Cattle production in agroforestry systems. An analysis on the role of intensification and dependence of subsidies

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Introduction

Extensive livestock production systems have faced socio-economic factors (such as the loss of profitability and competitiveness) that have led to modifications in their management and structure. The main changes have been the abandonment of grazing, the increase in the use of external feed, the abandonment of farms, and the intensification of the systems.

The dehesa is the consequence of human intervention in the natural Mediterranean forest. Due to this, the conservation of this ecosystem depends on the use of appropriate agricultural practices (Gaspar et al., 2007). Thus small changes in the production systems may have a great impact on its conservation and on the rural population. As consequence, the intensification of farms and the high prices of feed, make it difficult to increase farms' profitability while preserving the dehesas. In this context, dehesa livestock farms have increased their dependence on subsidies.

In view of the above it is necessary to identify the different livestock systems located in agroforestry systems, in order to allow appropriate measures to be developed for each system.

Moreover, given the lack of knowledge about the organic beef cattle sector, and its potential impacts on both the dehesa ecosystem and the rural population, this study has the objective of identifying and describing the production systems, paying special attention to their level of intensification and their dependence on subsidies.

Material

The data collected correspond to 63 dehesa beef cattle farms (30 conventional farms and 33 organic farms). The data were obtained through direct survey interviews with dehesa farmers which were carried out in 2012.

For the identification of the production systems, two steps were followed, following the methodology used by Gaspar et al. (2007; 2008). Firstly, a principal component analysis (PCA) was used. This allowed us to eliminate the redundancy involved in dealing with many variables. Secondly, a cluster analysis allowed classifying the farms into homogeneous production systems or

typologies. Descriptive statistics for the indicators were calculated. We also carried out ANOVA tests aimed at checking the existence of statistically significant differences among production systems. All the analyses were performed using the SPSS (v.21.0) statistical package.

Results

The result of the PCA gave the top three principal components (PC). The total variance explained by these three PCs was 83.5 %—a satisfactory percentage according to Malhotra (2004). These PCs were then defined by using the rotated matrix components.

PCs: **PC 1** (intensification level) explained 54.6% of the variance. This presented very high positive correlation coefficients with the variables: total stocking rate, annual work units per 100 hectares, veterinary expenditures, and livestock sales. This PC also showed medium positive correlation coefficients with the feed cost. **PC 2** (productive orientation: presence of a calves fattening period) explained the 17.1 % of the total variance. This PC presented high positive correlation coefficients with the variable fattened calves sold/total of calves sold, feed cost and

