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Survey of demographic and phenotypic data of local pig breeds of TREASURE project

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SUMMARY

ADDITIONAL KEYWORDS

Autochthonous pigs.

Population data.

Herd data.

The paper reports the results of a survey on the demographic and phenotypic characterization of 20 European local pig breeds involved in the H2020 TREASURE project including information on: demographic parameters, main morphological features, reproductive information, additional information collected at herd-level (i.e. temperament, holding, mating practices), origins and development of the breeds. Almost all the breeds (18 out of 20) possess a herd book even if the starting year is highly variable (from 1980 to 2006). Number of breeding females ranged from 24 (Moravka) to over 200,000 heads (Ibérico). Male/female ratio varied greatly with the highest values for the Italian breeds probably due to the different policy of animal recording. Almost all the breeds undergo a conservation program whereas really few are interested by other conservation techniques and for less than five breeds data related to effective number and inbreeding coefficient are easily available. Average values for teat number, litter size and weaned piglets are 12, 8 and 6 respectively with a great potential for their improvement. The depicted scenario is highly diversified and the data collected represent the starting point for the achievement of a collective trademark under the umbrella of the TREASURE project.

PALABRAS CLAVE ADICIONALES

Cerdos autóctonos.

Datos poblacionales.

Datos del rebaño.

Encuesta de datos demográficos y fenotípicos de razas locales de cerdos del proyecto TREASURE

RESUMEN

Este trabajo presenta los resultados de una encuesta de datos demográficos y fenotípicos de 20 razas locales de cerdos en estudio en el proyecto H2020 TREASURE y incluí información de: parámetros demográficos, características morfológicas principales, parámetros reproductivos, informaciones adicionales a nivel de los efectivos (ex. Temperamento, instalaciones, prácticas de cubrición), orígenes y desarrollo de las razas. Casi todas las razas (18 de 20) tienen libro genealógico, aunque su fecha de inicio varía mucho (de 1980 a 2006). El número de hembras reproductoras varía de 24 (Moravka) a más de 200 mil cabezas (Ibérico). La relación macho/hembra varía mucho con los valores más altos verificados en las razas italianas muy probablemente debido a una política diferente relativamente al registro de animales. Casi todas las razas tienen programas de conservación, aunque pocas están interesadas en otras técnicas de conservación y sólo en menos que 5 razas los datos relativos a número de efectivos y de coeficiente de consanguinidad están fácilmente disponibles.

INFORMATION

Cronología del artículo.

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Los valores medios para números de pezones, tamaño de camada y lechones destetados son de 12, 8 y 6, respectivamente con un grande potencial para mejora. El escenario descrito es altamente diversificado y esta colecta de datos representa el punto de partida para una marca colectiva debajo del parasol del proyecto TREASURE.

INTRODUCTION

Local genetic resources represent an important reservoir of biodiversity in the animal sector. Sustainable use of these resources can be an important source of income for farmers taking advantage of the peculiar characteristics of their products. Over time local pig breeds underwent natural selection acquiring adaptive traits accumulating differences due to adaptation to specific environmental niches. Evaluation of pig genetic resources was usually made assessing genetic diversity (Ollivier et al. 2005), and genetic diversity of European pig was assessed by various Authors (Ollivier et al. 2005; San Cristobal et al. 2006). More recently a review on conservational issues for Mediterranean pig breeds highlighted that information on these breeds is highly variable both in terms of population data and breed performances (Bozzi and Croveti 2013). Knowledge about the morphological and productive characteristics of the breeds is essential to effectively manage the populations (Pietrolà et al. 2006). At this regard, European local pig breeds have a different level of knowledge of their characteristics both at demographic and phenotypic level. The aim of the survey is to provide an initial overview of these features for the breeds involved in the TREASURE project.

