instance by removing some shoots at various growing stages (level b of analysis). In this way, total biomass can be reduced and shoots will differ in age.

A differentiation in time and space of the developement phase may be so achieved. The smaller coppices, with an area less than about 10 ha, may need continuous supervision.

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Netherlands Journal of Agricultural Science 32 (1984) 242-245 SYNOPSIS

A matrix model of uneven-aged forest stands

H. Rottier (Department of Forest Management, Agricultural University, P.O. Box 342, 6700 AH Wageningen, Netherlands)

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Abstract. Matrix algebra showed that with uneven-aged stands allowable cut in a size class can be calculated from guessed number fractions of trees cut. The procedure can be used for calculation when optimization is impossible or not necessary.

Key-words: Leslie matrix, uneven-aged stand, selective forest management, allowable cut.

Introduction. Forest in the Netherlands is sometimes managed on a small scale. The need arose to calculate allowable cut on a basis other than area. In the past attention has been concentrated on the ideal Liocourt curve (Knuchel, 1950; Meijer, 1980). Prodan (1949) indicated that the ideal curve depended on the cut. This idea is here developed into a general matrix model.

Theory. Leslie matrices can be fitted for forestry as follows (e.g. Usher, 1969):

$$n(t)_i = b_{i,i-1} \cdot n_{i-1} + a_{ii} \cdot n_i \qquad (1)$$

in which $n(t)_i$ is number of trees in diameter class i at the end of period t, $b_{i,i-1}$ is number fraction of trees advancing one diameter class in period t, a_{ii} is number fraction of trees staying in its diameter class in period t, n_i and n_{i-1} is number of trees in classes i and $i-1$ at the beginning of period t.

For m diameter classes, Equation 1 can be transformed into the matrix equation:

$$\begin{bmatrix} a_{11}+f & 0 & \cdots & \cdots & 0 \\ b_{21} & a_{22} & \ddots & & \vdots \\ 0 & b_{32} & \ddots & \ddots & \vdots \\ \vdots & \ddots & \ddots & \ddots & 0 \\ 0 & \cdots & 0 & b_{m,m-1} & a_{mm} \end{bmatrix} \times \begin{bmatrix} n_1 \\ \vdots \\ \vdots \\ \vdots \\ n_m \end{bmatrix} = \begin{bmatrix} n(t)_1 \\ \vdots \\ \vdots \\ \vdots \\ n(t)_m \end{bmatrix} \qquad (2)$$

in which f is ingrowth (number fraction of young trees entering the lowest diameter class),

$a_{ii} + b_{i+1,i} \leqslant 1$ (because a tree may die),

and

$1 > a_{ii} \geqslant 0; \quad 1 \geqslant b_{i+1,i} > 0; \quad f \geqslant 0$

This model can be extended with factors c_{i+2}; d_{i+3} . . . for trees advancing more than one diameter class. However for simplicity they are not included in the equations, as this does not alter the theory nor the conclusions.

Equation 2 can be written as:

$$T \cdot n = n(t) \qquad (3)$$

As T (the transformation matrix) is a non-negative matrix, there is a latent root which has a non-negative latent vector. So:

$$T \cdot n = \lambda \cdot n \qquad (4)$$

For a managed forest, the matrix model can be constructed as

$$T \cdot (n-h) = \lambda \cdot n, \quad \text{or} \qquad (5)$$

$$T \cdot (I-H) \cdot n = \lambda \cdot n \qquad (6)$$

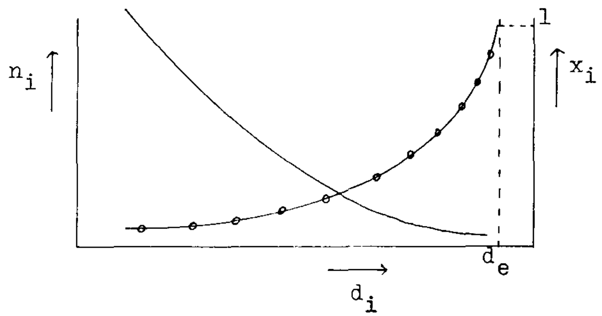

Fig. 1. Relation between numbers of trees (n_i), number fractions of trees cut within a size class (x_{ii}) and diameter (d_i). ——, relation between n_i and d_i; O——O, relation between x_{ii} and d_i; d_e, the management goal on diameter size.

In which h is the $m \times 1$ matrix which contains the number of trees extracted. I is the $m \times m$ unit matrix and H is an $m \times m$ matrix with the number fractions cut in a size class, x_{ii} ($= h_i/n_i$), on its diagonal and all other postions zero.

For λ, there are three biologically relevant cases:

1) $\lambda > 1$
2) $\lambda = 1$
3) $0 < \lambda < 1$

Cases 1 and 3 imply either exponential growth or the disappearance of the forest. As this is rarely true, we can state that the transformation matrix of a forest (whether managed or not) will change through all kinds of processes so that the laten root λ will become 1.

Discussion. Although matrix models have been used in forestry to calculate the stable distribution under a certain management (Usher, 1969; Satyamurthi, 1980; Buongiorno & Michie, 1980), no attention has been paid to the change in the number fractions a, b and f. Calculation of these changes is difficult (e.g. Ek & Monserud, 1979) and needs further research. It may be useful, however, to say something about the allowable cut without knowing these changes.

If we accept Equation 6 and the arguments about λ, the distribution will become stable for any reasonable matrix H. 'Reasonable' in this context means in accord to Fig. 1 (after Roches, 1970).

With this approach planning can be justified without knowing the exact value of the parameters.

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Effect of muscle temperature soon after slaughter on pork quality: a pilot study

P. G. van der Wal and G. Eikelenboom (Research Insitute for Animal Production 'Schoonoord', P.O. Box 501, 3700 AM Zeist, Netherlands)

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Abstract. The effect of various environmental temperatures, ranging between 42.5 and 25 °C during the first 2 h after slaughter, on pork quality was studied in longissimus dorsi samples. Higher environmental temperatures resulted in higher lactate and lower pH 2 h after slaughter. Samples kept at higher environmental temperatures (42.5 and 40 °C) showed characteristics typical for pale soft exudative pork.
Key-words: body temperature, environmental temperature, pork, pale soft exudative, drip loss, meat quality.

Introduction. Pale soft exudative pork is the result of rapid decline in pH after slaughter and elevated muscle temperature, which cause denaturation of muscular proteins. Heat production in porcine muscle is increased by stress, particularly in stress-susceptible pigs (Sybesma & Eikelenboom, 1978). With present slaughter procedures, carcase temperature frequently remains high for the first hours after