Environment report

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Foreword

The primary objective of the feed and food chain is to produce enough food to ensure food security, which was defined by the World Food Summit in 1996 as follows: "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO 1996).

The feed industry is an integral part of the production of animal products and plays a crucial role in ensuring sustainability and the responsible use of resources to achieve food security. The rising global demand for animal products places huge requirements on plant breeding and cultivation, but also on the conversion of feedstuffs into animal products.

In 1987, the Brundtland Commission defined sustainable development as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The European feed sector supports such a development and recognises sustainability as an element of its social responsibility. Consumption of Food & Drink products in the EU is one of the consumer activities with the highest environmental impact (20 to 30% according to the EIPRO study (IPTS 2006)). Environmental aspects of feed production and consumption therefore deserve

The FEFAC "Credo"

- FEFAC believes that products of animal origin form an integral part of the European diet providing key nutritional benefits to the European population. Nutritionally optimised feed meeting the physiological requirements of animals and fish raised for food production purposes is essential to mitigate the environmental impact of production and consumption of animal products.
- The EU compound feed industry is willing to responsibly contribute to the sustainable development of livestock and aquaculture production systems. FEFAC believes that the key drivers for such improvements are:
  - Promotion of ecologically intensive production systems for farm animals and fish, oriented towards maximisation of resources efficiency and minimisation of GHG emissions;
  - Changes in diet patterns and composition for farm animals and fish to significantly reduce the GHG emissions attributed to livestock production systems (e.g. methane);
  - Improvement of feed efficiency, i.e. the conversion of feed into animal products, in order to control the use of resources and to reduce the loss of nutrients;
  - Further optimisation of use of co-products from the food industry, biomass and non-organic raw materials to alleviate the pressure on natural resources.
- FEFAC and its member Associations believe they have a role to play in providing feed companies with tools to measure and improve the environmental performance of their products. FEFAC is committed to play a role as spokesman of the EU compound feed industry to facilitate feed chain cross-sector initiatives to develop standardised methodologies to evaluate carbon foot print and also to contribute to international agreements on sustainable criteria for feed production.

particular attention. The European compound feed producers are one of the stakeholders having a role to play in minimising this environmental impact while meeting the demand for high quality and cost effective products. In addition, the supply of safe feed plays a vital role for the EU livestock chain and thereby for EU consumers.

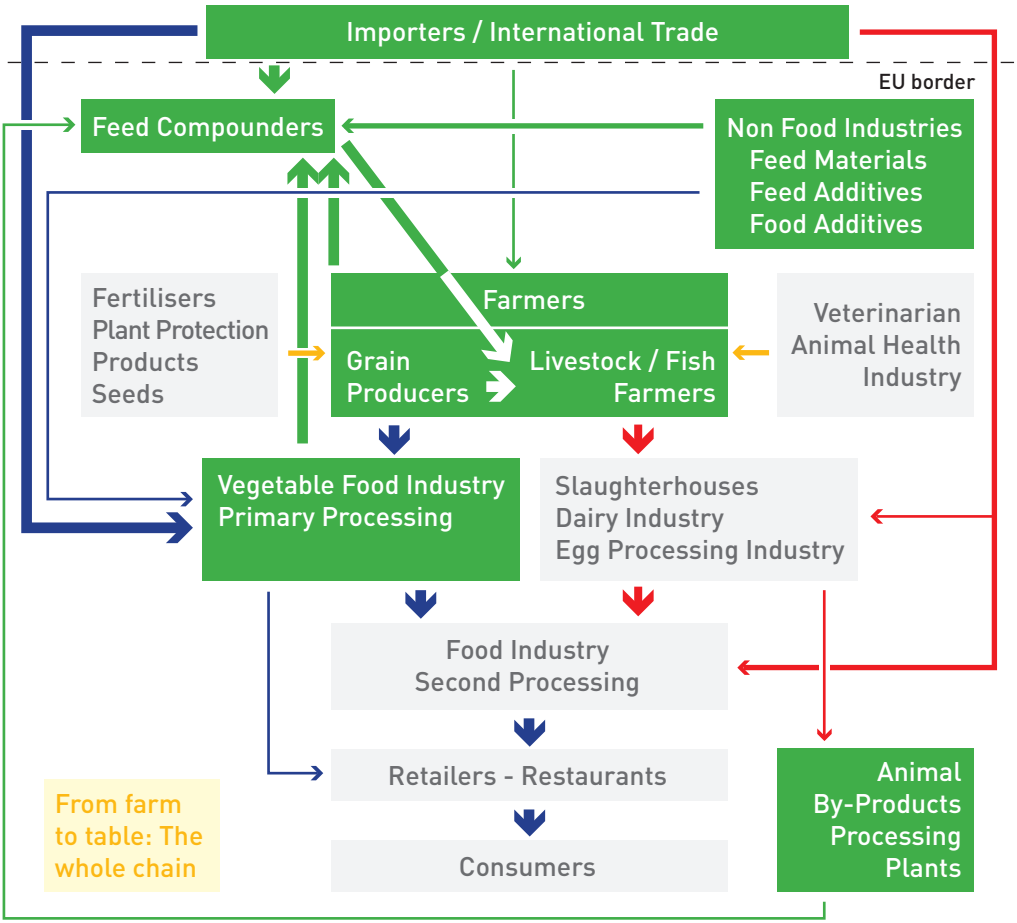
The global demand for animal products is expected to grow dramatically over the coming decades, driven by an ever increasing population and better per capita income which translates into a higher demand for animal products. The FAO estimates for example that meat consumption will increase globally from 37.4 kg/person/year in 2000 to over 52 kg/person/year by 2050 (FAO 2006a). In practice, this means that the global consumption of meat and milk will almost double, while the demand for seafood is expected to develop at an exponential rate (+37 mio. t between 2004 and 2030 (FAO 2007)), prompted by the recommendations of the World Health Organisation (WHO) for a minimum seafood intake as an essential tool to prevent several nutritional based health problems. The demand for feed is developing at a rapid pace and it is essential for the feed sector to be able to meet this demand in a sustainable manner. The supply of vegetable proteins for feed purposes is central to this challenge, in particular in terms of management of available resources and land use but also transport and processing of the harvested products may have an adverse effect on the environment, e.g. through the use of fossil energy. Solutions to these sustainability issues require a full chain approach.

A number of studies (FAO 2006b, IPTS 2008, UNEP 2009, etc.) have been published pointing to the importance of the feed sector in the sustainability of livestock production and consumption.

