7. Animal feed manufacture

Introduction

7.1 The animal feed manufacturing industry, together with the slaughtering and rendering industries, was central to the BSE story. This is because it is believed that most infected cattle were exposed to the BSE agent through feed containing MBM produced by renderers. Furthermore, the infection of some cattle born after the ruminant feed ban (RFB) is believed to be due, at least in part, to cross-contamination of ruminant feed with pig or poultry feed containing ruminant MBM.

7.2 This chapter will examine some features of the animal feed manufacturing industry, including the reasons for the widespread use of MBM in animal feed. It will then describe the processes involved in the manufacture of animal feed at 1986, and some related issues, followed by legislative changes or developments in these processes between 1986 and 1996.

7.3 None of the processes in the animal feed industry are capable of destroying the BSE agent. The Government’s controls have therefore been designed to prevent the BSE-infected material from being incorporated in animal feed in the first place, and being fed to ruminants or to other animals. As can be seen in vol. 14: Responsibilities for Human and Animal Health, the animal feed industry was and is subject to extensive regulation under EU legislation and both primary and secondary UK legislation. The controls introduced by the Government to combat BSE made use of the existing regulatory framework for the industry.

Some features of the industry

7.4 The animal feed industry has developed since the beginning of the 20th century, initially supplying feedstuffs only for ruminants and later, as demand developed, also for pigs and poultry. In the past, feedmills were usually built at the major ports or close to inland waterways. Many of the raw materials were imported, including cereals such as wheat, barley and maize, and proteins from groundnuts, linseed, cottonseed and fishmeal. Some home-produced materials were also used, generally by-products of the food industry. These included wheat feed, left over from flour manufacture; oilseed cakes and meal, from the manufacture of margarine and cooking oils; and some MBM from the rendering industry. Today, a range of by-products and other raw materials are mixed together to provide a complete diet. This process is known as ‘compounding’, and animal feed manufacturers who do this are often called ‘compounders’.

7.5 As can be seen from Figure 7.1, compound feed production for cattle increased between 1974 and 1983. This increase was influenced by the financial incentives for dairy farmers to produce as much milk as possible, thereby requiring large volumes
of feed for their cattle.\textsuperscript{472} However, in 1984 the European Union, under the Common Agriculture Policy, introduced milk quotas, designed to curtail over-production. Milk producers stopped feeding their cows so much compound feed, because it was no longer profitable for them to maintain the existing high levels of milk production. The number of dairy cows also fell, by 10.7 per cent between 1986 and 1990, after which there was only a slight drift downward. The total cattle population declined from an annual average of 12.9 million between 1984 and 1986 to 11.7 million in 1995.\textsuperscript{473} The drop in demand for cattle feed was partly offset by increased demand for feed for other animals. At its lowest point, in 1991, total compound feed usage was only 4.4 per cent below its 1982–84 annual average. Since 1991 there has been a slow increase in demand.\textsuperscript{474}

\textbf{Figure 7.1: Compound feedstuffs purchased in England, Scotland and Wales, 1974–94}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure71.png}
\caption{Compound feedstuffs purchased in England, Scotland and Wales, 1974–94}
\end{figure}

\texttt{Source: MAFF}

7.6 The report of the Lamming Committee (the Expert Group on Animal Feedingstuffs) in 1992 summarised the structure of the feed industry in the early 1990s:

About 55\% of all purchased feeds are cereals (about 40\% of which are compounded) and they mainly come from UK grain merchants, traders and farms. Most of the other 45\% of feeds and feed ingredients are by-products from agro-industrial operators (millers, maize processors, distillers, etc) divided between UK and imported supplies.\textsuperscript{475}

7.7 The Committee also noted that:

These materials flow to farms through a variety of channels. Two-thirds (by volume) flow through the compounders, and one third through agricultural merchants, blenders, mobile mixers or direct to farmers from retailers of straights [individual feed ingredients]. Most compounds are sold direct to farmers (70\% of production), and 30\% (mainly from the two largest compounders) is distributed through the agricultural merchant trade.\textsuperscript{476}

