Technical Note 2

ICOPP

Improved Contribution of Local Feed to Support 100% Organic Feed Supply to Pigs and Poultry

Fulfilling 100% organic poultry diets: Roughage and foraging from the range

Introduction

The derogation from the EU Organic Regulatory Board to allow organic pig and poultry producers to include up to 5% non-organic feed within their rations was due to finish at the end of December 2014. This has now been extended to 31 December 2017 when it will become compulsory under EU Regulations (EC) no 889/2008 to provide all organic livestock with feed derived from organic origin. A further requirement of the regulation is that at least 20% of the feed should originate from the farm unit or if this is not possible from the same region. The organic regulations also dictate that roughage, fresh or dried fodder, or silage be added to the daily ration for poultry. In addition, poultry must be given access to pasture to complement their dietary requirements and express natural behaviours. This guide investigates the role that ranging and forage feeding can play in contributing to fulfilling nutritional requirements of poultry. See ICOPP Technical Note 1 for information on alternative concentrates.

The main dietary challenge for poultry producers is ensuring that the organic feed fulfils the nutrient requirements of poultry, in particular with regards to protein and amino acid profile. Poultry are capable of finding and utilising a considerable amount of feed from a forage range area. Ranging birds obtain nutrients from pasture, seeds, insects and other small invertebrates. Crude protein content of edible insects ranges from 30% to 80%, and the amino acid profiles of insects are better matched to poultry requirements than the amino acid profiles of legumes or cereals.

Laying hens are able to consume considerable amounts of fresh grass, which may account for 12-13% of their total dry matter intake. It is estimated that hens could obtain 5-10 % of their nutritional demands from foraging. In organic broiler husbandry, access to a grass-clover covered pasture could also substantially contribute to protein supply. Broilers are able to obtain 7% of the recommended amount of protein by consuming grass-clover from the pasture.

Moreover, additional feed resources, such as maize silage, Lucerne, dried grass and carrots, can enhance natural behaviour (more time busy with feed intake), reduce the risk of feather pecking and provision of fibres enhances gut flora and gut health.

Nutritional requirements

The essential amino acids methionine and lysine are considered as the two first limiting amino acids in commercially prepared poultry rations (Table 1).

Restricting supplementary feed has the potential to increase forage consumption of poultry by up to 50%. Increasing consumption is dependent on the type and quality of forage available, foraging motivation, voluntary intake and the ability of poultry to ingest and utilise forage.

Nutrient-restricted hens can acquire at least 70% of the requirements of lysine and methionine from forage material and approximately 25% of their requirements for calcium. After an adaptation period, nutrient-restricted hens can perform well in a crop rotation; laying rates have been found to be comparable to non-restricted hens.

Table 1. Amino acid requirements as percentage of laying hen/broiler diets (Merck vet manual 2014)

	Layers (brown eggs)		Broilers (weeks old)		
			0-3	3-6	6-8
Feed intake g/b/d	100	120			
Protein %	18.0	15.0	23.0	20.0	18.0
Methionine %	0.36	0.30	0.50	0.38	0.32
Met+Cystine %	0.71	0.59	0.90	0.72	0.60
Arginine %	0.85	0.71	1.25	1.10	1.00
Lysine %	0.84	0.70	1.10	1.00	0.85
Tryptophan %	0.19	0.16	0.20	0.18	0.16
Threonine %	0.57	0.48	0.80	0.74	0.68

Benefits of herbage and ranging

In general, poultry have been found to have excellent welfare in forage-based systems, with regards to ability to perform natural behaviours and satisfy natural instincts and reduction of adverse behaviours such as feather pecking. Moreover, nutrient-restriction to encourage poultry to access forage does not seem to have any negative consequences on the welfare. Some of the benefits of ranging include:

- More natural behaviour (foraging, exploration, dust bathing).
- Better bird welfare including less feather pecking, drier litter, better air quality and lower mortality rate.
- Positive effects on the intake and digestibility of the standard diet.
- Potential for poultry becoming an integrated and functional part of the whole farming system e.g. optimised nutrient recycling, diverse crop rotations, weed and pest control, energy crops for biofuel and better use of existing resources.
- One of the most important egg quality parameters for the consumer is the yolk colour, which has been shown to become darker with herbage intake.

Initiatives to motivate poultry to forage include approaches such as artificial structuring and planting of trees to improve the attractiveness of the open-air run to increase the number and dispersion of poultry using the area. Introducing poultry to pasture at an early age also increases range usage.

However, the drawback to using forages, especially pastures, is that they may not be available during the entire year. This means that the feeding program may have to be modified from one season to the next. It is also difficult to quantify the availability and intake of invertebrates and thus the overall contribution of foraging and ranging towards fulfilling the nutritional requirements. When any forage is incorporated into a complete feed, the energy density of the feed is decreased because of the low concentrations of metabolisable energy in forages.

