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Article

Study of the impact of fighting cattle farms in the Spanish dehesa

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Abstract:

The objective was to determine the incidence of fighting cattle farms in the Spanish dehesa, defining those that are in this territory, and quantifying the hectares they occupy and some productive aspects in order to verify the importance of the breeding of the fighting bull in the maintenance and conservation of its biodiversity. To this end, different documentary sources of livestock associations and the Ministry of Agriculture, Fisheries and Food were consulted; and 304 surveys were carried out among fighting bull farmers in the Spanish provinces with dehesa. The area of the dehesa is 3'515,846 ha distributed in the Autonomous Communities of Andalusia, Extremadura, Castile and Leon, Castilla-La Mancha and Madrid, where there are 726 registered fighting cattle farms, although only 631 of them are active in the Stud Book of the Fighting Bovine Breed (2022), with a downward trend in recent years, and with an average census of 144 dams and 9 bulls, a low stocking rate. The estimated number of farms in the dehesa engaged exclusively in fighting bull farming is 581, with an average area of 534 ha and occupying 315,301 ha, representing 8.97 % of the total Spanish dehesa, although it would amount to 347,744 ha (9.89 %) considering the entire farm with the presence of other complementary activities. These farms are located in 358 municipalities, in which 72.61 % of the census is less than 5,000 inhabitants, which could help to fix the rural population.

Keywords: Dehesa, Fighting bull, Hectares.

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Introduction

The dehesa is one of the most characteristic landscapes of the Iberian Peninsula, and it is also the most characteristic and representative agrosilvopastoral system in Spain. It is a land-use system in which perennial woody plants and arable crops coexist, either in mixtures, zoned or sequentially over time, with the presence or absence of production animals[1]. The dehesas are classified by the European Union as Systems of High Natural Value, they are mostly located in disadvantaged areas of the Iberian Peninsula, many of them in natural parks and some in national parks, and they are a model of sustainable development with great ecological, economic, and social value[2].

The dehesa system is of great economic and social importance, both because of its area and because of the function of fixing the rural population in its nuclei, helping to minimize the negative migratory impact and its consequences, such as ageing, increased mortality rates, reduced activity rates and abandonment of farms. In addition, it has a great environmental and biodiversity value, since forestry, agricultural, hunting, and livestock activities are carried out in this territory[3,4].

The main use of the dehesa is animal production, and it is characterized by having a great ecological relevance, contributing to maintaining and improving the fertility of the pastures on which the cattle feed. One of the animals with the greatest presence in the dehesa is the fighting bull. It is mostly raised extensively and has a beneficial effect on the conservation of the land itself, since it rejuvenates the lowlands by preventing the invasion of scrubland, prevents soil erosion and desertification thanks to balanced grazing, which allows the optimal use of natural resources[3,5]. Therefore, the proper and sustainable management of fighting cattle farms is key to ensuring the quality and sustainable maintenance of the dehesa agroecosystem[6].

The fighting bull is considered to be the most emblematic animal in Spain and constitutes the greatest Spanish contribution to cattle breeding[7] and world genetics, in addition to being one of the oldest cattle breeds in the world, and the Spanish native breed with the greatest international fame, catalogued by various authors as a jewel of the Spanish and world genetic heritage as well as the "guardian of biodiversity"[8]. Likewise, it is considered not as a species, but as a meta-breed or also called a breed of breeds, due to the variety of "encastes" with wide genetic differentiation between them[9]. All this is the result of the activity of the cattle farmers, who leave their mark on the selection, playing a fundamental role in the conservation of the environment, the ecosystem where they live,

the flora and fauna, even carrying out conservation programs for protected species in the dehesa itself, as well as being stopping points for migratory birds when there is the presence of aquifers. It has even been found that the fighting bull that grazes in the dehesas has a contribution to their maintenance that is higher than that of the tame or slaughter cattle[10]. Likewise, the fighting bull is considered an irreplaceable tangible and intangible cultural heritage[8]. For all these reasons, the dehesa and the fighting bull are ecological heritages that contribute to Spain being an important natural reserve of biodiversity[8], and this combination of flora and fauna is not present in the rest of the European countries.

This study aimed to determine the incidence of fighting cattle farms in the Spanish dehesa, defining the number of cattle farms and farms and quantifying the hectares they occupy, as well as some productive aspects. This was done in order to highlight the importance of breeding fighting bulls in this European ecosystem of High Natural Value.

