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**LATE WINTER DIETARY OVERLAP AMONG GREATER RHEAS AND  
DOMESTIC HERBIVORES ON THE ARGENTINEAN FLOODING PAMPA**

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**Abstract**

This study evaluates the dietary overlap among greater rheas (*Rhea americana* L.) sheep and cattle in the Flooding Pampa, Buenos Aires, Argentina during late winter, when is observed the lowest forage availability. The work was carried out with the following forage classes (FC): warm and cool season grasses and forbs (legumes and no-legumes). Diet botanical composition was estimated by microanalysis of faeces. Principal Component Analysis and Kulczynsky's index of similarity were used for data analysis. Rhea populations selected diets with higher forb percentages. On the contrary, vegetation structure and their own morpho-physiology conditioned cattle to diets almost exclusively gramineous. Although forbs were more consumed by sheep than by cattle, they do not represent a major portion of sheep diets. In the Flooding Pampa grasslands, the probability of competition for forage between greater rheas and sheep is intermediate, and that between rheas and cattle is low.

**Keywords:** Cattle, diet botanical composition, Flooding Pampa, grasslands, rhea

## **Introduction**

Niche selection and habitat utilization are the broadest expressions of the way animals resolve the conflicts between the need for food and the intrinsic and extrinsic constraints (Hanley 1982). Differential resource selection is one of the principal relationships, which permit species coexist (Rosenzweig, 1981). The greater rhea (*Rhea americana* L.) is an herbivore native from the south-american grasslands. The size of the rhea populations is small, presumably due to the excessive hunting, and to the transformation of their natural habitat for agriculture and livestock production. In addition, rheas are usually eliminated because it is considered that they compete for vegetation with domestic livestock. However, a recent survey carried out in the southeast of the Buenos Aires province, indicates the existence of several populations of rheas whose size reach till 300 individuals in the area of livestock production (F. Milano, no published data). The rhea smallest body size, and their bill and sharp vision suggest that they can consume greater amounts of forbs than cattle and sheep. This study evaluates the dietary overlap among greater rheas and domestic herbivores in the Flooding Pampa during late winter, the period of lower forage availability.

## **Material and Methods**

The study was carried in the Laboratorio de Composición Botánica de Dietas de la Unidad Integrada Balcarce out during the first week of September of 1998 in a livestock production ranch located in Ayacucho county (38°10'W, 37°S), Buenos Aires province, Argentina. This 3500 ha ranch is dedicated to mixed beef production (cattle and sheep) on tall wheatgrass (*Thinopyrum ponticum* (Podp.) Barkw & Dewey) and tall fescue (*Festuca arundinacea* Schreb.) pastures. Most pastures are old, and has high percentages of native species, which reflect differences in topography, soil water table depth, and alkalinity. Native

species differ among high lands, alkaline lands and non-alkaline low lands, determining different plant communities. Cattle and sheep rotate among paddocks according forage availability, and a rhea population, that at the present is of approximately 300 individuals, has also used these paddocks at least since the owner of the ranch began to register its presence, in 1970. The work was carried out in two paddocks of different size (Paddock 1 = 200 ha; Paddock 2 = 140 ha), which have been grazed by cattle and sheep during 10 days. Rheas grazed in these paddocks, and others similar. Estimated stocking rate of cattle and sheep were: Paddock 1 (1 and 0.15 anim.ha<sup>-1</sup>) and Paddock 2 (0.30 y 0.2 anim.ha<sup>-1</sup>), respectively. Forage availability was estimated by an stratified sampling according plant communities, by the method of double sampling. In each paddock, thirty 0.10m<sup>2</sup> frames were clipped, and five visual determinations of biomass were made by each clipped frame. To estimate the botanical composition of each paddock, the species in each clipped frame were sorted, and dried (24h, 60°C). Finally, graminoids, grasses and forbs were grouped according their growth period in 6 forage classes (FC; see Figure 1).

Simultaneously with the sampling of the vegetation, 5 fresh feces of each animal population were gathered. The botanical composition of the individual faeces samples was estimated by microanalysis (Sparks and Malechek 1968), and the species were also grouped by forage classes. The variability among diets was explored by Principal Component analysis (PCA; Harris 1975), using a correlation matrix. Diet overlap was evaluated by the Kulczynsky's similarity index (KI; Oosting 1956). The selectivity of the herbivores for those forage classes that defined PC axes was established by the following index:  $SI(FC_i) = (\%FC_i \text{ Diet} - \%FC_i \text{ Vegetation}) / (\%FC_i \text{ Diet} + \%FC_i \text{ Vegetation})$ .