FEFAC intended to contribute by developing its first environment report, which aims at establishing an initial overview of the environmental benefits and burdens that result from activities under the direct control of the EU compound feed industry or within its sphere of influence (see Chart 1) and initial actions it is taking to address them. This report was initiated and developed by the FEFAC Task Force on Sustainability, set up in 2008 and composed of representatives of feed companies and national associations of compound feed manufacturers across Europe.

FEFAC identified three specific topics within the spectrum of compound feed manufacturers' activities: sustainability of feed resources, climate change & energy use and feed safety. These three topics constitute the three chapters of this report, which provide a picture of the current situation and report on collective or individual initiatives, seeking to improve the environmental performance of feed producers.

Chart 1: The food and feed chain (FEFAC 2009a)



Vegetable food products
Animal products
Feed
Intermediate consumption (except feed)

This chart illustrates the relations between key operators of the feed and food chain. The flows between operators have different colours depending on the type of product, i.e. vegetable food products, animal products, feed and production factors such as plant protection products, fertilisers or veterinary medicines (so-called intermediate consumption). The elements of this chain which are connected to feed manufacturers, either as suppliers or customers, are outlined in green. The present report addresses only these elements of the chain.

Highlights

Fact: The global demand for agriculture products is increasing rapidly, in particular for livestock products, with a demand for meat and milk expected to double by 2050 (FAO 2006a). This results in a higher demand for feed materials.

What does the EU feed industry do?

The feed industry

- makes the best use of by-products from the processing of virgin agriculture products into food or biofuels (70 mio. t in the EU-27) (FEFAC 2009a);
- improves the conversion of feed into animal products (5 kg of feed were necessary to produce 1 kg of pork in the 1950s against less than 3 kg nowadays) (European Commission 2003);
- supports the development of certifiable principles & criteria for the responsible production of soya worldwide (RTRS process);
- invests in research for the substitution of fish meal and fish oil by other feed materials for farmed fish feeding.

Fact: Food & Drink products are responsible for 20-30% of the various environmental impacts of total consumption of products in the EU. Globally, livestock production is responsible for 18% of greenhouse gas emissions.

What does the EU feed industry do?

The feed industry

- launched/is involved in national/European initiatives aiming at developing a methodology to evaluate the GHG emissions linked to feed production and consumption;
- improves nitrogen and phosphorous efficiency;
- invests in research to reduce methane emissions;
- participates in national programmes to reduce energy consumption (-20% in France in 20 years' time, -15% in 7 years' time in the UK).

Fact: Higher demand and higher prices for feed materials may favour bad practices that could generate feed and food safety incidents.

What does the EU feed industry do?

The feed industry

- develops good feed manufacturing practices and promotes these practices worldwide;
- has developed techniques to remove undesirable substances and products from feed.

Background

The demand for feedingstuffs depends on the market for livestock products. In 2007, the EU-27 livestock population produced 44 mio. t of meat (thereof 8 mio. t of beef, 23 mio. t of pork and 11.5 mio. t of poultry meat), 133 mio. t of milk, 7 mio. t of eggs and 1.3 mio. t of farmed fish. Average per capita consumption of meat (including horse meat and offals) in 2007 was 94.2 kg, compared to only 50 kg in the EC-6 during the late 1950s (FEFAC 2008). The value of livestock production amounting to 152 bio. € accounts for 40% of the overall EU-27 agricultural output amounting to 378 bio. € in 2008 (Chart 2 - FEFAC 2009b). Animal feed is the most important cost factor for livestock farmers and represents up to 85% of the production cost for chicken (Chart 3 - FEFAC 2009b).

Chart 2: Value of farm production in the EU in 2008 (FEFAC 2009b)

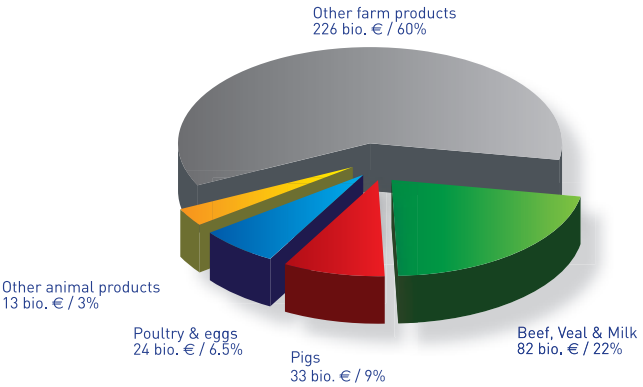
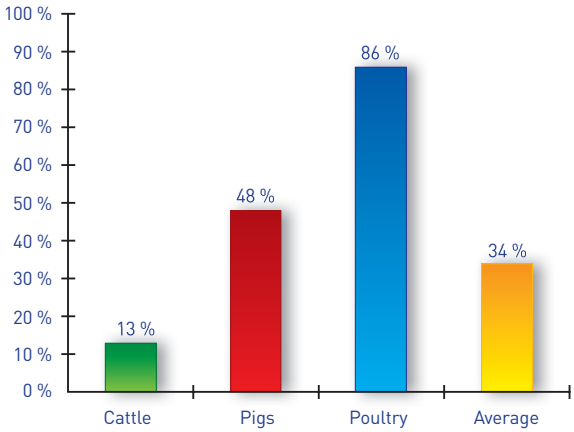
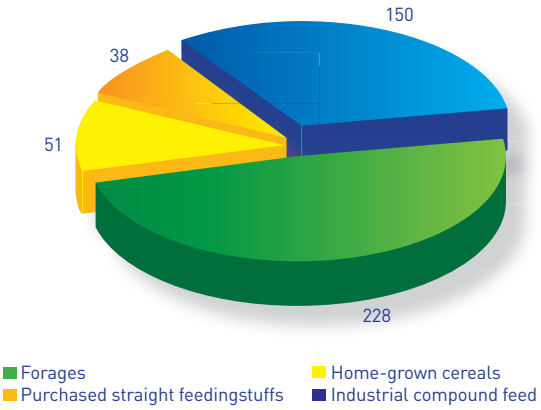


Chart 3: Value of purchased compound feed in total animal output value in 2008 (FEFAC 2009b)



Animal feedingstuffs, including feed materials and compound feeds, are the main input to land animal production. Within the EU-27, about 467 mio. t of feedingstuffs are consumed by livestock each year. Out of this quantity, 228 mio. t are roughages grown and used on the farm of origin. The balance, i.e. 239 mio. t of feed, includes cereals grown and used on the farm of origin (51 mio. t) and feed purchased by livestock producers to supplement their own feed resources (either feed materials or compound feed) (Chart 4 - FEFAC 2009b).

