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MAINTENANCE OF IBERIAN LIVESTOCK

Benjamin Naylor

ABSTRACT

The division of the main species of Iron Age Iberian livestock into categories of large, high-maintenance animals (equids and cattle) and medium-sized, low-maintenance animals (sheep, goats and pigs) allows us to investigate *grosso modo* Iberian livestock management. High proportions of large animals are, unsurprisingly, correlated with greater rainfall and fewer cold months. Yet they are also correlated with drier summers, suggesting techniques such as growing fodder crops may have been used to support such animals.

INTRODUCTION

More than simply the range of livestock species, we want to understand the importance and husbandry of each in order to describe their role within Iberian communities. An emerging picture from detailed zooarchaeological reporting suggests a diverse herd in most sites, the prime importance of ovicaprids (with goats perhaps more common than sheep) and a gentle rise in the number of swine over the late Iron Age (Iborra, 2004).

Figure 1 presents the proportion of different species from Iberian (and slightly later) sites in València and its surrounding provinces. Most of these sites are collected in Iborra 2004, to which I have added studies by Pérez, Alonso & Iborra 2007; Sanchis 2002, 2006; and González 2013 to expand the range of dates. The sites are dated by century with 'second Iron Age' sites treated as Middle Iberian (fifth to fourth or to third centuries BC). Proportions are calculated on the basis of Minimum Number of Individuals or Number of Remains where the former is unavailable. Note that the sample from the final century BC at *Ilici* includes only a handful of individuals

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(González, 2013: 330-1). As can be seen, the range of livestock even from small sites is clear. And the additional studies do not change the general trends for the Iberian era as identified by Iborra.

There are many reasons why households and communities might prefer different mixes of livestock. Animals might be kept for their meat, secondary products, for work, as a reserve of wealth, an expression of status or any combination of these reasons. They may be well or poorly cared-for. And not only

