Use of *fuzzy* systems to support decision making in the choice of reproductive bulls

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This work presents a case study where a fuzzy rule-based system was constructed in order to offer support to the evaluation of reproductive bulls. The process was used to validate an new interactive methodology for constructing fuzzy rule-based systems, which aims to integrate the knowledge extracted from experts and induced from data. The approach consists of six steps. Feature selection, fuzzy partitions definition, expert rule base definition, genetic learning of rule base, rule bases conciliation and genetic optimization of fuzzy partitions. In regions where livestock is extensive, the use of bulls for natural mating is the primary means of breeding management. So the selection of the bulls through the reproductive fitness is one of the key success factors, and to the breeding soundness evaluation be effective, various sperm characteristics need to be measured and combined in order to identify the bull with better sperm quality. The set of data used were andrological reviews of 4664 animals, belonging to different properties. Were collected 22 variables, consisting of data on the animal, clinical examination and sperm characteristics. The bulls were classified as satisfactory, unsatisfactory or questionable. The classification rules were established by the experts as 14 rules for 6 variables selected as the most significant. The bulls were subjected to fuzzy modeling method, and the results compared with the results obtained in the analysis of bulls from field data. The Kappa statistic was estimated at 0.87, and is considered high which means that there is agreement between the result derived from the modeling and observed in the database. However the odds of correct classifications of bulls among the observed in the field, with modeled by fuzzy sets were 90.96 %, 68.75 % and 52.55 %, respectively, for bulls considered satisfactory, unsatisfactory and questionable. The categories of unsatisfactory and questionable bulls must be better analyzed, and the rules must be better modeled in relation to the attributes.

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