A FLEXIBLE GRAZING MANAGEMENT SYSTEM PROPOSED FOR THE ADVANCED EVALUATION OF ASSOCIATIONS OF TROPICAL GRASSES AND LEGUMES

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SUMMARY

Traditional methods used for the advanced evaluation of associations of tropical grasses and legumes under grazing have a number of limitations. The rigid grazing systems commonly utilized do not recognize nor respond to the dynamics of pastures as they interact with climate, soils, biotic factors, and management. Consequently the true potential of new germplasm is often under-estimated. A flexible grazing management system is proposed to overcome some of the limitations of traditional fixed management methodology. The methodology proposed involves managing each association under evaluation in a flexible but pre-defined manner. Stocking rates and grazing systems are adjusted depending on two parameters to be measured or estimated in the pasture: 1. stocking rate is adjusted when grazing pressure based on green forage on offer reaches selected limits (e.g., 3 and 6 kg DM/100/kg liveweight/day) to maintain grazing pressure within the pre-established range. 2. grazing system is adjusted when the legume component reaches selected limits (e.g. 15 and 50% of the green forage on offer). When the pasture reaches the upper limit, the rest period is increased; when percent legume reaches the lower limit the rest period is reduced. Both stocking rate and grazing system adjustments are likely to be infrequent (two-three times yearly) in the humid tropics if the range of forage on offer and percent legume are properly chosen. A simple two paddock alternate grazing system is employed.

The methodology is presently being tested in a sub-humid tropical savanna location in eastern Colombia and a humid tropical forest environment in Bahia, Brazil.

KEYWORDS: Germplasm evaluation methodology, flexible grazing management, pasture management, advanced germplasm evaluation

INTRODUCTION

The advanced evaluation of tropical forage germplasm under grazing is an essential step in the process leading to selection and release of new cultivars. Most grazing trials use 2 or 3 fixed stocking rates and continuous grazing; seasonal adjustment of stocking rate is sometimes included. The choice of this methodology seems to have been based on a general consensus expressed by t'Mannetje et al. (1976) 'Currently available evidence from the tropics does not indicate that any grazing management system that will provide higher animal production than continuous grazing with set stocking can be readily devised.' The author recommend the use of this grazing management for the evaluation of pastures because the quickest and least expensive method to implement. Until recently, this view has been generally accepted by most researchers working in pasture evaluation programs in the humid American tropics.

Among the experiments summarized by t'Mannetje et al. (1976) one finds evidence favoring management other than continuous grazing for some legume-grass associations. For example Dias (1969) reported that pastures of Macroptilium atropurpureum and Panicum maximum were grazed more selectively under continuous grazing than under rotational grazing. He concluded that the high proportion of M. atropurpureum was probably due to the low palatability of this species compared with P. maximum and suggested that some form of rotational grazing would be desirable in order to maintain adequate grass content in pastures if they are required for

period longer than 3 years. Recent experience in the humid tropics of Latin America where structurally stable oxisols and ultisols dominate also indicates that continuous grazing is not always the optimum management for grass legume associations. In some cases, continuous grazing is quite appropriate, in others it leads rapidly to legume dominance of pastures (Spain 1980, Spain and Ferreira 1984). This has been the experience in Carimagua, Colombia with pastures of Andropogon gayanus and Pueraria phaseoloides (CIAT 1983). However pastures of Brachiaria decumbens with P. phaseoloides have been quite stable and productive during 6 years under continuous grazing (CIAT 1985).

Evaluation using set stocking is often justified by reasoning that stockmen have a finite pasture base, thus little opportunity for adjusting stocking rate downward for lack of pastures to absorb the animals removed. However in extensive and semi-intensive grazing systems which characterize most livestock production in the humid tropics the percentage of sown pasture is small (but expensive) relative to native resources and can be managed flexibly, taking advantage of the buffering capacity of the latter.

LIMITATIONS OF TRADITIONAL METHODOLOGY

Designs based on a range of stocking rates and one or more grazing systems. Available resources usually permit only one system of grazing with two or three stocking rates with both factors uniform for all associations under evaluation. Thus an association which functions best under continuous grazing may be evaluated using some form of rotational grazing system or vice- versa. If this occurs it is likely that the association will be unstable especially at higher stocking rates leading to an under-estimation of its potential. It could easily be discarded due to low productivity and/or lack of stability.

Another major limitation is the rigidity of this type of evaluation. It does not recognize the dynamics of the pasture and the ecosystem in which it is being evaluated and can easily lead to erroneous conclusions because of the cumulative effects of periods of sub-optimal management. Thus, a single severe drought period with a low probability of occurrence may unduly affect the outcome of a long-term grazing trial as a result of the temporary over-grazing of what might otherwise have been some of the best treatment combinations. The residual effects of this one period of stress could lead to serious underestimation of the potential of the association. Some species are much more susceptible to mis-management than others, and the effects of periods of stress can be irreversible or persist for many years in pastures formed by less resilient species.

Put and take designs. This methodology is used to estimate the production potential of pastures under one or more constant grazing pressures without regard for species balance and persistence. It requires intensive management which is usually not relevant to commercial pasture management.

