CANOPY CROWN CLOSURE OF THREE FOREST

TYPES AT NAMPROM BASIN, CHAIYAPHOOM PROVINCE

การปกคลุมของ เรือนยอดในป่าสามชนิดบริเวณลุ่มน้ำพรม   จังหวัดชัยภูมิ

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ปรีชา   ธรรม่านนท์ [1]/

เรื่องย่อ

การหา เปอร์ เซ็นต์การปกคลุมของ เรือนยอดในป่า ๓ ชนิด คือ ป่าดิบแล้ง ป่าเบญจ-
พรรณ และป่าเต็งรัง ได้ดำเนินการที่ลุ่มน้ำพรม   จังหวัดชัยภูมิ ระหว่าง เดือนกุมภาพันธ์ ๒๕๒๓
โดยการวางแปลงตัวอย่าง ขนาด ๔๐ ม. x ๔๐ ม. ๑ แปลง ในป่าแต่ละชนิด แล้วแบ่งออกเป็น
แปลงย่อย ขนาด ๑๐ ม. x ๑๐ ม. ทั้งหมด ๑๖ แปลง หมายตำแหน่งของต้นไม้ทุกต้นที่มีขนาด
เส้นผ่าศูนย์กลางที่ความสูง เพียงอก ตั้งแต่ ๔.๕ ซม. ขึ้นไป พร้อมทั้งวัดขนาด เส้นผ่าศูนย์กลาง
ของ เรือนยอด โดยใช้ เทปวัด ๒ ครั้ง ในแนวตั้งฉากซึ่งกันและกัน   แล้วจึงทำการ เขียนรูปแปลน
ของการปกคลุมของ เรือนยอดในลักษณะวงกลมลงบนกระดาษกราฟ การคำนวณหา เปอร์ เซ็นต์การ
ปกคลุมของ เรือนยอดนั้นกระทำโดยการใช้ Polar planimeter method, Weight-value
method และ Equal-area-segment method ผลปรากฏว่าการปกคลุมของ เรือนยอดจะลด
น้อยลง เมื่อความหนาแน่นของต้นไม้ลดน้อยลง การปกคลุมของ เรือนยอดจะมีมากที่สุดในป่าดิบแล้ง
รองลงมาคือ ป่าเต็งรัง และน้อยที่สุดในป่า เบญจพรรณ การทำ เปอร์ เซ็นต์การปกคลุมของ เรือน
ยอด ทั้ง ๓ วิธี ปรากฏว่ามีความแตกต่างกัน เพียง ๑.๕% เท่านั้น

ABSTRACT

Percent canopy closure estimation was carried out in three
forest types; dry evergreen forest, mixed deciduous forest and dry
dipterocarp forest at Namprom Dam, Amphoe Khon-San, Chaiyaphoom Province,
during February 1979. In each stand, one sample plot 40 x 40 m^2 was
laid out randomly. The plot was then divided into 16 subplots (10 x 10 m^2)

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All trees 4.5 cm. or more in D.B.H. in each plot were mapped and their crown diameters were measured twice perpendicularly by a measuring tape. Three methods; planimeter method, weight-value-method and equal-area-segment method were applied for percent canopy closure calculation. The results showed that the percent canopy closure value decreases with the decreasing of the density of the trees, being maximum in dry ever-green forest and minimum in mixed deciduous forest. The three methods for percent canopy closure estimation are insignificant.

INTRODUCTION

Canopy closure or percent coverage is a basic consideration in any study of the structure of vegetated areas. This attributed is significant in determining vertical visibility into or out of forested areas, light penetration, biomass and so on. In this work, canopy closure is defined as the proportion of the sample area that is encompassed when the crowns of all plants are projected vertically downward to the ground.

Three manual methods have been utilized to determine percent canopy closure. These methods require graphical diagrams representing the spatial arrangement and size of plant crowns contained in a circular or rectangular sample area. Construction of these diagrams is time consuming, and the measurement of coverage areas is subjected to error.

Several methods have been used to obtain crown coverage. The system devised by Mills (1963) and Mills and Clagg (1964) could not be adapted to complex tropical vegetation for the Namprom basin studies. That method was devised for comparatively simple vegetation stands and consists of an estimate of coverage for any height class based on the mean obtained from measurements of the largest and smallest trees in that height class. Mills and Clagg determined that for at least the areas they suited one could generalize all crowns to be usually recta-gonal or sometimes polygonal; this is not considered to be true for the Namprom basin site. For the complex vegetation crown stucture at the study sites, this method was found to be inadequate.

