

HIGHLIGHT

Assessment of the buffering and adaptive mechanisms underlying the economic resilience of sheep-meat farms

The resilience of farms in facing technical and economic hazards is a key determinant of their sustainability. We study it using a mathematical simulation approach for five contrasted sheep-meat farms and identify two types of mechanisms that mitigate the effects of these hazards: buffer effects, for example when there are several independent lambing periods in the year, and adaptive mechanisms associated with reproductive management, for example to compensate for a punctual drop in ewe fertility. Modelling allows us to quantify these effects and to calculate the probability for each farm to experience two successive years with low income. We also show that technical hazards have a greater effect on income variability than economic hazards, and that the most resilient livestock systems, i.e. those with the lowest coefficient of variation in income, are those that combine a low level of inputs (feed in particular) with at least two lambing periods per year.

The multi-performance analysis of farms is usually based on average results, particularly with regard to the economic aspect. However, very large variations in income and the succession of difficult years at this level can be critical for farm activity.

We model the impact on farm income of hazards on technical (ewe fertility, prolificacy, lamb mortality) and economic (meat, feed and energy prices) variables, combining them.



Legend: Maximising grazing, limiting the inputs used (in particular purchased feed), and spreading lambing over several periods (hardy breed RAVA with this ability) strengthen the resilience of farms in terms of income levels and stability. Author: Marc Benoît

Hazards on technical variables have a greater effect on income variability than economic ones. From a technical hazard standpoint, hazards on lamb mortality have the greatest impact on income, followed by hazards on prolificacy and then on ewe fertility. Three of the five farms studied, due to several lambing periods in the year, have significant potential for compensation and adaptation of their production system. This is the case of the most intensive system ("accelerated" reproduction), which is thus the most intensive user of feed and is highly exposed to the variations in the price of meat. However, buffer effects limit income variability in this farm.

They arise from the fact that the price conjunctures of meat and concentrates are disconnected, but also from the existence of three distinct reproduction periods. These three periods also provide strong adaptive capacities through the possible transfer of empty ewes from one period to another. However, even if relatively stable, the income remains below the average of the five farms due to high production costs, which ultimately reduces economic resilience. The coefficient of variation defined as the ratio [standard deviation of income/average income] is then higher than on other farms.

Finally, the most resilient farms are those that combine low input use with at least two lambing periods per year. This work also allows us to quantify the probability of observing two successive years of decline in a given level of income.

The hazards studied were considered to be independent and a refinement could be considered to study their correlation (hazards on technical variables in particular). Other hazards may be introduced, such as climatic hazards for example, but the study of these is complex as they may entail multiple adaptations or compensations. Hazards affecting work or the stabilization of income provided by CAP subsidies also enter into the field of farm resilience. Diversification of production and marketing activities, which is frequent on farms developing agro-ecological or organic farming principles, also provides a major advantage in terms of stabilizing economic performance.

Learn more:

Benoit M., Joly F., Blanc F., Dumont B., Sabatier R., Mosnier C. (2020) Assessment of the buffering and adaptive mechanisms underlying the economic resilience of sheep-meat farms. *Agronomy for Sustainable Development* In press, 15p. doi: 10.1007/s13593-020-00638-z

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