Kaen	Khon Kaen	rainfed	>400	9–10	4–5	300	4–5	>10
3. Ban Fang	Khon Kaen	rainfed	>400	8–10	4–5	300	6–7	>10
4. Chonnabot	Khon Kaen	rainfed	70–80	5–6	2–3	10–15	2	2
5. Nam Phong (1)	Khon Kaen	rainfed	>200	4–-5	5–6	70–80	2–3	5
6. Nam Phong (2)	Khon Kaen	irrigated	>100	3–4	5–6	50–60	2–3	5
7. Nong Ruea	Khon Kaen	rainfed	>200	6–7	5–6	>100	2–3	5
8. Si Chomphu	Khon Kaen	rainfed	300–400	7–8	7–8	200	2	7–8
9. Wiang Kao	Khon Kaen	rainfed	10–20	2–3	2	10–20	2–3	2
10. Kut Chap	Udon Thani	irrigated	300–400	5–6	5–6	200–300	4–5	7–8
11. Nong Wua So	Udon Thani	rainfed	200	4–5	5–6	>100	3–4	5
12. Phang Khon	Sakon Nakhon	irrigated	300–400	7–8	>10	200–300	3–4	5
13. Phanna Nikhom	Sakon Nakhon	irrigated	600–700	7–8	>10	>500	4–5	>10
14. Mueang Sakon Nakhon	Sakon Nakhon	irrigated	>100	5–6	>10	60–70	2–3	5–6
15. Wanon Niwat	Sakon Nakhon	rainfed	200–300	7–8	3–4	200	4–5	2–3
16. Akat Amnuai	Sakon Nakhon	rainfed	100–200	4–5	2–3	>100	3–4	2–3
17. Yang Talat	Kalasin	irrigated	100–200	4–5	7–8	20–30	2–3	6
18. Sam Chai	Kalasin	rainfed	50–60	2–3	2	10–15	2	2
19. Kham Muang	Kalasin	rainfed	20–30	2–3	2	1	1	1
20. Mueang Kalasin [a)]	Kalasin	rainfed	30–40	6–7	4–5	30–40	6–7	3–4
21. Huai Phueng [a)]	Kalasin	rainfed						
22. Na Mon [a)]	Kalasin	rainfed						
23. Somdet [a)]	Kalasin	rainfed						
24. Non Sang	Nong Bua Lam Phu	rainfed	30–40	2–3	2	10	1	2
25. Na Klang	Nong Bua Lam Phu	rainfed	100–200	5–6	2–3	60–70	2–3	2–3
26. Don Tan	Mukdahan	irrigated	200	1	4–5	0	0	0
27. Wan Yai	Mukdahan	irrigated	20–30	2–3	2–3	0	0	0
28. That Phanom	Nakhon Phanom	rainfed	10–20	2	2–3	0	0	0
29. Chanuman	Amnat Charoen	irrigated	200	2–3	4–5	0	0	0
30. Erawan	Loei	rainfed	20–30	1	1	0	0	0

Note: [a)] For the four sites in Kalasin (20–23), the figures show the sums at Mueang Kalasin, Huai Phueng, Na Mon, and Somdet.

Phase 1 (late 1970s): Transnational Company

In 1976 Petoseed Company (of the United States) started hybrid tomato seed production in rainfed areas, first in a village in Ban Phai District, Khon Kaen Province, and later expanding into four or five nearby villages. In 1979 the company expanded its production into rainfed areas in Sumran, Ban Kho, and Sawathee Subdistricts in Mueang District, Khon Kaen Province (Lamyai 2002) by contracting with the company Adams International via a third company from Taiwan (Rosset *et al.* 1999).

Phase 2 (1980s): Joint Ventures with Local Companies

Local Thai companies and joint ventures with transnational companies extended the production sites into both rainfed and irrigated areas. In Udon Thani Province the irrigated area was in Kut Chap District and the rainfed area was in Nong Wua So District. In Sakon Nakhon Province irrigated areas included Phang Khon, Phanna Nikhom, and Mueang Districts (Benziger 1996; Rosset *et al.* 1999).

Phase 3 (1990s): Relocation from Taiwan

During this period a large number of new sites were developed in Northeast Thailand due to relocation there by Taiwanese companies (Lamyai 2002). The production sites extended into rainfed areas in Chonnabot, Ban Fang, Nong Ruea, Si Chomphu, and Nam Phong Districts in Khon Kaen Province; Sam Chai District in Kalasin Province; and Non Sang and Na Klang Districts in Nong Bua Lam Phu Province. Production in irrigated areas also extended into Nam Phong District in Khon Kaen Province, Don Tan District in Mukdahan Province, Chanuman District in Amnat Charoen Province, and Yang Talat District in Kalasin Province.

Phase 4 (2000–14): Relocation of Production Sites

During this phase companies tried to expand into new sites in order to compensate for decreased production in the older sites, where the number of growers had declined. The new production sites with new growers were established in rainfed areas, including Wanon Niwat and Akat Amnuai Districts in Sakon Nakhon Province; That Phanom District in Nakhon Phanom Province; Erawan District in Loei Province; Wiang Kao District in Khon Kaen Province; and Kham Muang, Mueang, Huai Phueng, Na Mon, and Somdet Districts in Kalasin Province. In irrigated areas, production extended into Wan Yai District in Mukdahan Province.

Dynamics of Hybrid Tomato Seed Production in Northeast Thailand

Thirty sites in nine provinces where hybrid tomato seed used to be or is still being pro-

duced were surveyed in the 2013–14 crop year. Of the 30 sites, 21 (70%) were in rainfed areas and 9 (30%) in irrigated areas (Table 1).

Twenty-five sites in five provinces (83.3% of all sites surveyed) are still engaged in production. Nineteen sites are in rainfed areas, and six sites are in irrigated areas under the irrigation schemes of Huai Luang Dam in Udon Thani, Nam Oon Dam in Sakon Nakhon, and Lam Pao Dam in Kalasin Province. There were five sites (16.7% of all surveyed sites) in four provinces where the growers had ceased production. Two of them were in rainfed areas, while three (60%) were in irrigated areas served by electrical pumps.

Patterns of Change from the Late 1990s to 2013–14 of Hybrid Tomato Seed Growers in Various Sites

The key informants identified five sites where the number of growers had not changed recently. These included Site 9 in Khon Kaen Province and Sites 20–23 in Kalasin Province (Table 1). At all of these sites production had been established rather recently (four to five years ago) because of the decline in the number of growers in other sites. However, each site had fewer than 100 growers and fewer than five seed companies operating.

Many growers in 20 sites in five provinces had produced hybrid tomato seeds beginning in the late 1990s, but their number declined recently in all of these sites. The reasons were delicate production methods and management, disease and pest problems, inadequate labor supply, climate variability, deterioration of relations between growers and seed companies, detrimental government policies, and unsatisfactory profits earned by the growers. Presently, production in these 20 sites is confined to growers in only a few villages. These growers can maintain their production for decades. They are in 10 sites with fewer than 100 growers each, 9 sites with 100–500 growers each, and 1 site with more than 500 growers. The number of operating seed companies is fewer than 5 each in 8 sites, 5–10 each in 9 sites, and more than 10 each in 3 sites (Table 1).

In the remaining sites in four provinces where all growers had ceased producing hybrid tomato seeds, the growers switched to either pepper seed production (four sites) or sugarcane production to meet the demand of nearby sugar mills (three sites).

Factors Influencing the Dynamics of Hybrid Tomato Seed Production

Ninety-four key informants in 30 sites in nine provinces identified the factors positively or negatively influencing the continuation of hybrid tomato seed production. These factors included: benefits gained by the grower, company-grower relations, tedious work, suitable environment, kind of tomato cultivars, labor supply, grower's personal characteristics, advanced technology, and government policy (Table 2).

Table 2 Opinions of Key Informants (n=94) regarding Factors Influencing the Dynamics of Hybrid Tomato Seed Production under Contract Farming in 30 Sites in Northeast Thailand

Site (by district)	Factors								
	Benefit Obtained	Grower-Company Relations	Tedious Work	Suitable Environment	Tomato Cultivars	Labor Supply	Grower's Personal Characteristics	Advanced Technology	Government Policy
1. Ban Phai	±	+	–	±	–	–	n/a	+	n/a
2. Mueang Khon Kaen	±	±	–	±	–	±	+	+	–
3. Ban Fang	±	±	–	±	–	+	+	+	–
4. Chonnabot	±	+	–	–	–	n/a	n/a	n/a	n/a
5. Nam Phong (1)	±	±	–	–	–	–	n/a	n/a	n/a
6. Nam Phong (2)	±	±	–	n/a	–	±	+	+	–
7. Nong Ruea	±	+	n/a	+	–	+	+	+	n/a
8. Si Chomphu	±	±	–	±	–	–	+	+	n/a
9. Wiang Kao	±	±	–	+	–	+	n/a	+	n/a
10. Kut Chap	±	+	–	–	n/a	–	+	n/a	–
11. Nong Wua So	±	+	–	–	–	–	+	+	n/a
12. Phang Khon	±	±	–	–	–	+	+	+	–
13. Phanna Nikhom	±	±	–	–	–	+	+	+	–
14. Mueang Sakon Nakhon	±	±	–	–	–	+	+	+	–
15. Wanon Niwat	±	+	–	+	–	+	+	+	n/a
16. Akat Amnuai	±	±	–	+	–	+	+	+	n/a
17. Yang Talat	±	±	n/a	n/a	–	n/a	+	+	–
18. Sam Chai	±	±	–	–	–	–	n/a	n/a	–
19. Kham Muang	±	±	–	–	–	–	n/a	n/a	–
20. Mueang Kalasin	+	+	–	–	n/a	n/a	n/a	n/a	n/a
21. Huai Phueng	+	+	–	–	n/a	n/a	n/a	n/a	n/a
22. Na Mon	+	+	–	–	n/a	n/a	n/a	n/a	n/a
23. Somdet	+	+	–	–	n/a	n/a	n/a	n/a	n/a
24. Non Sang	±	±	–	–	–	n/a	n/a	n/a	–
25. Na Klang	±	±	–	–	–	n/a	+	n/a	–
26. Don Tan	–	–	–	–	n/a	n/a	n/a	n/a	n/a
27. Wan Yai	–	–	–	n/a	n/a	n/a	n/a	n/a	n/a
28. That Phanom	–	–	–	n/a	n/a	n/a	n/a	n/a	n/a
29. Chanuman	–	–	–	–	n/a	–	n/a	n/a	n/a
30. Erawan	–	–	–	–	–	n/a	n/a	n/a	–
Favorable factor (+)	4 (13.33%)	10 (33.33%)	0	4 (13.33%)	0	8 (26.67%)	14 (46.67%)	14 (46.67%)	0
Unfavorable factor (–)	5 (16.67%)	5 (16.67%)	28 (93.33%)	18 (60.00%)	21 (70.00%)	8 (26.67%)	0	0	13 (43.33%)
Both favorable and unfavorable factors (±)	21 (70.00%)	15 (50.00%)	0	4 (13.33%)	0	2 (6.67%)	0	0	0
Not available (n/a)	0	0	2 (6.67%)	4 (13.33%)	9 (30.00%)	12 (40.00%)	16 (53.33%)	16 (53.33%)	17 (56.67%)

Benefits Gained

The key informants in all sites identified the opportunity to earn a high income as being a very powerful incentive for growers to continue production. This was similarly reported by Benziger (1996), M. Sudha *et al.* (2006), and M. A. R. Sarkar *et al.* (2011). Growers in rainfed areas of Northeast Thailand aim to earn a higher income from a smaller land area

as compared to other off-season crops. For instance, one grower estimated the median income in an average year from hybrid tomato seeds to be about 100,000 baht (USD3,000) per 0.5–1 rai (800–1,600 m^2) of land for four months' production, whereas sugarcane production uses 10 rai (16,000 m^2) for one and a half years to yield the same amount of income. Besides, these growers were satisfied with receiving a lump sum payment that enabled them to invest in other agricultural activities, house construction, children's higher education, and loan repayment. The same was reported by Sudha *et al.* (2006). Furthermore, at sites where production had continued for a long time, growers developed specific skills in production and management (e.g., emasculation, pollination, and plot maintenance) that resulted in higher yield and quality. For example, growers in two sites (Sites 2 and 3 in Table 1) who have over 30 years of experience can make contracts with more than two companies that offer higher guaranteed prices or fixed prices. They produce hybrid tomato seeds on more than two plots with different cultivars by using relay or staggered planting that spreads out the labor requirement. This is reported also by Niwat and Kamol (2007). These measures allow the farmers to better control and reduce the risk associated with variations in the seed yield of different tomato cultivars, which greatly increases their opportunity to get a maximum return.

Although a high income is a powerful incentive for certain growers, most of the growers who had reduced or ceased production did so because it was not economically worthwhile. They were burdened by the companies' requirement for high inputs and also faced uncontrollable costs of production, especially increasing labor costs, as reported by Veerapong (1998), Peter Rosset *et al.* (1999), David Tay (2002), and Niwat and Kamol (2007). Moreover, some failed to have good yields due to very specific production conditions and inadequacies in management and care to meet the requirements of a given cultivar. Consequently, their substandard produce was refused by the companies. In other cases the companies' guaranteed price was reduced if the amount of product exceeded the quota. The price was predetermined by the company, with which the growers did not have bargaining power, as was also mentioned by Rosset *et al.* (1999).

Grower-Company Relations

The key informants at all sites stated that most seed companies provide production inputs on credit to the growers, including seedlings, agro-chemicals, nets to cover the plots, plastic sheets, water pumps, and also cash to pay hired laborers. This system of credit is the same as that reported by Veerapong (1998), Rosset *et al.* (1999), and Niwat and Kamol (2007). Accompanying the provision of credit is technical advice on crop cultivation and seed production ranging from crop management practices to pollination and seed-processing techniques, as also reported by Benziger (1996), Tay (2002), Sudha *et*

al. (2006), and Niwat and Kamol (2007). Growers are satisfied with the companies' provision of advanced inputs and guaranteed prices because they do not have to invest their own cash or face market risks. Credits and loans are usually forgiven by the companies in case of crop failure through no fault of the growers, and some companies even give a small remuneration to the growers in order to encourage them to continue planting in future years, as also reported by Benziger (1996), Veerapong (1998), and Niwat and Kamol (2007). Nowadays, payment for the seed produced reaches the growers more quickly than it did in the past. Moreover, some companies provide support for community activities or festivals, as also reported by Niwat and Kamol (2007). Therefore, the current relations between growers and seed companies are very good, which contributes to sustaining the number of growers in various villages.

Nevertheless, some growers ceased their production due to discontent with the process of seed testing and delayed payments by seed companies. Similar problems are reported in Karnataka, India (Sudha *et al.* 2006), and Northeast Thailand (Niwat and Kamol 2007). Hence, some growers at the sites of Phang Khon, Phanna Nikhom, Mueang Sakon Nakhon, and Kut Chap switched to producing other kinds of vegetable seeds, such as bitter gourd, watermelon, and cantaloupe or fresh fruit such as watermelon and cantaloupe. These crops require a shorter cultivation time than tomatoes and yield a quicker income. In addition, after the harvest the growers have time to work as hired laborers in the tomato plots of other growers.

Production Process

In 28 sites, the key informants mentioned that the production process for hybrid tomato seed is complex and requires dedicated management, costly inputs, and intensive and highly skilled labor, and the growers need to perform some very tedious operations, especially emasculation and pollination. There are high risks from disease and insect damage, which makes the heavy application of chemical pesticides mandatory; that, in turn, adversely affects the growers' health. Therefore, growers in some sites have changed to other crops. For example, the growers at the Don Tan, Chanuman, Si Chomphu, Kut Chap, Phang Khon, and Phanna Nikhom sites switched to producing other kinds of vegetable seed, such as pepper, eggplant, pumpkin, watermelon, and cantaloupe, which are easier to pollinate than tomatoes. Some growers at the Yang Talat and Phang Khon sites (in an irrigated area) changed to growing off-season rice, which requires less labor and agro-chemical use than dose hybrid tomato seed. The growers in rainfed areas such as the Mueang Khon Kaen, Ban Phai, Ban Fang, Nong Ruea, Nong Wua So, Sam Chai, Kham Muang, Non Sang, Na Klang, and Erawan sites switched to growing sugarcane due to its lower labor requirement.

Suitable Environment

The key informants in 26 sites indicated that a suitable environment was one of the reasons for continuous production. Hybrid tomato seed production fits into the cropping calendar as a second crop after rice at the start of the cool, dry season, which can limit disease and pest problems such as wilt disease, root-knot nematodes, and blossom end rot. They have sufficient water for small-scale irrigation, and the sandy loam soils guarantee good water drainage. Tay (2002), who studied hybrid tomato seed production in Taiwan, has a similar view about suitable conditions there.

