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BIOECOLOGICAL FUNCTION AS AN ADDED VALUE OF AGROSILVOPASTORAL ECOSYSTEMS. CASE STUDY IN A SPANISH DEHESA

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Abstract: The use of conventional and intensive exploitation practices, as opposed to the organic ones, has caused a loss of the ecological value in many natural ecosystems. A clear example is the dehesa ecosystem in Spain, a semi-natural system that has a great diversity of flora and fauna and in which the intensive and industrial productive systems are replacing the traditional practices, which have maintained biodiversity in these ecosystems through centuries. This research aims to endorse the organic practices as a way not only to maintain but also to enrich the biodiversity of these silvopastoral traditional systems whilst improving the economical resources of the farm. An organic farm located in the central-western Spain was selected to analyze its animal and plants diversity and therefore its natural capital, using direct and indirect observations.

Introduction: Dehesa is a semi-natural ecosystem that extends in environments characterized by gentle topography, nutrient-poor acid soils, semi-arid climate and sclerophilic vegetation, dominated by species of the *Quercus* spp. genus (Blanco-Salas, 2011). The climax of this ecosystem would be the forest, on which man has been carrying out pruning and clearing for centuries and using it as an extensive livestock system. This ecosystem represents the livelihood of a significant part of the Spanish rural population, so the use of its resources must be economically profitable provided that the ecosystem values that the dehesa brings to the society are safeguarded. Therefore, beyond the economic value and its commercial perception, the dehesa contains intrinsic environmental values that are well recognized by society (Prieto et al, 1999). The great animal and plant biodiversity found within a highly humanized ecosystem proves its enormous value, making it a perfect example of an ecological and sustainable exploitation system. Moreover, this recognized great biodiversity granted new alternative and complementary environmental services, among many others, botanical, faunistic and mycological routes, plant identification and wild animal tracking, etc. are suggested with the consequent added value of the natural assets (Caño *et al.*, 2016) and new incomes for the organic farmers.

The purpose of the work is to verify the positive effect that an organic management of the dehesa ecosystem has over its biological biodiversity as well as to suggest new profitable economical activities that this management offers to the organic

farmers. To this end, an example of an organic farm in the central-western part of Spain was studied. Flora and fauna diversity was field-observed and catalogued.

Material and methods: The dehesa organic farm (2270 ha.) under study belongs to the municipality of Larrodrigo, located in the southeast of the province of Salamanca (Spain). The typical open forest of this landscape coexists with undercover grassland and cereal crops.

To study the positive impact that the organic farming brings on the biodiversity, different transects and observations were made to assess both the animal and plant variety. Regarding the fauna, six phototramp cameras were used, which were rotationally located in 26 locations over different vegetation units, in order to observe the relationship between habitats and the animal species distribution. On the other hand, the characteristic flora habitats, following the Council Directive 92/43/EEC on the conservation of natural habitats, were defined. Finally, Geographic Information Systems were used to map the different vegetation units and the cameras locations. The vegetation units and the locations of the phototramp cameras are shown in Figure 1.

Results: The floristic inventory of the study area contains more than 300 species, from which more than 10% are of aromatic and/or medicinal use. Five Habitats of Community Interest (EEC, 1992) have been identified: *Quercus ilex* and *Quercus rotundifolia* forests (99340); *Salix alba* and *Populus alba* galleries (92A0); Mediterranean tall humid herb grasslands of the *Molinio-Holoschoenio*n (6420); Dehesa with evergreen *Quercus* spp. (6310); Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea* (6220*).

Dehesas, followed by the holm oaks forests, are the most extensive plant formations, with 766 ha. and 491 ha., respectively. These holm oaks forests, assigned to *Junipero oxycedri-Quercetum rotundifoliae*, occupy nutrient-poor acidic soils together with scrubs of *Cytisus scoparius* (L.) Link, *Dorycnium pentaphyllum* Scop, *Daphne gnidium* L., *Lavandula pedunculata* Cav., *Halimium viscosum* Silva, *Thymus zygis* Loefl., *Asparragus acutifolius* L. associated with *Crataegus monogyna* Jacq. and *Rosa corymbifera* Borkh, among others. They are well developed in the north-western part, along the riverbed located to the south and in the escarpments linked to water courses.

In the thalweg areas Mediterranean silicolous *majadales* of *Festuco amplae-Poetum bulbosae* (6220) develops. The best representation of this habitat is located in meadows of more than 90 ha., which are in the centre of the area. In zones with higher humidity, and associated with these *majadales* too, appear *juncales churerros* of *Trifolio resupinati-Holoschoenetum,* highlighting the presence of *Juncus effusus* L., *Juncus inflexus* L., *Scirpus holoschoenus* L. and *Carex sp.*; and *vallicares* constituted by vivacious grasses like *Agrostis castellana* Boiss & Reut. and *Arrhenatherum bulbosum* Presl. Due to the overgrazing resulted from the conventional practices carried out years ago, there are still some areas with poor quality pastures, developing consequently nitrophilic plants and arvenses of *Polypogo-Poetea annuae* and *Stellarietea mediae*, such as *Eryngium campestre* L., *Centaurea paniculata* L., *Scolymus hispanicus* L., *Jacobea vulgaris* Gaertn, among others.

