

屋久島の森林施業に関する研究

II 航空写真によるスギ人工林の林分構造評価

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Studies on the Treatment of the Forest in Yaku-shima Island

II. Evaluation of the Stand-composition of the Planted

Sugi (*Cryptomeria japonica*) Forests

Photographed by Aerial Shots

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要 旨

航空写真上で樹冠疎密度を判読し、林分構造を把握することは大変有効であって、航空写真の利用の最も有利なもの1つと考えられる。

そこでここでは屋久島のスギ人工林を対象に、航空写真上で樹冠疎密度を判読し、平均値、分散、構造相関係数によってその林分構造を把握した。初めに4林分について予備研究を行ったが、そこで得られた5回の繰返し判読の結果はきわめて安定したものであった。

そこで若齢から壮齢にいたる11林分について上述の判読を行い、この3つの値によって各林分の構造を明らかにした。

Introduction

Yaku-shima Island is world-famous for a lot of huge old Sugi (*Cryptomeria japonica*) trees growing in the forests. Therefore it has been a quite important problem how to preserve them, keeping their growth vigorous and everlasting. While the performed constructions of numerous forests planted with Sugi trees have made it indispensable to fix any adequate treatment method which will be workable from now on. Some exact evaluation of the stand-composition of the forest was considered to be essential for the proper treatment of those planted forests. The observation of the stand-composition may be carried out quite effectively, by making use of the aerial shots viewed with stereoscope. In this study some interpretations of the crown density were tried on the aerial shots. Some investigations of the evaluation of the stand-composition were made on the following items: mean value, variance and the structural correlation coefficient of the interpreted crown density.

Materials and Methods

Fifteen stands were selected at the valley of the Miyanoura-gawa River³⁾, in the

Miyanoura area situated in the north of this Yaku island. The age-range of these sample stands was estimated to be from ten to forty-eight years. On the aerial shots of the respective stands was drawn a net of 5mm meshes. The interpretation of the crown density of each square plot was carried out by means of the crown density scale on the aerial shots. Here the crown density was interpreted from 5% to 95% at the intervals of 10%. The shots enlarged twice were used, the scale being about 1:10,000. The shots used were YAMA-928, C3 No.7~10 and C4 No.9~10 snapped by an aviator of the Japan Forestry Agency in 1980. In the evaluation of the stand composition, the mean, the variance and the structural correlation coefficient of the interpreted crown density were put into consideration. Here, the last one is the value showing the partiality of the crown density²⁾. The calculation method is as follows: For example, in Fig.1, the arrangements of (n,a), (a,n); (n,b), (b,n); (n,c), (c,n); (n,d), (d,n) may be obtained. The use of all these arrangements will enable us to construct a symmetrical correlation table. And then, the correlation coefficient is to be calculated by making use of the table¹⁾.

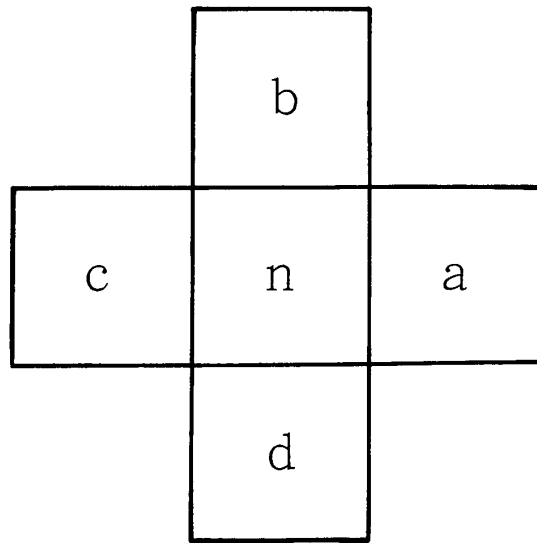


Fig.1 n and four nearest neighbours.

Results and Discussion

In the preliminary tests, the data obtained about the four stands were used. The interpretations of the crown densities of the respective plots were made five times.

The result obtained is as shown in Table 1. As is shown in Table 1, the densities interpreted five times showed almost the same values. Therefore, in case when the plots put under interpretations are numerous, repetition of the interpretations are hardly necessary. The followings were ascertained from Table 1. Namely, in case when comparison is made between Stand I and Stand II aged almost the same, the difference in the respective structures is to be found clearly, the crown densities of Stand I and

Table 1. Evaluating the stand composition (Preliminary test)

Stand	Age	Plot *	Time	Mean	Variance	S.C.C.**
I	28	105	1	52.6	4.0	0.626
			2	53.0	3.9	0.642
			3	53.8	3.6	0.633
			4	52.7	3.4	0.626
			5	53.8	4.0	0.616
II	26	76	1	52.5	29.0	0.147
			2	53.2	30.4	0.178
			3	52.8	25.0	0.117
			4	52.5	28.5	0.078
			5	52.8	25.0	0.036
III	13	45	1	16.8	6.8	0.511
			2	17.7	8.2	0.588
			3	17.9	6.0	0.464
			4	17.4	7.2	0.502
			5	17.0	7.8	0.549
IV	10	31	1	55.7	16.0	0.285
			2	56.0	15.9	0.396
			3	57.3	11.4	0.396
			4	56.3	14.3	0.347
			5	57.6	11.9	0.335

* Plot: Numbers of Plots

** S.C.C.: Structural Correlation Coefficient

Stand II being almost the same. However, as to the value of variance, that of Stand II is much larger than that of Stand I. And concerning the structural correlation coefficient, that of Stand I is larger than that of Stand II. All of the five structural correlation coefficients showed significance at 1% level in Stand I, which shows that there must be a partial distribution of the crown density in Stand I. Therefore, evaluation of the stand composition was assumed to be made possible by making use of the three factors: mean, variance, and the structural correlation coefficient.

In table 2, the interpreted values of the stands A, B, C, D and E are the mean values of those interpreted five times. While, in case of the stands F, G, H, I, J and K, the interpretation was taken only once. Here are illustrated the three pairs: A and B (high aged); F and G (middle aged); J and K (low aged). In case of the comparison

Table 2. Evaluating eleven stand compositions

Stand	Age	Plot*	Mean	Variance	S.C.C.**
A	48	17	15.9	9.2	-0.039
B	42	20	35.9	22.5	-0.073
C	39	12	43.8	16.7	0.005
D	24	13	80.7	9.1	0.152
E	24	11	62.8	8.7	0.125
F	26	57	38.0	86.3	0.488
G	21	44	64.5	47.2	0.569
H	16	39	50.9	79.7	0.494
I	16	40	61.3	48.7	0.572
J	15	108	20.7	75.3	0.494
K	13	68	52.2	29.3	0.285

* Plot: Numbers of Plots

** S.C.C.: Structural Correlation Coefficient

between A and B, concerning mean and variance those of A are smaller than those of B, but as to the structural correlation coefficient those of both A and B are rather small. In the comparison of F and G, in F mean is smaller but variance is larger than in G. The structural correlation coefficients are large in both of F and G, showing significance at 1% level. In the comparison of J and K, the same results as those in F and G were obtained. While, concerning the structural correlation coefficients the value of J was larger than that of K. Both of these showed significance at 1% level, crown density being partial.

Summary

Evaluation-method of the stand composition of the planted forest in the Yaku-shima Island was studied on the aerial shots. Some meshed nets were drawn on the aerial shots. The crown densities in the respective meshes were interpreted by means of the crown density scale on the aerial shots. The results were evaluated by means of the following items: value of the means, variance and structural correlation coefficient.

References

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