Chart 4: Livestock sourcing in feed in the EU in 2008 in mio. t (FEFAC 2009b)



Source: FEFAC - DG Agriculture

Certain types of animal production require specific types of feed. Fish feed production is estimated at around 1 mio. t for the EU-27 and 1 mio. t for Norway (FEFAC 2009c) and is produced by specialised units as the composition of the feed, its physical characteristics and its conditioning are significantly different from feed for land animals, due in particular to different nutritional requirements of farmed fish and the distribution of feed in an aquatic environment. Milk replacers, whose production is around 1.6 mio. t, are mostly composed of milk products and are designed to substitute standard milk for the feeding of young mammalian animals.

Compound feedingstuffs are manufactured to provide what the animals need in form of proteins, fat and carbohydrates, as well as essential nutrients such as vitamins and minerals. Compound feed can be used alone or in combination with farm-produced forage or straight feedingstuffs. Compound animal feeds are manufactured to meet specifications prepared by specialists in animal nutrition providing the required nutritional needs according to the particular species of animal and its growth stage or position in the production cycle.

The European compound feed industry employs over 110,000 persons on app. 4,500 production sites often in rural areas, where there are few other employment opportunities. The estimated turnover is close to 50 bio. € (FEFAC 2008).

Sustainable management of feed resources

Feed material consumption

To match the nutritional profile required for a particular feed, the formulator usually has several options for raw materials to be used. The mission of the compound feed manufacturer is to combine safe and compatible raw materials at the lowest cost that when combined meet the required nutritional specifications to ensure animal health and welfare. This cost is affected by the prices of raw materials and their nutritional content. Raw materials are purchased from a variety of sources, including agricultural operations in the same country as the feed is produced in, and from other countries and continents. Raw materials are also obtained as by-products from food and drinks processing and, more recently, from the production of biofuels.

The production, processing and transport of feed materials and compound feed manufacture have all an impact on the environment, e.g. in terms of energy consumption and the production of greenhouse gases. This is dealt with in the section on climate change.

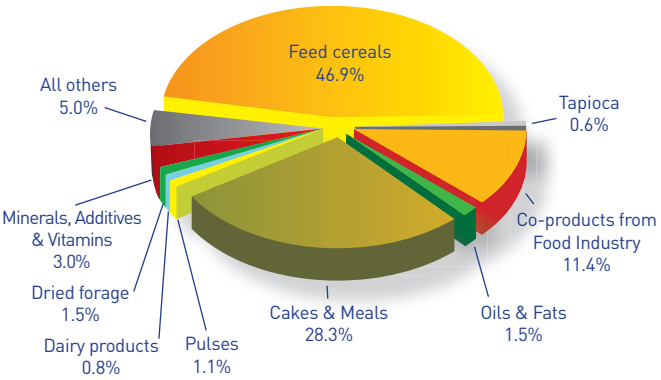
The feed industry and the raw materials market

The feed industry is an outlet for feed materials from three broad groups in decreasing order by volume:

- Feed grade raw materials that exceed the food demand or are not appropriate for food production for technical reasons (e.g. feed barley, bread-making wheat, etc.)
- By-products of the food, drinks and biofuel processing industries (e.g. bran, beet pulp, rapeseed meal, distillers grains, soya meal, fish trimmings, etc.)
- Raw materials used primarily by feed producers, such as fishmeal, fish oil, peas, beans, lupins and other crops grown as part of sustainable crop rotations.

At EU level, the most important category of feed materials entering into industrial compound feed are cereals (47% in 2008), the second being oilseed meals with 28%. Since the reform of the Common Agricultural Policy in 1991, the average inclusion rate of cereals in industrial compound feed increased from 32% to 47% replacing first and foremost tapioca which used to be imported from Thaïland and Indonesia. Processed animal proteins, which in the past represented up to 2% of feed materials, were banned in 2001 and mostly replaced by soybean meal.

Chart 5: Feed material consumption by the EU compound feed industry in 2008 (FEFAC 2009b)



The feed industry acts as a stabiliser of raw material markets

Modern animal feed formulation techniques make the use of raw materials flexible - a variety of combination of raw materials may be used to achieve the nutritional specification for an animal's requirements. Therefore, the industry acts as a stabiliser for raw material prices and, as far as possible, attempts to substitute raw materials that are becoming scarce. When a raw material is in surplus, feed companies will use it and thus raise demand, making prices less likely to fall to the point where dumping or destruction is an economic option. When there is a shortage and prices rise, feed companies will switch to alternative raw materials, reducing demand for the material that is in short supply and easing pressure on the demand for supply and thus on prices.

The feed industry contributes to the efficient use of raw materials processed by the food sector

Animal feed provides an effective way of upgrading non-food grade materials, such as feed grade wheat, and of making effective use of by-products of the starch, sugar, milling, dairy, brewery, distillery and juices industries. Indeed, any EU food processing activity generates by-products. Sugar provides a good example of why the 'whole crop' is not eaten by consumers. The sugar represents 15% of the fresh weight of a sugar beet root and 65% of the dry matter. The remaining parts of the processed sugar beet are not normally used for human consumption but may be useful feed materials for compound feed production if produced as by-products such as molasses or sugar beet pulp in accordance with feed safety standards. Other examples of by-products that are useful feed materials are bran from wheat flour milling, recognised for its high fibre content, oilseed meals from oilseed crushing, used for their high protein content, whey from cheese production, incorporated for its high protein quality, etc. FEFAC estimates that the processing of grains, oilseeds, sugar beet, potatoes, meat and milk generates overall some 70 mio. t of feed grade by-products (expressed at 12% moisture content) (FEFAC 2009a).

On average, these by-products represent 45% of the composition of a conventional pig or poultry diet (FEFAC 2009b). They are thereby converted by agricultural activities into high quality food, thus improving the sustainability both of the industries from which these materials are provided and of the production of feed and therefore animal products.

The net benefit is threefold: i) lower food production cost due to the utilisation of by-products to produce high-grade animal proteins (and therefore lower food prices), ii) lower feed demand for virgin grain resources (e.g. cereals) and iii) lower prices for animal products due to lower feed costs.

Increased production of 1st generation biofuels from crops is likely to generate even more by-products, e.g. rapeseed meal, beet pulp and dry distillers grains, although at the expense of the availability of grain for food and feed purpose. However, the parallel political encouragement to develop renewable energy production from biomass has the unwanted consequence that valuable feed grade by-products from the food and biofuels industry are

processed into renewable fuels. Subsidies promoting burning of these feed ingredients must be based on a proper assessment of the impact of such practice on the environment.