## Results

Forage availability differed between paddocks (Paddock 1=1000; Paddock 2=300 kg.ha<sup>-1</sup>). Rheas consumed higher percentages of forbs than the domestic herbivores ( Figures 1 and 2). The first two axes of the PCA explained 77% of the variation among diets. The first axis explained 54% of the variance, and it indicated that the main source of variation among the diets was the herbivore type. In average, forb percentage (legumes and non-legumes) in rhea diets was 7 times than that in cattle diets (40 vs 6%), and twice the percentage in sheep diets (40 vs 12%). By the contrary, domestic herbivores consumed higher percentages of the early regrowths of the spring-summer grasses (Figure 2). Rheas actively search forbs (SI>2.59), sheep consumed forbs in percentages similar to those in the vegetation, and cattle in lower percentages. The second axis explained 23% of the variance among diets, and indicated that domestic herbivores used more intensively the low land non-alkaline community in the paddock with lower forage availability, even though in this paddock that community represented a lower percentage of the total surface (43.6 vs 59.0 %). In average, rhea's diets strongly differed from cattle (KI=0.58) and sheep (KI=0,72) diets, and the greater overlap occurred between domestic herbivore diets (KI=0.86).

## Discussion

The available information concerning the morphology of the digestive tract of the greater rheas suggests that, in this species, the digestion could affect the identification of the vegetable fragments less than in cattle and sheep. Cattle rate of passage and percentage digestive tract volume with fermentative capacity duplicates that of the rheas (Van Soest 1994, Fowler 1993, Stewart 1994). It was experimentally observed the effect of cattle and rheas digestion on the relative recognition of three forage species ( F. Milano, no published data), by means of 1) quantification of 8 known composition mixtures before and after *in vitro*

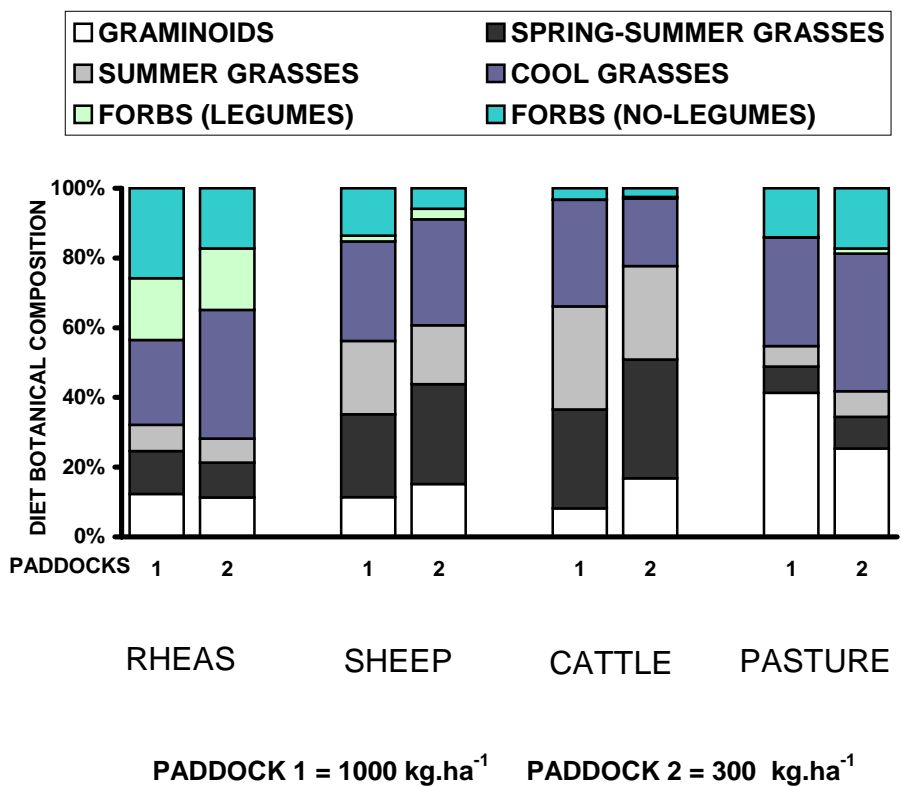
digestion with cattle ruminal liquor, and 2) microhistological quantification of the faeces of rheas which had been fed in pens with known composition diets. Digestion affected relatively more the recognition of the forb fragments in the rhea's diets, which means that the percentages of forbs determined in the present study could be higher.

