The Diet of “Organic” Livestock

Improving Nutrition and Performance of Organic Livestock

Tag Words: Organic Livestock, Diet, Feed Efficiency, Feed Palatability, Feed Intake, methane

Authors: Jessica Noll, Kavita Thiruchelvam and Julie M. Fagan, Ph.D.

Summary: The issue is whether organic livestock diets are balanced, efficient, and improve performance. The focus is on how inefficient diets leads to lower performance of the organic livestock and what diet supplements should be used to achieve this. The solution is to make the feed more palatable, supplement with carbohydrates and proteins, and to determine the most optimal diet supplement for the organic livestock.

Video Link: https://www.youtube.com/watch?v=UCo5raGpthA&list=UUts4_1WyqXMmVDfu9ZffStA

Organic Livestock Farming (JN)

In order for a farm with livestock to be certified as organic, it has to follow the USDA organic regulations throughout the animals’ life (1). These requirements involve practices that must conserve natural resources and biodiversity. Additional requirements are that there should be without 1) genetic engineering, 2) radiation due to ionization, and 3) sewage sludge in the feed. Additionally, the “National List of Allowed and Prohibited Substances” must be strictly followed. A USDA National Organic Program-authorized certifying agent must oversee all of the production. The livestock must follow those organic regulations immediately after birth for poultry or towards the end of the pregnancy for mammals. The animals must have access to the outdoors all year-round, within reason. All the feed crops must be organic and certified except trace minerals and vitamins which the animal may need according to the animal’s nutritional requirements. The animals must be raised per animal health and welfare standards. Antibiotics, growth hormones, mammalian or avian byproducts, or other prohibited feeds cannot be fed to the livestock. Only a few drugs, like vaccines can be used.

The diet of the animals is all organic feed that is grown without chemical pesticides or artificial fertilizers, free from genetically modified organisms, and the manure for fertilizer should come from organically-kept animals. These requirements allow the products which include milk, eggs, and meat to be grown under more humane conditions. The products should contain fewer residues (for example: pesticides and veterinary drugs) compared to factory farming.

Eating organic meat is more environmentally-friendly, some believe to be more humane than non-organic meat. However, the organic industry is not perfect. There are still some improvements regarding the industry that need to be made. One of the improvements that will be discussed is the demand for better performance of the livestock. The livestock from conventional farms tend to have better performance than livestock from organic farms. This could be due to many reasons, with one being that conventional farms use growth hormones which greatly
enhance performance. This paper will discuss why organic feeds results in lower performance in organic farms and how to improve it.

**Issues Associated with Organic Livestock Feed (KT)**

Since the diet of organic livestock does not include growth hormones and antibiotics, the performance of organic livestock is considerably lower than that of commercial farm’s livestock. The inclusion of growth hormones in commercial livestock enables them to have higher fat and muscle content and also increases their rate of growth. Hence, commercially grown livestock could easily outperform organic livestock of the same age, due to the effects of these growth hormones. Plus, with the inclusion of antibiotics in the diet, the commercial livestock is able to withstand diseases better than organic livestock. Therefore, although organic farms may more sustainability to the environment and be a preferred choice amongst some consumers, the diet of organic livestock has several drawbacks that lead to poor performance.

**Feed Efficiency**

A study by Rodenberg et al. (2) was carried out to compare the three different diets of organic broilers and their effect on the body conditions and performance of the organic broilers. These three different diets consist of 80% organic, 95% organic and 100% organic. From the study, it was found the broilers that were fed the 100% organic feed had lower body weight and slower growth rate compared to the 80% organic and 95% organic fed broilers. This was due to insufficient level of methionine in the 100% organic feed compared with the two other feeds. The broilers that was fed with the 100% organic feed also had a wetter litter which is deduced to be due to lack of amino acid balance that can lead to higher water intake and urination. This is an issue in the organic feed, since some of the essential feedstuffs needed for the optimum performance of broilers are not available in the organic feeds and these organic feeds also have significantly lower proteins compared to conventional feeds. Conventional feeds normally have these essential amino acids, especially methionine added from a synthetic source, which is prohibited in the organic farming. The lack of a whole-balanced organic diet that comprises all of the essential amino acids becomes a barrier for organic farms to compete with conventional farms in terms of the performance of their livestock.