Material and methods

Collection of information

Initially, to carry out this work framed in the year 2022, several documentary sources were considered, which contained census data of the different existing fighting cattle farms, as well as their geographical distribution, with special attention in the main provinces of the Autonomous Communities (ACs) of Extremadura, Andalusia, Castilla-La Mancha, Castile and Leon, and Madrid, representative of the Spanish dehesa.

The sources consulted for this work have been the publications, in various formats (book, compact disk, web), of each of the officially recognized cattle farmers' associations that manage the Stud Book of the Fighting Bovine Breed (SBFBB), among which were the Fighting Bull Livestock Breeders Association (UCTL, for its acronym in Spanish), Fighting Cattle Farm Association (AGL, for its acronym in Spanish), United Fighting Cattle Breeders (GLU, for its acronym in Spanish), Spanish Association of Fighting Bull Cattle Breeders (AEGRB, for its acronym in Spanish) and Association of Fighting Bull Cattle Breeders (AGRL, for its acronym in Spanish). Likewise, the latest census data published, as of December 31, 2022, on the fighting cattle breed by the National Information System ARCA under the Ministry of Agriculture, Fisheries and Food (MAPA, for its acronym in Spanish) were considered.

With the information available on the list of cattle farms located in the provinces of the ACs that present dehesa, a questionnaire was prepared in 2022, in order to obtain the information for this study. The variables collected by the questionnaire were as follows.

1) Name of the cattle farm. 2) Name of the farm on which it is located. 3) Locality where the farm is located. 4) Is the cattle farm located in the dehesa? 5) Total area of the farm in ha. 6) Area of hectares allocated to the breeding of fighting bulls. 7) Current number of dams. 8) Current number of bulls. 9) Does the cattle farm share the farm with another? 10) Other complementary activities of the farm.

From the different contact possibilities (address, email, telephone, and social networks), information was obtained from the owners or representatives of the fighting cattle farms for the collection of the data specified in the questionnaire. To make it available to the cattle farms that were the object of the sample, a simple online format was designed, which was distributed via email or through the different digital platforms available, or through direct contact by telephone.

Likewise, through the use of the viewer application of the Agricultural Plot Geographic Information System (SIGPAC, for its acronym in Spanish)[11] and the Google Maps application, the territorial location of the cattle farms was carried out, considering the diverse cartography of the dehesa published by MAPA and the ACs affected by it, with expression of the location coordinates. Also, through the Official Population Figures of the Spanish municipalities file of the National Institute of Statistics (INE, for its acronym in Spanish)[12], as of December 21, 2022, the number of inhabitants of the localities where the studied cattle farms were located was obtained.

Analysis of information

To determine the hectares of dehesa occupied by fighting cattle farming in Spain, several considerations were taken as a starting point. Firstly, a quantification of the area of Spanish dehesa in hectares and its territorial delimitation was made; to this end, data were taken from references that fit the strict definition of dehesa as a multifunctional livestock or hunting system in which at least 50 % of the area is occupied by grassland with scattered adult trees producing acorns and with a canopy cover fraction between 5 and 60 %[13]. Next, the precise number of fighting cattle farms currently existing (inventoried) was determined according to the association to which they belong and the farms they occupy in the provinces with dehesa, considering the location of the corresponding agricultural farm according to its geographical location; and, later, the number of active fighting cattle farms in these provinces according to MAPA was determined. Subsequently, an estimate was made of the total number of farms with dehesa in their territory engaged in the breeding of fighting bulls, based on the percentages obtained from the surveyed farms, and the total area occupied by them according to the average size of the farms surveyed in the territory occupied by dehesa. Productive data of the cattle farms were also assessed, such as the number of breeding stock and complementary activities and the population of the municipalities where they are located.

The population count of cattle farms located in the provinces that have dehesa and, therefore, on which the questionnaire was sent, was 726 cattle farms (Table 1). To consider the result as statistically significant, it was necessary to obtain a sample with a minimum number of 252 for the 95 % confidence level and a margin of error of 5 %, having assessed the results of 304 surveys received, 41.87 % of the total, as of February 28, 2023.

