Organic Knowledge Network on Monogastric Animal Feed

OK-Net EcoFeed

Fact sheets

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Document Versions

Version	Date	Contributor	Summary of Changes
0.1	14.09.2020	Andreas Basler	First draft
0.2	22.09.2020	Ambra De Simone	Revision
0.3	24.09.2020	Bram Moeskops	Revision
0.4	25.09.2020	Andreas Basler	Final Version
1.0	30.09.2020	Bram Moeskops	Approved final version

Executive summary

This deliverable is part of the Horizon 2020 project – OK-Net EcoFeed. The overall aim of OK-Net EcoFeed is to help farmers, breeders and the organic feed processing industry in achieving the goal of 100% use of organic and regional feed for monogastrics, in particular pigs, broilers, laying hens and parents of broilers and laying hens. The aim of "Work package 4 (WP4)- Evaluation of existing tools and development of new tools" is to collect and prepare end-user materials and develop new tools adapted to the needs of farmers, feed processors and breeders and helping to solve the challenge of organic and regional feed for monogastrics. The specific objectives of WP4 are to collect, evaluate and describe existing tools and end-user material, translate and adapt most promising tools, create fact sheets and videos and develop ration-planning tools for pigs, broilers and laying hens. This deliverable presents the work done in task 4.3 "Creation of fact sheets and videos" by the Research Institute of Organic Agriculture (FiBL). The fact sheets provide a wide range of topics from feeding strategies for layers, broilers and pigs, to processing feed, using byproducts as feed, increasing digestability of feed and using alternative sources of protein.

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I. Introduction

The Research Institute of Organic Agriculture (FiBL) was tasked to publish 30 fact sheets (also referred to as "Practice abstracts"[1]) created by the partners and Innovation groups (IGs) of the OK-Net EcoFeed project until the end of Month 33 (September 2020). The fact sheets collect and summarise practical and technical recommendations for practitioners in easy-to-understand language based on the EIP common format for practice abstracts. The list of the 30 fact sheets and their publication details can be found in Annex I. All fact sheets will be made available on Organic Farm Knowledge (https://organic-farmknowledge.org/), which is

[1] On Organic Farm Knowledge, the fact sheets are referred to as practice abstract. For the sake of clarity, the term fact sheet is used in this deliverable.

the knowledge platform that was created by OK-Net Arable and is being developed further by OK-Net Eco-Feed. At the time of submission of this deliverable, the 30 fact sheets are available on Organic Eprints (https://orgprints.org/), the database behind Organic Farm Knowledge.

Themes

The main themes that are dealt with in the 30 fact sheets are

- Pigs (11 fact sheets)
- Broilers (4 fact sheets)
- Layers (6 fact sheets)
- Feeding and ration planning (15 fact sheets)
- Processing and handling of harvested feed (13 fact sheets).

The statistics above make double counting as some factsheets covered more than one theme.

II. Process

The fact sheets were written by project partners, using a template that had been created by FiBL specifically for the fact sheets. It was based on the MS Word template[2] used in the Horizon 2020 project OK-Net Arable, where 43 practice abstracts related to arable crops were produced (Micheloni et al. 2018).

Once a fact sheet was submitted by a partner, FiBL did a first quality check and then sent it to an expert (from the OK-Net Ecofeed partnership), who then reviewed it. Some fact sheets were reviewed by two experts. Once the review was done, the feedback was communicated to the author(s), who then implememted the reviewers' comments and adapted the fact sheets accordingly. In some cases, the reviewers were consulted a second time.

Once the review was done, a language check was carried out and the layout was finalized.

The following fact sheets are available on Organic Eprints:

1. Rotating pasture for pregnant sows	https://orgprints.org/35449/
2. Foraging of pigs in outdoor areas	https://orgprints.org/37100/
3. Silage feeding for laying hens	https://orgprints.org/35470/
4. Guide for assessing the protein quality in soya feed products	https://orgprints.org/35520/
5. Foraging of broilers in outdoor areas	https://orgprints.org/35469/
6. Maize germ cake	https://orgprints.org/37794/
7. Dry Forages: Process and techniques	https://orgprints.org/37881/
8. Feeding strategies for broiler chicken	https://orgprints.org/37940/
9. Green protein from locally grown crops	https://orgprints.org/37034/
10. Phase feeding for growing and finishing pigs	https://orgprints.org/35451/
11. Starfish as feedstuff	https://orgprints.org/37559/
12. Protein requirements for piglets	https://orgprints.org/38395/
13. Relevance of roughage feeding to pigs	https://orgprints.org/36930/
14. Blue mussels as feedstuff	https://orgprints.org/37800/

[2] Currently, FiBL is experimenting with the uploading of practice abstracts to Organic Farm Knowledge in HTML format, which should ease the automatic translation of the material.

15. Seaweed as feed supplement	https://orgprints.org/37244/
16. Single-phase feeding and compensatory growth in growing and finishing pigs	https://orgprints.org/37512/
17. Using raw soya beans with reduced content of trypsin inhibitors in organic pig fattening	https://orgprints.org/38419/
18. Recommendations for using soy-based feedstuffs for poultry production	https://orgprints.org/37896/
19. Recommendations for using soya-based feedstuffs in pig husbandry	https://orgprints.org/37897/
20. Sunflower oil cake	https://orgprints.org/37801/
21. Guide for farms to plan small scale soya bean processing equipment	https://orgprints.org/38314/
22. Okara: Including a soya by-product into the poultry diet	https://orgprints.org/37898/
23. Feeding grass silage to fattening pigs	https://orgprints.org/36454/
24. Utilisation of waste heat from biogas plants for drying fine-grained legumes	https://orgprints.org/37511/
25. Acorns for fattening free-range pigs	https://orgprints.org/37476/
26. Brewer's yeast for organic pigs	https://orgprints.org/38116/
27. Whey for fattening organic pigs	https://orgprints.org/38117/
28. Focus on the amino acid content of energy feedstuff components	https://orgprints.org/38082/
29. Feeding insects for organic layers – video abstract	https://orgprints.org/38429/
30. Free choice feeding - an alternative feeding method for laying hens	https://orgprints.org/38443/

Of the 30 fact sheets that were published:

- 3 were contributed by AIAB
- 7 were contributed by Aarhus University
- 3 were contributed by Bioland
- 4 were contributed by Donausoja
- 3 were contributed by Ecovalia
- 3 were contributed by FiBL
- 1 was contributed by ITAB
- 1 was contributed by Naturland
- 3 were contributed by SLU
- 2 were contributed by the Soil Association

All fact sheets (practice abstracts) will be submitted to EIP Agri in the common format in the course of autumn 2020. Furthermore, they are all disseminated via various channels (see following chapter).

III. Dissemination of the fact sheets

Once finalized, the fact sheets are uploaded (via the online archive Organic Eprints) unto the Organic Farm Knowledge platform (https://organic-farmknowledge.org).

A news item is created for each tool as well as Facebook posts and Tweets that then are linked to the tool entry to facilitate discussion.

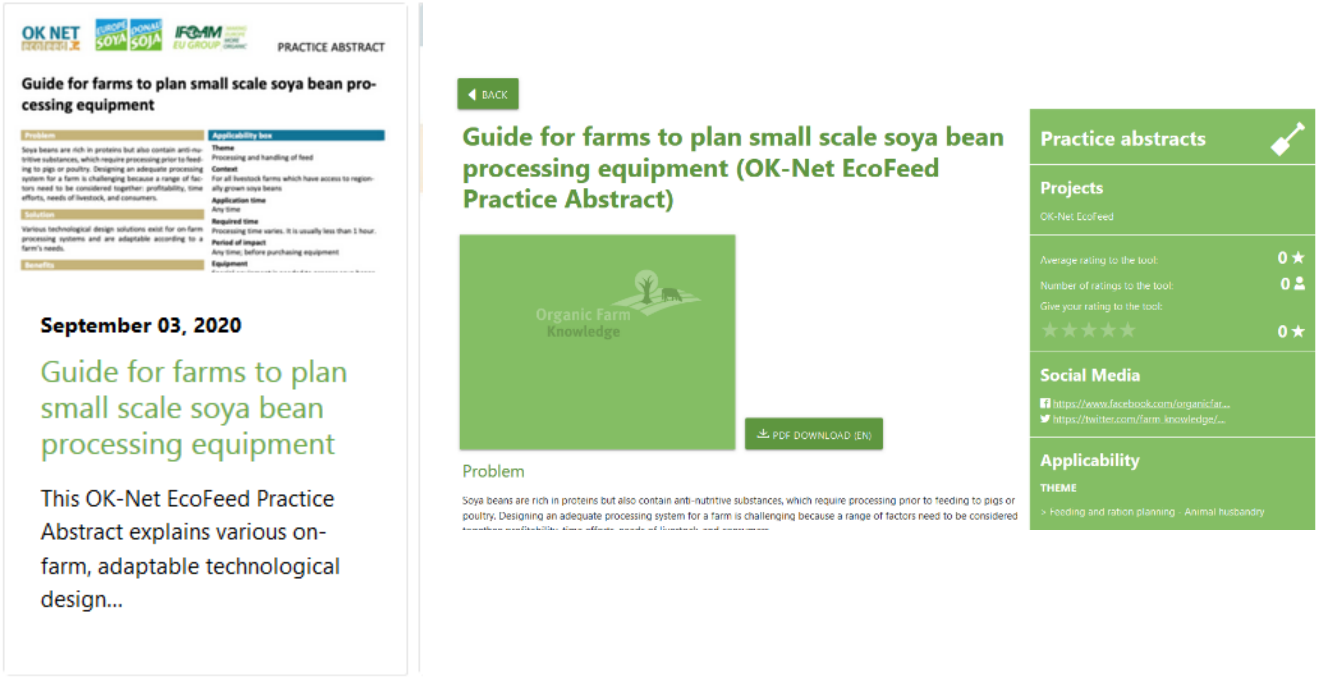


Figure 1: Example of a news item and tool view

News items and social media posts are shared with the project partners to facilitate the dissemination among their networks and social media.

Recently, a newsletter was created for Organic Farm Knowledge, which also features the fact sheets (https://organic-farmknowledge.org/news-events/newsletter).

IV. Translations

Each fact sheet has an entry in the toolbox of Organic Farm Knowledge (e.g. https://organic-farmknowledge.org/tool/38117). This entry contains a summary of the fact sheet in English, which can be translated using the platform's automatic translation facility.

Five fact sheets have been translated "manually" by Ecovalia, the Spanish OK-Net Ecofeed partner. Nine have been translated by the French partner ITAB. FiBL will translate its own as well as some further fact sheets into French and German. Aarhus University is working on translations into Danish.

V. Conclusions

In the 30 fact sheets that were compiled in the framework of OK-Net EcoFeed, existing knowledge in the field of feeding (organic) monogastrics was made accessible to a wider audience, using the Organic Farm Knowledge platform, project and partners' social media accounts as the key communication channels.

With the production of these fact sheets, a major step towards reaching the OK-Net EcoFeed aims of

a) helping organic pig and poultry farmers in achieving the goal of 100% use of organic and regional feed and

b) exchanging and co-creating knowledge among farmers, business actors, researchers and advisors was achieved.

However, to disseminate the knowledge wider, local dissemination is needed.

This means that translations of the fact sheets (and further tools compiled in the framework of OK-Net Eco-Feed) are important. While "manual" translation is the most desirable way forward, it is not feasible in all cases. Therefore, it would be good to expand the automatic translation, applying it to the fact sheets as a whole and not only their summaries. Technical solutions are needed to achieve this.

VI. Reference

Micheloni, Cristina; Bortolussi, Stefano; Moeskops, Bram; Conder, Malgorzarta, Padel, Susanne and Willer, Helga (2018): Collection of end-user material. OK-Net Arable Deliverable Report 3.3. AIAB, IFOAM EU, https://orgprints.org/36333/

VII. Annex I

VII.1 List of 30 fact sheets

Table 1: The 30 fact sheets[3]

PA number	Title and link	Theme	Issuing organisation	Author(s)	Published on
PA001	Rotating pasture for pregnant sows https://orgprints.org/35449/	Pigs; Feeding and ration planning	Institut de l'Agriculture et de l'Alimentation Biologiques ITAB	Roinsard, Antoine	09 September 2019
PA003	Foraging of pigs in outdoor areas https://orgprints.org/37100/	Pigs; Feeding and ration planning	Aarhus University	Kongsted, Anne Grete	22 January 2020
PA004	Silage feeding for laying hens https://orgprints.org/35470/	Layers; Feeding and ration planning	Aarhus University	Steenfeldt, Sanna	12 November 2019
PA005	Guide for assessing the protein quality in soya feed products https://orgprints.org/35520/	Processing and handling of harvested feed	Donau Soja	Rittler, Leopold	25 September 2020

[3] This list only displays the 30 fact sheets that are part of the deliverable. The count is higher (PA038), as seven more fact sheets are estimtated to be produced.

PA number	Title and link	Theme	Issuing organisation	Author(s)	Published on
PA006	Foraging of broilers in outdoor areas https://orgprints.org/35469/	Broilers; Feeding and ration planning	Aarhus University	Steenfeldt, Sanna	16 December 2019
PA008	Maize germ cake https://orgprints.org/37794/	Processing and handling of harvested feed	Soil Association	Alford, Jerry	08 April 2020
PA009	Dry Forages: Process and techniques https://orgprints.org/37881/	Processing and handling of harvested feed	Associazione Italiana per l'Agricoltura Biologica AIAB	Papi, Eugenio	22 April 2020
PA011	Feeding strategies for broiler chicken https://orgprints.org/37940/	Broilers; Feeding and ration planning	Soil Association	Alford, Jerry	30 April 2020
PA013	Green protein from locally grown crops https://orgprints.org/37034/	Layers; Feeding and ration planning; Processing and handling of harvested feed	Aarhus University	Steenfeldt, Sanna; Ambye-Jensen, Morten; Lübeck, Mette	13 January 2020
PA015	Phase feeding for growing and finishing pigs https://orgprints.org/35451/	Pigs; Feeding and ration planning	Swedish University of Agricultural Sciences (SLU);	Presto Akerfeldt, Magdalena	29 May 2020
PA016	Starfish as feedstuff https://orgprints.org/37559/	Processing and handling of harvested feed	Aarhus University	van der Heide, Marleen Elise; Værum Nørgaard, Jan	17 March 2020
PA018	Protein requirements for piglets https://orgprints.org/38395/	Pigs; Feeding and ration planning	Swedish University of Agricultural Sciences (SLU); Research Institute of Organic Agriculture (FiBL); Institut de l'Agriculture et de l'Alimentation Biologiques ITAB	Akerfeldt, Magdalena; Früh Barbara, Roinsard, Antoine	25 September 2020
PA021	Relevance of roughage feeding to pigs https://orgprints.org/36930/	Pigs; Feeding and ration planning	Research Institute of Organic Agriculture (FiBL)	Früh, Barbara	16 December 2019

PA number	Title and link	Theme	Issuing organisation	Author(s)	Published on
PA022	Blue mussels as feedstuff https://orgprints.org/37800	Processing and handling of harvested feed	Aarhus University	van der Heide, Marleen Elise; Værum Nørgaard, Jan	26 March 2020
PA023	Seaweed as feed supplement https://orgprints.org/37244/	Processing and handling of harvested feed	Aarhus University	van der Heide, Marleen Elise; Værum Nørgaard, Jan	13 February 2020
PA024	Single-phase feeding and compensatory growth in growing and finishing pigs https://orgprints.org/37512/	Pigs; Feeding and ration planning	Swedish University of Agricultural Sciences (SLU)	Akerfeldt, Magdalena	09 March 2020
PA025	Using raw soya beans with reduced content of trypsin inhibitors in organic pig fattening https://orgprints.org/38419/	Processing and handling of harvested feed	Donau Soja	Rittler, Leo	25 September 2020
PA026	Recommendations for using soy-based feedstuffs for poultry production https://orgprints.org/37896/	Layers; Broilers; Processing and handling of harvested feed	Bioland Beratung GmbH	Lindner, Christopher; Schmelzer, Elias	29 May 2020
PA027	Recommendations for using soya-based feedstuffs in pig husbandry https://orgprints.org/37897/	Pigs; Feeding and ration planning	Donau Soja	Rittler, Leo	30 April 2020
PA028	Sunflower oil cake https://orgprints.org/37801/	Processing and handling of harvested feed	Associazione Italiana per l'Agricoltura Biologica AIAB	Proietti, Lavinia	13 May 2020
PA029	Guide for farms to plan small scale soya bean processing equipment https://orgprints.org/38314/	Processing and handling of harvested feed	Donau Soja	Rittler, Leopold	02 September 2020
PA030	Okara: Including a soya by-product into the poultry diet	Processing and handling of harvested feed	Associazione Italiana per l'Agricoltura Biologica AIAB	Eugenio Papi	13 May 2020

PA number	Title and link	Theme	Issuing organisation	Author(s)	Published on
	https://orgprints.org/37898/				
PA031	Feeding grass silage to fattening pigs https://orgprints.org/36454/	Pigs	Research Institute of Organic Agriculture (FiBL)	Holinger, Mirjam; Scheibler, Samuel; Früh, Barbara	16 September 2019
PA032	Utilisation of waste heat from biogas plants for drying fine-grained legumes https://orgprints.org/37511/	Processing and handling of harvested feed	Bioland Beratung GmbH	Lindner, Christopher; Schmelzer, Elias; Vogt-Kaute, Werner	09 March 2020
PA033	Acorns for fattening free-range pigs https://orgprints.org/37476/	Pigs; Feeding and ration planning	Ecovalia - Asociación Valor Ecológico, Universidad de Córdoba	Rodríguez-Estévez, Vicente; Díaz-Gaona, Cipriano; Sanz-Fernández, Santos; Reyes-Palomo, Carolina; Sánchez-Rodríguez, Manuel	05 March 2020
PA034	Brewer's yeast for organic pigs https://orgprints.org/38116/	Pigs	Ecovalia - Asociación Valor Ecológico, Universidad de Córdoba	Rodríguez-Estévez, Vicente	05 June 2020
PA035	Whey for fattening organic pigs https://orgprints.org/38117/	Pigs	Ecovalia - Asociación Valor Ecológico, Universidad de Córdoba	Reyes-Palomo, Carolina; Sanz-Fernández, Santos; Díaz-Gaona, Cipriano; Sánchez-Rodríguez, Manuel; Rodríguez-Estévez, Vicente	05 June 2020
PA036	Focus on the amino acid content of energy feedstuff components https://orgprints.org/38082/	Layers; Broilers; Feeding and ration planning	Öko-Beratungsgesellschaft mbH, Bioland Beratung GmbH	Vogt-Kaute, Werner und Schmelzer, Elias	29 May 2020

PA number	Title and link	Theme	Issuing organisation	Author(s)	Published on
PA037	Feeding insects for organic layers – video abstract https://orgprints.org/38429/	Layers; Feeding and ration planning	Research Institute of Organic Agriculture (FiBL)	Früh, Barbara	25 September 2020
PA038	Free choice feeding - an alternative feeding meth-od for laying hens https://orgprints.org/38443/	Layers; Feeding and ration planning	Naturland – Verband für ökologischen Landbau e. V.	Olivia Müsseler, Werner Vogt-Kaute	28 September 2020

VII.2 The fact sheets

P001 Rotating pasture for pregnant sows

PRACTICE ABSTRACT

Rotating pasture for pregnant sows

Problem

Feed is the biggest cost in pig farming, especially in free-range systems. In these systems, feed consumption is higher due to higher activity and higher thermal regulation needs. Outdoor sows are usually housed in huts on grass leys.

Solution

During periods of high grass growth, it is possible to reduce the amount of feed and protein content given to sows in order to get the most out of grazing. The concentrated feed can be limited to 80 % of the recommended amount for at least 3 months. At the same time, this "pasture feed" can be lower in protein. Note: from 3 weeks before farrowing, sows need a complete diet.

Benefits

With this practice, feed and production costs can be reduced by 16 % due to lower quantities of concentrate feed and lower costs of "pasture feed" per ton.

Applicability box

Theme

Pigs, feeding and ration planning

Geographical coverage

More efficient in areas of high grassland productivity

Application time

Pasturing season

Required time

10 minutes per week for 50 sows for fence management (not including setting up the fences)

Period of impact

Pasturing season

Equipment

Movable fences to contain/move sows to desired areas; pig feeders

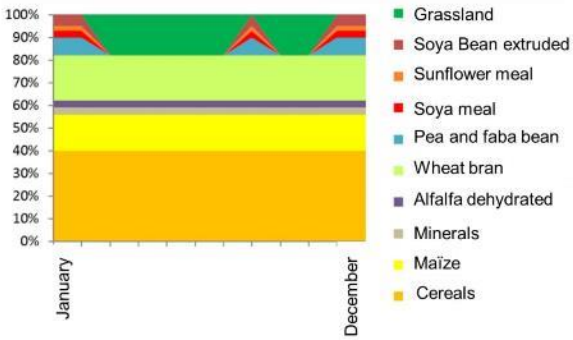
Best in

On-farm feed processing (possibility to process low-protein feed)

Practical recommendations

- Allow time for the grass ley to establish before sows start grazing.
- Enrich the ley with legumes to provide good nutritional value and palatability for sows.
- Harvest/remove less palatable plants that are not eaten by sows.

Sows before accessing a new paddock. Photo: ITAB



Ration planning (concentrate feed and pasturing) for pregnant sows. Graph: ITAB

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PRACTICE ABSTRACT

- To prevent rooting behaviour remove sows when the grass is still high (> 8 cm).
- Encourage the creation of functional areas (lying area, feeding area) and encourage sows to learn to graze on the paddock.
- Provide individual feeding distribution systems to avoid aggression.
- Provide excess grass as silage during periods with no grass production.

Further information

Video

- Have a look at the following video for further instructions (French): Paturage des truies aux trinottières.

Weblinks

- Check the Organic Farm Knowledge platform for more practical recommendations on animal husbandry.
- ITAB (2019, online): Alimentation des monogastriques en agriculture biologique.

About this practice abstract and OK-Net EcoFeed

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Permalink: Organic-farmknowledge.org/tool/35449

OK-Net EcoFeed: This practice abstract was elaborated in the Organic Knowledge Network on Monogastric Animal Feed project. The project is running from January 2018 to December 2020. The overall aim of OK-Net EcoFeed is to help farmers, breeders and the organic feed processing industry in achieving the goal of 100% use of organic and regional feed for monogastrics.

Project website: ok-net-ecofeed.eu

Project partners: IFOAM EU Group (project coordinator), BE; Aarhus University (ICROFS), DK; Organic Research Centre (ORC), UK; Institut Technique de l'Agriculture Biologique (ITAB), FR; Research Institute of Organic Agriculture (FiBL), CH; Bioland, DE; Associazione Italiana per l'Agricoltura Biologica (AIAB), IT; Donau Soja DS, AT; Swedish University of Agricultural Sciences, SE; ECOVALIA, ES; Soil Association, UK.

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PA003 Foraging of pigs in outdoor areas

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PRACTICE ABSTRACT

Foraging of pigs in outdoor areas

Problem

To reduce the risk of nutrient losses from free-range pigs, it is important to limit stocking density and to reduce nutrient inputs from concentrated feed.

