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Evolution of agroecology and associate indicators – looking for balance in farming systems

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Agroecology can be defined as an integrated approach that applies ecology and sociology to agricultural production systems. The agroecological transition has to be accounted through multi-disciplinary approaches, in fact in the last 20 years it has been studied coupling agricultural or animal sciences with social and economic approaches. Since 2014, the growth of case studies was exponential and produced several indicators to measure its applicability. This study aims to identify a set of indicators for monitoring agroecological transition in grassland-based farming systems with a systematic literature review approach, through Scopus search engine. Selection criteria are the following: (1) published since 2000; (2) concerning agroecology as a discipline. The database consists of 74 papers, 35 of them related to our objective. Through article's aim we sorted indicators, based on the principles from Dumont *et al.* and Wezel and Peeters. The results showed that for Dumont at least 20 articles cover 3 principles out of 5: 'decreasing input', 'decreasing pollution' and 'preserving biodiversity in agroecosystems'. Only 5 articles relate to 'increasing animal health' and 9 to 'enhancing diversity in animal production'. Based on Wezel and Peeters at least 21 articles reach out 4 principles out of 6: 'resources' and 'system management', 'biodiversity conservation' and 'knowledge, culture and socio-economics of farmers'. The principles of the authors overlap on biodiversity and resources management. Both indicators and principles suggest that most of the articles still relate to the agricultural sector more than livestock. Moreover, it appears that the two sectors are still taken into consideration in a separate way. The results of this research evidenced that the indicators can be used to highlight threats and opportunities of different contexts, to enhance the resilience of grassland-based farming systems, both from an economical and practical point of view, and favour the agroecological transition. The outputs of this study will be used to define a multicriteria approach for grassland-based case studies in Italy and France.

Small ruminants farming systems of Spain: challenges and attributes for their resilience

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Small ruminants farming systems (SRFS) is facing an important crisis (linked to high input prices, low meat and milk prices, social issues, etc) which ends up in a significant lack of generational turnover. The aim of this paper is to analyse the current challenges with different origin (economic, environmental, institutional or social) and temporality (short-term, ST; long-term, LT) faced by SRFS in Spain and to identify the attributes that promote or limit their resilience. To collect data, 24 depth interviews with farmers have been conducted in 4 case studies of SRFS in Spain: 8 in dairy goats in Andalucía, 6 in meat sheep in Aragón, 4 in dairy sheep in Extremadura and 6 in the Basque Country and Navarra. The interviews were analysed using deductive content analysis coding them according to the bibliographic compilation of challenges and attributes. Results have shown that the SRFS have common challenges referred to institutional ST bureaucracy and administrative workload. However, particularities between the systems have been observed: for example, Andalusian system highlights economic difficulties; Aragon and Extremadura systems highlight LT and ST institutional aspects; and Basque Country and Navarra system highlights ST social challenges. In terms of the attributes that strengthen their resilience, farmers differ according to the specificities of each system, but they agree that resilience is strengthened by aspects such as the autonomy, functional diversity and human capital, and it is weakened by the lack of economic capital. The knowledge about the attributes that promote the resilience will help to define the political measures to support the SRFS to deal with current and future challenges.