Environment Matters

Green pork

This year has seen the first international Environmental Product Declaration (EPD) published for an animal health product. Not only that, but it was for a swine product: Improvac, the immunological product that is used to reduce boar taint.

EPDs provide a summary of the environmental burden of a product or service based on a detailed and certified life cycle assessment (LCA).

The LCA is a well established methodology for quantifying the entire environmental burden of a product or process from start to finish. It takes into account every aspect of the manufacture, distribution, usage and disposal of a product.

So, an LCA for pork production would take account of all the resources, such as energy, water and feed, required to raise pigs, slaughter them, prepare the meat and distribute it to consumers.

The assessment would also assess the waste products produced by all of these processes and the resources used to dispose of them.

Pork production has already been the subject of life cycle assessments conducted by different groups around the world and has been described as a 'low environmental burden' meat product with a relatively low potential for global warming.

However, this is not a reason for complacency and the fact that Improvac can actually reduce that burden even further is good news for the pork industry. So, are we likely to see a flood of life cycle assessments and EPDs for products used in the production of food animals?

"Life cycle assessment is a key tool used by many industries around the world to keep track of the environmental impact of what they do," says Gian Luca Baldo, senior engineer at Life Cycle Engineering, Turin, who managed the LCA for Improvac.

"The farming sector has always been in the spotlight for its impact on the environment, for example the amount of methane and other greenhouse gases that it produces.

"However, there are very few animal health products that have the potential to reduce that burden – Improvac is quite unusual in that respect."

Although the Improvac EPD may not herald a new trend for environmentally friendly animal health products, it does highlight the fact that farmers can do more to protect the environment which provides their livelihood.

It also provides further support for the environmental impact of pork production compared to other meats.

Farming, like all major industries, is under increasing pressure to improve its green credentials.

Environmental concerns may not be the only or main criteria that most people apply when choosing a meat, but they are becoming a more important factor in developed markets.

Anything we can do to show the world that pork is a 'greener' and more welfare friendly meat than beef, lamb, chicken or fish will help to support and protect our industry against inroads from other sources of protein.

Subsequent articles in this series will take a closer look at LCAs and how they can help us to understand and improve the relationship between the pork chain and the environment.

Environment Matters

Carbon footprint

Carbon footprint is the term that is being increasingly used when environmental issues are discussed, but few understand exactly what it means. Put simply, the carbon footprint of a product, person or service is the amount of greenhouse gases that it releases into the atmosphere over a given period.

There are a number of gases that are believed to contribute to global warming, including carbon dioxide, methane, nitrous oxide and hydrofluorocarbons.

Each gas has a different potential for global warming and scientists have drawn up an internationally agreed protocol which compares the relative effect of each one. For example, one unit of methane is equivalent to 25 units of CO_2 and one unit of nitrous oxide is equivalent to 298 units of CO_2.

Rather than list all the different greenhouse gases produced by an activity, it was decided to make life easier by converting all gases to their carbon dioxide equivalent (CO_2e) using the agreed conversion rates. This allows gas emissions to be quantified using the CO_2e unit (kg or tons for example) and thus the impact of different types of activities to be compared directly.

The amount of CO_2e produced by an activity is referred to as its carbon footprint or global warming potential (GWP), and is a general measure of its impact on the environment.

Life Cycle Assessment (LCA) is a well established method of determining the entire environmental impact of a product or service throughout its life cycle, from cradle to grave. So, for example, an LCA of swine production would assess all of the resources used in raising pigs, including the energy, water and other resources required to feed, manage, transport, slaughter and process animals. It would also quantify the amount of waste produced by the entire process including those produced by the burning of fossil fuels in energy generation and transportation, and the gaseous, solid and liquid waste produced by the pigs themselves. The carbon footprint will vary from farm to farm and country to country depending on management systems, location of feed sources and methods of energy production. However, by analysing data from a number of farms, average figures can be determined.

A number of LCAs of swine and pork production have been carried out and have found that swine production has a relatively small carbon footprint compared to other food animal industries. For example, the pork carbon footprint is around a quarter of that for beef.

A swine production LCA carried out last year revealed that feed and waste (slurry/manure) make by far the biggest contribution to the carbon footprint of swine production – around 20% and 40% respectively.

The same LCA compared the environmental burden of boars raised using the immunological product Improvac to reduce boar taint, with those physically castrated as piglets. Data was collected and analysed from farms in different global regions and using different production systems, and the carbon footprint of each method was calculated.

The results showed that for each boar raised to a live weight of 115kg using Improvac, 28kg less CO_2e was released into the atmosphere. That is equivalent to a 100km journey in an average car. The saving is mainly due to an improvement in feed conversion and a reduction in the amount of waste produced (about 60 litres less per pig).