In addition to direct by-products, the feed sector may also be an outlet for surplus food, i.e. food products which are not purchased by consumers and may be returned to food producers. These products are then processed by dedicated companies subject to the same legal requirements as other feed business operators before being put into the feed chain.

Of course, one important element that must be taken into account when considering the suitability of a by-product or surplus food as a feed ingredient is its safety (see page 24-26 of this report). This is particularly true for emerging feed resources such as by-products of the biofuels industry or new valorisation of food surplus.

Fish feed: a specific composition

Fish diets are different from those for land animal species, in particular for carnivorous fish species. Two important ingredients of fish feed are fishmeal and fish oil produced from the processing of wild fish and to a lesser extent but increasingly, fish offals and trimmings. Typically, the wild fish species used for fishmeal and fish oil production are small, oil-rich, bony pelagic fish from sustainable fisheries that are not normally used for direct human consumption. Two decades ago, the majority of fishmeal and fish oil was used in feed for land animal production and most of the fish oil was used as hardened fat in margarine and as fuel. At present, over 50% of fishmeal and over 80% of the fish oil produced is used for aquaculture (IFFO 2007).

Insufficient protein sources in the EU

Most of the energy-rich feed materials such as cereals or forages used for feeding animals in the EU are from EU origin (FEFAC 2008). In this sense, 2007 was not representative of the normal market situation as the EU cereals harvest was not sufficient to meet the food, feed and biofuels demand, thus leading to the importation of significant quantities of grain. As regards feedingstuffs with high protein content, the situation is completely different: the EU imports more than 75% of its requirements for protein rich feed materials, most of it being soyabeans and soyabean meal imported from South America (Chart 6, Table 1 - FEFAC 2008).

Chart 6: Imports of feed materials in the EU in 2007 (FEFAC 2008)

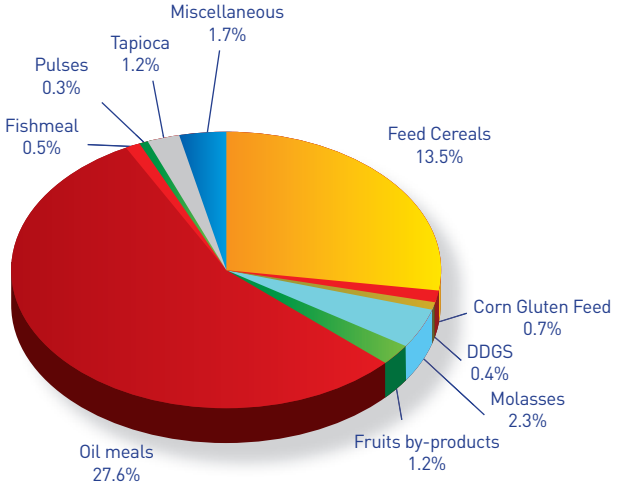


Table 1: Contribution of different types of feed materials to the supply of proteins to the EU livestock population (*1,000 t)

	EU production (*)		EU consumption (**)		Self-sufficiency (protein equivalent)
	Products	Proteins	Products	Proteins	
Soyabean meal	726	319	34,784	15,305	2%
Sunflower meal	1,988	381	4,503	1,225	31%
Rapeseed meal	8,291	2,079	9,254	2,868	72%
Cottonseed meal	512	179	511	198	90%
Copra-Palm meal	0	0	3,130	501	0%
Pulses	3,350	754	3,850	810	93%
Dried forage	4,600	736	4,400	784	94%
Corn Gluten Feed	2,193	430	4,550	893	48%
Miscellaneous	376	71	1,047	307	23%
Sub-Total	22,036	4,949	66,029	22,891	22%
Fishmeal	521	370	982	651	57%
Total	**22,557**	**5,319**	**67,011**	**23,542**	**23%**

(*) EU production from EU seeds
(**) Including consumption by the petfood industry and on-farm uses

1st generation biofuel production generates valuable by-products for feed use, with a medium-protein content and, as long as they are available and safe, the EU feed industry is prepared to use them. These feed materials can contribute to reducing the EU dependence on imported proteins.

FEFAC estimates a potential reduction of this dependence from 77% to 64% (providing they are not used as biomass for energy production) (FEFAC 2009a). An additional protein reserve of 0.7 to 1.2 mio. t of non-ruminant processed animal proteins may become available for feed use if efficient risk management tools are developed and adopted by EU legislators and if the feed and food chain is prepared to accept it (EFPRA 2008).

The sustainability challenge for certain feed resources

Responsible soya production - the RTRS process

By-products from the food and biofuel industries worldwide are an essential source of proteins for feed use. However, they are not sufficient to meet the ever increasing demand for feed proteins as a result of the rapidly developing consumption of animal products at global level.

Soya has become the most important source of protein for animal feed worldwide and its share is likely to further increase in the future. However, the soya sector has been criticised for deforestation, illegal appropriation of land, displacement of small farmers and indigenous people and non-compliance with labour laws.

FEFAC is a participating member of the Round Table on Responsible Soy, which is an international multi-stakeholder initiative that brings together those concerned with the impacts of the soy economy, i.e. soya producers and traders, food, feed and finance companies, and representatives of civil society, including a number of NGOs.

This platform was officially established in 2006. Its main task is to define criteria and principles for the responsible cultivation of soybeans and to promote the best available practices to mitigate negative impacts throughout the value chain at global level.

European feed industry experts are actively participating in the Executive Board of the RTRS and the Principle, Criteria and Verification Mechanism Development Group (DG), in charge of developing a set of standards for the production and sourcing of responsible soy and a verification mechanism to reinforce these standards.

At national level, several platforms mirroring the RTRS were established to support the RTRS process (Belgium, The Netherlands, UK). As a consequence, some operators have already started using certain core criteria of the new RTRS standard for their purchase of soybean meal to enhance the RTRS process and, for 2009, EU compound feed manufacturers are already expected to import more than 1 mio. t of soybean meal audited against those core criteria (FEFAC Member Associations 2009).

Further information on the RTRS can be found at: **www.responsiblesoy.org**

Improving the conversion of fishmeal & fish oil into farmed fish and seeking alternatives

As regards aquaculture, the most important feed ingredients of fish diets are fishmeal and fish oil. This is one of the most frequently cited issues with regard to the sustainable development of aquaculture because of its potential impact on the depletion of marine resources. If aquaculture is to fill the gap in demand for seafood due to the limitation of marine resources, this raises important sustainability issues as to the availability of sufficient and nutritionally balanced feed supplies (e.g. omega 3 sources). This is particularly relevant given the fact that fishmeal and fish oil production has been, and is likely to remain, at a relatively constant level.