In a study by Olsson et al. (3), they compared the nitrogen emissions between organic and non-organic pigs. In one of their conclusions they claimed that the larger amount of nitrogen excreted by organic pigs was due to (among other reasons) a lower feed efficiency. Their study found that phosphorus in the form of phytate in the cereals fed to the animals is not digestion friendly for the non-ruminant animals. Livestock do not have the digestive enzyme phytase, which is required to breakdown the phytate. Due to the importance of phosphorus in the pigs diet, in conventional farms, phytase is often added from an artificial source and fed to the non-organic pigs. However, the addition of feed additives is prohibited in organic farming. As a result, the organic pigs were found to have a high percentage of faecal excretion of about 55% due to low phosphorus digestibility. Thus, high excretion rate of organic feed due to absence of feed additive leads to low digestibility of feed and inadvertently increases the nitrogen emission.
One of the staple sources of protein in organic feed is Lupin. This protein source is used in place of peas in the organic farm diet, which in turn helps to supplement the diet with recommended amino acids needed by the organic livestock. However, in a study by Norgaard et al. (4), they evaluated the consequences of an oversupply of the protein source from the Lupin and found that it reduced the energy efficiency by 15kJ. The part of the energy from the feed is actually used to remove surplus of amino acid, which in turn reduces the energy needed for fat deposition. As a result, the performance of organic livestock is lower compared to conventional livestock. In addition, the study evaluated the consequences of reducing amino acids and crude protein levels. When given 85-58% of the recommended amount of methionine, 86-88% of recommended lysine and the other amino acids were reduced to about 85%. It became clear that methionine was the first limiting amino acid. Pea and lupin have a decreased amount of sulfur-containing amino acids which were given to the animals. Compared to the pea, lupin has lower methionine and lysine. Male castrates fed a lower amino acid level diet (no lupin) had a decrease in performance. Adding lupin lowered the protein quality but it had a higher crude protein level and fiber content than the pea. The 0.08% slaughter loss increased for each percent of lupin included in the feed. In addition, groups given 25% lupin had a decreased feed intake which may be due to the high content of alkaloids. “25% lupin reduced feed efficiency by 5% and increased slaughter loss by 10%.” Oversupplying proteins also leads to a lower energy efficiency. Having a diet with too much protein (high lupin) has more of a negative effect on performance than having a diet with 15% below recommended levels depending if the amount of essential amino acids are balanced (methionine and lysine). Providing 12.5% below recommended levels of lupin had no negative effects. Thus, choosing the right kind of organic feed is a real issue in organic farms since under and over supply of nutrients need to be taken into account to achieve an optimum performance of the organic livestock.

**Feed Intake**

Food consumption is one of the essential elements that affects the growth and performance of livestock. Feed intake is likely to be influenced by the composition of the feed and also the palatability of the feed itself (5). Especially, during the pre-weaning period, a low feed intake by livestock will lead to poor growth and development, which eventually affects the performance when fully matured. Hence, feed intake is essential in contributing to the performance of organic livestock since lower feed intake will lead to lower nutrient intake, which in turn will affect livestock growth.

In the previously mentioned study by Rodenberg et al. regarding broilers that were fed three different levels of organic diets (80%, 95%, and 100%), it was also stipulated that the 100% organic feed may also have lower palatability since the consumption of feed using the 100% organic feed was a lot less compared to the other feeds. Thus, it is likely that organic feed does have an impact on the feed intake of the livestock.