WORKING HYPOTHESIS

As a basis for the development of alternate methodology the following hypotheses have been formulated:

1. Management requirements may be different for different associations in a given ecosystem.
2. A given association may require different management in different ecosystems.
3. Grazing selectivity is the function of many factors including grazing system, a major component of management which strongly affect species balance in most tropical pastures.
4. Continuous grazing usually favors the legume while deferred grazing favors the grass in most tropical associations.
5. The effect of trampling on pastures is minor on structurally stable soils if adequate cover is maintained.

THE PROPOSAL

It is proposed that each association be managed in a flexible manner. Stocking rates and grazing systems are adjusted depending on two pasture parameters. 1. The stocking rate is adjusted when grazing pressure based on green forage on offer reaches selected limits (e.g. 3 and 6 kg DM/100 kg liveweight/day). When the pasture reaches either limit the stocking rate will be adjusted to maintain the grazing pressure within the pre-established range. 2. The grazing system will be adjusted when the legume content reaches selected limits (e.g. 15 and 30% legume in green forage on offer). When the pasture reaches the upper limit the rest period is increased, when legume percent reaches the lower limit the rest period is reduced. The ranges of forage on offer and botanical composition are relatively broad therefore adjustments in stocking rates and grazing systems will be infrequent and in practice, may only be seasonal. It is important to note that the proposed system of management is much less intensive than that required for put and take design. The management responses required are presented schematically in Figure 1. The field design being used as a test of this methodology in Carimagua and in the Gregorio Pondar Experiment Station of CIPAC near

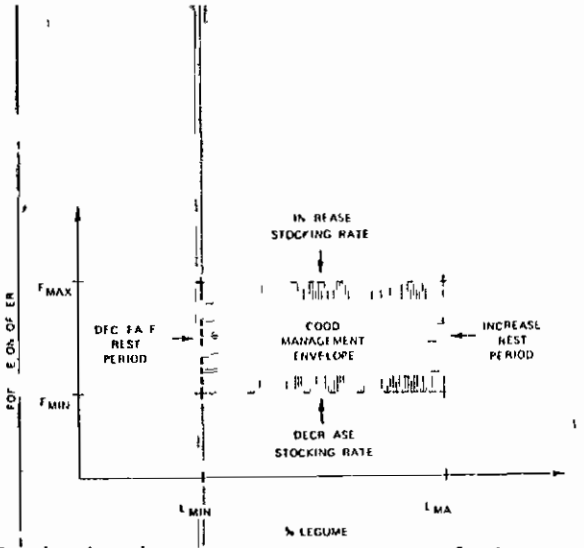

Fig 1 A schematic representation of the management required to maintain most associations of adapted tropical grasses and legumes within the good management envelope

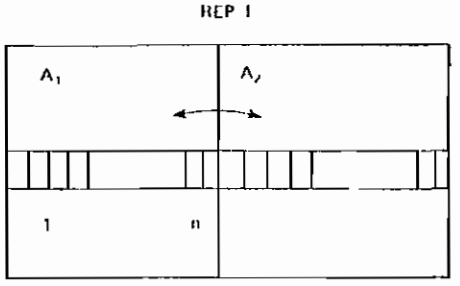

Fig 2 A field design for advanced evaluation of associations under grazing Animals graze A_1 and A_2 alternately Small plots (1 n) within each paddock contain additional ecotypes of one of the species in association

Barrolandia, Bahía, Brazil, is shown in Figure 2 In the basic design each association is planted in one paddock in each replicate The paddock should be large enough to carry at least two animals Size will depend on association and ecosystem In Barrolandia and Carimagua each paddock is 0 75 ha with two replicates for a total of 1 5 ha per association In Carimagua each paddock is divided and a grazing group (beginning with three animals) will alternate between the two divisions in each replicate The initial stocking rate will be approximately two animal units/ha (four recently weaned calves) Larger paddocks and more animals could be used to obtain greater precision if resources were available

The measurements to be taken are botanical composition and availability of green forage as animals enter each division at least two time during each season and periodic animal weight gains A record of all aspects of management is required to calculate animal grazing days and average stocking rate (number of animals and animal units derived from liveweight gain data) A record of climatic and biotic events should be maintained in order to correlate these data with animal performance, the performance of each association and the management required to maintain the basic pasture parameters within pre-established limits

POTENTIAL ADVANTAGES OF THE PROPOSED METHODOLOGY

1 The management proposed recognizes the dynamics both long- and short-term of the different pastures under trial as well as the differences between associations in any given ecosystem 2 The system is self-adjusting responding to feedback from pastures under trial in the form of changes in basic pasture parameters 3 It is similar to commercial systems which are flexible to assure adequate animal production consistent with acceptable persistence and balance of the association 4 Flexible management requires the definition of "good management" of associations in practical terms i e in terms of observable pasture parameters thus should be valid for commercial production systems as well As a consequence the information should be of immediate value in the transfer of technology 5 The methodology is efficient in terms of land animals time and personnel in determining the germplasm useful for a particular ecosystem its management requirements approximate potential stability and persistence 6 Flexibly managed trials should be less influenced by seasonal and random climatic and biotic stresses and random land variation than rigidly managed trials Therefore the results are expected to provide a better basis for temporal and spatial extrapolation of germplasm and management recommendations within an ecosystem

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