Monitoring Reforestation in Northeast Thailand using the NETVIS

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Abstract

The area of forest in Northeast Thailand decreased by about 30% of the area of the region in 30 years from 1961. To prevent further loss of forest, many reforestation projects have progressed significantly in the last decade. However, forest areas estimated from satellite images continue to decline and do not reflect recent expansion of tree plantations. This is partly due to the difficulty of distinguishing newly planted forest land from idle land and upland fields by remote sensing.

This study aims at monitoring and mapping recent reforestation in Northeast Thailand based on the results of a questionnaire survey, available databases and national statistics, as a preparatory step to combining remote sensing technology with various types of field survey. NETVIS, an integrated GIS developed by the authors, which incorporates the Village Database and agricultural statistics as its primary data, is applied to this study.

1. Background

According to the statistics published by the Royal Forest Department (RFD), Thailand, the area of forest in Northeast Thailand decreased by about 30% of the area of the region in 30 years from 1961 (RFD, 1985; 1994). To prevent further loss of forest, many reforestation projects have progressed significantly in the last decade. Besides those run by the RFD, other governmental organizations such as the Community Development Department (CDD), the Department of Agricultural Extension (DOAE) and the Forestry Industry Organization (FIO) and NGOs typified

by the Population and Community Development Association (PDA) have their own projects (Akaha, 1994).

In recent years, in projects run by RFD alone, hundreds of millions of seedlings of various tree species have been distributed and planted every year in Northeast Thailand (Yoshida, 1996). However, forest areas estimated from satellite images continue to decline and do not reflect the new planting. This is partly due to the difficulty of distinguishing newly planted forest land from idle land and upland fields by remote sensing. Therefore, this study aims at monitoring and mapping recent reforestation in Northeast Thailand based on non-remote-sensing data, including results of a questionnaire survey, available databases and national statistics, as a preparatory step to combining remote sensing technology with various types of field survey.

2. Data Used

2.1 Questionnaire Survey

To collect information on the present status of tree plantation on private and public lands, a questionnaire survey was carried out in four provinces, Yasothon, Buriram, Maha Sarakham and Nong Bua Lamphu, from among nineteen provinces in Northeast Thailand in cooperation with the RFD and the REX (the Reforestation and Extension Project in the Northeast of Thailand). The questionnaire was distributed to every village headman in the four provinces at the beginning of June, 1996. It covered: 1) eucalyptus plantation as a whole, 2) eucalyptus plantation in the past five years, 3) eucalyptus forest cut last year, 4) tree plantation other than eucalyptus as a whole, and 5) tree plantation other than eucalyptus in the past five years. Each item had sub-items for a) public land, b) private land, and c) total. After filling out the questionnaire, village headmen sent it by mail to Maha Sarakham Nursery Center, one of four nursery centers of the REX, or brought it to a district office. Headmen were questionnaired in about 5,300 villages in total and about 23% of them replied.

2.2 Village Level Socio-economic Conditions

Village Databases (*Ko Cho Cho Song Kho*) for 1986, 1988, 1990 and 1992 were already incorporated in NETVIS and are referred to in this study. These databases cover a wide range of information, including basic information on population and households, infrastructure, production environment, education, and hygiene (Nagata, 1996a; 1996b).

3. Present Tree Plantation

3.1 Eucalyptus Plantations on Private Lands

The average area of eucalyptus plantations on private lands does not significantly differ between provinces and is presently 6 to 8 ha per village, of which 50% was planted during the last five years (1991 - 1995). Assuming that the average area of eucalyptus plantations per village is 6.4 ha (= 40 *rai*), the total area of eucalyptus plantations on private lands in Northeast Thailand is estimated to be 0.18 million ha, which is equal to 2% of the total agricultural land. Eucalyptus plantations

in the Northeast were mainly established from the mid-1980s, and thus their area increased by 0.2% of the total agricultural land per year during the last decade.

3.2 Non-eucalyptus Tree Stands on Private Lands

Areas of tree stands other than eucalyptus per village are 6 to 8 ha in Buriram and Maha Sarakham provinces and more than 16 ha in Yasothon and Nong Bua Lamphu Provinces. The area newly planted during the last five years does not differ significantly between provinces and is about 3 ha per village. Estimated areas of tree stands other than eucalyptus in the three provinces other than Nong Bua Lamphu in 1991 coincide closely with the areas of "fruit trees and tree crops" in *Agricultural Statistics of Thailand* (Office of Agricultural Economics).