All the data obtained from the answered surveys were recorded in a database created using Microsoft Excel® Office 16 version and then processed using IBM SPPS Statistics® version 28. Finally, a descriptive statistical study of the information collected and the Kruskal-Walis test were carried out to study the possible significant differences ($P<0.05$) between ACs in the number of animals, cattle farms, and hectares of the farms.

Results and discussion

Despite the large presence of fighting bulls in the Spanish dehesa, Systems of High Natural Value, and the beneficial effect that cattle exert on its maintenance and conservation[3,5], there are very few rigorous studies that indicate the area of dehesa occupied by fighting cattle farming. It has even been found that the fighting bull that grazes in the dehesas has a contribution to their maintenance greater than that of the cattle for slaughter, and that the owners of fighting cattle have a high preference for the continuity of the activity, so that their dehesas show an environmental value in the market higher than the environmental value of the tame or slaughter cattle[10]. For this reason, the results obtained and the analysis carried out can be placed within the framework of a general scarcity of specific studies that delve into the true incidence of fighting cattle farming in the context of the dehesa in Spain.

Area of the dehesa in Spain

In Spain, the dehesa is mainly distributed in the west and southwest, covering the Castile and Leon province of Salamanca, Extremadura, and the western area of Andalusia, and with derivations that extend to other ACs such as Madrid and Castilla-La Mancha. The total area occupied by the dehesa in the country differs according to the different sources consulted, fluctuating between very disparate figures that range from 2.3 to 5.8 million hectares[4,13,14], and perhaps this has to do with the definition of the term itself and its greater or lesser quantification depending on whether other adehesada or potential formations are taken into account according to the percentage of the type of trees, grasslands, shrublands, or including open areas of juniper, pine forests and some low scrubland[13].

To carry out this study, an estimated area of around 3.5 million hectares (Table 1) was taken as a reference for the Spanish dehesa, adjusted to its strict definition, provided by Silva and Fernández[15]. This, in its wide territorial distribution, is located in several ACs, although not all of their provinces have dehesa. Nevertheless, there are other sources that report different areas; the Extremadura Forest Plan indicates a larger area of dehesa, 1'987,733 ha according to the canopy cover fraction[4]; for Andalusia, Costa[16] also indicates a larger area of 1'262,594 ha; however, the area of dehesa in Castilla-La Mancha is lower, with 486,916 ha of Mediterranean Iberian dehesa, which extends through the five provinces of the La Mancha region[13]. From all this, it can be deduced that, according to the criteria applied by the ACs themselves and the contributions of other authors, the area of the dehesa may vary substantially, yielding different figures, even higher if other territories or systems called adehesados, which are not classified as dehesa *per se*, are estimated, since they do not meet the strict definition of dehesa[13] and would, therefore, significantly increase the overall figure of the area of the Spanish dehesa.

Table 1: Area of the dehesa in Spain distributed by Autonomous Community and number of fighting bull farms

Autonomous Community	**Area (ha)**	**Area (%)**	**Inventoried farms***	**Active farms****
Extremadura	1'237,000	35.18	263	222
Andalucia	946,482	26.92	169	168
Castilla-La Mancha	751,554	21.38	115	103
Castilla y León	467,759	13.30	107	83
Madrid	113,051	3.22	72	55
Total	3,515,846	100.00	726	631

* Number of cattle farms inventoried according to livestock associations. ** Number of active cattle farms according to the SBFBB (MAPA[17]).
Source: Silva and Fernández[15].

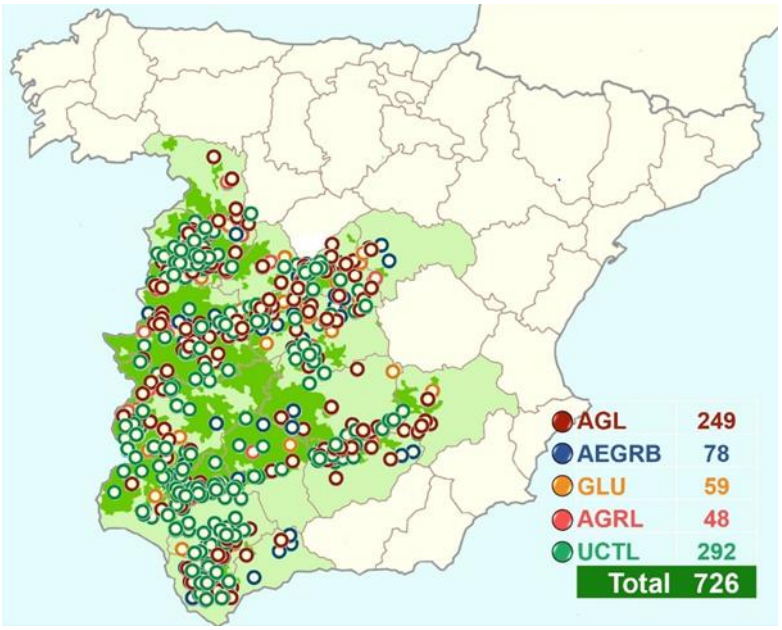
Number of fighting cattle farms in dehesas in Spain