Solution

Stimulating pigs' nutrient intake from foraging. Utilising available biomass is an obvious strategy to improve the sustainability of free-range systems.

Benefits

Improved utilisation of foraging crops reduces the use of concentrated feed, thereby decreasing feed costs, risk of nitrate leaching and greenhouse gas emissions.

Practical recommendation

- Root foraging crops, like Jerusalem artichokes or sugar beet (photo 1), can cover more than 80 % and 50 % of the energy requirements of pregnant sows and growing/finishing pigs, respectively.
- Protein-rich foraging crops like Lucerne or grass/clover can provide 100 % of the lysine and methionine requirements of pregnant sows and 30-40 % of the lysine and methionine requirements of growing/finishing pigs when including estimated contribution from foraged soil organisms like earthworms (photo 2).
- If pig producers adopt restrictive feeding (limited access to concentrated feed) to stimulate foraging behaviour, it is important to reduce competition for feed by allowing adequate time and space for feed consumption.
- As continuous access to attractive foraging crops stimulates pig foraging behaviour, it is important to consider and develop competitive moveable fences/systems.

Applicability box

Theme

Pigs, Feeding and ration planning

Context

Relevant for all regions allowing free-range pig production.

Application time

In Northern Europe, it is a challenge to grow winter crops suitable for direct foraging. A few foraging crops are frost-resistant, e.g. Jerusalem artichokes; however, frost can compromise the availability of the tubers.

Equipment

Moveable fences/rotational paddock systems are preferable to stimulate pig foraging behaviour and to reduce the risk of nutrient hotspots due to uneven spatial deposition of pig faeces and urine.

Best in

Pregnant sows and growing/finishing pigs.

Photo1: Sugar beet is a suitable foraging crop. Photo: Anne Grete Kongsted

Photo 2: Un-ringed pigs can easily turn the grass clover sward searching for earthworms, etc. Photo: Anne Grete Kongsted

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PRACTICE ABSTRACT

Further information

Video

- Check the following video: Foraging growing pigs (Danish narration)

Further reading

- Studnitz, M (Ed), 2019: Feeding monogastrics 100% organic and regionally produced feed. Knowledge Synthesis. OK-Net EcoFeed. H2020-project. http://orgprints.org/34560/
- Kongsted, AG et al., 2016: Slagtesvin på friland – Afgrødetilbud, fourageringsadfærd, plantedække, produktionsresultater og miljøeffekter (In Danish) www.dca.au.dk

Weblinks

- Check the Organic Farm Knowledge platform for more practical recommendations.

About this practice abstract and OK-Net EcoFeed

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OK-Net EcoFeed: This practice abstract was elaborated in the Organic Knowledge Network on Monogastric Animal Feed project. The project is running from January 2018 to December 2020. The overall aim of OK-Net EcoFeed is to help farmers, breeders and the organic feed processing industry in achieving the goal of 100% use of organic and regional feed for monogastrics.

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FICHE PRATIQUE

Pâturage des porcs élevés en plein-air

Problème

Pour réduire le risque de pertes de nutriments dans l'environnement chez les porcs élevés en plein-air, il est important de limiter le chargement et de réduire les apports de nutriments provenant des aliments concentrés.

Solution

Stimuler l'ingestion de nutriments par les porcs via le pâturage. L'utilisation de la biomasse disponible est une stratégie intéressante pour améliorer la durabilité des systèmes d'élevage de plein air.

Bénéfices

Une meilleure utilisation des cultures fourragères pâturées réduit l'utilisation d'aliments concentrés, ce qui diminue les coûts d'alimentation, le risque de lixiviation des nitrates et les émissions de gaz à effet de serre.

Recommandations pratiques

- Les tubercules comme le topinambour ou la betterave sucrière (photo 1), peuvent couvrir respectivement plus de 80 % et 50 % des besoins énergétiques des truies gestantes et des porcs en croissance/finition.
- Les cultures fourragères riches en protéines telles que la luzerne ou les associations graminée/trèfle peuvent couvrir respectivement 100 % et 30 à 40 % des besoins en lysine et méthionine des truies gestantes et des porcs en croissance/finition, si l'on tient compte de la contribution estimée des organismes du sol comme les vers de terre (photo 2).
- Si les éleveurs de porcs réduisent la quantité d'aliments concentrés pour stimuler le comportement de recherche de nourriture, il est important de réduire la compétition entre animaux en laissant suffisamment de temps et d'espace pour la consommation d'aliments.
- L'accès continu à des cultures fourragères appétentes stimulant le comportement de recherche de nourriture des porcs, il est important de développer le recours à des barrières et systèmes mobiles performants.

Mise en oeuvre

Thème

Porcs, alimentation et plan de rationnement

Couverture géographique

Pertinent pour toute région permettant la production de porcs en plein-air.

Période d'application

En Europe du Nord, il est difficile de réaliser des cultures fourragères d'hiver adaptées au pâturage. Certaines résistent au gel, comme les topinambours, mais le gel peut compromettre la disponibilité des tubercules.

Equipement

Les clôtures mobiles/systèmes de paddocks en rotation sont préférables pour stimuler le comportement de recherche de nourriture des porcs et réduire le risque de rejet de nutriments sur une zone réduite.

Efficacité maximale

Truies gestantes et porcs en croissance/finition.

Photo1: La betterave à sucre est une culture fourragère adaptée.
Photo: Anne Grete Kongsted

Photo 2: Les porcs sans anneau peuvent facilement retourner la prairie de trèfle à la recherche de vers de terre, etc.
Photo: Anne Grete Kongsted

Aarhus University. Pâturage des porcs élevés en plein-air. Fiche Pratique OK-Net EcoFeed.

FICHE PRATIQUE

Informations complémentaires

Vidéo

- Consultez la vidéo suivante: Foraging growing pigs (rédigé en danois)

Lectures complémentaires

- Studnitz, M (Ed), 2019: Feeding monogastrics 100% organic and regionally produced feed. Knowledge Synthesis. OK-Net EcoFeed. H2020-project. http://orgprints.org/34560/
- Kongsted, AG et al., 2016: Slagtesvin på friland – Afgrødetilbud, fourageringsadfærd, plantedække, produktionsresultater og miljøeffekter (In Danish) www.dca.au.dk

Liens Internet

- Consultez la plateforme Organic Farm Knowledge pour plus d'informations pratiques.

A propos de cette fiche pratique et du projet OK-Net EcoFeed

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Site Internet du projet: ok-net-ecofeed.eu

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FICHA PRÁCTICA

Forrajeo de cerdos en áreas al aire libre

Problema

Para reducir el riesgo de pérdidas de nutrientes de los cerdos criados en libertad, es importante limitar la densidad de carga ganadera y disminuir el aporte de nutrientes de los piensos.

Solución

Estimular la ingesta de nutrientes de los cerdos vía forrajes. Utilizar la biomasa disponible es una estrategia obvia para mejorar la sostenibilidad de los sistemas de producción con pastoreo.

Beneficios

La mejor utilización de los cultivos forrajeros reduce el uso de piensos, disminuyendo de este modo los costes de alimentación, el riesgo de lixiviación de nitratos y las emisiones de gases de efecto invernadero.

Aplicabilidad

Tema
Cerdos. Planificación de alimentación y raciones.

Área de influencia
Relevante para todas las regiones que permiten la producción porcina en pastoreo.

Tiempo de aplicación
En el norte de Europa, los cultivos de invierno adecuados para el consumo directo son un desafío. Algunos forrajes son resistentes a las heladas, p. ej. patacas. Sin embargo, la congelación del suelo puede impedir el acceso a los tubérculos.

Equipamiento
Los sistemas de vallas móviles o cercados rotacionales son preferibles para estimular el comportamiento de búsqueda de alimento de los cerdos y reducir el riesgo de puntos de concentración de nutrientes debido a la desigual deposición espacial de heces y orina por parte de los cerdos.

Especialmente para
Cerdas gestantes. Cerdos en crecimiento-cebo.

Recomendaciones prácticas

- Los cultivos de raíces forrajeras, como la pataca (*Helianthus tuberosus*) o la remolacha azucarera (*Beta vulgaris*) (foto 1), pueden cubrir más del 80% y del 50% de las necesidades energéticas respectivamente de las cerdas gestantes y cerdos en crecimiento-cebo.
- Cultivos forrajeros ricos en proteína como alfalfa o praderas con trébol pueden proporcionar el 100% de los requerimientos de lisina y metionina de cerdas gestantes y el 30-40% de los de los cerdos de crecimiento-cebo cuando se incluye la estimación de la contribución de organismos del suelo, como son las lombrices de tierra (foto 2).
- Si los productores de cerdos dan una alimentación restringida (acceso limitado al pienso) para estimular la búsqueda de alimento con pastoreo, es importante reducir la competencia por el pienso, dando el tiempo y el espacio necesario para el consumo de pienso.
- Dado que el continuo acceso a cultivos forrajeros apetecibles estimula el comportamiento de pastoreo selectivo de los cerdos, es importante considerar el empleo de sistemas económicos de cercas móviles.

Foto 1: La remolacha azucarera es un cultivo forrajero adecuado. Foto: Anne Grete Kongsted

Foto 2: Los cerdos sin anillar pueden voltear fácilmente la hierba de las praderas de trébol en busca de lombrices de tierra, etc. Foto: Anne Grete Kongsted

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FICHA PRÁCTICA

Más información

Video

- Ver el video: Foraging growing pigs (narración en danés).

Otras lecturas

- Studnitz, M (Ed), 2019: Feeding monogastrics 100% organic and regionally produced feed. Knowledge Synthesis. OK-Net EcoFeed. H2020-project (en inglés) http://orgprints.org/34560/
- Kongsted, AG et al., 2016: Slagtesvin på friland – Afgrødetilbud, fourageringsadfærd, plantedække, produktionsresultater og miljøeffekter (en danés) www.dca.au.dk

Weblinks

- Consultar la plataforma Organic Farm Knowledge para obtener más recomendaciones prácticas.

Sobre esta Ficha Práctica y el Proyecto OK-Net EcoFeed

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Web del protecto: ok-net-ecofeed.eu

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PA004 Silage feeding for laying hens

PRACTICE ABSTRACT

Silage feeding for laying hens

Problem

Feeding silage to organic laying hens is practised on a daily basis by many egg producers (see figure 1). Since hens can eat large amounts of silage, it is important to use high-quality silage.

Solution

Different types of silage can be used. However, e.g. grass, clover grass, alfalfa, hemp, horse beans, lupines and sunflower silage often have a higher protein content than e.g. barley/pea (see figure 2) or maize silage (whole plant or the cobs only). A chemical analysis of the harvested silage is important in order to estimate the quality.

Benefits

High-quality silage can provide nutrients for the hen and encourage natural foraging behaviour, thus reducing the risk for feather pecking. Growing protein-rich silage helps increase self-sufficiency and improve the crop rotation of the organic poultry farms.

Applicability box

Theme
Layers, feeding and ration planning

Geographical coverage
Global

Application time
Feeding silage on a daily basis all year. The amount given depends on hen age and silage type.

Required time
Harvest time during spring, summer or autumn, depending on the silage type.

Period of impact
During the entire laying period.

Equipment
Silage chopper, automatic system (robot) to feed the silage 1-3 times per day in the barn.

Best in
Choice of silage will depend on the soil type and if the land is often dry or waterlogged. The silages should be harvested as whole crops.

Figure 1: Laying hens on a veranda feeding silage distributed by an automatic system (robot). Photo: Sanna Steenfeldt, AU

Figure 2: Barley-pea silage for laying hens. Photo: Niels Finn Johansen, SEGES

Practical recommendation

- Choose the silage type(s) that provides the best yield and quality, depending on soil type and weather conditions.
- The silage has to be finely chopped.
- Silage generally has to be preserved under proper conditions to optimize the fermentation process.

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PRACTICE ABSTRACT

- Analyse the protein content of the silage and other nutrients if possible.
- Avoid silage with anti-nutritional factors.
- Investing in an automatic feeding system (robot) is recommended for larger flocks to distribute the silage evenly and encourage the hens to eat it.
- Including the chemical content of the silage in the feed formulation could be an advantage, when feeding more than 20 g silage (wet weight) per hen per day.

Further information

Link

- This video provides further instructions on feeding silage to layers (in Danish).
- On the website of Økologisk Landsforening 2019, there is an overview of the most important feed materials for self-supply of organic poultry with dry feed and silage. You can download and print listings of data on each crop and information on cultivation, crop rotation, harvesting, storage, nutrient content and nutritional considerations (in Danish).
- Check the Organic Farm Knowledge platform for more practical recommendation on animal husbandry.

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PA005 Guide for assessing the protein quality in soya feed products

PRACTICE ABSTRACT

Guide for assessing the protein quality in soya feed products

Problem

Soya beans are an excellent source of protein but they also contain anti-nutritive components, which need to be deactivated by heat prior to feeding to swine or poultry. However, high temperatures can also damage key nutrients, reducing their digestibility.

Solution

Trypsin inhibitor activity (TIA), protein dispersibility index (PDI) and urease activity are useful indicators in soya products to assess the quality of soya bean processing and help to predict availability and digestibility of nutrients. Most feed laboratories can measure these parameters. In addition, specialised near infra-red spectroscopy (NIRS) can now measure the availability of amino acids.

Benefits

Regular monitoring of key soya bean processing indicators is essential for achieving a consistently high product quality. Results can be also used by animal keepers for planning feed rations.

Applicability box

Theme
Processing and handling of harvested feed

Geographical coverage
For all farms where soya can be grown

Application time
On demand

Required time
Time for sample collection, posting to laboratory and interpretation of testing reports should be accounted. It depends on local conditions and experience of the operators.

Equipment
Sample bags and standard lab equipment

Best in
Farms with animal husbandry and arable production

Practical Recommendations

Processing intensity is key to quality

Common procedures for the heat treatment of soya beans are toasting, steaming and extrusion. The purpose of these procedures is to deactivate anti-nutritive components such as trypsin inhibitors. However, applying high temperatures inevitably leads to nutrient damage so the goal is to balance processing intensity. For toasted soya beans, the intensity is a function of processing time and temperature.

Soya bean cake. Photo: Donau Soja, Ina Jäger

Crude protein content is a standard feed parameter, but it does not provide information on the digestibility. Processing indicators are measurable components of soya feed products which make the quality of soya bean processing (heat treatment) quantifiable. Table 1 summarises processing indicators which best predict the digestibility of the feed. Nutrient availability can be high if the values for trypsin-inhibitor activity (TIA) and protein dispersibility index (PDI) are within the target range (see numbers in Table 1). On the other hand, a poor feed conversion ratio becomes more likely if, for example, the TIA value in soya cake is higher than 4 mg/g (see Figure 1).

Guide for assessing the protein quality in soya feed products. Donau Soja. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

Table 1: Overview of processing indicators in soya bean-based feed products. Values are based on dry matter (88%). Sources: various, see in further information.

	Application	Soybeans unprocessed	Soybean feed products
Trypsin-inhibitor activity, TIA	Trypsin-inhibitors are anti-nutritive substances which are naturally present in soya beans. TIA is reduced by heat. High TIA values in soya products can indicate poor digestibility and too low processing intensity.	Common: 30-50 mg/g DM	Recommended target range: <3 mg/g DM
Urease activity	Urease is an enzyme naturally present in soya beans. It has little relevance for animal growth. Urease activity serves as a marker for TIA since it is also reduced by heat. High urease activity in soya products is often linked to a high TIA. Recent experiences indicate that very low values for urease activity are not suitable to assess accurately the digestibility of soya feed. If available, TIA or PDI should be used.	Common: >2 mg/g DM	Recommended target range: <0.4 mg/g DM *Note: Better to also measure TIA or PDI.*
Protein Dispersibility Index, PDI	Protein dispersibility is based on the solubility of soya bean protein in a solvent. Most common solvents are water (PDI) or potash (PDI-KOH). PDI decreases with heat. Low PDI values in soya products can indicate damage to nutrients and a too high processing intensity. High PDI values can indicate poor digestibility due to too low processing intensity.	Common: Water: >50 % KOH: 100 %	Recommended target range: Water: 10-25 % KOH: 78-85 %
Availability of amino acids **Reactive lysine / lysine [%]**	Amino acids are the components of protein. Measuring the quality of amino acids is the best indicator for detecting damages through processing. Reactive lysine is a very suitable parameter but measurements through wet chemistry are expensive. The latest NIRS applications are low-cost and provide instant results. Reactive lysine is the part of total lysine which is digestible. It is reduced by heat.	Common: >91 %	Recommended target range: 89-90 %

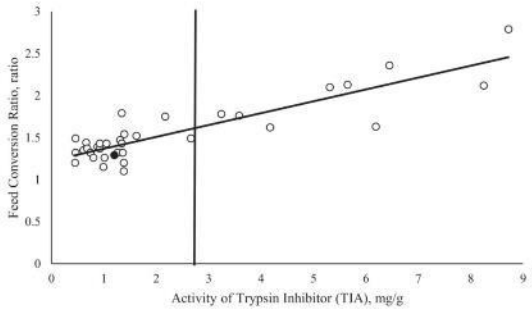

Figure 1: The effect of trypsin inhibitor activity (TIA) on the feed conversion ratio of broiler chicken. TIA values are based on the total feed mix. Each dot represents the mean value of each dietary treatment (n =35). The black dot represents a feed mix with commercial soya bean meal. Source: Hoffman et al. (2019)

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PRACTICE ABSTRACT

Monitoring and testing of processing indicators

The monitoring of processing indicators provides key information for ensuring the quality of soya feed products over the whole year. All common kinds of soya feed products (toasted soya beans, expeller, or solvent-meal) can be tested on urease activity, TIA and PDI. Most laboratories with a specialisation on feed analysis can measure urease activity and PDI. Analysis of TIA or amino acids are less commonly offered by laboratories in Central Europe (see also in "Further information").

Even under routine operating conditions it is fundamental to collect a correct, representative sample so that any subsequent analytical work and interpretation makes sense. The monitoring of the processing indicators of soya products can be compared with the guidelines applied in other crop quality management and assurance schemes.

The following list contains guidance points which are special for soya bean processing indicators:

- When soya bean processing equipment is operating for the first time, frequent testing is necessary until a constant product quality can be reached.
- More frequent testing is recommended if the processing equipment is not continuously in use or if the processing settings are frequently changed.
- Experienced operators of soya bean processing equipment can detect changes in processing performance by the taste of the soya product. However, tasting provides only a rough indication and cannot replace lab tests.
- An adequate sample weight is usually 0.5 kilogram.
- Occasional testing of unprocessed soya beans is advisable since the quality can differ significantly between each batch.
- It is essential that soya beans are standardised for particle size, purity, and moisture content prior to processing. Ideal conditions can also differ depending on the processing equipment used.

Further information

References and recommended literature

- Dozier, W.A. and Hess, J.B. 2011. Soybean Meal Quality and Analytical Techniques. Soybean and Nutrition. InTech. https://doi.org/10.5772/24161.
- Hoffmann, D., Thurner, S., Ankerst, D., Damme, K., Windisch, W., & Brugger, D. (2019). Chickens' growth performance and pancreas development exposed to soy cake varying in trypsin inhibitor activity, heat-degraded lysine concentration, and protein solubility in potassium hydroxide. *Poultry Science*, *98*(6), 2489–2499. www.doi.org/10.3382/ps/pey592
- Asam, L., Spory, K., Spiegel A.-K. 2014. Futtersoja aufbereiten – Gründe und Zielparameter. German leaflet. Available on the website of the German Soybean Association: www.sojafoerderring.de

Further reading

- Van Eys, J.E. 2015. Manual of Quality Analysis for Soybean Products in the Feed Industry. 2nd Edition. Published by U.S. Soybean Export Council. Available under: www.ussec.org
- Organic Farm Knowledge provides access to further literature on soybean processing.

Weblinks

- AGES - Austrian Agency for Health and Food Safety. AGES offers an evaluation of feed tests and is capable of analysing also trypsin inhibitor activity. Further information on the AGES website: www.ages.at/en

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PA006 Foraging of broilers in outdoor areas

PRACTICE ABSTRACT

Foraging of broilers in outdoor areas

Problem

Access to outdoor areas is mandatory in organic poultry production. Stimulating organic broilers to use outdoor areas can be a challenge if there is only sparse vegetation without trees and bushes outside the houses.

Solution

Establishing attractive areas is necessary to increase the number of broilers going outside. A combination of smaller open areas with grass and herbs as well as areas with different bushes and trees, where the broilers can feel safe, will stimulate the chickens to use a larger part of the outdoor areas (see figure 1). Choice of genotypes can be important, as some genotypes are more active than others.

Benefits

Having access to an attractive outdoor area will stimulate the broilers to be more active and forage, which contributes to a more natural behaviour. Active broilers are expected to have fewer food pad lesions, which is important for the birds' welfare. In addition to higher activity, grass, herbs and/or crops in the outdoor area can provide the birds with nutrients.

Practical recommendation

- Select plant species that are robust and adjusted to the climate such as caraway (*Carum carvi),* red clover (*Trifolium pratense),* chicory (*Cichorium intybus),* plantain (*plantago major (broadleaf)/Plantago lanceolate (lancetleaf),* ryegrass (*Lolium perenne),* selfheal (Prunella vulgaris), birdsfoot trefoil (*Lotus corniculatus),* lucerne/alfalfa (*Medicago sativa).*

Applicability box

Theme
Broilers, feeding and ration planning

Geographical coverage
Global

Application time
Outdoor areas can be used all year round; however, in a colder climate, winter periods can be difficult and winter gardens are recommended.

Required time
Planting outdoor areas takes time and new bushes and trees as well as grass/herbs have to be protected from birds for 1 to 2 years.

Period of impact
The planting period is critical. Newly planted trees or bushes can be protected by fencing.

Equipment
Equipment for planting trees and bushes, movable fences

Best in
Slow-growing trees, e.g. fruit trees, can be sheltered by fast-growing nurse trees, e.g. willow or poplar. Planting time will depend on climate and weather conditions.

Figure 1: An protective environment encourages the birds to use the outside area. Photo: Sanna Steenfeldt, Aarhus University

Figure 2: Planting some trees in rows from the broiler houses will encourage the birds to leave the house and spread far into the outdoor areas. Photo: Sanna Steenfeldt, Aarhus University

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PRACTICE ABSTRACT

- Fencing off part of the plants might be necessary until they have reached a size that makes them less vulnerable to birds eating leaves and smaller branches.
- Planting some trees in rows from the broiler houses will encourage the birds to leave the house and spread far into the outdoor areas (see figure 2).
- Combine trees and bushes with smaller open areas with grass/herbs or even crops that encourage foraging activity and other natural behaviour such as dustbathing, which is good for animal welfare.
- Choice of genotype is important. Very fast growing genotypes are not suitable for establishing a population with active animals.
- During cold winter periods, broilers are less motivated to go outside; a veranda system (winter garden), where silage can be provided, is recommended.

