Integrated evaluation of the sustainability of the Noir de Bigorre pork chain

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The effect of birth-weight on growth performance and meat quality in Iberian pigs

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The variability of birth-weight (BIW) in lean commercial swine breeds is known to cause heterogeneity in growth patterns and meat quality affecting profitability. This effect may be more severe in local breeds because of its reproductive characteristics. There is scarce information for traditional breeds, so we evaluated BIW effects on postnatal development during the growing-fattening phase (from 72 d-old to slaughter) and on carcass and meat quality at slaughter in Iberian crossbred pigs. Males and females (120 pigs each) classified by BIW into very low, low and average BIW (VLBIW, LBIW and ABIW) were distributed by sex and BIW. At 110 d-old, VLBIW and LBIW females showed a lower feed conversion rate (FCR, $P<0.05$) than the other groups. However, the VLBIW females had the highest FCR values from 111 d-old to the slaughter ($P<0.05$). At slaughter, VLBIW pigs showed less average daily gain weight (ADGW) and weight ($P<0.0001$) than heavier groups due to the lowest values of females. Age to slaughter was negatively correlated with BIW and decreased by approximately 28 days per kg of BIW increased ($P<0.0001$, for both). Regarding carcass quality analysis, VLBIW pigs showed shorter carcass than heavier groups ($P<0.05$). Meat quality showed that LBIW and ABIW males had the highest and lowest values of intramuscular fat values, respectively. The analysis of fatty acid (FA) profile of loin showed that sex modulated the neutral fraction (triglycerides) while BIW modulated the polar fraction (phospholipids). The polar fraction of LVBIW showed lower values of unsaturation index and polyunsaturated FA (PUFA; $P<0.05$, for both), but higher concentrations of monounsaturated and saturated FA (MUFA and SFA; $P<0.05$, for both). The neutral fraction of males showed higher desaturation indexes (MUFA/SFA and C18:1/C18:0 ratios) and MUFA content than females, but lower SFA content. Our results support the adverse effects of low BIW, modulated by sex-related effects, on postnatal growth traits and carcass and meat quality of Iberian pigs.

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The social expectation for more sustainable livestock farming systems is growing. However, multidisciplinary approaches to assess the sustainability of pig farming systems are not sufficiently addressed. Twenty-five farms of local pig breed's production in France (Noir de Bigorre chain – Gascon breed) were evaluated altogether in terms of environmental impacts (EN), economic sustainability (EC) and animal welfare (AW), using multiple factor analysis (MFA) and hierarchical clustering (HC). The first dimension of MFA (22.7% the total variance) was mainly associated to the EN (r=0.56) and AW (r=0.52), while the second (20.8% of the total variance) was linked to EC (r=0.41). The HC resulted in the identification of four groups: Group 1 comprised farrow-to-finish farms, with a farmer aged between 20-30 years-old, characterized by high EN, high dietary crude protein (CP) of fattening feeds and feed conversion ratio (FCR), low AW, and usually low EC. It could be described as 'sustainability unfavourable', with an overall inefficient management of the farm, when the high FCR could be a result of the high feed waste. Group 2, composed by 75% of feeder-to-finish farms, was characterized by high transferability, high land occupation (LO), and low AW. It could be described as 'AW unfavourable and Transferability favourable'; maybe due to the high LO, animals were raised with lower level of care. Group 3 comprised farrow-to-finish farms managed by a man, and characterized by high EC, high number of sows and low EN per ha. It could be described as 'EC and EN favourable', described by high farm size and good management practices. Group 4, characterized by high AW and low EN, could be described as 'AW and EN favourable', with more attention to AW and lower surface available to pig production. The use of an integrated evaluation highlights different profiles of farmers which are associated with various results in the different themes considered. Based on complementary themes, it provides a broader representation of the sustainability of pig farming systems than the use of one theme. Funded by European Union's H2020 RIA program (grant agreement no. 634476).