# OKNET EcoFeed - Information for mapping of existing scientific and advisor's knowledge

Animal category: Pigs (sows, piglets and growing/finishing pigs)

**General information on feed ingredients and feeding strategies to organic pigs:**

| |
|---|
| Björnberg, Odelros, Persson och Alarik. 2005. Vägen mot 100 procent ekologiskt foder till enkelmagade djur. Synthesis report. SLU, CUL, Uppsala. https://www.slu.se/globalassets/ew/org/centrb/epok/aldre-bilder-och-dokument/publikationer/foderenkelmagade.pdf<br><br>**Summary:** Synthesis report on (at the time) current knowledge, possibilities and restrictions to use 100 % organic feed to monogastric animals. Relevant and available to use for researchers, advisors/industry and farmers. |
| Göransson, L. 2009. Feed to organic pigs. http://www.gardochdjurhalsan.se/upload/documents/Dokument/Startsida_Gris/Kunskapsbank/Ekologisk_grisproduktion/Foder_till_ekologiska_grisar.pdf<br><br>**Summary:** Information material on feed to organic pigs, relevant and available to use for advisors and farmers. |
| Alarik, M., Göransson, L., Presto, M., Wallenbeck, A (editor) and Wivstad, M. 2012. Feed for pigs in organic production. Synthesis report. SLU, EPOK, Uppsala. https://www.slu.se/globalassets/ew/org/centrb/epok/aldre-bilder-och-dokument/grisfodersyntes_web.pdf<br><br>**Summary:** Synthesis report on current knowledge and discussions in the seminar about 100 % organic feed to pigs (Uppsala 8-9 November 2011) about organic pig nutrient requirements, feeding strategies, feed availability, potential protein feed resources. 'Best practice' examples from different farms with different feeding strategies and discussion on areas for development. Relevant and available to use for researchers, pig industry, advisors and farmers. |
| Olsson, AC., Rantzer, D., Andersson, M., Botermans, J. 2010. 100 % ekologiskt foder till slaktgrisar - ett foderförsök (100 % organic feed to finishing pigs – a feeding trial). SLU, Faculty of Landscape Planning, Horticulture and Agricultural Sciences, LTJ-fact sheet, 2010:13. https://www.researchgate.net/publication/44190019_100_ekologiskt_foder_till_slaktgrisar<br><br>**Summary:** Feed with 100% organic and Swedish-grown feedstuffs and without synthetic amino acids or high-quality by-products can be used in feed rations to slaughter pigs with acceptable production results. It is however, important to be aware of optimization of feed without soya is a "balance sheet" as regards how to combine protein feedstuffs to get feed rations equivalent to those including soy. Relevant and available to use for researchers, pig industry and advisors. |
| Feed in organic production. 2016. Agricultural information report no. 12. Swedish Borard of Agriculture. https://www2.jordbruksverket.se/download/18.1a906c1e153e0d1ad3e7c4c9/1459856138631/jo16_12.pdf<br><br>**Summary:** The report includes the most common feedstuffs for organic production. For each feedstuff nutrient content, treatment/processing and possibilities/restrictions for feeding different animal spieces, including pigs. Relevant and available to use for advisors and farmers. |
| Høøk Presto, M., Andersson, KH., Wallgren, P., Lindberg, JE. 2007. Acta Agriculturae Scand Section A, 57:2, 61-72, https://doi.org/10.1080/09064700701691908<br><br>**Summary:** The result from this study suggests that the amino acid level in diets for organic growing/finishing pigs fed ad libitum could be reduced, below current Swedish standards for conventionally raised growing/finishing pigs, without any negative effects on performance and carcass quality. Reduced dietary amino acid levels will make it easier to optimize nutritionally sufficient feeds for organically raised pigs with available feed resources. In addition, this will also benefit the environment by minimizing the excretion of |

nitrogen. Relevant for researchers, advisors/industry. Also available in a popular science publication, available for advisors and industry.

