

How can we achieve 100% organic diets for pigs and poultry?

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Summary

The question of quantity and quality of inputs that may be used is of high importance for the development of organic livestock production in light of the current revision of the European regulation on organic food. The paper is based on the EU funded project Organic Revision and presents selected results concerning the question of independence from conventional inputs in relation to organic feed. Fundamental differences in the structure and in the relationship between input and output lead to completely different agro-ecosystems. This limits the relevance of recommendations derived from nutritional research in conventional systems for organic animal husbandry. The limitation of protein supply in organic systems represents not only a challenge but also an opportunity for improved quality. It is possible to formulate diets for pigs and poultry with only organic ingredients, although availability of protein can be problematic. Farmers can adopt a range of measures to reduce the demand for high quality protein sources in the diet of pigs and poultry.

Key words: Organic rations, animal nutrition, feeding strategies

Introduction

The question of which non-organic inputs and their volume used in organic farm systems is of high importance for the integrity of organic production. According to current regulations organic farm animals must be fed on organically produced feedstuffs which are primarily of home-grown feedstuffs (EC Regulation 2092/91, Annex I B 4.2-4.3). Only if organic feed is not available in sufficient quantity and quality, can a set percentage for each type of non-organic components (from Annex II) be used. The proposal for a total revision of the European Organic Regulation envisages no further use of non-organic materials unless special conditions for flexibility apply.

Closing the nutrient cycle within a farm system both for plants and livestock is an important aim of organic farming. Under the conditions of 100% organic diets organic livestock production is challenged to deal with limited availability of feed materials. There is particular concern about being able to formulate adequate rations that meet the nutritional and physiological requirements of livestock, especially in relation to essential amino acids in the feeding of poultry and pigs. Nutritional imbalances could have a negative impact on animal health and welfare mainly in the case of young stock. However, allowing conventional feedstuffs to be used carries the risk of residues and GM contamination, and could lead to an unwanted intensification of organic animal production with damaging effects on consumer confidence in organic animal products.

The EU funded research project Organic Revision has looked at the question of how 100% organic feed rations for pigs and poultry can be achieved. A literature review provided an

overview of the system related aspects of the protein supply in organic poultry and pig production. The physiological effects of a variation in protein nutrition with respect to growth performance and protein accretion in broilers, turkeys, laying hens and pigs were examined. The potential side-effects on product quality and animal health and welfare were addressed (Sundrum et al., 2005). In addition, an overview of supply and demand for organic concentrate feed based on statistical data under the assumption of 100% organic rations was calculated (Padel, 2005).

A systems approach to animal nutrition

Organic agriculture is frequently described as a systems approach to farming. The principle of organic production of aiming for a balanced relationship between crops and animals through the use of farm derived and renewable natural resources corresponds well with characteristics of 'open systems' that aim for a state of equilibrium (Hodson, 2002). Using a system approach implies that a farm system can only be understood if all its components, properties, boundaries, goals and internal feedback mechanism are considered.

Matching the supply of nutrients as accurately as possible to the requirements of maintenance and performance at various stages of development is an important tool of performance-oriented conventional livestock production (Flachowsky, 1998). In formulating diets for organic farm animals the goals of producing animal products of high quality in a cost effective way have to be balanced with the needs of both the animals in the various stages of life and the environment (Sundrum, 2001). The overall aim of minimising the use of external inputs implies that at least some of the required feed materials should be grown on the holding. Both nutrient requirements and availability of farm feed materials are farm specific, the former depending on genotype and expected performance, the latter on farm resources, climate, soils and the resulting crop rotation. Animal nutrition in organic livestock production therefore requires a systems oriented approach taking supply and demand at various levels into account. This fundamentally different approach restricts the applicability of the conclusions and recommendations from research in animal nutrition under the conditions of conventional agriculture.

Limited protein accretion and protein supply as an opportunity for quality

Protein accretion in the organism is the result of protein synthesis rate and decomposition rate; both are greatly influenced by the genotype of the organism. Under the economic conditions of conventional agriculture, farmers aim to maximise protein accretion by using genotypes with a high growth capacity and by increasing the supply of essential amino acids (EAA) through increasing their concentration in the feed ration. Aiming for high protein accretion carries associated risks, as observed particularly in the case of poultry production (European Commission, 2000). In organic poultry and pig production systems, growth rates and protein accretion are clearly lower compared with conventional, because of the restricted availability of feedstuffs with a high content of the limiting amino acids. Reduced growth rates are an important precondition for high sensorial quality of meat from monogastric animals due to antagonistic relationships between traits related to performance and to sensorial quality. Limitations of the supply of protein in organic systems, if managed appropriately, represent not only a challenge for ration formulation for pigs and poultry but also an opportunity to improve product quality.

Organic animal systems aim to utilise organic home grown protein sources because conventional feed materials of Annex II C of EC Regulation 2092/91 can only be used until the end of the transition period ending the derogation for such feeds. Apart from pulses other organically produced feedstuffs that could potentially be valuable are various expeller cakes and milk products. However, factors such as digestibility and amino acid availability, content of metabolisable energy, fibre, fat, and type and quantity of anti-nutritive factors (ANFs) influence the maximum inclusion rate of many home grown protein sources. Particular challenges arise in replacing conventional ingredients in organically produced compound feeds.