Many key informants strongly believed that the spread of diseases and pests as well as seed yield were directly affected by climate variability. They observed that in the past, when the cool season was cooler, tomato plants flowered later, produced better fruit-set, had fewer diseases and pest problems, and gave a higher seed yield. In recent years, with a warmer cool season, tomato plants flower faster, have low fruit-set, and have more flower abscission; thus, pollination must be done quickly. Tomato plants require moderate temperatures (around 25°C in the day and 15°C at night). Too low a temperature results in a low seed set, and too high a temperature results in more flower abscission, low pollen production, and pest and disease problems (Tay 2002). In the 2012–13 crop year, this had high temperatures in the cool season, whiteflies and viral disease spread quickly, especially in irrigated sites in Sakon Nakhon Province. In the 2013–14 crop year, drought negatively affected hybrid tomato seed yield and seed quality in almost all sites in the rainfed area and caused most of the growers' incomes to decline.

Although the cool, dry winter season in Northeast Thailand is suitable for hybrid tomato seed production because of fewer disease and pest problems (Rosset *et al.* 1999; Tay 2002), in many sites, for instance at Don Tan, Chanuman, Chonnabot, Ban Fang, Nam Phong, Si Chomphu, Nong Wua So, Kham Muang, Non Sang, and Na Klang, the tomato crop suffers from wilt disease, root-knot nematodes, and blossom end rot, which directly affect seed yield and quality. Companies promoted the grafted tomato seedling technique in order to prevent these problems, but wilt disease is still severe. The irrigated sites in Sakon Nakhon Province, where growers have continually produced the seeds for a long time, now suffer from water contamination and spread of diseases and pests through the irrigation water. Thus, the problem of diseases and pests is an important factor affecting growers' decision making.

Tomato Cultivars

The key informants in 21 sites said that tomato cultivars were an important factor influencing the yield. Some cultivars are unsuitable for the site's ecological conditions, not resistant to disease, have few flowers, easily suffer flower abscission, have small flowers

that are difficult to pollinate, and produce poor fruit-set. Every year growers are assigned different cultivars by the seed companies. Such a practice brings about a greater risk when the companies introduce new cultivars, particularly when prior field testing is inadequate. Although the seed companies provide technical and extension services, the growers have to bear the risks (see Niwat and Kamol 2007).

Labor Supply

In 18 sites, the key informants noted that an adequate supply of skilled laborers, particularly during the pollination period, is an important determinant of continuity. Labor management strategies by the growers include making maximum use of family labor, giving advance cash credit to the hired laborers in their own and nearby villages, and employing their kin as hired exchange laborers (*ibid.*).

Nowadays, all of the production sites are faced with a limited supply of skilled labor. Aged growers no longer have the eyesight for pollination, while younger people prefer to engage in non-farm activities in the industrial and service sectors. A study in Khon Kaen Province found the same problem (*ibid.*). In addition, workers in Si Chomphu and Kut Chap refuse to do the pollination operation because of the offensive smell of flowers, sticky latex from the anthers, and long working hours (6 a.m.–6 p.m.). They are also afraid of the effects of agro-chemicals on their health. In addition, at the Mueang Khon Kaen, Ban Phai, Ban Fang, Nong Ruea, Nong Wua So, Sam Chai, and Kham Muang sites, the sugarcane harvest competes for labor with tomato pollination. Labor resource competition results in higher wages and hence a higher production cost. These are important factors that affect growers' decisions on whether to decrease or cease hybrid tomato seed production.

Grower's Personal Characteristics

The key informants in 14 sites stated that hybrid tomato seed production is complex and tedious and requires dedication; it needs workers with special skills and a willingness to do intensive labor, particularly for special operations such as caring for seedlings, emasculation, pollination, harvesting, and seed cleaning. A team of skillful growers is required, including many dedicated pollinators with good eyesight and manual dexterity. In addition, growers must conform to the seed companies' designated tasks and strict schedules (Rosset *et al.* 1999; Tay 2002). Many growers, together with their spouses and children, work in the tomato plots for long hours—sometimes even during the night—to reduce the need for costly hired laborers. Accordingly, our key informants confirmed that growers who were successful in hybrid tomato seed production needed to be diligent, patient, disciplined, and honest, with excellent production and management skills. How-

ever, Rosset *et al.* (1999) report that some growers cannot meet these conditions, which leads them to stop production. Consequently, in the late 1990s, seed companies in Northeast Thailand experienced a general trend of 12% reduction per year in the number of hybrid tomato seed growers.

Advanced Technology

In 14 sites, the key informants believed that the availability of advanced labor-saving technology was one of the factors favoring continuation of hybrid tomato seed production. In the past, the production process was difficult and took a long time to complete. Nowadays, the tasks and the operation time have been reduced by the use of machines, including four-wheel tractors to prepare the land, chemical sprayers, irrigation with mechanical water pumps and drip irrigation systems, and wet seed extractors. Tomato plants' high tolerance to wilt disease and high seed yield by grafted seedling technology have led to easier plot maintenance. The adoption of nets to cover the plots, plastic sheets to cover the surface of the plots, and some other equipment have made hybrid tomato seed production easier. Moreover, in rainfed areas groundwater can be drawn for irrigation using electrical, diesel, or gas water pumps.

Government Policy

In 13 sites, the key informants suggested that some growers ceased production due to government policy. For example, the rice-pledging scheme of the Thai government made it attractive for growers in the irrigated area to change to off-season rice because of the better price and lower labor demand of rice compared to hybrid tomato seed production. Many growers in rainfed areas switched to sugarcane cultivation after the government allowed more private sugar mills to be established near their sites. The policy of increasing the minimum wage to 300 baht per day, including for agricultural labor, had a great effect on the cost of hybrid tomato seed production.

Views of Staff of Seed Companies on Favorable Factors Influencing Hybrid Tomato Seed Production under Contract Farming in Northeast Thailand

Six staff of seed companies identified several favorable factors influencing the continuation of hybrid tomato seed production in Northeast Thailand. These include the grower's personal characteristics (100%), benefits gained by growers (66.7%), advanced technology (66.7%), suitable environment (66.7%), good grower-company relations (50%), adequate labor supply (16.7%), adequate production processes (16.7%), and high capability of company staff (16.7%). The last includes selecting a suitable cultivar for the site, providing correct technical advice, and good planning and arrangement of grower farms.

In addition, most staff also pointed out that growers were more important than having a suitable environment due to difficulties in recruiting new growers and expanding to new areas of production.

Conclusion

Hybrid tomato seed production under contract farming emerged in Northeast Thailand in the late 1970s. It was initiated by transnational seed companies that were searching for cheap and diligent labor, suitable ecological conditions, and high product quality. The numbers of growers rapidly increased in many villages, in both rainfed and irrigated areas, because this crop fits well into the rice-based cropping system, particularly in rainfed areas. More recently, however, the number of growers in many sites has started declining. Consequently, seed companies have either concentrated their operations in a limited number of villages or moved to new areas to open new sites where there may be suitable growers, an adequate skilled labor supply with low wages, and a suitable environment, especially in rainfed areas. Nowadays, growers are confined to only a few villages in many sites.

The benefits gained by growers as well as grower-company relations are important factors influencing growers' decision to continue or discontinue production. Secondary factors include tedious work, suitable environment, kinds of tomato cultivars, labor supply, grower's personal characteristics, advanced technology, and government policy. For their part, companies point to growers' personal characteristics, particularly their skill, as important factors influencing continuation of production.

Hybrid tomato seed production in Northeast Thailand is sustainable, but the sites for production will continue to shift in certain areas while remaining stable in others. For example, in irrigated areas production declined due to the availability of alternative land uses (e.g., growing off-season rice, watermelon and cantaloupe, vegetables, and seeds of other kinds of vegetables) and contamination of plots by diseases and pests spread through the water in irrigation canals. In rainfed areas in Northeast Thailand production is likely to continue only in certain villages because of limited alternative sources of income and having a suitable environment, including fewer diseases and pests. Possible effects of climate variability were not included in this study but might force companies to introduce new cultivars, which might in turn lead to changes in the distribution of locations for hybrid tomato seed production.

Hybrid tomato seed production has evolved as part of the ongoing agrarian transformation of Northeast Thailand. Traditionally, rainfed rice farmers in the Northeast only

cultivated a single crop of rice each year, which was mostly used for household consumption. During the dry season the paddy fields were left fallow. In recent years, however, farmers have felt a growing urgency to gain more cash income in order to have a decent living style, invest in agricultural activities, construct houses, take care of their children's education, and repay loans. Hybrid tomato seed production under contract farming is one way that they can increase their income through agriculture intensification and specialization.

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References

Benziger, Vincent. 1996. Small Fields, Big Money: Two Successful Programs in Helping Small Farmers Make the Transition to High Value-Added Crops. *World Development* 24(11): 1681–1693.

Da Silva, Carlos Arthur B. 2005. *The Growing Role of Contract Farming in Agri-food Systems Development: Drivers, Theory and Practice*. Agricultural Management, Marketing and Finance Service. Rome: Food and Agriculture Organization.

Delforge, Isabelle. 2007. Contract Farming in Thailand: A View from the Farm. Occasional Papers 2. Focus on the Global South CUSRI, Chulalongkorn University.

Eaton, Charles; and Shepherd, Andrew W. 2001. *Contract Farming: Partnerships for Growth*. Agricultural Services Bulletin 145. Rome: Food and Agriculture Organization.

Glover, David; and Lim, Teck Ghee. 1992. *Contract Farming in Southeast Asia: Three Country Studies*. Kuala Lumpur: Vinlin Press.

Kirsten, Johann; and Sartorius, Kurt. 2002. Linking Agribusiness and Small-scale Farmers in Developing Countries: Is There a New Role for Contract Farming? *Development Southern Africa* 19(4): 503–529.

Lamyai Kowithayakorn ลำใย โกวิทยากร. 2002. *Kan phalit maletphan phak* การผลิตเมล็ดพันธุ์ผัก [Vegetable seed production]. Faculty of Agriculture, Khon Kaen University.

Niwat Martwanna นิวัฒน์ มาศวรรณา; and Kamol Lertrat กมล เลิศรัตน์. 2007. *Kan tham kan kaset baep mir saunyaa phuk phan: Kan phalit malet phan khong borisat malet phan nai pratheet Thai* การทำการเกษตรแบบมีสัญญาผูกพัน: การผลิตเมล็ดพันธุ์ของบริษัทเมล็ดพันธุ์ในประเทศไทย [Contract farming: Seed production of seed companies in Thailand]. Thailand Research Fund report.

Prowse, Martin. 2012. *Contract Farming in Developing Countries: A Review*. Paris: Research Department, Agence Francaise de Developpement.

Rosset, Peter; Rice, Robert; and Watts, Michael. 1999. Thailand and the World Tomato: Globalization,

New Agricultural Countries (NACs) and the Agrarian Question. *International Journal of Sociology Agriculture and Food* 8: 71–94.

Sarkar, M. A. R.; Rashid, M. H. A.; and Sarker, M. R. 2011. Contract Farming in Tomato Seed Production in Rangpur District of Bangladesh: A Financial Analysis. *Progressive Agriculture* 22(1–2): 169–179.

Songsak Sriboonchitta; and Aree Wiboonpoongse. 2008. Overview of Contract Farming in Thailand: Lessons Learned. Asian Development Bank Institute Discussion Paper No. 112.

Sudha, M.; Gajanana, T. M.; and Murthy, D. Sreenivasa. 2006. Economic Impact of Commercial Hybrid Seed Production in Vegetables on Farm Income, Employment and Farm Welfare: A Case of Tomato and Okra in Karnataka. *Agricultural Economics Research Review* 19 (July–December): 251–268.

Tay, David. 2002. Vegetable Hybrid Seed Production. In *Proceedings of the International Seed Seminar: Trade Production and Technology*, October, pp. 128–139. Consortium for International Seed Technology Training. http://www.seedconsortium.org/PUC/pdf%20files/23-Vegetable%20Hybrid%20Seed%20Production.pdf, accessed October 5, 2014.

Veerapong Saenjan. 1998. Future Prospect of Small and Medium Size Agribusiness in Thailand. In *Proceedings of the Second International Seminar on Agribusiness and Its Impact on Agricultural Production in Southeast Asia (DABIA II)*, edited by Aran Patanothai and Pirmpoon Keerati-Kasikorn, pp. 159–180. Faculty of Agriculture, Khon Kaen University.

Viriya Limpinuntana. 2001. Physical Factors Related to Agricultural Potential and Limitations in Northeast Thailand. In *Natural Resource Management Issues in the Korat Basin of Northeast Thailand: An Overview*, edited by S. P. Kam, C. T. Hoanh, G. Trebuil, and B. Hardy, pp. 3–17. Metro Manila: International Rice Research Institute (IRRI).

Recent Changes in Agricultural Land Use in the Riverine Area of Nakhon Phanom Province, Northeast Thailand

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This paper describes changes in the pattern of land use in two riverine districts of Nakhon Phanom Province between 2006 and 2010. A great deal of land use change occurred in these five years. In Mueang District, about 12.1% of the area (9,477 ha) had a different use in 2010 from that in 2006. In That Phanom District the magnitude of change was even greater, with about 27.3% of the area (9,326 ha) changing use between 2006 and 2010. Much of the land use change in both districts resulted from the conversion of natural forests, orchards, and rice paddies into rubber plantations. At the same time, rapid urbanization led to the conversion of large areas of farmland into housing estates in the peri-urban zone around Nakhon Phanom City and, to a lesser extent, around That Phanom district town. Most of these land use changes are reducing overall agroecological diversity. Several factors have influenced these land use changes, including lack of secure land titles, urban growth, and changes in the costs and benefits of growing different crops.

Keywords: deforestation, crop diversification, rubber plantations, urbanization, GIS analysis

Introduction

Although it is known that the agrarian transformation in Northeast Thailand has resulted in major changes in land use in the region, including a decline in the area of natural forest due to the expansion of cash crops and the conversion of agricultural land into the new

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housing estates that surround the region's rapidly expanding urban centers, detailed empirical studies on the nature and causes of land use changes in specific areas are lacking. Therefore, the present study was carried out in order to describe recent changes in agricultural land use and identify the factors influencing these changes in two districts along the bank of the Mekong River in Nakhon Phanom Province. This area is of particular interest because it is characterized by more fertile soil and a higher amount of rainfall than is typical in Northeast Thailand. It also borders the Lao People's Democratic Republic, to which it has been linked by the Third Friendship Bridge between Nakhon Phanom and Khammouane Provinces, which was officially opened on November 11, 2011. This and other transportation links, which are being built in the context of the Greater Mekong Subregion Economic Corridor and ASEAN Economic Community, may be influencing changes in land use in the area.

Methodology

Research Site

This study was conducted in Mueang and That Phanom Districts in Nakhon Phanom Province (coordinates: Upper left 17.99N, 103.96E, Upper right 17.99N, 104.86E, Lower left 16.70N, 103.96E, and Lower right 16.70N, 104.86E) in the valley of the Mekong River (Fig. 1). Neighboring provinces (clockwise from the south) are Mukdahan, Sakon Nakhon, and Bueng Kan. In the northeast, the province borders Khammouane of Laos. The northern part of the province has both uplands and forest-covered plains and is drained by the Song Kram and the smaller Oun Rivers. The southern part is mostly flatland, with the Kum the only notable river. The provincial capital, the city of Nakhon Phanom, is located directly on the bank of the Mekong.

Mueang Nakhon Phanom is the capital district of Nakhon Phanom Province. Mueang District is subdivided into 15 subdistricts (*tambol*), which are further subdivided into 169 villages (*muban*). The city of Nakhon Phanom (*thesaban mueang*) covers all of Nai Mueang and Nong Saeng Subdistricts as well as parts of At Samat and Nong Yat Subdistricts.

That Phanom District is in the southern part of Nakhon Phanom Province. The district is named after Wat Phra That Phanom, the most important Buddhist temple in the region. The district is divided into 12 subdistricts, which are further subdivided into 142 villages. That Phanom Municipality covers parts of That Phanom and That Phanom Nuea Subdistricts.

