

Optimal contribution selection – tool for sustainable breeding in small pig populations

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Local breeds of pigs are often characterised by low genetic diversity due to small population sizes and bottlenecks in populations. However, conservation processes for local breeds aim to maintain genetic diversity of the population and breeding programmes rarely include genetic evaluation for economically important traits. Conservation processes in local pig breeds usually rely on public financial support. However, to achieve sustainable management of breeds, breeding associations should establish breeding objectives that allow for self-sustainable breeding. From this point of view, genetic evaluation is necessary to achieve the breeding objectives and define specific characteristics of the breed. Maintaining genetic diversity and genetic progress in economically important traits are conflicting breeding objectives, especially when genetic evaluation is based on an animal model that tends to increase inbreeding by selecting more related animals. Optimal contribution selection (OCS) is an adequate approach that may obtain a balance between conflicting breeding objectives. However, the practical application of OCS in pig populations is not widespread. Few studies have been published on this topic based on simulations. Pedigree and molecular information can be used to obtain information on breeding values and average relatedness in the population. Several practical problems arise in the selection of local pig breeds, such as incomplete pedigree and data information, low connectedness between herds, low motivation of breeders to participate in the breeding programme, or high genotyping costs. OCS uses algorithms to find the best solutions between genetic gain and increase of inbreeding in the population. Different types of

algorithms have been introduced and applied for the optimization process, such as evolutionary and deterministic algorithms or solvers for linear, quadratic, and rational programmes. The preliminary results of OCS implementation on litter data for local Black Slavonian pig showed that it is possible to balance the genetic gain in the number of piglets born alive and the loss of genetic diversity, despite challenges derived by the poor quality of pedigree data. To this end, it is important to assign selection candidate status only to animals with complete phenotype information and sufficient pedigree quality. This results in a smaller number of selection candidates but ensures the reliability of the estimated relationships in the population and thus a balance between genetic gain and the loss of genetic variability.

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