7.8 In 1986, there were 374 feed companies, compared with 407 in 1979. The compound animal feed industry comprised three different types of firm. Five companies – BOCM Silcock, Dalgety Agriculture, J Bibby Agriculture, Nitrovit

\texttt{472 FEG84 – Roger W Dean, ‘History lesson’, from Feed Compounder, March 1991}
\texttt{476 ‘The Report of the Expert Group on Animal Feedingstuffs’, p. 77 (IBD1 tab 11)}
and Pauls Agriculture – owned mills throughout the country and controlled 54 per cent of the market. They had vertical links to other agricultural activities such as agricultural merchanting and livestock production. They were referred to as the ‘nationals’. The balance of the market consisted of compounders owned by farmer cooperatives, which had between 9 and 10 per cent of market share, and a number of independent or ‘country’ compounders, serving regional or local markets.  

7.9 The Lamming Committee noted that an increasing proportion of livestock was being fed with feed that was mixed on farm. Instead of purchasing compound feed, farmers could buy individual ingredients from feed manufacturers and other sources, or produce them on the farm, and mix their own feed. The individual ingredients were known as ‘straights’. Farmers could seek advice on feed formulae from manufacturers, MAFF’s Agricultural Development and Advisory Service (ADAS), and universities. On-farm mixing is considered in more detail in vol. 12: Livestock Farming.

7.10 The compounders’ overall share of the feedstuffs market declined in the period leading up to 1986 – from 66.3 per cent in 1976 to 59.4 per cent ten years later. In June 1991, the Chemical Safety of Food Division of MAFF estimated that 40 per cent of feedstuffs was produced on the farm, and that the compounders’ share of market was falling as farmers increasingly turned to home-mixing.

Geographical issues relating to the compound animal feed industry

(i) Sources of MBM

7.11 As noted above in Chapter 6, renderers sold their MBM to animal feed compounders across the country, although the smaller plants generally sold within a 200-mile radius.
(ii) Production of compound cattle feed by region

7.12 Figure 7.2 shows the production of compound cattle feed, broken down by region for 1987, a year before the ruminant feed ban was introduced.

Figure 7.2: Cattle feed production in the UK, by region, 1987

United Kingdom Agricultural Supply and Trade Association (UKASTA)

7.13 UKASTA is the principal UK trade association representing the interests of agricultural merchants and manufacturers of animal feedstuffs. In March 1988, the number of full members of UKASTA was 318. Of these, about 100 actually manufactured feed; many others were distributors of feed materials and/or finished feedstuffs.

7.14 UKASTA’s income is derived mostly from membership subscriptions. In acting as the representative body for its members, its principal activities are the collection and dissemination of relevant information, and liaison with UK and EU government agencies and others. 481

Grain and Feed Trade Association (GAFTA)

7.15 GAFTA is an international trading organisation representing traders of many agricultural commodities, including raw materials used in animal feedstuffs. GAFTA’s role is to promote trade in the commercial interest of its members. It also kept its members advised of developments in legislative Regulations and Orders that were made in relation to BSE. One of GAFTA’s services is the provision of a range of standard forms of contract which sellers and buyers may use in their trade negotiations. These contracts have common trading clauses, leaving quality provisions for individual parties to agree. 482

481 S155 Kirby-Johnson paras 2–4; T61 p. 46
482 S24 Reed paras 2.1–2.2
Formulation of animal feed

7.16 Compound feed manufacturers produce both finished compound feeds (suitable for consumption by an animal without further processing), and protein concentrates, which are mixed and diluted with cereals on the farm before they are eaten by animals.483

7.17 They produce compound feeds to meet specific nutritional requirements. However, market forces generally drive decisions on the raw materials to be used:

The compound feed producers will know the requirements that feed should meet in terms of energy, protein, fibre, vitamins and so on. The compounders will also have a list of different ingredients available to provide the requisite make-up of the feed. They will marry up the list of ingredients available with the feed requirements to provide the least cost formulation, that is, effectively, the cheapest combination of ingredients available on the market place for producing a feed compound capable of meeting the requirements.484

The process of diet formulation is complex and necessitates the use of computers to run linear programming calculations. This programme matches the set constraints (specification) of the diets with all the data on all the raw materials available to produce formulations for each product sold. The linear programme would operate to optimum cost, whilst ensuring that the specification of all diets was met.485

