GRAZING MANAGEMENT OF PASTURE AND FORAGE CROPS AS IT AFFECTS FORAGE UTILIZATION AND ANIMAL PRODUCTION IN TROPICAL AUSTRALIA

G. J. CASSIDY*

INTRODUCTION

Willoughby (1970) has distinguished two basic systems of animal production, viz. pastoral and non-pastoral systems. Tropical and sub-tropical dairying enterprises can be divided accordingly. The former can be said to include those farms where size, topography and soil type preclude cultivation for supplementary fodder crops, or limit it to odd small patches, so that the major source of forage on the farm is perennial pasture. Farms where extensive cultivation is practised so that a series of annual fodder crops, irrigated pastures and conservation contribute to high levels of forage utilisation, can be placed in the non-pastoral category.

In all cases at the farm level the objectives of grazing management can be defined thus—

(a) To convert as much as possible of the particular forage into livestock product—which means striving for maximum effective consumption of it by the herd.

(b) To maintain the pasture or crop in a productive state, that is, to maintain the feed supply and (in the case of perennial pasture) to preserve the desired botanical composition.

These two considerations are opposed to one another (except for pure grass swards on pastoral farms) and the farmer's requirement is a satisfactory compromise between the two. The scope of this paper is obviously more concerned with (a) than with (b), but the latter is often the farmer's primary consideration, so that uncertainty about the limits of grazing pressure does have a profound effect on forage utilisation.

NON-PASTORAL ENTERPRISES

To farmers generally, a particular area of pasture or fodder crop qualifies for special grazing management, aimed at maximum utilisation and conversion to animal output, only if it is a valuable and limited source of higher quality feed.

Forage crops

Factors involved in the grazing management of temperate type forage (lucerne, winter cereals), which have some uniformity of seasonal growth rate and fairly well defined criteria as to the limits of grazing pressure, seem to be well understood and widely, although not always, applied at the farm level. Rotational or (in the case of rationed forage) strip grazing systems are readily devised to combine a high level of utilisation and conversion with optimum regrowth periods (Anon. 1970).

On the other hand, the farmer's perception and experience indicate no economic benefits to follow such critical techniques applied to summer growing annuals (forage sorghums, millets, cowpeas, Dolichos) except on small areas which are strictly rationed on a daily basis. Less sophisticated manipulations are often used which are dictated as much by agronomic and property management considerations as by feed conversion. They usually involve the strategic manipula-

*A.C.F.-Austral Fertilizers Limited, Little Roma St., Brisbane 4001.

tion of two or three paddocks and planting times in order to extend the availability of forage at a pre-determined growth stage. In this, farmers and advisers have no quarrel with the experimental evidence available to them (Boorman 1967; Hendrickson 1969).

Irrigated perennial pastures

The traditional irrigated pasture in sub-tropical Queensland is a mixture of temperate grasses and legumes subject to a recommended rotational grazing system designed to combine efficient utilisation of forage with regular watering and cultural operations during the winter and spring months. However, grazing pressure during the summer is lessened in order to preserve the original botanical composition—at the expense of forage utilisation.

Such flexibility is accepted and practised on larger-scale enterprises but is not economically feasible on smaller (essentially pastoral) coastal units, with limited irrigation, where major capital resources need to make their maximum contribution to utilisable forage (Lamond 1968). In such cases, farmers and advisers have devised more intensive production systems based on annual renewal by seasonal oversowing with suitable species and fertilizing. Thus the manipulation of species and fertilizer is directed towards a continuous supply of highly utilisable forage under an inflexible grazing rotation—instead of vice versa.

PASTORAL ENTERPRISES

Perennial pasture

This remains the principal source of digestible dry matter on most sub-tropical and tropical dairy farms, i.e. they are pastoral farms where a fixed number of animals is subject to the wide annual variations in forage quantity and quality inherent in such a system (Willoughby 1970). The most elementary are undoubtedly those based on perennial pastures of pure grass, dominated by paspalum, kikuyu, couch or rhodes grass. Daily growth rates can vary from nil for several months to 80 lb per acre during a short growing season.

In the absence of fodder conservation, herd sizes are limited to the number of animals which these pastures can maintain during the leanest part of the year —i.e. late winter and spring. Therefore, during much of the annual cycle a progressively increasing quantity of unconsumed plant material accumulates, undergoing rapid losses in quality and quantity through ageing and decomposition. Gross under-utilisation of the total forage within the farm boundary is the norm. Farmers recognise this and also the futility of any existing grazing management system which might be applied in an attempt to improve the situation.

Stated simply, the key to better utilisation and conversion to animal product is the maintenance of grazing pressure by adjusting stocking rate and pasture growth rate so that rate of consumption more nearly approaches rate of dry matter accumulation, and in turn the forage presented remains young and of high quality (Minson 1968). This adjustment is made successfully by some enlightened farmers for significant periods, using nitrogen fertilizers under set stocking on part of the farm (within a feed year system), in accordance with experimental results and advisers' recommendations (Holder 1967; Hartridge 1969).