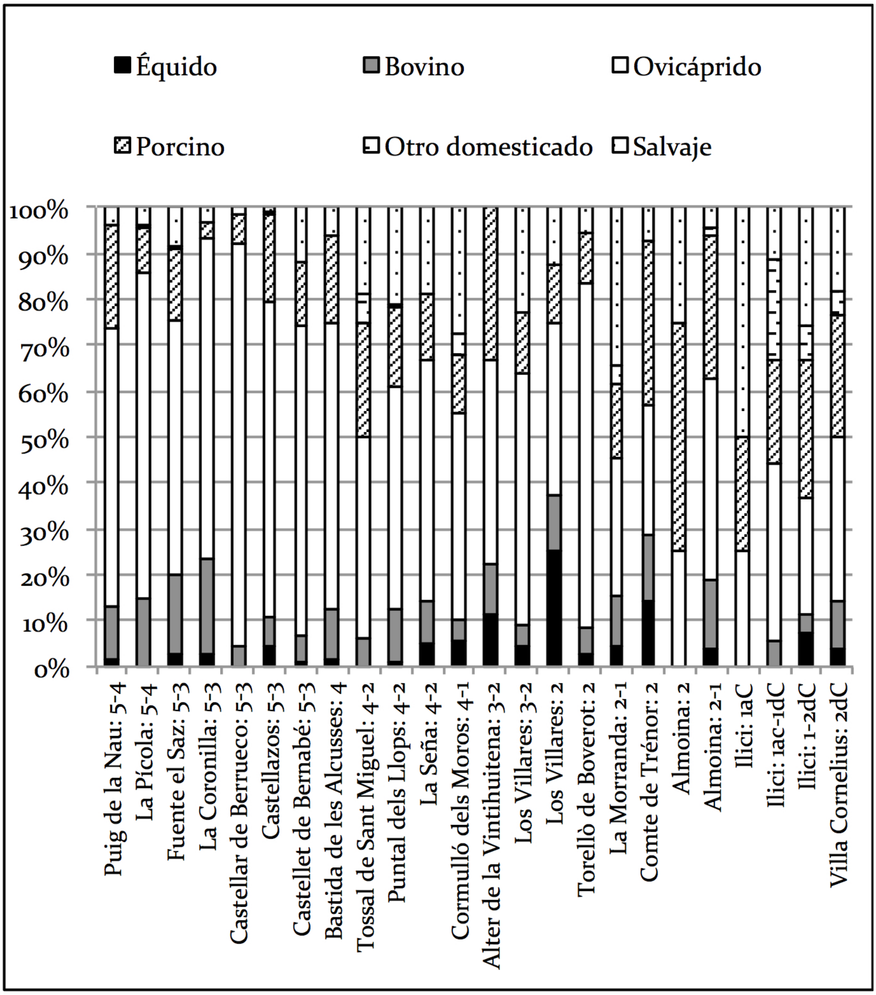

FIGURE 1. The proportions of different species in the faunal remains

do settlements differ in size, population, characteristics and environments, but so too practices differ from household to household, as shown by analysis of the distribution of tools and animal remains in La Bastida de les Alcusses (Bonet, Soria y Vives-Ferrándiz, 2011: 171; Iborra y Vives-Ferrándiz, 2015). We should also consider processes of formation, preservation and recovery of archaeological remains that likely change the apparent mix of livestock, presumably privileging larger animals. And although the number of sites analysed is growing, it is still low and mainly includes larger sites.

Accounting for the presence and importance of different livestock species is tricky. For this reason, I seek to simplify the analysis along the lines of livestock behaviour (or agency). I divide the species into two groups. First, the largest animals, which need the most fodder: equids and cows. Second, the medium-sized animals that generally require less fodder: sheep, goats and swine. We can consider these groups as high and low-maintenance animals respectively. I exclude remains of small animals (in particular, fowl and dogs) and wild beasts.

This division is a working hypothesis only. Sheep, pigs and even goats may be foddered to some extent, and sheep often require dedicated provision of salt (Iborra, 2004: 323-4). Conversely, cows and to a lesser extent equids may be abandoned to their luck for a season or fed principally with plants that do not compete with human consumption (Foxhall, 1998). And ethnographic examples show that cows may be left with ovicaprids when they are not needed for work (Khuele, 1983). But as a general rule, equids and cows have markedly higher maintenance requirements, particularly in terms of fodder and water and particularly when needed for work (Fall, 1995).

Reconsidering Figure 1 in this light, there is not a clear chronological division in the proportions of large and medium-sized animals. The proportions oscillate between five and twenty-five percent, although with more variation in later centuries.

We can also use this division to consider geographical patterns, as shown in Figures 2 and 3 (the last is a close-up area of the first). The proportion of large animals is shown in black, the ovicaprids and swine in white. Although maps at such large scales provide only a general impression, no clear pattern is evident. Neighbouring sites of the same era might have proportions that are very similar (such as El Castellet de Bernabé and El Tossal de Sant Miguel) or very divergent (La Coronilla de Chera and El Castellar de Berrueco).

Should we expect a geographical or chronological relationship with animals that require more fodder? The latter seems less clear. Studies of the written sources have suggested a diffusion of new fodder crops in the Italian peninsula during the last two centuries BC, which might suggest an increased ability to maintain large animals (White, 1970: 202). But archaeobotanical studies in the Iberian peninsula have found a range of legumes available, at least through the Iron Age and much earlier in some cases (Alonso, 2000: 34-5).

Geography on the other hand is intuitively related to different agricultural and pastoral strategies.