A possible option to reduce the dependence on fishmeal could be the use of processed animal proteins from non ruminant species.

The future limitation in availability of fishmeal and fish oil production has driven the aquafeed sector to improve the conversion from fishmeal & fish oil into farmed fish and seek nutritional alternatives to fishmeal and fish oil. This is an on-going process and estimates made by the International Fishmeal & Fish Oil Organisation (IFFO) show that the growth of aquaculture and the substitution of fishmeal and fish oil must continue together (IFFO 2007). Improved technology in fishmeal and fish oil production as well as better feeding practices on farms have reduced over time the volume of wild fish required for producing farmed fish. For aquaculture overall, the ratio is now well below one: less fish is used for feed than is produced on fish farms. For carnivorous species, the ratio is still decreasing and expected to reach 1.0 in the coming years. By comparison, it is estimated that wild salmon eat ten times their weight of other fish over their lifespan (CONSENSUS 2008). However, ensuring sustainable production of fish feed is mostly achieved by securing that only fish caught according to sustainable practices is used for fishmeal and fish oil production.

The European Aquaculture Technology and Innovation Platform (EATIP) aims at gathering all stakeholders interested in the development of aquaculture (Universities, industry, farmers, NGOs) in order to agree on a common vision of the development of aquaculture in the EU and the co-ordination of research activity. FEFAC and the key fish feed producers are members of EATIP and are involved in particular in the working group responsible for identifying research areas to evaluate and improve the sustainability of fish feed ingredients, including alternatives to fishmeal and fish oil.

Further information on the EATIP can be found at: **www.eatip.eu**

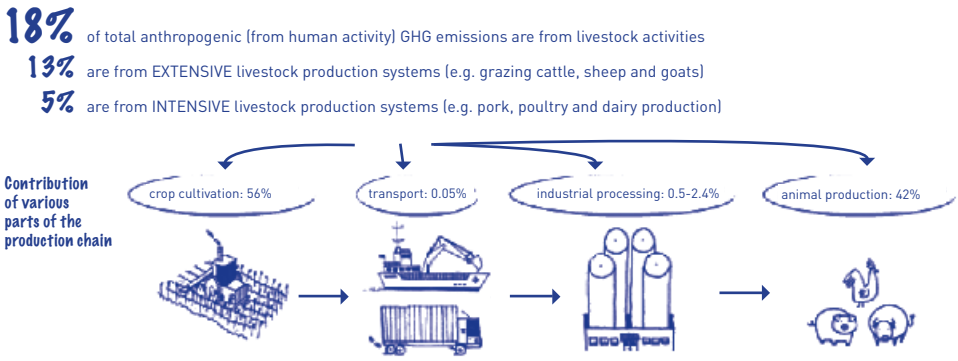
Climate change and energy use

The challenge

Food & Drink products are responsible for 20-30% of the various environmental impacts of total consumable products in the EU. Among Food & Drink products, meat and dairy products have the highest impact. Most of the impact is related to agriculture (IPTS 2006).

Agriculture is indeed an important contributor to the production of greenhouse gases, which contribute to climate change. These are carbon dioxide from energy consumption, methane from livestock and nitrous oxide from cultivated land and organic manure. The United Nations Food and Agriculture Organisation (FAO), in its report Livestock's Long Shadow, estimated that globally livestock are responsible for 18% of greenhouse gas emissions (FAO 2006b). This is illustrated in Chart 2, which shows that crop cultivation and animal production represent the bulk of the GHG emissions, whereas transport and industrial processing are far less important at a global level.

Chart 7: Greenhouse gas emissions (GHG) from livestock activities -
All figures are based on estimates published in 'Livestock's Long Shadow'



* Contribution to total greenhouse gas emissions from intensive livestock production systems, including deforestation.

Some of these emissions can be directly influenced by the feed industry, e.g. the manufacturing of compound feed or the selection of feed materials and the way they are produced and transported. The feed industry may also facilitate a reduction of the emissions by animals through improved compound feed formulation (improved feed conversion rate, reduction of methane emissions).

However, it is important to find the right balance between the carbon foot print linked to the production of the compound feed and the environmental impact linked to its consumption on the farm: a compound feed formulated for a minimum carbon foot print may be less digestible, i.e. less efficient for animal production and therefore give rise to higher emissions on the farm.

Feed production related emissions

Energy consumption by the EU feed industry

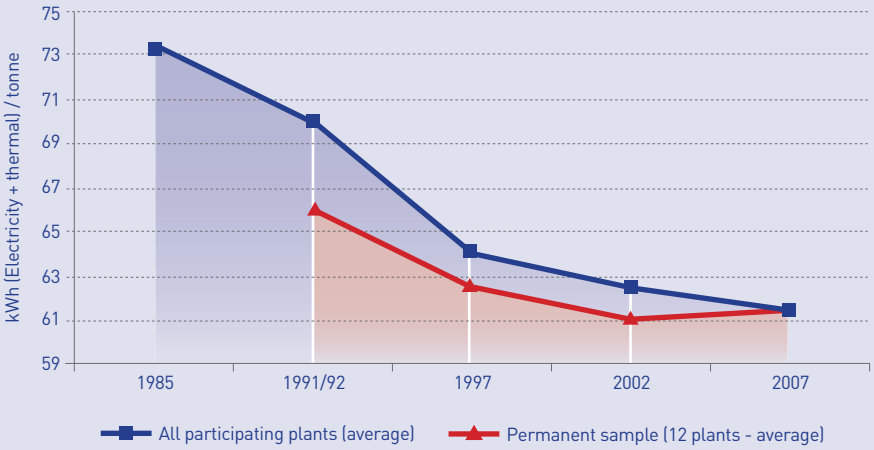
Feed manufacturing requires power in the form of electricity, mostly for grinding, and steam for heat treatment and to facilitate pelleting. Electricity is the major form of energy consumed in the feed sector, representing half of the energy cost and more than half the power consumed in a compound feed plant.

Energy savings are an essential driver for increased competitiveness. Opportunities to save energy in feed production are limited but there is scope in the manufacturing operation and in the rationalisation of logistics. Handling feed in bulk rather than bags reduces energy consumption and this has been a trend in the industry for a number of years. Certain steps in the production process requiring high energy input (i.e. pelleting, extrusion, heat treatment) provide physiological benefits in terms of improved nutrient utilisation and feed conversion or to improve the hygiene status of feed; these effects related to feed safety, nutritional and environmental balance have to be taken into account.

