



Work Package 6

Evaluating the sustainability of new approaches to livestock feeding

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Objectives

- ▶ To use life-cycle analysis to explore the environmental impact of the innovations proposed by Feed-a-Gene across a sample production scenarios for pigs and poultry.
- ▶ To use cost-benefit analysis to estimate the economic impacts of the same scenarios to evaluate their net economic benefits.
- ▶ To investigate the attitudes of farmers and consumers towards the adoption of new practices associated with the proposed innovations.
- ▶ To use data from the project to construct indicators to evaluate the sustainability of the new approaches to livestock feeding.



Life cycle analysis

- ▶ The production of feed for livestock is an important contributor to the negative impacts of farming systems on the environment, so changing animal feeding systems is one way in which these impacts can be reduced.
- ▶ Life cycle analysis was used to analyse the environmental impacts of two innovations in pig and poultry farms: (1) the use of European protein sources as substitutes for Brazilian soybean meal, and (2) precision feeding systems to reduce the impacts associated with feed production and nutrient excretions.
- ▶ The project estimated the impacts of innovative feeding systems on energy consumption, climate change, land utilisation, acidification and eutrophication.



Life cycle analysis – main results

- ▶ Innovative feedstuffs were found to have the potential to reduce climate change impact and reduce energy consumption (through lower transport costs).
- ▶ Soybean (which can crop twice a year), however, requires less land and less fertiliser.
- ▶ Impacts depend on how much soya is currently incorporated in feeds or can be replaced.
- ▶ For pigs, precision feeding can reduce nitrogen excretion which has benefits for acidification and eutrophication.
- ▶ For broilers, precision feeding was found to result in a range of small environmental improvements.
- ▶ Need to be cautious, as environmental benefits can be offset by a reduction in performance.



Cost-benefit analysis

- ▶ Used to examine the benefits of alternatives feeding systems for both pig and broiler production.
- ▶ This approach is commonly used to help farmers and policy makers make better informed decisions about the economic impact of adopting new technologies.
- ▶ Helps us to discover whether or not it is profitable for farmers to adopt innovative new production systems rather than continue using existing ones.
- ▶ Models were estimated using baseline data from the Farm Accountancy Data Network and based around sample farms from five EU countries (Germany, Spain, France, Poland and Denmark).



Cost-benefit analysis – main results

- ▶ The use of European rapeseed (with physical fractionation of meal) and green protein in pig feeds can improve farm net income (FNI) provided any associated feed cost increases are small.
- ▶ The adoption of *ad libitum* precision feeding strategies for pigs was also found to lead to a slight improvement in FNI, while the use of a restricted strategy was less effective.
- ▶ Improved traits in pigs suggested by WP5, were shown to improve FNI for both conventional and alternative diets.
- ▶ For broilers, FNI increased slightly with the use of innovatively prepared local soybean meals in feed, while feeds including green biomass had a negative impact on FNI.



Consumer and industry attitudes

- ▶ A total of 700 consumers from the UK and 1047 in Spain were interviewed in a survey to investigate consumer preferences for different production methods.
- ▶ Analysis included exploring consumers' willingness to pay for eggs with a lower environmental footprint.
- ▶ A small sample of farmers and their representatives were interviewed in the UK and Spain to explore their attitudes to the introduction of some of the innovations suggested by the project.
- ▶ This can help identify potential barriers to the uptake of new technologies and to identify approaches that may be used to improve their acceptability and uptake.



Consumer results

- ▶ Consumers were willing to pay more for eggs produced with lower emissions and water use.
- ▶ High levels of welfare and food safety were found to be more important to consumers than lower prices or increased environmental impacts.
- ▶ Improved feeding methods, use of specially bred animals with higher feed conversion rates and using feeds incorporating processed grass or clover were all found to be acceptable to most consumers.
- ▶ By contrast, most consumers felt that using feeds with a significant GMO content was unacceptable.



Industry results

- ▶ Respondents were enthusiastic about precision feeding's potential to improve feed conversion efficiency and profits.
- ▶ There were questions about the reliability of associated equipment, the costs of adopting new technologies and the likely payback time in terms of savings from reduced feed use.
- ▶ Farmers were generally positive about using animal feeds incorporating green protein, especially when grown on poorer land.
- ▶ Farmers had reservations about the potential for feeds based around European-grown oil seed rape and soya.
- ▶ In the UK this reflected difficulties in growing soya and concerns about the ban on neonicotinoid pesticides.
- ▶ Spanish experts cited climate as preventing increased cultivation of soya and oil seed rape in the Mediterranean.
- ▶ They did, however, see European soya as an attractive GM-free alternative to imported soya.



Identification of sustainability indicators

- ▶ A Delphi study questioned 137 industry stakeholders in five countries to discover their opinions about the usefulness of a variety of economic, environmental and social indicators for assessing the sustainability of livestock production.
- ▶ Stakeholders rated economic indicators as the most important, followed by environmental and social. The most important individual indicators of sustainability were found to relate to the financial viability of farming activities.



Sustainability appraisal

- ▶ Simple composite indices have been developed to allow a comparison of the sustainability implications of different production scenarios.
- ▶ Indicators show that the innovative feeding solutions proposed by Feed-a-Gene offer a number of opportunities for livestock producers to be more sustainable.
- ▶ The level of economic and environmental benefits depends largely on the extent to which Brazilian soybean meal can be replaced in the feed mix by local protein alternatives and the relative costs of those ingredients compared to soya.