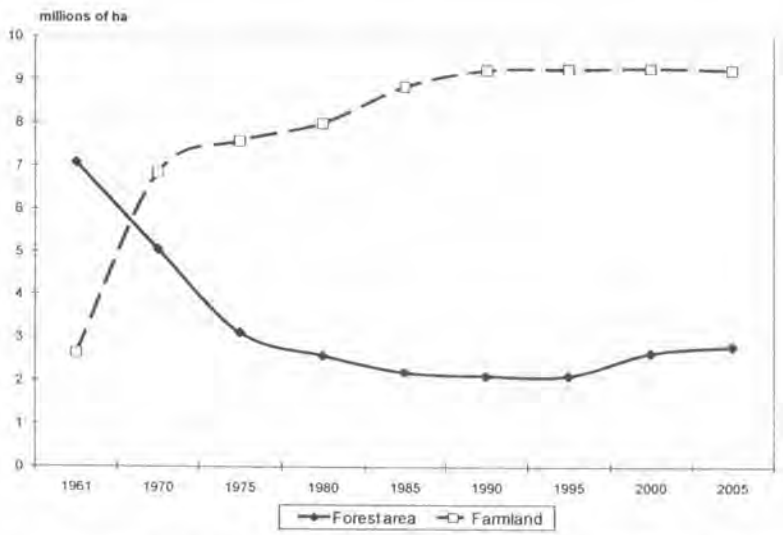
CHAPTER III

RECENT AGRICULTURAL TRANSFORMATIONS AND LAND USE CHANGE AT STUDY SITE

Important factors causing the transformation of APS include: (i) demographic pressure due to population increases; (ii) state policies and related projects or regulations; (iii) innovative agricultural changes through the employment of new technologies; (vi) infrastructure development, e.g. transportation systems facilitating integration, and (v) socio-cultural factors related to the northeastern people's ways of thinking, and inherited beliefs (Vityakon, Subhadhira et al., 2004). As a result of these interacting factors, the agricultural area of northeast Thailand expanded rapidly after the early 1960s (Figure 3.1). Since then, farmers have increasingly depended on the state's support via financial loans drawn from the Bank for Agriculture and Agricultural Co-operatives (BAAC), and private local capitalists to purchase farm inputs and consumer goods. Many farmers have become so indebted that their income received from agricultural production is insufficient to meet their basic needs. The best recourse of these farmers is to migrate to search for off-farm employment to help pay back their debts.



Source: a) Forest area 1961-73 from Royal Forestry Department, Ministry of Agriculture and Co-operatives, Bangkok.
b) Forest area and farm land 1986-2005 from Office of Agricultural Economics, Ministry of Agriculture and Co-operatives, Bangkok.

Figure 3.1 Evolution of forest area and farm land in northeast Thailand (1961-2005).

This section specifically documents the characteristics of the study area, including: the evolution of transportation networks; the agricultural production system and land use changes based on interpreted findings from farm surveys; and the analysis of secondary data using Geographic Information System (GIS) and remote sensing tools.

3.1. Location of Study Site

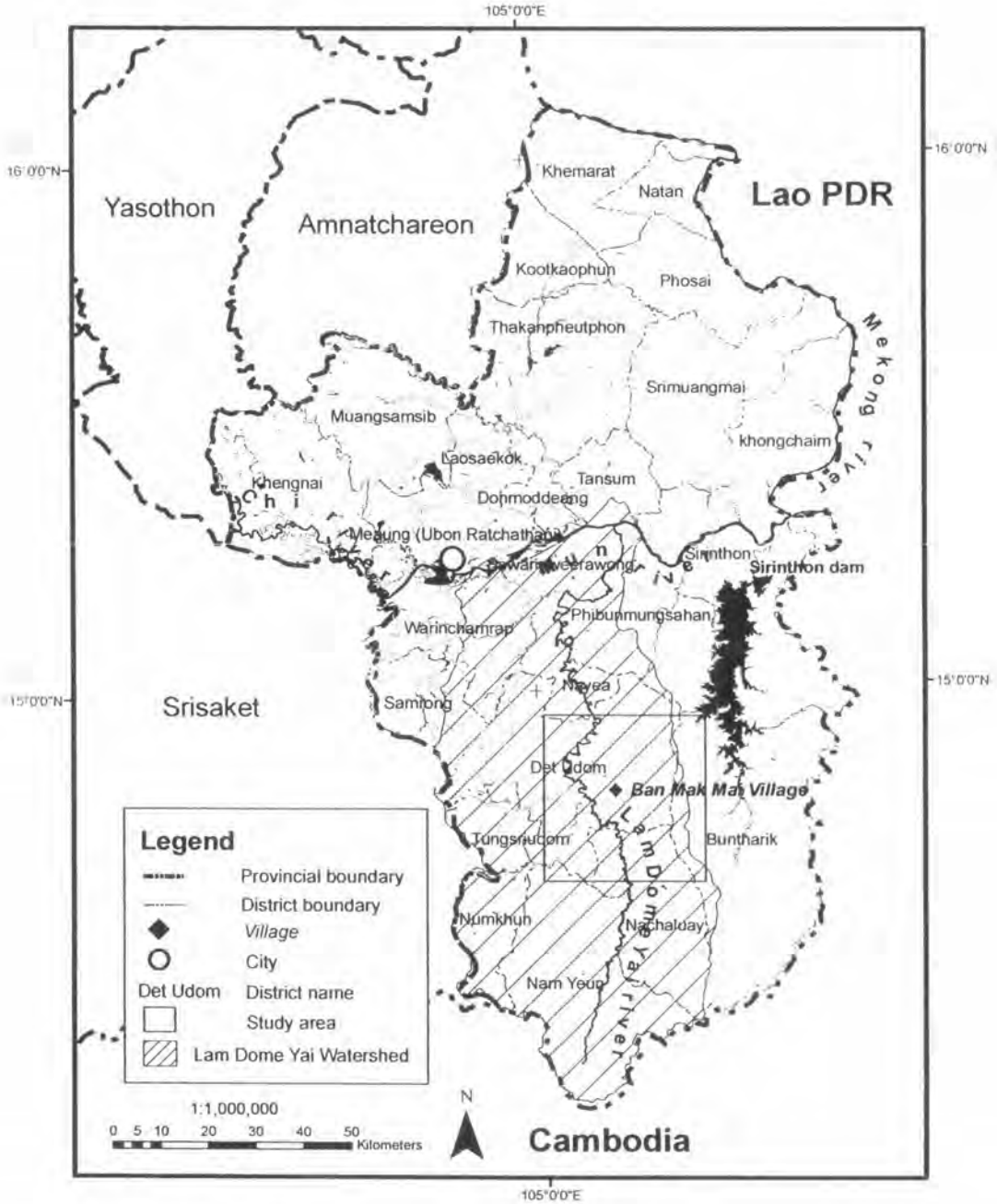
Ubon Ratchathani (often referred to in short as "Ubon" or "Lotus City") is the country's easternmost province. It is one among nine provinces located in the lower Korat Basin. This province covers 15,744 km^2 and consists of 25 districts in nine watersheds. The Lam Dome Yai watershed, where my study area is located, is the largest. It is located in the south, covering seven districts and parts of five other districts over a total area of 4,803 km^2 (Figure 3.2). The Lam Dome Yai River originates from the Panomdongruk mountain range and flows northwards into the river.

