

Optimising ex situ genetic resource collections for Spanish livestock conservation

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The global existential challenges for in situ livestock breed conservation are well documented, and while ex situ collections may have some limitations they nevertheless offer the potential to reduce extinction risks, affording option value to society in terms of maintaining future breeding opportunities for productivity and heritage traits. However, how much should we be seeking to collect and conserve in ex situ collections and where? A collaborative aim might be to harmonise collections to avoid costly overlaps in collecting and storage of genetic materials, keeping the most diverse collection at least cost. At a national scale, this managerial challenge entails selecting genetic or reproductive materials from several hundred candidate breeds from various species differentiated by location, collection costs, budgetary constraints and further limitations in terms of storage capacity, and specialised labour availability. To address this specific objective we developed a mathematical model to optimise breed conservation choices, and to evaluate alternative scenarios for efficiently re-allocating genetic materials currently stored in different Spanish cryogenic banks, allowing for cross-country gene collection, cost and cryogenic capacity differentials. We show how alternative allocations could reduce overall conservation costs, and illustrate the diversity-cost relationship using notional supply curves. These provide guidance for both policy makers and conservation scientists seeking to define objectives for the design of efficient ex situ conservation. We acknowledge funding from the IMAGE (Innovative Management of Animal Genetic Resources) project funded