**Organic protein feed concentrates:**

Høøk Presto, M., Lyberg, K., Lindberg, JE. 2011. Digestibility of amino acids in organically cultivated white-flowering faba bean and cake from cold-pressed rapeseed, linseed and hemp seed in growing pigs. Archives of Animal Nutrition, Vol. 65, No. 1, 21–33.
https://www.tandfonline.com/doi/full/10.1080/1745039X.2010.534897

**Summary**: The organically cultivated protein feed ingredients investigated had satisfactory digestibility of crude protein and amino acids, and the nutritional properties were in general comparable with conventional protein feed ingredients. The current data indicate that all oilseed cakes studied (hemp seed cake, linseed cake and rapeseed cake), in addition to white-flowering faba bean, are suitable as protein feed ingredients in organic pig feeds. Relevant for researchers and possibly also advisors/industry.

Ivarsson, E. & Neil, M. 2017. Åkerböna till gris i konventionell och ekologisk produktion – egenskaper och användbarhet hos olika sorter. Faba beans to pigs in conventional and organic production – properties and possibilities of different cultivars. Final report H1350188, Swedish farmers' foundation for agricultural research, 2017.
http://www.lantbruksforskning.se/projektbanken/akerbona-till-gris-i-konventionell-och-ekologisk-p/?search=neil&page=1&app_year=&pub_year=&category=

Also available at:
Ivarsson, E. & Neil, M. (2016). Faba beans to pigs: properties and possibilities of different cultivars. Book of abstracts 67th annual meeting of the European Federation of Animal Science (EAAP), Belfast, UK, 29 August – 2 September 2016, p 226.

Ivarsson, E. & Neil, M. (2018). Variations in nutritional and antinutritional contents among faba bean cultivars and effects on growth performance of weaner pigs
https://doi.org/10.1016/j.livsci.2018.03.017

**Summary:** Increased knowledge about faba bean feed value and potential use of colour-flowered beans in pig diets. Faba bean is a viable alternative protein source in well-balanced diets to weaner pigs, with cultivar rather than flower color determining the nutritional value. Combining yield data with nutritional value is important when selecting cultivar, since it gives different outcomes than separate evaluations. If home-grown feed is used, the higher digestibility in white-flowered beans may partially compensate for the lower yields of this crop. Relevant for researcher, advisors, industry. Final report and popular scientific publication ready to use for researchers advisors, farmers etc.

ICOPP – Improved contribution of local feed to support 100 % organic feed supply to pigs and poultry. Synthesis report, 2014. http://orgprints.org/28078/

**Summary:** Regarding the issue of supplying organic concentrates main findings were as follows:

- Sainfoin seeds are of high nutritional value, particularly if dehulled (similar to soybean cake), and can partially (up to 15 % in the diet) substitute commonly used protein sources also in feeding of weaners, which otherwise often are most difficult to feed on local feed resources.
- Nutrient content of grass pea seeds is slightly higher than that of Faba beans, but caution must be taken due to antinutritional substances. Grass pea seeds can partially (up to 30%) substitute commonly used protein if subjected to appropriate heat treatment, also for weaners.
- A high external input nutritional optimized diet versus a low external input and suboptimal diet resulted in better performance of piglets, in particular for week litters, without any differences in health status and mortality of the piglets. Also producing a 20 kg piglet was most economical with the low external input diet.
- Mussel meal can replace common protein sources in feed for growing/finishing pigs with maintained production results in terms of growth, feed efficiency and carcass quality. Inclusion rate should not exceed 5 % corresponding to max inclusion rate of fish meal.
- For lactating sows peas and faba beans are appropriate protein sources.

Relevant for researchers, industry and advisors.

Miech, P., Lindberg, JE., Berggren, Å., Chhay, T., Jansson, A. 2017. Apparent faecal digestibility and nitrogen retention in piglets fed whole and peeled Cambodian field cricket meal. Journal of Insects as Food and Feed, 2017; 3(4): 279-287.
https://doi.org/10.3920/JIFF2017.0019

**Summary:** This study showed that field cricket meal is a useful feed source for mono-gastric animals. The high nitrogen retention and digestibility is promising results in terms of pig nutrition. Removal of legs did not facilitate or improve the digestibility values and nitrogen retention. Thus, in order to minimise food waste, crickets should not be peeled in this way if they are going to be processed into meal. Relevant for researchers and industry. Some popular scientific publications available for public/industry.