According to the demographic records of NSO (2005), the total population in Ubon was 1,806,000 with only 14.6 % living in urban areas. The mean size of household was 4.6 while the population growth rate was 0.83%. The working aged population (13-60 year old) was 68.32% and roughly 46% of them were engaged in agricultural production.

3.2. Development of the Local Transportation Network in Relation to Agricultural Production and Labour Mobility

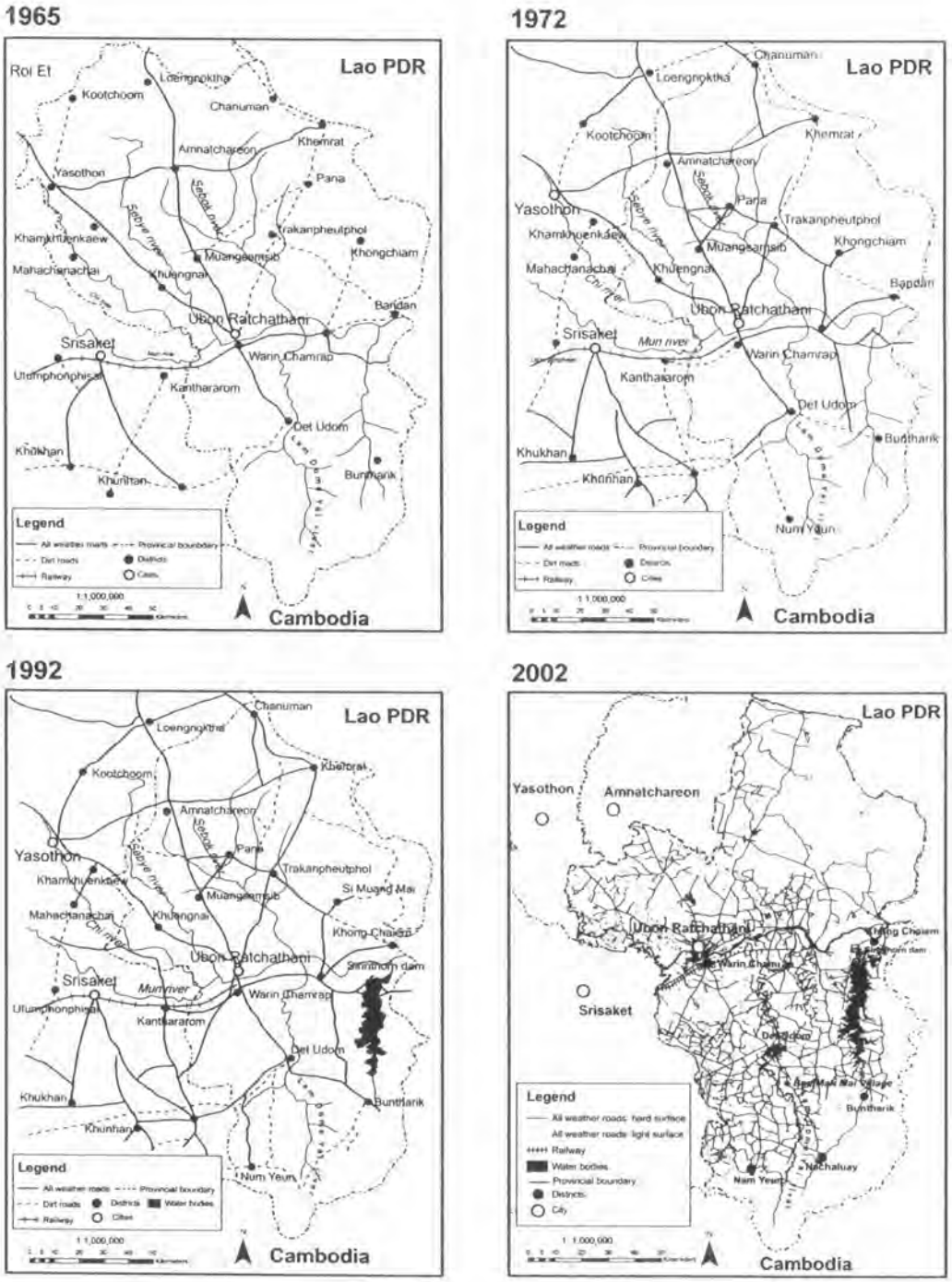
One key development that has influenced the lives of rural dwellers has been the extensive expansion of the transportation network. The first major communication axis was the railway, which was completed in 1930. It connected the central plain to Ubon, through the lower northeast, ending in the district of Warinchamrap. Following the railway, a major road, the so called "friendship highway", was constructed during the Vietnam War to provide better accessibility for national defence purposes.

The Office of Rapid Rural Development (RRD) was established in 1965 to build more roads to connect people who lived in remote areas to provincial cities (Figure 3.3).



Source: Adapted from northeast provincial boundary map, Geographic Information System Center, Faculty of Engineering, Ubon Rajathanee University, Ubon Ratchathani (2002).

Figure 3.2 Provincial map showing district administrative boundaries and the study site in the Lam Dome Yai watershed, Ubon Ratchathani.



