

agriculture & rural development Department: agriculture & rural development PROVINCE OF KWAZULU-NATAL

PASTURES IN KWAZULU-NATAL

Pasture Utilisation

A STOCKING RATE MODEL P E Bartholomew

INTRODUCTION

Stocking rate is defined as the number of animals, of a particular class, per unit area of land for a specified period of time (usually the growing period of the pasture in question).

Stocking rate, from the point of view of animal production from pasture, is probably the single factor that has the greatest effect on production per animal and on animal production per hectare. Clearly, the more animals per unit area of pasture, the less herbage available per animal and the lower will be the dry matter intake per animal and the lower the production per animal.

THE STOCKING RATE MODEL

A model that describes the relationship between stocking rate and the performance of grazing animals is illustrated in Figure 1. The simple linear model y = a - bx (where y = gain per animal per day; x = stocking rate in animals, of the class in question, per ha; a and b are constants) describes the relationship between animal gain and stocking rate (line BXn) and indicates that there is a uniform rate of decline in animal performance with increasing stocking rate, from Xb to Xn. The line AB indicates the area of no improvement or gain per animal as the stocking rate is reduced below Xb: indicating that the availability of more feed per animal does not improve animal performance. This may be due to the potential of the animal having been reached or it may be due to pasture quality (excess accumulation of old material) restricting animal performance may thus decline at stocking rates below Xb where there is accumulation of old material.

Since the model, y = a - bx, is empirical, no biological determinants exist for *a* and *b* and their value must be determined experimentally for each

pasture, class and type of grazing animal.

The animal gain per unit area model, describing the relationship between animal gain per unit area and stocking rate is also shown in Figure 1. This model, a quadratic of the form $y = ax - bx^2$ (where y = animal gain per area; *a*, *b* and *x* as before), is derived by multiplying individual

animal performance (in the model y = a - bx) by the stocking rate x (*i.e.* the number of animals per area).

PRACTICAL IMPLICATIONS

From Figure 1 it can be seen that as the stocking rate is reduced (*i.e.* fewer animals per hectare) from Xc to Xb so there is an increase in the average daily gain per animal, but a reduction in livemass gain per hectare. Conversely, as stocking rate is increased from Xc to Xn (*i.e.* more animals per hectare) there is a reduction in both average daily gain per animal and in animal gain per hectare (*i.e.* relative to animal performance at stocking rate Xc). At stocking rate Xn maintenance of animal mass (no gain per animal and no gain per hectare) occurs.

For situations where the aim is maximum production per animal the stocking rate Xb (Figure 1.) is chosen. Where the objective is maximum gain per unit area the stocking rate to use is *Xc*. The stocking rate for dairy animals should be *Xb* (to maximise production per animal). For beef and sheep situations the objectives of what daily gain is required to attain specific mass at specific date determines the stocking rate to use (between *Xb* and *Xc*).

Generally it is not economic to use stocking rates greater than *Xc*, unless animals are to be finished in some other system (feedlot or other pasture) or unless there is a big price differential between the start of the period on pasture and the end of the period on the pasture. The economic stocking rate for slaughter beef and lamb production usually lies to the left of *Xc*.



FIG. 1. The theoretical relationship between stocking rate and averge daily gain (y = a-*bx*) and between stocking rate and livemass gain per hectare (y = x-*bx*²)

REFERENCES

Edwards, P J, 1981. Principles of grassland management. Grazing management. In Veld and Pasture Management in South Africa. Ed. N M Tainton. Shuter & Shooter, Pietermaritzburg. 325-354.

Jones, R J. & Sandland, R L., 1974. The relation between animal gain and stocking rate. Derivation of the relation from the results of grazing trials. J. Agric. Sci: Camb., 83: 335 - 342.