Crops to improve foraging quality

Grass/clover

Grass/clover swards are the cornerstone in the fertility-building phase of organic farming systems. They can have a crude protein content of 20-24% and lysine and methionine content of 0.99 and 0.30% (DM basis) respectively. Intake of grass/clover may be 10-30g/hen/day rising to 20-40g/hen/day for nutrient-restricted hens.

Oats

Oats (with a crude protein content of 12-15%) are a very robust crop that complement organic farming practices. Oat crops are well adapted to cultivation in North-West and Eastern Europe. The amino acid composition of oats is superior to that of other cereals with regards to poultry diets, due to the higher amounts of the limiting amino acids methionine, lysine and threonine.

Lucerne (alfalfa) and lucerne silage

Lucerne harvested at an early stage is high in lysine and methionine with low crude fibre content. Conserved as silage, this material has a high potential to serve as a protein source for poultry, and research indicates that grazing lucerne can make an important contribution to protein supply in organic poultry.

Lucerne has been found to contain between 15.4% and 24% crude protein (DM basis) and has 1.15% and 0.27% lysine and methionine content respectively. Poultry fed lucerne silage produce eggs and meat with a higher content of Omega-3 fatty-acids, and meat lower in cholesterol than poultry fed a complete feed mixture.

The yield potential of lucerne is high, ranging from 10-14 t/ha annually, and it can persist for 3 years. When producing lucerne silage the following instructions should be followed:

- The crops need to be mowed at a height of at least 10cm to prevent soil contamination, further increase protein concentration and reduce fibre content of the crop.
- Crops must be wilted to at least 40% of dry matter.
- To ensure an adequate compaction, the crop must be chopped very short and pressed with a special press for corn silage.

Using these practices, lucerne silage can have at least 22.5% crude protein, 1.1% lysine and 3% methionine (DM basis).

Lucerne can be grown on a range of soil types (chalk, clay loams to limestone) which are free draining; waterlogging will kill the lucerne plant. Sowing should take place in warm soils in late spring. Light establishment of the crop can be expected in the first year. It is recommended to sow a companion grass separately like timothy or meadow fescue to give a thicker sward for weed control which is particularly important for organic farms.

Due to the low energy and relatively high protein content in lucerne silage the supplementary concentrated feed

mixture must contain a high energy content and a low protein content. This ensures that the ratio between ingested amino acids and absorbed energy corresponds to the requirements of the animals.

Arable silage

Arable silage, usually peas and a cereal, is a good way to increase the protein content of forage. It can be included readily in an organic rotation (especially with oats) due to the nitrogen-fixing ability of peas.

Harvesting oats and other cereals at the milk to soft dough stage is recommended. Yields are lower, but nutrient concentration in dry matter is higher. Wilting the mass before chopping is recommended to increase the dry matter content up to 35% to improve fermentation, avoiding juice out-flow and nutrient loss.

The length of chopping is an important factor for the success of ensiling. A theoretical chop length of 10-20 mm is considered optimal. Finely chopped silage is ingested in greater quantity.

Herbs to be sown in the range area

Herbs or herb products have been the focus of a number of feeding studies in poultry as a component of high nutrition forage. Poultry tend to give priority to the plant species nearer the ground (20-30 cm) so having nutrient-rich, palatable herbs in the forage area should increase forage intake.

Chicory

Chicory is potentially a high nutritional value forage crop for poultry with a crude protein content of up to 30% (DM). Analyses of chicory leaves revealed a relatively high content of lysine and methionine (1.21% and 0.4% respectively (DM basis)). Hens foraging chicory plots can consume up to twice as much as those on grass/clover leys. Hens can ingest up to 70g DM of chicory per day which would correspond to approximately 0.39 MJ metabolisable energy (ME) per hen per day. However, amino acid concentration in chicory varies according to cultivar, the age of the plant and the part of the plant analysed. Chicory may have an influence on egg quality: albumen DM is higher and yolk colour darker and redder when hens forage chicory compared to grass/clover.

Chicory has the potential to be grown throughout Europe as it grows well in poor soil and under drought conditions.

Purslane

Purslane is worth considering as a feedstuff for organic laying hens. Purslane leaves have their highest amounts of protein (44.3% DM) in the third growth stage (seed formation). The lysine and methionine+cystine contents of purslane range from 6.3% to 6.9% and 1.3% to 1.45% of protein content respectively. Ideal temperatures for production are between 24°C and 27°C during germination, and less (between 20°C and 22°C) during the maturation stage so may not be appropriate for growing in north-western European countries.

