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## A PORK VALUE CHAIN IN PORTUGAL: THE CASE STUDY OF PORCO ALENTEJANO, MONTANHEIRA SYSTEM AND TRADITIONAL PRODUCTS

Maria João PARREIRA<sup>1\*</sup>, Fátima OLIVEIRA<sup>2</sup>, Pedro REIS<sup>1</sup>, Inocência  
COELHO<sup>1</sup>

<sup>1</sup>National Institute for Agricultural and Veterinary Research (INIAV I.P.), Oeiras, Portugal

<sup>2</sup>College of Agriculture, Polytechnic Institute of Coimbra (IPC, CERNAS), Coimbra,  
Portugal

\*Corresponding author: mjoaoparreira@gmail.com

### ABSTRACT

For the production of the *Porco Alentejano*, an autochthonous Portuguese porcine breed, the *Montanheira* system is a crucial process, corresponding to a period of an intensive pig's fattening in the *Montado*. It occurs between October and March, where the pigs freely consume the acorns. *Montado* is an agro-forestry-pastoral Portuguese system created by the human intervention, which occupies a large part of the territory, being a source of unique products, as the cork and the acorn. *Montado's* management is a complex process due to its susceptibility to disturbances of soil and *Quercus* trees, and a dynamic between the economic activities and the conservation of this system. The objective of this study is to estimate, along the value chain, the Gross Product of the acorn, the *Montanheira* pig value, and of the fresh meat and final processed products, protected designation of origin (PDO) products. From the secondary information about the *Montado* area, the *Porco Alentejano* herds, and with the information collected in the field works, we estimate and present the results. The pig is the most efficient animal in the acorn conversion, multiplying by ten the economic value of food animal resource. The transformation into high quality traditional PDO hams and shoulders increases about 50% the value of the *Porco Alentejano* reared in *Montanheira*. The joint between the *Montado* and the development of rural areas, where the studied animal rearing takes place, is a good example of the balance between the economy, the sustainability of natural resources and cultural heritage.

**Keywords:** *Porco Alentejano, Montado, Montanheira, PDO, Sustainability.*

### INTRODUCTION

In Portugal, the *Montado* is the most prominent agroforestry system, a system of high natural value and of great extension, with predominance in the south of the country. According to the European classification proposed by the European Environmental Agency, the *Montado* is a High Nature Value Farming System

(Pinto-Correia *et al.*, 2011). There are different typologies of *Montado* in an irregular continuum, where the type, density of trees and under-cover, vary without obvious limits, creating a unique landscape with a specific character (Lauw *et al.*, 2013). In addition to cork, an important product for the Portuguese economy, the *Montado* also supports ecological and socioeconomic opportunities, especially in less favoured areas. The production of the *Porco Alentejano* breed is one remarkable evidence of the potential associated with the *Montado*. In this work, we explore the valuation of the production-processing-marketing chain of products of unique quality and high economic value, such as hams (*presuntos*) and shoulders (*paletas*) from the Alentejo, Protected Designation of Origin (PDO) products. It is not possible to obtain quality features of traditional pork products from conventional intensive production systems, since they have intrinsic attributes recognized by quality schemes and represent one culinary heritage of specific regions (Candek-Potokar *et al.*, 2018). The creation of the *Montanheira* pig felt a sharp decline in the 1960s, due to health problems (African swine fever), but revived at the end of the last century and revealed great dynamism at the beginning of the 21<sup>st</sup> century. Its profitability is strongly dependent on the quality of the products obtained from the *Porco Alentejano*, fattened mainly with acorn, well expressed in the five PDO products (four hams and palettes and one for fresh meat) and twenty-three Protected Geographical Indication (PGI) sausages. The aim of this work is to contribute to the understanding of the value added dynamics along the *Alentejano* Pork (*Porco Alentejano*) value chain, pointing out key issues that may stimulate multi-stakeholder processes for problem solving and sustainable farming practices, key drivers for rural prosperity.