Along the riverbank appears a riparian formation of *Salicineo trichae-Populetum nigrae* as well as many small, fragmented extensions of ash trees (*Fraxinus angustifolia* Vahl) and willows. On the shores, *esparganiales* develop with reeds of the *Glycerio declinatae-Eleocharitetum palustris* and brambles of *Rubo ulmifolii-Rosetum corymbiferae*. Also small extensions of the invasive aquatic fern *Azolla filiculoides* Franch. & Sav. were detected in some points of the water course.

Related to the animal diversity, 1056 recordings were taken in the phototramp campaign, identifying up to 19 species, mostly mammals, notably: *Sus scroffa* (52%), *Vulpes vulpes* (13%), *Lepus granatensis* (9%), *Meles meles* (8%), *Genetta genetta* (5%), *Canis lupus signatus* (3%), *Capreolus capreolus* (3%) and *Martes foina* (1%). Regarding their distribution,

and considering the inherent mobility of animals, the highest number of recordings was taken in holm oak forests (49%), followed by dehesas (37%), crops (8%) and, finally, grasslands (6%). However, the greatest diversity of species was observed in the dehesa areas (18), more than in holm oak forests (11), grasslands (6) or crops (5).

Discussion: According to Pardo de Santayana *et al*. (2014), conventional productive systems related with intensive uses in the dehesa had led to an increasing loss of its biodiversity. The secular and traditional uses that characterised it are nowadays threatened. Others authors also emphasise on the importance of the dehesa ecosystem in the endangered species conservation (Diaz *et al*, 2013). Therefore, to prevent the social and natural declining of these traditional spaces, it seems necessary to extend the environmental values of the organic farming. For example, the local implementation of a productive system certified in the European Organic Farming legislation may fulfil the growing demand of the society in terms of sustainable management of natural resources. Organic farming respects the environmental values of this ecosystem while promoting their improvement, as reflected in the results obtained in this research in which it has been identified more than 300 plant species and 19 mammals species. A certified production system supported by the European organic farming regulations framework not only will safeguard and improve the ecological and environmental values of the dehesa, but also it will allow the producers to incorporate these additional yields to their profits.

Conclusions: The organic farming system promoted a synergic and positive effect on both the variety and the abundance of biological biodiversity in the area of study. Results highlighted the remarkable biodiversity that these practices have led in animals and plants. In addition, new economic opportunities can be developed directly linked to organic farming and environmental value of its surroundings, such as ecotourism, ethnobotanical routes, hiking and recreation, wild animal tracking and sighting, cultural activities, sustainable collection of natural resources, etc. Therefore, the incomes of the farmers will be increased.

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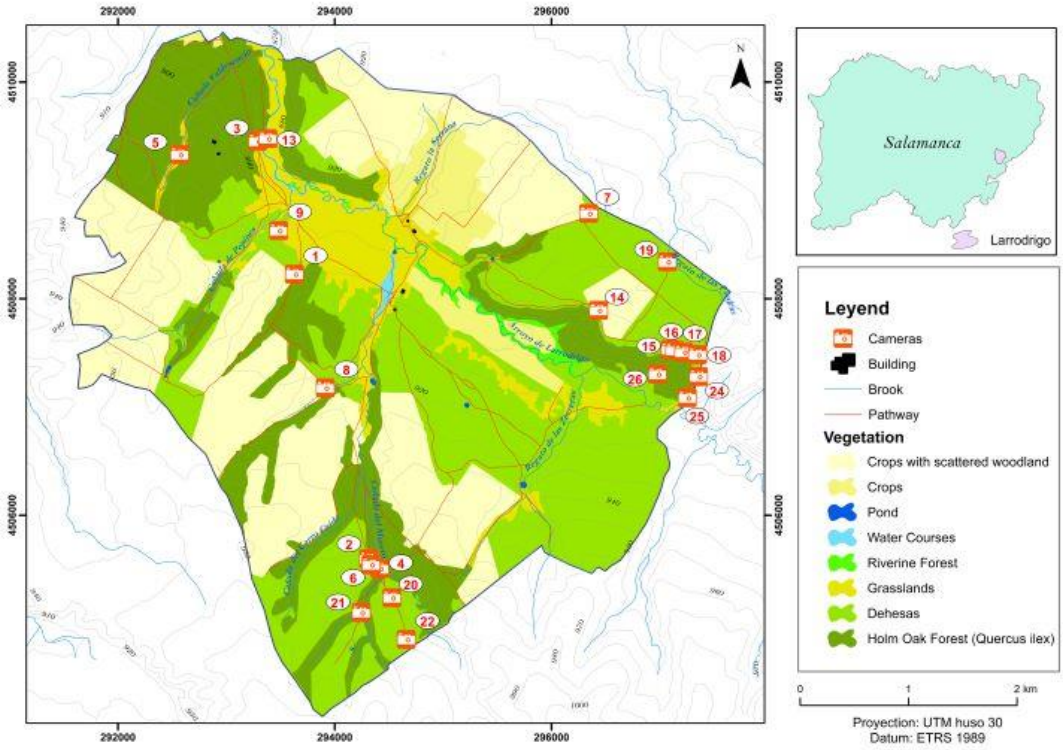
Image: Figure 1.



Disclosure of Interest: None Declared

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