Adapting feed, animals and feeding techniques for more efficient and sustainable monogastric livestock production systems

FEED-A-GENE

Deliverable D7.7

Six factsheets presenting the results of the six R&D WPs of the project to be used during the final stakeholder meeting

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<tr>
<td>Confidential, only for members of the consortium (including Commission Services) – CO</td>
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<td>Classified, as referred to in Commission Decision 2001/844/EC - Cl</td>
<td></td>
</tr>
</tbody>
</table>
Table of contents

1 Summary ........................................................................................................................................3
2 Factsheets ......................................................................................................................................3
  2.1 Introduction ...............................................................................................................................3
  2.2 Methodology ..............................................................................................................................3
2.3 Results .........................................................................................................................................3
  2.3.1 Delivery format .......................................................................................................................3
  2.3.2 Content ..................................................................................................................................3
  2.3.3 Dissemination ..........................................................................................................................7
3 Conclusions .....................................................................................................................................7
4 Partners involved in the work .........................................................................................................7
5 Annexes .........................................................................................................................................7
1 Summary

This deliverable includes six factsheets presenting the results of the six R&D work packages of the Feed-a-Gene project. For each WP, the content of corresponding factsheet was established by the WP leader with contributions of the researchers involved in the WP. The factsheets were reviewed by the project coordinator and their design and final layout created by AFZ, who also organized the printing and the distribution of the factsheets. The factsheets will be distributed in hardcopy to the participants of the final stakeholder meeting that will take place on 22-23 January in Rennes, France. They will also be provided online on the project’s website.

2 Factsheets

2.1 Introduction

The Feed-a-Gene project is coming to its term and, at the time of writing this deliverable, most of the work has been carried out. It is then possible to propose a recapitulative and prospective presentation of the work done during the 5 years of the project.

One factsheet was made for each WP. Each factsheet consists in an A4 recto-verso leaflet. The front page presents the general challenge that the WP was addressing, and the solutions found to solve this challenge. The back page presents in more detail, and with illustrations, the main novel technologies and concepts developed in the WP, followed by a take-home message.

2.2 Methodology

The layout and structure of the factsheets were defined by AFZ. Each WP leader was invited to send the corresponding texts and images. AFZ then edited the factsheets and sent them for review to the project coordinator, to the WP leaders and to other concerned researchers, who sent back their remarks. The operation was repeated until the factsheets were found satisfying by all the participants.

2.3 Results

2.3.1 Delivery format

The factsheets are provided in 2 formats.

- As a PDF file available on the project’s website under Results > Factsheets.
- As a printed A4 leaflet distributed during the final stakeholder meeting on 22-23 January 2020.

2.3.2 Content

The leaflets are presented in the following pages:
New animal traits for innovative livestock management strategies

European protein autonomy: more and better

The challenge

Feed-a-Gene has long been deficient in protein for its livestock production. Although expressed, feed (EM) is increasingly produced in Europe, its use for monogastric animals is hampered by its lower content and digestibility of protein and amino acids compared to soybean meal (SBM).

Soybean meal

- 11% of feed intake
- Protein levels in broilers and rabbits
- Protein levels in pigs and N- efficiency
- Faecal nutrient digestibility in pigs
- Better feed efficiency in pigs

New traits related to feed efficiency were identified, which can be used in future precision feeding concepts for production animals kept in groups and in future breeding strategies.

Recommendations & benefits

- The novel feeding strategies developed by Feed-a-Gene will ensure a higher supply of European protein, as they make possible the production of optimally processed protein concentrates obtained from European-grown soybeans and rapeseed. Biotechnologies can be used to further improve the nutritional value of these proteins.
- The developed NIRS methodologies enable the real-time evaluation of key nutritional parameters of economic importance.

New traits related to performance and feed efficiency

- These traits will be available for precision feeding and breeding programmes.

Novel technologies & concepts

Several technologies and methodologies have been developed in the Feed-a-Gene project for the production and evaluation of novel protein sources.

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- The developed NIRS methodologies enable the real-time evaluation of key nutritional parameters of economic importance.
The Feed-a-Gene project has developed several novel technologies and concepts for precision feeding systems in different situations in pig and poultry farms.

**Decision support system**

- The decision support system (DSS) developed by the Feed-a-Gene project integrates various data sources, including growth performance, feed intake, and environmental conditions. This enables farmers to make informed decisions based on real-time data.