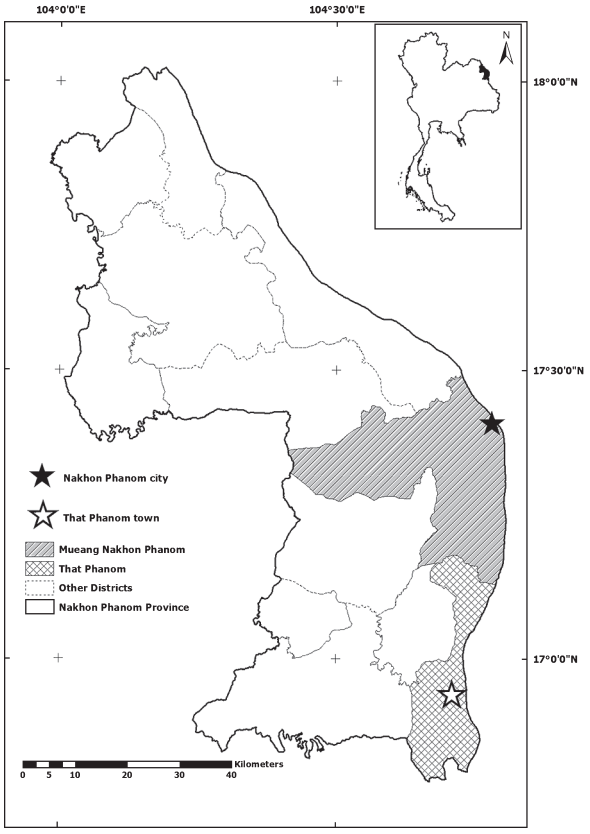

Fig. 1 Map of Mueang and That Phanom Districts, Nakhon Phanom Province

Data Sources

Land use maps for 2006 and 2010 of both districts were obtained in shapefile format from Land Development Department Office 4 in Ubon Ratchatani. These maps were made from unclouded and terrain corrected Landsat images in 2006 and 2010. Image processing and data manipulation were conducted using ERDAS IMAGINE 8.6 and ArcGIS 9.1. A handheld Garmin GPS eTrex HC (12–15 m accuracy) was used to obtain the coordinates of plots with different types of land uses. Some ancillary data were also used as references in image processing (Land Development Department 2010).

Information on the causes of some important types of land use changes in several localities was collected from local officials and farmers by holding focus groups. This was done after the changes in land use were analyzed and several problematic types of change were identified, especially conversion of paddy fields to forests and vice versa.

Method of Analysis

Spatial analysis employing the Decision Support System Research and Development Network for Agricultural and Natural Resource Management (DSSARM)[1] Program was used to identify all plots that had been converted from one land use to a different one between 2006 and 2010. DSSARM images of the two districts were analyzed using a supervised classification method. This classification was used to compile Tables 1a and 1b.

Results and Discussion

Recent Changes in Agricultural Land Use

The changes in land use between 2006 and 2010 are presented in Tables 1a and 1b. It is readily evident that a great deal of change occurred during this five-year period. In Mueang District, about one-eighth (12.1%) of the area (9,477 ha) was in different use in 2010 than it was in 2006. In That Phanom District the magnitude of change was even greater, with more than one-fourth (27.3%) of the area (9,326 ha) changing uses between 2006 and 2010.

In Mueang District there was a small decrease in the area under agriculture from 47,920 to 47,249 ha a net loss of 671 ha, while in That Phanom District it increased from 25,327 to 26,303 ha, a net gain of 976 ha. The area of settlement increased in Mueang District by 1.4 times from 4,644 to 6,950 ha, which was a net gain of 2,306 ha; in That Phanom District it increased by almost 1.3 times, from 2,413 to 3,032 ha, for a gain of 619 ha. Given these increases in the area of agricultural land in That Phanom District and the area of settlement in both districts, the decrease of natural forest is not surprising: it decreased in Mueang District from 22,089 to 19,484 ha for a net loss of 2,605 ha, while in That Phanom District it decreased from 4,226 to 2,611 ha for a net loss of 1,615 ha.

In Mueang District in both 2006 and 2010 the four most important land uses in terms of area covered were rice, natural forest, settlement area, and water. In That Phanom District in 2006 they were rice, natural forest, orchards, and settlement area; in 2010 rice

1) DSSARM is an integrated Geographic Information System (GIS) program developed for general users to enter and display data layer maps and data tables. Using this system requires a shorter learning period than a full-grown GIS program. It was developed by Visual Basic 6 and ArcGIS version 9.3 and designed to handle the spatial data in geodatabase format. DSSARM was designed to ensure the effective uses of spatial and attribute databases in the planning and management of agricultural and natural resources (Methi *et al.* 2005).

Table 1a Changes in Land Use from 2006 to 2010 in Mueang District, Nakhon Phanom Province

Land Use	Land Use in 2006 (ha)	Land Use in 2010 (ha)									
		Cassava	Eucalyptus	Grass	Natural Forest	Orchards	Rubber	Rice Paddies	Settlement	Specialty Crops	Water
Eucalyptus	442		15		300		127				
Grass	30		17					13			
Natural forest	22,089	95	111		17,937	23	827	1,522	1,052	26	496
Orchards	496		14		77	10		47	348		
Rubber	59				59						
Rice paddies	46,088	41	25	39	776	38	354	43,082	1,027	78	628
Settlement	4,644			29	58	17		206	4,277	30	27
Specialty crops	835			32	225		45	59	43	356	75
Water	3,441			145	52			59	203	12	2,970
2006 total	78,124										
Land use 2010 total	78,124	136	182	245	19,484	88	1,353	44,988	6,950	502	4,196

Table 1b Changes in Land Use from 2006 to 2010 in That Phanom District, Nakhon Phanom Province

Land Use	Land Use in 2006 (ha)	Land Use in 2010 (ha)										
		Cassava	Eucalyptus	Grass	Natural Forest	Orchards	Rubber	Rice Paddies	Settlement	Specialty Crops	Sugarcane	Water
Cassava	957	25	37	14			881					
Eucalyptus	1,019		829		134		56					
Grass	12				12							
Natural forest	4,226	64	652	11	1,939	23	1,312	131	37			57
Orchards	2,621	14	143		291		1,553	303	275		32	10
Rubber	246				12		234					
Rice paddies	18,714	32	39		116		473	17,252	524	237		41
Settlement	2,413				61	18	13	198	2,096	27		
Specialty crops	1,442	20			46		723	84	81	470		18
Sugarcane	328	22		12			229				65	
Water	2,160			127			24	11	19	77		1,902
2006 total	34,138											
Land use 2010 total	34,138	177	1,700	164	2,611	41	5,498	17,979	3,032	811	97	2,028

was still in the first place followed by rubber, settlement area, and natural forest.

In both districts there was a major shift from other land uses to rubber plantations. Rubber plantations expanded at the expense of rice, eucalyptus, and specialty crops in Mueang District and orchards, cassava, specialty crops, rice, and sugarcane in That Phanom District. In Mueang District the area of rubber increased by 23 times (from 59 to 1,353 ha) for a net gain of 1,294 ha, while in That Phanom District it increased by 22 times (from 246 to 5,498 ha) for a net gain of 5,252 ha. However, after the period under study, in 2011, a steep decline in latex price led some farmers to begin shifting out of rubber into other crops.

Rice fields suffered significant losses of area in both districts: 1,100 ha in Mueang District and 735 ha in That Phanom District. A major cause of the decline in Mueang District was the expansion of urban settlements, with 1,027 ha of paddy fields converted to settlement area. At the same time, however, 206 ha of settlement area were converted to paddy fields. This was land on the fringe of villages that may not have actually contained houses in 2006. Curiously, the area of rice fields in Mueang District lost 776 ha to natural forest but gained 1,522 ha from natural forest during this period. The rice fields that were converted to forest were in areas where the government ordered farmers to stop illegal cultivation of publicly owned forestland, while the forestland that was converted to paddy fields was located in areas where the government had reclassified degraded forestland for agricultural uses.

Orchards also lost 408 ha and 2,580 ha respectively in Mueang and That Phanom Districts, while the area devoted to growing specialty crops (e.g., tomatoes, chilies, tobacco) also declined in both districts.

The area of eucalyptus plantation declined from 442 ha to 182 ha in Mueang District; most of this area was changed to natural forest and rubber. In That Phanom District it increased from 1,019 ha to 1,700 ha. This expansion was initially promoted by a private company primarily at the expense of natural forest, orchards, cassava, and rice paddies. Other land uses, such as grassland, showed small gains in area in both districts. Sugarcane was not planted in Mueang District, whereas in That Phanom District it suffered a loss of area of almost two-thirds, dropping from 328 ha to 97 ha, with most of that area converted to rubber.

Water (swamps, fishponds) lost 471 ha and 258 ha respectively in Mueang and That Phanom Districts. Almost half of the lost area in Mueang District was converted to settlement area, whereas in That Phanom District it was converted to grassland.

Factors Influencing Land Use Change

Based on our field observations and discussions with farmers we have identified several

factors that exerted an important influence on land use changes in our study site. These factors include: (1) lack of secure land titles; (2) urban growth and expansion of housing estates and infrastructure (e.g., roads, public buildings, airports) into peri-urban areas; and (3) changes in the costs and benefits of growing different crops.

Lack of Secure Land Titles

A dispute and a lawsuit over landownership resulted in abandonment of agricultural land and its reversion to natural forest in Kham Toei Subdistrict, Mueang District. There, in the late 1990s, there were approximately 160 ha of village community forest. An entrepreneur illegally cleared part of the forest for a rubber plantation. Villagers repeatedly asked the provincial officers to resolve the problem of overlapping claims to this land. Finally, in 2008, the Administrative Court declared the land to be public forest. The entrepreneur filed an appeal with the Administrative Court to revoke the order, but the case was later dropped even though the conflict over ownership had not been resolved. Because of the lack of secure tenure the land has been abandoned, and the area that had been cleared for rubber is reverting to natural forest.

Urban Growth and Expansion of Housing Estates and Infrastructure into Peri-urban Areas

Nakhon Phanom Municipality and, to a lesser extent, That Phanom district town have experienced considerable population growth in recent years, which has led to rapid expansion of the settlement areas. New housing estates and infrastructure projects occupy former agricultural land in the neighboring subdistricts, which have been transformed from rural to peri-urban zones. This urban growth is a consequence of the rapid economic growth that has accompanied the opening of the new bridge across the Mekong River to Laos, the expansion of Nakhon Phanom University, and the development of the Nakhon Phanom airport. Students attending the university, which has campuses in both Nakhon Phanom Municipality and That Phanom district town, have created a strong demand for new housing. The airport, which is located in Na Sai Subdistrict, on the outskirts of Nakhon Phanom City, was opened in 1977. It has recently undergone a major expansion so it can serve as a transit point for passengers bound for neighboring countries via the new bridge. It also serves as the home base for Nakhon Phanom University's International Aviation College. Many restaurants, shops, and service enterprises have developed to serve the airport's users. As a consequence of the employment opportunities offered by the airport and associated businesses, the population of nearby communities has expanded, with new housing taking over land formerly used for agriculture. Also located in the subdistrict is the Nakhon Phanom Municipality landfill, which occupies approximately 12 ha in Ban Sukkasem. This facility receives an average of 70 tons of waste each

day. Located in close proximity to the landfill are a number of recycling businesses that occupy former farmland. Similar conversion of farmland to urban use is occurring in Ku Ru Ku Subdistrict. This subdistrict is home to the Nakhon Phanom Army Camp and the associated military hospital. Developers have bought agricultural land surrounding the camp to build housing for service personnel and hospital staff. The value of farmland has increased by as much as 30 times in 10 years.

Changes in the Costs and Benefits of Growing Different Crops

Much of the land use change in both districts has resulted from the conversion of land from other uses, especially natural forest, orchards, and rice paddies, to rubber. This change was accelerated after 2006, as the pioneer farmers, who had planted small areas of rubber during the early 1990s, began to earn high profits, which influenced neighboring farmers to also plant rubber on their land. The decision making of many farmers was more influenced by knowledge about rubber conveyed through their social networks, sometimes across the provincial boundary, than by government extension programs. According to interviews with rubber farmers, they heard about the success of rubber farmers in nearby Nong Khai and Bueang Kan Provinces. The increasing price of rubber and the higher cost of agricultural labor, which reduced the profitability of rice cultivation at that time, also provided farmers with an incentive to convert their paddy fields into rubber plantations.

Conclusion

The land use system in our study area is quite dynamic, with rapid changes of use occurring in extensive areas during the period of five years between 2006 and 2010. Two major changes in this study area are expansion of rubber and expansion of settlement areas.

Although at first glance it appears that rubber is expanding at the expense of all other uses, the reality on the ground is not so simple. It is true that the expansion of rubber plantations has often occurred at the expense of natural forests and paddy fields. Conversion of forest into rubber plantations is especially rampant in areas along the roads, where the population is concentrated. In both Mueang and That Phanom Districts, many farmers whose livelihoods were once dependent on diversified agriculture have become dependent on a monocultural system with concomitant instability due to variable product prices. However, this shift reflects the fact that farmers have become highly sensitive to price changes of their products and altered their land use accordingly. This would never have occurred when they were subsistence-oriented peasants. In the past, rice

was the most important crop for the Northeastern farmers. They all preferred to grow their own rice, even though it was a low-value crop, but now they are much more concerned with maximizing cash income from their land.

The change of various types of land use to urban settlements has affected an even larger area than that affected by the expansion of rubber. Rapid development of the local economy, especially of the commercial and service sectors in the towns and cities, has resulted in the conversion of large areas of agricultural land to urban settlement. Many farmers who sold their land to urban developers have left the agricultural sector and become dependent on non-farm income. Such a change from farmland to urban settlement uses, because it is essentially irreversible, may have greater long-term impacts on land use than shorter-term conversion of land from one crop to another.

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References

Land Development Department. 2010. Soil and Land Use (Including Aquaculture) Maps for Each Province at a Scale of 1:100,000, Compiled at 1:50,000. Bangkok.

Methi Ekasingh เมธี เอกะสิงห์; Chanchai Saenchyosawat ชาญชัย แสงชโยสวัสดิ์; Pongdhan Sampaongen พงศ์ธนว์ สำเภาเงิน; Pinpeth Sakulsongboonsiri ปิ่นเพชร สกุลส่งบุญศิริ; Phraphassorn Pansompong ประภัสสร พันธ์สมพงษ์; Charit Soomham ชาฤทธิ์ สุ่มเหม; Wattana Pattanathaworn วัฒนา พัฒนาถาวร; and Chatnapa Prommanon ฉัตรนภา พรหมมานนท์. 2005 (2548). Rabop sanapsanun kan wangphaen chatkan sapphayakon phuea kan kaset lae kan borikan raya thii 1 phaak nuea tambon: kan chai sapphayakon kae rabop sanapsanun kan tatsinchai (rabop klang) ระบบสนับสนุนการ-วางแผน จัดการทรัพยากรเพื่อการเกษตรและการบริการ ระยะที่ 1 ภาคเหนือตอนบน: การใช้ทรัพยากรและระบบการตัดสินใจ (ระบบกลาง) [Decision Support System for planning of agricultural resource management and services 1st phase upper north Thailand: Resource utilization and decision support system (the core system)], Faculty of Agriculture, Chiang Mai University, A Final Report of a Research Project no. NIG45006, submitted to the Thailand Research Fund (TRF).

Indonesia's Changing Political Economy: Governing the Roads

JAMIE S. DAVIDSON

Cambridge: Cambridge University Press, 2015, xvii+292pp.

Jamie S. Davidson's *Indonesia's Changing Political Economy: Governing the Roads* starts by raising an intriguing question: "How does a weakened democratic government with a checkered past of economic property rights and contracts establish a regulatory framework to promote private sector investment in infrastructure?" (p. 8).

Let us review the discussion along the path laid out in the book. According to the introductory chapter, while conventional discussions underscore that a regulatory regime would induce private investment, the author asserts that a balance between institutionalizing rules and government discretion, in other words sectoral governance, is essential for private investment. This is, he insists, a political question (p. 15). Setting out the book's conceptual framework in Chapter 1, the author treats toll roads not as a technical matter but as a product of conflicts and compromises. To do this, he attempts to apply the New Institutional Economics (NIE) discussions that underlie formal institutions as constraints in transaction costs.

However, Davidson finds that formal institutions in developing countries are weaker and more susceptible to powerful interests (p. 29), and that the NIE-based approach fails to take into account the informal aspects of governance. Broadening the NIE's scope of analyzing formal institutions, the author takes the wider approach of "*political sociology of infrastructure development*" (p. 29). He focuses also on the NIE's blind spots, such as variations in rent-seeking outcomes with prevailing firms' incentives, extra-parliamentary politics of redistribution in the post-enactment phase, and the land rights of citizens, not of investors, by way of shining a light on the contested nature of the eminent domain.

Chapter 2 illustrates how the New Order's governance of toll roads changed twice. The first occasion was the emergence of former President Soeharto's children in the late 1980s. As Jagorawi Toll Road was financed by the government and international agencies, the private sector was still "poorly endowed" in order that "the state should be at the forefront of infrastructure investment" (p. 60) from the 1970s until the mid-1980s. However, once Soeharto's children emerged in the toll

road sector after the financial liberalization of the late-1980s, decrees sought to mediate between the first family and the state toll-road company, Jasa Marga (pp. 65–66). As a result, foreign investors rushed to businesses connected with Soeharto's daughter Tutut, one of which was known as CMNP. The second occasion was when the president launched the Trans-Java expressway project and divided its control into several concessions in 1995. The author raises four outcomes of the distribution: a high number of short-distance concessions, ideally positioned indigenous (*pribumi*) contractors who were dissatisfied with the government's preferential treatment of Sino-Indonesian businesses, "ghosts" and "shadows" in opaque holding structures of the project, and dubiously competitive auctions. Thus, sectoral governance had been clearly transformed into corrupt, or non-transparent, decision making.