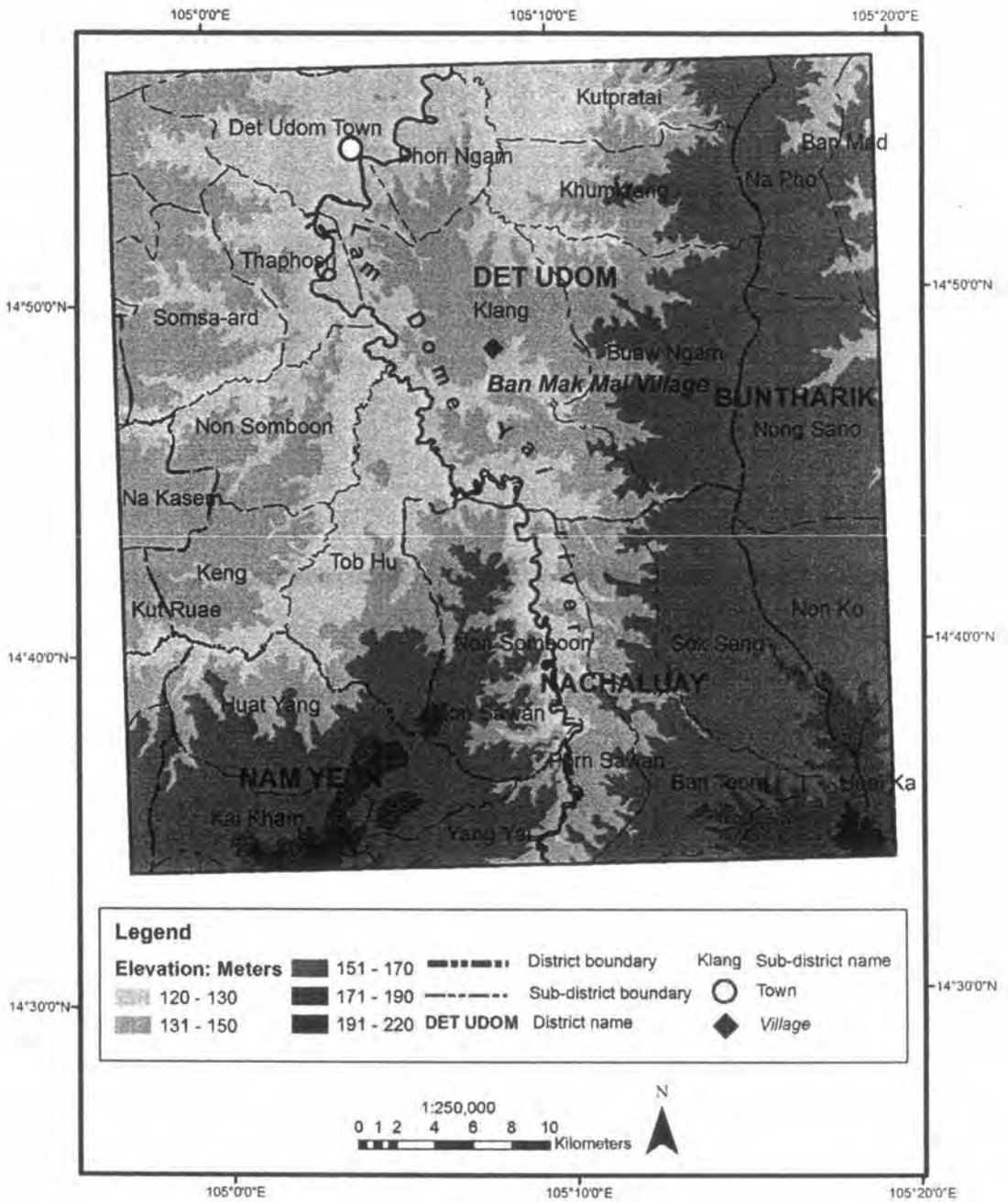
Source: a) Digitized from Map of Provinces in Thailand; 1965 (Loha-aunjit 1965).
b) Digitized from Map of Provinces in Thailand; 1972 (Jareeyapat 1972).
c) Digitized from Map of Highway in Thailand, Highway Department, Ministry of Interior, Bangkok, 1992.
d) Adapted from northeast regional transportation network map, Geographic Information System Center, Faculty of Engineer, Ubon Rajathanee University, Ubon Ratchathan; 2002.

Figure 3.3 Expansion of the local road network in Ubon Ratchathani over the past four decades.

In the early 1970s, the road network provided access to a hub at Det Udom district to people living in the southern part of the province. This was also the terminal of a major transportation network named "Chokchai-Det Udom", which greatly enabled the delivery of agricultural products, especially rice and kenaf, to the regional hub in Nakhon Ratchasima province. Figure 3.3 clearly shows the extensive expansion of the road networks built in Ubon during the following decades. Because of this transportation network, the access to non-farm employment out of any village is widening. Career change and the movement of farm workers to non-farm sectors have both increased, resulting in changes in the use of local natural resource and farming practices.

3.3. History of Local Agrarian System and Land Use Change

The study area is located inside the Lam Dome Yai watershed covering 1,680 km^2 and taking in Det Udom district and the northern part of Na Chaluay district. Its topography is flat (about 1% slope) with an elevation that varies between 120 and 170 meters above mean sea level (MSL) and relatively steep elevation between 170-220 meters above MSL in the southern part (Figure 3.4). Hilly areas are found in the south, and a mini-watershed landform dominates along the Lam Dome Yai River. The dynamics of the agroecological features and socioeconomic dimensions in this area are typical of those observed in the lower northeast region. Information related to such socioeconomic changes matching agroecological transformations is displayed in chronological order in the historical profile (Figure 3.5).



Source: Adapted from Ubon Ratchathani topographic map, Geographic Information System Center, Faculty of Engineering, Ubon Rajathanee University, Ubon Ratchathani (2002).

Figure 3.4 Topographic map of the study area in southern Ubon Ratchathani province.

