

cement production in Belgium, France, Germany, Japan, and possibly other countries.) Naturally, diversion of large quantities of rendered products into new uses raises significant economic issues, and many diversion uses may not currently make sense in purely economic terms, as other nations that practice such diversion have found.⁹ For example, MBM, when burned, generates only about half the energy obtained from burning coal, yet MBM sells for about 12 times the price of coal.

Although many industrial products are produced mainly from rendered fats and oils, rather than rendered protein, some products utilize rendered protein. In other cases, a percentage of rendered protein can be included as a harmless additive with the rendered fat or oil product. If such diversion into non-food uses is effectively accomplished, it could provide a safe means of dead stock disposal for animals that might spread TSE's if disposed of in other ways.

Composting of dead stock in a properly designed and sized dead animal composter. Composting of dead stock allows the end product to be recycled back to the land as a fertilizer. Poultry and swine industries use this technology effectively. Composting is used to dispose of some cattle and other large species, but large-scale cost-effective approaches are still under development. Composting requires careful planning and monitoring to be successful. Issues include moisture and temperature control and proper admixture of plant matter (often straw or old feedstuffs) to raise the carbon-nitrogen level to a point where proper composting can occur. Composting also takes time; decomposition of a mature cattle carcass takes about 6 to 8 months. The remaining bony matter is soft and easily broken for land application or other final disposal. One successful composting approach uses a three-bin

system, which is best located downwind from nearby residences and away from waterways and ponds. Permanent composting facilities have significant start-up costs of \$5,000 or more. Composting operations must also take steps to control the potential risk of disease spread by wild and feral animals.

Composting is problematic with regard to BSE infectivity; it may be effective, or it may reduce but not destroy infectivity. Composting does not usually raise material temperatures over 160 °F, a temperature the BSE agent is known to survive for long periods. Further research is needed to characterize the effectiveness of composting with regard to BSE. The United Kingdom's Department for Environment, Food, and Rural Affairs is currently preparing a risk assessment, to be completed in the near future, that may help resolve this question.

Dead stock disposal in an approved sanitary landfill. Most municipal landfills are permitted to accept dead animals but may limit their numbers. To minimize pathogen contamination of groundwater, modern sanitary landfills are designed and operated to prevent leaching into groundwater or surface waters. Drawbacks include limited capacity and expense—many landfills charge over \$100 a head to dispose of cattle. However, properly operated landfills will keep infectious material away from livestock.

Incinerating dead stock. Incineration is very effective but is costly and energy intensive, and it may pollute the environment if the incinerator is not operated and maintained properly. Incinerators generally must be licensed by a State government. Open burning of dead animals is not allowed in most States without a permit.

A subset of incineration technology that is gaining popularity is on-site disposal using either complete mobile incinerators or air curtain trench burners. There are cost and air quality issues associated with both of these technologies, and they are usually considered most suitable for short-term disposal projects (such as depopulating a herd) rather than long-term use. However, air curtain trench burners in particular have been gaining use in recent years for on-site disposal of diseased animals. They have been used in Great Britain for disposal of animals during the recent foot-and-mouth disease outbreak, and they have been used in Montana and Colorado to dispose of elk implicated in CWD outbreaks. When properly used, this technology produces ash that presents

no disease risk when disposed of properly.

Air curtain trench burners are essentially giant blowers that direct powerful airstreams onto trenches in which carcasses are burned on firewood fuel. This superheats the fire to temperatures steadily above 1,000 °C., resulting in total carcass incineration in approximately 20 minutes. (Cadaver incineration times will vary with factors such as fat content, moisture content, firebox or pit temperature, type of wood waste used, etc.) Site selection is important for air curtain trench burners, and soil type, underground water table, and prevailing wind direction should be carefully considered. High water table areas and sandy soil types should be avoided. Stable vertical trench walls with minimum entry of underground water into the burn area are needed for steady high incineration temperatures.

Burial on premises. Many States specify requirements for owners who bury their dead stock on their own premises. Typically, State laws limit the number of animals that may be buried, require adequate topsoil covering the animals (usually 2 or 3 feet), and attempt to restrict burials in areas where runoff passing over the animals would contaminate groundwater or aquifers.

Tissue digestion. Because this is a new and relatively expensive technology, most State laws do not yet recognize or recommend it as a means of dead stock disposal. Tissue digesters are essentially large "pressure cooker" devices that use boiling sodium hydroxide solutions to degrade proteins and fats and result in a sterile liquid suitable for municipal sewage systems, and a sterile, crumbling calcium phosphate residue from the bones and teeth of the animals. Research has shown this method to very effectively reduce levels of TSE infectivity. A typical digester costs several hundred thousand dollars, could process several cattle cadavers simultaneously, and takes several hours to complete a processing cycle. Currently, most digesters in the United States are located at major veterinary research centers or veterinary teaching hospitals.

Preferred Methods for Dead Stock Disposal

APHIS is seeking comments on which approaches for safe disposal of dead stock should be encouraged or required. The primary issue we would like commenters to address is how to develop a combination of regulatory requirements, incentives, and cooperative relationships with production and disposal industries that

⁹ "In Germany all fallen animals and all animals unfit for human consumption must be disposed of at rendering plants. The renderers collect the animals. All fallen and sick bovines over 24 months are BSE tested * * * If the results of the test have not come through then the whole carcass must be processed into MBM under the standard procedure at 133°C and 3 bar. Since the introduction of the MBM feed ban all MBM must be burnt either in waste incinerators, power stations, or as fuel for cement producers * * * Since the introduction of the MBM feed ban rendering operations run at a loss. Federal and Land Governments are still discussing the coverage of the extra costs brought about by the BSE crisis. The Federal Government has so far resisted the wish of the Land Governments that the Federal Government should pay all BSE follow-up costs including the disposal costs of MBM."—British Embassy Bonn Office Agriculture Note: September 2001, available at <http://www.britischesbotschaft.de/en/embassy/agriculture/Agri-Note-Fallen%20Stock.htm>.