After the Asian Economic Crisis in 1998, officials of the post-Soeharto government contended unsuccessfully with the stigma of corruption in the chaos of democratization, as Chapter 3 shows. In order to encourage private investment in the toll road sector, President Megawati signed the 2004 Road Act bill, which included the reform of sectoral governance, introduced as "best practice" upon the conditionality of the IMF and the World Bank. However, BPJT, a new agency to which the act relocated Jasa Marga's regulatory authority, was subsequently emasculated by the government's decrees and regulations (pp. 107–109). The Act also could not invalidate the concessions of New Order interests, such as Jusuf Kalla and Aburizal Bakrie. Megawati's successor, President Yudhoyono, who lacked military support, quickly moved to implement the act and accelerate land acquisition by issuing presidential decrees that were more "draconian" than the New Order's. Nevertheless, the internal squabbles of his Cabinet over finances caused a slowdown in disbursements.

Chapter 4 illustrates the political economy of the further delay of sectoral development in the Yudhoyono era. While there are investment risks inherent to the sector, illustrated by incidents such as the Bakries' Lapindo disaster and Tutut's CMNP debacle, informal collective action by business associations was partially successful in passing more pro-investor measures for special "revolving" funds for land acquisition in a Ministerial Decree (pp. 129–130). However, land purchases proceeded at a slow pace because local officials were reluctant to enforce them and clashed with central government officials. As a result, the latter recentralized the eminent domain with the 2012 Law on compulsory land acquisition, the implementation of which in turn brought further delay. Adding to that, populist parliamentarians threatened to "punish" the operators not only for the delay but also the worsening traffic conditions on Jakarta's toll road. Thus, Yudhoyono's dream of constructing a 1,600 km road was thwarted.

Another factor in the underperformance of the toll road in the post-Soeharto era was the concessionaires' reluctance, as discussed in Chapter 5. However, the author insists that rent seeking in the weaker government led to a wide range of outcomes. Political connections with the BPJT had negative consequences in the Kalla and Bakrie cases: in the former, the regulation was

retroactively changed to legitimize the sale to foreign companies and got a foreign investor as a result; in the latter case, not paying for the purchase of land showed a lack of the agency's capacity. Meanwhile, there was a positive outcome in the Jasa Marga case: political influence in debt servicing and privatization brought the firm high profits, which in turn induced investment. These various outcomes show the "failure of financing alternatives to take root." The concessionaires were afraid of the liberalists' idea of ending up relying on state capital and pursued their own interests, not national growth nor technical details of distribution. Thus, the chapter concludes that "Characteristic of the Indonesian toll road sector, power, interests and path-dependent trajectory have triumphed once more" (p. 197).

In Chapter 6, the author argues that local rather than national sources were the forces that favored road development, with some case studies of local politics that fall outside of NIE literature. The Solo-Semarang turnpike project was protested by the strongly motivated governor of Central Java as part of his legacy of a top-down approach, and local politics for *bupati* election and decentralization pushed his hand. The author observes that reformist-outsider leaders who opposed the inner ring road projects in the mega-cities were expected to contend with vested interests, namely, the Solo-born governor of Jakarta, Jokowi, and the non-politician Surabaya mayor, Risma.

The last chapter points out that private sector participation in infrastructure has not fared well. The following factors account for the poor record of economic governance and its inefficacy: weak and fragmented state institutions captured by predatory elite interests; business-government relations that vacillate from collusive to antagonistic; an incapacitated rule of law; economic nationalism; and an uncertain investment climate (p. 230).

Among the author's suggestions for policy implications, the foremost one is to overcome "a glaring inability to discipline the business class that will keep rule of law at bay" (p. 242). With this in mind, he concludes that the Java Expressway shows evidence of varying results—from regulatory progress to policy failure, from high growth to "jobless growth," from negative to positive rent-seeking outcomes, and from coercive enforcement to democratic deliberation of state policy.

I would like to point out some "cracks" in the exciting scholarly road paved by this book. First of all, Davidson shows how, and how far, politics has informed economic governance in Indonesia, so his main targets are Jasa Marga, BPJT, and corporate investment behaviors. The question arises, however: How far has the politics of governance shaped, and also how far will it shape, the outcomes of changing each corporation's perception, as assumed by NIE scholars (Aoki 2008; North 2015)? In the Bakrie case, to quote my interview with some Indonesian businesspersons, it is not Aburizal but his younger brother, Nirwan Bakrie, who has led the group business since Aburizal became committed to the politics of the business world in the 1980s. But the group's behavior has been under the control of Nirwan, a genius in financial management. The author convincingly points out that the complicated and opaque ownership structures of BTR "may have been intended to mask Bakrie's intention to use these assets to boost BTR's valuation in order to raise more funds"

(p. 177), considering Nirwan's capability. And the Bakrie group shifted its perception that finance with a large portion for the short term would be more beneficial for its business during the commodities boom.

Second, the author points out that finance has been a constraint in the creation of private businesses in developing countries, while environmental issues and noise level are issues in developed countries (p. 11), as evident in cases ranging from Soekarno's Jakarta-Bogor road to the World Bank's failure in financing alternatives. If so, alongside the discussion of weaker civil society, uncertainty and non-transparency in securing corporate finance should be discussed further to clarify how much state bank loans have been provided, and how political connections play a key role in securing such loans. More specifically, Jusuf Kalla played an active role in mobilizing the state banks' capital, as Chapter 3 (p. 117) describes. If so, it is much more important to explore Kalla's political connections with state banks and how he could have made the latter mobilize their capital for private interests. Similarly, in clarifying Aburizal's role in Bakrie's financing for roads, it is more appropriate to thoroughly refer to the dynamics of Aburizal's influence behind the government's commitment to Pawenang's decision not to nullify the bank loan deeds for SMR (p. 174).

Finally, Davidson views economic factors exogenously, but it would provide a more balanced view if he took into consideration state capital constraints and political dynamics. The book illustrates appropriation by vested interests, as the liberal Minister tried to do when he resisted firmly the business associations' plan (pp. 129–130). If so, along with state-led developmentalism (p. 242), more light should be shed on the political dynamics of state finances as part of a weak government's defense arsenal.

Despite the "cracks" above, this book enables us to grasp today's changing Indonesian political economy. First, the author offers this insight on the outcome of politics over economic governance: the weaker the government, the more penetrative the governance for private interests. And referring to "*the financialisation*" (p. 11) in the Indonesian business sector is insightful, as it suggests that state banks' finances are the principal means in the battle over—and against—rent seeking. Second, the author shows that there is some hope of change through the agency exercised by government officials. In the political economy of independent regulation agencies, the government has kept attempting to induce capital and protect investors' rights (see achievement of Pawenang of BPJT, pp. 118–119), against both of which in turn vested interests have triumphed. But now Davidson pays attention to how the new leadership of this state will change the momentum of governance politics.

Last but not least, the methodology of Political Sociology is insightful. Although lacking some points of view related to corporate finance as indicated above, the author succeeds in proving the dynamism of the political and social informality of institutions. The contributions of this book help in navigating the road toward a better understanding of Indonesian governance.

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References

Aoki, Masahiko. 青木昌彦. 2008. *Hikakukeizai-seido bunseki josetsu: Keizai-shisutemu no shinka to tagensei* 比較経済制度分析序説――経済システムの進化と多元性 [Introduction for comparative institutional analysis: Evolution and pluralism of economic system]. Tokyo: Kodansha.
North, Douglous C. ダグラス C. ノース. 2015. *Seido-genron* 制度原論 [Understanding the process of economic changes]. Tokyo: Toyo Keizai Shimpo-sha.

Rural Thailand: Change and Continuity

PORPHANT OUYYANONT

Trends in Southeast Asia, No. 8. Singapore: ISEAS–Yusof Ishak Institute, 2016, 31pp.

Rural Thailand is a slim, 25-page publication in the ISEAS–Yusof Ishak Institute's Trends in Southeast Asia series. The aim of the series is to "act as a platform for serious analyses . . . [that encourage] policy makers and scholars to contemplate the diversity and dynamism of this exciting region."

In this issue, Porphant Ouyyanont seeks to explain how and why Thailand's agricultural sector has remained such a significant player in the Thai economy, notwithstanding half a century of rapid and deep social and economic transformation. Not only does agriculture provide work for one-third of the Thai labor force and contribute significantly to national exports and output, but "rather surprisingly, village communities did not decline to the extent that one might have expected" (p. 2). In 1990 agriculture contributed 12.4 percent of GDP and 22.6 percent of exports. In 2014, almost a quarter of a century later, the respective figures were 10.4 percent and 17.8 percent. This, then, provides the context for the author to explore the "change and continuity" theme of the publication's subtitle.

Given that the paper is only a short exposition, it is inevitable that the discussion is generalized in tone and aggregate in formulation. This is a big-picture description of agrarian change in Thailand over the modernization period, one where ethnographic or regional detail is eschewed in the interests of marking out a wider case. The empirical material, which is secondary, and the argument are not new; what is valuable, however, is to have the argument encapsulated in this succinct and clear manner. If a policy maker or student wished quickly to get to grips with the evolution of the Thai agricultural sector over the last half century, this would be as good a place as any to start.

Part of the reason for the persistence of agriculture can be understood in terms of a shift from

farming as a way of life to farming as a business and the emergence of Thailand as a significant player in the global agro-food system, from frozen prawns to industrial chicken, high-value vegetables, and canned pineapple. This is the "change" element in the subtitle, one where Thailand's farmers have made the transition from peasants to agrarian entrepreneurs. But Porphant also states, "peasants showed a remarkable capacity to adapt to changing conditions while at the same time conserving their established patterns of behaviour and their particular mode of survival" (p. 23). This is the "continuity" part of the subtitle. The sustaining of the rural economy and village lives has been achieved by rural people embracing non-farm work and (temporary) urban living but without giving up their connections to natal homes. Households have been separated over space, but connections to the village and to land and farming remain surprisingly strong.

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Burma/Myanmar: Where Now?
Mikael Gravers and Flemming Ytzen, eds.
Copenhagen: NIAS Press, 2014, xiv+447pp.

Metamorphosis: Studies in Social and Political Change in Myanmar
Renaud Egreteau and François Robinne, eds.
Singapore: NUS Press in association with IRASEC, 2015, xiv+428pp.

Political developments in Burma/Myanmar in recent years have been so unexpectedly rapid, if spotty and at times inscrutable, that people both inside and outside the country are often hard pressed to keep track of what is going on. The pace of events explains both the need for the kinds of books under review here, books whose titles indicate the urgency with which the question of change presents itself, and at the same time the reason why they appear dated virtually from the moment they appear, given the unavoidable lag between the time of a book's preparation and its actual appearance.

The collection of pieces edited by Mikael Gravers and Flemming Ytzen appeared in 2014, whereas Renaud Egreteau and François Robinne's collection appeared in 2015. As a result, the former necessarily suffers particularly acutely from a reader's desire to pose the question "Yes, and then what happened?" To the extent that the book provides timely background accounts with which better to understand recent developments, however, it serves a very useful function. Its many parts, most of them short (even as short as just a couple of pages), catch readers up on a great range of topics that come to mind, or should, when thinking about a country that most of the

world did not think about for decades. So there are brief accounts of Burma's recent political thaw, its transition from colonial rule to independence, the major actors in current politics, the troubled relations between the authorities and the press, the role of monks, the situation of women, the vagaries of ethnic minorities' struggles against the Burman-dominated central government, as well as their struggles among themselves, the consequences of international investment, etc.

If the above list appears disheveled, then it conveys an impression the book itself makes. The editors have clearly had to keep in mind the nature of the series, the Nordic Institute of Asian Studies' Asia Insights, in which their volume appears, a series "aimed" (we read on the page facing the frontispiece) "at increasing an understanding of contemporary Asia among policy-makers, NGOs, businesses [sic], journalists and other members of the general public as well as scholars and students." That addressing this combined audience troubled the editors shows up in an odd admission they make on the first page of their preface, when they note that it has not been "easy to draw these diverse contributions together in a completely coherent volume" (Gravers and Ytzen, p. vii). They then provide a list of bullet points as to why someone should read the book.

As an academic, I am allergic to bullet points: they mark the divide between reflection and marketing, analysis and debating points, nuance and executive summaries. (Full disclosure: I also hate PowerPoint slides.) Nevertheless, I admit that in reading through all the pieces, I did indeed fill in many gaps in my knowledge of, say, the long-term and recent twists and turns in Karen history, or the complex (and for that reason particularly vexed) nature of Burma's citizenship laws. All of this information is useful and handy, providing a kind of reference guide to Burma's cascading acronyms, proliferating local conflicts, and apparently irresolvable political quandaries. If there is an overarching message the editors wish to convey above and beyond the book's purpose as a general but extensive background briefing, it appears in the final one of those prefatory bullet points, in which they promise potential readers that reading the book will help them "face up to the discrepancy between the current optimism and the many stumbling blocks" (Gravers and Ytzen, p. vii).

Still, by throwing up their hands, as they seem to have done, at the prospect of pulling the contents together more tightly, the editors have let the problem of repetition, and even occasional incoherence, go unaddressed. This may only bother readers who start at the beginning and read the book through. People who turn to it as needed when wishing to learn about a particular topic—such as prospects for peace in Kachin regions, or Buddhist nationalism, or economic development—may not be put off, and they will find much useful information, no matter whether they are policy makers, journalists, students, or scholars.

Egreteau and Robinne clearly did not need to shorten or package their contributors' articles to appeal to a broader audience. So their collection consists of a more conventionally scholarly, and so more reflective, set of essays, all written by people with fieldwork experience in the region and most of them able to speak Burmese to one degree or another.

Burma was so hard to get into for so long, due in large part to Ne Win's xenophobia, that study of the language languished for decades. Fortunately, John Okell and Anna Allott at SOAS, and Denise Bernot at INALCO in Paris, kept the flame alive for Anglophones and Francophones, respectively, and it is no coincidence that many of the contributors to this collection benefited from study with these distinguished teachers. (I should note that scholars in Germany, Russia, and Japan, among other places, also sustained the study of Burmese language and society during the long years of Burma's isolation. But none of them are represented in this collection—and indeed they are relatively little known in Anglophone circles.)

Because this volume went to press much more recently than Gravers and Ytzen's, it provides some answers to the questions the latter raises as to what happened next. Curiously, not all the answers are as downbeat as Gravers and Ytzen's warnings of "stumbling blocks" might suggest. In his analysis of the way that the military's appointed representatives to Parliament chose to conduct themselves from 2010 through 2015, thus from just before until after the transfer of power from military to civilian hands, Egreteau paints a surprisingly encouraging picture of their behavior. They did not position themselves as a monolithic block; they did not seek to involve themselves in most mundane decision making; and they entered into informal relations with their civilian counterparts. Egreteau thinks all of this might bode well for their eventual acceptance of diminished political authority—although in the final few paragraphs of his essay, he admits that such a development probably remains distant on the horizon. Focused on Parliament rather than the military's role in the country at large, for that matter, Egreteau is spared any obligation to consider how likely the military is to give up its extensive economic interests.

Alexandra de Mersan also points to encouraging signs in the development of real political dialogue in Rakhine, as instantiated in the late-blooming career of an elderly man elected to Parliament in 2010. This man, after an early, unfortunate foray into politics in the early Ne Win years, turned his attention to "Arakanese culture," a symbol of resistance to the junta, for decades, until the moment when doing politics again became permissible. That it then took the form of Buddhist nationalism makes good sense—but opens onto the ethnic violence that has so afflicted Burma's recent political history, since the people Arakanese (aka Rakhine) define themselves against are no longer Burman power holders but rather Muslims in their midst.

Jacques Leider presents a valuable, nuanced discussion of the background to that anti-Muslim violence, demonstrating how thoroughly distorted all accounts of Rakhine history have become in light of the agendas diverse actors bring to their treatment of the past. The much-disputed term "Rohingya" is a relatively recent one, he shows, although Muslim spokespeople have found great advantage in labeling all Muslim residents of the region with that term. Buddhist residents want, on the other hand, simply to write all Muslims out of the region's history, seeing them exclusively as recently arrived from the West. Leider makes clear that imposing categories retroactively and rewriting history ad libitum constitute so many incitements to violence. He also implies that

outsiders who take any of the parties' renderings at face value (including those people trying to help the most victimized) fail to carry out due diligence.

