

A CLEANER TOMORROW



Pigs on a pelleted control diet - no enzymes added
(Photo by courtesy of the MLC)



Pigs on a pelleted diet - with enzyme added
(Photo by courtesy of the MLC)

When the Federation of Swedish Farmers introduced its strategy to have the cleanest agriculture in the world, it imposed many obligations on each player in the food chain. The guidelines drawn up placed a series of rules and restrictions on many farming practices and management aids.

For instance, the ban on in-feed growth promoters (antibiotics and chemotherapeutics) for prophylactic purposes came into force without giving researchers and nutritionists the time to find well-proven alternatives that could maintain animal performance and health under commercial conditions - especially in the pig industry.

Consequently, Sweden's pig producers faced many challenges during the last decade,

most of which have been imposed upon them through legislation and consumer demand to provide the cleanest meat in the world. Although animal density and farming intensity is low in the country, compared with the rest of Europe, the ban on the use of antibiotic growth promoters in 1986 remained the greatest hurdle to climb, coupled with the introduction of rigorous hygiene control and housing systems - all introduced against the backdrop of a vociferous, on-going consumer-led debate on animal welfare issues.

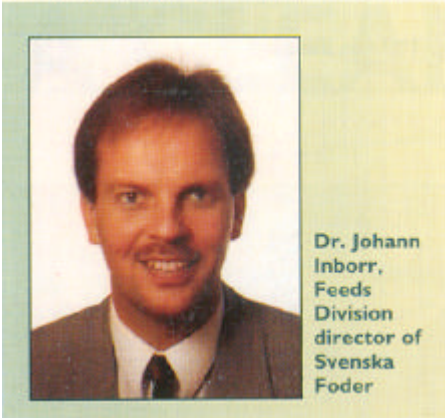
"Under these circumstances, the feed industry had to change and adapt quickly to fill the need for alternative, antibiotic-free feed products," says Dr Johann Inbarr, Feeds Division director of Svenska Foder, one of the leading feed manufacturers in Sweden. "At that time, many probiotic concepts were

promoted which included options such as lactic acid bacteria, organic acids and acidifiers, oligosaccharides and functional fibres.

"Coincidentally, we were getting the first clear evidence of the efficacy of feed enzymes in pig starter diets which provided another non-antibiotic concept for further evaluation under commercial conditions."

In addition, changed nutrient specifications and feeding programmes were tested. As a result, the nutrient density of pig diets was reduced, coarse grinding of all raw materials introduced, with heat-treated cereals included at the expense of uncooked feedstuffs.

"Despite all these measures, pig producers faced many problems during the first few years since the in-feed antibiotic ban was introduced," adds Dr Inbarr. "The incidence of



Green Approach

The industries within the food production chain are now developing new production systems and programmes to convince consumers of the superiority of home-produced food in terms of cleanliness and hygiene, compared with imported products. The feed industry is contributing by launching feeds aimed at reducing pollution and bacterial contamination - involving heat treatment and the careful selection of raw materials. Furthermore, formulation concepts which help to reduce the risk of nitrogen and phosphorus environmental contamination through reduced animal excretions are being introduced.

Like most of Sweden's feed compounders, Svenska Foder has looked at the whole range of feed options available and has found that feed enzymes seem to provide the most consistent results, both in terms of performance and health status. "Three years ago, we tested the effects of including a commercial xylanase-based enzyme (Porzyme) in feeds for growers and finishers," adds Dr Inbarr whose thesis at the university of Helsinki, Finland included the use of enzyme supplementation in pig diets.

"The product improved feed utilisation and increased daily weight gain by on average 3.3 and 3.4 per cent, respectively. Commercially, this means approximately 100 megajoules less energy - and two fewer feeding days - are required for a 25kg pig to reach 105kg slaughter weight. In cash terms, this translates to an increased profit of about £2 (20 Swedish kroner) a pig which repays more than twice over the cost of enzyme supplementation." (See Table 3)

"The increased nutrient digestibility of feeds

Table 1.
Use of in-feed antibiotics between 1983 and 1994 in Sweden.

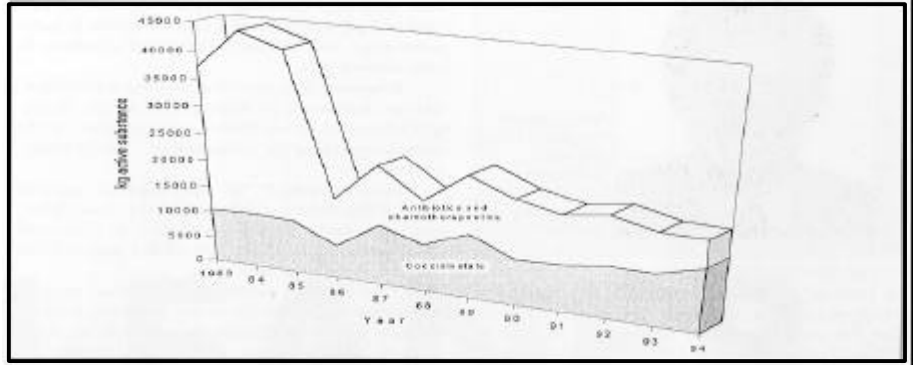
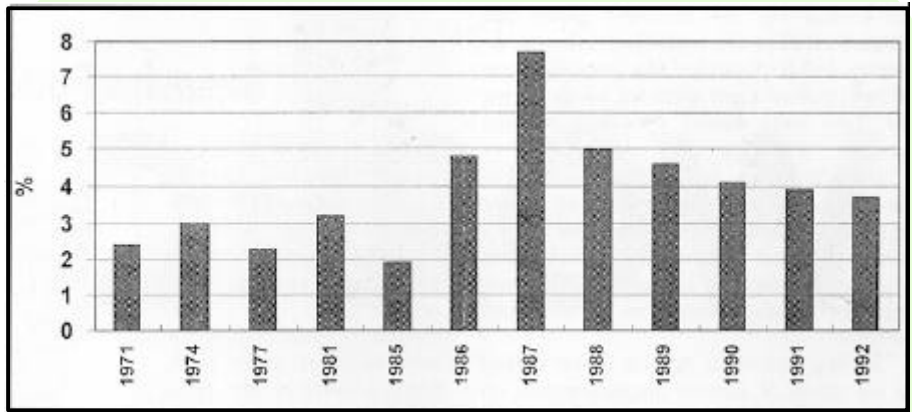