Variable levels of amino acids fed to livestock will result in an increased variability in the growth and body performance of livestock. A decrease in the feed ingestion is generally observed after the consumption of feeds that contains insufficient amino acids. Feed lacking in amino acids was totally refused by young turkeys (6). This study concludes that an amino acid deficiency in the organic feed results in a lower intake of the organic feed; hence, leading to a lower weight gain and performance. In order to eradicate this lower feed intake issue, the
Producers often try to utilize “processed soybeans, potato protein, yeast, dried milk or egg products” (6). However, these protein sources are often costly and are difficult to find in organic sources.

Organic feeds do not necessarily lead to lower performance. The consequences of restricting the livestock to naturally, home-grown feedstuffs and feeding with feeds insufficient in synthetic amino acids on performance of growth and characteristics of carcass produced was studied. Lack of synthetic acid in the diet can be supplemented with potato protein which was used in the study or other sources. However, the study did point out that the levels of crude proteins in the organic feeds are lower than the conventional feed. Pigs that were fed with the organic diets without the amino acid supplementation did not reach optimum growth as their conventional counterparts. Plus, there was also smaller percentage of lean meat and longissimus portion in pigs not supplemented with amino acids. Also feeding the non-supplemented diet caused a lower feed intake and slower growing period, perhaps due to low palatability of organic feeds.

According to Seabolt, livestock such as pigs show their obvious dislike for different feeds regarding its palatability (5). Feed initiation at the end of the weaning process is essential in determining the performance and growth of an organic livestock. Thus, feed palatability of the livestock need to be increased using palatable feeds in order for the organic livestock to grow in mannerly order. Seabolt discusses the effects of changes in feed composition that compromises the palatability of pigs under study. Therefore, the palatability of feed can affect the consumption of feed by livestock.

**Improving Organic Livestock Production (JN)**

**Feed Efficiency**

There was a study done by Waghorn and co-authors in 2011 to improve the feed conversion efficiency in food production animals (8). Animals that have good feed conversion efficiency require less feed than average. Animals with good feed conversion efficiency produce less ammonium and nitrous oxide per unit product than the average of the population. Farms can select for this trait. Therefore, the methane emissions will be lower per animal. Residual feed intake (RFI) is the “intake variation” taken from a predicted mean for animals in the same level of production and size. RFI should also be selected for. This is a more observable trait to distinguish. Efficient animals exist on farms but research must be done to identify and remove the inefficient individuals. Another important aspect is to focus on an animal’s emissions/unit of product or the emissions intensity (Ei). Farms want their livestock to have low RFI which will lead to low Ei.

Ruminant meat production (cow, etc) has a higher Ei compared to pig and poultry production. A few management options in order to increase feed efficiency and reduce the Ei is by “reducing the proportion of feed energy expended on animal maintenance and increasing the proportion expended on production” (8). Some options include increasing reproductive rate, growth rate, and selection for RFI. It is important to not select livestock that is associated with weaknesses because the health of the animal is more important than the NFE, RFI, and Ei. Some weaknesses may include disease susceptibility and poor reproduction.
In yet another study, the nutritional difficulties of organic pigs were assessed. Some options that they provide in order to overcome low performance are “1. diets based on grains and grain legumes produced on the farm and supplemented with external protein feedstuffs such as certain by-products; 2. incorporation of maximum amounts of grain legumes produced on the farm, accepting a relatively unbalanced dietary amino acid pattern; 3) maximum use of ‘unconventional’ feedstuffs such as by-products as a contribution to intact nutrient cycles (7)” Each of these options requires research and understanding of the limitation in order for them to be successful.

In another study, a feed additive of probiotics was used to test improvement of growth performance in piglets. A probiotic is “a live microbial feed supplement which beneficially affects the host animal by improving its intestinal balance” (10). The combined probiotic preparation used was of *Enterococcus faecium* and *Saccharomyces cerevisiae*. The conclusion was that the supplementation of combined probiotic as a feed additive led to an improvement of the production parameters in piglets. However, the differences were rather small. Feeding the combined probiotic preparation led to an increase Daily Weight Gain of 2.7% and a Feed Conversion Ratio of 4.4%.