MATERIAL AND METHODS

Data for each breed (20) were collected during the 2016 involving 14 respondents participating in the TREASURE H2020 project. A questionnaire was drawn-up with the selected topics based on what suggested by FAO (2012) for phenotypic characterization of pigs, spanning a period of five years (2011-2015). Additionally, the questionnaire included some questions collecting information at herd-level (i.e. temperament, holding, mating practices), as well as information on origins and development of the breeds. The first section regarded the collection of general information of the breed as well as the available demographic parameters, the structure of the breed (i.e. number of males, females and replacements), the main morphological features, the reproductive information plus additional information collected at herd-level. A second section asked information on market characteristics and the presence and distribution of niche products. The third and final section regarded the specific characteristics of each breed and their management in relation to food and environment. Collected data were analysed through descriptive statistics (n, mean, standard deviation, minimum and maximum). In this article, historical data were used to understand the general trends of the breed involved.

Table I. Number of breeding females, average herd size per farm and male/female ratio (%) for the different breeds (average of the last three years 2013-2015) and starting year of the herd book. (Número de hembras reproductoras, tamaño del rebaño y proporción machos/hembras para las diferentes razas (promedio de los tres últimos años 2013-2015) y año inicial del libro genealógico).

| Breed | Breeding females (n) | Average herd size per farm (n) | M/F (%) | Starting year of the herd book |
|--------------------------------|----------------------|--------------------------------|---------|--------------------------------|
| Iberico | 284592 | 99.67 | 6.95 | 1987 |
| Alentejano | 5614 | 35.00 | 6.96 | 1992 |
| Bisaro | 4312 | 28.67 | 10.14 | 1995 |
| Crna slavonska | 3567 | 11.00 | 10.93 | 1996 |
| Nero Siciliano | 2762 | 69.52 | 70.08 | 2001 |
| Cinta Senese | 2024 | 82.16 | 28.31 | 1997 |
| Apulo Calabrese | 1843 | 75.16 | 68.46 | 2001 |
| Gascon | 1310 | 21.80 | 11.45 | 1980 |
| Mora Romagnola | 897 | 78.69 | 33.98 | 2001 |
| Negre Mallorquí | 889 | 19.00 | 6.94 | 1999 |
| Basque | 408 | 20.40 | 12.25 | 1980 |
| Mangulica | 345 | | 14.49 | |
| Casertana | 326 | 34.48 | 69.25 | 2001 |
| Krškopoljska | 311 | 4.35 | 17.04 | 1993 |
| Schwäbisch-Hällisches | 294 | 19.50 | 11.93 | |
| Sarda | 264 | 23.42 | 55.88 | 2006 |
| Turopoljska | 125 | | 23.47 | 1996 |
| Senojo tipo Lietuvos baltosios | 91 | | 18.98 | 2001 |
| Lietuvos vietines | 40 | | 26.67 | 2001 |
| Moravka | 24 | | 16.67 | |

RESULTS AND DISCUSSION

Table I reports the number of breeding females for the different breeds and it is evident that the census is highly variable. Apart from Iberian breed that resembles more to cosmopolitan breeds, the size of the breeds is rather limited with 12 out of 19 populations under 1,000 breeding females confirming the necessity of the control of genetic variability. Animals per herd above 50 is reported for Iberian and 4 Italian pig breeds whereas the other populations presented values below 35. Krškopoljska breed is placed at the bottom of the rank with only 4.35 animals per herd. Male/Female ratio expressed as percentage is quite high in the Italian breeds (> 28) whereas the breeds of the Iberian Peninsula are placed on the opposite side with values always lower than 10; these values probably reflecting the different policies of animal recording put in place in the different countries. Descriptive statistics of phenotypic and reproductive traits are reported in **Table II**. Measures of the adult animals are different between sexes showing an accentuated sexual dimorphism; also, the variation coefficients within measures are

Table II. Descriptive statistics of morphological and reproductive parameters. (Estadísticas descriptivas de los parámetros morfológicos y reproductivos).