Concerning animal health and welfare problems in relation to nutritional imbalances, there is sound evidence that, apart from the animal's first weeks of life, both poultry and pigs can compensate to a high degree for imbalanced feed rations without the onset of specific health and welfare problems. Many examples of 100% organic feed rations clearly indicate that in general, it is possible to formulate diets without the use of non-organic feedstuffs (see Tab 1). However, strains with a high genetic yield capacity seem to be more sensitive to suboptimal feed rations than slow growing strains or robust breeds.

Tab 1: Examples of 100% organic feed ration for broiler (fattening period)

Ration / Ingredient	Wheat	Wheat bran	Barley	Oat	Maize	Peas	Soya bean	Soya cake	Maize gluten	Linseed cake	Sunflower cake	Minerals	Oil	Energy MJME	Lysine	Methionine
I	21		11		19	14	15		2	5	7	3.8	2	12.4	7.2	3
II	23		15		21	14	12			4	5	3.8	2	12.4	6.5	2
III	21		14	9	19	12		12		4	5	3.7		11.2	7.2	3
IV	20		20	10	18	12		10		3	3	3.7		11.2	6.5	2
IV	33	3			10	15	29				5	3.9	2	12.3	11	4

Source: various authors in Sundrum et al (2005)

Balance of supply and demand for protein feeds

On the basis of statistical data on land use and number of livestock on organic farms in the EU-25 between 2002 and 2004 estimates for average crop yield, proportion used in animal feed, average intake of concentrated organic feed for various stock categories and demand balances for organic concentrate feed in Europe and in the UK were calculated (Padel, 2005; see Figure 1).

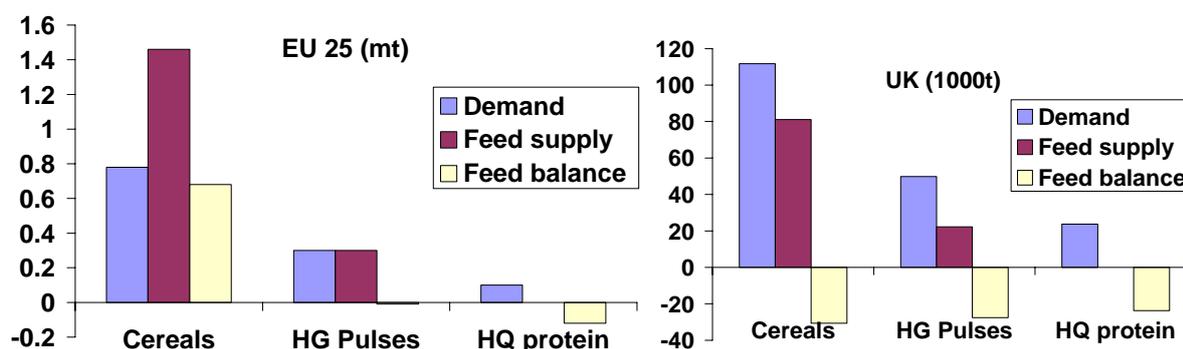


Figure 1: Supply and Demand for organic feed materials in Europe and the UK (Source Padel, 2005)

In the EU 25 More than half of the demand arises from ruminant stock, a quarter from organic poultry, and the remainder from organic pigs, in the UK less than half arises from ruminants and the highest demand comes from poultry. Between 2002 and 2004, in the EU-25 the production of cereals would have been sufficient to feed all stock with 100% organic diets, but there was insufficient high quality protein. Adopting the feeding strategies suggested below could reduce

the overall demand for high quality protein sources, but would increase the demand for pulses and cereals. Greater demand because of the move to 100% organic should help to stimulate supply. Because of the considerable number of animals involved, changes in the diet of ruminants could have an impact on the overall demand and availability of organic protein sources in Europe.

Developing a farm specific strategy for feeding and monitoring

Organic farms vary in relation to availability and quality of home-grown feedstuffs, the performance and feed intake of animal genotypes, and in farm specific housing and feeding conditions. Typical crop rotations in the UK range from mainly grass based systems in the high rainfall and mountain areas to rotations with a high proportion of cereals and pulses. Livestock systems range from sheep and cattle farms in the grassland areas to mixed livestock systems comprising cattle, sheep, pigs and poultry of a range of breeds and strains and of varying flock sizes. Due to this variability, feeding strategies that aim to achieve 100% organic feed within the given time scale need to be closely related to the farm specific situation and cannot be based on blueprint recommendations. The analysis of home-grown feedstuffs and accurate calculation of feed rations according to the requirements in the different stages of life are essential to improve the efficiency of feed use. Regular monitoring of the supply and demand for feed at the farm gate helps to assess the necessity for supplementation with external feed materials. The following measures could be used by organic farmers in working towards 100% organic diets:

- Using of slow growing strains, thus reducing nutritional requirements;
- Increasing the feed intake
 - by reducing the energy content of the diet and
 - by optimising feeding and housing conditions so that the concentration of essential amino acids in the feed ration can be reduced which reduces the demand for high quality protein feeds;
- Implementing multiple phase feeding, thus adapting the supply more closely to the requirements in the different stages of production,
- Implementing sex-segregated housing to adapt the supply more closely to the different requirements of the genders,
- Using compensatory growth effects, thus reducing the demand for feedstuffs of high quality protein,
- Purchasing of organic protein sources like rape cake, soybean cake, or skim milk powder to compensate for the previous use of non-organic feedstuffs.

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