"Energy Club" in TECALIMAN: benchmarking for improving energy efficiency

The French Technical Institute of the Compound Feed Sector, TECALIMAN, set up 20 years ago, together with compound feed production units, a "club" whose objective was to enable feed plants to benchmark their energy consumption and to investigate together areas of improvement. The results of this project have delivered a reduction of 20% in the energy consumption over a period of 20 years.

Chart 8: Energy savings in feed mills (TECALIMAN 2009)



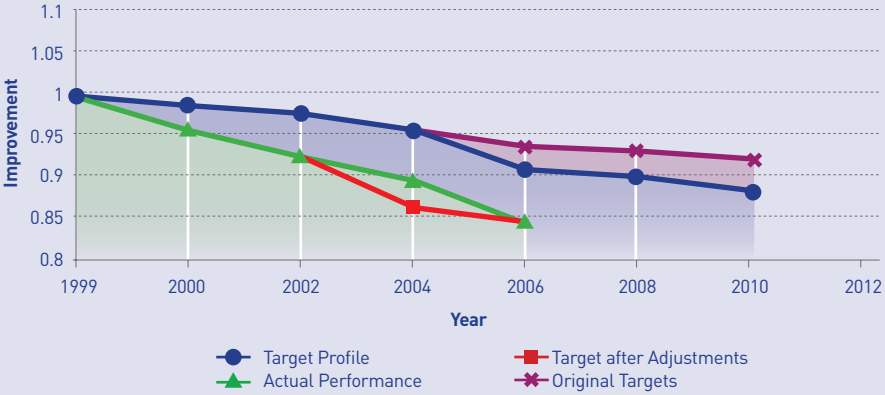
Further information can be found at: **www.tecaliman.com**

Climate Change Agreements

Climate Change Agreements cover the majority of UK animal feed production. The feed sector is represented in the UK Climate Change platform by the Agricultural Industries Confederation (AIC). Targets are set for the sector in kWh/t of production and agreements are made on a relative energy basis. These targets change with time as the composition of the sector changes. The sector currently produces over 11 mio. t of product per year.

The following figure shows how the relative energy consumption and CO_2 emissions for the sector have improved compared with the equivalent base year (1999) position. Overall CO_2 savings of 12% have been achieved.

Chart 9: Energy savings in UK feed mills



To provide further insight into the potential for energy savings, the industry is currently working with the Carbon Trust in the UK on an Industrial Energy Efficiency Accelerator Project. The first report presents the findings of the investigations into potential energy saving solutions. A number of projects are being evaluated to implement the findings, including training and support for energy management and process optimisation.

Further information can be found at:
www.defra.gov.uk/environment/climatechange/uk/business/cca/index.htm
or ***www.carbontrust.co.uk***

GHG emissions in the feed chain

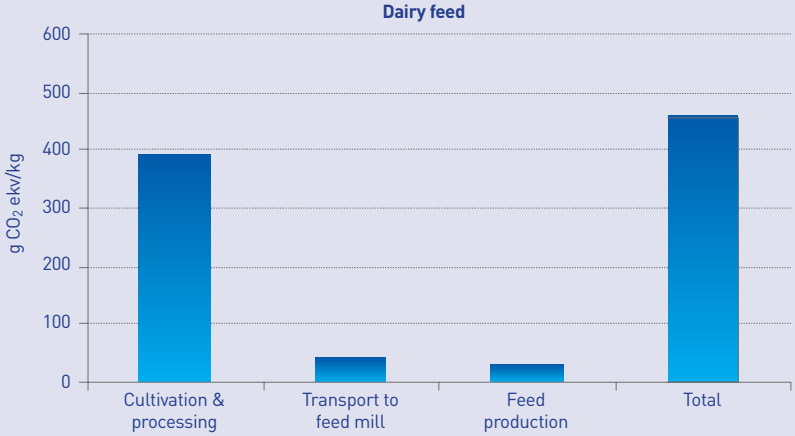
GHG emissions from the compound feed industry are almost exclusively energy use related as process emissions in the industry are virtually zero. In the absence of an international or EU-wide agreed methodology for the calculation of the Global Warming Potential of compound feed, different initiatives have been launched at national level to evaluate the GHG emissions linked to compound feed production (Sweden, France, UK) or both compound feed production & consumption (The Netherlands).

UK individual initiatives for measurement and reduction of GHG emissions

A number of commercial companies have produced GHG models for use on farm. The models identify current output and highlight areas for improvement. The data is solely available for the use of group members to monitor and improve performance.

The Lantmännen system for the calculation of the GHG emissions linked to compound feed production

Chart 10: Respective weight of different segments of the feed chain in the feed carbon footprint (Lantmännen - 2008)



The Swedish group Lantmännen has calculated an average value for compound feed between 450 and 520 g CO_2 equivalent per kg of compound feed. The large majority comes from cultivation and processing while transport and feed manufacturing account for around 9% and 7% respectively.

Lantmännen calculations are based on available LCA (Life Cycle Assessment) data for feed materials, i.e. average standard figures contained in databases (SIK, Ecoinvent, FAO, etc.). The scope of the calculation includes emissions from crop cultivation, including use of fertilizers and crop protection products, land use change, etc.) through transport and processing until the exit gate of the compound feed mill (i.e. not transport of compound feed to the farm). The values can be calculated when formulating (for those customers wanting feed with lower climate impact).

The allocation of the CO_2 value to by-products is based on the respective value of by-products vs. products, not on the volume. For soybean, the ratio is 65% soybean meal against 35% for soybeanoil as 65% of the revenue of the crushing industry comes from meal. For wheat bran, it is 25%. For transport, the calculations are in compliance with ARTEMIS. The carbon footprint of feed additives (vitamins and trace elements) and the environmental impact of feed consumption are not taken into account in the calculation.

Evaluation of the environmental impact of compound feed production in France

Further to the large national consultation process launched in France on sustainable development (so-called "Grenelle de l'environnement"), it was agreed to move towards providing consumers with information on the environmental impacts of goods, including food. Priority will be given to the measurement and communication of the carbon footprint of the different economic activities through the chain but other elements should be considered as well. Several working groups were established, in particular on methodology for the environmental impact assessment. The French association of compound feed producers, SNIA, is partner of the project.