Following organic standards does not guarantee a lower performance in pigs (10-12). Diets lacking in synthetic amino acids, potato protein among other types of sources can be used to compensate the diet. However, the crude protein levels were lower. Pigs grew slower when they were given an organic diet without amino acid supplementation. Pigs fed the organic diet without amino acid supplementation also had a decreased feed intake. The feed efficiency however, did not change between the organic diet with amino acid supplementation and a conventional diet. The pigs given the organic diet had a smaller amount of lean meat in the longissimus portion. Knowing this information, the intramuscular fat levels can be manipulated in order to obtain market requirements and therefore have the desired performance on the farm. Excluding amino acid supplementation resulted in an increase in intramuscular fat content.

The Nouriche Nutrition Company conducted research on their products and has tested their efficiency in improving the organic livestock performances. The Emcelle Tocopherol contains vitamin E that can improve organic calves’ health and performances (13). Supplanting young calves with vitamin E is important to prevent muscular dystrophy which affects the calves’ skeletal, muscular and cardiac muscles (13). Emcelle readily combines with milk; hence, does not affect the consumption and palatability of the calves’ food. Plus, calves are not able to metabolize acetate ester as effectively as free alpha-tocopherol. The Emcelle contains micellized form of the natural Vitamin E which readily allows for its absorption into the calf’s serum (13). To study the effectiveness of the Emcelle, 18 calves were randomly given three types of milk with no supplements, with Emcelle enriched and with vitamin C enriched. The results showed calves fed with Emcelle enriched milk weighed more than other calves. Thus, they showed that the Emcelle Tocopherol improved the performance of young calves in organic farming.

**Feed Intake**
A way to improve the assumed lower palatability of organic feeds which will therefore improve the feed intake is to add distiller coproducts and flavors. A study was done with pigs to analyze the preferences for different diets containing increasing amounts of Distillers Dried Grain (HP-DDG) or Distillers Dried Grain with Solubles (DDGS). They also examined the effects of flavor supplementation on preference and growth performance. Pigs are good to research palatability because they obviously show the palatability of different diets (10-12).

The coproducts (HP-DDG and DDGS) can help to improve profitability of pig production if they replace high-cost ingredients. DDGS can vary in quality with their sources and batch. Dark-colored DDGS usually has a burned, smoky odor. This can be due to overheating in the drying process. Since the early 1960s, feed flavors have helped increase palatability for nursery pig diets. Flavors mask less palatable ingredients like rapeseed meal for example. The phase that pigs will show the greatest change in feed intake with additives is the weaning phase. This is because the feed intake is usually low due to the need to adapt to solid feed and a new environment. A test was done giving pigs two options between corn- and rice-based diets. A preference was noticed after two days and palatability was been detected after 1 to 2 days. Therefore, the method to determining the preference for the pigs is fast and maximum accuracy. Testing fewer pigs at a time helps to reduce the errors due to feeding competition. This research involved two-week weaned pigs in order to guarantee feed intake and reduce the sensitivity to the experiments. They used corn and soybean meal with the test ingredients in order to reduce confusion in a drastic change of diet.

Placement of feeders, temperature, and ventilation differences were controlled in order to avoid errors. When given DDGS in the feed, there was a reduction in preference. This may be because DDGS has deoxynivalenol (DON) which pigs are very sensitive to. A high-fiber diet also leads to a lower feed intake which may be due to the texture of the feed. Texture has a great effect on feed preference. There was an increase average daily gain (ADG) when the pigs were fed a flavored diet compared to pigs fed a non-flavored diet. This was mostly the case the week immediately after weaning. Pigs preferred the diets with greater furfual which was the dark DDGS compared to diets with less. When given a two-choice test of acidified and non-acidified feeds, the pigs preferred the non-acidified feed. Flavors increase feed intake regardless of the DDGS amount when given no-choice between feeds.