These results show that in the naturalized pastures highly gramineous of the Flooding Pampa, rheas populations, adapted to the environment, are able to select a diet with a high percentage of forbs, and rich in cellular contents. On the contrary, in this region, the structure of the vegetation and their own morpho-physiology conditionate cattle and sheep to gramineous diets. The probability of forage competition between the greater rheas populations and sheep is higher than that between rheas and cattle, whose probability is low.

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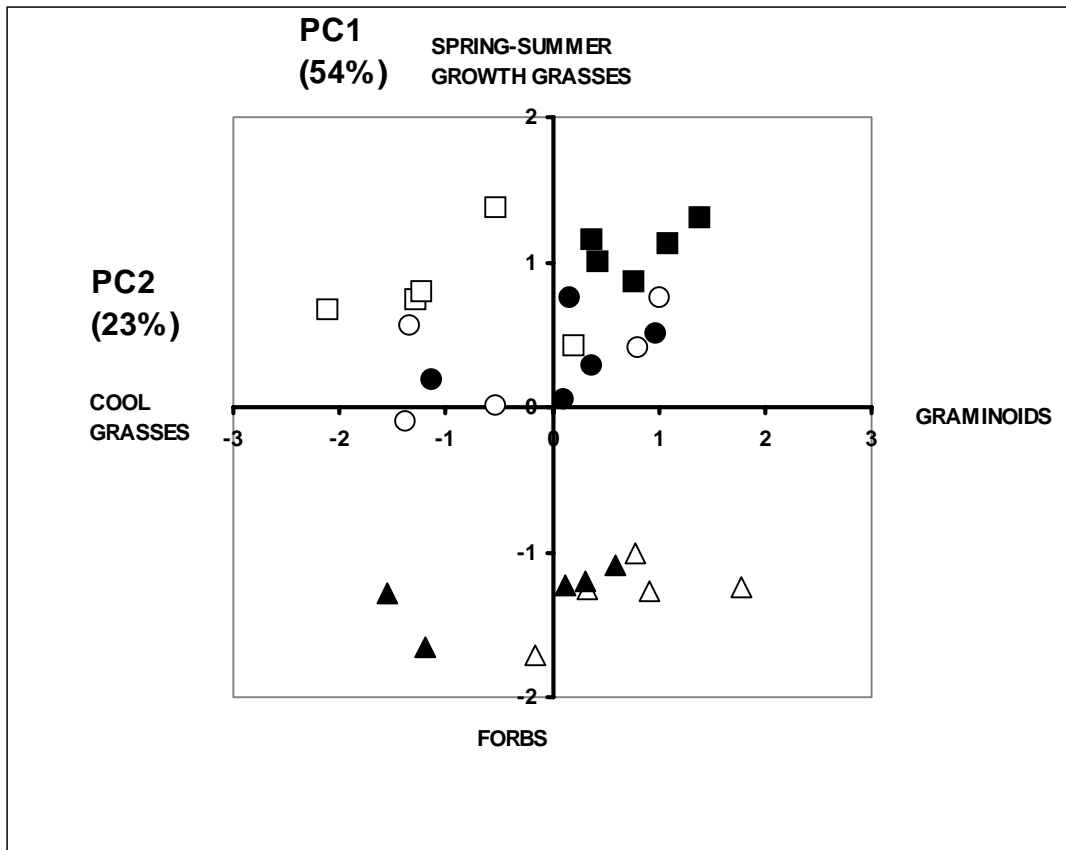
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**Figure 1** - Late winter average relative botanical composition of greater rheas, sheep and cattle diets, and available biomass by forage classes in two paddocks of the area of livestock production of the Flooding Pampa, Buenos Aires province, Argentina.





**Figure 2** – Diet scattergram of greater rheas ( $\Delta$ ), cattle (●) and sheep (○) in a naturalized pasture of the Flooding Pampa, Buenos Aires, Argentina. White = paddock with 59% and black = paddock with 43.6% of non alkaline low lands. Values in brackets show the percentage of the variance among diets explained by each axis.