In Spain, a total of 980 fighting cattle farms have been inventoried according to livestock associations; on the other hand, according to the latest available census data on the Fighting Cattle Breed[17], and as of 31 December 2022, only 840 of them were active in the SBFBB. A total of 726 cattle farms which were in provinces with dehesa were selected to be surveyed, with this value being higher than the 631 active cattle farms located in the ACs with dehesa (Table 1). Nonetheless, it was not feasible to have carried out the survey on this last population of active cattle farms, since the figures provided by the census are global and there is no individually specified data to be able to identify the cattle farms, and therefore, in view of this lack of knowledge, in this work the total number of inventoried cattle farms was surveyed.

Thus, of the total of 980 cattle farms initially inventoried in the Spanish territory, the 726 that are located in provinces with dehesa were selected; it should also be noted that, of the 840 Spanish cattle farms active in the SBFBB, 631 cattle farms are located in ACs with dehesa (Table 1).

Assessing the location by autonomous community, it can be observed that Andalusia is the one with the highest number of cattle farms devoted to the breeding of fighting cattle, followed by Castile and Leon, Extremadura, Castilla-La Mancha, and Madrid, respectively (Table 1). Of the five ACs mentioned, the provinces of Córdoba, Cádiz, Huelva, Seville, Málaga, Jaén, Cáceres, Badajoz, Albacete, Ciudad Real, Toledo, Guadalajara, Ávila, Zamora, Salamanca, and Madrid (Figure 1) are the ones that have dehesa[4,18,19].

Figure 1: Provinces and cattle farms located in dehesas in Spain of each of the livestock associations that make up the SBFBB



From the detailed analysis of the initial data regarding the locality and the farm in which the different cattle farms are located, with expression of the geographical coordinates of latitude and longitude which indicate their precise location, it is observed that several of them have the same municipal location and farm. Thus, the 726 cattle farms are housed in 621 farms, since in 541 farms there is only one cattle farm, in 61 farms there are 2 cattle farms, in 13 farms there are 3 cattle farms and in 6 farms there are 4 cattle farms. Therefore, in order to determine the area of fighting cattle farms and, therefore, the area they represent over the total dehesa in Spain, it is necessary to establish the number, as reliable as possible, of fighting cattle farms located on their corresponding farm. It can be observed that the number of farms is lower than the number of cattle farms, mainly due to the fact that some cattle farms share the same farm, since they have different cattle branding irons, understood as the identity mark of the cattle farm[20], which are even

registered in different associations. Nevertheless, from the data reported, it can also be deduced that there are some cattle farms that, although they do not currently have animals of the fighting breed, keep their registration in the corresponding association, and even some have changed their legal ownership and still appear in the catalogues consulted, without the corresponding deregistration. For all these reasons, the most accurate thing for this study, instead of taking the number of existing cattle farms itself as a reference, is to contemplate the number of farms in which they are located, facts verified in some of the responses issued by the cattle farmers, where they indicate that they share a farm with other cattle farms.

From the results of the 304 surveys received, it can be observed that there are 283 fighting cattle farms located in the dehesa, which represents 93.1 % of them. Nevertheless, in order to make the total estimate of the farms located in dehesas, must be know that these cattle farms are located in 263 different agricultural farms, representing (93.5 %), a percentage that applied to the total number of farms inventoried with dehesa would allow to estimate the number of farms with dehesa at 580.88 and, broken down by AC, Andalusia is the one with the highest number of farms in dehesa engaged in bull breeding (Table 2), as well as in the overall calculation of fighting cattle farms[17].