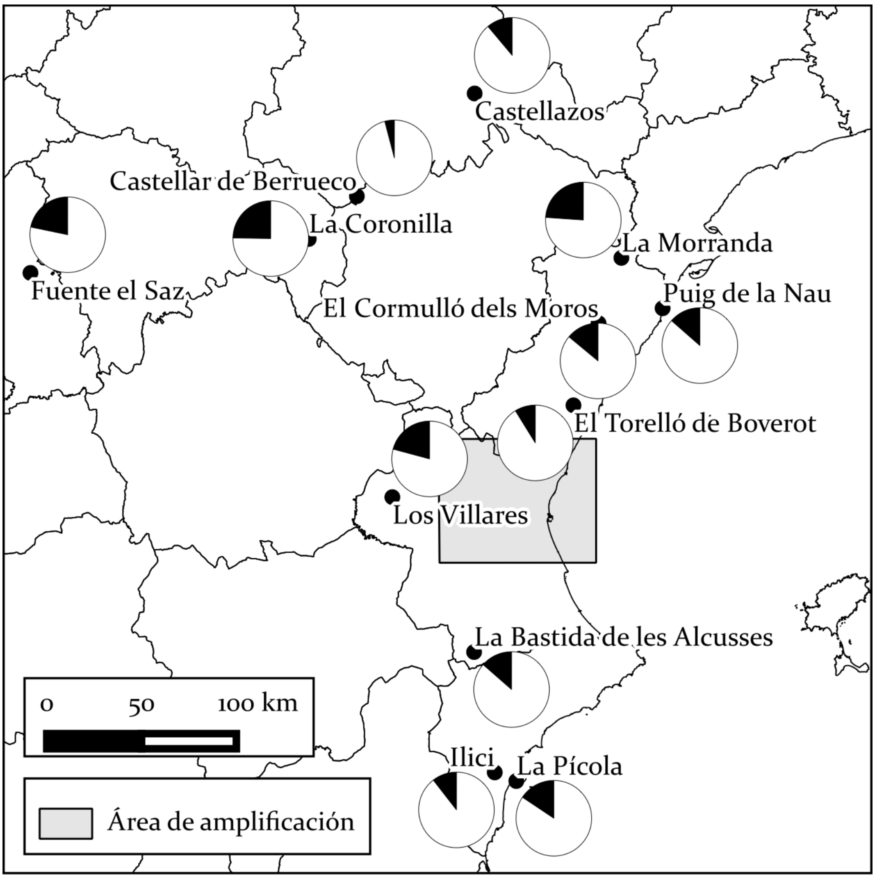

FIGURE 2. The proportions of large and medium-sized livestock

METHODS

To explore this relationship, I use precipitation data, kindly provided by the Spanish Agencia Estatal de Meteorología. Late-twentieth century measurements will never be an exact match for the climate in antiquity, owing to regional variation in climates over time and changes in additional factors such as the soil and vegetative cover (Riera et al., 2009). But they provide the density of data necessary to investigate the scale and patterns of variation. This density is evident in figure 4, which shows the meteorological stations in the provinces of Castelló, Teruel, València, Cuenca, Alacant and Albacete. Unfor-