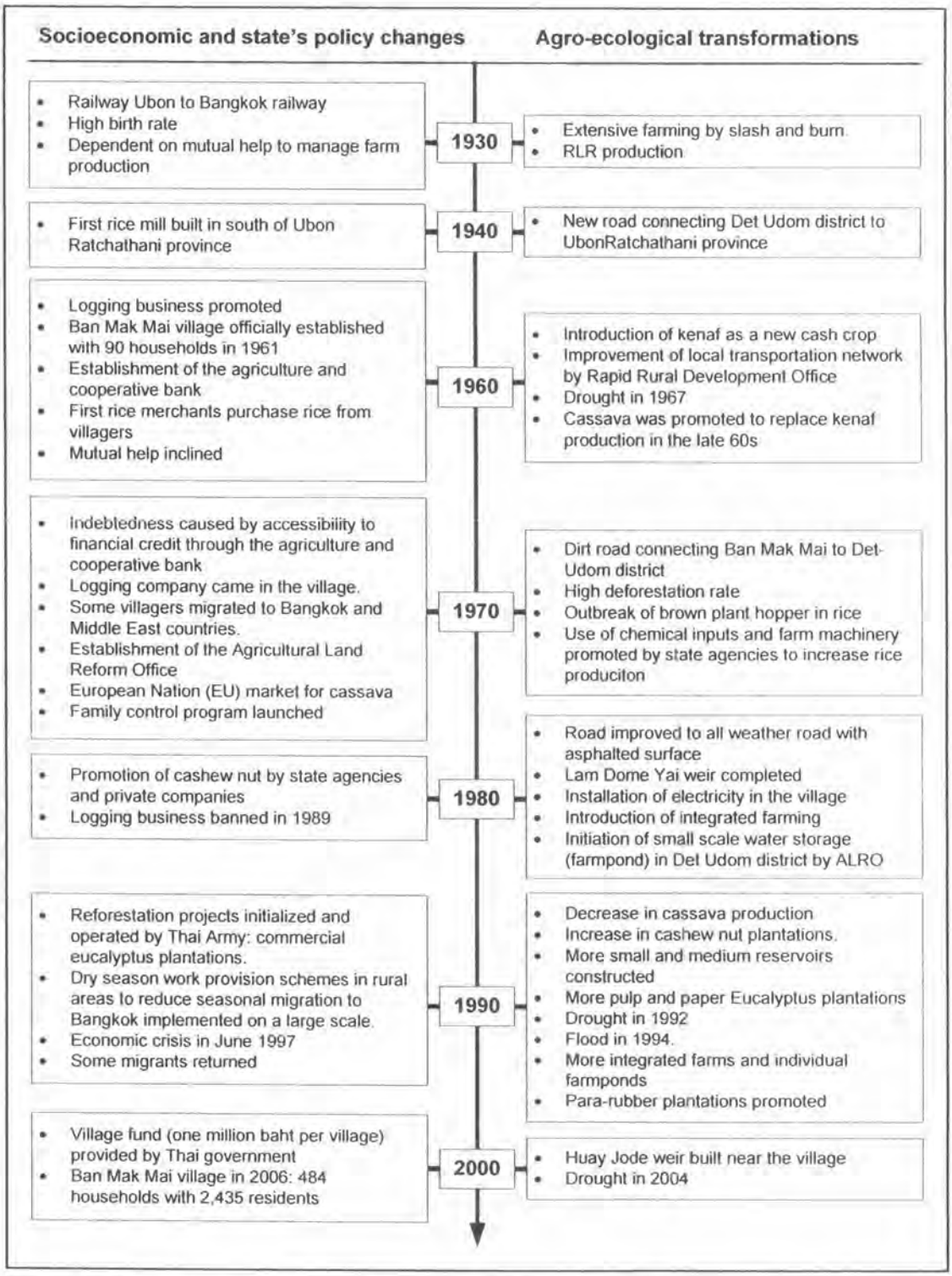


Figure 3.5 Evolution of socioeconomic and agroecological characteristics of Ban Mak Mai village in Klang sub-district, Det Udom district, Ubon Ratchathani province (1930-2000).

3.3.1. Self-subsistence before the First National Economic Development Plan 1961-66

The first settlers of Ban Mak Mai village migrated from Srisaket province around 1940. They settled on uplands and established rice paddies in lowlands for family consumption. Small-scale diverse agricultural production in mixed gardens was practiced to provide different kinds of food. The forest surrounding the village was also a source of construction materials, fuel, medicinal plants and additional food items. Cattle and buffaloes were raised and used as draft animals in paddies and for transportation. Their manure was an important source of organic fertilizer. Due to its remoteness, Ban Mak Mai village was not affected by the railway or the arrival of rice trading managed by Chinese tradesmen. However, improved transportation encouraged people from other provinces to settle in Ubon Ratchathani province.

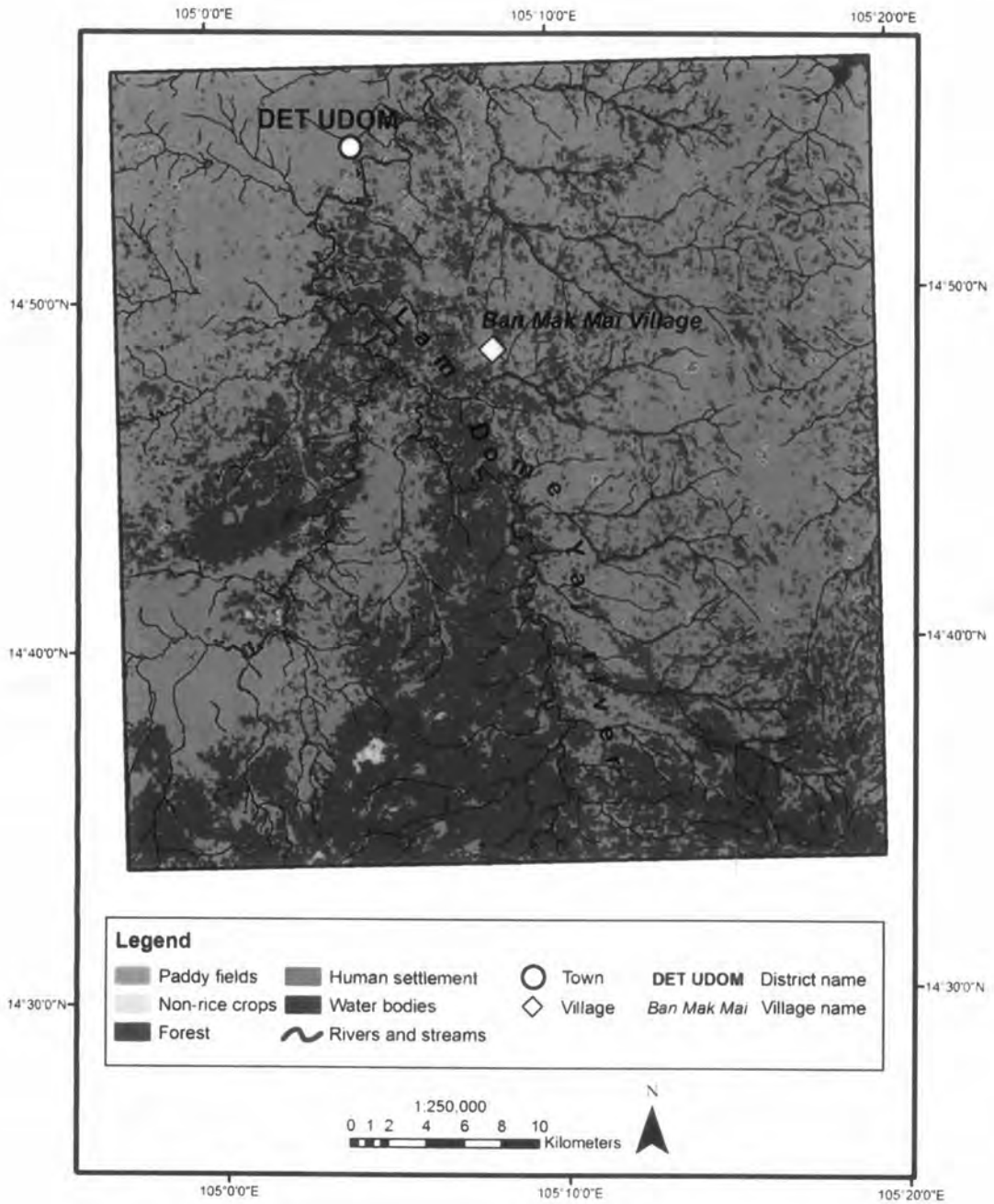
3.3.2. Expansion of Farm Land for New Cash Cropping in 1960s and 70s, and Emergence of Labour Migration for Off-farm Employment in the Seventies