Johnson and Vogel (1965) present still another method of obtaining coverage data; it involves a macrodensitometer that measures light transmittance through a positive print of a photograph of the canopy. The photograph is obtained by a camera equipped with a hemispheric lens mounted on a tripod 3 ft. above the ground with the optical axis vertical. This method does not measure canopy closure as defined above since many of the openings recorded on the photograph are the result of light coming though the canopy at various angles rather than vertically.

The aim of this investigation was to find the crown cover of three forest types; dry evergreen forest, mixed deciduous forest and dry dipterocarp forest at Namprom basin, Chaiyaphoom province, by the using of three methods; planimeter method, weight-value method and equal-area-segment method.

STUDY AREA

Coverage of tree crown (crown cover) estimation was carried out in three forest types; dry evergreen forest, mixed deciduous forest and dry dipterocarp forest at Namprom basin, Amphoe Khon-San, Chaiyaphoom Province, about 150 km. northwest of Khonkhan in northeastern Thailand. The area is on 16° $27'$ N lattitude and 103° $39'$ E longitude. The elevation is about 700 m. above M.S.L. (Thipsuwan, 1974).

MATERIALS AND METHODS

In each stand, one sample plot 40 x 40 $m.^2$ was laid out randomly. The plot was then divided into 16 subplots (10 x 10 $m.^2$). All trees with 4.5 cm. in D.B.H. and over existing in each 40 x 40 $m.^2$ plot were mapped and their crown diameters were measured twice perpendicularly by a measuring tape.

Three manual means to obtain percent canopy closure are the planimeter method, the weighed-value method and the equal-area-segment method. The planimeter method is the most tedious and difficult.

Textbook instructions concerning the planimeter mention that the value of an area should be the average of at least three consecutive readings of that area.

The weighed-value method consists of cutting out the plot of the rectangular sample area and weighting it to the nearest thousandth of a gm. Individual crowns and distinct groups of overlapping crowns area then cut out and weighed similarly. The percent canopy closure equals 100 times the ratio of covered-area weight to cell-area weight. It can be said that, the process of cutting out the individual crowns and crown groups can be tedious and time consuming.

The equal-segment method is the quickest manual method. The circular sample area is divided into a large number of equal-area segments, 1296 in this case as illustrated by Fig.4. The crown diagrams are drawn to scale on the grid; then the covered segments can readily be counted. The number of covered segments divided by 1296 and multiplied by 100 yields the percent canopy closure.

A portion of the time required by these procedures could be eliminated if the crown diagrams were constructed by a computer with an x-y plotter. However, since the crown diagrams serve no purpose beyond providing a procedural step for the manual methods, an analytical solution that would climinate the diagrams entirely was sought.

In this case, the sample area or structural cell area Mills (1963) and Mills and Clagg (1964) is circular, and most plant crowns are circular or nearly so.

RESULTS AND DISCUSSION

Spatial arrangement of plant crown for all trees with 4.5 cm. in D.B.H. and over existing in each 40×40 m.^{2} plot in dry evergreen forest, mixed deciduous forest and dry dipterocarp forest was shown in Fig.1, 2 and 3 respectively. Percent canopy closure value varies with the density of trees, i.e. the higher the number of trees, the bigger the percent canopy closure. Table 1. contains the results

obtained by the three methods. Close scruting of this table shows
that the coverage values for the three manual methods are within
approximately 1.5% points of each other, which is rather insignificant
when the experimental error inherent in the system for collection the
crown-diameter data is considered. For example, irregular crown
(plan view) were normalized to circles in the field and crown of tall
trees were inaccessible for accurate measurement.

Table 1.   Comparision of coverage values for all trees with 4.5 cm.
in D.B.H. and over existing in each plot 40 x 40 m.^{2}
obtained by the three methods

Forest type	Density of trees (No./ha)	Percent canopy closure value		
		Planimeter method	Weight-value method	Equal-area-segment method
1. D.E.F.	1,088	86.72	86.12	87.01
2. M.D.F.	238	56.45	56.34	57.00
3. D.D.F.	938	77.03	76.39	76.17

Source : Sahunalu et al. 1979.

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