Feed consumption related emissions

Feed conversion rates

One of the most efficient ways to reduce emissions is to increase feed efficiency, i.e. the quantity of feed that is needed to produce one kg of food of animal origin (milk, egg, meat). In the 1950s, 5 kg of feed were required to produce 1 kg of pig (live weight). The figure is now below 3 kg for the most efficient production systems (European Commission 2003). Less than 2 kg of feed are needed for 1 kg of poultry live weight (European Commission 2003) and only 1 kg of fish feed for 1 kg of farmed fish (CONSENSUS 2008) but for beef and lamb, the ratio is higher. These substantial gains in efficiency have resulted from significant investments in research and product development. The net benefit for society is threefold: lower demand for feed resources, lower production costs and lower amounts of manure (N and P emissions) per animal.

Reducing emissions of nitrogen, phosphorous and methane

Livestock production generates a number of emissions to the air (methane, ammonia and nitrous oxide), or to the soil (nitrates, phosphates and heavy metals). Some of these emissions are directly connected to Global Warming, in particular methane. FAO estimates that 42% of the emissions from livestock production take place on the farm (FAO 2006b).

Reducing the excretion of nutrients (N, P) in manure reduces emissions of both elements into the environment (water and air pollution). To achieve this, the feed industry in co-operation with technical research institutes has invested hugely to develop knowledge in how to better meet the animals' needs by improving nutrient digestibility (e.g. through the use of enzymes in low protein feeds) and by balancing the concentration of the different essential components (e.g. use of highly digestible phosphorous sources). FEFAC is a partner

of an EU funded research programme REDNEX aiming at quantifying, predicting and reducing N-emission in dairy herds. In addition, feeding practices were developed to ensure that animals receive during their different stages of life the nutrients they need, no more, no less, by phase feeding (European Commission 2003).

Globally, the livestock sector emits 35% to 40% of anthropogenic emissions most of which is enteric fermentation by ruminants (FAO 2006b). Feed formulation may also significantly help reduce the production of methane.

Collecting biogas from manure and thereby using the undigested part of the feed for energy generation may become an important way to reduce the carbon footprint in livestock production in the future.

Regional agreement for a limitation of the amounts of nitrogen and phosphorous in feed in Belgium

Farmers, compound feed manufacturers and authorities of Flanders (region of Belgium) signed a voluntary agreement whereby the compound feed manufacturers commit to limit the amount of protein and phosphorous in pig and poultry feed. This agreement enables farmers to better control their nitrogen and phosphorous input/output balance. This agreement has resulted in a 20% decrease in emissions of phosphorous and a 5% decrease in nitrogen.

Avoiding phosphorous admixture in mineral feed for dairy cows in Finland

The Baltic Sea is a very vulnerable closed sea area surrounded by 80 million people and a lot of agriculture. In most areas, phosphorous is the limiting nutrient for eutrophication but nitrogen is also important (HELCOM 2008). Nutrient leakage has been successfully limited by several means such as limiting the quantity of fertilizer and manure added to fields and better manure handling. The level of animal production and basic self sufficiency of food for the population could only be achieved by means of improving phosphorous and nitrogen efficiency for animal feeding: the level of phosphorous and nitrogen per unit of animal production could be reduced through producing highly digestible feed formulations including enzymes (especially phytase for phosphorous digestibility for monogastrics). For dairy feed, "no added phosphorous" has become a standard and the first "phosphorous-free" dairy mineral feed was placed on the Finnish market in 2006.

Towards elaboration of methodologies for the environmental assessment across the feed and food chain

The promotion of best practices to improve the sustainability of production and consumption of food first requires the development of a methodology that is recognised all along the food chain, from primary crop production to the consumer.

Different initiatives have been launched at national level (see examples in France, The Netherlands and UK).

FEFAC is an active member of the Round Table for Sustainable Consumption and Production of Food established in March 2009. The purpose of this initiative, launched by COPA-COGECA (representing EU farmers) and CIAA (representing the EU food industry), gathering all voluntary organisations representing feed and food chain stakeholders is to:

- Work towards reliable & uniform environmental assessment methodologies for food (deliverables expected by the end of 2010)
- Identify suitable communication tools vis-à-vis consumers
- Communicate existing and identify future sustainability actions along the food chain.

FEFAC is also a member of EISA, the European Initiative for Sustainable Agriculture, which provides a framework document for integrated crop cultivation and animal husbandry production methods to reduce the environmental impact of modern agriculture production systems.

Further information can be found at:
www.sustainable-agriculture.org

Environmental assessment of feed production and consumption in The Netherlands

The Dutch Product Board Animal Feed (in Dutch: Productschap Diervoeder, PDV) decided to start with an inventory of available knowledge on the development of an interactive model for calculating the carbon footprints of animal feed production and consumption. Eventually the goal is to make a tool available to the feed production chain, including the compound feed manufacturers as one of the most important links in this chain. The Dutch Compound Feed Manufacturers Association, NEVEDI, is participating in this PDV project. The project is split up in three phases:
Phase 1: *Inventory of available knowledge and designing a proposal for Phase 2*
Phase 2: *Building, testing and making the interactive model available*
Phase 3: *Maintenance and further development of the calculation model*

The user groups are the producers of feed materials, the producers of compound feed and farmers. They all can use the model to evaluate their contribution to greenhouse

gas emissions and to evaluate potential solutions to reduce them. The objective is also to seek harmonisation with other sectors that precede and follow the feed chain.

Phase 1 of the project is accepted by the Board of PDV and has started: the inventory and evaluation of available knowledge for carbon footprinting focuses on specific methodology and data issues for calculating greenhouse gas emissions for feed. Phase 1 of the project proposes calculation methods based on existing standards such as the ISO 14040 series for the Life Cycle Assessment and the BSI PAS2050 for carbon footprint calculation and proposes sources for determination of default data. The scope of the assessment is both production and consumption of feed. After positive decision-making by the board of the PDV phase 2 (and 3) can start.

Further information can be found at: ***www.pdv.nl***

Environmental assessment of the feed & food chain in Belgium

BEMEFA, representing the Belgian feed manufacturers, has created a platform for sustainable feed. Members are the feed association, the dairy sector, food sector, retail, trade and farmer unions. The objectives are to determine standards for responsible feed, discuss alternatives for imported proteins, organise symposia, etc.

Further information can be found at:
http://bemefa.pluritech.com/Sustainability.aspx?lang=nl

Implementation agenda on sustainable animal husbandry in The Netherlands

The Dutch Ministry of Agriculture has set up a programme on sustainable animal husbandry. The agenda was established in cooperation with several representative organisations. The objective of this programme is to promote sustainable animal husbandry in The Netherlands by developing views and challenges on 6 spearheads.