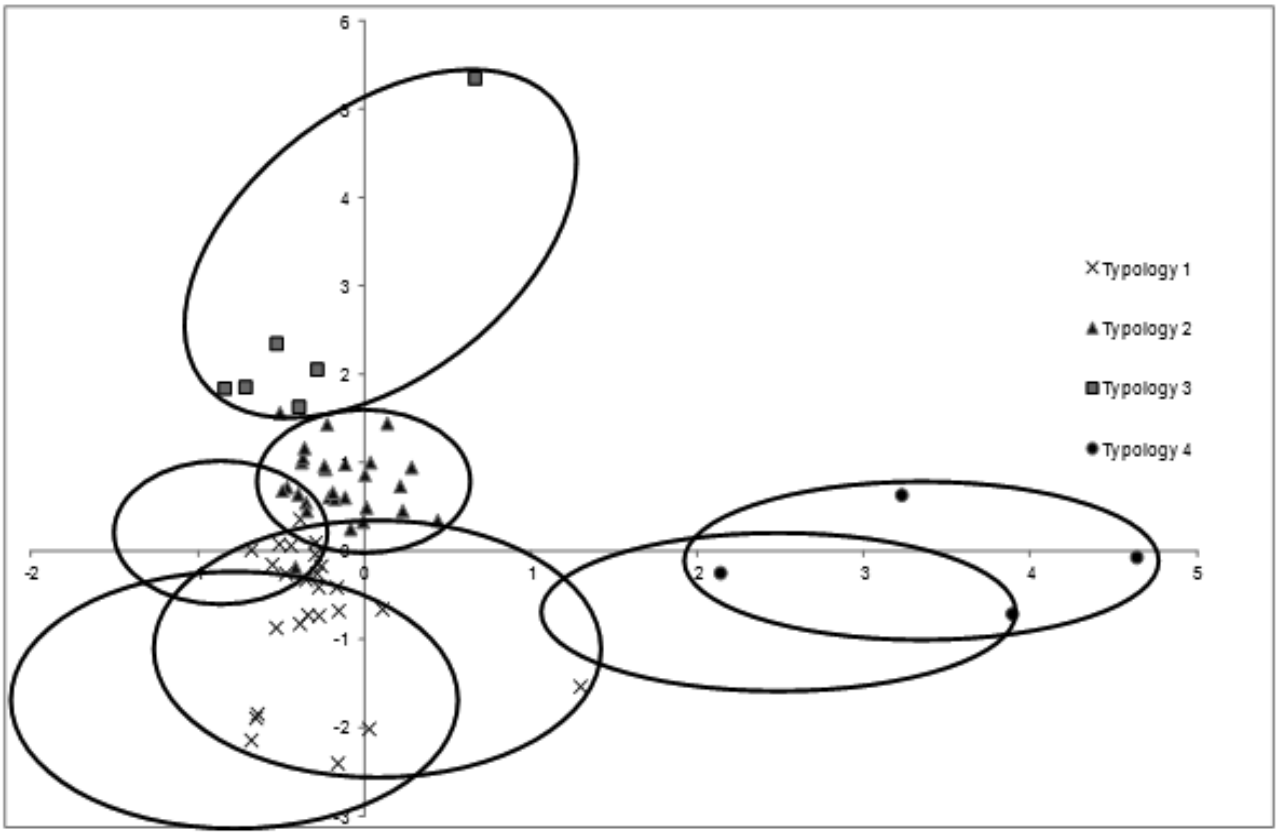

Fig 1: Positioning of the farms according to the scores for PC 1 (level of intensification) and PC 3 (dependence on subsidies)

intra-unit consumption. **PC 3** (dependence on subsidies) explained the 11.8 % of the variance. This PC only showed possitive high correlation coefficients with the variable subsidies/total income.

Cluster analysis: the cluster analysis that presented the most significant results was the solution of four groups. The groups thus obtained were compared by an analysis of variance. This allowed us to characterize the clusters (production systems). **Cluster 1**: **extensive farms with low productivity**. This group of 25 farms represents 39.7% of the sample. It is characterized by its low total stocking rate (0.41 livestock units –LU- per ha) and the absence of a calves fattening period. These farms presented low feed costs (54 €/ha), when compared to the rest of farms. Due to this, although, they obtained reduced livestock sales (171 €/ha), their depence on subsidies was the lowest (29.5%). **Cluster 2**: **diversified farms with low efficiency and high dependence on subsidies**. This cluster grouped 28 farms (44.4% of the farms). Its total stocking rate was also low (0.46 LU/ha). However, this cluster group a great number of full-cycle farms. These farms, although fattening their calves, presented lowest feed cost: 30.29 €/ha). They also showed the lowest livestock sales per ha (153 €/ha). As a consequence, their dependence on subsidies is the highest (56.4 %). **Cluster 3**: **medium stocking density farms and high profitability**. This group consisted of 6 farms (9.5 % of the total),with medium level of intensification (0.51 LU/ha) and the lowest porportion of cultivated area (5.8 %). As a consequence, they presented the highest feed costs (277.56 €/ha). Regarding the subsidies, they showed a level of dependence equal to 34.7 %. **Cluster 4**: **cultivated farms with high livestock density**. This group of 4 farms represents 6.4 % of the sample. The farms grouped into this cluster presented the highest total stocking rate (2.82 LU/ha), the highest proportion of cultivated area (72.5 %), the absence of a calves fattening period (any calve was fattened), the highest investments on fixed capital (355 €/ha). Due to their high total stocking rate, they showed the highest livestock sales per ha (846 €/ha). Their presented a medium level of dependence on subsidies (33.6 %), with respect to the rest of farm groups.

Discussion (and conclusions)

This study allowed us to identify the large diversity of beef cattle farms located in the dehesas according to the level of intensification and dependence on subsidies. In general terms, all farm groups showed adequate levels of intensification in the context of the dehesas extensive farming (Escribano et al., 2006). However, group 4 must modify its structure in order to preserve the ecosystem. This high level of intensification was related to the these farms being located in the margins of the dehesa area. Moreover, these farms needed to purchase external feed. Thus, these

two groups have a further negative characteristic with respect to their sustainability — their external dependence. However, this can be overcome by a high total income, as a consequence of growing and selling more crops than other farms.

By contrast, farms grouped in Clusters 1 and 2 are more effective in preserving the dehesa (due to a low total stocking rate) than other farms. However, as they scarcely fattened their calves, their profitability is very low. Moreover, the high dependence on subsidies showed by the Cluster 2, will hinder the future competitiveness and sustainability of the farms in this group. Finally Cluster 3 showed better structure and results as they sold the majority of fattened calves. Despite having the highest feed cost, their dependence on subsidies was not high, and their level of intensification was medium. Due to this, these farms have presumably the highest chance of success under the context of the dehesas.

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