| | Unit | Mean | Std. Dev. | Minimum | Maximum |
|--------------------------|------|-------|-----------|---------|---------|
| Male wither height | cm | 81.8 | 15.0 | 62 | 126 |
| Female wither height | cm | 76.0 | 8.7 | 62 | 89 |
| Male body length | cm | 121.8 | 26.8 | 84.1 | 190 |
| Female body length | cm | 117.8 | 22.5 | 84.6 | 170 |
| Male chest girth | cm | 136.1 | 19.3 | 110 | 170 |
| Female chest girth | cm | 128.7 | 17.1 | 100 | 150 |
| Calving interval | days | 198.9 | 84.4 | 154 | 462 |
| Age at first parity | mo. | 18.1 | 5.4 | 10 | 29.6 |
| Teat numbers | n | 12.3 | 2.0 | 8 | 16 |
| Birth weight | kg | 1.3 | 0.4 | 0.75 | 2.5 |
| Litter size | n | 7.8 | 1.6 | 4.6 | 11 |
| Number of weaned piglets | n | 6.3 | 1.4 | 3.6 | 9.7 |

high, indicating phenotypic variation among breeds. Reduced performance for reproductive data are evident especially for number of live and weaned piglets. Minimum values recorded are worrying, as well as the minimum number of teats. It seems that space for improvement exists both for management and genetics. If an average age at first calving of 18 months and an average calving interval of 200 days are acceptable for local pig resources, the maximum values recorded for these parameters are unsuitable for modern farming also when carried out with autochthonous genotypes. Recording activity started during the 80's (Table I) with the first two breeds (namely Basque and Gascon). Activity continued steadily until 2006 with a total of 18 out of 20 breeds controlled and only the Serbian populations do not possess a registration system. Nevertheless, important information that could be derived from the recording, such as inbreeding coefficient and effective number, are available only for few breeds (Figure 1). This lack can probably be ascribed more to a non-availability of information that at a real absence of the data considering that all the breeds possessing a registration system declared to have an active conservation programme (Figure 2). Apart from this, other germplasm conservation techniques are rarely

used in these populations; it is interesting to note that it is particularly reduced the conservation of biological samples both as tissues (semen, blood) and DNA. Regarding management of the breeds (Figure 3), despite the nature of the local breeds, most of them are kept confined all along the year or at least for a part of the year/day whereas only 6 breeds are kept unconfined throughout the year (half of them only for a part of the population). Basic heat and cold protections is largely but not fully diffused whereas controlled climate conditions, as expected, are present in few cases. Feeding regime is highly variable within and between breeds (Figure 4); no restriction is rarely used whereas the management of food restriction is variable during the year. Finally, as regard mating practices, the most diffused techniques are hand mating (9 cases) and uncontrolled non-seasonal natural mating (7 cases) with only one breed (Schwabisch-Hällisches) performing artificial insemination.

CONCLUSIONS

It appears a strongly diversified scenario for the different breeds involved in the project. Much data is still lacking for many breeds and additional information

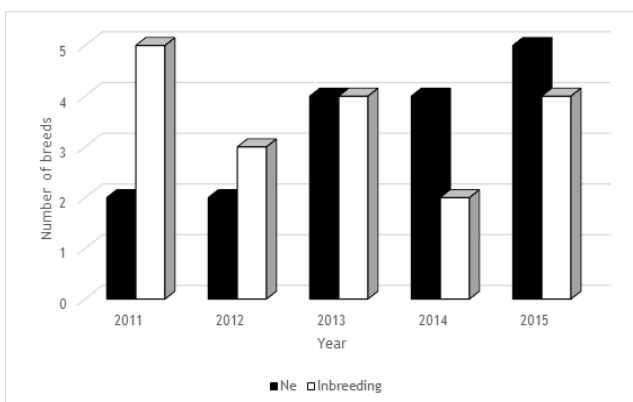


Figure 1. Number of breeds with available data for Ne and ΔF (Número de razas con datos disponibles para Ne y ΔF).

