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## MIXED VS MONO ANIMAL SPECIES GRAZING UNDER TEMPERATE AND SEMI-ARID CONDITIONS

T. Nolan<sup>1</sup>, J. Connolly<sup>2</sup>, L.M. Guillon<sup>3</sup>, C. Sall<sup>4</sup>,  
K. Dieye<sup>4</sup>, H. Guerin<sup>3</sup>.

<sup>1</sup>Teagasc, Creagh, Ballinrobe, Co. Mayo, Ireland.

<sup>2</sup>Teagasc, 19 Sandymount Ave., Dublin 4, Ireland.

<sup>3</sup>IEMVT, 10, Rue Pierre Curie, 94704 Maisons Alfort, France.

<sup>4</sup>ISRA, LNERV, Dakar-Hann, Senegal.

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### INTRODUCTION

Mixed grazing has been practiced for a long time, under a variety of climatic conditions, combinations of animal species and grazing managements (Nolan and Connolly, 1977). They suggested that although mixed grazing research progress was impeded by difficulties associated with the increased number of variables involved it offered greater opportunity to improve resource use. The purpose of this paper is to present results from recent research carried out under temperate and semi-arid conditions related to individual animal and per unit area output animal/vegetation relationships and complementary patterns of grazing behaviour in relation to more efficient and balanced use of vegetation resources.

### METHODS

Animal production and output per unit area results are from a four-year experiment on permanent pasture. Treatments were three mono steer, three mono sheep and seven mixed grazing groups where stocking rate and species relative frequency varied. Treatments consisted of five equal sized paddocks and were self-sufficient for winter silage requirements. Statistical analyses were based on regressions relating individual animal liveweight gain to the stocking rate of each animal species used and using them to make predictions. Production per unit area comparisons used the Relative Resource Total (RRT) which estimated the area required to sustain the same number of each animal type at the same liveweight.

mono grazing. The methods are described in detail in Connolly and Nolan (1976) and Nolan and Connolly (in press). Temperature animal/vegetation relationships studies were carried out within the production experiment and in separate small plot experiments to measure the effects of mixed and mono grazing on (i) the evolution of steer dung pat (DP) and associated soiled herbage (SH) and unsoiled herbage (UH) in terms of herbage mass and (ii) the seasonal and age effects on palatability/acceptability of SH and UH. Detailed descriptions are given in de Rancourt et al., (1980); Nolan et al., (1987) and Nolan and Connolly (in press).

Research by Nolan et al., (1988) in the semi-arid Senegalese Sahel (funded in part by the Commission of the European Communities, measured (i) preferences of different cattle/sheep/goat mixtures for different plant species and (ii) whether preference was affected by proportion of each species on offer or by the stocking rate applied. Six treatments consisting of 4 cattle only, 6 sheep + 8 goats and 4 cattle + 6 sheep + 8 goats each at two stocking rates were used on representative exclosures. Preferences, using the Bergere method of Guerin et al., (1983-84) were related to proportion of the different plant species on offer. Results for woody species are given with the preference index representing the ratio of the percentage contribution of plant species to animal diet to its percentage contribution to the point quadrat hits.

## RESULTS

Production per animal: Mixed grazing increased steer and lamb ADG (g) to lamb weaning from 1419 to 1520 ( $P < 0.05$ ) and 249 to 265 ( $P < 0.001$ ) and to drafting from 930 to 1094 ( $P < 0.001$ ) and 211 to 223 ( $P < 0.001$ ) over four years. These data are based on within group error having eliminated the effects of birthweight, sex and parity for lambs. Under temperate conditions these benefits are mainly due to sheep consuming SH which steers mostly refuse. Results in Table 1 from comparison of the influence of steer dung pat deposition at four dates over the grazing season and four grazing periods show that the ratio of dry matter per unit area of SH before and after grazing and the ratio of SH to UH was reversed between mono steer and mono sheep grazing.

TABLE 1: Ratio of DM per unit area, after \*100/before

Treatment <sup>1</sup>	Deposit Date	Grazing Cycle				
		1	2	3	4	5
C-S	1	68	83	61	81	91
	2		76	44	69	101
	3			33	41	89
	4				51	75
C	UH	57	69	43	59	82
	1	65	93	78	88	97
	2		110	44	124	103
	3			114	95	69
	4				117	75
	UH	60	58	39	88	66

<sup>1</sup>C-S = Sheep only grazing with cattle dung pats artificially simulated and C = cattle only normal grazing.