A higher quality source of perennial forage is sown pasture comprising a mixture of the newer tropical grasses and legumes, which in general conform closely to advisers' recommendations (Luck and Douglas 1966; Cassidy 1968). It has been established that digestibility and nutritive value of the legumes also decline with age of the material and stage of growth (Minson 1968), and their daily growth rate pattern exhibits a similar annual pattern to that outlined above. How-

ever, infinitely better utilisation and animal production are achieved at farm level from pastures comprising these species. This superiority, of the order outlined by Jeffery *et al.* (1970), is inherent in the quality characteristics of the species and is achieved under normal set stocking regimes at present appropriate to pastoral dairying. No case has ever been presented to farmers or advisers for a specialised grazing management system aimed at better utilisation and conversion of this material.

Recommendations published by agronomic advisers (Luck and Douglas 1966; Cassidy 1967) are all plant oriented and emphasize the preservation of the sown species, especially the legume component, by limiting grazing pressure at the expense of forage utilisation. Their wide adoption to farm practice leads to waste through mechanical slashing for the disposal of surplus ungrazed material.

Stocking rate

The implications of stocking rate with regard to feed utilisation and the productivity per unit area of land are not lost on the dairyman. He will consider them in making decisions regarding the components of his production system—i.e. the area of sown pasture to establish, or the amount of fertilizer and the area to be treated, thus assigning a more or less fixed stocking rate to each "sward area", as outlined by Lamond (1968). These will average out to the farm carrying capacity. Stocking rate is not (and it is difficult to see how it ever could be) an adjustable tool in grazing management on tropical and sub-tropical dairy farms.

CONCLUSIONS

a) Defined grazing management techniques are readily and successfully applied by farmers to achieve maximum utilisation of winter forage crops or to allow animals to get the maximum effective daily ration from small areas of high quality supplementary forage.

b) On limited areas of irrigated pasture, which involve high capital input per acre, farmers' strategy is to maintain continuous grazing pressure under a fixed rotation by using the necessary agronomic inputs to match feed supply to herd requirements.

c) On perennial pastures, no specialised grazing management systems have been defined or used for maximum utilisation. Set stocking is the rule, with some appreciation of the role of stocking rate as applied to "sward area". Available grazing management advice is pasture oriented with the object of preserving the original botanical composition.

REFERENCES

ANON. (1970)—*Qd Agric. J.* **96**: 117-120.
BOORMAN, A. J. (1967)—*Qd Agric. J.* **93**: 554-556.
CASSIDY, G. J. (1967)—*Qd Agric. J.* **93**: 732-742.
CASSIDY, G. J. (1968)—*Qd Agric. J.* **94**: 43-52.
HARTRIDGE, F. J. (1969)—*Agric. Gaz. N.S.W.* **80**: 391-394.
HENDRICKSON, R. E. (1969)—*Qd Agric. J.* **95**: 189-190.
HOLDER, J. M. (1967)—*Trop. Grasslds* **1**: 135-142.
JEFFREY, H. J., COLMAN, R. L., DALE, A. B., and HOLDER, J. H. (1970)—*Proc. Aust. Soc. Anim. Prod.* 8: 476-481.
LAMOND, D. R. (1968)—*Trop. Grasslds* **2**: 129-134.
LUCK, P. E., and DOUGLAS, N. J. (1966)—*Proc. Trop. Grassld Soc. Aust.* 6: 45.
MINSON, D. J. (1968)—*Trop. Grasslds* **2**: 197-198.
WILLOUGHBY, W. M. (1970)—*Proc. Aust. Soc. Anim. Prod.* 8: 415-421.

DISCUSSION

Stocking rates

Guidelines for determining stocking rates exist in some areas from data such as dry matter yields, measured in cutting experiments. In many cases however, the optimum stocking rates are unknown.

The principle that maximum per acre production is achieved at higher stocking rates is well accepted. Due consideration should be given to per animal production and sward composition when considering high stocking rates.

Research is needed to determine the stocking rate-animal production functions with the aim of assessing the optimum relationships between per cow and per acre production for various pastures.

Grazing systems

The following aspects of grazing management of tropical pastures need further investigation:—

(i) Frequency of grazing

(ii) Grazing interval

(iii) Stocking rate and grazing pressure.

It is imperative that the results of these studies be expressed in terms of both animal and pasture production.

Whereas it is preferable for research and extension officers to provide simple grazing systems for the farmer when possible, there is a need for investigations of more complex systems which might raise production. More research is required to compare the productivity of various pasture systems.

The grazing animal

It is not known to what extent a cow can lose weight over early lactation before this begins to have a deleterious effect on the animal. The relationships between body condition at calving, weight loss over early lactation and milk production need to be quantified so that the extent to which the cow's body reserves can be used for milk production can be determined.