7.18 In 1986, a typical dairy cow compound would have been made up as follows:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals and/or substitutes</td>
<td>40% (wheat, barley, manioc).</td>
</tr>
<tr>
<td>Cereal by-products</td>
<td>35% (from flour milling, starch extraction, brewing and distilling industries).</td>
</tr>
<tr>
<td>Oilseed meals</td>
<td>10% (usually after fat extraction, mainly rapeseed but could be others such as soya, sunflower, etc).</td>
</tr>
<tr>
<td>High-protein supplement</td>
<td>3 to 5% (MBM or fishmeal).</td>
</tr>
<tr>
<td>Oils or fats</td>
<td>3 to 4% (vegetable and animal).</td>
</tr>
<tr>
<td>Molasses</td>
<td>3 to 4%.</td>
</tr>
<tr>
<td>Minerals and vitamins</td>
<td>2 to 3%.486</td>
</tr>
</tbody>
</table>

483 S25 Raine
484 S47 Gill para. 16
485 S28 Sanderson para. 38
486 S37A Foxcroft para. 11
7.19 Sometimes more unusual ingredients were used. A series of articles appearing in 1991 described ingredients ranging from dried citrus fruit pulp to dried coffee residues, and including nutritionally improved straw and feather meal.\textsuperscript{487}

7.20 New ingredients in a compound feed were tested, both in the laboratory and on animals, to check for palatability and toxicity.\textsuperscript{488} However, MBM was considered a safe material that did not need testing. Its quality was regarded as the responsibility of the renderers.\textsuperscript{489} The issue of whether MBM used in animal feed was homogeneous in terms of its ingredients, or instead might have contained concentrated lumps of one ingredient, is discussed in Chapter 6, on rendering. That chapter also notes that renderers were divided between those that rendered red meat by-products of all kinds (producing MBM), and those that rendered poultry by-products (producing poultry meal). MBM could be derived from the by-products of cattle, sheep or pigs (or all of them together), and animal feed manufacturers were not told which were used. Poultry meal was sometimes used in feed production, but MBM was cheaper and thus usually preferred.\textsuperscript{490}

7.21 In addition, tallow from the rendering process was used in feeds for all animals.\textsuperscript{491} It was suggested that tallow was also used as a fat supplement in milk fed to calves.\textsuperscript{492}

7.22 It was common for products containing gelatine to be incorporated in animal feed (for information on the production of gelatine from bovine material, see Chapter 8). Representatives of the animal feed industry said in oral evidence:

\begin{quote}
The animal feed industry has long used by-products from the human food industry; and it is entirely possible that some of those by-products from the human food industry would contain gelatine.\textsuperscript{493}

There could be 2.5 per cent gelatine in some of the human food by-products. So, whilst the source from vitamins would be extremely low, if you were using that particular by-product, there could be that quantity or a quantity of gelatine which may or may not have been detected; we do not know.\textsuperscript{494}

Every compound feed that contains vitamin supplement would contain gelatine; but we are talking about fractions of a milligram from the vitamins side.\textsuperscript{495}
\end{quote}

7.23 There were statutory limits on the amounts of certain potentially harmful ingredients, such as arsenic, fluorine, lead and mercury, which could be included in animal feed.\textsuperscript{496} Volume 14: \textit{Responsibilities for Human and Animal Health} describes more fully the statutory controls on feed ingredients and contaminants.

\textsuperscript{487} E J Ross, \textit{Unusual Raw Materials, agr\textsuperscript{Trade}}, May 1991 (M13A tab 9)
\textsuperscript{488} T17 p. 96
\textsuperscript{489} T17
\textsuperscript{490} T60 p. 70
\textsuperscript{491} UKAS\textsuperscript{T}A, ‘Compendium of Raw Materials Used in the Feed Industry’, 1996 (M13 tab 1)
\textsuperscript{492} S132 Comley p. 4; T57 p. 23
\textsuperscript{493} T61 p. 44 – Mr James Reed, Director-General of UKAS\textsuperscript{T}A
\textsuperscript{494} T61 p. 45 – Dr Brian Cooke of Dalgety Agriculture
\textsuperscript{495} T61 p. 45 – Dr Michael Marsden of J Bibby Agriculture
\textsuperscript{496} Feeding Stuffs Regulations 1986, Regulation 16 (L3 tab 2)
7.24 Protein concentrates are produced by compound manufacturers in a similar way to compound feeds, generally in the form of protein pellets designed to be mixed with cereals, such as barley, by the farmer.\textsuperscript{497}