The area under SH increased during mono steer grazing and mono sheep grazing caused 46 to 73% reduction. Observations of time spent grazing and percentage of bites taken from SH and CH by steers and sheep support these results.

In the semi-arid area experiment preference indices for cattle, sheep and goats were greatest for the combined five most abundant species followed by a lower preference for the next eleven most abundant species and rejection for the combined remaining 16 plant species. Species with C3 photosynthetic pathway were preferred by all animal species and C4 plants were strongly ( $P < 0.001$ ) rejected.

Aggregation of plants tended to cloak differential selection for individual plant species e.g. Zornia was preferred significantly ( $P < 0.05$ ) more by cattle than by goats. Differential selection for woody species exemplified how animal diet differed from vegetation composition, Balanites accounted for 87% of woody vegetation plants but only 33% of diet woody component representing a preference value of 0.30 (the percentage contribution to diet divided by the percentage contribution to vegetation). Acacia sayal contributed only 2.7% of the vegetation plants but up to 40% of the diet giving preference values between 6.7 and 17.0. Acacia senegal contributed 7.3% to woody vegetation and up to 24% of diet representing preference values between 1.4 and 3.3.

## DISCUSSION

The main challenge in mixed grazing research is to identify complementary patterns of behaviour which result in more efficient, balanced and sustained use of vegetation resources. Under both temperate and semi-arid conditions the results show that the diets selected by animals may differ markedly from the vegetation on offer and suggest that more efficient and balanced use of vegetation can be achieved through matching different animal type grazing preferences with the vegetation. Mixed grazing offers one possibility for range preservation under semi-arid conditions and higher and more sustained output of animal products under both environmental conditions. Improved output per individual animal is probably due to a higher intake of preferred fractions of the vegetation. There is a need to define the origins of the diets selected under mixed vs mono grazing.

## REFERENCES

- Connolly, J. and Nolan, T. (1976). The design and analysis of mixed grazing experiments. Animal Production, 23 : 63-71.
- De Rancourt, M. Nolan, T. & Connolly, J. (1980). Proceedings of Workshop on Mixed Grazing, Galway, p. 227-139. Published by An Foras Taluntais, 19, Sandymount Ave., Dublin 4, Ireland.
- Guerin, H., Friot, D., Mbaye, nD., 1983-1984 - Methodologie d'etude de la valeur alimentaire des parcours naturels a faible productivite: 1 - Approche bibliographique no. 103/LNERV, 1983-31 p.; 11 - Protocoles et premiers resultats no. 13/LNERV, 1984-33 p.
- Nolan, T. & Connolly, J. (1977). Mixed stocking by sheep and steers - a review. Herbage Abstracts, 47:367-374.
- Nolan, T., Connolly, J., Sall, C., Guillon, L.M. & mBaye, nD., (1987). Mixed grazing by cattle, sheep and goats. Paper to regional seminar on forages and ruminant nutrition, IEMVT, IRZ, N'Gaundere Cameroun, 16-20 November.
- Nolan, T., Connolly, J., Sall, C., Guillon, L.M., Dieye, K. & Guerin, H. (1988). Mixed species in range grazing and preservation Ireland/Senegal/France. Report of project TSD/A/424 funded in part under the STD subprogramme "Tropical Agriculture, of DGXII of the European Communities.
- Nolan, T. & Connolly, J. (in press). Mixed sheep and cattle grazing research in Ireland: Extension/Development experiences and design and analysis methods.
- Nolan, T. & Connolly, J. (in press). Mixed versus mono grazing by

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## SUMMARY

The effects of mixed vs mono animal species grazing on some animal/vegetation relationships were compared under temperate and semi-arid conditions. Under temperate conditions mixed grazing increased steer and lamb growth rates by about 7%. Under both environmental conditions complementary grazing between the different animal species appeared to be the basis for the mixed grazing benefits. Steer dung soiled herbage was mostly refused by steers but was preferentially grazed by sheep so that during grazing the area under and dry matter contained in soiled herbage increased for steers only and decreased for sheep only. In the semi-arid environment there was strong selection by cattle, sheep and goats relative to vegetation and also strong differential selection among animal species. These preference differences in mixed grazing can result in more efficient use of vegetation resources, improved individual animal growth rate and offer one method for preservation of range vegetation.