Further information

Further reading

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- Almeida, G. et al. (2012) Feed intake and activity level of two broiler genotypes foraging different types of vegetation in the finishing period. Poultry Science 91(9):2105-13. DOI:10.3382/ps.2012-02187

Weblinks

- Check the Organic Farm Knowledge platform for more practical recommendations on animal husbandry.

About this practice abstract and OK-Net EcoFeed

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PA008 Maize germ cake

PRACTICE ABSTRACT

Maize germ cake

Problem

The protein supply to organic pigs and poultry requires careful management to ensure an adequate supply of essential amino acids and to avoid overfeeding. Alternative sources of protein need to be used to supply the balance of amino acids needed.

Solution

By-products of manufacturing processes are useful alternatives. Maize germ cake is a by-product of starch and corn oil production, as well as a brewing by-product.

Benefits

Maize germ cake contains higher levels of essential amino acids than whole maize, but less energy, which should help with rationing for slower growing breeds of pigs and poultry.

Applicability box

Theme

Processing and handling of harvested feed

Geographical coverage

In all countries where maize is grown

Application time

Any time

Required time

No extra time required

Period of impact

Immediate Impact

Equipment

Existing feed equipment but good dry storage needed

Best in

All conditions

Practical recommendation

- Maize germ cake is part of a group of loosely named by-products yielded from the wet milling and dry milling maize industries. It is important to know what process the cake is from because that will affect its feed value.
    - Dry milled maize should contain more soluble protein, starch, and phosphorus.
    - Wet-milled maize tends to contain more residual oil.
    - Organic cake will have high oil levels because oil can only be extracted by pressing, not solvents.
- Maize germ (about 11 % of the grain weight) cake contains 20-24 % crude protein and higher levels of essential amino acids than whole maize as shown in Table 1.

Table 1: Protein and amino acid levels in maize and maize germ meal

	Maize	Maize germ cake
Crude protein %	7.6	20
Lysine %	3.1	4.0
Methionine %	2.1	1.7
AMEn MJ/kg DM*	15.1	8.8

Source : Heuzé et al. 2015

*AMEn MJ/kg DM: Apparent metabolizable energy, nitrogen-corrected

Maize germ cake. Soil Association. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

- Other products like maize gluten feed are similar but contain more bran and have different nutritional values. Maize quality and processing methods should be identified well in advance to avoid any nutritional imbalances. Ideally, the feed should be analysed to determine nutritional value.
- The maize germ contains high levels of phytic acid which has some anti-nutritional factors, particularly relating to phosphorus availability, but up to 20 % maize germ cake can be used without reduced productivity in pigs and poultry rations.
- If badly stored, the feed can turn rancid.
- Maize germ cake can replace maize within the ration for layers and during the fattening period for broilers.
- It is essential to develop a sound feeding plan to avoid any nutritional problems

Further information

References & further reading

- Heuzé V., Tran G., Lebas F. (2015): Maize germ meal and maize germ. Feedipedia, a programme by INRA, CIRAD, AFZ and FAO. https://www.feedipedia.org/node/716. Last updated on October 27, 2015, 16:23. Available at https://www.feedipedia.org/node/716
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FICHE PRATIQUE

Tourteau de germes de maïs

Problème

L'apport de protéines aux porcs et volailles biologiques exige une gestion attentive pour garantir un apport adéquat d'acides aminés essentiels et éviter la suralimentation. Des sources alternatives de protéines doivent être utilisées pour garantir l'équilibre en acides aminés nécessaires.

Solution

Les co-produits des processus industriels de transformation constituent des alternatives utiles. Le tourteau de germes de maïs est un co-produit de la production d'amidon et d'huile de maïs, et de la brasserie.

Bénéfices

Le tourteau de germes de maïs contient des teneurs plus élevées en acides aminés essentiels que le maïs entier, mais moins d'énergie, ce qui facilite le rationnement pour les races de porcs et de volailles à croissance plus lente.

Mise en oeuvre

Thème

Transformation et traitement des matières premières récoltées.

Couverture géographique

Tous les pays où la culture du maïs est possible

Période d'application

Toute l'année

Temps requis

Aucun temps supplémentaire

Délai d'impact

Impact immédiat

Equipement

Equipement classique pour l'alimentation. Un bon stockage au sec est nécessaire.

Efficacité maximale

Toutes conditions

Recommandations pratiques

- Le tourteau de germes de maïs regroupe sous la même appellation des sous-produits divers issus des industries de mouture humide ou sèche du maïs. Il est important de savoir de quel processus provient le tourteau, car cela aura une incidence sur sa valeur alimentaire.
    - Le maïs moulu à sec contiendrait davantage de protéines solubles, d'amidon et de phosphore
    - Le maïs moulu par voie humide a tendance à contenir plus d'huile résiduelle.
    - Le tourteau biologique aura une teneur élevée en huile car celle-ci ne peut être extraite que par pression, et non par usage de solvant.
- Le tourteau de germes de maïs (environ 11 % du poids du grain) contient 20 à 24 % de protéines brutes et des teneurs plus élevées en acides aminés essentiels que le maïs entier, comme le montre le tableau 1.

Tableau 1: Teneurs en protéines et en acides aminés du maïs et du tourteau de germes de maïs.

	Maïs	Tourteau de germes de maïs
Protéines brutes (%)	7.6	20
Lysine (%)	3.1	4.0
Méthionine (%)	2.1	1.7
EMAn (MJ/kg MS)*	15.1	8.8

Source : Heuzé et al. 2015

*EMAn (MJ/kg MS): Énergie métabolisable apparente quand l'azote est limitant

Tourteau de germes de maïs. Soil Association. Fiche pratique OK-Net EcoFeed.

FICHE PRATIQUE

- D'autres produits, comme les matières premières à base de gluten de maïs, sont similaires mais contiennent plus de son et ont des valeurs nutritionnelles différentes. La qualité du maïs et les méthodes de transformation doivent être bien identifiées pour éviter tout déséquilibre nutritionnel. Idéalement, la matière première devrait être analysée pour déterminer sa valeur nutritionnelle.
- Le germe de maïs a des teneurs élevées en acide phytique qui contient des facteurs antinutritionnels, notamment vis-à-vis de la disponibilité du phosphore, mais le tourteau de germes de maïs peut être incorporé jusqu'à 20 % dans les aliments sans réduction de la productivité des porcs et des volailles.
- La matière première peut devenir rance si elle est mal stockée.
- Le tourteau de germes de maïs peut remplacer le maïs dans la ration des poules pondeuses et pendant la période d'engraissement des poulets de chair.
- Il est essentiel d'élaborer un plan d'alimentation rigoureux pour éviter tout problème nutritionnel.

Pour plus d'informations

Références et lectures complémentaires

- Heuzé V., Tran G., Lebas F. (2015): Maize germ meal and maize germ. Feedipedia, a programme by INRA, CIRAD, AFZ and FAO. https://www.feedipedia.org/node/716. Last updated on October 27, 2015, 16:23. Available at https://www.feedipedia.org/node/716
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PA009 Dry forages: Process and techniques

PRACTICE ABSTRACT

Dry forages: Process and techniques

Problem

Forage storage and quality are affected by the percentage of water contained in the plants. A high water content encourages the formation of mould and indigestible compounds from, a reaction between sugar and amino acids (Maillard reaction) and brown forage. Enzyme processes can also modify forage quality due to plant respiration after cutting. A decrease in forage quality is also due to weather conditions during haymaking.

Solution

To increase water loss after cutting, grass needs to be spread with an appropriate machine (tedder) to expose more surface to the sun. When moisture content is around 45-50 %, the grass is turned. Rowing the grass at night reduces surface area and water reabsorption as well as increasing soil drying (Figure 1). This helps to decrease drying time and reduce losses in forage quality and quantity.

Applicability box

Theme
Processing and handling of harvested feed

Geographical coverage
Global

Application time
Growing and harvesting time

Required time
A few days of dry and sunny weather

Period of impact
October – June

Equipment
Hay-making machinery, tedder, mower, baler

Best in
Alfalfa, grass.

Benefits

The drying process preserves forage quality and increases protein and energy content. To improve the process, a conditioner can be attached to the mower where the grass is crushed between two rollers. Crushing the stems can speed-up the on field drying process, reduce nutrient losses and, if the drying process is completed in a hay dryer, reduce the energy consumption.

Figure 1: Rowing hay with a tedder. Photo curtesy of John Deere

Figure 2: Cutting forage. Photo curtesy of New Holland

Practical recommendation

- To obtain the best forage quality, cutting at the correct time is important, when cellulose and lignin content is not too high. During spring, cutting early is the best option to preserve forage quality; for grasses, the correct time is beginning of heading; for leguminous plants, it is beginning of blooming. However delaying cutting increases dry matter (DM) content, which speeds up the drying process. Favourable weather conditions can reduce drying costs. Making hay decreases the moisture content to 15 % and increases dry

Dry forages: Process and techniques. Associazione Italiana Agricoltura Biologica (AIAB). OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

matter (DM) to 85 %. Cutting height (Figure 2) is important for a perennial crop, affecting speed and quantity of regrowth. Generally is not recommended cutting too close to the ground, because basal buds are the slowest to refill and have low vigour.

- Spreading the grass at cutting helps to decrease drying time and minimise forage quality and quantity losses. On field crushing of stems using a conditioner, increases water loss by up to 30 % and increases DM. The drying process can be completed on the field or in drying rooms, where forage quality is highest. At the end of the drying process, the hay can be baled and stored.

Further information

Video

The Character & Heritage Institute: Video «The process of making hay».

Weblinks

- Check the Organic Farm Knowledge platform for more practical recommendations on animal husbandry and livestock feeding.

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PA011 Feeding strategies for broilers

PRACTICE ABSTRACT

Feeding strategies for broilers

Problem

Organic broilers grow slower than conventional birds and so producers face the challenge of feeding quality feed components at lower concentrations. Feed needs to fulfil the amino acid and energy requirements of broilers for efficient growth and development, but growth is slower.

Solution

Choice feeding, access to range and forages can increase the utilisation of protein and energy, which will increase feed efficiency. The requirements for birds to use the range area is part of the solution.

Benefits

Improved energy and protein utilisation in broilers. Furthermore, as these approaches rely on local feed sources and forage from the range, the feeding strategies add to agricultural sustainability and reduce the need to import foreign feed.

Applicability box

Theme

Broilers, feeding and ration planning

Geographical coverage

In all countries

Application time

Any time

Required time

No extra time required

Period of impact

Immediate Impact

Equipment

Existing feed equipment

Best in

All conditions

Practical recommendation

Organic standards require organic broilers to be free range and have access to open-air spaces as soon as possible (figure 1) but at a minimum of one-third of their life. The minimum slaughter age for broilers is 81 days.

- Feed components should contain high-quality proteins, e.g., legumes, aquatic feed sources and by-products from food manufacturing and industrial processes.
- Organic standards prevent the use of synthetic amino acids, so there is a need to ensure amino acid availability (especially methionine and lysine).
- A phase feeding strategy should be used to account for the differences in the dietary needs of broilers during different growth stages.
- Account for feed consumed in outdoor areas (i.e., roughages) when calculating nutritional requirements and formulating feed rations.

Figure 1. Forage can provide significant food for organic broilers (Photo: Jerry Alford, Soil Association)

PRACTICE ABSTRACT

- Formulate diets on a digestible amino acid basis rather than on a total amino acid or crude protein level.
- Choose appropriate breeds that are able to perform with the given resources, particularly slower-growing breeds.

Slower-growing breeds will need less energy-dense rations and are also more inclined to seek food in the range.

Choice feeding, where birds select separate foods, rather than manufactured compound feed, has been found to increase Feed conversion efficiency (FCE) when birds have access to range.

Limiting protein intake for organic broilers in the finishing stages can be an acceptable feeding strategy if the broilers have access to vegetation with a high nutritional value. Reducing protein levels for slow-growing breeds to 15% resulted in a lower FCE but a lower cost of production.

Key to this is range management and alternative forages, such as baled haylages, which will be needed during winter or drought periods. High protein sources such as lucerne and clovers can also supply some of the required protein. Account can also be taken of insects and invertebrates eaten on the range, which can supply some of the protein and amino acids required.

Further information

Further readings

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Weblinks

- Further information can be found on the Organic Farm Knowledge platform.

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PA013 Green protein from locally grown crops

PRACTICE ABSTRACT

Green protein from locally grown crops

Problem

Organic poultry producers are often confronted with high feed costs and a lack of alternative high-quality protein sources for poultry.

Solution

Green protein concentrate can be produced from locally grown crops such as clover-grass (see figure 1) or alfalfa. It can be used in the diets of organic broilers and layers. In a bio-refinery, protein concentrate is obtained by pressing fresh green material (see figure 2), heating/fermenting the juice to precipitate protein and finally putting it in a centrifuge. The concentrated green protein can be dried and added to poultry feed.

Benefits

Concentrate from clover/clover grass and alfalfa has a high protein content and an optimal amino acid profile for poultry, which makes the feed formulation of organic diets more optimal. An increase in locally grown protein sources can improve the sustainability of the farm and make the farmer less dependent upon imported protein, such as soya, from overseas.

Practical recommendation

- Choose an appropriate type of green crop, such as clover-grass or alfalfa, with an expected high protein and amino acid content. Consider soil types and weather patterns to grow a crop with a good and high quality yield.
- Harvest the field at regular intervals in order to achieve good plant growth and to obtain batches with more high quality protein and less fibre

Applicability box

Theme
Layers; feeding, processing and handling of harvested feed

Geographical coverage
In temperate climates. Middle and Northern Europe.

Application time
The product can be used at any time of the year if the protein paste are dried and stored under optimal conditions.

Required time
Harvest time of green protein during spring, summer and autumn, processing time in a bio-refinery and time to dry it.

Period of impact
Immediate Impact

Equipment
Machinery required for harvest of green material (clover/grass/ alfalfa) and for transportation to a bio-refinery plant or to storage facilities.

Best in

Choice of crop for production of green protein depends on the country, soil type and weather conditions during preferred harvest time. Advantageous in crop rotation.

Figure 1: Harvesting of locally grown clover-grass. Photo: Erik Fog, SEGES

Figure 2: Screw pressing of fresh clover grass into green juice and press cake. Photo: Erik Fog, SEGES

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PRACTICE ABSTRACT

- Harvesting procedures, which minimise soil content in the green material obtained from the field are necessary to obtain good quality green protein and to avoid wear of machinery and technical equipment
- Cooperation with a bio-refinery plant is a prerequisite in order to concentrate the protein into a green paste that can be dried and used in poultry feed.
- If not dried, the wet green paste can be stored in closed containers/plastic bags in cool conditions for a shorter period.
- Chemical analysis of the green protein concentrate is important in order to replace other protein sources such as soya and to carry out the correct feed formulation. This can be done together with advisors or feed companies.

Further information

Further readings

Video

- Video "GRASS PROTEIN - a golden chance to improve organic farming" from Seges

Links

- Report on "Green Biomass – Protein Production Through Bio-refining"
- OrganoFinery: Organic growth with biorefined organic protein feed, fertilizer and energy
- Check the Organic Farm Knowledge platform for more practical recommendations.

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OK-Net EcoFeed: This practice abstract was elaborated in the Organic Knowledge Network on Monogastric Animal Feed project. The project is running from January 2018 to December 2020. The overall aim of OK-Net EcoFeed is to help farmers, breeders and the organic feed processing industry in achieving the goal of 100% use of organic and regional feed for monogastrics.

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PA015 Phase feeding for growing and finishing pigs

PRACTICE ABSTRACT

Phase feeding for growing and finishing pigs

Problem

Large variation between pigs in a litter or production batch makes it difficult to target their nutrient requirements for optimal growth. Diets are therefore formulated with higher lysine and protein contents than recommended, resulting in wastage of nutrients and unnecessarily high N-emissions.

Solution

A phase feeding plan, with two or more phases, will better reflect the actual need of protein and amino acids for pigs at different live weights (growth phases) as dietary content of crude protein and essential amino acids is decreasing with increasing age of the pigs.

Benefits

Phase feeding will more closely match the pig's nutrient requirements and minimise the over- and under-feeding of nutrients. The feed will be better utilised by the pigs, in favour of both production economy and reduced N-emissions.

Applicability box

Theme
Pigs, Feeding and ration planning

Geographical coverage
Global

Application time
All year round

Required time
Growing/finishing period

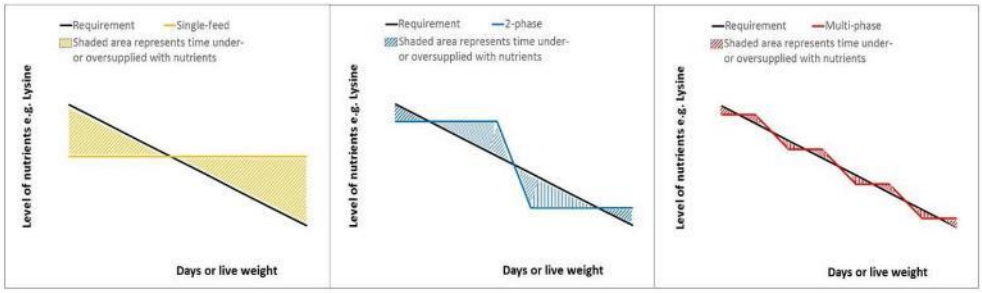
Period of impact
All year round

Equipment
Feed ration planning

Best in
Growing/finishing period

Practical recommendation

- To get the maximum benefit from phase feeding, diets and feeding should be established based on actual animal performance and profitability/performance goals for each stage of production. It is easier to develop with a small number of pigs per batch (to manage heterogeneity)
- Diets should be formulated on a digestible amino acid basis rather than on a total amino acid or crude protein basis, crude protein should preferably be kept at a low level and ingredients should be analysed for their nutrient contents.



A single-feed diet meets the nutrient requirements of the pigs "on average" and due to the variation within the group, while 2- or multi-phase feeding will more closely match the pig's nutrient requirements and minimise the over- and under-feeding of nutrients. More phases will better reflect the actual need for protein and amino acids for pigs at different live weights (growth phases). Illustration: Magdalena Presto Åkerfeldt.

Phase feeding for growing and finishing pigs. Swedish University of Agricultural Sciences. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

- A phase feeding system is complex and factors such as the availability of high-quality protein feed ingredients, the managing and ordering of feed as well as the need for additional feed bins on the farm must be considered.
- Consult with an advisor or nutritionist to adjust the feeding plan accordingly to meet the production goals.

Further information

Weblinks

- Check the Organic Farm Knowledge platform for more practical recommendations on pigs as well as feeding and ration planning.

About this practice abstract and OK-Net EcoFeed

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PA016 Starfish as feedstuff

OK NET ecofeed | AARHUS UNIVERSITY | IFOAM EU GROUP MAKING EUROPE MORE ORGANIC

PRACTICE ABSTRACT

Starfish as feedstuff

Problem

An increase in demand for organic feedstuffs is expected to limit protein availability. Therefore, new and more sustainable protein-rich ingredients are needed.

Solution

Starfish are caught to reduce predation on farmed mussels. Starfish meal contains 38-70% protein and can be used to partially replace other protein-rich ingredients in monogastric animal feed.

Benefits

Feeding starfish meal gives comparable growth to feeding fishmeal in piglets. For layers, egg production and quality are maintained at normal levels when feeding up to 8% starfish meal.

Practical recommendation

- Starfish should be harvested, at the earliest, three months before spawning to have highest protein and lowest ash content.
- High calcium levels limit the inclusion level of starfish meal in piglets' diets to around 5%.
- Starfish meal is not organically certified but can still be used because it is not of agricultural origin.
- Starfish meal is already commercially available in Denmark.
- Diets can be optimized regarding amino acids and with lower crude protein.

Applicability box

Theme

Processing and handling of harvested feed

Context

Coastal countries

Application time

February-May

Required time

Time of feeding

Period of impact

Immediate

Equipment

No extra equipment needed for feeding

Best in

Piglets, layers

Figure 1: Starfish before processing. Photo: Jan Værum Nørgaard

Figure 2: Boat specialized in fishing starfish. Photo: Pia Sørensen

Starfish as feedstuff. Aarhus University. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

Further information

Further reading

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Weblinks

- Check the Organic Farm Knowledge platform www.organic-farmknowledge.org for more practical recommendations

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PA018 Protein requirements for piglets and weaners

OK NET ecofeed | AARHUS UNIVERSITET | IFOAM EU GROUP MAKING EUROPE MORE ORGANIC

PRACTICE ABSTRACT

Protein requirement for piglets and weaners

Problem

According to the National Research Council (USA) recommended levels of protein and amino acids for pigs are based on data obtained in experiments performed under different conditions, e.g. genetic lines, dietary raw materials, health status and management practices (NRC, 2012). In organic farming, protein and amino acid balance is difficult to achieve, especially in the context of a 100 % organic diet. Reports based on practical experiences highlight that the amino acid requirements of modern pig breeds reared under organic conditions might be lower than the recommended levels, particularly with more balanced growth rates. Thus, e.g., the recommended intake of digestible lysine by organically reared pigs could be lowered.

For piglets, the most physiologically critical phase is the time after weaning when their protein requirement is high, but at the same time, they are sensitive to gastrointestinal disorders. Organic farmers have to rely on organic, and locally grown feedstuffs in combination with organic protein concentrates to provide a good balance of amino acids in the diet.

Applicability box

Theme
Pigs, feeding and ration planning

Geographical coverage
Global

Application time
Any time

Required time
Diet formulation

Feed mixing on farm

Period of impact
During the entire piglet and weaning period

Equipment
Equipment for home-mixing.

Best in
Farrowing farms, by either using home mixing or in cooperation with a local feed mill.

Solution

Adjusting amino acid requirements to below the current recommended levels can help organic producers to meet the nutritional needs for piglets and weaners, in the context of a 100 % organic diet. The diets should be formulated according to the specific production potential and farmer objectives (breed, weaning age, actual health status, aimed growth rate and feed conversion). Examples of different dietary amino acid requirements according to various reccommendations are shown in Table 1.

It is important to always apply careful monitoring of the production and health status of the herd.. Photo: Marie Liljeholm, SLU

Protein requirement for piglets and weaners. Aarhus Universitet. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

Benefits

The acceptance of a reduced level of amino acids in the diet can enable higher use of locally produced protein feed resources and simplify feed manufacturing, feed handling and diet formulation at the farm level. Formulating diets with optimal protein content and amino acid composition, in relation to piglet needs, will improve health and growth performance and decrease the risk for excessive protein in the diets and excretion of nitrogen to the environment. Using a higher percentage of local feed resources increases self-sufficiency and sustainability of the farm.