7.25 They were a mixture of various high protein materials, including MBM. Indeed, MBM might make up as much as 25 per cent of the concentrates,\textsuperscript{498} which were accompanied by ‘detailed written instructions as to how they should be mixed with on-farm material or other materials’.\textsuperscript{499} When mixed correctly with cereals, the MBM content should not have exceeded 5 per cent of the finished feed.\textsuperscript{500} Vol. 12: \textit{Livestock Farming} gives a fuller description of the feed practices for cattle and on-farm mixing.

The reason for widespread use of MBM in cattle diets

7.26 The need for protein supplements for cows has been well known for a long time. The earliest references to the use of animal by-products as a protein source in animal feed go back to the 19th century; Liebig recommended their use in pig feed in 1865.\textsuperscript{501} In 1908 a book by Kellner on the scientific feeding of animals described an early form of industrial rendering to produce a type of MBM.\textsuperscript{502}

7.27 In the UK, the use of MBM in ruminant nutrition was well established by the 1920s.\textsuperscript{503} MBM was mentioned as a feedstuff in the Fertiliser and Feedingstuffs Act 1926. In the US in 1928, Morrison described the production of MBM and stated that, although this was normally fed to pigs and poultry, when mixed with other feeds it could also be fed to horses, cattle and sheep.\textsuperscript{504} During the 1930s and 1940s there were a number of references in scientific literature to the commercial use of rendered meat by-products, for example: as alternative protein for calves in New Zealand; as a supplement to grass for sheep in Australia; and in various experiments on dairy cows, to assess the effect of protein intake and quality on milk production.\textsuperscript{505}

7.28 During the Second World War, Regulations set out minimum and/or maximum proportions of ingredients to be used in feed in the UK. For example, in 1941 the inclusion of a minimum of 2.5 per cent meat meal or MBM was prescribed,\textsuperscript{506} which was later increased for young stock to 5 per cent.\textsuperscript{507}

7.29 Use of MBM as an ingredient of cattle feed continued to grow post-war after ruminant nutritionists identified that cattle digested some proteins (including those in MBM) more efficiently than they did others. In 1980, the Agricultural Research Council (ARC) published \textit{The Nutrient Requirements of Ruminant Livestock}. This publication defined two types of protein: undegraded (by the rumen) protein (UDP) and rumen degradable protein (RDP). RDP is protein, such as the vegetable protein found in soyabean meal, which is degraded by micro-organisms in the rumen (the first stomach of a cow). In contrast, UDP is not degraded by micro-organisms in the
rumen, but instead moves through to the abomasum (the fourth stomach) and small intestine, where it is digested (see Glossary). Examples of UDP can be found in MBM and fishmeal. Amino acids are absorbed in the small intestine, and are supplied partly from microbial protein resulting from the fermentation of RDP in the rumen, and partly from UDP which has escaped rumen fermentation. Amino acids are absorbed and used by the animal for maintenance, growth and milk production. UDP therefore increases potential milk yield.

7.30 The ARC’s work meant that optimum formulae for the inclusion of UDP and RDP in cattle feed could now be calculated. The emphasis on increasing milk production led to the use of MBM in place of some of the cheaper vegetable proteins, which had been the main protein source up until then. From about 1982 the least cost formulation of rations manufactured for dairy cows recommended the inclusion of substantial amounts of MBM.

7.31 MBM was also an important source of minerals, providing much higher levels of calcium and phosphorus than other sources of protein. MBM produced without solvent extraction during the rendering process also contained higher quantities of oil, an important source of energy for the animal. In short, MBM gave ‘a particular package of nutrients that was useful. It was not necessarily a single issue... it was the total package that it provided that made it so useful in a range of feeding stuffs.’