Kachin State is the location of still more violence, although in this case between the national army and ethnic rebels, as reported by Carine Jaquet. Her analytic frame focuses on contrasting narratives of Kachin ethnicity, but in the welter of competing parties the contrasting narratives seem to come down to whether leaders are really seeking people's well-being or only their own material interests. The Burmese army, meanwhile, offers very little by way of information, so hardly any narrative, as to what it seeks other than total victory. In the end, it all points to a familiar and depressing tale ("narrative") of greed, distrust, and endless suffering for people caught in ongoing warfare.

Jane Ferguson's essay on "the Shan" shows how complicated all matters concerning ethnicity really are, since residents of Shan State may or may not consider themselves Shan, may or may not speak Shan, and may or may not see advantages in increasing their interaction with Burmans and the Burmese state—although that seems clearly to be taking place. Shan who have taken up residence in Thailand, meanwhile, show a similar range of inclinations. Whether or not they intend to reengage with a country they had at one point given up on depends as much on their class status and the degree of cultural capital they possess (in Burma or Thailand) as any ethnic consciousness they may evince.

Maxime Boutry's essay on "Burman-Moken" identity in southern Burma is perhaps the most surprising one in the collection, since it shows how in recent years intermarriage among Burman men and Moken women has brought about a new hybrid identity, with new connections to markets, new political alliances, and new myths and rituals all following as a result. Boutry suggests that noting those developments clearly might help us see interethnic interactions in other regions of the country as more complex and more dynamic than we are accustomed to assume, as well.

If ethnic labels are more flexible than we used to think—and we are put off by some people's opportunistic insistence on their rigid definition—we can only hope that both Burmans and other citizens of the country will develop a vigorous but also sensible politics, one that promotes the interests of the country's poor. Elliott Prasse-Freeman looks into this question in his essay, examining a number of forms political protest has taken in recent years. Noting how many retrograde elements mix in with what might seem progressive ones in much that he observed, he appears to conclude that the possibility for seeking justice is there but that there is no guarantee it will win out.

Perhaps education reform holds out the best hope for such a development of an effective, democratic politics, dedicated to everyone's welfare. Rosalie Metro believes that critical thinking can indeed replace rote memorization as the heart of educational method in Burma, and that threats of violence, ethnic and racial stereotyping, and a lack of commitment as well as a lack of resources can cease to be the order of the day in Burma's schools. Atypically upbeat about this possibility of

change, she insists that many teachers and students understand what critical thinking looks like and are acting on that understanding to put it into practice. Only toward the end of her essay does she admit that the obstacles are indeed enormous and that one can only hope for incremental change over the long term.

Comparable to the military régime's neglect of the country's educational network was its inattention to public health. Céline Coderey's account of how health care is delivered to people in Rakhine State is as a consequence unsurprisingly grim. Not only is access to biomedicine extremely limited—there are too few facilities and too few trained personnel, and it costs too much for poor people to take advantage of what facilities and personnel there are—but there is also great reluctance on the part of many people to turn to biomedicine in a timely manner, or to do so in the case of certain ailments deemed inappropriate to such treatment. As a result, mortality rates are needlessly high for infants, for mothers, and indeed for everyone except the wealthy few who can go to Rangoon in search of better health-care options.

The four remaining essays all treat various people among Burma's outliers. These include people on and beyond the country's physical and political margins in Susan Banki's report on transnational activists. They also include Burma's Buddhist monks, discussed by Bénédicte Brac de la Perrière, and nuns, discussed by Hiroko Kawanami. Finally, and most problematically, they include Burmans' others, whether Indian, Chinese, Muslim, Christian, Kachin, or Karen, among others, as Robinne discusses in his closing essay.

Banki's account, based on interviews she conducted with activists in Burma, on its borders, and farther afield, stresses activists' "precarity," both in host communities (where they may well lack all legal protections) and in Burma (where just how much protest will be tolerated remains altogether unclear). As political conditions inside Burma appear to normalize, foreign support for activists is waning—perhaps prematurely. How safe it might be for individuals to return to their places of origin in Burma is rarely clear. Part of the frustration that accompanies Burma's "transition" is that even though things are certainly getting better, uncertainty and so mistrust and disarray remain prevalent.

Ambivalence toward women who wish to pursue a religious vocation, we know from Kawanami's earlier work, runs deep in Burma. At this point, they confront a number of choices: to fight for the reinstatement of their ordination on an equal footing with monks (as nuns have been doing in Sri Lanka, Taiwan, and Thailand); to pursue scriptural learning in parallel to some monks and/or to undertake rigorous meditation, augmenting in either case impressions of their otherworldly commitments; to engage to a greater degree in social work, thereby fulfilling a role many people think appropriate for them as women yet one that is likely to compromise their standing as truly otherworldly.

The great value of Brac de la Perrière's contribution is that it goes a long way to resolving a puzzle many outsiders remark upon in Burma's recent history, namely, the apparent contradiction

between the many laudable actions monks have undertaken, such as spearheading relief efforts after Nargis devastated the Delta and defying the military during the "Saffron Revolution," and the hateful rhetoric and incitements to violence monks have unleashed upon Muslims. Brac de la Perrière notes that there is no contradiction: monks, whose prestigious position was assured during the years of military rule, are uneasy about what the democratic transition may mean for their place in a changing Burma, and all of their actions are so many soundings as to how they may retain or even augment their authority in what she refers to as "the new game."

In his brief but passionate closing essay, "To Be Burmese Is Not (Only) Being Buddhist," Robinne bewails the trend toward rigidifying rather than effacing ethnic divisions, and divisions based on religion, that appears to be proceeding apace in Burma. He notes how the hopelessly complex variety of identity cards tangles together ethnicity and religion, such that being Muslim is assumed to mean that someone is Indian, although they might well be of Chinese origin. Christians among ethnic minorities, meanwhile, fracture into competing congregations while finding it hard to amalgamate across ethnic lines. Indeed, "Kachin" consciousness waxes and wanes: the period from the signing of a ceasefire in 1994 until its abrogation by the military in 2011 saw a reversion to less encompassing notions of community, whereas intensified warfare, as continues up to the present, heightens a sense of "Kachin" solidarity. Yet Christians, while subject to military attack, do not suffer the sorts of rhetorical attack, in addition to physical violence, that Muslims suffer so much in today's Burma. Robinne remarks, sadly, that such attacks are not actually anything new in Burma: Muslims have simply been singled out as the latest target.

The two books under review differ inasmuch as the volume edited by Gravers and Ytzen is intended as a handbook to bring all interested readers up to speed on Burma's many challenges—their contexts, their origins, their recent vagaries—whereas that edited by Egreteau and Robinne addresses specific subjects in more scholarly depth. Each book has its uses. Together, they provide a panoramic and clear-eyed, if cautionary, view of a country facing daunting problems, no matter how great the relief we all feel at its recent shift from military to civilian rule.

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Tulong: An Articulation of Politics in the Christian Philippines

Soon Chuan Yean

Manila: University of Santo Tomas Publishing House, 2015, xvii+275pp.

The dominant analytical framework of elite rule in the Philippine local politics has been the patron-client relationship and machine politics in which politicians provide *tulong* (help) to the poor and

the poor return the debt with their votes. Criticizing the dominant view of pragmatic and functional exchange of material benefits as being too narrow, Soon Chuan Yean argues that the relationship between politicians and ordinary people entails a moral and religious dimension in which the poor have agency to negotiate with politicians from the bottom up. His methodology to support his argument is in-depth fieldwork to explore "the clients'" viewpoints based on their everyday struggle in Tanauan City, Batangas.

Chapter 1, "Layering the Level of *Tulong* (Help) from the Peasantry," examines the "Janus-faced" characteristics of the patron-client relationship in Tanauan. The local political landscape is very similar to the arguments of patron-client relations and machine politics. Local politicians subordinate and manipulate the poor though material benefits, fraud, violence, and coercion. However, moral order also exists between them, in which the poor negotiate with the elites. Even though the poor receive help from the elites, they are not always subordinated to their patrons because the poor scrutinize politicians' *loob* (inner being) and authenticity of *tulong*. Through such moral judgment, the poor determine whether they support a politician, receive benefits without supporting him/her, or cast a vote for a rival politician.

Chapter 2, "The Research Setting," introduces the physical landscape of the main field site, Barangay Angeles, Tanauan City, and how the author collected data as a Malaysian researcher. The chapter also describes how ordinary people in the villages struggle for everyday subsistence.

Chapter 3, "Reaching the Popular," explores the moral order between politicians and ordinary people beyond a mechanical exchange of money and votes by examining the discourse of development in local politics. For local politicians, money is not sufficient to win the hearts and support of ordinary people. They are required to project their *loob* as righteous and *tulong* as unselfish sacrifice within the framework of moral order while blurring the hierarchal gap between the rich and poor in order to capture the sentiments of the people. In other words, politicians and constituents actively negotiate within the moral order.

Chapter 4 "Locating a Language of Emotion in Popular Politics," discusses how ordinary people scrutinize whether politicians' help comes sincerely from their *loob*. Only when ordinary people believe in the righteousness of politicians, the latter's act (*gawa*) is recognized as *tulong*. For ordinary people to have the ability to appropriately scrutinize acts of politicians, *lakaran* (journey) and *sariling sikap* (self-initiative) to discipline and purify their *loob* is important. The negotiation of *loob* between a politician and ordinary people produces different outcomes. When ordinary people feel harmonization of *loob* transcending the hierarchical gap, they are emancipated from *utang* (debt). On the contrary, if harmonization of *loob* is not achieved, a politician's acts are not recognized as *tulong*. This is the situation of *pulitilka* (politics) equated with spoils and blank promises in the game of personal interests.

Chapter 5, "Religious Ideas in the Politics of Moral Order," explores the religious background of moral politics over *tulong*. Ordinary people associate *tulong* from God with *tulong* from a politi-

cian. They believe that those who help the needy along a *matuwid na landas* (straight path) will be blessed with *liwanag* (light), and those who reach *liwanag* must circulate this *liwanag* though their sacrifice of giving *tulong*. Such mutual help represents equality of people before God and breaks down the hierarchy. In the religious framework, politicians are morally required to act as Christlike leaders who are willing to sacrifice themselves for the salvation of the weak from miseries, without any vested interests. Ordinary people's ultimate aim in submitting themselves to a politician is not any material gain but freedom from darkness and constructing a society where everyone is treated equally.

The Conclusion emphasizes that ordinary people's submission to a saintlike patron is a strategy to escape from the debtor's position. Therefore, the author concludes that "politics of *tulong* is a process of negotiation of power to transform the patron-client relations into an equilibrium of the *loob*" (p. 240).

I believe that the book makes three major contributions to Philippine political studies. First, Soon radically reexamines the interest politics of material transactions between politicians and the poor from the perspective of moral politics based on a religious worldview. This does not mean that previous studies on the patron-client relationship entirely ignore its moral aspects, but they emphasize that the poor who receive help from a politician inevitably embrace *utang na loob* (debt of inner being) as a moral obligation to be paid back in the form of political support. In contrast, Soon insists that even though politicians are superordinate to the poor in interest politics, the poor actually have the agency to force politicians to provide sincere help to the needy in moral politics.

Second, Soon makes his argument convincing by introducing the unique analysis that bridges studies on local politics and folk Catholicism. The two topics have been separately discussed by scholars in different fields, and this division has prevented scholars from fully exploring the moral and religious aspects that characterize interaction between local elites and the poor. For the marginalized, the choice of asking help from a politician or God in order to overcome everyday hardships would be analogous but not the same, because God is perfect while politicians are often dubious. The difference gives moral power to the poor to scrutinize politicians and induce them to behave morally.

Third, with the religious analysis, Soon successfully sheds light on the emancipatory moment in moral politics. He disintegrates the concept of *utang na loob*, which has been analyzed to highlight the poor's submission to elites. Rejecting the dominant view, he points out the tension between *utang* and *loob*: while the former is associated with the economic debt that subordinates the poor, the latter is marked by the poor's desire to attain an authentic self, namely, freedom. Help from an ambitious and devious politician further subordinates the needy, but *tulong* from a politician with good *loob* can lead to a harmonization of *loob* that transcends the hierarchy of a patron-client relationship. Therefore, even though ordinary people are trapped in a vertical patron-client relationship, their behavior and decision to seek freedom of *loob* can realize horizontal mutu-

ality in moral politics.

Considering that Philippine political studies have been dominated by various versions of elite democracy arguments such as patron-client relations, machine politics, and patrimonialism, these findings of the book are a great contribution, especially in highlighting the moral agency of the poor that challenges the elites' control. However, I cannot help questioning whether the freedom of *loob* in moral politics can really be emancipation for the poor.

First, I regret that Soon does not further elaborate the complicated interaction between moral politics over the definition of "good" and interest politics over the distribution of resources. Freedom of *loob* in moral politics means neither economic emancipation nor the disappearance of social hierarchy in interest politics. I wonder whether the voting behavior or "resistance" of the poor who seek salvation of *loob* has had any impact on improving unequal distribution of wealth or paradoxically perpetuated the elite rule that exploits them. If the latter is the case, freedom of the *loob* that the poor enjoy as a result of "resistance" in moral politics has an ironic implication for interest politics.

Second, although Soon evaluates the poor's appreciation of moral leadership as "resistance," it may actually signify penetration of the elites' hegemony over them. We are familiar with cases where ambitious politicians exploit moral discourses and images to woo votes of the poor. Sometimes the poor are skeptical over politicians' morality but still support them in order to maximize their own economic benefit. However, if the poor truly appreciate the moral discourses and behaviors of ambitious politicians, it may imply that the poor are actually subjugated by the latter's hegemony. I am afraid it might be a paradox that while Soon tries to figure out the agency of the poor, his study might implicate their further hegemonic subjugation.

Finally, the poor cannot always enjoy the initiative in moral politics, especially at the national level. The urban middle classes who uphold the morality of neoliberalism totally criticize the patron-client relationship as a corruption that has damaged national development. They believe that hard-working taxpayers are morally superior to the poor, who are dependent on handouts from corrupt politicians. Moreover, the state's and NGOs' attempts to uplift the poor through moral education via conditional cash transfer programs assume the cause of poverty is the poor's lack of morality. Against the moral marginalization, the poor may be utilizing another form of moral discourse that even rejects a patron-client relationship. For instance, in the 2016 presidential election the number of poor that supported Rodrigo Duterte, who appealed the moral discourse of discipline, was bigger than those who voted for Jejomar Binay, who exploited morality in the patron-client relationship. It needs careful examination if many of the poor only avoided Binay who seemed to have a dubious *loob* or entirely rejected traditional politics based morality of patron-client relationship.

As a scholar who also works on moral politics in the Philippines, I attempted a critical engagement with the new findings of the book, but I know that some of the criticisms I have made in this review are beyond the scope of the book and must not lower its value. I expect that studies on

moral politics in the Philippines will further develop from the book, which will give us a new understanding of Philippine politics beyond the elite democracy arguments.

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Tropical Renditions: Making Musical Scenes in Filipino America

Christine Bacareza Balance
Durham: Duke University Press, 2016, xviii+230pp.

Tropical Renditions by Christine Bacareza Balance tracks the sounding of Filipino America through its social and cultural geographies of popular music. These geographies traverse three conceptual boundaries that have long constricted the critical understanding of popular music and culture from the United States to (and through) the Philippines: the geopolitical distinction between nation-states; the sensorial separation of visual and sonic forms of cultural production; and the social-aesthetic divisions of music-making as creation, interpretation, and imitation. Assuming a conceptual stance of "disobedient listening," Balance redraws these boundaries by resisting conclusions made by two discourses dominant in racial-cultural politics. The first, a holdover from imperial colonialism, reads Filipino music as mere mimicry through the lenses of visibility and authenticity. The second is its antithesis: a nationalist project that seeks to render Filipino culture visible through a formalistic categorization of its content as culturally distinctive. Rather than parse what Filipinoness means in light of this essentialist problematic, Balance instead tunes into what is made as Filipino in America through the performative, improvisatory, and participatory, in translocal and alternative spaces of community that continually "[unsettle] dominant discourses of race, performance, and U.S. popular music" (p. 26).

To accomplish this, Balance analyzes four case studies frequently misread or unread by colonial as well as nationalist perspectives on Filipino American popular music. The first chapter is a profile of Invisibl Skratch Piklz, a turntablist-DJ collective from the Bay Area whose futuristic musical aesthetic and artistic branding resist direct reference to their Filipino heritage. The second chapter contemplates karaoke from two disparate ends of Filipino American musical labor—performance art and social activity at house parties—to foreground its ability to generate alternative spaces of socialization and vocal pedagogy. The third chapter explores the musical oeuvre of the renowned Filipino American writer Jessica Hagedorn, whose collaboration with the multiracial and multi-genre collective the West Coast Gangster Choir produced a rich rock 'n' roll poetics of Third World immigrant subjectivity in the late 1970s and early 1980s. In the final chapter, these themes of translocality, sociability, and performativity are located in two cultural histories of Pinoise

rock, pop, and hiphop from around 1995 to 2012: independently-run Filipino-American music festivals in the Bay Area and the overseas performance mobilities of Manila-based indie bands and films making their way through gig and festival circuits in various US cities.

