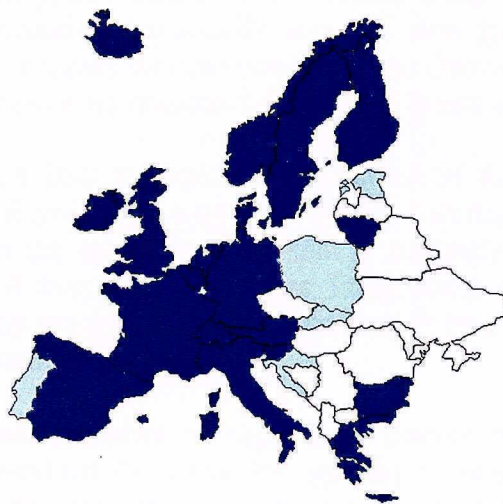




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# An overview on Portuguese Mediterranean annual-type pastures

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## Abstract

Portuguese grazing systems are based on extensive grasslands with low stocking rates, on acid, shallow and low fertility soils. Natural pastures represent 97% from total grassland. Experiments showed that fertilisation and subterranean clover sward establishment increase yield significantly. However, farmers did not adapt these procedures. In a more detailed analysis, those methods are not efficient along the whole year, depending on an apparent water limitation for pasture growth due to rainfall regime. Under this scenario, we identify open fields for research aiming stable legume based systems.

keywords: Mediterranean pastures, sward, subterranean clover, water stress, extensive grassland

## Introduction

Three quarters of Portugal is under a Terno-mediterranean climate; most representative soils are shallow, acid, with low organic matter content and water field capacity. Although botanical composition of native pastures is very diverse, annual legumes represent the most important group, due to its known ecological function. According to the 1999 agricultural stats, farmers keep stocking rates very low, i.e. 0.4-0.5 cattle equivalent per ha<sup>-1</sup> year<sup>-1</sup>. However, several studies reported sward establishment methods, particularly for subterranean clover, that allow significant yield increases (Almeida and Fernandes, 1990; Moreira *et al*, 1994). Despite these findings, subterranean clover swards represented only 3% of Portuguese grassland at 1999 (INE, 2001). Therefore, we try to find some reasons to explain why those sward establishment methods failed in the field, and identify the open points for research.

## Material and methods

We analysed data from a long-term experiment established at Castelo Branco region, from 1985 to 1990. The description was made elsewhere (Almeida and Fernandes, 1990). Briefly, in a CRB design with 3 replications, four sward treatments were compared: native pasture (control); native fertilized pasture (CaCO<sub>3</sub>, N, P, K, micronutrients); subterranean clover mixture [*Trifolium subterraneum* L. (cv. Nungarin, Seaton Park, Woogenelup, Clare) x *Dactylis glomerata* (cv. Currie) x *Lolium rigidum* (cv. Wimmera)] established by minimum soil tillage with same fertilization; same subterranean clover sward and fertilizers but with conventional tillage (ploughing followed by disk drilling). Yield was measured along the cycle, by cutting samples before and after grazing. Pasture growth was estimated between each grazing period.

## Results and discussion

From the second till fifth year, native pasture had the lowest DM yield, 3455 kg ha<sup>-1</sup> year<sup>-1</sup>; fertilisation of native pasture increased yield to 4986 kg DM ha<sup>-1</sup> year<sup>-1</sup>; subterranean clover treatments had no significant difference between both establishment methods and yields were 6283 kg DM ha<sup>-1</sup> year<sup>-1</sup> and 6199 kg DM ha<sup>-1</sup> year<sup>-1</sup> for the conventional and minimum tillage, respectively. Contrasting with these results, daily growth varies along the year and from year to year (Fig. 1). In the year 1986/87, with 680 mm rainfall, the initial values were low and the difference between sward treatments was significant only at spring; as comparing, in the year 1989/90, with a total rainfall of 1100 mm, the differences between

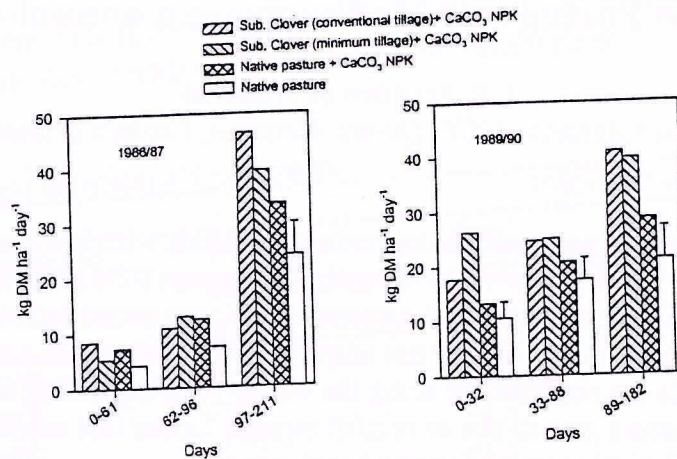


Figure 1. Means for pasture daily growth after germination (day 0). Total rainfall (September-August) was 680 mm and 1100 mm at 1986/87 and 1989/90, respectively. 2 times SE bars are indicated for periods where treatment differences were significant ( $P < 0.05$ ).

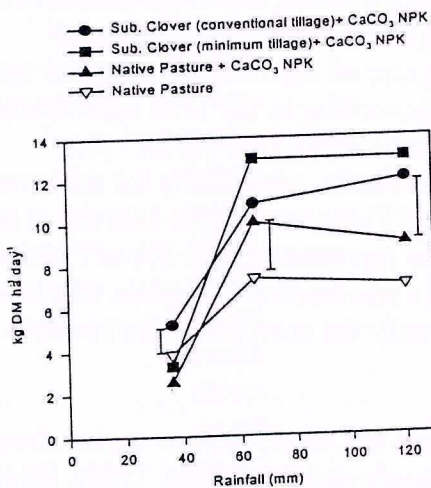


Figure 2. Means for pasture daily growth, in the first 60 days after germination, versus accumulated rainfall for the same period (1985/86, 1986/87 and 1989/90). Each point is the mean of 3 replications and 2 times SE bars are indicated for each year.

treatments were significant along the whole year and the DM yield response to treatments was similar to the global annual values. The plot of first growth period (Autumn) versus corresponding rainfall in three different years (Fig. 2) suggests at low levels of precipitation the sward establishment methods lose their yield advantage. In other hand, taking into account the climate data for the last 10 years, i.e. 1992-2001, we observe long periods where evaporation values exceed rainfall, all years; most likely, at those periods the subterranean clover advantages were water limited. Therefore, if the potential advantages of subterranean clover swards as comparing with native pastures are so often limited, we do not expect that they induce more stable grassland systems than native pasture does.

Under these conditions, research must be devoted to: effect of water stress on subterranean clover physiology; selection criteria for water stress tolerance of annual legumes; methods to increase soil water field capacity.

## References

- Almeida, J.P.F. and Fernandes, A.J.G. (1990). Improvement of Mediterranean annual type pastures, under covering of olive grove, in Castelo Branco (Portugal). *Proc. 6th Meeting of the F.A.O. European Sub-Network on Mediterranean Pastures and Fodder Crops*, 17-19 October, Bari, Italy, 69-72.
- Instituto Nacional Estatística (2001). *Agricultura Portuguesa, Principais indicadores*. Gabinete de planeamento e política agro-alimentar. Lisboa.
- Moreira, N., Trindade, H., Coutinho, J. and Almeida, J.P.F. (1994). Effects of liming and method of cultivation on the establishment and persistence of rain fed Mediterranean pastures. *Experimental Agriculture*, 30: 453-459.