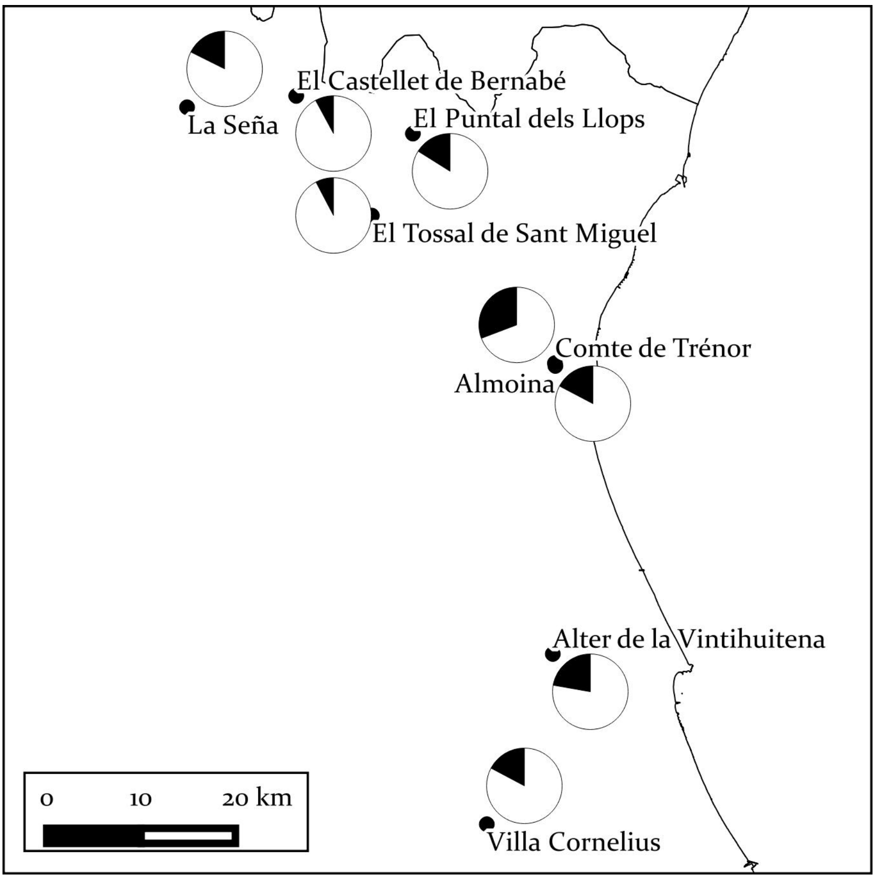

FIGURE 3. The proportions of large and medium-sized livestock (close-up of central València)

tunately this data does not cover the sites of Fuente el Saz, La Coronilla or Los Castellazos, which are excluded from the relevant analyses. Each point displays the average annual precipitation in the decade 1981-90. Best practice in climate modelling is to use three decades of data but given changes in station operation over such a long period, this reduces the number of stations available. I accept a shorter time period in order to utilise data as close as possible to the archaeological sites (even accepting occasional stations with less than the full decade of data, down to a minimum of three years). As can be seen, using this approach, there are generally multiple stations within around ten kilometres from each site. To calculate the average precipitation for each site, I use the average of the three nearest stations (without weighting).

This focus on nearby resources reflects an unwillingness to accept transhumance as a widespread livestock strategy in the Iberian era. This debate is not settled but recent studies have tended to exclude the practice (e.g., Valenzuela et al., 2015), something which accords with the density and political fragmentation of Iberian settlement patterns. Regardless, transhumance is less relevant to this study because it is more practicable for ovicaprids than equids and cows and so would tend to exacerbate the difficulty in maintaining larger and particularly working animals (although there are references to its use for larger animals as well: Pliny *Epistulae* 2.17.3)

A further environmental measure is the ‘period of frost or cold’ calculated by the Ministerio de Agricultura, Alimentación y Medio Ambiente (available through their WMS). This measures the ‘number of months in which the average minimum temperature is less than 7 °C’. This is a somewhat crude measure but a useful complement to rainfall in that it provides a different type of constraint, especially given some mountainous areas with higher rainfall.

RESULTS

Figure 5 shows that the resulting correlation with the proportion of high-maintenance livestock is positive (0,23) although not dramatically so. This is unsurprising and provides little information about the mechanisms through which rainfall is being used, although it does provides some confidence in the general approach.

Figure 6 shows the relationship between high-maintenance animals and months of cold or frost. The results are more granular than figure 5, but show an expected negative correlation of -0,21. That is, higher proportions of large animals are correlated with fewer cold months. This analysis includes the three sites not covered by the precipitation data.

These two correlations appear logical although with one wrinkle. Conventionally, the Spanish interior has been associated with higher levels of pastoralism despite its long and hard winters. And analysis of Iron Age tomb furnishings has suggested that the eastern (Iberian) coast had lower levels of horse-ownership than the (Celtiberian) north Meseta, although this could of course reflect different burial practices (Quesada, 1998: 179).

