

RAINFALL VARIABILITY, LAND COVER DYNAMICS AND LOCAL LIVELIHOOD IN DRY ZONE, CENTRAL MYANMAR

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Thesis Summary

Chapter1, Introduction: Myanmar central dry zone (CDZ) is the driest part of the country and of Southeast Asia generally. It is believed originally climate vulnerable area. The rainfall variability is reported very common threatening the local livelihood. Concurrently, the forest in dry zone which is important context of local and regional climate, and the livelihood of the inhabitants, was decreasing at an alarming rate. Therefore, the main goal of the study is to collectively explore the information fundamental for planning and developing the conservation strategies in the area before the worst scenario. Firstly, the rainfall variabilities in CDZ were investigated. Second, the land cover change, the forest loss in particular, was examined. Third, the livelihood (a measure of annual income) in different rainfall zone and their dependency on remnant forests was explored.

Chapter2, Spatial and Temporal Rainfall Patterns in Central Dry Zone, Myanmar – A Hydrological Cross-Scale Analysis: Daily rainfall of 54 stations available from 2000-2014 were analyzed using exploratory data analysis, semivariogram modeling, K-means cluster analysis and principal component analysis. The general climatology of the CDZ and the spatial-temporal variation patterns of rainfalls of different scales (daily, event-scale and monthly rainfalls) were investigated. The CDZ has very distinctive pattern of dry and wet seasons, but the latter received > 90% of all annual rainfall amounts. A climatological monsoon break divides the wet season into two peaks and is the results of two different climate mechanisms – monsoon southwesterly of the May-to-June period and tropical cyclonic vorticity of the August-to-October period. These climate dynamics and the orographic effect divide the CDZ spatially into three homogeneous areas. The spatial rainfall variations were more dominant pattern in CDZ which can assist in making sound decisions in cropland planning and forest management. However the seasonal (i.e., temporal) variation of rainfalls, although less significant, probably influences the annual productivity of the rainfed croplands.

Chapter3, Quantifying the Land Cover Change of Myanmar Dry Land from 1989-2014:

Six non-thermal bands of Landsat imageries were used to explore the extent of land cover change in CDZ of 1989 and 2014. The supervised classification, Gaussian Maximum Likelihood (GML) classifier, was applied for analysis. The training data collected from various sources and fieldworks were partly used for validation of classified images. Seven LC categories: (1)forest (dense dry dipterocarps and deciduous forest), (2)shrubland (both open and degraded dipterocarps forest and scrubs to grassland with less tress covers), (3)agricultural land (both rainfed and winter croplands), (4)water area of permanent river, (5) water area of dams and reservoir, (6) bareland and (7) others (shade and clouds) were classified in both years. Overall classification accuracies are 94.00% and 92.83% for 1989 and 2014 respectively. Our study showed that the CDZ has been occupied by agriculture for decades. However, the area of agricultural use has continued to increase for 14 % during the period under observation study. The areas of reservoir, although less coverage, have increased in double. In contrast, the area of forests and shrublands decreased. The degree of forest and shrubland loss was different among the rainfall zone (classified in previous chapter). It has been highest in high-forested areas and lowest in the driest area where the forest was, presumably, degraded decades ago. Overall, Shrublands have been lost, mainly to agricultural use, while the forest has been replaced, in particular, by shrublands. This study suggests the losses of natural vegetation are the most important change during the study period. Recognizing the continuous agricultural expansion, it is also vitally important to implement sound croplands planning and forest management in order to mitigate potential forest loss in future.

Chapter4, Livelihood in Local Communities and their Dependence on Dry Forest in

Central Dry Zone, Myanmar: The livelihood of local people was clarified in the areas of regional heterogeneity of climate and forest resource availability (classified in previous chapters). The primary data were collected through semi-structured interviews. In total, 185 households residing near remnant forests were sampled. The majority of respondents (87% of total respondents) were farmers. The average annual income of respondents was 1,263 USD (1 USD = 1,000 MMK). Annual incomes were the lowest in landless households (664 USD per year), the poorest among all respondents. Overall incomes were significantly different among different zones. In all areas, agriculture constituted the major source of income for both farming households and landless households, whose major livelihood was agricultural wage labor. Accessibility to income options played an important role in the income

differences among the areas. However, the forests have provided 2-5% of overall income, on average. The majority of the respondents depend on the forest for firewood and their dependency ranges from 50-100%. The wood was mainly from natural forest in wetter areas, while 50% of total firewood use was from their farmland in the driest areas, where the forest area remains very low. Poorer farming households possessing less than 2 ha of land and landless (wage-laboring) households were more likely to depend on forest resources for their income. Overall, the poor income from their major livelihood, farming, and their extensive use of firewood is likely to be one of the reasons for higher forest degradation and deforestation in the remaining forest of the CDZ. As the pattern of deforestation and livelihood differs with that of the climate zone, an effective conservation and management plan should be based on the heterogeneity of the CDZ.

Chapter5, Major Findings and General Conclusions: The income options including out-migration option plays the major role for the overall income of local communities. However, the remaining forests in CDZ still support noticeable incomes to local inhabitants. At the same time, the forest and shrublands were lost under the continuous agricultural expansion and overuse for firewood. Recognizing the land cover change may accelerate local climate variability in the long-run, integrated planning and management of agricultural land and forest land and the development program of local people are highly required to avoid the endless conversion of forest into agricultural land and the worst scenario of the consequences of deforestation in the area.