Table 1. Examples of dietary amino acid requirements [a] according to National Research Council of the US (NRC 2012)[b], the Swedish University of Agricultural Sciences (SLU 2011)[c] and recommendations from the French ITAB (2014) based on practical experiences in organic farming.[d]

	Examples of some dietary essential amino acid requirements					
	NRC			SLU	ITAB	
Pig weight	5-7 kg	7-11 kg	11-25 kg	10-30 kg	During lactation to 7-10 days post-weaning	Up to 25 kg
Lysine	1.47	1.32	1.22	1.03-0.94	1.2	1.1-1.0
Methionine	0.42	0.38	0.36	0.31-0.28	0.36	0.33-0.30
Methionine + cysteine	0.80	0.72	0.67	0.62-0.56	0.72	0.66-0.60
Threonine	0.86	0.77	0.72	0.64-0.58	0.78	0.72-0.65
Tryptophane	0.25	0.22	0.20	0.20-0.18	0.23	0.21-0.19

[a] Requirements are expressed as standardised ileal digestible (sis) basis (g/MJ NE).
[b] Recommended values (% in diet) are recalculated to g/MJ NE. The values for pigs of 5-11 and 11-25 kg are based on diets with 10.2 and 10.1 MJ NE, respectively.
*[c] Requirements are expressed in a range, established by calculations based on BSAS (2003), Jørgensen & Tybrik (2008) and simulations in InraPorc (http://w3.rennes.inra.fr/inraporc/). For the calculations of NEv from FEsv 8.8 MJ NEv/FEsv (Sloth, 2008) was used. The overall recommendations are described by the equation: y = 1.06 - 0.00376 * x, where y is the recommended amount of sis-lysine/MJ NEv and x the live weight of the pigs.*
[d] ITAB (2014). Cahier technique: Alimentation des porcins en agriculture biologique.

Abbreviations
NE = net energy
NEv = net energy for growing pigs
FEsv = feed unit for piglets and growing pigs
Sis-lysine = standardised ileal digestible lysine

Practical recommendation

- Current recommended levels are based on the maximum production that can be achieved under varying conventional conditions regarding sex, health, environment and breed.
- Use the recommended levels more as guidelines and not as absolute requirements for achieving a certain performance under organic conditions, as the pigs' response can further vary with sex, health, environment and genotype.
- Focus on a gut-friendly diet (adjusted to the piglet's gastrointestinal conditions and nutritional requirements) in order to strengthen the pigs' micro flora and intestinal health.
- A less energy-dense diet with reduced amino acid content, fed *ad libitum*, can increase the daily feed intake by the pigs, and thereby assure a sufficient total daily intake of amino acids.
- Always apply careful monitoring of the production and health status of the herd.
- Own replacement of gilts could be one way to get animals with a lower requirement of amino acids.
- Contact an agricultural adviser for diet formulation or when implementing new feed formulation tools and investing in new technical equipment.
- Analyse the contents of protein and amino acids for the main feed ingredients produced on the farm and those bought on the market in order to make correct diet formulations.

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PRACTICE ABSTRACT

Further information

Link

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- Check the Organic Farm Knowledge platform for more practical recommendation on animal husbandry.

About this practice abstract and OK-Net EcoFeed

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PA021 Relevance of roughage feeding to pigs

PRACTICE ABSTRACT

Relevance of roughage feeding to pigs

Problem

A species-appropriate pig diet consists of different feed components with different structures. However, such a diet is technically, and in terms of ration planning, more complex to produce than a feed that is always of the same structure.

Solution

Integrate roughage feeding into ration plans and use the farm's potential for feed production.

Benefits

Roughage feeding promotes animal health and welfare and can, at the same time, reduce feed costs on the farm. A good structure and a high crude fibre content of a ration serves as enrichment, improves the feeling of satiety and improves stomach health (Picture 1).

Applicability box

Theme
Pigs, Feeding and ration planning

Geographical coverage
In all countries

Application time
Any time

Required time
The time needed to harvest the roughage and feed animals

Period of impact
Immediate impact

Equipment
Machines for harvesting and ensiling, for delivering feed to animals as well as a feeder.

Best in
Gestating sows and finishing pigs

Practical recommendation

- With combined feeding, the energy requirement of pregnant sows can be reduced by up to 50 % in the first stage of gestation and up to 20 % in the last stage of gestation by providing energy-rich roughage products like grass or corn silage (Picture 2).
- For pregnant sows, the daily feed intake capacity for clover grass and maize silage is 2-4 kg fresh matter.
- In addition to clover grass silage (with a high protein value), a cereal and minerals mixture without protein-rich feed components should be used.

Picture 1: Feeding roughage, in this case, fresh grass, to sows and piglets. Photo: BOKU

Picture 2: A round bale feeder for the ad libitum feeding of rain-protected straw, hay or silage to pregnant sows. Photo: Antje Schubbert

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PRACTICE ABSTRACT

- In addition to maize silage, a very protein-rich concentrate is needed. The daily intake of 3.5 kg maize silage per sow can compensate for a concentrated feed quantity of up to 1 kg per day compared with pure concentrated feed.
- In addition to grass silage, 85 % of complete feed requirement for pregnant sows could be provided.
- Feeding silage to suckling piglets and weaned piglets prevents diarrhoea.

Further information

Video

- The video "Feeding pigs: effect of silage" is available on Organic Farm Knowledge.

Further reading

- Früh, Barbara and Mirjam Holinger (2019) Organic Pig Farming: Key Characteristics, Opportunities, Advantages and Challenges. In: *Improving Organic Animal Farming. Burleigh Dodds Series in Agricultural Science*, pp. 287–306., doi:10.19103/as.2017.0028.16
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- Holinger, Mirjam et al. (2015) Improving Health and Welfare of Pigs - A Handbook for Organic Pig Farmers. Research Institute of Organic Agriculture (FiBL), 2015.

Weblinks

- Further documents can be found on the Organic Farm Knowledge website.

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FICHE PRATIQUE

Distribution de fourrages aux porcs

Problème

Une alimentation adaptée au porc est constituée de matières premières et fourrages ayant des structures différentes. Toutefois, techniquement et en termes de plan de rationnement, un tel régime est plus complexe à réaliser qu'un aliment homogène.

Solution

Intégrer des fourrages distribués dans l'alimentation et utiliser le potentiel de la ferme pour produire des matières premières.

Bénéfices

La distribution de fourrages favorise la santé et le bien-être des animaux et peut, dans le même temps, réduire les coûts alimentaires sur la ferme.
Une bonne structure et une teneur élevée en fibres brutes dans une ration l'enrichissent, améliorant la sensation de satiété et la santé de l'estomac (photo 1).

Mise en oeuvre

Thème
Porcs

Couverture géographique
Tous pays

Période d'application
Toute l'année

Temps requis
Le temps nécessaire à la récolte du fourrage et à l'alimentation des animaux

Délai d'impact
Impact immédiat

Equipement
Engins pour récolter, ensiler et distribuer l'aliment aux animaux, et une mangeoire.

Efficacité maximale
Truies gestantes et porcs en finition

Recommandations pratiques

- Avec une alimentation combinée, les apports énergétiques des truies gestantes via l'aliment complet peuvent être réduits jusqu'à 50 % au premier stade de la gestation et jusqu'à 20 % les 3 dernières semaines en distribuant des fourrages riches en énergie comme l'herbe ou l'ensilage de maïs (photo 2).
- Pour les truies gestantes, la capacité d'ingestion quotidienne pour l'ensilage de graminées, de trèfle et de maïs est de 2 à 4 kg bruts.
- En complément d'un ensilage de trèfle, à haute valeur protéique, il est possible d'utiliser un mélange de céréales et minéraux sans composante riches en protéines.

Figure 1: Distribution de fourrage aux truies et porcelets, ici de l'herbe fraîche. Photo: BOKU

Figure 2: Râtelier protégé contre la pluie pour l'alimentation ad libitum des truies gestantes avec paille, foin ou ensilage. Photo: Antje Schubbert

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FICHE PRATIQUE

- En complément de l'ensilage de maïs, un concentré très riche en protéines est nécessaire. L'apport quotidien de 3,5 kg de maïs ensilage par truie peut compenser jusqu'à 1kg d'aliment classique (dans le cadre d'une conduite sans fourrages).
- La distribution d'ensilage d'herbe permet de réduire à 85% la quantité d'aliment à distribuer à des truies gestantes.
- La distribution d'ensilage aux porcelets (avant et après sevrage) permet de limiter les risques de diarrhée.

Informations complémentaires

Vidéo

- La vidéo "Feeding pigs: effect of silage" est disponible sur Organic Farm Knowledge.

Lectures complémentaires

- Früh, Barbara and Mirjam Holinger (2019) Organic Pig Farming: Key Characteristics, Opportunities, Advantages and Challenges. In: *Improving Organic Animal Farming. Burleigh Dodds Series in Agricultural Science*, pp. 287–306., doi:10.19103/as.2017.0028.16
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- Holinger, Mirjam et al. (2015) Improving Health and Welfare of Pigs - A Handbook for Organic Pig Farmers. Research Institute of Organic Agriculture (FiBL), 2015.

Liens Internet

- Des documents complémentaires sont disponibles sur Organic Farm Knowledge website.

A propos de cette fiche pratique et du projet OK-Net EcoFeed

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Site Internet du projet: ok-net-ecofeed.eu

Partenaires du projet: IFOAM EU Group (coordinateur de projet), BE; Aarhus University (ICROFS), DK; Organic Research Centre (ORC), UK; Institut Technique de l'Agriculture Biologique (ITAB), FR; Research Institute of Organic Agriculture (FiBL), CH; Bioland, DE; Associazione Italiana per l'Agricoltura Biologica (AIAB), IT; Donau Soja DS, AT; Swedish University of Agricultural Sciences, SE; ECOVALIA, ES; Soil Association, UK.

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PA022 Blue mussels as feedstuff

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PRACTICE ABSTRACT

Blue mussels as feedstuff

Problem

Organic production should use 100 % organic protein in 2025, but the availability of organic protein is limited.

Solution

Mussel meal can replace other less sustainable protein-rich ingredients, in particular fishmeal, in the diets of organic pigs and layers. Furthermore, mussels can lessen water eutrophication by uptake of nitrogen and phosphorus.

Benefits

Feed intake, weight gain and egg-laying are sustained at normal levels when feeding mussel meal to grower-finisher pigs or layers. Egg quality remains good with a more orange yolk colour compared to feeding fishmeal (Figure 1).

Applicability box

Theme
Processing and handling of harvested feed

Context
Coastal regions

Application time
All year after harvest of blue mussel

Required time
Time of feeding

Period of impact
Immediate impact

Equipment
No special machinery needed for feeding

Best in
Piglets, layers

Practical recommendation

- Mussels are harvested from nutrient-rich water before maturation.
- Mussels are deshelled by boiling, dried and processed into meal with approximately 60 % crude protein.
- Mussel meal is included in the diet at a maximum 8% in layer hen diets to avoid off flavour in eggs (Figure 2).
- No maximum inclusion rate has been established in piglets.
- Diets can be optimised for essential amino acid requirements and will often include less crude protein.

Figure 1: Differences in egg yolk colour. Photo: Marleen van der Heide

Figure 2: Feeding diets with mussel meal to layer hens. Photo: Marianne Hammershøj

Blue mussels as feedstuff. Aarhus University. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

Further information

Further reading

Afrose, S., M. Hammershøj, J. V. Nørgaard, R. M. Engberg, and S. Steenfeldt. 2016. Influence of blue mussel (Mytilus edulis) and starfish (Asterias rubens) meals on production performance, egg quality and apparent total tract digestibility of nutrients of laying hens. Animal Feed Science and Technology 213:108-117. (Article) doi: 10.1016/j.anifeedsci.2016.01.008

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Jönsson, L., H. Wall, and R. Tauson. 2011. Production and egg quality in layers fed organic diets with mussel meal. Animal 5(3):387-393.

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Wallenbeck, A., M. Neil, N. Lundeheim, and K. Andersson. 2014. Mussel meal diets to growing/finishing pigs: influence on performance and carcass quality. In: Book of Abstracts of the 65th Annual Meeting of the European Federation of Animal Science, p 249.

Weblinks

- Check the Organic Farm Knowledge platform for more practical recommendations.

About this practice abstract and OK-Net EcoFeed

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FICHE PRATIQUE

La moule, matière première pour l'alimentation des porcs et pondeuses

Problème

La production biologique devra utiliser 100% de protéines d'origine biologique d'ici 2022, mais la disponibilité de ces protéines biologiques est limitée.

Solution

La farine de moules peut remplacer certaines matières premières riches en protéines moins durables dans l'alimentation des porcs et pondeuses biologiques, comme la farine de poisson (issue de pêche durable). En outre, les moules peuvent réduire l'eutrophisation des eaux par l'absorption d'azote et de phosphore.

Bénéfices

La consommation d'aliments, le gain de poids et la ponte sont maintenus à des niveaux normaux lorsqu'on donne de la farine de moules à des porcs en croissance / finition ou à des poules pondeuses. La qualité des œufs reste bonne, avec un jaune de couleur plus orangée que dans le cas d'une utilisation de farine de poisson (figure 1).

Mise en oeuvre

Thème

Porcs, poules pondeuses

Couverture géographique

Régions côtières

Période d'application

Toute l'année après récolte de moules

Temps requis

Temps consacré à l'alimentation

Délai d'impact

Impact immédiat

Equipement

Aucun matériel spécifique n'est nécessaire pour l'alimentation

Efficacité maximale

Porcelets, poules pondeuses

Recommandations pratiques

- Les moules sont récoltées dans une eau riche en nutriments avant leur maturation.
- Elles sont décoquillées par ébullition, séchées et transformées en farine contenant environ 60 % de protéines brutes.
- La farine de moules est incorporée dans l'alimentation des poules pondeuses à hauteur de 8 % maximum afin d'éviter les défauts de goût des œufs.
- Aucun taux d'incorporation maximal n'a été établi pour les porcelets.
- Les aliments peuvent être optimisés sur l'équilibre en acides aminés essentiels et contiennent souvent moins de protéines brutes.

Figure 1: Différences de couleurs entre jaunes d'œufs. Photo: Marleen van der Heide

Figure 2: Alimentation de poules pondeuses avec de la farine de moules. Photo: Marianne Hammershøj

Aarhus University. La moule, matière première pour l'alimentation des porcs et pondeuses. Fiche pratique OK-Net EcoFeed.

FICHE PRATIQUE

Pour plus d'informations

Lectures complémentaires

Afrose, S., M. Hammershøj, J. V. Nørgaard, R. M. Engberg, and S. Steenfeldt. 2016. Influence of blue mussel (Mytilus edulis) and starfish (Asterias rubens) meals on production performance, egg quality and apparent total tract digestibility of nutrients of laying hens. Animal Feed Science and Technology 213:108-117. (Article) doi: 10.1016/j.anifeedsci.2016.01.008

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Liens Internet

- Des documents complémentaires sont disponibles sur Organic Farm Knowledge website.

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PA023 Seaweed as feed supplement

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PRACTICE ABSTRACT

Seaweed as feed supplement

Problem

The growth and health of piglets is reduced directly after weaning because of high incidence of diarrhoea.

Solution

Feeding low doses of seaweed to piglets may positively affect gut health and reduce diarrhoea. It will also supply several minerals.

Benefits

Polysaccharides in seaweeds can have antimicrobial, prebiotic or immunomodulatory effects, alleviating negative effects linked to weaning.

Practical recommendation

- Effectivity might differ depending on the seaweed type, harvest season and processing method. Brown and red seaweed species may be better than green (Figure 1).
- Several commercial seaweed products can be used, and it is important to ask for documentation of effect before relying on e.g. effect on diarrhoea.
- High levels of macro and micro minerals have to be taken into account when composing diets with seaweed.
- Many seaweed extracts are available, which may not be suitable for organic production.

Applicability box

Theme

Processing and handling of harvested feed

Context

Coastal regions

Application time

All year

Required time

Time of feeding

Period of impact

Immediate

Equipment

No extra equipment needed for feeding

Best in

Brown seaweeds

Figure 1: Brown seaweed, sugar kelp. Photo: Annette Bruhn

Figure 2: Organic piglets may benefit from seaweed. Photo: Jan Værum Nørgaard

Aarhus University. Seaweed as feed supplement. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

Further information

Further reading

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Weblinks

- Check the Organic Farm Knowledge platform for more practical recommendations.

About this practice abstract and OK-Net EcoFeed

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FICHE PRATIQUE

Les algues marines comme complément alimentaire

Problème

La croissance et la santé des porcelets se dégradent juste après le sevrage en raison de l'impact élevé des diarrhées.

Solution

Donner de faibles doses d'algues aux porcelets peut avoir un effet positif sur la santé intestinale et réduire les diarrhées. Cela apporte également divers minéraux.

Bénéfices

Les polysaccharides présents dans les algues marines peuvent avoir des effets antimicrobiens, prébiotiques ou immunomodulateurs, qui atténuent les effets négatifs liés au sevrage.

Recommandations pratiques

- L'efficacité peut varier selon le type d'algue, la saison de récolte et la méthode de traitement. Les espèces d'algues brunes et rouges semblent plus efficaces que les vertes (Figure 1).
- Plusieurs produits commerciaux à base d'algues marines peuvent être utilisés. Il est important de consulter une documentation sur leurs effets avant de s'en servir, par exemple, pour lutter contre la diarrhée.
- Les niveaux élevés de macro et micro minéraux doivent être pris en compte lorsqu'on formule des aliments contenant des algues.
- Il existe de nombreux extraits d'algues pouvant ne pas être adaptés à la production biologique.

Mise en oeuvre

Thème

Porcs, bovins

Couverture géographique

Régions côtières

Période d'application

Toute l'année

Temps requis

Temps consacré à l'alimentation des porcs

Délai d'impact

Immédiat

Equipement

Aucun équipement spécifique nécessaire

Efficacité maximale

Algues marines brunes

Figure 1: Algues brunes, varechs. Photo: Annette Bruhn

Figure 2: Les porcelets biologiques peuvent tirer profit des algues marines. Photo: Jan Værum Nørgaard

Aarhus University. Les algues marines comme complément alimentaire. Fiche pratique OK-Net EcoFeed.

FICHE PRATIQUE

Informations complémentaires

Lectures complémentaires

- Dierick, N., A. Ovyn, and S. De Smet. 2009. Effect of feeding intact brown seaweed Ascophyllum nodosum on some digestive parameters and on iodine content in edible tissues in pigs. Journal of the Science of Food and Agriculture 89(4):584-594. (Article) doi: 10.1002/jsfa.3480
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- Michiels, J., E. Skrivanova, J. Missotten, A. Ovyn, J. Mrazek, S. De Smet, and N. Dierick. 2012. Intact brown seaweed (Ascophyllum nodosum) in diets of weaned piglets: effects on performance, gut bacteria and morphology and plasma oxidative status. Journal of animal physiology and animal nutrition 96(6):1101-1111.

Lien Internet

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PA024 Single-phase feeding and compensatory growth in growing and finishing pigs

PRACTICE ABSTRACT

Single-phase feeding and compensatory growth in growing and finishing pigs

Problem

Meeting growing pigs' nutrient requirements with on-farm-produced cereals and protein feed ingredients can be hard. To overcome the risk of undersupplying pigs with amino acids, diets are formulated with higher contents of protein than recommended. With 100 % organic feedstuffs, it is difficult to match the amino acid requirement without a very high level of protein. This can decrease the health and welfare of weaners and increase nitrogen losses.

Solution

A single-phase feeding strategy and utilising pigs' capacity for compensatory growth (Figure 2) can lessen the need for diets with high protein and amino acid content in the early stage of the growing phase. It can promote the use of locally produced protein feed resources in diets to organic pigs.

Benefits

Single-phase feeding of pigs followed by growth compensation might reduce nitrogen emissions, as it excludes the need for a high protein and amino acid content in the diet in the early stages of growth. It enables efficient use of locally produced protein feed resources and can reduce soya intake by pig and simplify feed manufacturing, feed handling and diet formulation at the farm level. This practice can reduce the cost of the feed for the weaners.

Applicability box

Theme
Pigs, feeding and ration planning

Geographical coverage
Global

Application time
All year round

Required time
Growing/finishing period

Period of impact
All year round

Equipment
Feed ration planning

Best in
Growing/finishing period

Figure 1: Growing finishing pigs: Photos: Magdalena Presto Åkerfeldt, SLU

Swedish University of Agricultural Sciences. Single-phase feeding and compensatory growth in growing and finishing pigs.
OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

Practical recommendation

- Limit the supply of essential amino acids during early growth and utilise the pigs' capacity to fully compensate for the restriction by increased protein retention and faster growth during later growth phases.
- Crude protein and lysine contents can be substantially reduced, below common standards (i.e. crude protein to 16.5% and digestible lysine between 0.70-0.80 g standardised ileal digestible (SID) lysine/MJ NE), in well-balanced diets.
- A reduction in crude protein content, from 15.5 to 14.5 g SID/g SID lysine can lower the nitrogen output by approximately 10%.
- Formulate diets on a digestible amino acid basis rather than on a total amino acid or crude protein basis.
- High-quality protein feed ingredients such as faba beans, peas, oil seed-, dairy- and cereal-based by-products, aquatic resources, etc., or a combination of them, can be used.
- At the pig level, this practice can reduce soya bean cake utilisation (14%) and increase pea utilisation (22%).
- Careful follow-up of the pigs' feed consumption, growth and health status is recommended.

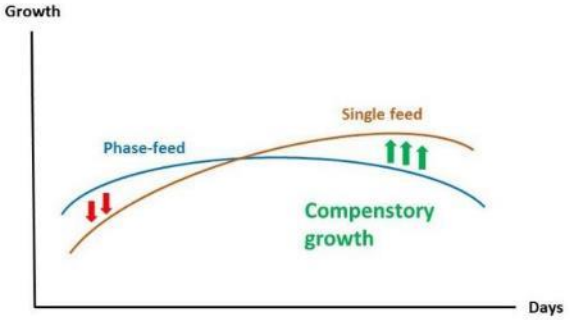

Figure 2: Pigs can compensate for a limited supply of amino acids during early growth, followed by excess dietary amino acids and faster growth during later growth phases. Illustration: Leif Göransson, modified by Magdalena Presto Åkerfeldt

Further information

Further reading

- Presto Åkerfeldt, M. and L. Göransson (2019). Effects of using locally produced protein feed ingredients in low protein diets to single-phase-fed growing-finishing pigs. Acta Agriculturae Scandinavica, Section A - Animal Science, 68 (3), 134-141. https://doi.org/10.1080/09064702.2019.1657175.
- Presto Åkerfeldt, M. and J.E. Lindberg, L. Göransson, K. Andersson (2019). Effects of reducing dietary content of crude protein and indispensable amino acids on performance and carcass traits of single-phase- and 2-phase-fed growing-finishing pigs. Livestock Science 224, 96-101. https://doi.org/10.1016/j.livsci.2019.04.014.

Weblinks

- Check the Organic Farm Knowledge platform for more practical recommendations on pigs as well as feeding and ration planning.

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PRACTICE ABSTRACT

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PA025 Using raw soya beans with reduced content of trypsin inhibitors in organic pig fattening

PRACTICE ABSTRACT

Using raw soya beans with reduced content of trypsin inhibitors in organic pig fattening

Problem

Soya beans naturally contain inhibitors that reduce the digestibility of protein. These components are deactivated by heat (e.g., toasting) to enable feeding to monogastrics. Meaningful reductions can be achieved through the selective breeding of soya bean varieties with a low content of these inhibitors. Currently there is little knowledge in Europe available about the potential of these varieties in organic pig fattening.

Solution

Evidence from recent trials in Austria indicate that raw soya beans with reduced content of trypsin inhibitors can be used in pig feeding. This Practice Abstract outlines key points which are essential to maintain a favourable growth performance.