Accepting these general correlations, however, leaves open the question of their mechanism. More rainfall and less interruption to the growing sea-

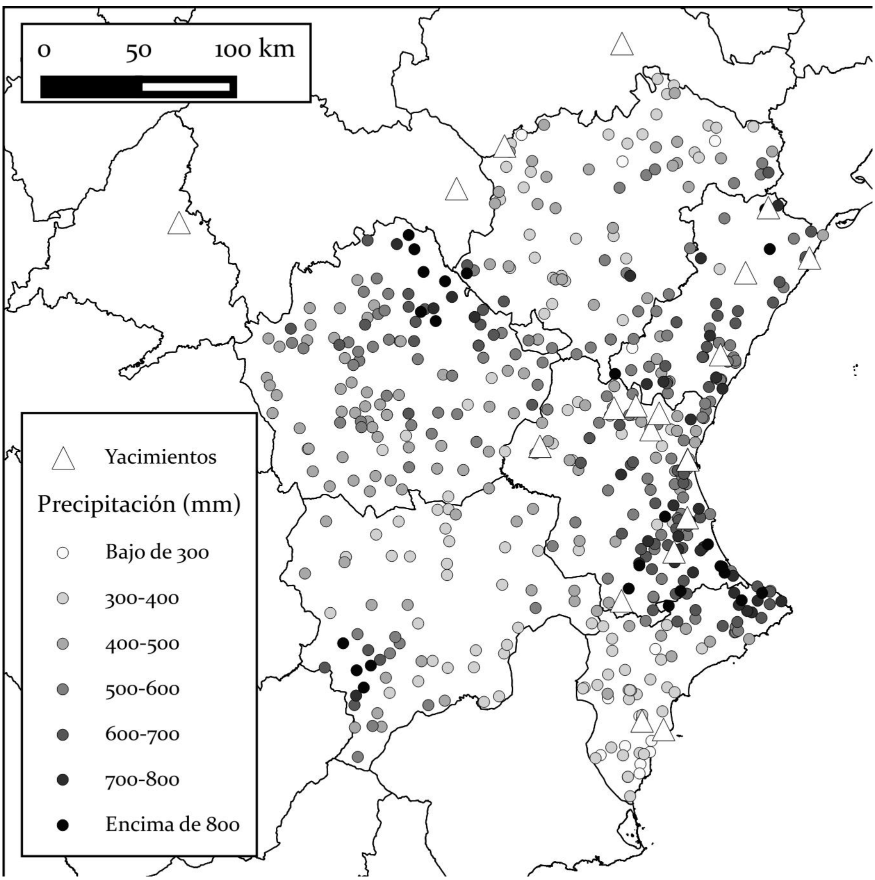

FIGURE 4. Meteorological stations and average annual precipitation

son by inclement weather could be related to more high-maintenance livestock in both direct and indirect ways. Directly, it provides a global increase in vegetation, hence providing more pasture. Indirectly, it permits greater agricultural fertility and so facilitates a range of strategies to support large livestock. Greater fertility increases the ability to divert crops to livestock, pasture livestock on sprouting crops, cut some crops early as green fodder, include more fodder plants (both in autumn and spring) in crop rotations, or include thirstier, multi-use crops such as broad beans.

These indirect mechanisms remind us of Halstead's (1987) suggestion of virtuous circles in intensive agriculture, in which increased fertiliser and traction from higher numbers of livestock supports the additional feed requirements of these animals. A crucial independent variable, however, is the availability of water. This is not to say that rainfall determines the complex