Table 2.
Incidence of post-weaning diarrhoea before and after the ban.



fertilisers and general agricultural supplies. With an annual feed tonnage of 360,000 tonnes and an overall turnover of £140 million (SEK 1.4 billion) it holds a 20 per cent share of the country's animal feed market.

Recently, Svenska Foder launched Viking Feeds containing Porzyme feed



Table 3. Summary of three trials with growing/finishing pigs in commercial conditions in Sweden using Porzyme 9300 in wheat-based diets (1406 pigs in total.)

Weight range, kg	Daily weight gain (g)		Feed conversion ratio	
	Control	Porzyme	Control	Porzyme
27-105	796	803	2.45	2.40
23-90	667	725*	2.93	2.90
27-106	754	761	2.64	2.46*
Av improvement%		3.4		3.3
*P<0.05				

by natural means of enzyme supplementation on digestibility - especially of enzymes fits well with new crop cereals." Sweden's growing image for additive-free. Currently, Finnfeeds International supplies between 70 per cent and 80 per cent of enzymes used in growing interest in pig feed. The use of barley in pig feed which has been a recent work beneficial effect

wheat and 22 per cent soyabean meal and was used as the control. The two treatment groups had enzyme supplements containing xylanase, alpha-amylase and β -glucanase - the latter from one of two sources. Diets were fed ad-lib during the three week period with pigs weighed weekly.

β -glucan, starch and dry matter digestibilities significantly improved in the last quarter of the small intestine of supplemented pigs - a sure sign that enzyme supplementation increases the efficiency of digestion with more nutrients absorbed higher up in the small intestine.

Having established this, Dr Inbarr looked at the effects of enzyme supplementation on barley-based diets (75 per cent). Using high and low β -glucan varieties, he recorded higher liveweight gains and feed utilisation amongst pigs fed the enzyme-treated barley diet. Generally, he puts this down to the role of supplementary enzymes creating more efficient conditions for digestion.

"There are significant changes in gut structure and associated enzyme development after weaning which means that intestinal cells have limited ability to produce sufficient or appropriate enzymes to break down some of the nutrients found in the new foodstuffs provided in post-weaning rations," explains Dr Inbarr. "Also, the pancreas - important for producing enzymes as well - is undergoing change. All this leaves the animal short of enzymes and particularly vulnerable to digestive disorders."

As the sow's milk is withdrawn and dry feed introduced, the digestive system of the pig is challenged by a completely new set of chemical compounds such as vegetable protein, starch and fibre. The reduced secretion of digestive enzymes at this stage can lead to growth depression - the classic growth check at weaning - and digestive upsets due to mal-absorption.

"Enzyme supplementation of pig starter diets can serve two purposes. Firstly, to complement the production of the pig's own digestive enzymes and, secondly, to reduce the negative effect of fibre on the digestibility of the nutrients in the diet. More recent trials

in commercial conditions when pigs are fed enzyme-supplemented feeds.," says Dr Inbarr.

Nutritionists now have firm evidence about how feed enzymes work. For instance, appropriately fibre and starch-degrading enzymes, when added to wheat and cereal-based pig starter diets, exert their activity along the entire digestive tract of the pigs by reducing digesta viscosity which helps to increase the efficiency and rate of digestion.

As a result, less digestive enzymes produced by the animal are needed and a greater portion of the nutrients are absorbed in the upper part of the small intestine - leading to reduced microbial activity in the distal parts of the digestive tract, resulting in less fermentation losses and digestive upsets.

"All these effects contribute to the overall improved performance and health status of the pigs. At Svenska Foder, we are convinced of the benefits to pig producers, the environment and consumer alike," adds Dr Inbarr.

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diarrhoea in early-weaned pigs.

"It appears that the conditions for better digestion are determined by reductions in digesta viscosity. This means less worthless nutrient losses to the animal, improving the utilisation of dietary energy for growth."

Further analysis of the digesta samples show a significant reduction in the concentration of volatile fatty acids (VFA) in the distal small intestine and hind gut of the pigs fed the enzyme-supplemented diets.

"This provides further evidence that enzyme supplementation leads to fewer nutrients escaping digestion and more efficient absorption in the small intestine - reducing the amount of readily fermentable material available for microbial growth.

"These results are supported by the reduced incidence of diarrhoea often observed