In the early 1960s, there were only 90 households in Ban Mak Mai village. During this period, Thailand issued its first economic development plan that was geared to influence changes in APS throughout the whole kingdom. This national economic development plan aimed to promote an industrialized expansion of crops such as cotton, kenaf, cassava, sugarcane, maize, etc. The BAAC established in 1966, provided loans to local farmers at low interest.

The APS of Ban Mak Mai village were affected by these changes. Kenaf and roselle, which were long fibre crops used to produce gunny bags, were the first cash crops introduced to local farmers in the early 1960s, reaching its peak production seven years later. The Chokchi-Det Udom road was an important economic route because many gunny bag factories were established along this road. As a consequence, some farmers abandoned their land to migrate to work in these factories and settle nearby. Since the labour demand was high, the wage was considerably higher than the income received from rice. Gradually, the traditional mutual help system was replaced by hired labourers (Promjuy et al., 2003).

In 1967, the production of kenaf decreased due to its declining price caused by international competition, and because the Thai government shifted its policy: cassava exports were now being subsidized for the European market. Cassava became more favoured by farmers because of its higher price, drought tolerance and less labour intensive production compared to kenaf. However, rice producing areas in lowlands were not affected by the expansion of these upland cash crops and continued to expand. In the study area, these cash crops were not produced at a large scale in this period due to its remote location until the first dirt road to connect this area to Det Udom town was built in 1975. Dense forest cover was still found in the more distant areas to the south of study area, while rice production was the dominant use of land near Det Udom town (Figure 3.6). These two types of land cover were dominating in my study site (Figure 3.7). Farm and labour productivity was higher than during previous decades because of the expansion of farming with draft animals (Manarangsan, 2002).

Following the promulgation of the Land Code in 1954 and the Land Allocation Occupature Act in 1957, the Agricultural Land Reform Act in 1976 was gazetted. The land tenure policy aimed at improving ownership and tenurial rights, and the opening up of land for new settlements. At the same time, demographic pressures were increasing as a result of the combined effects of national population growth and migration. Many farmers began to convert the forest to upland field crop areas and claim their tenurial rights on the cleared areas.



Source: Landsat MSS taken on 3 January 1973, downloaded from http://glcfapp.umiacs.umd.edu.

Figure 3.6 Land use map highlighting the five main land use types of the study area in 1973 based on supervised classification of Landsat MSS imagery.

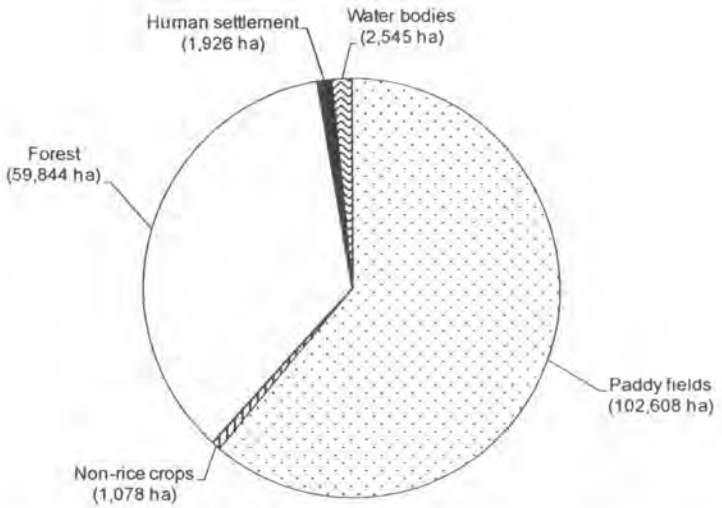
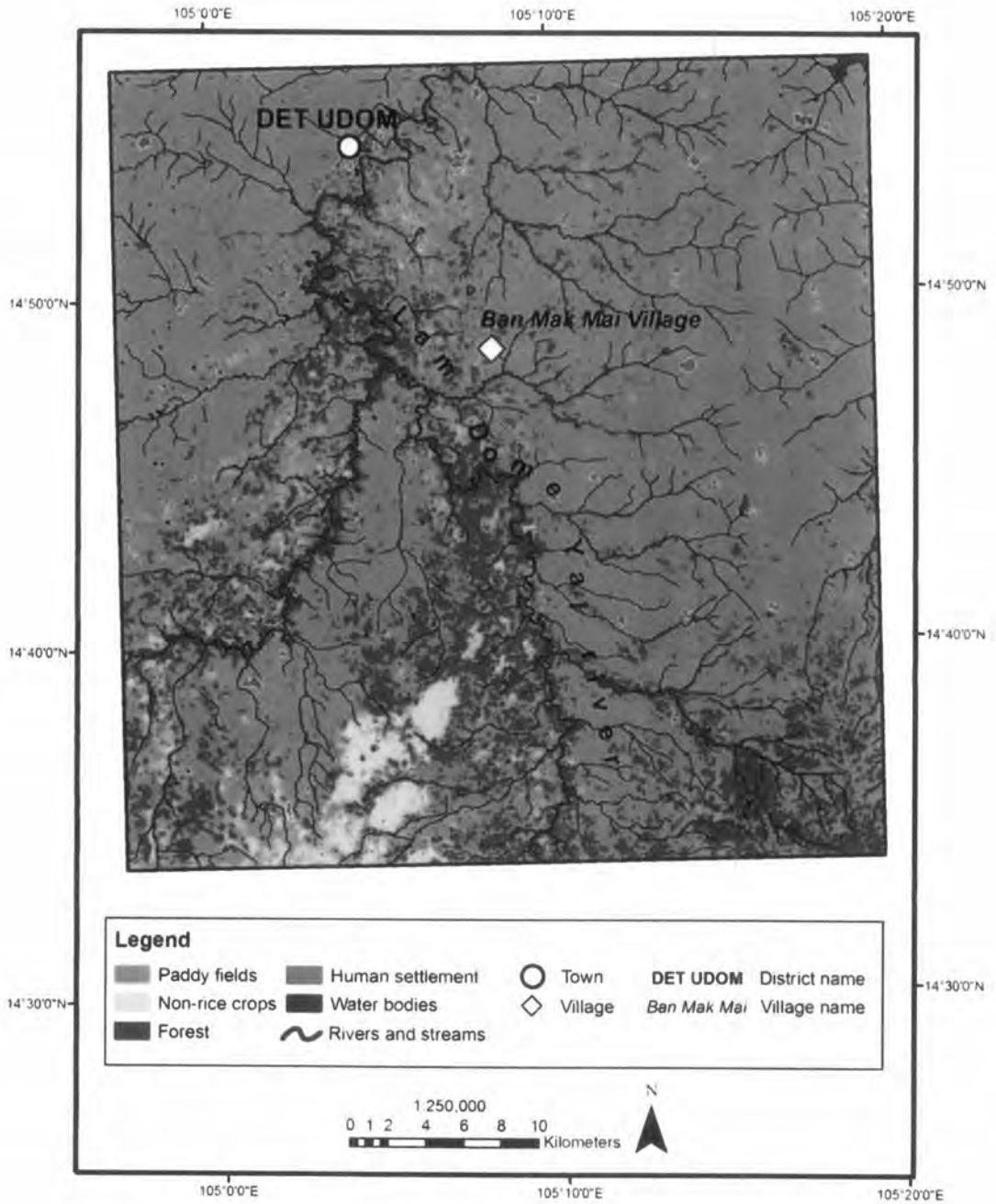