## MATERIALS AND METHODS

We follow the methodology of Coelho (2010), complementing with actual data. From the secondary information with official data about the *Montado* area, the *Porco Alentejano* herds, and, with the primary data from actors in the production and industry sectors, we made our estimations along the value chain. Overall, we estimate the value creation associated with the potential value (in euros) of the resource acorn, in the *Montanheira* fattening period, with the respective estimated potential number of pigs produced by each production cycle and its own potential value, and the value associated with the industrial transformation of the *Alentejano* Pork traditional products. For the calculation of the forest area with cork oaks and holm oaks by municipalities, the information available was used in field data referring to the years 1995 and 1998, since it was not possible to obtain more recent data in that area. The areas of *Montado* in the 185 municipalities of Portugal were calculated using the 4<sup>th</sup> national forest inventory (ICNF, 2019), as also for the *Montanheira* area, the delimited area of PDO products (meat, hams and palettes). It is necessary to consider that not all areas of Cork tree (*Quercus suber*) and Holm tree (*Quercus ilex* L. ou *Ballota*) surface are *Montado* areas. Thus, we had to apply coefficients

based on secondary information. The *Montado* surface (cork oak trees) represents about 70% of the total cork oak area in Portugal (Costa and Pereira, 2007). Regarding holm, the areas of holm oak forest represent 2% of this forest species (Onofre, 2007). For the calculation of the *Montado* area for each species, we applied a coefficient of 0.7 and 0.98, respectively, in the cork oak and holm oak areas. After determining the national areas of *Montado* with the two species of *Quercus*, we estimated the corresponding delimited area for the production of pigs and the transformation into DOP products (fresh meat, hams and palettes). We evaluated those *Montado* areas with the support of the national PDO product specification document and the IFN4 data (ICNF, 2019), correlating the specific areas. Then, we assess the number of potential pigs in each production cycle and the monetary value of the *Montado*, two key steps to quantify the potential acorn value. As some producers are the owners of the *Montado* and others just rent it, to determine the *Montado* value we consider the average price by hectare that the pig producers pay for the rent of the *Montado*, that is the *Montanha* rent (€) paid by each fattened pig. We estimate the Gross Product at basic price, the Gross Value Added (GVA) at the primary production level, i.e. at the *Alentejano* herd rearing in *Montanha*, and the GVA of the industrial part, i.e. concerning the final products obtained after processing such as PDO hams (*Presunto*), palettes (*Paleta*) products, and other sausages products, recognized for their high quality. The Gross Product and the GVA of the pig breeding, under the *Montanha* system were estimated based on the results of the survey carried out with 50 breeders, from the Association of South *Alentejano* Pig Breeders (ACPA - *Associação de Criadores de Porco Alentejano*) in the 2005/2006 campaign. Those survey results also allowed us to determine the animal head on *Montanha*. To apply this methodology we assume that in the last decade there have been no significant changes in the technical itinerary. Thus, considering the maintenance of technical intentions, it would only be necessary to determine the current prices. For this determination, we used the current quotations of animals and the Consumer price index in the intermediate goods of agricultural production. For the pigs prices at producer level, we apply the values presented in the Agricultural Market Information System, SIMA - *Sistema de Informação de Mercados Agrícolas* (GPP, 2019). To determine the price indices, we applied the indicators of the agroforestry complex, produced by the Office of Planning, Policies and General Administration (GPP, 2019). To calculate the Gross Product and the GVA industry, we used the technical coefficients provided by the meat processor *Alentejano* pork with PDO scheme quality certification located in the *Alentejo*, called Montaraz (Coelho, 2010).

## RESULTS AND DISCUSSION

The total forest area in Portugal with cork and holm oaks is 1,128,788 hectares (ha), 715,913 ha with cork oak and 412,875 with holm oak. Applying the coefficients collected in secondary sources, we obtain a total of a *Montado* area of 905,757 ha, 501,139 ha with cork oaks and 404,618 with holm oaks. Of the 185 forest counties in Portugal, 65 counties belong to the delimited regions of the *Porco Alentejano* value chain in Alentejo, concerning the production, transformation and distribution of the traditional PDO *Alentejano* pork products.

The potential of *Montado* areas delimited by the PDO *Alentejano* pig are for the holm and cork oak, 450,830 ha and 394,983 ha, respectively, in a potential total area of 845,813 ha. The area of holm and cork oak, correlated with the area of denomination of protected origin of the pig Alentejo products and fresh meat PDO, corresponds to 98% of the national area of holm oak and 90% of the national cork oak area. It is interesting to note that although the holm oak represents 37% of the national forest and 45% of the national *Montado* in the studied region (PDO *Alentejano* pork), its representativeness in relation to the national total of the *Montado* is higher than that of the *Montado* cork oak. In the holm oak *Montado*, 2.9 hectares are needed to feed a pig and in the Cork oak *Montado* this value is 4.8 hectares.