Stødkilde, L., Damborg, VK., Jørgensen, H., Lærke, HN., Jensen, SK. 2017. White clover fractions as protein source for monogastrics: dry matter digestibility and protein digestibility-corrected amino acid scores. J Sci Food Agric. Published on-line at: https://onlinelibrary.wiley.com/doi/full/10.1002/jsfa.8744

**Summary:** A high digestibility of white clover protein was found irrespective of the physical fractionation. Together with a well-balanced amino acid composition, this makes white clover a promising protein source for monogastrics. Relevant for researchers and industry.

Hermansen et al., 2017. Green biomass – protein production through bio-refining. DCA Report no. 093 February 2017. Aarhus University, Danish Centre for Food and Agriculture.
http://pure.au.dk/portal/files/110736531/DCArapport093.pdf

**Summary:** Utilization of 'Green biomasses' for producing high quality feed proteins has been proposed as a mean to substitute other protein sources for monogastric animals and at the same time obtain environmental benefits when the production of green biomass substitutes cereal production. The reports contain mainly the final reporting of research projects, scientific reviews, knowledge syntheses, commissioned work for authorities, technical assessments, guidelines, etc. Relevant for researchers, industry and advisors.

**Roughage:**

Wallenbeck, A., Rundgren, M., Presto, M. 2014. Inclusion of grass/clover silage in diets to growing/finishing pigs – Influence on performance and carcass quality. Acta Agriculturae Scand Section A, Vol. 64, No. 3, 145–153, http://dx.doi.org/10.1080/09064702.2015.1006668

**Summary:** Growing/finishing pigs fed 20% grass/clover silage in the diet (ME basis) had somewhat lower daily weight gain than pigs fed only commercial cereal-based feed, but the results showed that pigs can make use of the nutrients of grass/clover silage. However, due to silage refusals when silage was fed chopped or intact, the results indicate that the form in which the silage is fed is important for consumption, nutrient utilisation and for the ability of pigs to consume the silage. Relevant for researchers, advisors and industry.

ICOPP – Improved contribution of local feed to support 100 % organic feed supply to pigs and poultry. Synthesis report, 2014. http://orgprints.org/28078/

**Summary:** The potential of roughage to contribute to the nutritional needs of monogastrics are unclear or not taken into account in the feeding planning. Key conclusions are:

- For growing pigs inclusion of grass-silage cut at an early stage of development in a mixed diet with concentrates does contribute to the energy and in particular protein supply (and prevent ulcer damages), but the overall production results (daily gain and feed conversion rate) becomes poorer when silage is included with more than 10%. At the same time activity/competition at the feed trough may increase resulting in more skin lesions.
- In a diet with lucerne silage for growers no difference were found in growth rate when soybean protein were substituted with peas protein, underpinning the fact that forage does contribute to amino acid supply
- No difference in production results for growers were found between using silage of red clover or chicory silage

Relevant for researchers, industry, advisors, farmers.

ICOPP – Improved contribution of local feed to support 100 % organic feed supply to pigs and poultry. Synthesis report, 2014. http://orgprints.org/28078/

**Summary:** Access to a foraging area represent a possibility for the pigs to partly cover their nutritionals needs by the biomass available here. Main findings are:

- For growing pigs direct foraging on well-established lucerne can pose an important contribution to energy and protein supply in fattening pigs if the pigs are fed restrictively with a low-protein feed mixture and if the pigs get regularly access to new land (strip-grazing). However, the restriction in supplemental feed also reduces growth rate significantly. Thus while the feed conversion rate of the supplied concentrate improves, the overall feed conversion rate becomes poorer as was also seen when feeding grass silage to growing pigs. Thus, it seems that for growing pigs the foraging in particular is useful in supplying amino acids.

Relevant for researchers, industry, advisors, farmers.

Presto Åkerfeldt, M. et al., 2018. Chicory and red clover silage in diets to finishing pigs - influence on performance, time budgets and social interactions (manuscript submitted to Organic Agriculture)

**Summary:** Finishing pigs fed 80% commercial cereal-based feed (energy basis) and chicory or red clover silage ad libitum showed lower daily weight gain than pigs in a control group fed 100% commercial cereal-based feed (100% of nutrient recommendation). Conversion of the commercial cereal-based feed to lean meat growth was more efficient for pigs fed red clover silage than pigs fed chicory silage and pigs fed only commercial feed (control), indicating that the pigs utilized the nutrients in clover silage. Relevant for researchers, advisors, farmers.