By and large, Balance succeeds admirably in meeting her intellectual objective of "flipping the beat" of cultural analyses of Filipino America. By shifting her scalar focus from the bipolar model of the nation-state ("America" versus "the Philippines") to the heterogeneous terrain of urban and suburban locales—in New York, Daly City, San Francisco, Manila, and Olongapo—the work registers the significance of performative musical practices that would otherwise be ignored by the dominant scholarly preoccupation with what is categorically and authentically "Filipino." Likewise, Balance ably demonstrates the necessity of a phonographic approach attentive to music's "sonic, literary, visual, and bodily" (p. 19) aspects, particularly through the chapters that bookend her case studies with close readings of films, documentaries, and photographs that address the peculiar contradictions of Filipino invisibility and foreignness in the North American cultural imagination. The assortment of popular music personages and practices offered in the book helpfully expands the scholarly purview of what count as legitimate subjects of study in diasporic and migrant music, eschewing explicitly racialized forms in favor of marginalized circuits and communities that continually re-inscribe "new affiliations, politics, and ways of thinking" about/through race and identity (p. 28).

Beyond tangential mentions at each chapter's close, however, the deeper interconnections and implications of these affiliations, politics, and ways of thinking remain relatively unexplored. One wonders how the greater import of these case studies could have been more strongly delineated had they been compared with one another rather than presented serially as alternative examples to the limiting tropes of both scholarly and popular cultural criticism. Though a comparative internal synthesis could draw from the many intriguing lines of inquiry sketched throughout the work, two themes that cross-cut Balance's case studies—translocality and, to a lesser extent, temporality—present a promising itinerary for developing the intellectual agenda of listening disobediently not just *against*, but *toward*, a tropical rendition of race, place, and identity in the performative register of popular music.

First, an in-depth notion of translocality as a socioeconomic and institutional dynamic is implicit, but never comprehensively addressed, in Balance's accounts of music-making sites across various cities and communities in the Philippines and the United States. There is something of a missed opportunity to articulate how these micro-geographies of performance intersect with what Georgina Born (2012) calls the other planes of musical mediation. Born identifies four interrelated contexts of activity and signification in the mediation of music: the first involves the physical, affective, and embodied dimension of performance; the second pertains to publics of belonging aggregated by the participation in the first plane; the third refers to music's stratified formations of sociocultural through and beyond the second; and the fourth indicates the industrial and institutional

conditions that enable (or discourage) certain processes of musical production. The idea of a US-Philippine musical translocality in *Tropical Renditions* is configured primarily according to the first, second, and third planes of mediation—the intimate socialities of musical participation and genre culture-formation through the performative practice of "Filipinoness"—but does not confront the ways in which this rich sociospatial diversity of DJ contests, house parties, poetry readings, community events, arts festivals, and club gigs might be mediated by a broader translocal context of musical consumption and production. For instance, how are the listening practices of fandom that informed Jessica Hagedorn's performance as rock 'n' roll poet shared by those that animate the stylings of Filipino families enjoying karaoke—and how does this labor of listening subsequently accrue differential value in the purported spatial divide between public performance and private enjoyment, through the performativities of guerrilla "art" and mainstream "leisure"? How do the spaces of the DJ contest and the international industry festival legitimate the labor of Filipinos as performing artists, circulating a persistent, hegemonic ideal of artistic value—whether or not they are explicitly branded according to their racial-national identity? Are there qualitative differences between the performance mobilities of Pinoise and other, more overtly Filipino, artists in the mainstream and traditional categories, which emerge in the translocal space of the Filipino-American city and perhaps attest to the valence of popular music by Filipinos as a cultural export to the United States? In answering the latter, Balance makes a critical distinction between a *community* and *scene*, similar to Born's differentiation between the second (genre-based) and third (identity-based) planes of musical mediation; taken further, such a nuancing adds much-needed precision to the understanding of translocality as encompassing different, and not always congruent, scales and spaces of affiliation.

Second, Balance's study offers a unique space from which to contemplate a temporality that emerges in the translocal geographies of music between the United States and the Philippines. Balance's prose thrums with a vitality and contemporaneity appropriate to the subjects of its study. What emerges in these translocal scenes—that listens against predictable tropes not only of place but also time—as life stages, generations, and epochs? Among these modes of disobedient listening, are there perhaps contrapuntal rhythms to be perceived between (for instance) the "Filipino futurism" of Invisbl Skratch Piklz's sonic abstractions and the ever-replenishing nostalgia of Filipinos' karaoke singing; or the generational differences between current Pinoy indie music acts and the throwback appeal of traditional and mainstream Filipino performers, within the US translocal and diasporic context? How might these contradictory rhythms flip the beat of what we perceive as the continuing history of US-Philippine relations? While these questions are yet to be addressed in a more direct and thematic way, *Tropical Renditions* offers a script from which to begin rehearsing a multiscalar phonography of place, race, and music that is "alien, experimental, archipelagic and moving" (p. 186)—that is, relentlessly and productively disobedient.

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References

Born, Georgina. 2012. Music and the Social. In *The Cultural Study of Music: A Critical Introduction*, edited by Martin Clayton, Trevor Herbert, and Richard Middleton, pp. 260–274. New York: Routledge.

The Hybrid Tsinoys: Challenges of Hybridity and Homogeneity as Sociocultural Constructs among the Chinese in the Philippines

Juliet Lee Uytanlet

Eugene: Pickwick Publications, 2016, xx+261pp.

How do present-day Tsinoys (colloquial term for Chinese living in the Philippines) self-identify? How can Christian churches in the Philippines use this knowledge to better carry out their mission to Christianize them? These are the two main questions that drive this latest work on the ethnic identities of Chinese in the Philippines. Sub-questions include: Do they see themselves as "Filipinos," "Chinese," or cultural hybrids? What factors help them to identify more with one identity than another? Divided into six chapters, *The Hybrid Tsinoys* specifically focuses on Chinese and Chinese mestizos in Manila and utilizes an ethnographic method (e.g., conducting surveys, using participant observation) to analyze how 86 respondents of varying gender, class, immigration status, religion, and generation understand, negotiate, construct, and reconstruct their ethnic identities.

Chapter 1 spells out the aims, goals, research methods, significance, and limitations of the study. It also has a section on the definition of key terms and a review of related literature. The second chapter provides an overview—from the Spanish colonial period to the present—of how Chinese and their family members have been categorized and racialized. It demonstrates how through time the local population and the state "liked and disliked, welcomed and unwelcomed" them (p. 55). Chapter 3 discusses the different theoretical frameworks on ethnicity used for the study. Examples include Jan Nederveen Pieterse's concept of hybridity and Fredrik Barth's situational identity model. Chapter 4 can be considered the "meat" of the study, in which the author presents the results of her investigation. She divides the respondents into six categories: Old Immigrants (OI), New Immigrants (NI), Tsinoys, and first-, second-, and third-generation Chinese mestizos (CM1, CM2, CM3, respectively). Accounts that are included in this chapter include how the OIs viewed the NIs, how Tsinoys encountered resistance from family members to date or marry Filipinos, how CMs of different generations self-identified, and how Tsinoys experienced living as an ethnic minority in the Philippines (as well as abroad for those who emigrated). Uytanlet

also lists the five factors that affect the construction of an ethnic identity: parents, school, friends, environment or location, and will factor.

Using data gathered from the study, Chapter 5 analyzes the ethnic identifications of the informants. The author concludes that her subjects, constantly shaping and reshaping their identities, can be considered "constructivists" rather than "primordialists." Furthermore, those who intermarry with Filipinos, along with their offspring, tend to become more "Filipinized," although efforts are made within most households to retain some Chinese cultural practices or traditions by sending the children to Chinese schools. The last chapter is aimed primarily at discussing how the study can benefit Christian churches or organizations in the Philippines. Having demonstrated that modern-day Christian Chinese, like their earlier counterparts, practice a kind of "syncretic" Christianity, the author echoes the missionaries' call to "evangelize, re-evangelize, and/or disciple the Chinese Filipino Roman Catholics and Protestants to become authentic believers and faithful followers of Jesus Christ" (p. 180). Apart from these six chapters, the book contains appendices that include a chart with information about the respondents, a short history of Chinese mestizos, and the rise of ethnocentrism in China.

The rich ethnographic details in this study provide new and interesting data for historical and anthropological studies. For instance, it is rarely known nowadays among the younger generation that *kabise* also was a word used to refer to the Chinese. The word is derived from the Spanish *cabeza*, meaning "boss" or "head" (of a company or business). The first time I learned about the word being used was when, several years ago, my mother told me that in Tarlac—a place where she grew up, located approximately 100 kilometers north of Manila—people referred to Chinese as "kabise." However, she explained that the word was derived from the Minnan words *kap-yi-se*, which literally mean "to speak to him." Hence, a kabise was a Chinese boss whom one approached to discuss an important matter. As we know the original usage of this word from Uytanlet's work, the term as it was used elsewhere can be regarded as an instance of people appropriating the meanings of foreign words to make them their own.

Another example of how this study enriches our knowledge of the history of Chinese in the Philippines is found in the account of one respondent named Bee-hua. She met her Chinese Filipino husband in China, and when they decided to flee China after the Communist takeover in 1949, her Filipino mother-in-law falsified her papers so that she could come in as her daughter who was born in China. In other words, Bee-hua became her husband's sister. This phenomenon of paper daughters coming to the Philippines is little understood in the history of Chinese in the Philippines and can be an area of future study. Another interesting finding in the study is the practice of endogamy that persisted over time. In particular, daughters of Chinese Filipino households, whether Chinese or Chinese mestiza, are often married off to fellow Chinese. My own study of Chinese merchant families in Binondo in the latter part of the nineteenth century demonstrated that Chinese men who married local women preferred Chinese mestizas. The female mestizo

offspring of such unions also were often married off to Chinese men. Thus, a pattern can be seen in which daughters repeated the practice of their own Chinese mestizo mothers of marrying back into the Chinese community, thus slowing down the "indigenization" process of such families when traced matrilineally. A similar pattern of Chinese mestizo daughters marrying Chinese men can be seen in the matriline of the respondent named Halley. Halley is a Chinese mestiza whose mother, grandmother, and great-grandmother—all Chinese mestizas like her—married "pure" Chinese men. These women's lives thus challenge the traditional narrative of Chinese mestizos becoming Filipinos over time, as advanced by scholars such as Edgar Wickberg and Antonio Tan. Their histories also show that Chinese families utilized and continue to utilize their women to uphold Chinese patriarchy by opposing intermarriage with Filipinos while allowing their Chinese or Chinese mestizo sons to marry Filipino women.

My only quibble about the book is that structurally, it could have been edited so that it does not read like a dissertation. Also, it seems problematic for the author to use perspectives and approaches from cultural anthropology and ethnic studies that are critical of "regimes of truth and power" to create homogenized and monolithic identities, then conclude at the end of the book that Christian churches need to find ways to re-evangelize their followers so that the latter become "true" Christians. These shortcomings aside, the study has much to offer to scholars of ethnicity in general and the history of the Chinese diaspora in the Philippines in particular.

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Siege of the Spirits: Community and Polity in Bangkok

MICHAEL HERZFELD
Chicago: The University of Chicago Press, 2016, xii+267pp.

Heritage is not the first thing that springs to mind when people think of Bangkok. Rather, modern skyscrapers, traffic snarls, glitzy shopping malls, chaotic markets, red light districts, and ornate temples dominate its popular image. Yet, the city's pulse beats strongly in vibrant pockets of life that are often hidden amidst the urban sprawl. These distinctive localities give Bangkok a richness and complexity that make it one of the most fascinating cities in the world. Michael Herzfeld's new book focuses on one of these neighborhoods, Pom Mahakan—a tiny community of 300 people adjacent to the fortress built in 1783 after which it is named. For almost 25 years, city authorities have attempted to evict the community's residents in order to replace Pom Mahakan's artisans and traditional wooden houses with a public park paying tribute to the monarchy and nation.

Although heritage conservation policies have existed since the early twentieth century, these

efforts have been directed primarily toward monuments, temples, buildings, and sites of royal significance (Askew 1996, 190). Simultaneously, local neighborhoods or urban communities (*yarn*) "have borne the brunt of the urban changes" as the city undergoes increasing development and modernization (*ibid*., 194). *Siege of the Spirits* is therefore a significant contribution to the scarce literature on heritage and urban conservation in Bangkok. Herzfeld's focus on grassroots activism is particularly important, as local public participation has crucially been lacking in this area in Thailand (Tiamsoon 2009). One of the few recent examples that does exist is the major public outcry over plans to demolish the Art Deco Lido and Scala movie theaters, two unique and well-known Bangkok institutions. However, in general there are a lack of financial incentives combined with lack of enforcement of conservation laws, meaning there is little to prevent Bangkok's historic monuments, buildings, and neighborhoods from fading away.

In the first chapter of the book Herzfeld introduces the large cast of actors involved in the conflict, including the bureaucrats of the Rattanakosin City Project, the Bangkok Metropolitan Authority (BMA), NGOs, activists, political figures, academics, students, foreign and middle-class supporters, and more. He also describes the circumstances of his initial contact with the Pom Mahakan community, as well as the trust that he gradually earned from the residents and relationships that grew from his involvement in their struggle. This engagement included getting to know leaders and residents of the community, attending protests, writing op-eds and letters to politicians, speaking to journalists on behalf of the residents, and even making signs to help attract tourists to the neighborhood's museum spaces.

In their efforts to survive, residents strategically focus on making the claim that the community is a microcosm of the Thai nation and its Buddhist heritage. In the second chapter, Herzfeld explores the notion of Pom Mahakan as a miniaturized version of the nation in further detail, arguing that such a perspective provides clues not only to the nature of Pom Mahakan as a community but also to the nature of the Thai polity itself. This polity, according to Herzfeld, comprises two polities, *mueang* and *prathet*, the former the historical, galactic form and the latter the modern territorial nation-state (p. 44). Reproduced from the local to the national level, the *mueang* model of polity signifies a sense of community in contrast to the bureaucratic, clearly demarcated *prathet*. The key to the Pom Mahakan residents' strategy therefore lies in this reproducibility of *mueang* on multiple levels. This is captured in material form by the many shrines throughout the community. Residents connect the shrines with not only their own ancestors but also a past population that includes the original royal bureaucrats who settled in the area. Via this process, they render the space of the Pom Mahakan community sacred. This claim allows residents to "present themselves as guardians of a historically deep spiritual and national trust indexed and symbolized by the shrines," so that any attack on the community "becomes a disloyal and sacrilegious attack on the entire polity" (p. 53).

In Chapter 3 Herzfeld addresses the topic of urban beautification, arguing that it reflects a

class-based aesthetic that captures both a sense of "Thainess" as well as Western standards of modernity. He notes that while Pom Mahakan residents are not necessarily antithetical to these aesthetics per se, they did reject "any notion of urban beautification that was purely monumental and uninhabited by ordinary people" (p. 70). The chapter also includes a discussion of the Rattanakosin Island project that emerged from a campaign launched by the military dictator Sarit Thanarat, who was prime minister from 1957 to 1963. The controversial project focused on buttressing monarchic and national prestige at the cost of ignoring or destroying local architecture and ways of life. In response, the residents' projection of an image of rural romantic exoticism and preservation of tradition is used in a strategic manner to bolster the community's legitimacy.

The fourth chapter delves into the everyday details of the residents' struggle with the authorities. Examples Herzfeld draws on include an encounter involving residents and BMA officials regarding the removal of protest signs, a site inspection from the army and a delegation from the Fine Arts Department, and a meeting with the Department of Public Works. While the law is on the BMA's side, the residents have the moral advantage as caretakers and guardians of the historical site. A key legal element on which the BMA rests its case is the acceptance of compensation to relocate by some members of the community. Yet, Herzfeld points out that the terms of the compensation were ungenerous and proposed alongside the threat of forced deportation if the terms were not accepted within three days. Furthermore, after inspecting alternative settlement sites and finding them unsuitable, the residents offered to return the first installment of the payment they had received and continue their resistance.

By Chapter 5, the intense pressure that the residents were under becomes increasingly evident. The pressure was alleviated somewhat by the election of Apirak Kosayodhin as governor of Bangkok in 2004. His support led to a contractual agreement in 2005 to recognize the heritage value of the community, restore many of the old houses, and incorporate them into the plan for a public park. However, BMA officials managed to convince the Administrative Court that private residences were incompatible with the definition of a public park. This led to the end of the previous, promising agreement. Furthermore, Apirak was succeeded as governor by the less amenable Sukhumbhand Paribatra in 2009. This led to further pressure on Pom Mahakan residents in the form of a renewed eviction threat.

