Pollution in Livestock Production Systems


Pollution from animal production is now one of the most serious challenges for farmers. The book, edited by Dewi, Axford, Marai, and Omed, is therefore most timely. The chapters in the book comprise reviews presented at an international symposium at the University College of Wales, Bangor, in September of 1992. There were three main purposes of the symposium and now of the book. These were to review (i) the impact of pollution on livestock production; (ii) the environmental effects of pollution arising from livestock enterprises; and (iii) the control of pollution from livestock production and the beneficial use of wastes. The book is divided into three parts corresponding to these topics.

It is easy to overlook that livestock can be a victim of pollution as well as its cause. The first part of the book, encompassing about 40% of its contents, describes risks posed to animals and humans by feedstuffs, polluted air, saline water, and microbes. Some of the information presented stretches the conventional sense of pollution. The first chapter in Part 1 reviews contamination in animal feeds. The following chapter pursues the subject of animal welfare by reviewing the hazards and control of aflatoxins. More recognizably serious problems of pollution are addressed in the next two chapters, which are concerned, respectively, with the effects of airborne particulates and gaseous pollution on animals. Both chapters clearly make the case for clean, well-ventilated animal housing. This is as desirable for farm workers as it is for livestock.

The following two chapters describe risks posed by radiation, including that caused by Chernobyl. The ill-consequences of the catastrophic failure at Chernobyl on upland sheep farming in the UK is a powerful reminder of the long-range effects of radioactive fallout.

Of potential concern to farmers in arid areas is the potential consequences of saline drinking water on farm animals. More ubiquitous and potentially lethal threats to animal and human health are posed by Salmonella and Leptospira. These two long-standing foes of humans as well as animals are well reviewed in the final two chapters of Part 1.

Part 2 is concerned with livestock as a cause of pollution. The first chapter therein describes the pollution of soils and water by animals wastes. The point is clearly made that animal wastes are a serious issue for the farmer and the environment. In the UK, about one-tenth of pollution incidents recorded in 1990 were caused by livestock waste. If the severity of the incidents is considered, this position is worse since farms accounted for nearly a third of major pollution incidents. The following chapter describes pollution from fish farms. Presumably, this chapter is the reason for the use of the word livestock rather than animal in the title of the book. Also, this chapter is the only one in the book focused on phosphorus as a pollutant. Water used in fish production is significantly enriched by phosphorus with significant consequences for biota downstream of the effluent discharge.

The book gives much greater emphasis to nitrogen, as in the next chapter, which describes the nitrogen flows to and from grassland. The chapter reviews current understanding of the transformation and losses of nitrogen through ammonia volatization, denitrification, and leaching. Grassland, which is grazed, can have significantly higher losses of nitrogen than cut swards. Timing the applications of nitrogen to the grass according to its growth patterns, and the use of mixed grass-clover swards both reduce losses. Our need is to increase the accuracy of predicting and controlling these losses through greater understanding of nitrogen utilization by grasses under different management schemes.

The following chapter addresses a major source of contention as residential developments encroach into agricultural areas. That is the problem of nuisances caused by offensive smells. Although options exist for the farmer, as the chapter describes, the costs are likely to be high. As in other respects, mixed land uses as they extend into farmland areas means inevitably greater cost for the farmer.

Part 3 of the book deals with use and disposal of wastes. The first chapter reviews the promising option of feeding sludge effluent to pigs and beef cattle. The following chapter describes the more convenient use of farm wastes as plant food. Advantages and disadvantages are weighed against each other. The author observes that “much of the research on appropriate rates of application of animal manures was conducted before the current emphasis on environmental aspects related to waste management.”

A decade ago, there was considerable interest in methods of anaerobic treatment of farm slurries to produce biogas. The stabilization of the waste produced by digestion was also an attraction. As the author of the next chapter describes, the promise has not been fulfilled. This is partly because of adverse experiences caused in part by equipment failures. Although the technology has advanced, its application remains limited. There is renewed interest in composting as an alternative method of stabilizing and sanitizing farm waste. The following chapter reviews composting and a new technique using artificial wetlands through the construction of reed beds. These beds were popularized in Germany several years ago and taken up in the UK and Denmark, especially as an inexpensive option for treating municipal wastewater. The experience in designing and using reed beds had had variable successes for this purpose. This appears to be the case in their use for farm wastes.

Another technique described in the following chapter is aeration of livestock slurries followed by treatment in shallow algal ponds. The algal ponds described are operated at a high rate by maintaining turbulence. From the description given, it appears unlikely that high-rate algal ponds will be widely adopted in the near future, given their operating requirements.

More conventional management is described in the next chapter in terms of waste storage systems. The final chapter is an extended discussion of expert systems for farm wastes. The chapter has 10 international coauthors and represents a unique collaboration. Expert systems as a method are first reviewed, followed by a description of the well-known waste engineering expert system (WEES). Expert systems are likely to have increased use in farming and WEES is a particularly promising application.

The final chapter addresses the need in Dutch agriculture to reduce emissions of ammonia from animal wastes. The methods include flushing systems in cattle houses, which have the possible disadvantage of increasing the volume of slurry produced. This method can reduce ammonia losses by up to 70%. An additional step is to lower the pH of the slurry to 4.5, which reduces ammonia volatization by another 35%.

In general, there is some overlap between chapters, which is inevitable in this type of compilation. The book would have been substantially improved if the chapters were linked rather than independent. There are inconsistencies. For example, information presented in Table 1.1 is inconsistent with Table 11.6, and likewise Table 11.1 and Table 21.1 purport to show similar data but with large discrepancies.

Despite its weaknesses, the book is a useful overview of pollution and livestock production. Readers interested in planning and managing livestock systems will find much of interest.