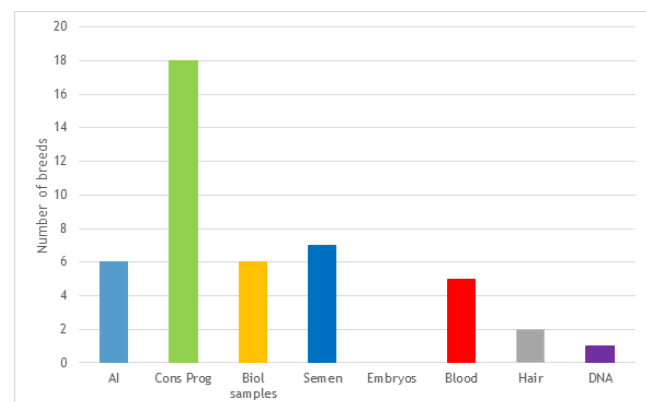


Figure 2. Number of breeds interested by conservation techniques (Número de razas interesadas por técnicas de conservación).

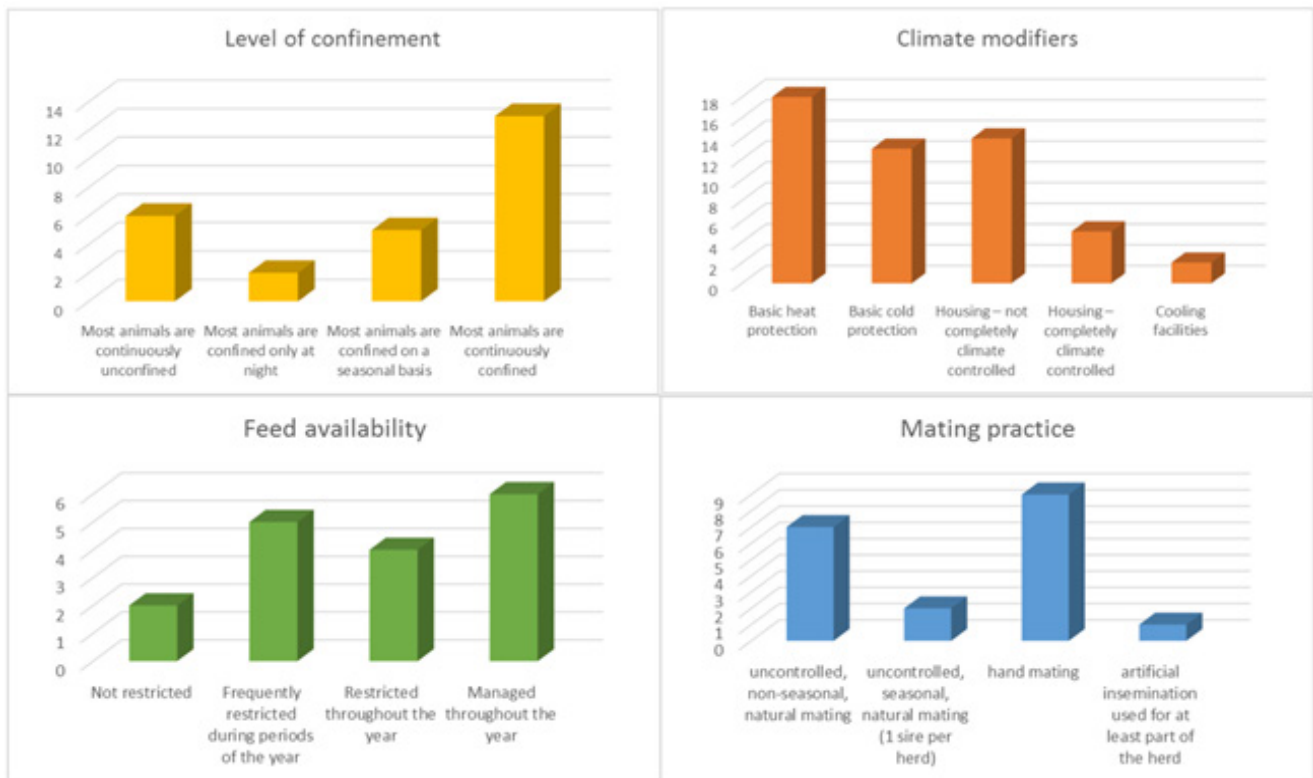


Figure 3. Management of the breeds (Gestión de las razas).

are required for a better management of the breeds. Gathering information is the first step of the long road that leads to the realization of a collective mark for TREASURE local pig breeds.

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