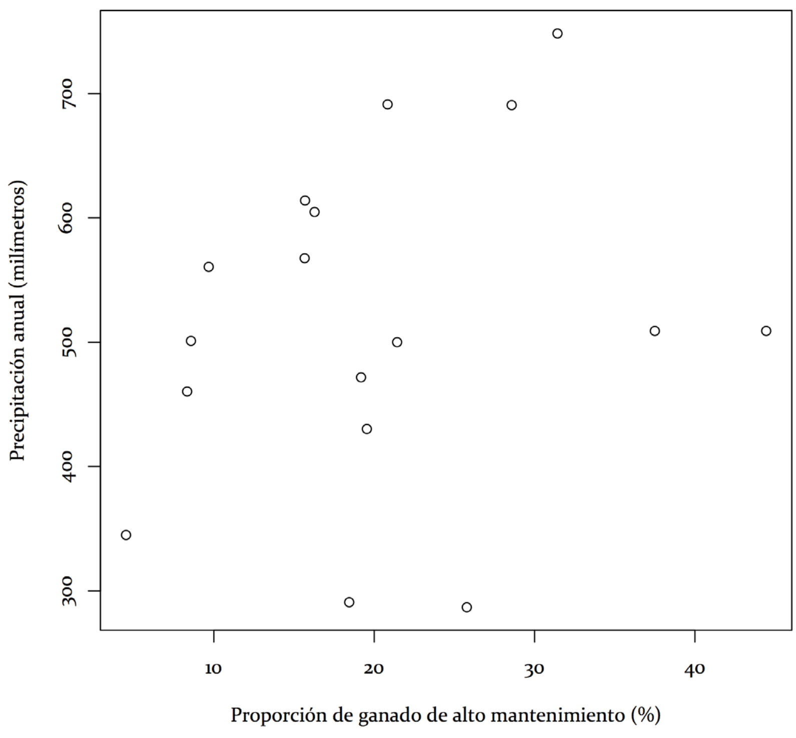

FIGURE 5. Average annual precipitation and the proportion of high-maintenance livestock

interaction of humans, animals and plants. Indeed, it may be manipulated in turn through irrigation, storage, the digging of wells, terracing, and a multitide of passive strategies. But rainfall clearly plays a role.

Because these indirect strategies for supporting more livestock have implications for how rain is useful, I include two further analyses. Firstly, average spring rainfall. One way to add fodder crops to the rotation is by including spring-sown crops in 'fallow' fields. Many legumes can be sown at this time, particularly chickpeas and cow peas, but also lentils, broad beans and peas (Halstead, 2014: 24; Chapa and Mayoral, 2007: 48). Some fodder legumes (lucerne, grass pea and bitter vetch) can also be sown in spring, although autumn is more common (Arnon, 1972: 578; Halstead, 2014: 24). Both millets are sown in spring, as are oats and rye (Alonso, 2000: 33; Cubero, 1999: 59). Some types of wheat and barley are also spring-sown.

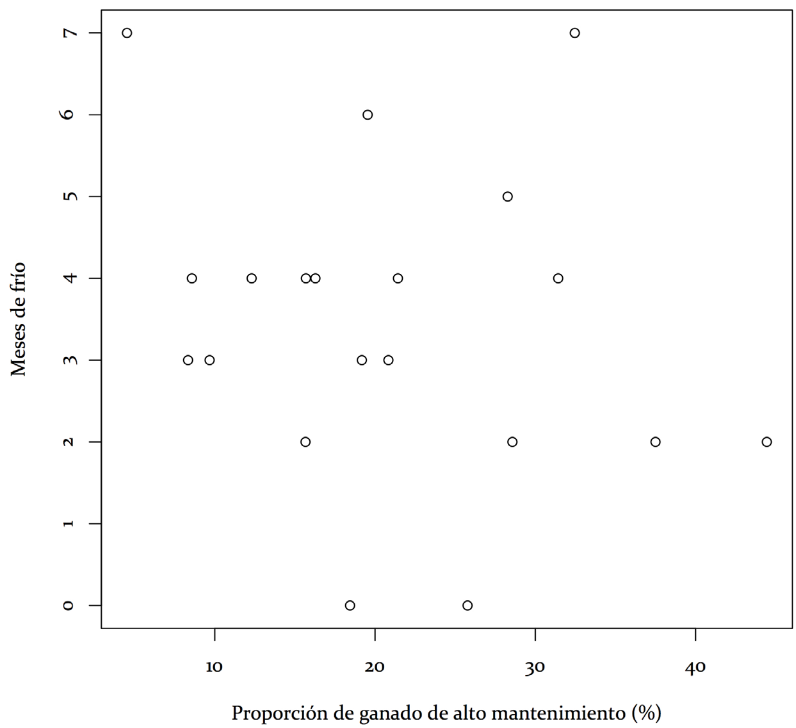

FIGURE 6. Cold months and the proportion of high-maintenance livestock

All these crops have their own requirements but most important factor for short-cycle crops is spring rainfall. As such, we would expect that if these crops were an important part of supporting high-maintenance herds, these animals would abound in areas with high spring rainfall. Figure 7 suggests, however, that there is not a strong relation between these two factors (the correlation is only 0,04).