Figure 3.7 Five main land use types in the study area from a 1973 land use map.

3.3.3. High Deforestation for Cassava and Timber Production Leading to Forest Conservation Law, and Eucalyptus and Cashew nut Plantations in the Eighties

The high rate of deforestation between 1979 and 1988 was caused by: (i) legal timber concessions; (ii) rapid improvement of the transportation network, and (iii) the demand for farm land, especially to grow field cash crops in upland areas (Faculty of Economics Kasetsart University, 2000). Figure 3.8 shows that the dense forest area that existed in the southern part in 1973 was almost completely replaced by field crops in 1989. This was a consequence of state policies emphasizing rapid economic growth through agro-industrialization to serve the demand of international markets. The 5th National Economic and Social Development Plan implemented during 1982-86 focused on export-led growth, while ensuring the supply of affordable food and relatively low prices of rice to maintain low costs of labour in the industrial sector. The development plan effectively sought to maintain the country's comparative advantage in international competition.



Source: Landsat TM taken on 25 December 1989, downloaded from http://glcfapp.umiacs.umd.edu.

Figure 3.8 Land use map that highlights the five main land use types of the study area in 1989 based on supervised classification of Landsat TM imagery.

Since producing rice did not provide enough income to meet basic human needs, cash crops with high-economic returns such as kenaf and cassava were extensively grown in the 70s and 80s (Barnaud, Trébuil et al., 2004). Furthermore, the

extensive road network stimulated more labour migration to the industrial sector. Because migrant workers from this area were not skilled workers, their jobs were not secure and wages were low. As most of the migrants were ethnic Lao, their means of subsistence remained strongly linked to rice, and they maintained close contact with the rest of the family in their home villages. The pattern of seasonal migration was increasingly prominent. Once the RLR growing season started, the seasonal migrants returned home to help with the transplanting and harvesting to ensure adequate rice production for their family consumption and a surplus for sale.

The loss of biodiversity, particularly rice varieties, is another emerging concern. In 1977, an aromatic glutinous photosensitive rice variety, RD6, was introduced to the farmers. With its excellent gain quality and adaptability to the harsh agro-ecosystem of the northeast, this rice variety has gradually replaced many traditional glutinous varieties used as staple food in northeast Thailand. This photosensitive rice is usually planted in lower paddies where water availability is more secured. The lower paddies are also favoured for another aromatic but non-glutinous main variety, KDML105. KDML105 is mainly produced for sale due to its high demand on both domestic and world markets and high market price (roughly a third higher than other cultivars), while some traditional early-maturing varieties are still produced for family consumption. In 1978, RD15, a non-glutinous, aromatic, early-maturing type, was introduced and considerably grown to be sold in early markets (Bureau of Rice Research and Development, 1999). Because of its early maturing trait, RD15 is also a choice for farmers in alleviating labour constraints during harvesting time.

Because water availability was the focus of development schemes by Thai governments, small-scale irrigation infrastructures were built in this area. Apart from weirs and community reservoirs, farm pond construction was first subsidized by the ALRO in the late 80s. This water improvement motivated farmers to purchase more motorized water pumps. Draft animals were gradually replaced by two-wheel hand tractors to accelerate land preparation. These changes provided local farmers with spare time, enabling them to be hired by their neighbours or even migrate to work off-farm jobs. In 1989, rice producing areas and non-rice crops were the dominant land uses, while forest cover had sharply decreased (Figure 3.9).

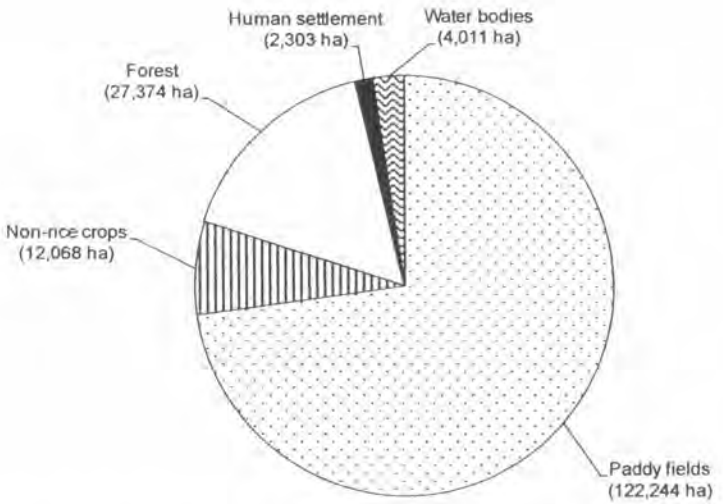


Figure 3.9 Five main land use types in the study area from a 1989 land use map.