Table 2: Number of fighting cattle farms in the dehesa in Spain by Autonomous Community

Autonomous Community	Farms surveyed					Farms in dehesa	
	No. Total	With dehesa		Without dehesa		No. of farms inventoried*	No. of farms estimated**
		No	%	No	%		
Andalucía	110	104	94.55	6	5.45	233	220.30
Castilla y León	58	55	94.83	3	5.17	125	118.54
Extremadura	33	31	93.94	2	6.06	105	98.64
Castilla-La Mancha	31	28	90.32	3	9.68	95	85.81
Madrid	31	28	90.32	3	9.68	63	56.90
Total	263	246	93.54	17	6.46	621	580.88

*No. of farms inventoried according to information from livestock associations. **No. of farms estimated when applying the % of farms with dehesa resulting from the survey and which appears in the same row.

It should be noted that the state registry created by MAPA to know the census of live animals also refers to the number of fighting cattle farms active in the SBFBB[17] and does not do so for the farms in which they are located according to the criterion cited above. However, if the latest data published by MAPA on the number of active fighting cattle farms in the stud book is taken as a reference, in 2022 there are 631 cattle farms in the ACs that present dehesa[17], and if the aforementioned correction criteria were applied, that is, 93.1 % of the cattle farms located in the reference ACs that are located in the dehesa (93.54 % of the farms), an adjusted number of 587.5 cattle farms or 549.5 referring to farms would be obtained, values slightly lower than the 580.88 farms with fighting cattle in the dehesa estimated in this study, and to be taken into account, since it registers

those cattle farms that provide ownership of fighting animals for the corresponding annual period according to MAPA.

Area of fighting cattle farms in dehesas in Spain

In recent years, there has been an intense social debate about bullfighting and it seems that it is necessary to repeatedly justify the importance of the fighting bull in ecology and biodiversity, systematically resorting to linking its breeding with the conservation of the dehesa and trying to justify the large area enjoyed by the farms engaged in the breeding of fighting cattle immersed in this space rich in biodiversity. Thus, there are repeated references by multiple authors who attribute a total area ranging from 400,000 ha to 540,000 ha[5,6,21], or globally "one seventh" of the dehesa, as simplified by others, even stating that 20 % of the more than three million hectares allocated to the dehesa in Spain are occupied by fighting cattle[22]. These values are higher than those provided in this study, where is estimated that the production of the fighting bull occupied 315,300.79 ha in the Spanish dehesa (Table 3).

Table 3: Area of farms engaged in the breeding of fighting bulls in dehesas in Spain

	Area of farms surveyed (ha)			**Estimated farms area (ha)**	
Autonomous Community (AC)	**Total**	**Fightingbull**	**Area/ Farm/ Fightingbull**	**No. of farms**	**Total, Area****
Andalucía	64,600	59,503	572.14±448.14^{e}	220.30	126,042.44
Castilla y León	32,059	27,329	496.89±350.49^{e}	118.54	58,901.34
Extremadura	21,050	19,060	614.84±592.01^{e}	98.64	60,645.58
Castilla-La Mancha	21,214	17,214	614.79±672.75^{e}	85.81	52,752.95
Madrid	8,345	8,345	298.04±199.11^{a,b,c,d}	56.90	16,958.48
Total	147,268	131,451	534.35±466.40	580.88	315,300.79

* Average value of the area allocated to fighting bull breeding per farm. **Estimated area allocated to fighting bull breeding, obtained by multiplying the estimated number of farms by the area per farm. ^{a,b,c,d,e} Significant differences (P<0.05) between ACs.

It should be noted that in order to estimate this area of dehesa, the duplication of the area of cattle farms located or sharing the same farm must be discarded and, therefore, it would be more appropriate to use the concept of farm and not that of cattle farm. Thus, the total area of the farms surveyed in which the breeding of the fighting bull coexists in the dehesa amounts to 147,268 ha, and that of those allocated exclusively to it decreases to 131,451 ha, since some farms carry out other complementary activities, such as the production of