3.3 Tree Stands on Public Lands

The average area of community forests in the four provinces is 24 ha, of which 4 ha was newly planted during the last five years, with half of newly planted trees being eucalyptus. It is remarkable that the average area of community forest in Yasothon is as large as 40 ha, of which 30% is recently planted eucalyptus.

4. Distribution of Eucalyptus Plantations

4.1 Method of Analysis

Two factors are hypothetically assumed to determine the distribution of eucalyptus plantations. These are land availability and labor availability. Land availability is assumed to be quantified in terms of the scale of cassava farm holding, because cassava is the dominant field crop in the Northeast and is in the process of being replaced by eucalyptus plantations. The questionnaire-surveyed districts are classified into three types based on the average scale of cassava farm holding: large (1.6 ha or over), medium (0.8 to 1.6 ha) and small (less than 0.8 ha). Labor availability is assumed to be quantified in terms of the proportion of the total labor population that is working away from the village. The districts are also classified into three types from this viewpoint: high (one-third or more), medium (one-fifth to one-third) and low (less than one-fifth). With these criteria, all the surveyed districts in the Northeast were classified into nine types, and the average area of eucalyptus plantations in each type was calculated.

4.2 Results

The results show a clear correlation between the area of eucalyptus plantations and the scale of cassava farm holding. Expansion of eucalyptus plantations is concentrated in areas with large cassava farm holdings. This indicates that many of the lands planted with eucalyptus were formerly cassava fields, and this trend is expected to continue in the future. On the other hand, no correlation can be found between eucalyptus plantation and labor availability. This indicates that there are various reasons why villagers work away from their home villages. A lack of diversity in local working opportunities is one reason for a high proportion of working away, because the proportion is comparatively high in areas of monoculture of rice.

5. Conclusions

The major conclusions of this study are 1) it is estimated that 2 % of agricultural land in Northeast Thailand is occupied by eucalyptus plantations at present; and 2) many of the present eucalyptus plantations occupy former cassava fields.

Remote sensing data is expected to provide more detailed information on reforestation, which could substantiate statistical analysis like that described here. If the technology to distinguish tree species becomes established, it will bring revolutionize every stage of the reforestation projects.

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Note

This report is a revised and combined edition of (Nagata *et al.*, 1996a) and (Nagata *et al.*, 1996b).

References

Akaha, Takeshi, 1994, "Study on Institutionalization of Collaborative Systems to Promote Social Forestry in Thailand" (in Japanese), *A Study on the Development of a System for Identification, Registration and Utilization of Specialists in Education Required for International Co-operation Volume 1*, pp. 127-248.

Nagata, Yoshikatsu, 1996a, "Development of the Northeast Thailand Village Information System (NETVIS) based on the Village Database" (in Japanese), *Theory and Applications of GIS*, 4(1), pp. 19-26.

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

Nagata, Y.; Yoshida, K.; Takeda, S. and Kono, Y., 1996a, "Application of NETVIS to the Evaluation of a Reforestation Project in Northeast Thailand", *Proceedings of the 17th Asian Conference on Remote Sensing*, pp. E.3.1-6.

Nagata, Y.; Kono, Y.; Takeda, S.; Yoshida, K.; Monton J. and Somchai M., 1996b, "Monitoring and Mapping Reforestation in Northeast Thailand: An Application of the Northeast Thailand Village Information System (NETVIS)", *Proceedings of the FORTROP'96* (forthcoming).

Royal Forest Department (RFD), Thailand, 1985, *Forestry Statistics of Thailand 1985*.

Royal Forest Department (RFD), Thailand, 1994, *Forestry Statistics of Thailand 1994*.

Yoshida, Kengo, 1996, *Tohoku Tai Zorin Fukyu Keikaku 1996 Nendo Dai 2 Shihanki Gyomu Hokokusho (Progress Report of the REX Project, the Second Quarter of Fiscal Year 1996)* (in Japanese).