Chapter 6 draws attention to the importance of prevarication and delay tactics on the part of all parties involved in the ongoing dispute. One noteworthy tactic that engaged notions of "time" involved residents' adoption of the language of historical conservation and cultural resource management, for instance by describing old houses in the community as "ancient" (*boran*) and pointing out that the styles of certain houses could be attributed to various dynastic reigns (*ratchakan*). In Chapter 7 Herzfeld examines the politicized distinction between positivistic "data" as opposed to "local knowledge." He also highlights the adaptability of the community to outside threats. This, in combination with other elements that Herzfeld identifies in this chapter, such as

an effective and functional leadership collective, served to strengthen the community's resistance efforts.

The final chapter of the book captures some of the residents' cautious optimism in their construction of new houses on the site. However, this optimism was quashed with the news in 2009 that the BMA was once again threatening imminent eviction. Summarizing his reflections on why Pom Mahakan has endured for so long in its struggle against state officials, Herzfeld identifies the most significant factors as the "resilience" of residents, their skill in "buying time," and, most important, their flexibility and adaptability to the various circumstances and events that have punctuated the conflict. Herzfeld also raises a number of important questions, including whether or not the residents' project comprises a form of "self-gentrification" and whether or not the "participatory process of self-management" is leading community members "along an ineluctable path of embourgeoisement" (p. 201).

The book is filled with absorbing ethnographic material that draws the reader into the plight of Pom Mahakan's residents (examples include the description of protest on pages 28–29 and the description of the tense buildup to a confrontation between residents and authorities that never came on pages 32–34). These accounts could have been made more vivid with additional details about the backgrounds of individual community members, many of whom are compelling figures who have lived in the neighborhood for decades. A bit more focus on the shrines themselves would also have been welcome, especially in regards to the role that they play in daily life at Pom Mahakan, and the discourses and practices they are embedded in. Such information would have been especially useful in the form of quotes or examples illustrating how the residents connected the spirit shrines to original aristocrats and courtiers who lived in the area. Furthermore, since the narrative does not always proceed in a linear fashion, a timeline of events in appendix form would have been helpful for the reader in order to trace the events of the conflict.

Today, the struggle continues for residents of Pom Mahakan. On March 28, 2016, another eviction notice was posted requiring residents to relocate by April 30. Public discussions took place in June, and evictions were delayed once more. A tense showdown occurred in early September when BMA authorities and a demolition crew attempted to breach the neighborhood walls. The ensuing siege ended with residents allowing 12 houses whose occupants had agreed to leave to be knocked down. Meanwhile, amidst allegations of embezzlement, Sukhumbhand was replaced as the governor of Bangkok in October 2016 by Aswin Kwanmuang. The outcome of the conflict under Aswin's leadership remains to be seen, although his successful battles against the Saphan Lek toys and electronics market and Pak Khlong Talat flower market are telling indications of his uncompromising approach.

Siege of the Spirits is an essential resource for understanding Pom Mahakan's past and present—as well as its uncertain future. Herzfeld paints a picture of a complex community that subverts numerous assumptions and stereotypes that are common to urban eviction narratives.

The result is an important work of scholarship that will appeal to a wide audience outside of scholars of Thailand and Southeast Asia, especially those interested in engaged anthropology, urbanism and development, heritage and conservation, civil rights, and grassroots movements.

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References

Askew, Mark. 1996. The Rise of *Moradok* and the Decline of the *Yarn:* Heritage and Cultural Construction in Urban Thailand. *Sojourn* 11(2): 183–210.
Tiamsoon Sirisrisak. 2009. Conservation of Bangkok Old Town. *Habitat International* 33(4): 405–411.

Forests Are Gold: Trees, People, and Environmental Rule in Vietnam

Pamela D. McElwee
Seattle: University of Washington Press, 2016, xxvi+283pp.

Forests Are Gold: Trees, People, and Environmental Rule in Vietnam is made of gold, both the woody and the intellectual kind. Its title is drawn from a remark supposedly made by Ho Chi Minh in 1962 at the opening of North Vietnam's first national park (p. 3). The story is apocryphal, but the real source of this saying is rather revealing. At a 1963 meeting about the mountainous region, Ho gave a speech to 200 participants that focused on the climatic and agricultural impacts of forests and on the work of spreading socialism to the hinterlands. Tellingly, Ho valued forests not for their biodiversity but as a resource for a new society.

Pamela McElwee's book explores the imbricated projects of governing society and nature articulated in Ho's speech. She argues that "environmental policy is at times aimed not at nature, but at people, and failing to acknowledge this fact has resulted in numerous unintended, not to mention some intentional, consequences" (p. xiii). She urges her readers to be cognizant of both the social and environmental effects of what she terms environmental practices. In her analysis, McElwee develops the concept of environmental rule "whereby states, organizations, and individuals use environmental explanations to justify policy interventions in other social areas, such as populations, markets, settlements, or cultural identities" (p. xiii). McElwee's careful reading of the history of Vietnam's forests calls into question the standard explanations for their currently degraded state. The author shows that neither the Vietnam War nor Malthusian pressures, so often invoked as the explanation for environmental destruction in Vietnam, had as great an effect as the outcomes of various projects of environmental rule (p. 223). As McElwee reminds us, the Ke Go Nature Reserve was created in 1996 "out of the ashes of over-logged former timber

reserves" (pp. xiv, 73).

McElwee draws from recent work in the field of Science and Technology Studies and one of its formations, Actor-Network Theory. She views the latter as "less a full-fledged theory and more a series of observations" that illuminate the ways that knowledge circulates and how subjects and objects are coproduced during these circulations (p. 23). Such a perspective can be usefully combined with theories of governmentality (generated by the work of Michel Foucault) to analyze environmental practices. McElwee argues that environmental rule occurs through four steps that can take place in various combinations and orders: problematization, knowledge making, directing conduct, and subject making (pp. 12–22). These four processes provide a structure, either implicitly or explicitly, for each chapter.

McElwee's "historical-ethnographic approach" provides a rich source base, and the author draws on nuggets of information from almost two decades of research around the world. Often social scientists pay lip service to history but spend little time in the archives. McElwee not only exhibits a lively historical imagination but also shows specific continuities and discontinuities during the different periods in Vietnam's twentieth-century history. An anthropologist and environmental scientist by training, she along with her research team also performed household surveys and over 100 interviews that give, especially for the post-1975 era, an on-the-ground sense of why environmental rule has played out the way it has. Readers of *Southeast Asian Studies* will appreciate the applicability of McElwee's analyses to other Southeast Asian societies with environments—i.e., all of them. Although a more extensive examination of "ethnic minorities" and people living on Lao, Cambodian, and Chinese borders would have tied her book directly to other peoples in the region, McElwee engages in broad narratives of interest to Southeast Asian scholars.

Forests is divided into five chapters with an Introduction and Conclusion covering the long twentieth century, from the late-nineteenth century to the present. The first chapter provides a useful overview, one of the few written in English, of the history of forests in French Indochina. The practice and theory of French forestry in its empire mirrored those of other colonial empires but also diverged because of the ecological conditions of French Indochina. The "problem" from the perspective of French foresters and the colonial government was that, unlike hardwood forests elsewhere, Indochina's forests did not contain a high concentration of "economically valuable" trees. There was a lot of growth, but not of the kind that the French could profit from (p. 41). Furthermore, timely floods in Hanoi bolstered the case of those who argued that forests provided protection against such floods. While such arguments were made by analogy with Alpine forests and had very few studies to support them, they carried weight with colonial administrators and allowed foresters to expand their reach and exercise control over people living in the highlands. McElwee also ties the effects of forest regulation to anticolonial activity of the 1930s, showing how the Nghe Tinh rebellion in 1930 arose not just from food security concerns and Indochinese Communist Party organizing but also access to forests (pp. 57–58).

The second chapter focuses on environmental rule at the beginning of the socialist era during which the state management of forests increased. By the late 1950s initial efforts at organization through local boards had largely failed, so the Democratic Republic of Vietnam (DRV) government shifted its attention to State Forest Enterprises (SFE). The DRV faced the same ecological conditions (and challenges from the perspective of industrialization) that the French had faced. Following the logic of environmental rule, SFE sought both to increase production of wood and to create new socialist subjectivities. Similarly, the resettlement and sedentarization program (FCSP, Dinh Canh Dinh Cu) sought to manage both human and non-human nature, though it proved much less successful at transforming environments and forming citizens than the SFEs (p. 85). It was more successful after 1975, when the North took control of the South and priorities shifted to destroying longhouses and moving people into individual family units to break potentially unruly allegiances and redirect them toward the state (pp. 88–89).

The next three chapters focus on more contemporary issues. Chapter 3 examines the emergence of two forest subjectivities: state forest rangers and "illegal loggers." On the one hand, the forest rangers were defined as heroic for their efforts to protect a communal good. In practice their effects were more ambiguous, and they found themselves focused as much on enforcing state control and making a living as on protecting forests. On the other hand, although illegal loggers, hidden agriculturalists, and other forces outside of state control were blamed for deforestation, it was the development of cash crops, such as coffee and shrimp farms, encouraged by state policy that contributed to much deforestation (p. 108). Later, state officials learned to speak the environmental language of donor aid while pursuing other priorities, such as maintaining local employment or lining state and personal pockets.

In Chapter 4 McElwee turns to reforestation projects, revealing why colonial, socialist, and neoliberal efforts have all failed in their stated goal of creating forests. Although the "bare hills" that needed reforestation "became a political, not an ecological category" (p. 149), the biology of the exotic plants worked to reshape human subjectivities and tree species clearly emerged as "important actors in this story in their own right" (p. 136). These trees could not grow themselves and required large labor inputs of hand weeding and the application of fertilizers. Species such as eucalyptus also had high water demands, and farmers complained of dried-up streams and desiccated soils. The regeneration of forests affected human gender relationships as women collected non-timber forest products on nearby bare hills and men went farther afield to cut down trees. Finally, reforestation made land grabs by the rich seem less selfish and harder to protest on moral grounds as newly planted trees supposedly benefited the whole nation.

Chapter 5 examines the paradoxical effects of payments for ecosystem services and "Reduced Emissions from Deforestation and Degradation" (REDD+) that Vietnamese officials implemented after turning to markets to find cheaper solutions to environmental protection. Ironically, this move to markets has often strengthened the hand of experts and state actors. Rubber plantation

managers, too, have cynically claimed that replacing reforesting areas and watershed forests with rubber trees should be viewed as merely replacing one type of carbon with another. Indeed, McElwee claims that there is "some evidence that the ontological uncertainties about what constitutes a forest or a tree that have arisen in the context of discussions about REDD+ may be contributing to forest conversion and deforestation . . ." (p. 199). The question of what counts as a forest is one that runs throughout McElwee's book.

McElwee asks in her Conclusion, "is environmental rule a deliberate pretext to hide social goals under environmental practices, or is it more diffuse and less directed?" (pp. 213–214). While she views her project as one of unmasking the real social intent behind practices aimed at protecting nature, the book particularly succeeds in drawing attention to the unwanted social consequences of such projects. It helps us to understand better the effects of environmental rule and to plan more properly such interventions. Even though the author speculates that environmental rule is weakening in Vietnam, her book demonstrates that almost any human intervention into non-human nature will create winners and losers in society.

Given McElwee's experience advising on forest policy, she could have done more to sketch out what successful interventions might look like. She could have also written more about the agency of actual trees as, surprisingly, readers are mostly shown only the forests and not individual species. But now I am asking for an act of alchemy—the gold that McElwee provides is more than enough.

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The Oil Palm Complex: Smallholders, Agribusiness and the State in Indonesia and Malaysia

Rob Cramb and John F. McCarthy, eds.
Singapore: NUS Press, 2016, xvi+470pp.

The Oil Palm Complex: Smallholders, Agribusiness and the State in Indonesia and Malaysia consists of 14 chapters written by 16 contributors. Each chapter has its own topic and independent conclusion, especially Chapters 3 to 13. And the final chapter (Chapter 14) provides a conclusion based on the key findings of each chapter. Therefore, I will summarize each chapter and then discuss Chapter 14.

Chapters 1 and 2 provide a framework for the following chapters, including a systematic overview of the ways in which land, labor, and capital have been mobilized and combined in different modes of production. In Chapter 1 Rob Cramb and John F. McCarthy explain the aim of the

book: understanding the oil palm industry in Indonesia and Malaysia as a complex whole from the perspective of political economy. To provide the context for the following chapters, the authors clarify the economic differences between Indonesia and Malaysia; the different political backgrounds and characteristics of Indonesia, Peninsular Malaysia, and Malaysia's Borneo states (Sabah and Sarawak); and the regionalization that means a fusion of the Indonesian and Malaysian oil palm industries and formation of the Roundtable on Sustainable Palm Oil (RSPO) on a global scale. In Chapter 2 Cramb and McCarthy explain the agro-economic features of oil palm production. They examine the mobilization of land, labor, and capital within and across the oil palm industries in Indonesia and Malaysia, and their incorporation in different modes of production; as well as estates, managed smallholder schemes, nucleus estate and smallholder (NES) schemes, joint venture schemes, assisted smallholders, and independent smallholders. The authors clarify two contradictory trajectories in production modes. On the one hand is "capitalist convergence," which means the expansion of the estate mode and pursuit of the joint venture scheme; on the other hand is the surge of independent smallholders.

Chapters 3, 4, 5, 6, and 7 explore the different modes of oil palm production in practice and the circumstances that give rise to different livelihood outcomes, both within and between given modes. In Chapter 3 Zahari Zen, Colin Barlow, Ria Gondowarsito, and John F. McCarthy reveal the NES schemes that were implemented mainly during the Suharto period and contribute moderately to rural socioeconomic improvement. In addition, the authors explain new phenomena from the post-Suharto period, namely, increasing individual smallholders, new private companies' initiatives for local contributions such as a community oil palm area, and the partnership model (joint venture scheme in Chapter 2). The authors maintain that the role of the state remains critical in socioeconomic improvement. The challenge remains making initiatives even more effective. In Chapter 4 John F. McCarthy and Zahari Zen analyze the processes of inclusion/exclusion or adverse incorporation regarding the oil palm boom in Jambi, Sumatra. NES scheme projects help to create agrarian differentiation in which rural elites and entrepreneurs accumulate economic and social power (inclusion process). Successful transmigrants, in-migrants, and village and district elites bought local private/common lands. Some local farmers who lost their lands/livelihoods became wage laborers (exclusion process); others who established oil palm fields by themselves were suffering from low productivity because they did not have the techniques and capital for buying high-yielding seedlings and agrochemical inputs (adverse incorporation). In Chapter 5 Lesley M. Potter searches for alternative smallholder pathways in Indonesian oil palm production and for methods and techniques that are "smallholder-friendly." Based on case studies in Costa Rica, Cameroon, and Ecuador, the author considers three alternative pathways: (1) mixed cultivation of oil palm and other crops, (2) increased numbers of small competing mills that would supply inputs and extension services or be specifically designed to serve local markets, and (3) a widening of the roles of Indonesian cooperatives to engage in alternative economic activities. In Chapter 6 Rob

Cramb argues that the dominant mode of oil palm expansion in Sarawak has been driven not primarily by technical or market imperatives but by the exercise of state power to maximize opportunities for surplus extraction and political patronage. Sarawak state promoted the joint venture scheme to deliver extensive state and customary land to private estates and to import low-wage Indonesian labor by using the policy narrative, bringing the "native" into the modern sector or mainstream of development. In Chapter 7 Rob Cramb and Patrick S. Sujang focus on the recent emergence of oil palm smallholders in northern Sarawak. The authors find that smallholders achieve good returns with their limited resources of labor and capital while maintaining a degree of livelihood diversity. Different from the findings of Chapter 4 in the case of Jambi, Indonesia, the rapid growth of oil palm smallholders has not been associated with marked differentiation between rural households in northern Sarawak.

Chapters 8, 9, and 10 explore the nature of the conflicts arising from contested approaches to oil palm development. In Chapter 8 the authors mention that NGO advocacy often results in unintended consequences, including intensified conflicts among oil palm stakeholders. Contrary to what is widely assumed, the environmental impact is rather a less common issue in such disputes. As oil palm is more profitable for local smallholders, the main causes of conflict are merely economic ones, namely, unwanted land conversion in West Kalimantan. Also, the authors refute the traditional view that companies are the only ones to blame for exploiting other stakeholders. As such, the authors state that the contemporary NGO mission is not to advocate against the crop itself but to ensure the fair distribution of wealth in the production chain of oil palms. In Chapter 9 the author focuses on four key local stakeholders in an Indonesian oil palm plantation: the company, government, cooperative, and community. Through a stakeholder map analysis and a discussion of their diverse quotes, the author reveals the diversity, complexity, and power imbalances within a plantation. The prevailing participatory process used by the companies reinforces the existing power imbalance because it fails to take into account the implicit power relations. Participation per se is no longer a panacea. Because power relations are intimately connected to how stakeholders communicate, participation must encompass an awareness of the power relations and of smallholder agency. Chapter 10 studies the ways in which resistance against oil palm plantations has varied, using two case studies in Landak District (PIR-Bun V Ngabang) and Seruyan District (the Lake Sembuluh Subdistrict). Comparing the covert and individual actions in Ngabang with the overt and organized ones in Sembuluh, it not only demonstrates their variations in contexts and strategies but also reveals that both have the common intention to gain greater access to the benefits that the paradigm of a large-scale capitalist enterprise system can offer.