The demand for electronic appliances, such as refrigerators and television sets, increased once electricity was established in Ban Mak Mai village in 1982. Rising agricultural production costs, rising demand for consumer goods and other domestic products, and the availability of credit from BAAC were major reasons for the increasing indebtedness of farmers. Therefore, family workers had to migrate to look for off-farm employment to generate supplementary income; moreover, workers still faced the ever present risk of unemployment because of the nature of the local industrial sector and its low capacity to absorb a labour force (Manarangsan, 2002). Successive Thai governments tried to implement policies to alleviate rural poverty and to curb labour migration. Among these policies, the conversion from monoculture crop systems to mixed cropping systems has been widely promoted since the early 1990s.

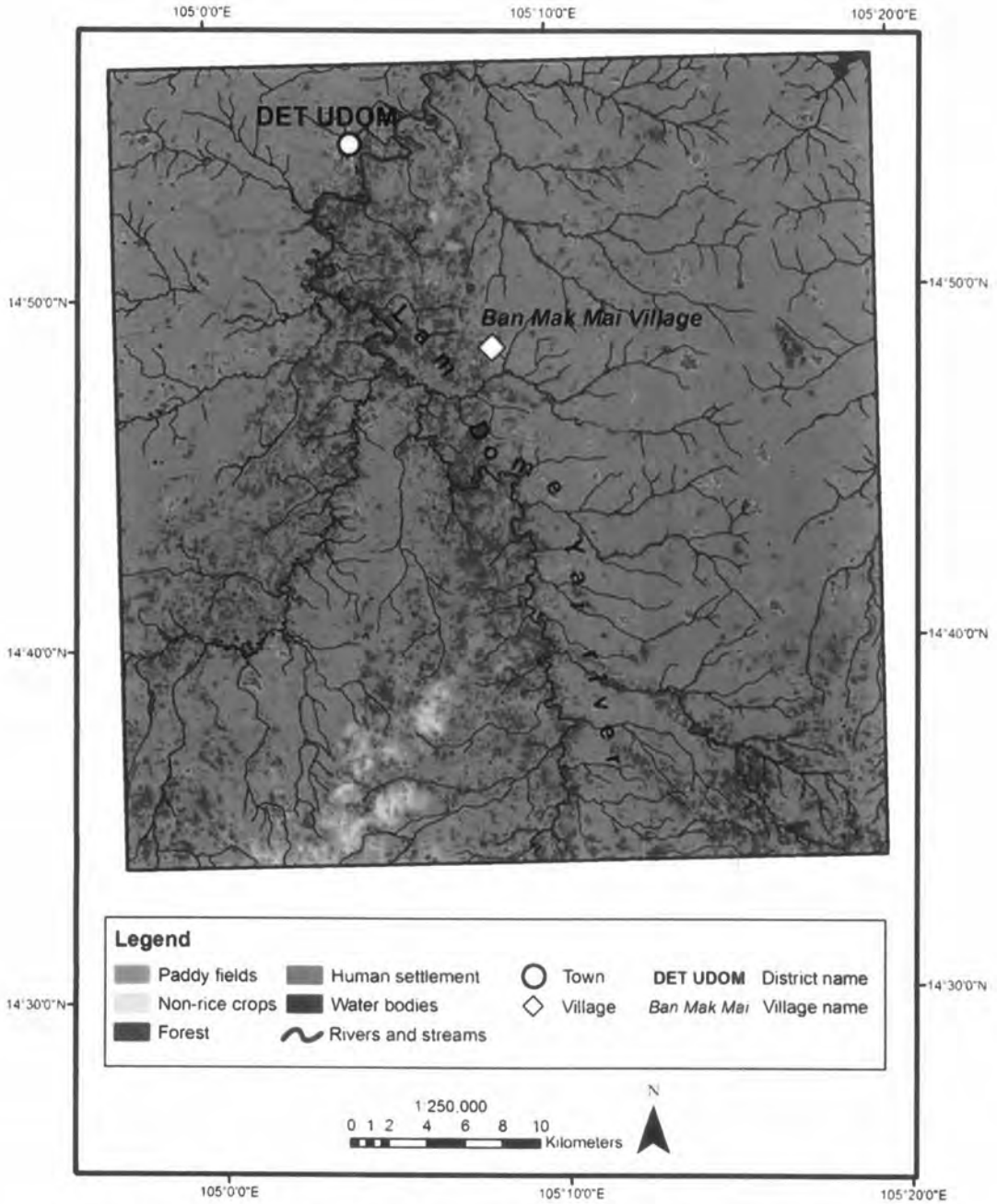
3.3.4. Promotion of Reforestation and Diversification of Agricultural Production Systems in the Nineties

In 1989, the logging business was banned and the "Green Issan" project was launched. Thanks to the new legitimacy of forest conservation, people were no longer allowed to encroach on forest areas. At the same time, reforestation was initiated by the Royal Thai Army. The aims were to plant commercial, fast-growing trees such as eucalyptus, and to conserve community forests. Perennial plantations like eucalyptus

and cashew nut were promoted. Figure 3.10 shows less field crop area in 2002 compared to 1989, while more tree plantations are found in the northern part near Det Udom town. In addition, some field crops were converted into paddy fields in the southern part. Despite the declaration of the logging ban, deforestation in some parts continued, mainly through agricultural encroachment and the development of water resources sponsored by state agencies (The World Commission on Dams, 2000).

Because of the success of family planning schemes, demographic pressures on the land decreased. Economic policies increasingly became the determinants of changes in land use type. For example, the reform of the Common Agricultural Policy (CAP) of European Union (EU) in 1993 was particularly influential. This falling cassava demand greatly affected the exports of Thai cassava product since two thirds of the total production of cassava was exported to the EU before. The "Si Prasan project", a joint-venture project between state agencies and private companies, was implemented in late 1987 to solve the problem of declining cassava prices by replacing cassava areas with cashew nut plantations. However, the project had very limited impact.