Interestingly, this result is supported by the scarce evidence for the inclusion of C4 plants in animal diets (pertinent to the millets, not the legumes or other cereals). From isotope analysis of sheep's teeth, Valenzuela et al. (2015) have suggested that occasional foddering with millets was a possibility but uncertain in coastal Catalunya. And isotope analysis for two cows and a sheep amongst twelve domestic animals from Castellet de Bernabé and La Bastida de les Alcusses (València) found signs of only a small contribution of

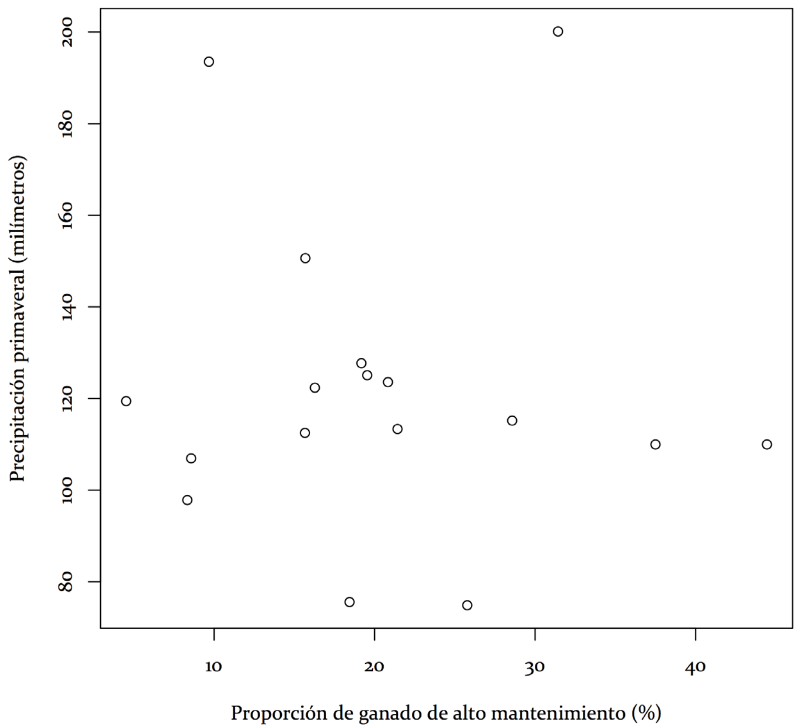

FIGURE 7. Average spring precipitation and the proportion of high-maintenance livestock

C4 plants to their diet (Salazar-García, et al. 2010). Overall, the evidence for fodder millets, and more broadly the role of legumes in general, is still very unclear (Alonso, 2000: 35).

Figure 8 presents summer rainfall. Summer is a difficult period for livestock in the Mediterranean. Given mild, rainy winters, summer is the period of greatest vegetative scarcity for livestock (aside from intermittent crop residues). Hence the models of transhumance found particularly in the Medieval period. The correlation here is inverse (-0,22). That is, the areas with more high-maintenance livestock also have drier summers.