Other herbs

Dandelions in a sward can contribute to the nutrient supply of foraging poultry. Crude protein content can range from 13.8% to 22.8% (DM basis) with lysine and methionine contents of 1.40 and 0.46% respectively. Other herbs of note that are both palatable and of nutritional value to poultry include chickweed, fat hen, plantain and birdsfoot trefoil. Seed companies can provide organic herbal ley seed mixtures with a variety of herbs that provide a range of nutritional benefits for foraging poultry.

Feeding strategies

It is recommended that organic poultry producers implement strategies to increase the overall intake of forage from both rations and the range. Therefore the supply of silage would require a feeding system that allows simultaneous feeding of more birds and a reduction of competition for feed. Alternatively, birds can be allowed free access to grass silage in addition to a base restricted ration of concentrate feed.

Silage consumption increases with the age of the poultry and broilers can eat between 10% and 20% of the daily dry matter in the rearing period (week 1 to 4) and up to 30% in the fattening period (week 5 to 8). Therefore, an adjustment of the concentrated feed is required to reflect the increasing silage intake at different stages of broiler development. Silage intake of up to 20% of the total daily dry matter feed intake can be reached in the feeding of laying hens. The laying performance and egg weights of animals fed within this silage system have been found to be comparable with the performance achieved in hens fed a complete feed mixture.

Recommendations for feeding roughage:

- Restrict supplementary feed to a lower level to encourage foraging and herbage intake.
- Reducing the particle size of herbage by chopping the silage may improve digestion and reduce spillage of the feed material.
- Provide a system that allows adequate time and space for feed consumption, and reduces competition for feed.

- Provide small amounts of roughage every day instead of large amounts less frequently.
- Spread out the roughage such that all birds have access to it.
- Dispense roughage during the evening to keep the hens calm.
- Dispense roughage during the day to keep the hens busy.
- Provide roughage during rearing.
- Vary the types of roughage that are provided.
- If you don't feed roughage already, then start feeding it when feather pecking occurs.

Organic poultry houses may have to be adapted to enable roughage feeding. Extra labour requirements may be offset by reduced feed costs and better bird welfare.

Environmental considerations

If increased foraging of suitable vegetation is utilised, better use of local resources can take place. This could increase the cycling of nutrients within the system, ease the transition to 100% organic rations, lead to greater dispersion of poultry in the field spreading manure instead of accumulation directly around the stable and increase welfare in terms of encouraging birds to perform natural behaviours.

Nitrogen (N) and phosphorous (P) surpluses have shown to be lower in eggs from hens that have access to forage. One study found surpluses of N and P to be approximately 0.9 and 0.3g per hen per day respectively where forage was accessed, whereas in systems where concentrates made up the entire diet the average N-surplus varied from 2.5-3.4g per hen per day and the average P-surplus was around 0.8g per hen per day.

Other issues and ideas

The forage part of total feed intake should form the foundation of poultry rations going forward. This would decrease the reliance on feed imported onto the farm, which in theory should make it easier to fulfill 100% organic poultry diets, and adhere to the organic standards and philosophies ensuring a more sustainable and environmentally friendly end product. Therefore it is essential to introduce strategies to motivate birds to forage and range.

Another way of providing novel proteins (without high production costs) includes improving the range by increasing biodiversity (plants and insects) so chickens can supplement their diet themselves. Maybe the range can be inoculated with earthworms or forage boxes with insects can be placed on the range. This idea fits in with an organic system. It is also important to consider other ways of solving the 100% organic feed problem, e.g. by using slower growing broilers, less highly producing hybrids, which have lower methionine requirements.

Finally, poultry grazing and receiving silage will inevitably use more energy for maintenance processes therefore production targets should be adjusted to cater for increased energy use.

Conclusions

The organic regulations dictate that roughage, fresh or dried fodder, or silage be added to the daily ration for poultry. In addition, poultry must be given access to pasture to complement their dietary requirements and express natural behaviours. Some of the benefits of ranging include the opportunity for birds to perform natural behaviours and the potential for poultry to become an integrated part of the whole farming system. Various crops can be used to improve forage quality. In terms of forage supplied to the birds, lucerne or crop silage may provide a good level of nutrients including essential amino acids. In terms of pasture grass/clover swards can contribute to poultry diets and additional herbs such as chicory may provide higher nutritional value.

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Also see ICOPP Technical Note 1 for information on alternative concentrates.

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ICOPP is the acronym of the project 'Improved Contribution of local feed to support 100% Organic feed supply to Pigs and Poultry' which ran from 2011 to 2014. It was funded through the European CORE Organic II ERA-net programme to support organic research, and led by Aarhus University in Denmark with 15 partners across 10 EU countries.

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