Chapters 11 and 12 focus on plantation labor. Chapter 11 studies the impact of oil palm plantations on the labor regime in Indonesia. Although some legitimate the allocation of large parts of land to oil palm plantations due to its effect of creating employment and reducing poverty, the author demonstrates that this argument does not consider "Indonesia's oil palm labor regime"

through the dual strategy of enclosing land to dispossess local people and importing labor from other regions by the transmigration system. Chapter 12 focuses on the situation of Indonesian migrant workers on oil palm plantations in Malaysia. Due to the economic gap between Malaysia and Indonesia, Malaysian oil palm plantations invite migrant workers from Indonesia to undertake work that locals are not willing to do, the so-called 3D: dirty, dangerous, and demeaning. Based on interviews with workers in Sarawak, this chapter depicts the factors that drove them to migration, how they are experiencing it, and what sort of household livelihood strategies they are constructing.

In Chapter 13 Oliver Pye examines the oil palm complex at the transnational level by focusing on the RSPO, a global multi-stakeholder organization made up of oil palm growers, NGOs, manufacturing and retail companies, and so on that develops a certification system to realize sustainable palm oil production. However, the author shows that even certified oil palm companies can be engaged in environmentally and socially unsustainable production methods. The author explains that this contradiction is caused by the voluntary system of RSPO and collaboration between Malaysian political bodies and leading oil palm companies to prioritize economic profits in RSPO.

In Chapter 14 McCarthy and Cramb explain the way of understanding the oil palm industry in Indonesia and Malaysia as a complex whole (Indonesia-Malaysia oil palm complex) based on the key findings of each chapter. First, the authors recognize the oil palm complex as being constituted of interrelationships among agribusiness firms and agents, national and local governments, rural households and communities, and local and transnational civil society actors. Then, the oil palm complex is formed and reformed based on shifts of interests and capabilities on the part of constituent actors, being influenced by both internal and external changes (e.g., the shift to market-led forms of development and the 1998 financial crisis). Various oil palm plantation development schemes in Indonesia and Malaysia have been formed and changed in this process. This formation or reformation of the oil palm complex is determined by political settlements emerging from compromises between powerful groups, mainly companies and governments, that set the context for institutional and other policies. Subsequently, development schemes formalized by political settlements are implemented at the local level. The working of social relations within a scheme, village, or plantation context—such as negotiations between plantation representatives, village leaders, and farmers over land allocation (amount of land taken over by a company, returned to farmers as productive oil palm, and left available for food crops) and availability and conditions of employment on the plantation—shapes the degree to which farmers and plantation workers access the stream of benefits derived from oil palm production. Based on this way of understanding, the authors discuss three recent trajectories of the oil palm complex: (1) convergence on the plantation mode, (2) smallholder resurgence, and (3) a trend toward private regulation, such as the RSPO.

Here I would like to discuss the achievements of this book and the next issues to be dealt with. The book provides a way of understanding the oil palm industry in Indonesia and Malaysia

as a complex whole. This way of understanding can answer the following long-debated questions: Why are companies' oil palm plantations still expanding in forested areas? Why are there still land conflicts between local people and companies? Why are plantation workers still working under poor conditions? This book provides a new answer, namely, structural, political, and economic co-dependencies and mutualities of companies and governments between Indonesia and Malaysia. Malaysian companies provide financial capital and technology through joint ventures with Indonesian companies, while those Malaysian companies can get access to land and labor at a low cost with lax regulation, with help from Indonesian politicians and officials. In addition, although previous research has focused on the social-economic impacts of oil palm development for smallholders, this book discusses and provides a way of understanding why social-economic impacts for smallholders and smallholders' reactions to the oil palm boom are so different within and between communities. This book emphasizes that the success of smallholders depends on (1) the way in which local contextual factors, scheme designs (e.g., NES and joint-venture schemes), and structural factors intersect; (2) the interests, agency, and resistance of smallholders and local communities; and (3) mediating institutional processes that can influence smallholders' access to resources (e.g., technology, inputs, finance, market, land, and benefits). In addition, this book explains the issues with the RSPO's approach from the viewpoint of the Indonesia-Malaysia oil palm complex.

Although the idea of an Indonesia-Malaysia oil palm complex is based on the key findings of each chapter, including case studies at specific locales, it seems that the case studies are still limited, particularly in the provinces of Jambi and West Kalimantan in Indonesia and the state of Sarawak in Malaysia. Considering that there are diverse political, economic/industrial, social, and cultural situations in Indonesia and Malaysia, it is necessary to accumulate case studies to find diverse patterns of oil palm complex at the local level and elaborate the understanding of the oil palm complex. In addition, although this book provides original insights into oil palm issues, it unfortunately does not make any original policy recommendation based on its understanding of the Indonesia-Malaysia oil palm complex. It is also a shame that some of the literature cited in several chapters is not in the respective reference lists.

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From World City to the World in One City: Liverpool through Malay Lives

Tim Bunnell

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One day in September 2005, this reviewer was enjoying "authentic Malaysian cuisine that is 100%

HALAL Food" at Mawar ("Rose") Restaurant on Edgware Road, London, thanks to the hospitality of the localized Malaysian freelance journalist/broadcaster Wan Zaharah Othman. The restaurant was then the only Malaysian restaurant in London, and Malaysian and Singapore clientele formed a large portion of its regulars. So, in addition to Malay food, customers could also enjoy conversation in Bahasa Melayu (the Malay language). On that particular night, Art Fazil, a Malay singer of Singapore origin, was singing his original song "Anak Melayu di Kota Inggeris" (Malay diaspora in an English town) to the accompaniment of his own guitar. He was one of the committee members of the London Malay Festival held just one month earlier, "showcasing the diversity of the Malay diaspora in one festival, a sort of regathering of the tribe," in his words. Incidentally, Anthony Milner reports that advertised participants in the festival were from Sri Lanka, Madagascar, and South Africa as well as Southeast Asia (Milner 2008, 184). I was visiting the UK chiefly to extend my anthropological field of interest to the Malay diaspora in that country.

Before starting my review of Tim Bunnell's book, let me give a brief history of my encounter with the Malay diaspora/Dunia Melayu (Malay World) movement led mainly by the late Professor Ismail Hussein of the GAPENA (Malaysian National Writers' Association). While I was engaged in anthropological fieldwork on a different research theme in Negeri Sembilan, Malaysia, the first Malay World Assembly was held in Melaka (Malacca) in 1982. I happened to be invited to take part as an observer. It was only after the 1990s and the early twenty-first century, however, that I became really conscious of the importance of the movement and conducted my research on the topic, as a result of which I published a paper based chiefly on the GAPENA activities (Abdul Latiff 2002; Tomizawa 2010).

Since I met Wan Zaharah in London I have not seen her again, but after more than a decade I was able to meet her again in Bunnell's book *From World City to the World in One City: Liverpool through Malay Lives*. In contrast with my main approach to the Malay world focusing on Malay elites and culturists, Bunnell's basic focus seems to be on the ordinary subaltern strata of the Malay diaspora. His "Malay Routes" research project provided the basic data for the book, which formally began at the National University of Singapore in 2004. It is noteworthy that his interest in "a long-standing Malay seafaring presence in England" was triggered by a Malay-language film titled *Dari Jemapoh ke Manchester* (From Jemapoh to Manchester) as well as his grandfather's death in the UK a couple of years before he started the project. His grandfather had worked in the merchant navy, shipping out of Liverpool to spend some time in Singapore during and after World War II before finally returning to the UK. So Bunnell's memory had been sustained by the painting of a Blue Funnel Line ship set against the Liverpool waterfront that was in the room where he always ate during childhood visits to his grandparents' home. Probably that formed the *root* and *route* of the author's strenuous efforts to launch into the huge ocean of the Malay world and Malay Routes project.

This book elaborately and carefully depicts people who met at Liverpool's Malay Club over a

period of more than half a century until its closure in 2007. The author examines, in particular, the maritime linkages that made possible the formation of the Malay Club and the worlds of connection that the club in turn sustained. The original objective of the Malay Routes research project was to examine historically shifting connections between Liverpool and the *alam Melayu* (Malay world) through life histories and geographies of Malay ex-seamen. As his research went on, however, he realized the importance of the present life realities of the ex-seamen and shifted his main focus of research to their ongoing life geographies. Then the memories and stories of ordinary "non-expert" individuals, families, and other social groupings seemed to constitute largely undocumented archives of everyday or subaltern forms of historical urban worlding. These are lived archives of memory, not only yielding insights into connected geographies of a bygone era but also leading to consideration of how historical connections inhabit contemporary imaginings, practices, and worlds in the city.

Examining Liverpool's urban geographies through Malay lives, the author attempts to advance three key sets of arguments in the book concerning the relational and territorial dimensions of cities, and historically sensitive ways of studying them. The first concerns Liverpool's long-distance social webs or networks, and the wider geographies of connection with which they have been intertwined. The author's important theoretical contribution here is his assertion that Malay social webs spun in late colonial times not only exceeded formal political economic linkages but also preceded globalization and transnationalism and even outlived the imperial world city of Liverpool. A second set of his arguments has to do with the territorial grounding of transnational social webs or networks. The author argues that Malay transnational urban networks in Liverpool were anchored or locally grounded in the successive sites of the city's Malay Club, connecting them to other maritime centers including in Southeast Asia and across the Atlantic to New York. His third set of arguments has to do with what the lives of people who met at the sites in Liverpool reveal about the relational (re)making of cities. In this connection, life histories and geographies of the people concerned can also tell us about multiple worlds in cities according to the author.

The book consists of nine chapters including the introductory and concluding ones. The seven main chapters (Chapters 2 to 8) are organized in broadly chronological terms, beginning from the tail end of the era during which Liverpool was a prominent imperial maritime and commercial center—a world city. Chapter 2, "From the Malay World to the Malay Atlantic," shedding light on Malay transatlantic mobilities, traces the shipping routes that connected the *alam Melayu* to Liverpool, positioning the city and seafaring Malay men in world-spanning commercial and social webs.

In Chapter 3, "Home Port Liverpool and its Malay Places," the author focuses on the social geography of Liverpool as "home port" to men from the *alam Melayu* with varying degrees of attachment to the city. This chapter provides us with precious ethnographic data concerning the realities of Malay diaspora daily life. For example, we can learn that food became central to mem-

bers of the Malay Club. Having a taste for spicy food was the common denominator marker of Malayness in the mid-twentieth century, and Muslim food taboos (typified by *babi* /pork-free practice) tended to be kept by the first generation but rarely extended to second-generation Malay girls and boys. After all, for children of seamen as well as (ex-)seamen themselves, the club was the place where they could be—at least partly—"Malay," typically through the Malay-language conversations and food provided there, showing the interaction among food culture, religious beliefs, and ethnicity. In this way, children of Malay seamen experienced the club as a place to "be Malay" and as a site of connection to Malay worlds.

The following three chapters are set in the context of Liverpool's repositioning in the new international division of labor and in relation to the concomitant political economic development of independent nation-states in Southeast Asia. Chapter 4, "Merseyside Malaise and the Unmaking of British Malaya," examines changes to the social composition and transnational connections of the Malay Club associated with the post-independence remaking of territories of the former British Malaya and Liverpool's interrelated post-maritime economic transformation. In Chapter 5, "Diasporic (Re)connections," the author turns his eyes anew to recent Liverpool as a destination for students, tourists, and diaspora seekers from Southeast Asian nation-states as they have become more affluent and, especially in the case of Malaysia, increasingly concerned with transnational Malayness. This chapter interestingly depicts histories of non-seafaring travels to the site of the club, including both individual searches for seafaring ancestors and politically driven interest in diaspora communities among Malay nationalist elites in Malaysia. Furthermore, Bunnell's precious historical insight teaches us that the existence of visitors showing interest in the Malay diaspora in Liverpool can be traced back as far as the 1960s. He also suggests that encounters among diasporic Malays in Sri Lanka, South Africa, Madagascar, and so on had already occurred decades before the Dunia Melayu or Malay diaspora movement that was dramatically activated in the 1980s and after. On the other hand, we are also informed that it was during the period after the first Malay World Assembly in Melaka in 1982 that Malays in Liverpool and elsewhere in Britain began to attract the interest of prominent Malaysian political figures. This chapter is especially important and illuminating for Malay diaspora studies, providing stimulative data on global-scale dynamic interactions over Malayness between "old Malays" and "the Islamized New Malay." Subsequently, the "return" journeys of Liverpool-based ex-seafarers to newly emerging centers of urban modernity in the Malay world in Southeast Asia form the focus of Chapter 6. Although a recurring theme of this book is how diverse individual life experiences and associated geographies defy group generalization, the author does not deny the fact that among Malay ex-seamen in Liverpool it is possible to identify a prevailing trend toward increased religiosity in later life.

The last three chapters mainly highlight the rather new positioning into which diaspora communities and ethnic groups in general have been thrown in the context of local administrative

cultural policies and urban regeneration strategies in the UK and other nations. Chapter 7, "Community in the Capital of Culture," pays special attention to recent and ongoing culture-led urban regeneration strategies in Liverpool, particularly the city's rebranding as "the World in One City." The author analyzes opportunities for Liverpool-based Malaysian students to make Malay(sian)s visible and fundable in the context of community-led urban governance regimes. Chapter 8, "The Last Hurrah: From Independence Celebrations and Interculturalism to Club Closure," contains a detailed description and analysis of local celebrations of Merdeka (Malaysian independence) in two events intended to heighten community visibility in the lead-up to Liverpool's year as European capital of culture around 2008. This symbolically reflects the essential transformation of Liverpool from "World City" to "World in One City," which took place over the last half century. In other words, Liverpool itself has also been thrown into a new positioning in the present phase of globalization as well as the local Malay diaspora. In Chapter 9, the author concludes the book by revisiting the main arguments and comparative contributions of the study.

Overall, this book is a well-written transnational urban geography through Malay lives. The author's sincere and tireless attitude in always turning his eyes to every detailed reality is especially praiseworthy. As far as the Dunia Melayu movement is concerned, no doubt Bunnell's work has added an important contribution to a series of academic endeavors in this field so far. As Milner properly suggests, Dunia Melayu is a continuation of the process of redefinition that has been under way over the last two centuries; furthermore, there is a post-nation-state dimension to the movement (Milner 2008, 185). This is precisely why the movement is so interesting, and Bunnell's proposition regarding "transnationalism from below," which preceded today's globalization according to him, might correspond to this comprehensive understanding of the movement. Lastly, if I dare to point out what is a little bit wanting in his work, discussion on the intranational (not international or transnational) aspect of the Malay network and interactions in the UK does not seem to be satisfactory. For example, the Malay Association UK (Persatuan Masyarakat Melayu UK, or Melayu UK) was formed around the beginning of the twenty-first century as "the first UK-wide Malay society" to directly address the welfare of Malays resident in the UK. I wonder what sorts of interaction or lack of interaction could be detected between the Malay Club in Liverpool and the newly instituted Melayu UK or other dispersed Malay communities in that country. I also wonder whether there was any causality between the establishment of the Melayu UK and the closure of the Malay Club in Liverpool. The author's diligent attempt at drawing our attention to the world-spanning historical urban interrelations and circulations in and through Malay places is satisfactorily successful, illuminating and inspiring further challenging studies in this field of research.

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References

Abdul Latiff Abu Bakar. 2002. *Ismail Hussein bersama GAPENA: Biografi & koleksi* [Ismail Hussein and GAPENA: Biography and collection]. Kuala Lumpur: GAPENA.

Milner, Anthony. 2008. *The Malays*. West Sussex: Wiley-Blackwell.

Tomizawa, Hisao. 2010. Old and New Aspects of Malayness in the Contemporary Dunia Melayu Movement. In *Tinta di dada naskhah: Melakar jasa Dato' Dr. Abu Hassan Sham* [Issues on Malay literature and material: Festschrift in honor of Abu Hassan Sham], edited by Hashim Ismail, pp. 29–44. Kuala Lumpur: Jabatan Penerbitan Akademi Pengajian Melayu, Universiti Malaya.