other breeds of cattle, Iberian pigs and sheep[22], implying a global average of 598.65 ha for the total of the farm and 534.35 ha allocated to the fighting breed, although the most opportune, as has already been seen, is to consider the results individually for each of the different ACs (Table 3). In this sense, it can be observed that the cattle farms located in Madrid have an area significantly smaller than those located in the rest of the ACs, which could be related to the higher economic value of the land in Madrid, which stands at 9,260 €/ha[23]. Few contributions have been made regarding the area allocated by cattle farmers to the breeding of fighting bulls, and much less in relation to the dehesa; these include those by Purroy and Grijalba[24], who, after a study in 20 farms, provide an average area of 715 ha, and those by Tabernero de Paz *et al.*[22], who, after a survey of 177 cattle farms throughout the national territory, establish that they have an average area of 536 ha, being 657 ha for those farms located in what they call zone 1, which precisely corresponds to the ACs in which the dehesa is circumscribed (Andalusia, Castilla-La Mancha, Castile and Leon, Extremadura and Madrid) and in which they only conduct 132 surveys. Nevertheless, the average farm size of 534.35 ha (Table 3) is smaller than in this study[22], and similar to the 529.5 ha found by Bea[25], although the location of all the farms in the dehesa is not specified, and to the 500 ha on average of the cattle systems in the dehesa[3,26]. In addition, it was observed that the variation in the area of the farms ranges from a minimum of only 10 ha to 3,000 ha; 10.16 % (25 farms) have less than 100 ha, 55.7 % (137 farms) have between 100 and 500 ha, 26.42 % (65 farms) have between 500 and 1,000 ha and 7.72 % (19 farms) have more than 1,000 ha.

In any case, the larger area of dehesa allocated to fighting bulls observed in previous studies[22,24] could be due to several factors, such as the lower number of surveys carried out by these authors, a possible duplication of cattle farms counted and the date they were conducted, where more hectares were allocated to fighting bull breeding on the farms and the number of fighting cattle farms was higher (Table 4). In this sense, the data published by MAPA on the number of active cattle farms registered in the SBFBB in the last decade[17] can be observed, showing a worrying progressive downward trend, which could also be influenced by the outbreak of the Covid-19 pandemic, although this trend has remained less pronounced in the last two years (Table 4).

Table 4: Number of active fighting cattle farms in the last decade (MAPA, 2023).

	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
TOTAL -SBFBB-*	1016	1003	990	971	988	984	951	913	881	881
ACs. with dehesa	742	732	714	698	705	703	677	648	630	631

* Number of active cattle farms according to SBFBB in Spain, Portugal, and France.

Considering the limitations mentioned throughout the text, such as the difference in the total area of dehesa, which varies according to the various data of authors and the ACs themselves, the existence of several cattle farms located on the same farm and that, at present, not all cattle farms are active, and in accordance with the criteria provided here regarding the number of farms to calculate the reference hectares of fighting cattle farms

as the best approximation to the average area for the ACs with dehesa, it could be estimated that the 580.88 farms that house the fighting cattle farms could occupy an area of 315,300.79 ha, which currently represents 8.97 % of the total dehesa (3'515,846 ha) in Spain; although it is true that the total area would amount to 347,743.81 ha (9.89 % of the total area) taking into account the entire farm itself, with the carrying out of other activities complementary to the main one, which is the breeding of fighting cattle.

Size of fighting cattle farms in dehesas in Spain

In most cases, the size of a fighting cattle farm is estimated in terms of the number of breeding stock it presents and this can vary depending on several factors, such as the capacity of the farm itself, the different production strategies of each cattle farmer and the market demand since, in general, the animals are carefully selected to ensure an offspring with the desirable genetic, physical, and behavioral characteristics for their destination in bullfighting[27].

In addition, of course, cattle farms tend to have a much higher number of breeding cows than bulls. According to these results, breeding cows represent an average of 144.05 for those farms located in the Spanish dehesa, with 8.99 for bulls (Table 5), where the cattle farms with the most breeding stock are in Andalusia, despite the fact that the farms that use the most hectares for fighting bulls are in Extremadura (Table 3). In addition, the results of the present study on the size of the cattle farms are lower than the 162 cows and 6 bulls provided in 2013 by Tabernero de Paz *et al*[22] and Bea[25], who found an average of 185.6 mother cows per cattle farm. The decrease in breeding females, compared to previous studies, may be in line with a lower census of fighting cattle in recent years, in line with the lower number of cattle farms, and the lower demand for animals[21]. On the other hand, it is worth highlighting the increase in the number of bulls in the cattle farms, compared to these studies, which could be due to the improvement in production management in recent years, in order to increase the fertility rates of the cattle farms since artificial insemination and other assisted reproduction techniques are very scarce[28].