7.32 With the introduction of price supports for milk and limitations on herd size under the EU Common Agricultural Policy, there was a further incentive to increase the milk yield from each cow. One of the various techniques for maximising yield was to modify the diet by increasing the amount of protein in the feed. One way of doing so was to include a greater proportion of MBM in dairy feeds. This proportion could not generally exceed 5 per cent of MBM in compound feed, since inclusion at a higher rate made the feed unpalatable to cattle.

7.33 According to Mr Alan Lawrence of MAFF, in 1988 the annual UK production of MBM was 350,000 to 400,000 tons. Most went into feed rations, of which about 90 per cent went to pigs and poultry and about 10 per cent to ruminant feed.
Processes involved in animal feed manufacture in 1986

Manufacturing process\textsuperscript{517}

Intake

7.34 Ingredients were purchased by the manufacturers against a forward demand requirement, which could be for the next day’s consumption only or, for some raw materials, for a full year’s requirement.\textsuperscript{518}

7.35 All products were delivered to them by road. The material was sampled before being tipped into an intake pit from which conveyors and elevators transferred the load to bulk silos.

Raw material storage

7.36 Deliveries were stored in raw material holding bins. Low volume items (minerals, vitamins, etc) were stored in smaller bulk containers. Some were stored in bags and handled manually.

Weighing, mixing and grinding

7.37 In automated mills, ingredients were automatically weighed out of storage, according to the formulation being used for that batch.

7.38 A smaller feedmill would usually have a simple weighing, mixing and production system. More typical of larger, more automated mills was a complex blending and mixing system with several production units.

7.39 In a simple system, one batch of about a tonne was mixed at a time. A few of the main cereal ingredients, held ready-ground in bulk bins, were drawn onto a conveyor and into the mixer. Any medicinal additives were incorporated at this stage (for more on medicinal additives, see the section below on cross-contamination). If the feed was to be sold as a meal, it would now be diverted to storage. Otherwise, steam was added to the meal mixture to raise its temperature (a procedure known as ‘conditioning’) before the material was forced through a ring roll press to form ‘pellets’, which varied in diameter from 2.5 to 20 mm. The moist, hot pellets were then passed through a cooler to reduce their temperature, also causing them to harden. If some of the production was to be sold in bulk, the sieved pellets or mixed meal went to holding bins. However, in small mills of this type it was not usual for much of the feed to be delivered in bulk, in which case it was bagged.

7.40 In a more complex mixing system, typical of a high-volume mill, there were groups of bins for cereals, proteins and possibly minerals. These bins discharged their contents in discrete batches of one to four tonnes through separate, computerised weighers to a collecting and elevating system. The material then

\textsuperscript{517} The process descriptions are taken from the Pauls Good Feed Guide (M13A tab 12), the UKASTA Code of Practice for Cross Contamination in Animal Feedingstuffs Manufacture (M13 tab 3), and S28 Sanderson

\textsuperscript{518} S28 Sanderson para. 35
passed through a hammer mill, which reduced the particles to a size which allowed them to pass through a screen from which they were conveyed to the batch mixer. This was usually a ‘three-tier’ mixer consisting of:

i. holding bin above the mixer;

ii. the mixer itself; and

iii. a discharge/holding bin below the mixer.

7.41 At this stage the vitamins, trace materials and other low inclusion ingredients (such as medicinal additives) were normally added in a premix directly into the mixer. Some oils and other liquid materials could also be added at this stage. After a mixing period of three to four minutes, the batch was transferred as a meal to bulk storage ready for bagging or bulk delivery, or to conditioning and conversion into pellets. A high-capacity mill of this type probably produced a large proportion of its output as pellets or cubes, and as much as 90 per cent of its output was delivered in bulk.

Storage, loading and bagging

7.42 The finished product was stored in bulk bins prior to loading or bagging. Bulk quantities of feed were loaded into bulk tanker lorries. In most mills, the vehicles stood on a weighbridge while being loaded. Smaller quantities were siphoned into bags of 25 kilograms.