Benefits

Successful use of raw soya beans with reduced content of trypsin inhibitors enables farms to become more independent in their feed supply. Costs for thermal treatment can be saved.

Applicability box

Theme
Processing and handling of harvested feed

Geographical coverage
For all farms where soya can be grown

Application time
On demand

Required time
Time for sample collection, posting to laboratory and interpretation of testing reports should be accounted. Preparation of feed ration.

Equipment
Sample bags and standard lab equipment

Best in
Farms with animal husbandry and arable production

Ripe soya bean pod. Photo: Donau Soja

Special soybean varieties with reduced trypsin inhibitor content can be included without heat treatment in the ration. Photo: FiBL

Practical Recommendations

Soya bean cultivars differ in their trypsin-inhibitor content which is measured as trypsin-inhibitor activity (TIA). The soya bean variety "Xonia" is special due its reduced TIA content.

- Raw soya beans of standard varieties contain about 30-50 mg TIA/g soya bean
- TIA content in soya bean varieties with low content is about 10 mg, although current trials indicate that the TIA content can differ significantly between batches. (example: Xonia)

Using raw soya beans with reduced content of trypsin inhibitors in organic pig fattening. Donau Soja. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

The following recommendations were derived from feeding tests in Austria during 2017 - 2020.

- Since the TIA value differs between batches, the TIA of all available batches of raw/untreated soya beans must be known to adjust the ration.
- Recent trials indicate that a mixing rate of more than than 10% raw "Xonia" soybeans in rations of organic pigs can result in significant reduction in feed intake, weight gain and feed conversion ratio. If higher quantities of raw Xonia are used, economic disadvantages must be expected, especially due to higher feeding costs and a lower number of fattened pigs per year.
- When using whole soya beans, special care must be taken to ensure that there is no energy surplus so that an adequate protein-energy balance is achieved.
- For achieving a satisfying lean meat quality the content of polyenoic acids in the ration should be carefully managed.

Outlook

Further breeding progress is needed to increase the use of raw soya beans without thermal treatment. As any heat treatment also leads to damage of the amino acids and thus reduces their availability to the animal, further work should be done on the potential of trypsin inhibitor reduced soya bean varieties

Further information

Further reading

In Central Europe, research teams in Austria and Germany are conducting feeding trials with pigs and poultry on the effects of soya bean feed with high and low TIA values:

- University of Natural Resources and Life Sciences, Vienna (BOKU). Institute of Animal Nutrition, Livestock Products, and Nutrition Physiology (TTE). Contact person: Prof. Wolfgang Wetscherek
- Agricultural Chamber of Lower Austria. Contact person: Helmut Raser
- Bavarian State Research Center for Agriculture (LfL). Institute for Agricultural Engineering and Animal Husbandry. Contact person: Stefan Thurner
- University of Rostock. Department for Nutritional Physiology and Animal Nutrition. Contact persons: Dr Reinhard Puntigam and Dr Julia Slama

Weblinks

- AGES - Austrian Agency for Health and Food Safety. AGES offers an evaluation of feed tests and is capable of analysing also trypsin inhibitor activity. Further information on the AGES website: www.ages.at/en

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PA026 Recommendations for using soy-based feedstuffs for poultry production

PRACTICE ABSTRACT

Recommendations for using soy-based feedstuffs for poultry production

Problem

Soya is one of the most important sources of protein in poultry feeding. However, the high crude protein content alone is not sufficient to meet the special needs of poultry on essential amino acids. They need to be supplemented with other components to get optimal amounts and ratios.

In poultry, the feeding of raw soya beans is not possible due to digestive inhibiting components (trypsin inhibitors), and must be prepared by thermal treatment.

Soya beans have a very high oil content. Full-fat beans can therefore be used in the ration with a maximum of 10 - 12 %. In this case, the methionine-rich components such as corn gluten must also have a low raw fat content. A high raw fat content in the ration can lead to health problems.

Applicability box

Theme
Processing and handling of harvested feed

Context
Climatic conditions, variety and the degree of ripeness appropriate to the location are determining

Application time
Year-round use in animal feeding

Required time
Output spectrum for toasting from 100-1,000 kg/h

Period of impact
Permanent

Equipment
Toaster and press

Best in
Own cultivation and use at the farm

Solution

Toasting, or roasting, the raw bean improves the digestibility and usability of the protein and extends the shelf life of the toasted beans to approximately 6-12 months. Toasting, or roasting, means the deactivation of the anti-nutritional factors (ANF) of the soya bean by heating.

Figure 1: Mobile toaster – Möhler Technik.
Source: Möhler Technik, https://mobilersojatoaster.de

Figure 2: Mobile Toaster - Eco Toast EST GmbH. Source: http://www.sojatoaster.com/referenzen-sicherung

PRACTICE ABSTRACT

There are different toasting, or roasting, methods with different effects on the quality of the soya. For the mobile solutions (figures 1 and 2), the thermal method is predominantly used.

In order to increase the quantity used from about 10 % to about 20 % in the ration, the soya bean must be de-oiled by pressing, which reduces the crude fat content from about 20 % to about 10 %.

Since synthetic amino acids may not be used in organic farming, the ration must be supplemented with components with a high methionine content. In 100% organic rations (check Table 1) rice protein or methionine-rich oil cakes such as sesame cake and sunflower cake are used for this purpose. Especially in oil cakes, the ingredients are subject to strong fluctuations. It is recommended to use several components. This reduces the influence of individual components on the total ration. Alternatively, a protein supplement can be used, which can also be individually mixed by the feed mills if sufficient quantities are required.

Benefits

- Soya can be very well integrated into crop rotation and can cover up to 80 % of the N requirement by inoculating the seed with N-fixing nodule bacteria (*Bradyrhizobium japonicum*).
- High added value through refinement in own plant. Soya contains a lot of energy and protein. It is very tasty for the animals and easy to digest. The high content of linoleic acid has a positive effect on the egg size of laying hens.
- Dependence on soya imports can be reduced
- The pressed oil can be sold for further use.

Practical recommendation

- Soya toasting and de-oiling is now well established and the process steps are defined (temperature and duration), but availability of mobile soya toasting plants must be ensured.

Table 1: Typical ration for 100 % organic feeding of laying hens (Christopher Lindner)

Components	Share	Ingredients										Blend
	%	ME	Protein	Fat	Fibre	Lys	Met	Trp	Ca	P	Na	2,000
		MJ	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*kg*
Corn	20.00	2.88	1.78	0.80	0.50	0.05	0.04	0.01	0.01	0.06	0.00	400
Wheat	20.00	2.30	2.12	0.32	0.52	0.06	0.03	0.03	0.01	0.07	0.00	400
Milled grass	6.40	0.35	0.90	0.19	1.28	0.04	0.01	0.02	0.06	0.02	0.01	128
Wheat gluten	1.80	0.14	0.57	0.12	0.13	0.01	0.01	0.01	0.01	0.02	0.00	36
Peas	8.30	1.05	1.68	0.11	0.46	0.13	0.02	0.02	0.01	0.04	0.00	166
Soya oil	1.60	0.59	0.00	1.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32
Feed lime	7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.86	0.00	0.00	150
Premix	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.24	0.17	44
Sunflower cake peeled	14.00	1.19	3.81	1.53	3.63	0.14	0.08	0.09	0.05	0.05	0.00	280
Rape seed cake	5.00	0.56	1.36	0.55	0.62	0.05	0.03	0.03	0.02	0.02	0.00	100
Soya cake	11.30	1.23	4,80	1,02	0,62	0,29	0.07	0.06	0.03	0.07	0.00	226
Sesame cake	1.90	0.15	0.93	0.72	0.11	0.02	0.02	0.00	0.00	0.00	0.00	38
Content in compound feed	**100.00**	**10.43**	**17.94**	**6.86**	**8.55**	**0.78**	**0.31**	**0.26**	**3.60**	**0.59**	**0.18**	**2,000**
Target values		10,5 11	17.50	6.00	5.00	0.80	0.32	0.17	3.70	0.54	0.18	

Abbreviations: ME = Metabolizable Energy; MJ = Megajoule; Lys = Lysine; Met = Methionine; Trp = Tryptophan; Ca = Calcium; P = Phosphorus; Na = Natrium (Sodium)

Protein, Fat, Fibre = indicated in crude

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PRACTICE ABSTRACT

Further information

Video

- Check the video "Sojabohnen-Toaster + Ölpresse für die Landwirtschaft" (German)

Weblinks

- Different soy processing intensities - sequences for the mast (German)
- Check the Organic Farm Knowledge platform for more practical recommendations.
- Web pages of manufacturers: Effizient Soja Toasten and Mobiler Sojatoaster

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PA027 Recommendations for using soya-based feedstuffs in pig husbandry

PRACTICE ABSTRACT

Recommendations for using soya-based feedstuffs in pig husbandry

Problem

Soya beans are rich in protein with a valuable composition of amino acids but also contain anti-nutritive substances (trypsin inhibitors) and approximately 20 % fat, which can limit the applicability in organic pig husbandry.

Solution

If soya beans are pressed and heat treated, the products can be used in organic feed rations for pigs. Critical points in ration planning must be considered to achieve a high meat quality.

Benefits

Short soya supply chains are in line with the principles of organic agriculture and help to enable farmers to meet requirements of organic farming regulations or private labelling systems.

Practical recommendation

- Soya beans need to be heat treated to enable digestion by pigs or poultry. Professional processing technology is required to apply a heat treatment of the right quality and intensity. This is essential to preserve protein quality.
- De-fatting of soya beans helps to increase shelf life and the amount that can be fed to sows, piglets and pigs. A mechanical press reduces the fat content down to approximately 7-10%, see table 1. The product is called soya cake (see figure 1). Before feeding it to pigs, it needs to be heat treated.

Applicability box

Theme

Pigs; Feeding and ration planning

Context

For all livestock farms which have access to regionally grown organic soya feedstuff

Application time

Any time

Required time

Time needed to feed pigs

Period of impact

Immediate impact

Equipment

Special equipment is needed to process soybeans into feed. Further equipment on-farm for storage and mixing is needed.

Best in

Farms with pig production in proximity to soya production

Figure 1: Soya cake. Photo: Donau Soja

Recommendations for using soya-based feedstuffs in pig husbandry. Donau Soja. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

- Soya cake or full-fat soya beans are best in growth phases with high energy needs: nursing sows, rearing piglets and in the first fattening phase (share in total feed <15 % DM), see table 2.
- The fat of soya beans contains relatively high levels of polyene fatty acids. For achieving lean meat of high quality, the use of soya cake is limited during the final fattening phase (approximately 5 % of DM). Full-fat soybeans should be avoided during this phase.
- If soya cake is the main protein feed during the fattening period, the share of corn should be lower than 20 %. Otherwise, lean meat of high quality is not achievable.

Table 1: Average composition of soybean feedstuff. Source: ITAB

Values based on fresh matter	Soybean toasted	Soya cake toasted
Dry matter	90.7 %	94.4 %
Crude protein	37.6 %	46.2 %
Crude fibre	4.2 %	5.9 %
Fat	17.5 %	8.7 %
Energy	4990 kcal/kg	4780 kcal/kg
Net energy pig	2650 kcal/kg	2470 kcal/kg
Metabolizable energy broiler	3170 kcal/kg	2870 kcal/kg
Lysine	23.4 g/kg	26 g/kg
Threonine	15.1 g/kg	17.9 g/kg
Methionine	5.4 g/kg	6.6 g/kg
Cysteine	5.6 g/kg	7.2 g/kg
Methionine + cysteine	11 g/kg	13.8 g/kg
Tryptophan	4.8 g/kg	6.3 g/kg

Table 2: Recommendations for using soya feed in organic pig husbandry. Source: BioAustria 2011, see weblinks

% of DM in feed	Piglets	Sows		Fattening	
		Pregnant	Nursing	Start	Finish
Soybeans heat-treated	10	5	10	10	5
Soya cake heat-treated, de-fattened	15-20	5	15	10-15	5-10

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PRACTICE ABSTRACT

Further information

Further reading

- For more practice abstracts on organic pig husbandry, go to the Organic Farm Knowledge platform > Search Toolbox > Select "By type: Practice Abstracts" and "By theme: Pigs"
- For more practice abstracts from Donau Soja, go to the Organic Farm Knowledge platform > Search Toolbox > Select "By institution: Donau Soja"
- Bernet T, Recknagel T, Asam T, Messmer M (2016): Biosoja aus Europa. Empfehlungen für den Anbau und den Handel von biologischer Soja in Europa. Research Institute of Organic Agriculture (FiBL), Frick.
- Further information on organic farming can be found on the Organic Farm Knowledge platform.

Weblinks

- LFI Oberösterreich, BioAustria, LFZ Raumperg-Gumpenstein, LK OÖ, 2011. Bio-Schweinefütterung. Linz, Austria. (German)
- Website of the Bavarian State Research Center for Agriculture (LfL) (German)

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FICHE PRATIQUE

Recommandations pour l'utilisation du soja en élevage porcin

Problème

Les graines de soja sont riches en protéines, ont un profil intéressant en acides aminés, mais contiennent également des facteurs antinutritionnels (inhibiteurs de trypsine) et environ 20 % de matières grasses, ce qui peut limiter leur utilisation en élevage biologique de porcs.

Solution

Si les graines de soja sont pressées et traitées thermiquement, elles peuvent être utilisées dans les aliments biologiques pour les porcs. Une certaine vigilance s'impose dans la gestion de l'alimentation pour obtenir une viande de la qualité désirée.

Bénéfices

L'approvisionnement local en soja est conforme aux principes de l'agriculture biologique et contribue à satisfaire les exigences de la réglementation sur l'agriculture biologique ou des labellisations privés.

Recommandations pratiques

- Les graines de soja doivent être traitées thermiquement pour permettre une bonne valorisation par les porcs ou les volailles. Une technologie professionnelle de transformation est nécessaire pour appliquer un traitement thermique de qualité et d'intensité appropriées, essentiel pour préserver la qualité des protéines.
- Le déshuilage des graines de soja (obtention d'un tourteau, Cf. Figure 1) permet d'augmenter la durée de conservation et la quantité distribuée aux truies, porcelets et porcs. Une presse mécanique réduit la teneur en matières grasses à environ 7-10 % (Cf. Tableau 1). Le tourteau obtenu doit-être traité thermiquement avant distribution aux porcs

Mise en oeuvre

Thème

Porcs, alimentation et plan de rationnement

Contexte

Adapté à tous les élevages ayant accès à du soja produit dans la région.

Période d'application

Toute l'année

Temps requis

Temps nécessaire à l'alimentation des porcs

Délai d'impact

Impact immédiat

Equipement

Equipement spécifique nécessaire pour le traitement des graines de soja. Equipement complémentaire nécessaire dans les élevages pour le stockage des matières premières et la fabrication des aliments.

Efficacité maximale

Elevages de porcs à proximité de zones de production de soja.

Figure 1: Tourteau de soja. Photo: Donau Soja

Donau Soja. Recommandations pour l'utilisation d'aliments à base de soja dans l'élevage des porcs. Fiche pratique OK-Net EcoFeed.

FICHE PRATIQUE

- Les tourteaux de soja ou les graines de soja entières sont les plus efficaces pour les phases de croissance à besoins énergétiques élevés : truies allaitantes, porcelets en post-sevrage et première phase d'engraissement (part dans l'alimentation totale <15 % de MS) : Cf. tableau 2.
- La matière grasse des graines de soja contient des taux relativement élevés d'acides gras polyènes. Pour obtenir une viande maigre de haute qualité, l'utilisation du tourteau de soja est limitée pendant la phase de finition (environ 5 %), et l'utilisation de graines de soja entières est proscrite.
- Si le tourteau de soja est la principale matière première protéique pendant la période d'engraissement, la part du maïs doit être inférieure à 20 %. Dans le cas contraire, il n'est pas possible d'obtenir une viande maigre de haute qualité.

Tableau 1: Composition moyenne de matières premières issues de soja.
Source: ITAB

Valeurs basées sur la matière fraîche	Soja toasté	Tourteau de soja toasté
Matière sèche	90.7%	94.4%
Protéines brutes	37.6%	46.2%
Fibres brutes	4.2%	5.9%
Matière grasse	17.5%	8.7%
Energie	4990 kcal/kg	4780 kcal/kg
Energie nette porcs	2650 kcal/kg	2470 kcal/kg
Energie métabolisable poulets de chair	3170 kcal/kg	2870 kcal/kg
Lysine	23.4 g/kg	26 g/kg
Thréonine	15.1 g/kg	17.9 g/kg
Méthionine	5.4 g/kg	6.6 g/kg
Cystéine	5.6 g/kg	7.2 g/kg
Méthionine + cystéine	11 g/kg	13.8 g/kg
Tryptophane	4.8 g/kg	6.3 g/kg

Tableau 2: Recommandations pour l'utilisation de soja dans l'alimentation des porcs biologiques.
Source: BioAustria 2011, voir les liens Internet

% de MS dans l'aliment	Porcelets	Truies		Porcs en engraissement	
		Gestantes	Allaitantes	Croissance	Finition
Graines de soja Traité thermiquement	10	5	10	10	5
Tourteau de soja Traité thermiquement, déshuilé	15-20	5	15	10-15	5-10

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FICHE PRATIQUE

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- Retrouvez d'autres fiches pratiques sur l'élevage des porcs biologiques sur la plateforme Organic Farm Knowledge > Chercher > Sélectionner "Par type: Practice Abstracts" et "Par thème: Porcins"
- Retrouvez d'autres fiches pratiques de Donau Soja sur la plateforme Organic Farm Knowledge > Chercher > Sélectionner "By organisation: Donau Soja"
- Bernet T, Recknagel T, Asam T, Messmer M (2016): Biosoja aus Europa. Empfehlungen für den Anbau und den Handel von biologischer Soja in Europa. Research Institute of Organic Agriculture (FiBL), Frick.
- Des informations complémentaires sur l'agriculture biologique sont disponibles sur la plateforme Organic Farm Knowledge

Liens Internet

- LFI Oberösterreich, BioAustria, LFZ Raumperg-Gumpenstein, LK OÖ, 2011. Bio-Schweinefütterung. Linz, Austria. (Allemand)
- Site Internet de Bavarian State Research Center for Agriculture (LfL) (Allemand)

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Site Internet du projet: ok-net-ecofeed.eu

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PA028 Sunflower oil cake

PRACTICE ABSTRACT

Sunflower oil cake

Problem

Sunflower oil cake is a high protein and fat feed source for livestock. It is a by-product obtained from the extraction of oil from sunflower seeds. It can be obtained by mechanical pressing resulting in a „cake" (see Figure 1) containing 15-20 % oil or by solvent, which increases the quantity of oil. In organic farming, oil may only be extracted by mechanical pressing.

The quality of the oil depends on plant characteristics and on the processing.

Solution

The quality of the product can be increased by first de-hulling the seeds. This improves the pressing capacity as well as the oil and meal quality. Mechanical extraction is used by producers of speciality oils and smallholder farmers in both developed and developing countries.

Applicability box

Theme

Processing and handling of harvested feed

Context

Global, dry climate

Application time

After harvesting

Required time

It depends on the press machine.

Period of impact

Sequential cropping

Equipment

Oil press

Benefits

An advantage over soybean is that is generally not genetically modified so it is easier to include in organic feeding. Sunflowers can be included in the crop rotation (Pantipa Na Chiangmai et al., 2014).

Practical recommendation

Oil presses are used for the mechanical extraction of oil from oilseed crops. The procedure to obtain oil cake is as follows:

- The seeds are delivered to the press where they are crushed and squeezed.
- Under pressure, the oil leaks through the press holes and gathers into the oil repository underneath the press.

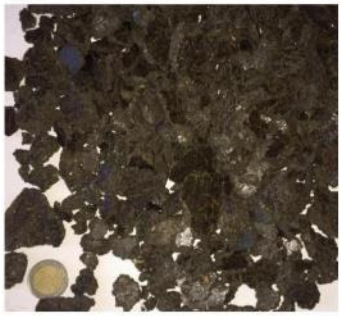

Figure 1: Organic sunflower oil cake. Picture: Savi Italo at saviitalosrl.com

Chemical characteristics of sunflower oil cake - Data Sheet

Analysis	Range	Unit of measurement
Moisture	10-12	%
Protein	26-29	%
Fat	11-13	%
Ash	4-5	%
Fibre	23-26	%

Figure 2: Technical sheet of organic sunflower oil cake. Source: Savi Italo at saviitalosrl.com

Sunflower oil cake. Associazione Italiana per l'Agricoltura Biologica (AIAB). OK-Net EcoFeed Practice Abstract.

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- The oil is filtered to remove any solids, which are then cleaned of unwanted substances.
- Together with the oil, an oil-rich press cake is produced.
- After the oil cake has been removed from the press, it is cooled down. It can be stored for up to 3 months.
- This procedure is a current processing technique that produces a good quality oil cake (see Table 1).

In terms of feeding, sunflower oil cake plays an important role in monogastric diets due to its high methionine content, similar to soy cake. It has a high fiber content; the well-structured raw fibre has a positive dietary effect on pigs. Its use in the finishing phase has to be limited because of the relatively high proportion of polyphenolic acids (PUFA), which can lead to an undesirable soft fat consistency in the carcass if the dosage is too high.

Further information

Video

- The video "Oil press SP-1000 2015" at shows the process of oil extraction and cake production.

Further readings

- Heuzé V., Tran G., Hassoun P., Lessire M., Lebas F. (2019): *Sunflower meal.* Feedipedia, a programme by INRA, CIRAD, AFZ and FAO. Available at https://www.feedipedia.org/node/732. *Last updated on September 25, 2019, 14:17*
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Weblinks

- Website of the oil press supplier Bronto with a selection of presses.

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PA029 Guide for farms to plan small scale soya bean processing equipment

PRACTICE ABSTRACT

Guide for farms to plan small scale soya bean processing equipment

Problem

Soya beans are rich in proteins but also contain anti-nutritive substances, which require processing prior to feeding to pigs or poultry. Designing an adequate processing system for a farm is challenging because a range of factors need to be considered together: profitability, time efforts, needs of livestock, and consumers.

Solution

Various technological design solutions exist for on-farm processing systems and are adaptable according to a farm's needs.

Benefits

Using processing equipment for home-grown soya beans can increase and retain the value created on the farm.

Practical recommendation

Applicability box

Theme
Processing and handling of feed

Context
For all livestock farms which have access to regionally grown soya beans

Application time
Any time

Required time
Processing time varies. It is usually less than 1 hour.

Period of impact
Any time; before purchasing equipment

Equipment
Special equipment is needed to process soya beans into feed.

Best in
Livestock farms within proximity to soya production

The core of the processing facility is equipment which serves the purpose to convert raw soya beans into a digestible form via heat treatment.

The required processing can be achieved through different technological procedures (see overview in Table 1).