Table 5: Average number of breeding stock in the cattle farms in the dehesa by Autonomous Community (AC)

AC	Breeding cows	Bulls
Andalucía	158.59±126.75	9.91±7.66
Castilla y León	136.10±113.87	8.04±8.80
Extremadura	128.77±84.58	9.20±6.07
Castilla-La Mancha	119.75±77.08	7.50±3.32
Madrid	146.27±97.81	8.38±4.50
Total	144.05±111.34	8.99±7.34

As can be seen in Table 6, almost half of the cattle farms have up to 100 breeding cows, with cattle farms with a minimum of 15 breeding cows and even a cattle farm with more than a thousand individuals. In the case of bulls, it can be observed that three quarters of the cattle farms have fewer than 10 bulls, with those with more than 20 units (5 %) being exceptional. Thus, the size of a fighting cattle farm can vary significantly, from small family farms, the majority, to large cattle companies with more than a thousand head of cattle, occupying large extensions, being an animal production where the size of the cattle farm presents great heterogeneity, as in other productive aspects[22]. It should be noted that the stocking rate in this production is lower than in other animal productions, which favors the conservation and maintenance of the dehesa to a greater extent[10].

Table 6: Cattle farms located in the dehesa in Spain according to the number of breeding stock

	Breeding cows		Bulls	
Cattle farm	**No. of animals**	**% Cattle farms**	**No. of animals**	**% Cattle farms**
Small	≤ 100	46.58	≤ 10	73.75
Medium	> 100 ≤ 200	35.74	> 10 ≤ 20	21.25
Large	> 200	17.67	> 20	5.00

Population in the municipalities of the dehesa in Spain with fighting cattle farms

There is no doubt about the importance of the fighting cattle breed in its relationship with the dehesa in terms of the territory it covers, as well as the protection of the biodiversity of this valued ecosystem with the use of the natural resources available and the conservation of wild flora and fauna[2,3]. But it cannot ignore the enormous social and economic significance that this entails in the rural environment due to the role that cattle farms and bull production contribute to the fixation of the rural population, in its corresponding territorial location. Thus, from the extract of the 621 farms studied, these are located in 358 different municipalities (Table 7), of which more than 72 % are located in towns with less than 5,000 inhabitants, with Andalusia, Castile and Leon, and Castilla-La Mancha, respectively, being the ACs with the most farms in these municipalities, data that agree with those collected from the 2022 annual report of indicators prepared by MAPA, which establishes them among those with the largest number of people registered in rural municipalities.

Table 7: Number of inhabitants in municipalities with dehesa in Spain where fighting bull farms are located

	No. of municipalities	**Percentage**	
≤ 1,000	154	43.01	72.61
> 1,000 ≤ 5,000	106	29.60	
> 5,000 ≤ 10,000	39	10.89	27.36
> 10,000 ≤ 20,000	27	7.54	
> 20,000 ≤50,000	15	4.19	
> 50,000	17	4.74	
Total	358	100	100

Considering that the activity rate and population density is lower in municipalities with dehesas compared to those that do not include them, as reported by Campos *et al*[14], the activity carried out in fighting cattle farming is assumed to contribute to avoiding depopulation, reducing the migratory flow in those nuclei with clear agricultural activity, in which it is difficult to find alternatives to carry out other productive or industrial activities, as reflected in the characteristics of the dehesa in the Master Plan of the Andalusia Dehesas.

Conclusions and implications

The number of active fighting cattle farms, according to MAPA, is lower than the number inventoried by the livestock associations themselves in the provinces of the Spanish dehesa; in addition, their trend has been downward in recent years. The area of dehesa of the farms engaged in the breeding of the fighting bull, which sometimes includes the presence of other productions and complementary activities, is estimated at around 350,000 ha, values lower than previous studies. The existence of fighting cattle farms for the breeding of fighting bulls is intimately linked to the maintenance and conservation of the highly biodiverse ecosystem of the Spanish dehesa, with a low stocking rate, which makes it a low-intensity land use system. For this reason, the progressive decrease in the number of fighting cattle farms and the area occupied in this system classified by the European Union as of High Natural Value is worrying. Finally, the fighting cattle farms in the dehesa are located in municipalities that mostly have less than 5,000 inhabitants, which could help to fix the rural population.

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