**Precision feeders**

- These feeders are designed to meet individual animal needs by precisely controlling the amount of feed given. They are especially useful in intensive systems where precise nutrition is crucial.

**Control module**

- The control module integrates various sensors and actuators to monitor and control the feeding process. It can be used in both traditional and automatic feeding systems.

**Communication language**

- A universal language for communication is essential for ensuring that different systems can communicate effectively. This language should be standardized to simplify integration and ensure compatibility.

**Recommendations & benefits**

- Precision feeding systems improve the efficiency of nutrient utilization, reducing waste and improving productivity.
- They help in maintaining health and welfare, reducing stress, and improving animal performance.
- By providing optimal feed supply, these systems can enhance the overall profitability of the farm.

Feed-a-Gene is a demonstration tool with a modular structure and interactive interfaces for a better understanding of the response of the animal to different conditions, including feed use mechanisms.
Feed-a-Gene – H2020 n°633531

New selection strategies for better feed use

Monogastric animals are usually selected in commercial units using records from nuclear farms, whereas commercial farms data crossbreeds. Nuclear farms provide better sanitary and nutritional conditions than production farms so that animals can express their best performance. Also, crossbreeds have different gene combinations compared to crossbreeds. As a result, productivity in commercial farms always deviate from the standards obtained in nuclear farms.

Directly improving feed efficiency of crossbreeds through genetic selection of crosses is a promising goal, but feed efficiency is challenging to measure in production farms due to the specific and often costly resources necessary to record it. This makes it difficult to select for crossbreeds that consume feed and have a lower environmental impact.

The Feed-a-Gene project tested approaches that could be used to improve the accuracy of selecting feed efficiency for production farms:

- Individual measurements of feed intake in groups of poultry and rabbits through automated devices or video cameras.
- Individual measurements of body samples (e.g., feces, blood, saliva, hair).
- New statistical models based on existing data to capture time dynamics, dynamics of groups, and trait heterogeneity.

After testing more than ten types of measurement, five were found to be promising to further improve feed efficiency by genetic selection in different production environments.

Recommendations & benefits

In each of the three livestock species targeted by Feed-a-Gene, at least one promising solution (additive feeders in rabbits, and poultry: group records in pigs) was proposed, either to increase genetic gain or to reduce phenotyping costs.

- Digestibility, microbiota and biomarkers are promising for genetic selection and still require further investigation and validation before they can be implemented in farms.

Positive effects on sustainability

Feed-a-Gene provides encouraging results for livestock producers seeking to reduce the environmental footprint and at the same time improve their profitability. Many consumers and farmers are supportive of the innovations proposed by the project.

Environmental impacts

New feeds have the greatest environmental benefits when:
- They replace traditional practices, resulting in a reduction in climate change impacts or leading to land use transfer and land use product feed, feed.
- They are more cost-effective across different climate change scenarios, reducing the need for further research and development.

Economic impacts

Feed-a-Gene provides ongoing support for the development of new additives, which can be included in the feed at a lower cost.

Social impacts

Sustainability appraisal

These new approaches and combinations of economic, environmental, and social impacts are promising for future feed systems.

Recommendations & benefits

The feeding solutions proposed in Feed-a-Gene offer a number of important opportunities for livestock producers to become more sustainable.

- Replacing traditional soybean meal in the diet with locally-produced proteins, such as expressed or fermented plant proteins, can reduce energy costs and impacts on climate change, though this will result in a transfer of land use and in more arable land used to produce animal feed.
- Precision feeding is another route to more sustainable livestock production. The adoption of feeding systems that allow pigs to eat when they choose reduces key environmental impacts and increases profitability compared to conventional alternative feeding systems.
2.3.3 Dissemination

At the beginning of 2020, the factsheets will be uploaded on the website and information will be sent about their availability to the stakeholders by different channels:

- by email for those who have registered on the stakeholder platform
- on social networks, including Twitter, LinkedIn and Facebook

On 22 January, copies of each factsheet (200 copies per factsheet) will be brought to the venue of the Final stakeholder meeting and a copy of each factsheet will be included in the folder given to each participant.

3 Conclusions

The factsheets are a dissemination tool meant to inform stakeholders of the results of the Feed-a-Gene project, with a practical focus on the expected benefits of each novel technology and concept developed during the project.

4 Partners involved in the work

All partners contributed this deliverable.

5 Annexes

- 6 factsheets