Fermented liquid feed is well known for its health promoting effects on piglets. Lactic acid in high levels, acetic acids and certain biogenic amines in low levels are desired in feed. There is a limit for acetic acid in order to avoid a decreased palatability of feed. The purpose of the research was to examine which levels of lactic acid and acetic acid that can be accepted in a fermented feed without affecting the feed intake and the weight gain of the pig. In the first trial, the pigs were given increasing levels of lactic acid. In the second trial, the pigs were given increasing levels of acetic acid. No significant differences in feed consumption or daily weight gain was seen. A significant difference was found with a large amount of lactic acid the feed conversion rate (FCR) was significantly larger than the control. There was also a significant difference in FCR with the pigs that had a large amount of acetic acid. Therefore, a level of 200 mmol/kg lactic acid and 150 mmol/kg acetic acid can be given without negatively affecting the feed intake or growth performance.
In turkeys fed organic feed, there was a depression of feed intake and subsequent complete refusal to consume the food, which was most likely due to the deficiency of amino acids in the diets. Feed companies have a high quality protein feed in order to prevent feed refusal problems. These diets may include: “processed soybeans, potato protein, yeast, dried milk and/or egg products” (6). It is rather difficult to obtain these products as organic and they are also very expensive.

**Conclusion (JN and KT)**

The organic meat industry is a great industry but the performance of the livestock and the diet could be improved. Costs are 54% higher for meat from broilers that were considered 100% organically fed (2). One of the reasons for the higher cost of organic products compared to conventional products is due to a lower feed conversion; percentage of the feed mass was converted into meat output. Since organic farming has certain rules that needs to be followed, its feed conversion ratio is lower than conventional feeds. Unlike organic feeds, conventional feed is fortified with various artificial and synthetic compounds that helps to increase the performance of conventional livestock. The price of organic products is higher than conventional products due to inefficiency of the organic feed. In order to improve the feed efficiency farms can select livestock for the traits of low RFI and low Ei. They can also research and provide diet based on grain and grain legumes produced on the farm and supplemented with external protein feedstuffs, incorporation of maximum amounts of grain legumes produced on the farm, accepting a relatively unbalanced dietary amino acid pattern; and maximum use of ‘unconventional’ feedstuff such as by-products. Additional solutions are to provide probiotics and/or amino acid supplements in the diet. In order to improve the feed intake, farms can provide flavors and less DDGS in the diets. They can also provide high quality protein feedstuffs in the compound diets, such as processed soybeans, potato protein, yeast, and dried milk or egg products.

**Community Action: Survey and Suggestions to Local Organic Farmers**

We communicated with a few local organic farmers to begin to understand some of the issues they were experiencing having to do with suboptimal performance of their livestock perhaps because of the organic feed. We initiated the conversation with a few questions about their organic farm and then recommended several solutions that may help improve the efficiency of organic feed that may in turn help to improve the performance of their organic livestock.

**Questions that we asked the organic farmers: (KT)**

1. What type of organic livestock being raised?
2. What is the size of the farm?
3. What are the difficulties being faced in the organic farming? In terms of livestock diet?
4. What measures have been as the solutions for the problems as mentioned above?
5. What is the selling price of the organic livestock being sold?
6. What is the current organic feed being used?
7. What is the cost of the organic feed per month?
8. How is the performance of those organic feeds? Do you think it is balanced?
9. What is the feed conversion ratio for the organic feed used?
10. Is the organic feed being currently used efficient?
11. Any patterns on the feed intake of the livestock?
12. Are there any leftovers of the feeds?