First step: Economic assessment

- Is the consumption of soya products on my farm sufficient to achieve a return on investment within a reasonable period? A reference example for on-farm soya bean processing infrastructure in Austria and Germany are farms operating with an annual consumption of minimum 70-100 tons of soya beans. For organic farms, profitability can start around 50 tons per year already
- Conduct a cost-benefit calculation for the whole processing equipment system. Cost factors to be included: depreciation of the equipment, energy costs per unit of output, maintenance costs per unit of output unit and time efforts for maintenance, processing and supervision. When processing equipment is operating only in small batches and with many breaks, the machinery is operating on a below average efficiency. Full energy efficiency as listed by the manufacturer might not be achieved. It is

Photo 1: Toasting technology treats soya beans with steam or hot air. Photo: EST GmbH

Guide for farms to plan small scale soya bean processing equipment. Donau Soja. OK-Net EcoFeed Practice Abstract.

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like driving a car. Stop and go traffic is less efficient than a continuous drive.

Economic benefit factors: market value of the derived product. The market price for soya feed products can vary significantly over the year. The premium for soya products in non-GM quality ranges in Central Europe from 60-110 EUR during the last years.

Photo 2: Extrusion technology uses a combination of pressure and friction to generate processing temperature. Photo: www.farmet.cz/en

- If a depreciation calculation is not satisfying due to a too small number of operating hours per year, the subsequent follow-up actions can be considered:
  - Implementing the processing facility as a joint project with neighbouring farms
  - Offering processing as a service for others. This can be done either through stationary or mobile solutions.
  - Reconsidering the decision for investing in soya bean processing equipment
- If soya bean processing equipment is used for others as a service, the general legal framework and possible additional requirements of certification schemes must be considered.

Photo 3: Soya bean cake is the product after heat treatment and oil pressing. Before feeding, it is usually mixed with other feed ingredients. Photo: Donau Soja

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Table 1: Selection of manufacturers of processing technology for soya beans. This list covers equipment which is already used by farmers in Central Europe. Links to websites are in 'Further Information'.

Company name, brand	Based	Brief notes on applied procedure
EST, Ecotoast	AT	Throughput performance: approximately 100 - 1000 kg/h Heat treatment for about 40 min* in a container by a hot air fan with recirculated processing air to increase energy efficiency; see photo 1
FARMET, FE-series	CZ	Throughput performance: approximately 100 – 4000 kg/h Heat treatment for about 30 sec* through a press screw generates a temperature of 130 degrees under high pressures (extrusion), see photo 2
OIL PRESS, KKT-series	DE	Throughput performance: approximately 100 - 300 kg/h. Heat treatment for about 20 - 25 min* in a tube by flowing on heat exchange plates.
MECMAR, T-series	IT	Throughput performance: approximately 400 - 6000 kg/h Heat treatment in a container by a hot air fan for about 100 seconds
CIMBRIA, Dantoaster	DK	Throughput performance: approximately 9 tons/h Heat treatment in a container for < 10 min by infra-red radiation
FLORAPOWER Thermo-Major series	DE	Throughput performance: approximately 1000 kg/h Soya beans are moved on conveying screws. Very uniform heat treatment for about 30 - 40 min* through heating screws.
STRECKEL-SCHRADER DWS series	DE	Throughput performance: approximately 3000 – 5000 kg/h Very uniform heat treatment for about 20 - 30 min* by steam

*processing time can differ slightly. Time settings are for example adjusted to moisture content.

Complementary notes to Table 1

- Proper cleaning of soya beans before heat treating is a must.
- Additional pre-conditioning of beans such as moistening, peeling or splitting might be recommended by manufacturers to obtain a better processing performance.
- Availability of technical support by region and language is important for setup, maintenance and handling.
- Comparing processing temperatures among manufacturers can be challenging. Most relevant is the temperature in the core of the bean, but this value can be only estimated. Equally important is that the heat treatment is applied evenly.
- The possibility to manually adjust processing parameters is particularly important if batches of very different qualities are expected.
- Balance of investment and degree of process automatization and effort for supervision.
- Oil presses and additional coolers are optional tools and are commonly used.

Photo 4: Oil presses are common in soya bean processing. In this case, four presses are combined. Photo: Donau Soja

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Second step: When is an oil press advisable?

Using an oil press can reduce the oil content from about 20% in the raw soya bean to approximately 10%. The derived product is called soya bean cake (see photo 3 and 4). Using an oil press allows producers to respond to a diversity of customer needs: soya bean cake stores better and is easier to include in rations than full-fat soya beans.

A further advantage of pressing soya beans is that the resulting oil can be marketed. Possible applications are as feed or as a raw material in the food industry. It is common to sell soya bean oil in bottles for use in the kitchen, see photo 5. Cold pressed soya bean oil is suitable for frying or baking. It contains a high proportion of healthy polyunsaturated omega 3 fatty acids.

Photo 5: Soya bean oil Photo: www.troadoa.at

Further information

Reference and recommended literature

Organic Farm Knowledge provides access to further literature: *Soya processing technology, FiBL Germany, 2014.*

Weblinks to manufacturers of soya bean processing technology

- EST GMBH, www.sojatoaster.com
- FARMET, www.farmet.cz/en
- OIL PRESS, www.oelpresse.de
- MECMAR, www.mecmargroup.com/en
- CIMBRIA, www.cimbria.com
- FLORAPOWER, www.florapower.de
- STECKEL-SCHRADER, www.streckel-schrader.com
- RAINER AND JÜRGEN MÖHLER, mobile toasting technology, www.sojatoasten.de
- SCHNUPP'S GRAIN ROASTING, www.roast-a-matic.com
- ROASTEC FORCED CONVECTION ROASTING, www.roastech.com
- DILTS-WETZEL MANUFACTURING CO., www.diltswetzel.com

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PA030 Okara: Including a soya by-product into the poultry diet

PRACTICE ABSTRACT

Okara: Including a soya by-product into the poultry diet

Problem

The inclusion of soya meal into the poultry diet is relevant, as a source of high quality protein. However, as soya is planted for both human and animal consumption, the cost is high.

Solution

The production of tofu and soymilk generates okara as a waste product which can be added fresh or dried, to poultry rations, reducing both soya meal inclusion and costs. Due to its high fibre content, the amount of okara in the diet should be limited to avoid a decrease in feed intake.

Benefits

The inclusion of okara in the poultry diet has several advantages. The main advantage is related to sustainability, due to the fact that a by-product is used and not wasted. The second advantage is a reduced dependency on soya meal as a source of protein and amino acids. Finally the decrease in soya meal results in a lower cost of feed.

Applicability box

Theme
Processing and handling of harvested feed

Geographical coverage
Global

Application time
Related to the tofu and soymilk production

Required time
A few days related to the supply

Period of impact
All the year

Equipment
Storage, mixer

Best in
Ration planning, reducing soya meal and feed cost

Practical recommendation

- Due to its chemical and amino acid composition (Table 1 and 2), Okara can be used in different ways in the poultry diet. A possible use is to include okara in the starting and growing phases (from the 1st to 21st day). Another possibility is to feed okara from week 1 to slaughtering time. Okara inclusion replacing soyameal quantity from 25 to 75 % in the diet, will not affect feed intake or mortality, and it will reduce ration cost and achieve comparable daily body weight gains, to 100 % soya diets. However, due to the high fibre content, overfeeding Okara, could decrease feed intake and performance (Motawe et al., 2012).
- The composition of Okara ranges between 20 % and 47.3 % protein and 9.3 % and 22.3 % fats. It contains high amounts of isoflavones and the polyunsaturated fatty acids, linolenic acid, and linoleic acid (O'Toole 1999; Bowles and Demiate 2006). The energy content is also important to ensure weight gain from day 1 to 21 (Table 3).
- According to Rostagno et al. (2011), the okara digestibility of crude protein (CP), amino acids (AA) and lipids is higher than that of soya. In particular, okara CP has a higher digestibility of around 99.6% instead of 91% . Protein content, protein efficiency coefficient, and essential AAs of okara are usually higher than those of other soybean-based products, due to the heat process that soybean undergoes during processing of the soybean aqueous extract. This makes certain AAs better available, which in turn increases the digestibility of proteins and fats (O'Toole 1999)
- It should be noted that according to Diaz-Vargas (2016), okara CP content was 21 % lower than that of soy (45%). However, the biggest difference between okara and soybean meal was in regard to tryptophan, with 55.5 % less found in okara. The contents of lysine, methionine, and threonine varied by 7.5 %, 13.3 %, and 16.5 %, respectively (Table 3).
- The economic viability of including okara in the diets was determined according to the equation described by Bellaver et al. (1985), which calculates the average cost of feed per kilogram of body weight.

Okara: Including a soya by-product into the poultry diet.

PRACTICE ABSTRACT

Ingredients	DM	OM	CP	EE	CF	Ash	NFE	Ca	AV.P	ME/Kcal /Kg
Soybean meal	91.2	94.2	43.8	1.4	7.3	5.8	41.7	0.35	0.27	2225
Corn gluten	90.7	98.2	61.9	2.5	2.1	1.8	31.7	0.09	0.25	3695
Okara	93.1	94.8	36.8	10.8	12.1	5.2	35.1	0.28	0.23	2150
Yellow corn	89.5	98.5	8.8	3.9	2.4	1.5	83.4	0.03	0.14	3320

Table 1: Okara chemical composition of ingredients (%, on DM). (Motawe et all 2012)

Amino acid	%	
	Soybean meal	Okara
Aspartic acids	5.46	3.71
Threonine	1.81	1.42
Serine	2.39	1.73
Glutamic	8.55	6.34
Proline	2.3	1.46
Glycine	1.95	1.39
Alanine	2.03	1.5
Valine	2.16	1.54
Leucine	3.58	2.58
IsoLeucine	1.99	1.44
Phynilalanine	2.43	1.66
Histidine	1.19	0.92
Lysine	2.79	1.94
Arginine	3.36	1.8
Cyctine	0.69	0.41
Methionine	0.66	0.54

Table 2: Amino acids composition of soybean meal and okara. Motawe et al 2012

Chemical	
Dry matter (%)	95.35
Crude protein (%)	35.64
Ether extract (%)	21.50
NDF (%)	12.67
ADF (%)	10.16
Energy	
GE (kcal kg^{-1})	4.924
AME (kcal kg^{-1})	2.972
AMEn (kcal kg^{-1})	2.946
Coefficient of metabolizability AME (%)	60.72
Coefficient of metabolizability AMEn (%)	60.19

Table 3: Chemical and energy composition of soybean residue (okara). M. Diaz-Vargas et al 2016

Further information

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Weblinks

- Check the Organic Farm Knowledge platform for more practical recommendations on animal husbandry.

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PA031 Feeding grass silage to fattening pigs

PRACTICE ABSTRACT

Feeding grass silage to fattening pigs

Problem

Current production systems compromise pig health and welfare through a lack of structural feed components, which is associated with the development of gastric ulcers.

Solution

Feeding a diet which includes roughage, like grass silage, increases pig gut health.

Benefits

A reduction in gastric ulcers leads to increased animal welfare. Additionally, roughage, such as grass silage, may satisfy the pigs' need for rooting and lead to a reduction in tail biting. Furthermore, the pigs are occupied with feeding for longer periods of time, which leads to a reduction in boredom. As grass silage has a good nutritional value, it is an ideal supplement to concentrate feed.

Applicability box

Theme

Pigs

Geographical coverage

In all countries

Application time

Any time

Required time

Time needed to feed pigs

Period of impact

Immediate Impact

Equipment

No special machinery needed

Best in

Fattening Pigs

Note: feeding roughage does not negatively impact meat quality.

Practical recommendation

- Provide fattening pigs with roughage on a daily basis (minimum 100-300 grams per pig every day)
- Grass silage is an ideal roughage: it is very attractive for the pigs due to its taste and consistency. Besides grass silage, grass, hay, and other types of silage have comparable effects on health and welfare.
- To avoid feed waste and to provide good access, place feed in racks at an optimal height.
- Place racks away from areas where pigs rest in order to avoid disturbances.

Feeding roughage, in this case fresh grass, to fattening pigs (Marion Nitsch, FiBL)

Gastric ulcer in fattening pigs (Mirjam Holinger, FiBL)

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PRACTICE ABSTRACT

Further information

Video

- The video "Feeding pigs: effect of silage" is available at the Organic Farm Knowledge platform.

Further reading

- Früh, Barbara and Mirjam Holinger (2019) Organic Pig Farming: Key Characteristics, Opportunities, Advantages and Challenges. In: *Improving Organic Animal Farming. Burleigh Dodds Series in Agricultural Science*, pp. 287–306., doi:10.19103/as.2017.0028.16
- Holinger, Mirjam et al. (2018) Long-Term Effects of Castration, Chronic Intermittent Social Stress, Provision of Grass Silage and Their Interactions on Performance and Meat and Adipose Tissue Properties in Growing-Finishing Pigs. In: *Meat Science*, vol. 145, 2018, pp. 40–50., doi:10.1016/j.meatsci.2018.05.018
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- Holinger, Mirjam et al. (2015) Improving Heal and Welfare of Pigs - A Handbook for Organic Pig Farmers. Research Institute of Organic Agriculture - FiBL, 2015, organic-farmknowledge.org/tool/35307

Weblinks

- Further documents can be found on the Organic Farm Knowledge website.

About this practice abstract and OK-Net EcoFeed

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FICHA PRÁCTICA

Alimentación de cerdos de engorde con ensilado de hierba

Problema

Los sistemas de producción actuales comprometen la salud y el bienestar de los cerdos debido a la falta de alimentos fibrosos, lo que se asocia con el desarrollo de úlceras gástricas.

Solución

Alimentación con una dieta que incluye fibra, en forma de ensilado de hierba, aumentando la salud intestinal de los cerdos.

Beneficios

Una reducción de las úlceras gástricas conduce a un mayor bienestar animal. Además, los forrajes, como el ensilado de hierba, pueden satisfacer la necesidad de hozar de los cerdos y reducir la mordedura de colas. Por otra parte, los cerdos permanecen más tiempo comiendo, lo que reduce el aburrimiento. Además, como ensilado de hierba tiene un buen valor nutricional, es un complemento ideal para la alimentación con piensos.

Nota: la alimentación con forrajes no afecta negativamente la calidad de la carne.

Aplicabilidad

Tema

Cerdos.

Cobertura geográfica

En todos los países.

Tiempo de aplicación

En cualquier momento.

Tiempo requerido

El tiempo necesario para distribuírselo a los cerdos.

Periodo de impacto

Impacto inmediato.

Equipo

No se necesita maquinaria especial.

Mejor en

Cerdos de engorde.

Recomendaciones prácticas

- Proporcionar forraje a los cerdos de engorde diariamente (mínimo 100-300 gramos por cerdo al día).
- El ensilado de hierba es un forraje ideal: resulta muy atractivo para los cerdos por su sabor y consistencia. Además del ensilaje de hierba, la hierba, el heno y otros tipos de ensilaje tienen efectos comparables sobre la salud y el bienestar.
- Para evitar el desperdicio de alimento y facilitar el acceso al ensilaje hay que colocarlo en comederos de rejillas para forrajes a una altura óptima.
- Colocar los comederos de rejillas lejos de las áreas donde descansan los cerdos para evitarles molestias.

Alimentación de forraje, en este caso hierba fresca, a cerdos de engorde (Marion Nitsch, FiBL)

Úlcera gástrica en cerdos de engorde (Mirjam Holinger, FiBL)

Este proyecto ha recibido financiación del programa de investigación e innovación Horizonte 2020 de la Unión Europea en virtud del acuerdo de subvención nº 773911. Esta comunicación solo refleja la opinión del autor. La Agencia Ejecutiva de Investigación no se hace responsable del uso que pueda hacerse de la información proporcionada. Los autores y editores no asumen responsabilidad alguna por cualquier posible inexactitud fáctica o daño resultante de la aplicación de las recomendaciones en este resumen de práctica.

FICHA PRÁCTICA

Más información

Video

- El video "Feeding pigs: effect of silage" está disponible en la plataforma Organic Farm Knowledge.

Otras lecturas

- Früh, Barbara and Mirjam Holinger (2019) Organic Pig Farming: Key Characteristics, Opportunities, Advantages and Challenges. In: Improving Organic Animal Farming. Burleigh Dodds Series in Agricultural Science, pp. 287–306 (En inglés).
- Holinger, Mirjam et al. (2018) Long-Term Effects of Castration, Chronic Intermittent Social Stress, Provision of Grass Silage and Their Interactions on Performance and Meat and Adipose Tissue Properties in Growing-Finish-ing Pigs. In: Meat Science, vol. 145, 2018, pp. 40–50 (En inglés).
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Weblinks

- Se pueden encontrar más documentos en el sitio web Organic Farm Knowledge.

Sobre esta Ficha Práctica y el Proyecto OK-Net EcoFeed

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OK-Net EcoFeed: Esta ficha técnica se elaboró en el proyecto Organic Knowledge Network on Monogastric Animal Feed. Este proyecto lleva en marcha desde enero de 2018 a diciembre de 2020. La finalidad del OK- Net EcoFeed es ayudar a los ganaderos, criadores e industria de procesado de alimento ecológicos para alcanzar el objetivo de un uso de alimentación 100% ecológica y local para monogástricos.

Web del proyecto: ok-net-ecofeed.eu

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FICHE PRATIQUE

Alimentation des porcs en engraissement avec de l'ensilage d'herbe

Problème

Les systèmes de production actuels compromettent la santé et le bien-être des porcs en raison de l'absence de composants structurels dans l'alimentation, associée au développement d'ulcères gastriques.

Solution

Une alimentation qui comprend du fourrage grossier, comme l'ensilage d'herbe, améliore la santé intestinale des porcs.

Bénéfices

Une réduction des ulcères gastriques entraîne une amélioration du bien-être des animaux. De plus, les fourrages grossiers, tels que l'ensilage d'herbe, peuvent satisfaire le besoin de fouissage des porcs et réduire les morsures de queue. Par ailleurs, les porcs sont occupés à s'alimenter durant de plus longues périodes, ce qui réduit leur ennui. L'ensilage d'herbe a une bonne valeur nutritive : c'est donc un complément idéal pour les aliments concentrés.

Mise en oeuvre

Thème

Porcs

Couverture géographique

Tous pays

Période d'application

A tout moment

Temps requis

Temps consacré à l'alimentation des porcs

Délai d'impact

Immédiat

Equipement

Pas d'équipement spécifique nécessaire

Efficacité maximale

Porcs en engraissement

Note: l'apport de fourrages grossiers n'a pas d'impact négatif sur la qualité de la viande.

Recommandations pratiques

- Fournir quotidiennement du fourrage grossier aux porcs en engraissement (minimum 100 à 300 g de MS par porc chaque jour).
- L'ensilage d'herbe est un fourrage idéal : il est très appétent pour les porcs en raison de son goût et de sa consistance. L'ensilage d'herbe, l'herbe, le foin et d'autres types d'ensilages ont des effets comparables sur la santé et le bien-être.
- Pour éviter le gaspillage des aliments et assurer un bon accès, disposer les aliments dans des auges à une hauteur optimale.
- Placer les auges loin des zones de repos afin d'éviter les perturbations.

Fibl. Alimentation des porcs en engraissement avec de l'ensilage d'herbe. Fiche pratique OK-Net EcoFeed.

FICHE PRATIQUE

Nourrir les porcs en engraissement avec du fourrage, ici de l'herbe fraîche (Marion Nitsch, FiBL)

Ulcère gastrique sur un porc en engraissement (Mirjam Holinger, FiBL)

Pour plus d'informations

Vidéo

- La vidéo "Feeding pigs: effect of silage" est disponible sur la plateforme Organic Farm Knowledge.

Lectures complémentaires

- Früh, Barbara and Mirjam Holinger (2019) Organic Pig Farming: Key Characteristics, Opportunities, Advantages and Challenges. In: *Improving Organic Animal Farming. Burleigh Dodds Series in Agricultural Science*, pp. 287–306., doi:10.19103/as.2017.0028.16
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Lien Internet

- Des documents complémentaires sont disponibles sur Organic Farm Knowledge website.

A propos de cette fiche pratique et du projet OK-Net EcoFeed

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Partenaires du projet : IFOAM EU Group (coordinateur de projet), BE; Aarhus University (ICROFS), DK; Organic Research Centre (ORC), UK; Institut Technique de l'Agriculture Biologique (ITAB), FR; Research Institute of Organic Agriculture (FiBL), CH; Bioland, DE; Associazione Italiana per l'Agricoltura Biologica (AIAB), IT; Donau Soja DS, AT; Swedish University of Agricultural Sciences, SE; ECOVALIA, ES; Soil Association, UK.

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PA032 Utilisation of waste heat from biogas plants for drying fine-grained legumes

PRACTICE ABSTRACT

Utilisation of waste heat from biogas plants for drying fine-grained legumes

Problem

The combustion of biogas to generate electricity generates a lot of waste heat, which is often not sufficiently used. Fine-grained legumes, such as lucerne or clover, are important in the crop rotation on organic farms. At the same time, they are a good source of proteins, amino acids and roughage in feed.

Outdoor-dried hay from fine-grained legumes is a risky business due to the weather. Field drying can lead to very high leaf losses, which greatly reduces the protein and amino acid content. This is why fine-grained legumes are mown early (see Fig. 1), brought in moist (see Fig. 2) and then dried on the farm in an energy-intensive way.

Solution

The approach here is to use the waste heat from biogas combustion for the drying of fine-grained legumes. There are different methods for drying the crop. They all use the warm exhaust air, which is sucked in by a fan and fed to the various processes via air ducts.

Loose plants can be dried with a continuous dryer or in special drying containers with perforated floors (see Fig. 3). For better and more compact storage, the crop should then be compressed into bales (see Fig. 4).

Another option is to press the crop directly in the field, and the bales are then ventilated directly (see Fig. 6). However, the residual moisture in the field must be reduced to a maximum of 20%. The costs for the drying are 8 to 10 € per bale.

Applicability box

Theme

Processing and handling of harvested feed

Context

Use of biogas waste heat to achieve a high concentration of ingredients in fine-grained legumes.

Application time

During the vegetation period for hay, in autumn for maize and cereals.

Required time

10 to 20 hours for the crop to pass through the system; the net drying time is 3-6 hours.

mowing and recovery time depends on the degree of used technology.

Period of impact

Permanent

Equipment

Harvesting machines for grassland, continuous dryer, bale drying blower, baling press

Best in

mostly used for ruminant feeding, but can now also be used for monogastric feeding due to higher nutrient concentrations

Figure 1: Mowing of fine-grained legumes. Photo: Qualitätstrocknung Nordbayern (https://qtn.de/luzernecobs)

Figure 2: Fine-grained legumes are brought in moist. Photo: Qualitätstrocknung Nordbayern (https://qtn.de/luzernecobs)

Bioland. Utilisation of waste heat from biogas plants for drying fine-grained legumes. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

Benefits

- Low loss of leaf mass leads to high concentration of protein and amino acids.
- A fast harvest reduces the dependence on the weather.
- Waste heat utilisation of the biogas plant and a possibility for the operator to earn additional income through contract drying.
- Extension of the range of applications for fine-grained legumes in monogastric feed from roughage supplier to protein supplier

Practical recommendation

Continuous dryer

- The legumes must be mown early. Then they are chopped with knives in the loader wagon (length 3.5 cm).
- As a rule, it is left to dry in the field for one day before being loaded onto wagons. Depending on the weather, two days are also possible to reduce moisture content from 50% to 33%.
- A large loader wagon (see Fig. 2) is always delivered full, which corresponds to one hectare depending on the yield.
- The drying temperature for clover is 79°C on average. The hay runs through the system in 10 to 20 hours, depending on the humidity. The actual residence time in the dryer is 3 to 6 hours.
- The dried clover is baled under high pressure into large square bales weighing around 300 kg (see Fig. 4).
- Instead of using a bale press, the dried hay can be pelleted.