The calculated values, according to the obtained primary data, are in accordance with the values obtained in Passarinho *et al.* (2019) and Coelho (2010). Those hectares values by head were vital to estimate the potential number of finished pigs - 230,123 pigs. To estimate the potential value (in euros) of the resource acorn, we applied the *Montanha* rent (€) paid by each fattened pig, between 50 to 70 euros per head, which depends on the state of *Montado* (Freire, 2017). We considered the average value of 60 euros per head. Taking this value as a market reference value, the Potential Gross Product of the Acorn will be 13.8 million euros. In order to be able to estimate the value of certified *Porco Alentejano* traditional products, it is necessary to consider two different production processes. One, the breeding with the aim to produce meat for processed products, namely Ham (*Presunto*) and Pork Pallet (*Paleta*), both PDO products. The other, the breeding with the purpose to produce meat, for fresh consumption, also with PDO certification. The pig bred for the production of meat for processing into Ham and Pallet will make the process of fattening in a full range in *Montanha*. According to the data collected in the field, these pigs reach an average live weight of 170 kg. According to Grave (2015), the carcass yield is around 80%, that is, the pigs will present a carcass weight in average values of 135 kg. For the production of fresh meat, pigs do not make the complete fattening process in *Montanha* and reach average carcass weights of about 65 kg. For the appreciation of pork prices in *Alentejo*, we consulted and applied the prices of SIMA, between January 2017 and July 2019, for each typology of pig production. For the production of processed products (hams and pallets), the average price obtained was 4.00 Euros / kg. In the case of

pork for meat fresh consumption, the average price in the period referred to was 3.13 Euros/kg. Thus, for the estimated potential of 230,123 pigs, the Potential Gross Product of the *Alentejano* pork for the production of hams and pallets with PDO certification will be 124,266 million Euros.

To obtain the same potential associated to the animals for the production of PDO fresh meat, first, we obtain a coefficient of 0.10 pigs/ha destined for meat for fresh consumption, according to the ACPA surveys data. Applying the *Montado* area, we estimated the potential production of 84,581 pigs, for the production of fresh meat with PDO certification. Considering the price of meat per kilogram, we obtain the potential value of *Alentejano* pork for fresh meat production of 17,208 million euros. Summing up, the Potential Gross Product of the certified *Alentejano* pork considering the two types of production, i.e. animals for meat production for the production of processed products and animals for fresh production, is 141,474 million euros, corresponding the Gross Product of acorn (13.8 million euros) about 10% of that potential. To estimate the potential value of the Gross Added Value for *Alentejano* Pork with PDO certification, it is necessary to calculate an indicator between the Gross Added Value (GVA) and the Gross Production (GP). That is, that indicator helps to obtain the real weight of intermediate inputs in production, through the values presented by the producers. This relationship is obtained by applying the GVA value and the production value indicated in the survey mentioned above, carried out by ACPA. In order to update prices, the Implicit Price Index (IPI: Base 2011) for the production and intermediate inputs was applied (GPP, 2019). The weight of intermediate inputs will allow to obtain the Gross Added Value in relation to the Pork Gross Product Potential previously calculated, which was 141,474 million Euros. The Potential Gross Value Added of the *Alentejano* Pork with certification of origin will be 45.8% of 141,476 million Euros i.e. the *Potential GVA of Alentejano Pork* with PDO will be 64,795 million Euros. The processing of the *Alentejano* pigs allows obtaining a varied set of processed products, hams, pallet and other processed products, namely sausages. In the value chain of *Porco Alentejano*, we must not only consider the value of products processed with PDO certification, but also the value of other processed products with PGI certification of origin, such as sausages. The prices presented were those collected in Coelho's work (2010), updating through the Consumer price index (annual average) for food products and beverages, CPI: 109.9, (GPP, 2019) The total value of processed products obtained through the processing of 230,123 pigs raised in *Montanheira* was estimated in 252,376 million euros. About 73% of that total value corresponds to the production of Ham (*presunto*) and Palette (*paleta*) with PDO, 184,559 million euros. If we consider the potential value of the *Montanheira* pigs for Ham and Pallets, estimated in 124,266 million euros, with the total potential value of the industry, 252,376 million euros, we conclude the industrial transformation represents an increase, in relation to the value of the pig, of around 103%. If we consider just the potential industrial value for hams and palette (184,559 million euros), the transformation into high quality traditional PDO hams and shoulders increases about 50% the value of the *Porco*