Within this framework, the Dutch Compound Feed Manufacturers Association (NEVEDI), which signed also the agenda, aims to set up a Task Force on the nutrient cycle with emphasis on minerals, phosphorous and nitrogen in animal feed and manure. The goal of this Task Force is to find solutions for existing surpluses of these nutrients and to achieve a better balance in input and output.

Feed safety

Feed safety: a prerequisite to food security and sustainability

Feed safety is nowadays increasingly recognised as an important topic in the feed-to-food value chain and subject to comprehensive EU legislation. The nutritional value, taste, texture and safety of food products such as meat, fish, dairy products and eggs are directly influenced by the nutrition of the animal concerned. Compound feed manufacturers have an important role to play in providing feeds that are nutritious and safe, thereby contributing to the supply to consumers of safe food of high and consistent quality. The challenge for the compound feed manufacturer is to make the best use of available resources without compromising on the high safety standards established in the EU.

In its report on "Environmental Food Crisis" (UNEP 2009), the United Nations Environment Programme (UNEP) stressed that, "by using discards, waste and other post-harvest losses, the supply of animal and fish feed can be increased and be sustained without expanding current production, simply by increasing energy efficiency and conservation in the food supply chain". In principle, such an approach should be encouraged. However, a number of precautions, in particular an adequate feed safety assessment, must be undergone before using a potential new feed source or process. This approach is essential for the kind of potential feed sources that are mentioned by UNEP in order to preserve animal health and animal product safety.

Over the last decades, a series of feed & food safety incidents occurred, mostly relating to feed and food raw materials (BSE agent in meat and bone meal, PCBs/dioxins in fats and bread meal, etc). This triggered a worldwide review and upgrade of feed safety legislation, including in the EU (see below), which provides for the implementation of good hygiene principles and a risk assessment along the feed chain. This is also why the EU legislator has recognised that there was a difference between real waste and by-products used a.o. in the feed chain. Among the criteria are in particular the existence of a market and compliance with legal standards for quality and safety (European Commission 2007). In practice, a waste is a burden for the operator and often for the planet and the operator does not pay much attention to preserving the hygienic status of a waste. On the other hand, by-products are subject to the attention of all operators in the feed chain who are responsible, at each stage of the chain, for the safety and the traceability of the feed they place on the market. These are the key principles of the EU feed and food safety law. Preserving or even improving the safety of the feed they handle, process or deliver to farms enables operators to avoid wasting highly valuable resources.

Feed industry in action

The implementation of HACCP-based good hygiene practice - the role of the European Feed Manufacturers' Guide (EFMC)

As recommended by the EU legislation on Feed Hygiene, FEFAC developed a guide to good manufacturing practices, the European Feed Manufacturers' Guide (EFMC), aiming at assisting compound feed and premixture manufacturers to implement feed hygiene requirements, including guidance on implementation of HACCP principles. 20 EFMC-based national and international schemes have been implemented in EU Member States.

For more information see **www.fefac.eu**

Promoting good feed manufacturing practices worldwide

In 2000, the CODEX Alimentarius established a Task Force responsible for developing a code of practice for good animal feeding worldwide. FEFAC contributed significantly to this process in submitting its own guide and expertise as basic information material. The CODEX Code was completed in 2003 but additional work is being considered in 2009 as regards in particular the establishment of a global list of feed hazards and guidance on a harmonised methodology for the risk analysis of feed safety. FEFAC, as a member of the International Feed Industry Federation (IFIF), participated, with the support of FAO, in the development of a Feed Manual as a complement to the CODEX Code. Also each year IFIF organises a Feed Regulators Conference aimed at ensuring an effective co-ordination and co-operation between public authorities on a global basis on emerging feed safety incidents.

Monitoring contaminants in feed: the FEFAC database on mycotoxins

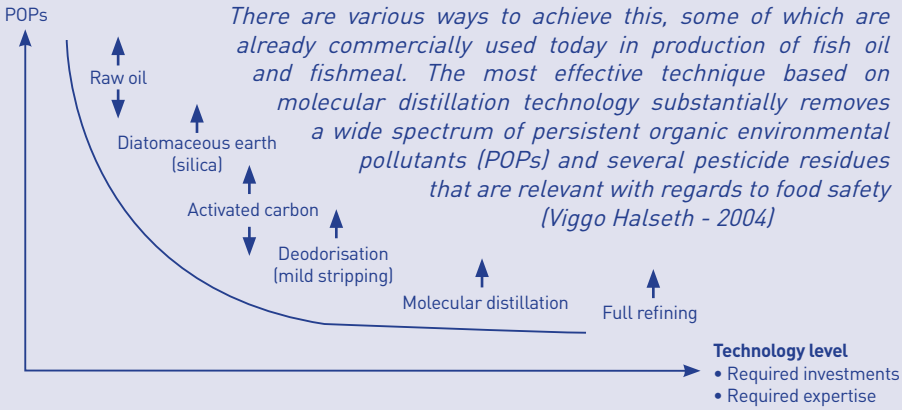
Mycotoxins are natural contaminants produced by moulds and primarily affect grain and oilseeds in the field or during storage. These contaminants can present a risk for animal health and some of them may be transferred to animal products and also pose a risk for human health. Mycotoxins are increasingly subject to maximum limitations in food and feed and the EU feed industry is committed to contribute to a better understanding of the background contamination of grain, whether processed or unprocessed, and also other feed materials. Each year FEFAC collates the data generated by member companies to populate a database which is made available to public authorities.

Decontamination

EU legislation permits the decontamination of feedingstuffs. This enables the industry to recover valuable materials without compromising feed safety. Different methods are used to decontaminate feedingstuffs:

- Chemical decontamination for removing aflatoxins in groundnut meals
- Physical removal of dioxins from fish oil via refining or distillation
- Use of feed additives as mycotoxin binders

Chart 11: Different technologies for cleaning oils and their efficacies on POPs



There are various ways to achieve this, some of which are already commercially used today in production of fish oil and fishmeal. The most effective technique based on molecular distillation technology substantially removes a wide spectrum of persistent organic environmental pollutants (POPs) and several pesticide residues that are relevant with regards to food safety (Viggo Halseth - 2004)

Addressing emerging issues at an early stage

Food safety crises cause market instability which penalises all chain partners and may lead to the wastage of resources. Organised communication across the feed & food chain may play a positive role in the risk management of emerging issues on the condition that these issues are addressed at an early stage. This is the purpose of the Food Safety Platform set up in 2003, which is composed of organisations of the food chain operators, retailers and consumers.

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