Bale drying

- The fine-grained legumes are mown at the beginning of flowering.
- As long as the crop is still green, it is turned twice on the field.
- In the evening, the hay is rowed. At noon of the following day, the crop is rowed for baling.
- In the afternoon, it is baled. Residual moisture should be between 16-20% and no higher than 22%
- The bales are dried at 40°C for 20 to 24 hours. They must be turned once.

Recommendations for both procedures:

- The dried bales can now be stored and fed directly
- For feeding monogastric animals, the dried legumes should be ground in a mobile grinding and mixing plant (see Fig. 5) and mixed homogeneously into the ration.

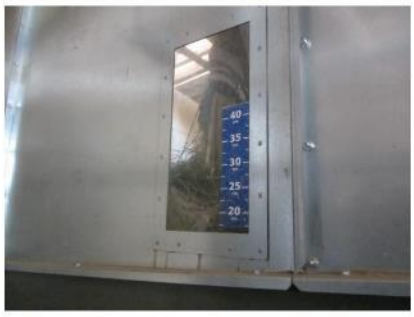

Figure 3: Special drying containers with perforated floors Photo: Werner Vogt-Kaute

Figure 4: The crop is compressed into bales. Photo: Werner Vogt-Kaute

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PRACTICE ABSTRACT

Figure 5: Mobile grinding and mixing plant. Photo: Christopher Lindner

Figure 6: Ventilation of bales. Photo: Anton Elsasser

Further information

Video

- Take a look at the video about the Alvan Blanch conveyor drier.

Weblinks

- Check the Organic Farm Knowledge platform for more practical recommendations.
- Alvan Blanch: Multi-Purpose drying ovens (in German)

About this practice abstract and OK-Net EcoFeed

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FICHE PRATIQUE

Utilisation de la chaleur résiduelle des méthaniseurs pour sécher les légumineuses fourragères

Problème

La combustion du biogaz pour produire de l'électricité génère beaucoup de chaleur résiduelle, qui n'est souvent pas suffisamment utilisée. Les légumineuses fourragères, comme la luzerne ou le trèfle, sont importantes dans la rotation des systèmes de cultures biologiques. Elles sont également une bonne source de protéines, d'acides aminés et de fibres dans l'alimentation animale.

Le foin de légumineuses séché en plein champ est une activité risquée, dépendante des conditions climatiques. Il peut entraîner des pertes de feuilles très importantes, ce qui réduit considérablement la teneur en protéines et en acides aminés. C'est pourquoi les légumineuses fourragères sont fauchées précocément (voir fig. 1), transportées humides (voir fig. 2) puis séchées à la ferme de manière énergivore.

Solution

L'approche consiste ici à utiliser la chaleur résiduelle de la combustion du biogaz pour le séchage des légumineuses fourragères. Il existe différentes méthodes de séchage. Elles utilisent toutes l'air chaud évacué, qui est aspiré par un ventilateur et acheminé vers les différents process par des conduits d'air.

Les plantes en vrac peuvent être séchées avec un **séchoir en continu** ou dans des containers de séchage spéciaux à planchers perforés (voir fig. 3). Pour un stockage plus efficace et plus compact, la récolte doit ensuite être compressée en balles (voir Fig. 4).

Mise en oeuvre

Thème

Transformation et traitement des matières premières récoltées.

Contexte

Utilisation de la chaleur résiduelle du biogaz pour obte nir une forte concentration des nutriments des légumi neuses fourragères.

Période d'application

Pendant la période de végétation pour le foin, en automne pour le maïs et les céréales.

Temps requis

10 à 20 h pour que la récolte passe dans le système ; le temps de séchage net est de 3 à 6 h. Le temps de fauche et ramassage dépend de la technique utilisée.

Délai d'impact

Permanent

Equipement

Matériel de récolte de fourrage, séchoir en continu, séchoir de balles de foin, presse à balles.

Efficacité maximale

Principalement utilisé pour les ruminants, mais peut être utilisé pour l'alimentation des monogastriques en raison des concentrations plus élevées en éléments nutritifs.

Une autre option consiste à presser la récolte directement au champ. Les balles sont ensuite ventilées directement (voir fig. 6). Toutefois, l'humidité résiduelle au champ doit être réduite à un maximum de 20 %. Le coût du séchage est de 8 à 10 € par balle.

Figure 1: Fauchage de légumineuses fourragères. Photo: Qualitätstrocknung Nordbayern (https://qtn.de/luzernecobs)

Figure 2: Les légumineuses fourragères sont acheminées humides. Photo: Qualitätstrocknung Nordbayern (https://qtn.de/luzernecobs)

Bioland. Utilisation de la chaleur résiduelle des centrales de biogaz pour sécher les légumineuses fourragères. Fiche pratique OK-Net EcoFeed.

FICHE PRATIQUE

Bénéfices

- Une faible perte de la biomasse foliaire entraîne une plus forte concentration de protéines et d'acides aminés.
- Une récolte rapide réduit la dépendance aux conditions météorologiques.
- Technique permettant la valorisation de la chaleur résiduelle d'un méthaniseur et la possibilité pour l'opérateur de gagner un revenu supplémentaire via des contrats de séchage.
- Extension du panel d'utilisation des légumineuses fourragères dans l'alimentation des monogastriques.

Recommandations pratiques

Séchoir en continu

- Les légumineuses doivent être fauchées précocement. Ensuite elles sont hachées avec des couteaux dans une remorque autochargeuse (longueur 3,5 cm).
- En règle générale, on laisse sécher le fourrage au champs pendant une journée avant chargement. Selon la météo, deux jours peuvent être possibles pour réduire le taux d'humidité de 50 % à 33 %.
- Une grande remorque autochargeuse (voir fig. 2) doit-être livrée pleine, ce qui correspond à plus ou moins un hectare selon le rendement.
- La température de séchage pour le trèfle est en moyenne de 79°C. Le foin passe dans le système en 10 à 20 heures, selon son humidité. Le temps de séjour effectif dans le séchoir est de 3 à 6 heures.
- Le trèfle séché est mis en grosse balles carrées sous haute pression (environ 300 kg par balle), voir fig. 4.
- Au lieu d'utiliser une presse à balles, le foin séché peut être transformé en granulés.

Séchage de balles

- Les légumineuses fourragères sont fauchées au début de la floraison.
- Tant que la culture est encore verte, elle est fanée deux fois au champ.
- Le soir, le foin est andainé une première fois, puis encore une fois le lendemain midi.
- L'après-midi, le fourrage est bottelé. L'humidité résiduelle doit être comprise entre 16 et 20 % et ne doit pas dépasser 22 %.
- Les balles sont séchées à 40°C pendant 20 à 24 heures. Elles doivent être retournées une fois.

Recommandations pour les deux techniques :

- Les balles séchées peuvent désormais être stockées et utilisées directement.
- Pour l'alimentation des monogastriques, les légumineuses séchées doivent être broyées dans une installation mobile de broyage et de mélange (voir fig. 5) et mélangées de manière homogène dans la ration.

Figure 3: Containers de séchage spéciaux à plancher perforé. Photo: Werner Vogt-Kaute

Figure 4: Le fourrage est compressé en balles. Photo: Werner Vogt-Kaute

Ce projet a été financé par le programme de recherche et d'innovation Horizon 2020 de l'Union Européenne dans le cadre de la convention de subvention n° 773911. Cette communication ne fait que refléter le point de vue de l'auteur. L'Agence exécutive pour la recherche n'est pas responsable de l'utilisation qui pourrait être faite des informations fournies. Les auteurs et les rédacteurs déclinent toute responsabilité pour d'éventuelles inexactitudes factuelles ou dommages résultant de l'application des recommandations de ce résumé de pratique.

FICHE PRATIQUE

Figure 5: Installation mobile de broyage et mélange. Photo: Christopher Lindner

Figure 6: Ventilation des balles. Photo: Anton Elsasser

Pour plus d'informations

Vidéo

- Consultez la vidéo concernant le séchoir Alvan Blanch Conveyor Dryer.

Liens Internet

- Des documents complémentaires sont disponibles sur la plateforme Organic Farm Knowledge
- Alvan Blanch: Séchoirs multi-usages (en allemand)

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Site Internet du projet: ok-net-ecofeed.eu

Partenaires du projet: IFOAM EU Group (coordinateur de projet), BE; Aarhus University (ICROFS), DK; Organic Research Centre (ORC), UK; Institut Technique de l'Agriculture Biologique (ITAB), FR; Research Institute of Organic Agriculture (FiBL), CH; Bioland, DE; Associazione Italiana per l'Agricoltura Biologica (AIAB), IT; Donau Soja DS, AT; Swedish University of Agricultural Sciences, SE; ECOVALIA, ES; Soil Association, UK.

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PA033 Acorns for fattening free-range pigs

PRACTICE ABSTRACT

Acorns for fattening free-range pigs

Problem

Montanera is a traditional feeding system where pigs forage for acorns. Iberian pigs foraging for acorns during their finishing phase has economically contributed to conserving the "dehesa", a high nature value (HNV) farmland based on agroforestry, currently consisting of more than four million hectares in the southwest of the Iberian Peninsula (photo 2).

Solution

This natural resource is used to fatten pigs without any kind of compound or supplementary feed. During the last 2-3 months of fattening, pigs can gain more than 40 kg of body weight from grass and foraged acorns.

Benefits

In the montanera system, the mean average daily gain for fattening pigs is ≥0.75 kg/day. Their body fat has a high concentration of oleic acid (around 55%) and very low concentrations of linoleic and palmitic acids; which is very important for the quality of pork and the cured products.

Applicability box

Theme
Pigs, feeding and ration planning

Context
South West of Iberian Peninsula; partly adaptable to other Mediterranean areas and forests with *Quercus* species (the best species is *Q. ilex rotundifolia*).

Application time
Autumn and winter.

Required time
None if there are adult trees; aproximately 15 years to have the first mast of acorns if it is necessary to establish trees and the surface is certified as organic.

Period of impact
1.5 months to influence meat quality and fatty acid profile

Equipment
None for free grazing; only a stick to knock down acorns if there is a swineherd with the pigs.

Best in
Fattening pigs (especially in fatty breeds)

Practical recommendation

- The fattening performance is very much influenced by the age of pigs and their compensatory growth; hence, pigs should be as old as possible (≥1 year) and adapted to grazing.
- Grass is necessary as a source of protein to compensate for the low protein levels in acorns.
- The food conversion rate is 10.5 kg of whole acorns of Q. i. rotundifolia to gain 1 kg, besides the contribution of grass; to establish the stocking rate, consider that an adult evergreen oak produces ≈11 kg of acorns/year).
- Iberian pigs peel acorns to avoid the high content of tannins in the shell. However, during peeling, approximately 20% of the kernel can be wasted.

Photo 1: Pig foraging acorns (Vicente Rodríguez-Estévez, University of Córdoba)

Photo 2: Group of Iberian pig fatteners grazing in a dehesa estate (Vicente Rodríguez-Estévez, University of Córdoba)

Ecovalia. Universidad de Córdoba. Acorns for fattening free-range pigs. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

Further information

Video

- The video "Cerdos Comiendo Bellotas en la Dehesa" shows a swineherd knocking down acorns.
- The video "Cerdos ibéricos comiendo bellotas en una dehesa de Extremadura" shows a herd of Iberian pigs foraging acorns.

Further reading

López-Bote, Clemente J. (1998). Sustained utilization of the Iberian pig breed. In: Meat Science, Vol. 49, No. Suppl. I, 2018, pp. I7-27, https://doi.org/10.1016/S0309-1740(98)90036-5

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Weblinks

- Further documents can be found on the Organic Farm Knowledge website.

About this practice abstract and OK-Net EcoFeed

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Project website: ok-net-ecofeed.eu

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FICHE PRATIQUE

Des glands pour engraisser des porcs élevés en plein-air

Problème

La Montanera est un système d'alimentation traditionnel où les porcs ibériques se nourrissent de glands pendant la phase de finition. Ce système a contribué économiquement à la conservation de la "dehesa", une terre agricole à haute valeur naturelle basée sur l'agroforesterie, qui s'étend actuellement sur plus de 4 millions d'ha dans le sud-ouest de la péninsule ibérique (photo 2).

Solution

Cette ressource naturelle est utilisée pour engraisser les porcs sans aucun autre aliment. Au cours des 2 à 3 derniers mois d'engraissement, les porcs peuvent gagner plus de 40 kg grâce à l'herbe et aux glands ingérés.

Bénéfices

Dans le système Montanera, le gain moyen quotidien des porcs en engraissement est ≥ 750 g. Leur gras présente une forte concentration d'acide oléique (environ 55 %) et de très faibles concentrations d'acides linoléique et palmitique, ce qui est très important pour la qualité de la viande de porc et les produits de salaison.

Mise en oeuvre

Thème

Porcs, alimentation et plan de rationnement

Couverture géographique

Sud-ouest de la péninsule ibérique ; partiellement adaptable à d'autres zones méditerranéennes et forêts de chênes (meilleure espèce : *Q. ilex rotundifolia*).

Période d'application

Automne et hiver.

Temps requis

Aucun s'il y a des arbres adultes ; environ 15 ans pour avoir les premiers glands s'il faut planter des arbres.

Délai d'impact

1,5 mois pour influencer la qualité de la viande et le profil d'acides gras.

Equipement

Aucun pour le pâturage libre ; un bâton pour faire tomber les glands s'il y a un gardien avec les porcs.

Efficacité maximale

Porcs en engraissement (surtout les races locales)

Recommandations pratiques

- Les performances d'engraissement sont très influencées par l'âge des porcs et leur croissance compensatrice : les porcs doivent être aussi âgés que possible (≥1 an) et adaptés au pâturage.
- L'herbe est nécessaire en tant que source de protéines pour compenser les faibles taux de protéines des glands.
- L'indice de consommation indicatif est de 10,5 kg de glands de *Q. ilex rotundifolia* pour un gain d'1 kg (sans compter le pâturage). Pour établir le taux de chargement, considérez qu'un chêne vert adulte produit ≈11 kg de glands/an.
- Les porcs ibériques épluchent les glands, dont l'enveloppe extérieure contient une forte teneur en tanins. Lors de cet épluchage, environ 20 % de la graine peut être gaspillée.

Photo 1: Porc consommant des glands (Vicente Rodríguez-Estévez, University of Córdoba)

Photo 2: Groupe de porcs ibériques en engraissement pâturant dans le domaine de la Dehesa (Vicente Rodríguez-Estévez, University of Córdoba)

Ecovalia. Universidad de Córdoba. Des glands pour engraisser des porcs élevés en plein-air. Fiche pratique OK-Net EcoFeed.

FICHE PRATIQUE

Pour plus d'informations

Vidéos

- La vidéo "Cerdos Comiendo Bellotas en la Dehesa" montre un gardien de porcs faisant tomber des glands.
- La vidéo "Cerdos ibéricos comiendo bellotas en una dehesa de Extremadura" montre un groupe de porcs ibériques à la recherche de glands.

Lectures complémentaires

López-Bote, Clemente J. (1998). Sustained utilization of the Iberian pig breed. In: Meat Science, Vol. 49, No. Suppl. I, 2018, pp. I7-27, https://doi.org/10.1016/S0309-1740(98)90036-5

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Liens Internet

- Des documents complémentaires sont disponibles sur le site Internet Organic Farm Knowledge

A propos de cette fiche pratique et du projet OK-Net EcoFeed

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FICHA PRÁCTICA

Bellotas para el engorde de cerdos en extensivo

Problema

La montanera es un sistema de engorde tradicional en el que los cerdos se alimentan pastoreando bellotas; con ello, la fase de acabado de los cerdos ibéricos ha contribuido económicamente a la conservación de la "dehesa", un sistema de Alto Valor Natural (SAV) que depende de la ganadería; que actualmente consta de más de cuatro millones de hectáreas en el suroeste de la Península Ibérica (foto 2), lo que lo convierte en uno de los SAV con más extensión de Europa.

Solución

Este recurso natural se utiliza para engordar cerdos sin ningún tipo de pienso o alimento suplementario. Durante los últimos 2-3 meses de engorde, los cerdos pueden ganar más de 40 kg de peso sólo pastoreando bellotas y hierba.

Beneficios

En la montanera, el promedio ganancia media diaria en el engorde es ≥ 0,75 kg/ día. Además, la grasa depositada tiene una alta concentración de ácido oleico (alrededor del 55%) y muy bajas concentraciones de ácido linoleico y palmítico; lo cual es muy importante para la calidad de la carne de cerdo y los productos curados.

Aplicabilidad

Tema
Cerdo, alimentación y racionamiento

Área de influencia
Suroeste de la Península Ibérica; parcialmente adaptable a otras áreas mediterráneas y bosques con especies de *Quercus* (la mejor especie es *Q. ilex rotundifolia*).

Tiempo de aplicación
Otoño e invierno.

Tiempo requerido
Ninguno si hay árboles adultos; si es necesario sembrar árboles estos requieren aproximadamente 15 años para tener las primeras bellotas.

Periodo de impacto
1,5 meses para influir en la calidad de la carne y en el perfil de ácidos grasos y 2 meses para cumplir con las exigencias de la Norma de Calidad del Cerdo Ibérico (RD 4/2014).

Equipamiento
Ninguno para el pastoreo; solo una vara para tirar las bellotas al suelo si hay un porquero que guie a los cerdos

Especialmente para
Cerdos de engorde (especialmente en razas grasas)

Recomendaciones prácticas

- El rendimiento durante el engorde está muy influenciado por la edad de los cerdos y su crecimiento compensatorio; por lo tanto, los cerdos deben tener la mayor edad posible (≥ 1 año) y estar adaptados al pastoreo.
- La hierba es necesaria como fuente de proteína, para compensar los bajos niveles de esta en las bellotas.
- El índice de conversión es de 10,5 kg de bellotas enteras de *Q. i. rotundifolia* para engordar 1 kg, además del aporte de hierba. Para establecer la carga ganadera, hay que considerar que una encina produce ≈11 kg de bellotas/ año.
- Los cerdos ibéricos pelan las bellotas para evitar el alto contenido de taninos de la cáscara. Sin embargo, durante el pelado, puede desperdiciarse aproximadamente el 20% de la pulpa.

Foto 1: Cerdo comiendo bellota (Vicente Rodríguez-Estévez, Univ. de Córdoba)

Foto 2: Grupo de cerdo Ibéricos pastoreando en una dehesa en montanera (Vicente Rodríguez-Estévez, Univ. de Córdoba)

Ecovalia. Universidad de Córdoba. Bellotas para el engorde de cerdos en extensivo. OK-Net EcoFeed Ficha Práctica.

FICHA PRÁCTICA

Más información

Video

- El video "Cerdos Comiendo Bellotas en la Dehesa" muestra una piara de cerdos tirando bellotas.
- El video "Cerdos ibéricos comiendo bellotas en una dehesa de Extremadura" muestra una piara de cerdos comiendo bellotas.

Otras lecturas

López-Bote, Clemente J. (1998). Sustained utilization of the Iberian pig breed. In: Meat Science, Vol. 49, No. Suppl. I, 2018, pp. I7-27, https://doi.org/10.1016/S0309-1740(98)90036-5

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Weblinks

- Más información puede encontrarse en la web Organic Farm Knowledge .

Sobre esta Ficha Práctica y el Proyecto OK-Net EcoFeed

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PA034 Brewer's yeast for organic pigs

PRACTICE ABSTRACT

Brewer's yeast for organic pigs

Problem

Protein supply is a constant challenge for organic farming. Organic raw materials with high protein content are quite scarce in some regions. The search for alternative sources of protein leads to the evaluation of the organic industry by-products.

Solution

Brewer's yeast is a by-product of beer in brewing industries. It is considered a liquid by-product (figure 1) with approximately 15% dry matter (DM). It is obtained from the anaerobic fermentation of beer, formed, among other ingredients, by *Saccharomyces cerevisiae*. Brewer's yeast has a high content of protein and vitamins of the B complex, which compensates the high transport costs due to its high water content.

Benefits

- Yeast has a high content of protein (> 47% DM) of high biological (3.6% of lysine) and digestible value (> 85%), thus reducing the cost of feed.
- Yeast is rich in B vitamins, especially biotin and folic acid (besides vitamin B1, B2, B6, B12, PP, B5) and in vitamin D, with a content of 2000 - 5000 IU1/g DM.
- The content of phosphorus in the yeast is up to 0.8-1.3%.

Applicability box

Theme
Pigs

Context
Farms close to an organic brewery.

Application time
All year, although it is more available in spring and summer.

Required time
None; but no more than two days of storage.

Period of impact
None.

Equipment
Special equipment is needed, including an automatic system for liquid feeding and two storage tanks (figure 2) so that they can be cleaned between batches.

Best in
Sows, growers and fattening pigs.

Figure 1: Yeast. V. Rodríguez-Estévez, Universidad de Córdoba

Figure 2: Tanks for yeast. V. Rodríguez-Estévez, Universidad de Córdoba

[1] International Unit

Brewer's yeast for organic pigs. Ecovalia & Universidad de Córdoba. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

- Yeast promotes animal performance and health.
- Yeast improves the quality of the carcass.

Practical recommendation

- Two holding tanks are needed for hygiene reasons.
- Yeast deteriorates very easily, do not use the product stored over 2 days.
- It is necessary to deactivate (kill) the yeast before transporting and using it on the farm. Hence, autolyzed yeast should be used.
- Yeast is a quite seasonal product, and it cannot be stored; however, it can be added to silage mixtures as an alternative to avoid its deterioration.

Further information

Video

- The video "Liquid Feed for pigs" is available from Lallemand Animal Nutrition. The video shows how liquid feed systems work.

Further reading

- Broadway, P.R., Carroll, J.A. and Burdick Sanchez, N.C. (2015). Live Yeast and Yeast Cell Wall Supplements Enhance Immune Function and Performance in Food-Producing Livestock: A Review. Microorganisms, Vol 3 (3), pp. 417-427.
- De Blas, C., Mateos, G.G. and Rebollar, P.G. (2010). Levadura de cerveza. In: Tablas FEDNA de composición y valor nutritivo de los alimentos para la fabricación de piensos compuestos (3ª ed.) Fundación Española para el Desarrollo de la Nutrición Animal. Madrid. 502 pp.
- Heuzé, V., Thiollet, H., Tran, G., Edouard, N., Lessire, M., Lebas, F. (2018). Brewers yeast. Feedipedia, a programme by INRA, CIRAD, AFZ and FAO.

Weblinks

- Further documents can be found on the Organic Farm Knowledge website.