Some of our suggestions provided to improve organic livestock feed: (JN)

Solutions for low feed efficiency:
- Select livestock for the traits of low RFI (Residual Feed Intake) and low Ei (Emissions intensity)
- Provide diets that are based on (1) grain and grain legumes produced on the farm and supplemented with external protein feedstuffs, (2) incorporation of maximum amounts of grain legumes produced on the farm, accepting a relatively unbalanced dietary amino acid pattern; and (3) maximum use of ‘unconventional’ feedstuff such as by-products
- Probiotic supplement
- Amino Acid supplement

Solutions for low feed intake:
- Flavor additives
- Less DDGS in the diet
- High quality protein feedstuffs in the compound diets (processed soybeans, potato protein, yeast, dried milk or egg products)
- Emcelle Tocophehol

Options for Natural and Organic Friendly Flavor Additives
- The Zook Molasses Company Provides
  1. Liquid Molasses Items: Cane Molasses, Custom Blending, Blends for Miling, and National Horse Pro
  2. Dry Molasses Products: Z-brand Dried Molasses, 200lbs. Sweetcake Tubs, and Horse & Deer Blocks
  3. Nutri Ad Ingredients: Feed Flavors, Appetite Enhancers, and Apex - Increased Performance Digestibility
- Nouriche Nutrition Ltd. Provides FEEDBUDS
- All American Ranch Feeds Provides Certified Organic Feeds
- GSB & Associates, Inc., Flavor Creators Provides
  1. Natural Anise Oil #2638, Natural Smokey Bacon Flavor O.S. #2236, Natural & Caramel Corn Flavor O.S. #889, Natural Cinnamon Flavor #1420, Natural & Corn Flavor W.S. #4168, Natural & Diacetyl Replacer W.S. #8246, Natural Hamburger Flavor O.S. #6995, Natural Lemon Juice Flavor #1199, Natural Licorice Flavor W.S. #1932, Natural Lime Oil Flavor #694, Natural Mesquite Smoke Flavor W.S. #104, Natural Orange Oil Flavor #1286, Natural Peanut Flavor O.S. #290, Natural Pig Creep Feed Flavor W.S. #187, Natural Roasted Garlic Flavor O.S. #3390, Natural Sweetener Flavor Key O.S. #1437, Natural Sweetener Flavor O.S. #10338

References

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**Letters to the Editor (sent Nov 2014)**

Dear Editor of the Targum,

Please consider my post below for publication in your online newsletter. If you have any questions or would like to contact me, please email me at xxx@yahoo.com or call me at xxx-xxx-xxxx. Thank You, Jessica Noll.

The organic meat industry is not perfect. It is clearly a more humane choice compared to conventional livestock farms however, it needs some work. Now that the demand for organic meat is growing, it is essential to have a more efficient industry. In order for the industry to improve, the performance of their livestock needs to increase. Since conventional livestock farms
use growth hormones, their livestock performance outweighs organic livestock performance. The organic industry needs to figure out a way to catch up.

The best way to approach this problem is through the diet of the livestock. Livestock tend to have a lower feed intake and feed efficiency when consuming organic diets. If these two issues are addressed, the performance of the livestock will increase. Low feed intake generally is caused by low palatability. If natural additives and flavors are added to the diet the palatability and therefore the feed intake will improve. The low feed efficiency is mostly due to the diet being unbalanced. If the protein levels are balanced by adding amino acid supplements the diet will progress.

Improving the performance of organic livestock through the diet will allow the organic industry to be more efficient. If the industry advances, more farmers may be likely to switch over to the organic industry.

Jessica Noll

Dear Editor,

I would like to bring upon your attention regarding the few issues concerning organic farms. Organic farms have been gaining a lot of attention from the consumers for the benefits that is provides such as long term health improvements and the maintenance of a sustainable environment. Despite this, there are few disadvantages surrounding the organic farms. One of the issues is the food and feed additive. Since the organic farms requires 100% pure organic feeds, it is difficult for the organic farm owners to fatten and increase their live stocks performance; Hence, the owners, make a lot less profits than conventional farmers (Stine and Kim 2001). Plus, during winter season, it is also often difficult for the ruminants to intake sufficient vitamins that is needed for their welfare (Stine and Kim 2001). Hence, it is a no surprise that these organic farm animals are often malnutritioned compared to other ordinary farms. Thus, measure to eliminate this condition of malnutrition among the organic farm animals need to be addressed more in order to raise public awareness. I hope you will look into this issue with utter priority.

Thank You,
Kavita Thiruchelvam
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