Delivery

7.43 Lorries were divided into compartments and often visited several farms to deliver feed into bulk bins. Bagged feed was delivered on a flat lorry, the pallets being loaded by forklift.

7.44 As mentioned above, most compound feed, about 70 per cent, was sold from the mill directly to farmers. The other 30 per cent was sold through the agricultural merchant trade. As Mr Ian Smith of Midland Shires Farmers (MSF – an agricultural cooperative) said in oral evidence:

MSF certainly would have a number of merchants, particularly in Wales, who would in effect be the selling agent for the product. We might well deliver it. He might indeed collect it from the mill. But the actual contact between the customer and the seller would be with the merchant. He may or may not have been supported by an MSF technical adviser and that would be common throughout the industry.

Clearly, if it moved in a bulk lorry, it tended to go from the mill to the farm regardless of the invoicing arrangements. If it was produced in bags, clearly then it could have gone through a store or, in MSF’s case, since we have about 23 shops, it could have gone through the shop and been bought by the customer from the shop.
7.45 If sales to feed merchants were in bulk, then, depending on the particular merchant’s storage facilities, different types of feed might have been stored in common facilities, or feed from different batches might have been intermingled.

7.46 The use of compound animal feed on farms is considered in detail in vol. 12: *Livestock Farming*.

**Labelling**

7.47 The legislation governing the labelling of compound animal feed is described in detail in vol. 14: *Responsibilities for Human and Animal Health*. In effect, it obliged the seller of prescribed feedstuffs to supply the buyer with a statutory statement (in the form of a label on the container or, for bulk deliveries, a document) containing certain particulars. The statement provided by a seller of feed for ruminant animals had to specify the amount of protein and, if any, the amounts of oil and fibre. The statement was not required to specify the source or nature of the protein (for example, to specify that the protein was MBM). The seller could, but was not obliged to, list the specific ingredients in the statement.

7.48 Owing to both the technical difficulties in providing an accurate list of ingredients, and the fear of compromising commercial secrets, most compounders did not publish ingredient lists.

**Cross-contamination of feed**

7.49 Cross-contamination of animal feed in the mill was a serious concern for the industry, even before the BSE period. In the late 1980s, most feedmills produced feed for different classes of stock in the same plant. A number of possible opportunities for the occurrence of low-level cross-contamination existed, not only during compounding of the feed, but also during manufacture and delivery of the raw materials, and during delivery of the finished product. For example, cross-contamination might occur:

- at an ingredient importer’s store;
- during manufacture of a processed ingredient, or as a result of a batch of blended feed or raw material picking up traces of feed or raw material left behind by the previous batch;
- from raw material having built up on the sides of bins, conveyors or manufacturing machinery, and falling into the stream of material of a later batch;
- as a result of errors in the computer software controlling the manufacturing processes; or
- as a result of human error (eg, mistakes by formulators, consignment of raw material to the wrong bin leading to an unplanned mixture of raw materials).
materials, or consignment of feed to the wrong truck compartment resulting in delivery of the feed to the wrong farm).  

7.50 In fact, there were so many opportunities that some degree of cross-contamination was considered unavoidable where different types of feed were manufactured by the same equipment.  

7.51 Before BSE, this low-level cross-contamination was of primary concern when medicinal additives were used in the production of compound feed. The problem here was that medicinal additives beneficial to one species could harm other species, or different species could tolerate different levels of additive. An example of this was the use of copper additives to promote growth:

In the case of pig food it is used at 100, 150 parts per million; whereas in other ruminants it is used at 30 to 40 parts per million. That level in sheep is too much to accept.  

7.52 The UKASTA ‘Code of Practice for Cross Contamination in Animal Feedingstuffs Manufacture’ was first published in 1982. The Inquiry was provided with the amended version of this document, which was published in June 1984. The Code divided medicinal additives into:

- Group I medicinal additives, which could be used without veterinary supervision. They were routinely included in feeds made for many classes of stock, to control disease or improve growth or performance. When the Code of Practice was published, about a third of the annual production of compounds included medicinal additives from Group I; and

- Group II medicinal additives, which could only be used under veterinary supervision. They were usually for the treatment of disease, and were used in less than 5 per cent of total feeds manufactured.