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FICHA PRÁCTICA

Levadura de cerveza para cerdos ecológicos

Problema

El suministro de proteínas es un desafío constante para la ganadería ecológica. Las materias primas ecológicas con alto contenido de proteínas son bastante escasas en algunas regiones. La búsqueda de fuentes alternativas de proteínas conduce a la valoración y aprovechamiento de los subproductos de la industria alimentaria ecológica.

Solución

La levadura de cerveza es un subproducto de la industria cervecera. Se considera un subproducto líquido (foto 1) con aproximadamente el 15% de materia seca (MS), obtenido de la fermentación anaeróbica de la cerveza, que incluye, entre otros ingredientes, *Saccharomyces cerevisiae*. La levadura de cerveza tiene un alto contenido en proteínas y vitaminas del complejo B; lo que compensa los altos costes de transporte debidos a su elevado contenido en agua.

Beneficios

- La levadura tiene un alto contenido en proteína (>47% de MS) de alto valor biológico (3,6% de lisina) y digestibilidad (> 85%); por lo que su aprovechamiento reduce el coste de la alimentación.
- La levadura es rica en vitaminas B, especialmente biotina y ácido fólico (además de vitamina B1, B2, B6, B12, PP, B5) y en vitamina D, con un contenido de 2000 - 5000 UI* / g de MS.
- El contenido de fósforo en la levadura es de 0,8 a 1,3%.
- La levadura promueve el rendimiento y la salud de los animales.
- La levadura mejora la calidad de la canal.

Aplicabilidad

Tema
Cerdos

Área de influencia
Explotaciones cercanas a una industria cervecera ecológica.

Tiempo de aplicación
Todo el año, mayor disponibilidad en primavera y verano.

Tiempo requerido
Ninguno; pero no almacenar más de dos días.

Periodo de empleo
Ninguno.

Equipamiento
Se necesita un equipo especial, como un sistema automático para alimentación líquida y dos tanques de almacenamiento (foto 2), para que estos puedan limpiarse entre lotes.

Especialmente para
Cerdas y cerdos de engorde.

Foto 1: Levadura de cerveza
(V. Rodríguez-Estévez, Universidad de Córdoba)

Foto 2: Tanques para almacenar levadura de cerveza
(V. Rodríguez-Estévez, Universidad de Córdoba)

*Unidades internacionales

Ecovalia. Universidad de Córdoba. Bellotas para el engorde de cerdos en extensivo. OK-Net EcoFeed Ficha Práctica.

FICHA PRÁCTICA

Recomendaciones prácticas

- Se necesitan dos tanques de almacenamiento por razones de higiene.
- La levadura se deteriora muy fácilmente; por lo que no se debe usar el producto almacenado durante más de 2 días.
- Es necesario inactivar (lisar "matar") la levadura antes de transportarla y usarla en la granja. Por lo tanto, se debe usar levadura lisada.
- La levadura es un producto bastante estacional y no puede almacenarse; sin embargo, se puede agregar a mezclas de ensilaje como alternativa para evitar su deterioro y aprovechar excedentes.

Más información

Video

- El video "Liquid Feed for pigs" muestra cómo funciona un sistema de alimentación líquido.

Otras lecturas

- Broadway, P.R., Carroll, J.A. and Burdick Sanchez, N.C. (2015). Live Yeast and Yeast Cell Wall Supplements Enhance Immune Function and Performance in Food-Producing Livestock: A Review. Microorganisms, Vol 3 (3), pp. 417-427.
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Ecovalia. Universidad de Córdoba. Bellotas para el engorde de cerdos en extensivo. OK-Net EcoFeed Ficha Práctica.

PA035 Whey for fattening organic pigs

PRACTICE ABSTRACT

Whey for fattening organic pigs

Problem

According to the EU regulations, the organic farming will be obliged to provide feed derived from 100% organic origin by 2021. To assure the sustainability of the feed supply, the regional feeds and raw materials shall be preferred. It is necessary to look for mutually beneficial collaborations with the organic sector stakeholders, such as food industry.

Solution

Whey is an alternative source of high-quality protein for fattening pigs (figure 1). It can supply one-third of their protein needs. At the same time whey is an important by-product of the cheese producers, as it represents approximately 70 to 80 % of the milk volume. Collaboration of organic cheese companies with the nearby organic farms can be mutually beneficial.

Benefits

- Whey is a natural ingredient derived from fresh milk and is characterized by its high nutritive value, palatability, and digestibility.
- It promotes feed intake in the post-weaning period.
- Whey fosters animal performance and gut health.
- Whey contains high-quality protein. It can supply one-third of the protein needs for fattening pigs.

Applicability box

Theme
Pigs

Context
Farms close to an organic cheese factory.

Application time
Year-round (more availability during spring and summer).

Required time
None; but no more than two days of storage.

Period of impact
3 to 6 months, depending on the slaughtering age and weight.

Equipment
Special equipment is needed, such as an automatic system for liquid feeding and two storage tanks, so that they can be cleaned between batches. Other cheaper option is tanks (these can be portable) connected to drinking troughs (figure 2). High salt content and low pH can deteriorate steel feeders and other equipment.

Best in
Growers and fattening pigs.

Practical recommendation

- Whey is a quite seasonal product; hence, this determines the period when it can be used and the number of pigs that can be fattened.

Figure 1: Whey in a cheese factory. V. Rodríguez-Estévez, Universidad de Córdoba

Figure 2: Fatteners drinking whey. V. Rodríguez-Estévez, Universidad de Córdoba

Whey for fattening organic pigs. Ecovalia & Universidad de Córdoba. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

- Whey can deteriorate very easily; two storage tanks are needed for hygiene reasons.
- Do not feed whey stored over 2 days.
- Sweet whey is the by-product remaining after the production of soft cheeses, while acid whey comes from hard cheeses and has a lower pH. It is important to consider that salt is added to the cheese before pressing; hence, the remaining liquid whey can contain as much as 10 % dry matter of salt.
- Pigs should be provided with water access ad libitum to avoid salt toxicity. Additionally, reduction or elimination of supplemental salt in the diet formulation should be considered.
- Salt and lactose contents should be considered to determine the daily intake rate. Fresh whey contains approximately 5% lactose, and growing pigs tolerate feeds containing up to 20-30% lactose (less for the older ones). Hence, whey should be analysed to determine the threshold for its inclusion before formulating pig diets.

Further information

Video

- The video "Whey for the pigs" shows pigs drinking whey.
- The video "Suero lácteo en la alimentación de cerdos | La Finca de Hoy" (Spanish) shows pigs drinking whey.

Further reading

- EWPA (n/d). Whey in animal nutrition. A valuable ingredient.
- Rodríguez- Estévez, V. and Mata Moreno, C. (2007). El suero de quesería, un recuso ganadero. In: *La fertilidad de la Tierra*, Vol 31, pp. 12-15.
- Scholten, R., van der Peet-Schwering, C., den Hargot L., Schrama, J. and Verstegen, M. (2001). Uso de diestas líquidas y co-productos líuidos para porcino. In: *ANAPORC*, Vol 209, pp. 101-116.

Weblinks

- Further documents can be found on the Organic Farm Knowledge website.

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FICHA PRÁCTICA

Suero para cerdos de engorde en ecológico

Problema

Según la normativa de la UE sobre producción ecológica, a partir de 2021, el 100% del alimento proporcionado a los animales deberá ser ecológico. Para asegurar la sostenibilidad del suministro, es preferible que los alimentos y materias primas procedan de la región; por lo que es necesario buscar colaboradores dentro del sector ecológico, como es el caso de la industria láctea, que genera suero de quesería como subproducto.

Solución

El suero es un subproducto importante de la producción de queso, ya que representa aproximadamente el 70-80% del volumen de leche. Al mismo tiempo, el suero es una fuente alternativa de proteínas de alta calidad para los cerdos de engorde (foto 1); pudiendo suministrar un tercio de sus necesidades de proteínas. La colaboración entre productores ecológicos de queso y granjas ecológicas cercanas puede ser beneficiosa para ambos.

Beneficios

- El suero es un ingrediente natural derivado de la leche fresca y se caracteriza por su alto valor nutritivo, palatabilidad y digestibilidad.
- Promueve la ingesta de alimento en el período de post-destete.
- Fomenta el rendimiento del animal y la salud intestinal.
- Contiene proteínas de alta calidad. Puede suministrar un tercio de las necesidades de proteínas para el engorde de cerdos.

Aplicabilidad

Tema
Cerdos

Área de influencia
Granjas cercanas a una industria quesera.

Tiempo de aplicación
Todo el año (mayor disponibilidad durante primavera y verano).

Tiempo requerido
Ninguno; pero no almacenar más de dos días.

Periodo de empleo
De 3 a 6 meses, dependiendo de la edad y peso al sacrificio.

Equipamiento
Se necesita un equipo adecuado, como un sistema automático de alimentación líquida y dos depósitos de almacenamiento, para que puedan limpiarse entre un lote de suero y otro. Otra opción más barata son los tanques, que pueden ser portátiles, conectados a bebederos (foto 2). El alto contenido de sal y el bajo pH pueden deteriorar las partes metálicas de los equipos.

Especialmente para
Cerdos de engorde

Recomendaciones prácticas

- El suero es un producto bastante estacional; por lo tanto, esto determina el período en que puede usarse y la cantidad de cerdos que se pueden engordar.

Foto 1: Suero en una quesería. V. Rodríguez-Estévez, Universidad de Córdoba

Foto 2: Cerdos bebiendo suero. V. Rodríguez-Estévez, Universidad de Córdoba

Ecovalia. Universidad de Córdoba. Suero para cerdos de engorde en ecológico. OK-Net EcoFeed Ficha Práctica.

FICHA PRÁCTICA

- El suero puede deteriorarse muy fácilmente; por lo que, por razones higiénicas, se necesitan dos tanques de almacenamiento.
- No alimentar a los animales con el suero almacenado durante más de 2 días.
- El suero dulce es el subproducto que queda después de la producción de quesos blandos, mientras que el suero ácido procede de la producción de quesos duros y tiene un pH más bajo. Es importante tener en cuenta que al queso se le agrega sal antes de prensarlo; por lo tanto, el suero líquido restante puede contener hasta un 10% de materia seca de sal.
- Los cerdos deben tener acceso ad libitum al agua para evitar la intoxicación por sal. Además, se debe considerar la reducción o eliminación de la sal suplementaria en la formulación de la dieta.
- Se debe considerar el contenido de sal y lactosa para determinar la tasa de ingesta diaria. El suero fresco contiene aproximadamente un 5% de lactosa, y los cerdos en crecimiento toleran alimentos que contienen hasta un 20-30% de lactosa (menos para los de más edad). Por lo tanto, el suero debe analizarse para determinar el umbral de inclusión antes de formular las raciones.

Más información

Video

- El video "Whey for the pigs" muestra una piara de cerdos tomando suero.
- El video "Suero lácteo en la alimentación de cerdos | La Finca de Hoy" muestra una piara de cerdos tomando suero.

Otras lecturas

- EWPA (n/d). Whey in animal nutrition. A valuable ingredient.
- Rodríguez- Estévez, V. and Mata Moreno, C. (2007). El suero de quesería, un recuso ganadero. La fertilidad de la Tierra, Vol 31, pp. 12-15.
- Scholten, R., van der Peet-Schwering, C., den Hargot L., Schrama, J. and Verstegen, M. (2001). Uso de dietas líquidas y co-productos líquidos para porcino. ANAPORC, Vol 209, pp. 101-116

Weblinks

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OK-Net EcoFeed: Esta ficha técnica se elaboró en el proyecto Organic Knowledge Network on Monogastric Animal Feed. Este proyecto lleva en marcha desde enero de 2018 a diciembre de 2020. La finalidad del OK- Net EcoFeed es ayudar a los ganaderos, criadores e industria de procesado de alimento ecológicos para alcanzar el objetivo de un uso de alimentación 100% ecológica y local para monogástricos.

Web del protecto: ok-net-ecofeed.eu

Socios del proyecto: IFOAM EU Group (project coordinator), BE; Aarhus University (ICROFS), DK; Organic Research Centre (ORC), UK; Institut Technique de l'Agriculture Biologique (ITAB), FR; Research Institute of Organic Agriculture (FiBL), CH; Bioland, DE; Associazione Italiana per l'Agricoltura Biologica (AIAB), IT; Donau Soja DS, AT; Swedish University of Agricultural Sciences, SE; ECOVALIA, ES; Soil Association, UK.

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PA036 Focus on the amino acid content of energy feedstuff components

PRACTICE ABSTRACT

Focus on the amino acid content of energy feedstuff components

Problem

Switching poultry rations from 95 % to 100 % organic feed can lead to a reduction in the use of home-grown and regional feed. Currently, conventional maize gluten and conventional potato protein are replaced by organic oilcake (soya, sunflower, rapeseed, sesame). Oilcake has a comparatively low content of important amino acids such as methionine and so higher proportions of oilcake must be used. This can lead to further reductions in the use of regionally produced and home-grown feed components such as cereals.

Applicability box

Theme
Layers, broilers, feeding and ration planning

Context
High percentage of self-produced or regional feed components

Application time
All-year-round use in animal feeding

Period of impact
Permanent

Equipment
Storage and mixing feed

Best in
Own cultivation and use on the farm

Solution

Energy feedstuff components contain different amounts of amino acids such as methionine. Some grain species have a high methionine content and can grow well in most regions by the farmers themselves. The best examples are proso millet (*Panicum milleceum*) and naked oats (*Avena nuda*) followed by spelt, naked barley (*Hordeum vulgare* L. var. *nudum* Hook. f.) and buckwheat with all containing higher levels of methionine than wheat or maize.

Figures 1 and 2 show the harvest and a field visit as part of the project "Proso millet in poultry feed"

Figure 1: Millet harvesting. Picture: Julia Roesch

Figure 2: Millet field visit. Picture: Elisabeth Assmann

Benefits

In the present ration example, the use of oil cake can be reduced from 34.8 % (see Table 1) to 26.1 % (see Table 2). This means that the share of home-grown and regional components can be increased by more than 8 % since the oil content could also be reduced.

Focus on the amino acid content of energy feedstuff components.
Öko-Beratungsgesellschaft mbH & Bioland Beratung GmbH. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

Practical recommendation

In proso millet, the methionine content is high, but the lysine content is low. Lysine can be added easily to the ration with grain legumes such as peas, field beans, lupins or soya. The low crude protein of millet is positive, as it is well complemented by the higher crude protein content of other feedstuffs, e.g. grain legumes. Overfeeding crude protein is undesirable as it puts a strain on the animal's metabolism and leads to excessive nitrogen excretion. Naked oats have a high content of amino acids plus a high fat content so that the use of oil can be reduced.

Proso millet and naked oats are crops that are easy to grow in many regions in Central and Southern Europe.

Table 1: Ration for 100 % organic feeding of laying hens with energy feed based on corn and wheat

Components	Share	Ingredients											Batch
	%	ME	Protein	Fat	Fibre	Lys	Met	Met+Cys	Trp	Ca	P	Na	3.000
		MJ	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*kg*
Corn	20.00	2.88	1.72	0.72	0.64	0.05	0.03	0.09	0.00	0.01	0.06	0.00	600
Wheat	19.50	2.24	2.11	0.51	0.60	0.06	0.04	0.09	0.03	0.01	0.06	0.00	585
Milled grass	6.00	0.32	0.97	0.22	1.50	0.04	0.02	0.02	0.02	0.05	0.02	0.01	180
Peas	8.10	1.02	1.70	0.22	0.55	0.13	0.02	0.04	0.02	0.01	0.04	0.00	243
Feed lime	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.05	0.00	0.00	240
Sunflower oil	1.40	0.52	0.00	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42
Premix	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.24	0.17	66
Sunflower cake	14.00	1.19	4.66	1.53	3.63	0.15	0.08	0.13	0.09	0.05	0.05	0.00	420
Sesame cake	4.50	0.36	2.21	1.70	0.27	0.05	0.04	0.08	0.02	0.04	0.02	0.00	135
Soya cake	16.30	1.78	7.24	1.30	1.17	0.47	0.09	0.23	0.09	0.05	0.13	0.00	489
	100.00	**10.31**	**20.61**	**7.52**	**8.36**	**0.94**	**0.31**	**0.68**	**0.27**	**3.81**	**0.63**	**0.18**	**3.000**

Table 2: Ration for 100 % organic feeding of laying hens with energy feed based on proso millet and naked oats

Wheat	12.00	1.38	1.30	0.31	0.37	0.04	0.02	0.06	0.02	0.01	0.04	0.00	360
Proso millet	20.00	2.50	2.04	0.54	1.48	0.04	0.05	0.08	0.03	0.01	0.06	0.01	600
Naked oats	15.00	2.10	1.52	1.05	0.23	0.09	0.04	0.10	0.03	0.02	0.05	0.00	450
Milled grass	6.00	0.32	0.97	0.22	1.50	0.04	0.02	0.02	0.02	0.05	0.02	0.01	180
Peas	10.00	1.26	2.10	0.27	0.68	0.16	0.02	0.05	0.02	0.01	0.05	0.00	300
Feed lime	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.05	0.00	0.00	240
Sunflower oil	0.70	0.26	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21
Premix	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.24	0.17	66
Sunflower cake	6.00	0.51	2.00	0.65	1.55	0.06	0.03	0.05	0.04	0.02	0.02	0.00	180
Sesame cake	4.90	0.39	2.40	1.85	0.29	0.05	0.05	0.09	0.03	0.04	0.02	0.00	147
Soya cake	15.20	1.66	6.75	1.22	1.09	0.44	0.08	0.21	0.08	0.05	0.12	0.00	456
	100.00	**10.38**	**19.07**	**6.78**	**7.20**	**0.92**	**0.31**	**0.68**	**0.26**	**3.79**	**0.62**	**0.19**	**3.000**
Target values		10.60	17.50	6.00	5.00	0.80	0.32	0.73	0.17	3.70	0.54	0.18	

Abbreviations: ME = Metabolizable Energy; MJ = Megajoule; Lys = Lysine; Met = Methionine; Cys = Cysteine; Trp = Tryptophan; Ca = Calcium; P = Phosphorus; Na = Natrium (Sodium)

Values for Protein, Fat and Fibre = crude

Literature: Vogt-Kaute, W. et al. (2018) Proso millet as a protein source for organic poultry. In: Santra D et al.: Proceedings of 3rd International Millet Symposium, Fort Collins: 27

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PRACTICE ABSTRACT

Further information

Weblinks

- Check the Organic Farm Knowledge platform for more practical recommendations.
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About this practice abstract and OK-Net EcoFeed

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PA037 Feeding insects for organic layers

OK NET ecofeed

PRACTICE ABSTRACT

Feeding insects for organic layers

Problem

A key challenge remains to achieve organic and sustainable monogastric feeding strategies: meeting their protein and essential amino acid needs with locally sourced feedstuffs.

Solution

Feeding of insects offers new possibilities to overcome the protein gap in organic farming. Insect feeds offer a sustainable and local alternative to commonly used protein feed sources.

Benefits

Live insects and larval meal can replace soy in feed rations. The amino acid profile of insects corresponds to the dietary needs of fish, poultry or swine animals, especially relating to amino acids like lysine, threonine, methionine, and tryptophan.

Practical recommendations

- Processed insect protein legally belongs to the group of 'animal proteins' and is currently not permitted in livestock feed; however, this legislsation does not apply to the feeding of live insects, as this is not a processed feed.
- Due the high fat content of the live larvae or worms there is an upper limit, which cannot be determined at present with the available results from the feeding trail.
- Feeding live mealworms (*Tenebrio*) (Fig. 2) to laying hens does not reduce aggressive behaviour (based on results of a FiBL trial, where hens received 10 g of live mealworms per day).

Applicability box

Theme

Layers, Feeding and ration planning

Context

Organic laying hen operations

Application time

All-year-round in animal feeding

Period of impact

Permanent

Equipment

No special equipment required for feeding purchased insects or larval meal. Specialised equipment required for on-farm insect production

Best in

Monogastric animals, trial application done with laying hens

Restrictions

Larval meal (Fig. 1) is not permitted – only live insects (Fig. 2)

Figure 1. Insect larval meal mixed with concentrate feed. Photo: OK-Net Ecofeed video 'Feeding insect for organic layers' videoproduced by FiBLFilm, image by Kaja Früh.

Figure 2. Mealworms. Photo: OK-Net Ecofeed video 'Feeding insect for organic layers (OK-Net EcoFeed)' produced by FiBLFilm.

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OK NET ecofeed

PRACTICE ABSTRACT

Further information

Video

- Check the following video, Feeding insects for organic layers (OK-Net EcoFeed) for further instructions (Video in English with German and French subtitles). It served as a basis for this practice abstract.

Weblinks

- Check the Organic Farm Knowledge platform for more practical recommendations.

About this practice abstract and OK-Net EcoFeed

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PA038 Free choice feeding - an alternative feeding meth-od for laying hens

PRACTICE ABSTRACT

Free choice feeding - an alternative feeding method for laying hens

Problem

Formulated, complete diets for laying hens do not reflect their nutrient requirements since their needs change according to the weather and their age. As a consequence, nutrients are often under- or oversupplied.

Solution

With free choice feeding, the rations are not fed to the chickens as a complete feed but instead offered as separate components.

Benefits

By using feed produced on-farm, feed costs can be reduced, and at the same time, the hens can use their so-called "food wisdom" to create their own rations. The system is interesting, especially for mobile housing systems as they offer high amounts of young grass and can thus reduce the amount of protein concentrates used.

Applicability box

Theme

Layers, Feeding and ration planning

Context

Feed cost savings, feed efficiency

Application time

At any time, best one month prior to onset of laying

Required time

One-month changeover time for hens

Period of impact

During the entire production period

Equipment

Feed troughs with inserted partitions

Best in

Small groups in permanent and mobile stables

Practical recommendation

- The feed choices can be grouped into three feeds (not including grit). The difference in nutrients between the feeds must be clear to the hens.
- The energy component must contain a lot of starch and energy, the protein component a lot of protein, minerals and vitamins, and the third component a lot of calcium. With only moderate amounts, the differences are not large enough for learning to take place.
- If different types of grain are used in the energy component, they should be fed mixed in the same trough.
- The transition of feed to whole grains should be done slowly over two to three weeks so that the gizzard can build up the muscles necessary to crush the grains.
- Habituation to the free choice system with whole grains should take place one month before the start of laying, i.e. from about the 15th week of life. This allows the hen to get used to the choice feed before the nutrient requirements increase with egg production. Calcium reserves can also be built up if necessary.
- Vitamins or trace elements must not be given separately as a single component; otherwise some animals may avoid them or eat too much, resulting in toxicity.
- To obtain a complete ration, the complementary feed must be suitable for mixing with cereals or cereals and limestone. Following the rearing supplement, the ration should be switched to the laying supplement, as usual, when egg production starts.
- A sufficient animal/feeding area ratio must be maintained, and there must be enough distance between the troughs. For example, for every 100 hens, two troughs per feed component.

There is further need for research on behaviour, potential savings and practical application.

Free choice feeding - an alternative feeding meth-od for laying hens. Naturland. OK-Net EcoFeed Practice Abstract.

PRACTICE ABSTRACT

Further information

Further Reading

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