How should we interpret this disconnect? Summer rainfall is sporadic in the Spanish Mediterranean (Cortesi et al., 2013). Possibly such unreliable (and lower in general) rainfall simply has little effect regardless of level and as such the correlation is meaningless. Possibly cows and equids were simply

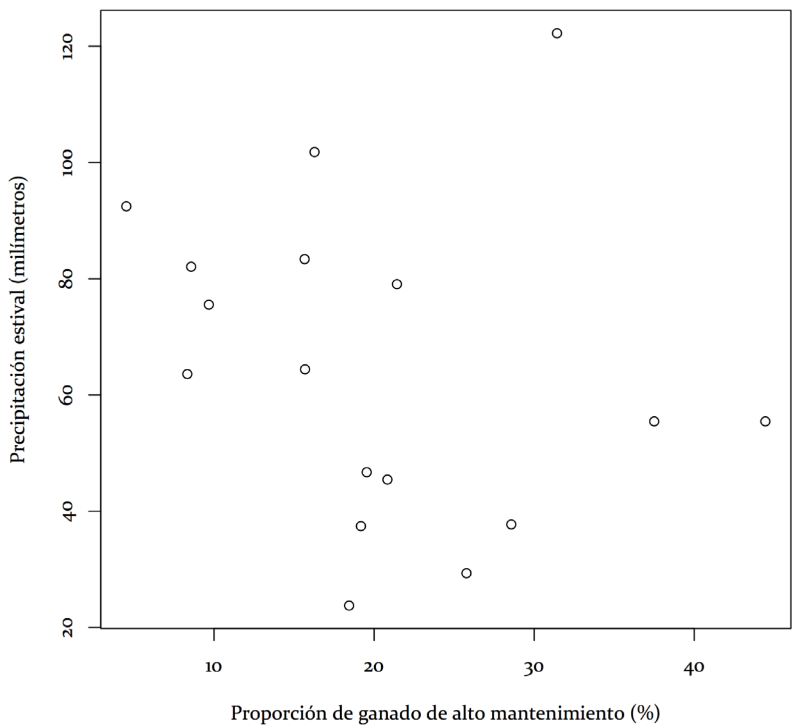

FIGURE 8. Average summer precipitation and the proportion of high-maintenance livestock

expected to go hungry through summer, surviving on crop residues and poor pasture until the autumn rains arrived, although this does not explain the negative correlation. Possibly fluvial water compensates for a lack of rainfall. Many of the sites with higher proportions of large animals have access to rivers and rich fluvial soils, in particular Comte de Trénor and L'Almoina in València city, Alter de Vintihuiteña and *Ilici* (soil data from the Instituto Geográfico Nacional, available through their WMS). Clearly there are many reasons to locate settlements near to rivers. But in this case, it may be that irrigation to assure pastures or the use of periodically-flooded zones allowed the maintenance of larger herds of cows and equids through the summer (Hodkinson, 1988: 47). An attractice alternative, however, considering the positive relationship between high-maintenance animals and higher annual rainfall, is that the Iberians were using fodder crops to effectively 'transfer' rainfall from the rest of the year and have it available during the dry summer. This possibility would accord with a more intensive, 'integrated' model of Iberian agriculture, at least in some sites, although this suggestion must remain a working hypothesis.

CONCLUSIONS

Excavation of Iberian settlements is beginning to provide not just a rich picture of the many activities of Iberian life but also some idea of regional differences. Pushing further on how these settlements 'worked' – the relative importance of different activities, the integration of different actors in each practice, the seasonal rhythms and population characteristics – will require that we test syntheses of the (growing number of) sites against hypotheses of how these settlements worked. Hopefully, this approach can resolve long-standing questions about the nature of Iberian communities and provide the basis for further investigation. This study is a somewhat tentative attempt to test strategies originally derived from ethnographic literature against a combination of climatic and zooarchaeological data. The indirect nature of the approach and the caveats around both sets of data mean that the results are suggestive at best, although the basic findings for annual rainfall and cold months give some reassurance over the method. Indeed, a pessimistic view might interpret them as supporting an Iberian agriculture less capable of overcoming environmental constraints. The seasonal division produced mixed results. The lack of correlation between spring rainfall and high-maintenance livestock is frustrating given it is a subject which seems crucial to unlocking the complexity of Iberian crop rotations. The negative correlation with summer rainfall, however, is a surprising finding that suggests water 'preservation' through fodder crops may have been a feature of Iberian life in communities which faced a seasonal deficit.

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