7.53 The Code of Practice covered a number of areas of concern, including:

- design of new plant or modification of existing plant, which should take account of the possibility of cross-contamination;

- training of staff, which should make clear the principles and implications of the medicinal additives being used, and the potential hazards of their misuse;

- storage and handling of medicinal additives, including issues such as security, labelling and record-keeping;

- manufacturing, with attention to scheduling of production and plant operation (see below), and management and disposal of discarded material containing medicinal additives; and
- packaging and delivery, which required clean equipment and bulk vehicles, and clear identification of medicated feed.\textsuperscript{530}

7.54 In respect of production scheduling, the Code of Practice required each mill to draft rules based on the needs of that particular mill. The rules were to be divided into:

(i) General programme rules based on the following:

Plan for the longest runs possible with minimal changes.

A medicated feed should be followed only by a feed for a species for which the medicament is licensed.

As a qualification to the above, particular care should be taken with breeder feeds.

Where feeds are made containing different concentrations of a medicinal additive, related to the age of stock within a species, feeds should be manufactured in descending order of concentration.

(ii) Particular exclusions, for example:

All feeds with high levels of added copper never to be followed by a feed for sheep.

All feeds containing monensin never to be followed by feed for horses.\textsuperscript{531}

7.55 In respect of plant operation, the Code of Practice required the following:

(i) Monitoring of plant performance

Regular assessment of plant performance should be made to ensure that the assessed potential for minimising cross-contamination is being fully realised.

(ii) Nature of premix

Addition of concentrated medicinal additives should be avoided by suitable dilution.

(iii) Point of addition

The medicinal additive should preferably be added directly to the mixer; otherwise it should be added as near to the mixer as possible. Due consideration should be paid to accuracy and reliability of ‘in-mill’ communication. The point of addition should be of a type enabling clean injection of the medicinal additives to be made.
(iv) Time of addition

The medicinal additive should be added to the main flow of ingredients and not at the beginning or end, both of which increase the likelihood of medicinal additives remaining in the system.

(v) Flushing and cleaning

This should be done by taking off the first 50 kg of the succeeding batch, except in the case where the same medicinal additive is being used at a lower concentration.

N.B. If 50 kg is considered inadequate in relation to a particular plant and products, then the amount should be increased accordingly.

(vi) Extruded feeds

Particular attention must be paid to the avoidance of an unacceptable level of recirculating feed in the subsequent batch. The level of this residue should be laid down for each production unit.

(vii) Extra provision for Group II medicinal additives

In addition, it is essential that dead spaces, such as elevator boot pockets and other accessible parts of the manufacturing plant, be physically cleaned out after production of a batch containing Group II medicinal additives. This must not be done beforehand.\footnote{M13 tab 3 pp. 11–12}

7.56 As noted above, many farmers preferred to mix their own feed on the farm, from ingredients purchased from the feed manufacturers or merchants (including protein concentrates and MBM), rather than relying on feed compounded in a mill. The Feeding Stuffs Regulations 1991 later applied some controls to feed produced on farms, but did not subject it to the full labelling and compositional requirements for other feedstuffs. In 1992, the Lamming Committee found that some farmers were not well informed about their responsibilities under the Regulations. The Committee recommended that farm-mixed feeds be sampled and inspected to ensure they complied with the statutory limits for undesirable substances and additives in feedstuffs. It also recommended that on-farm mixers be provided with a Code of Practice of their own to encourage good manufacturing practice and to explain farmers’ obligations under the Feeding Stuff Regulations.\footnote{IBD1 tab 11 – ‘The Report of the Expert Group on Animal Feedstuffs’ (Lamming Committee), paras 5.9–5.10. Drafting of a Code of Practice did begin as a result of this Lamming Report recommendation. However, discussions in the EU on Codes of Good Manufacturing Practice culminated in Council Directive 95/68/EC L18 tab 34. This Directive was implemented by the Feedingstuffs (Establishments and Intermediaries) Regulations 1999 and the Zootechnical Products Regulations 1999}
Legislative changes and developments in the process post-BSE

Bovine Spongiform Encephalopathy Order 1988

7.57 This Order, implementing the ‘rumen feed ban’, banned the feeding to ruminant animals, and the sale or supply for feeding to ruminant animals, of any feedstuffs containing MBM derived from ruminant animals, for a limited period. The ban commenced on 18 July 1988. UKASTA informed its members of the prospective ban on 3 June 1988. The ban was later extended, first for another year and then indefinitely.