*Alentejano* reared in *Montanheira*. These values are close to those previously obtained by Coelho (2010). It is important to highlight the values of the Gross Added Value associated with the production of the 230,123 pigs that it is 64,795 million Euros and the GVA industry of 128.11 million euros. They represent important values for the value chain of *Alentejano* Pork, summarized in the figure 1. Since the transformation phase is a great ally in the creation of the value added, it will be important to invest and improve the infrastructure and capacity of this industry. Portugal is still very dependent on Spain, as most of the *Montanheira* pigs, are sold to the neighboring country in the end of the fattening period. On the one hand, because it has no industrial capacity to transform the produced animals. On the other hand, because the production of this type of traditional products (hams and palettes) is very time-consuming and requires a lot of investment, one of the weaknesses of many entrepreneurs, with little financial capacity and without direct support. In addition, the acorn is a crucial resource and represents the beginning of this value chain, being an endogenous natural resource and vital for the valorization of these products, which are highly valued by the consumer. This resource currently faces great challenges related to the decline of the grove (phytosanitary problems), the need for more regeneration and thickening of the grove, associated with the soil's edaphoclimatic problems, low organic matter content, thin soils, frequency and severity of the drought periods. Yet, the holm oak values the pastures, given the greater nutritional value of the acorn in relation to the broadleaf, and more prominently when the production of the *Montanheira* pig is present on the farms. The *Alentejano* pig allows gross margins, without subsidies, higher than sheep, goats or cattle (Coelho and Reis, 2009), being fundamental for the conservation of the *Montado*, allowing the creation of an expressive added value for the economy of land owners, breeders and industry of processed pork products (Coelho, 2010).

Figure 1. Summary of the national potential related to the *Alentejano* Pork value chain

	 Potential Number of Pigs	 <i>Montanheira</i> Rent (€)	 Potential Gross Product	 Potential Gross Product
<i>Montado</i> PDO area (cork oak): 450,830 ha		60 € / fattened pig	Total: 141,474 M€	Total: 252,376 M€
<i>Montado</i> PDO area (holm oak): 394,983 ha				
4.8 ha / pig (cork oak)	93,922 pigs		Hams and Palettes: 124,266 M€	Hams and Palettes: 184,559 M€
2.9 ha / pig (holm oak)	136,201 pigs	Potential Gross Product	Potential Gross Value Added	Potential Gross Value Added
<b>Total PDO area: 845,813 ha</b>	<b>Total: 230,123 pigs</b>	<b>Total: 13,8 M€</b>	<b>64,795 M€</b>	<b>128,110 M€</b>

Source: Own elaboration

## CONCLUSION

In Portugal, there are few works in the field and context of this work, which may stimulate a better understanding of the involved socioeconomic challenges. The joint between the *Montado* and the development of rural

areas, where the studied animal rearing takes place, is a good example of the balance between the economy and the sustainability of natural resources, the gene pool maintenance, cultural heritage and identity preservation. The *Porco Alentejano* breed allows high yields for the economic agents in the value chain, but the respective profitability is very sensitive to the management of the *Montado* and the disposable income of the stakeholders, consumers included. From the consumer's perspective, it is crucial to ensure the guarantee of authenticity of the products, as the consumer is willing to pay a premium for products of exceptional quality, being trust an essential value and an attribute to assure. For example, a Lamego ham can be purchased at € 10 / kg, while a Barrancos DOP ham can reach a retail price of over € 100 / kg. We stress the need to achieve the true potential of the Geographical Indications (GIs), as PDO and PGI products. It will be not enough to implement GIs, since they may be registered but not activated in the market, as for instance at the production or marketing levels. Long-term vision is vital as well as a cohesive articulation between the several efforts developed by the involved stakeholders, both at the regional, national and international levels. We highlight the need to develop future works in the following key challenges issues: Innovation *versus* (vs.) Differentiation, Orientation for Sustainability, Cooperation vs. Partnership, Investment vs. Market Orientation, Outreach activities and Science Communication efforts, Risk Management throughout Processes, National and International Contracts vs. Legal Frameworks. It is urgent to deepen understanding and integrate those issues, to help to cover the whole value system in which stakeholders operate. To be able to design and apply strategic actions that lead to rural prosperity, it will be vital to articulate those challenges, effectively and more efficiently, to achieve the desired competitive position and sustainability.

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