Environment Matters

Swine feeds

The publication of the first Environmental Product Declaration (EPD) for an animal health product earlier this year has provided further insight into the impact that the swine industry has on the environment. A comprehensive life cycle assessment (LCA) conducted over a period of nine months last year, collected data from farms and slaughterhouses in different regions around the world, including China, Australia, Japan, Germany, The Netherlands, France, Italy, UK, Mexico, Chile, Canada, USA and Brazil. The aim was to compare the environmental impact of those raising boars using physical castration with those raising boars using the new immunological alternative, Improvac.

The results not only demonstrate the advantages of the new technology in environmental terms, but also give a valuable insight into the areas of pork production that are less green. The results of the LCA show that two factors contribute far more than any others to the carbon footprint of swine production: feed and waste.

These findings are in line with other life cycle assessments of swine production which have consistently demonstrated that these two factors are by far the most important in terms of environmental impact. Between them, feed and waste account for some 60% of the carbon footprint.

Hardly surprising then that Improvac, which reduces the amount of both feed used and waste generated per kg of live weight produced, can reduce the carbon footprint of swine production.

Feed accounts for around 20% of the total carbon footprint of swine production, thanks largely to the energy required for cultivation, fertiliser and pesticide use, consumption of water and transport of the feed to farms.

The Improvac LCA included a range of feed types, including wheat, corn, sorghum, soybean, rapeseed, synthetic lysine, vitamins and minerals reflecting different rearing phases and systems.

An LCA study conducted by Swedish researchers in 2005 compared the impact of different swine feeds, taking account of cultivation and management of pigs (including manure handling). Manure storage, and in particular the release of methane under anaerobic conditions, contributed most to the greenhouse gas emissions associated with raising pigs.

There is little that farmers can do to reduce the resources required to produce feed, all they can do is use the feed more efficiently, ie reduce the amount required to produce each kg of live pig or kg of lean meat.

Castrates of course utilise feed less efficiently than boars and so part of the benefit of Improvac over physical castration is that it allows normal boar growth patterns for most of the pig's life.

Feed is also the most costly input for many swine producers, so any reduction will not only benefit the environment but also improve the farmer's bottom line – especially when feed prices are high.

Based on LCA data from all the different regions, and making very conservative assumptions, for each pig raised to 115kg using Improvac rather than physical castration, producers used 18kg less feed.

That is equivalent to a 9,000kg hopper for every 500 boars. For a farm sending several thousand boars to slaughter each year, that could be a considerable saving – both financially and environmentally.

Environment Matters

Pig waste

Raising animals for food production is one of the biggest sources of greenhouse gases globally. In some regions, legislators have even considered taxing farmers based the amount of gases their livestock produce. Last year a life cycle assessment (LCA) was conducted to assess the environmental impact of a form of management which promises to significantly reduce the carbon footprint of swine production.

Improvac, an immunological product used to reduce boar taint, was compared to conventional physical castration of boars. Previous LCAs of swine production had found that feed and waste were by far the biggest contributors to the carbon footprint of swine production, and the recent Improvac specific study confirmed these findings: some 40% of the environmental burden of swine production can be attributed to the waste produced at farm level.

Another recent LCA, concentrating on the US pork chain and conducted by the University of Arkansas' Applied Sustainability Centre on behalf of the National Pork Board in the US, attributed environmental emissions as follows:

- 12% from breeding and lactating sows (including feed and waste handling).
- 60% nursery to finish.
- 5.3% processing/packaging.
- 9.4% retail (electricity, refrigerants).
- 13.3% the consumer.

The assessment found that the total environmental impact of pork production depends primarily on the amount of waste produced and the way in which it is handled. Other LCA studies have shown that different production systems produce varying results. The method used to handle manure and slurry has a marked effect on the different quantities of greenhouse gases produced: the US study, for example, found that on-farm energy consumption represented about 25% for deep pit systems and 10% for anaerobic lagoon systems.

The Improvac LCA found that 41% of the carbon footprint of pig production could be attributed to slurry management at the farm level. As Improvac pigs consume less feed than those that are physically castrated, they also produce less waste.

The LCA revealed that on average a boar raised to 115kg using Improvac produces around 60 litres less waste than a comparable castrated animal. That is equivalent to a tanker truck less waste for every 500 pigs.

The environmental impact and cost of waste handling has prompted researchers to look for more effective solutions to the issue. One group, at North Carolina State University in the US, has focused on five different technologies that show promise for the commercial setting:

- A covered in-ground lagoon system which is sealed and uses bacteria to digest waste anaerobically. The resulting biogas is used to generate electricity.
- Aerobic biofiltration which uses bacteria to break down ammonia to a liquid/solid that can be used as fertiliser.
- Sequencing batch reactor which uses a three-step process to reduce waste to harmless nitrogen gas.
- Wetlands system which uses natural plants to remove nitrogen from waste.
- High temperature anaerobic digestion and composting. Manure is digested in a closed tank and the resulting biogas used to generate power; partially digested solids are then mixed with compost material to produce material for greenhouses.