7.58 As ruminant protein could no longer be fed to ruminant animals, ruminant feed formulations had to be amended to substitute a non-ruminant protein source. Material derived from pigs and poultry could still legally be used in ruminant feed, and some renderers considered the possibility of producing MBM guaranteed to be derived only from porcine material. However, this was never pursued (see vol. 5: Animal Health, 1989–96). The feed manufacturers stopped using MBM in ruminant feeds. J Bibby Agriculture decided to exclude poultry meal and other animal by-products as well. By the early 1990s, pressure from the supermarkets meant that, to a large extent, other manufacturers also stopped using poultry material altogether. Mr Paul Foxcroft of PDM said that the use of poultry protein in ruminant feed was ‘almost nonexistent since March 1986’.

Voluntary animal SBO ban


Bovine Spongiform Encephalopathy (No. 2) Amendment Order 1990

7.60 One part of this Order, which came into force on 25 September 1990, prohibited the use of SBO or MBM derived from SBO in any animal or poultry feed. It had a limited impact upon the feed industry insofar as the voluntary ban was already in place. Dr Helen Raine of J Bibby Agriculture said in her statement:

The Order itself had no effect on the industry as the action took place 9 months prior to it becoming law. On 15 November 1989 Bibby wrote to all...
of its MBM suppliers stating that all MBM supplies must not contain any
SBO material or fallen animals as from 1 December 1989.\footnote{S154 Raine and Marsden para. 42}

7.61 The new Order also had the unintended effect of extending the ruminant feed
ban to the feeding of any animal protein to ruminants. However, this oversight was
described as having ‘no effect’ because no rendering plant was producing MBM for
incorporation into ruminant feeds from, say, ‘just pig material’.\footnote{FEG17 p. 1} The error was
subsequently amended by the Bovine Spongiform Encephalopathy Order 1991,
which came into force on 6 November 1991.\footnote{L2 tab 7}

**Feeding Stuffs Regulations 1991**

7.62 Under these Regulations, for the first time the statutory statement which a
seller of compound animal feed was obliged to give to the buyer was required to list
all the ingredients of the feed in descending order of weight.\footnote{L3 tab 7, schedule I, paragraph 12(1)} The ingredients
could be described either by their specific names (for example, MBM) or by the
names of categories in a schedule to the Regulations to which they belonged. In the
case of MBM, provided certain criteria were met, the relevant category name was
‘Land animal products’.

**Spongiform Encephalopathy (Miscellaneous Amendments) Order 1994**

7.63 This Order came into force on 2 November 1994 and implemented
Commission Decision 94/381/EC, which prohibited the feeding of protein derived
from any mammalian tissues to ruminant animals. In practice, the ruminant feed ban
had always operated as if it so provided.

**EC Decisions 94/474/EC and 95/287/EC**

7.64 Among other things, Commission Decision 94/474/EC required that the UK
ensure that SBO material was removed from the carcasses of cattle, stained and
destroyed.\footnote{L4 tab 10} It also prohibited the use of ruminant protein in ruminant rations.
Since these requirements merely restated the position in existing domestic law, they
had no effect on practice.

7.65 In addition, Decision 94/474/EC required that scientific tests be carried out to
ensure that ‘ruminant protein destined for use in pig and poultry rations and other
uses is not included in ruminant rations’. This requirement was further tightened by
Commission Decision 95/287/EC, which required that an ELISA test which could
detect the presence of protein be used routinely to monitor feeds intended to be
fed to ruminants, in order to ensure that ruminant protein was not incorporated
in them.\footnote{L4 tab 1}
7.66 Representatives of both J Bibby and Dalgety Agriculture said in statements that, after this decision, there were regular visits to their mills by SVS staff to take samples of their ruminant feed for testing.\textsuperscript{547}