A STUDY ON ENERGY OF ARTIFICIAL DAHURIAN LARCH COMMUNITY

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ABSTRACT By means of calorimetry measurement, the caloric values of various components, the standing crop of energy, net energy production and energy conversing efficiency of an artificial dahurian larch community at Laoshan Plantation Experimental Station of Maoer Shan Forest Farm in the eastern part of northeast China were determined and studied in the present paper. The result of the experiment were as follows: (1) caloric value varied with plant species and plant organs, in general, the order of caloric value was tree, shrub and herb, and for different organs, was leaf, branch, trunk (stem), bark and root. (2) The standing crop of energy of larch community and tree layer were $269.719 \times 10^8$ J/ha and $264.440 \times 10^8$ J/ha respectively. There existed different distributions of energy in various components and different layers. (3) Net energy production of larch community and its tree layer were $264.346 \times 10^8$ J/ha.a and $243.678 \times 10^8$ J/ha.a respectively. To the photosynthetical active radiation on the stand, its energy converting efficiency was 2.2990%. Compared with other common forest communities in nature, artificial larch community has a relative larger energy production and higher converting efficiency. Key Words: Energy, Larch Community

INTRODUCTION

Larch forest, with a wide distribution in cold zone and cold temperate zone and a long history of cultivation, is one of the principal commercial forest types in northeast China. As a result of unreasonable exploitation and utilization, as well as damage of forest fire, its natural forest resources had decreased greatly over the past several decades. Artificial larch forests, however, which will become the important
reserve forest resources in northeast China, have been developing gradually. In order to manage or establish man-made forest ecosystems with an optional structure and a high productivity, it is absolutely essential to conduct a comprehensive and systematic forest ecosystem research. Based on the determination and analyses of biomass and net primary production, energy concept was applied to study the characteristics of productivity of larch community, including energy accumulation, energy distribution, energy production and energy conversion.

NATURAL CONDITION OF THE SITE

Dahurian larch forest studied in this paper located at Laoshan Plantation Experimental Station of Maoershan Forest Farm in the eastern part of northeast China (45° 16' N, 127° 34'E) with an average altitude of 300m. The local climate belongs to the continental climate with cold, dry winter and wet, warm summer. Annual average temperature is 2.7°C, with the extreme from 18.0°C to -12.1°C. Annual average precipitation is 780mm, falling mainly in July through August, which is 52% of the total. The other climatic indexes, such as evaporation, relative humidity, accumulated temperature (greater than 10°C) and sunshine time are 915mm, 71%, 2638°C and 1586.8h, respectively. The soil is a typical dark brown forest soil with abundant organic matter and higher soil fertility.

MATERIALS AND METHODS

The stand was planted in 1967 and presently in good condition. There were some natural broad-leaved trees in the upper storey, such as ash (Fraxinus mandshurica), birch (Betula platyphylla) and poplar (Populus davidiana), which regenerated and grew naturally. Under the storey, there were a certain amount of saplings, shrub and herbs, which distributed unevenly. The basic characteristics of artificial dahurian larch plantation were shown in Table 1.

<table>
<thead>
<tr>
<th>Age (yr.)</th>
<th>Stand composition</th>
<th>Stand density (N/ha)</th>
<th>D. B. H. (cm)</th>
<th>Height (m)</th>
<th>Canopy density (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>10L.+A+B+P+Others</td>
<td>1450</td>
<td>13.4</td>
<td>13.5</td>
<td>90</td>
</tr>
</tbody>
</table>

※: A: Ash, B: Birch, P: Poplar, L: Larch.

The biomass and primary production were estimated by the regression analyses methods. The samples for experiment were collected in the process of determination of biomass and productivity of larch stand, in which trunk and bark were sampled by different sections (2m); needle and branch by different layers, involving three layers within the extent of crown, and by different directions, including east, south, west and north; root by different soil layers, including five soil layers and different diame-