The failure of centralized water management by the state was disputed to effective water control during the severe 1992 drought, followed by floods in 1994. A long protest against the existence and negative impacts of the Pak Mun Dam ensued and dragged on for many years. These movements have been looked upon as a major turning point in water management (Chantawong et al., 2003). As a result, small-scale water infrastructure, in particular on-farm reservoirs, was extensively built in this area while rice still shared the largest portion of land (Figure 3.11). In recent times, the Thai government has been promoting Para rubber plantations in this region. This on-going project is likely to be adopted by large-sized farms because of its high investment costs.



Source: Landsat ETM taken on 20 February 2002, Geographic Information System Center, Faculty of Engineering, Ubon Rajathanee University.

Figure 3.10 Land use map showing the five main land use types of the study area in 2002 based on supervised classification of Landsat ETM imagery.

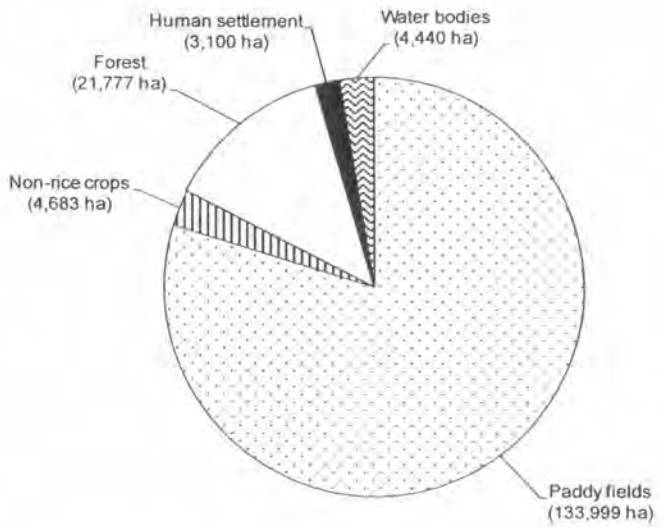


Figure 3.11 Five main land use types in the study area from a 2002 land use map.

Apart from economic incentives and infrastructure improvement driving changes in land and water use, the so-called "New Theory" of farming patterns has also affected northeastern farmers. This theory was initiated by His Majesty the King of Thailand to emphasize the self-reliance of farming units. It aims to provide food security and a decent quality of life at the farming household level in non-irrigated areas such as in the northeastern region. Resource-poor farmers managing small land holdings with scarce water resources have been the target group. The basic principle of this "theory" is the allocation of land to serve different household needs, with water as the most important component. "New Theory" types of APS (or "integrated systems") have emerged and are now being promoted and extended throughout the country, especially in the northeastern region where poverty and water shortage are still serious problems (Jitsanguan, 2001). This theory was first introduced to Ubon's farmers in 1984. However, its adoption is still limited because of inadequate water availability.

Due to the Thai traditional inheritance system, whereby all children inherit land from their parents, an increasing number of small landholders has resulted in recent times. The number of workers working on large farms has become critical. These farmers have had to rely on agricultural machinery to alleviate labour shortages. Small holders are a source of labour for medium to large farming

households. Well-off farmers have invested in more heavy equipment such as pick-up trucks and have used them to trade agricultural products between this community and cities. Tree plantations and fish production are now also found on large-sized farms.

Figure 3.12 shows the evolution of land use and land cover in the study area since 1973. Non-rice crops covered only 0.64% of the area in 1973 and reached their peak production at 7.18% of total area in 1988, dropping sharply to 2.79% by 2002 as a result of declining prices in the market. Meanwhile, rice-growing areas increased gradually, and forest cover quickly decreased from 1973 to 1989 in response to population growth and increased trade in timber commodities. Limited deforestation was seen in 2002 compared to the previous decades thanks to the ban on logging. As a result of water resource improvement, the area of water bodies increased from 1.5% in 1973 to 2.64% of the total area in 2002.

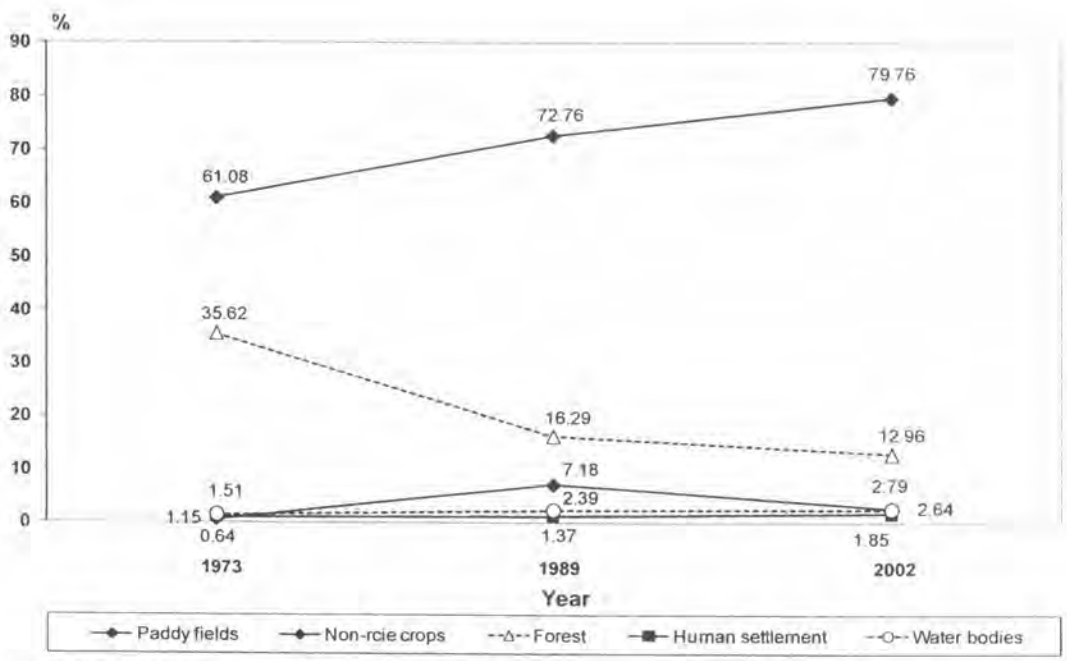


Figure 3.12 Changes of land use and land cover in the study area based on Landsat images taken in 1973, 1989 and 2000.

For these three decades, the people living in this area remained strongly attached to RLR production, even if the economic return was not adequate enough to meet their basic needs. Various strategies—such as diversification into annual, or more recently perennial, cash crops—have been used by community members to

increase their agricultural output and secure adequate household incomes. However, for the majority of households who are small holders, labour migration has been perceived to be the most successful choice in reaching economic goals, even if they have had to leave their land and water underused, and put their children in the care of elderly people at home in the dry season.