HOG MANURE MANAGEMENT TECHNOLOGY: HISTORY ©

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Hog Manure Management Technology Workshop

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Introduction

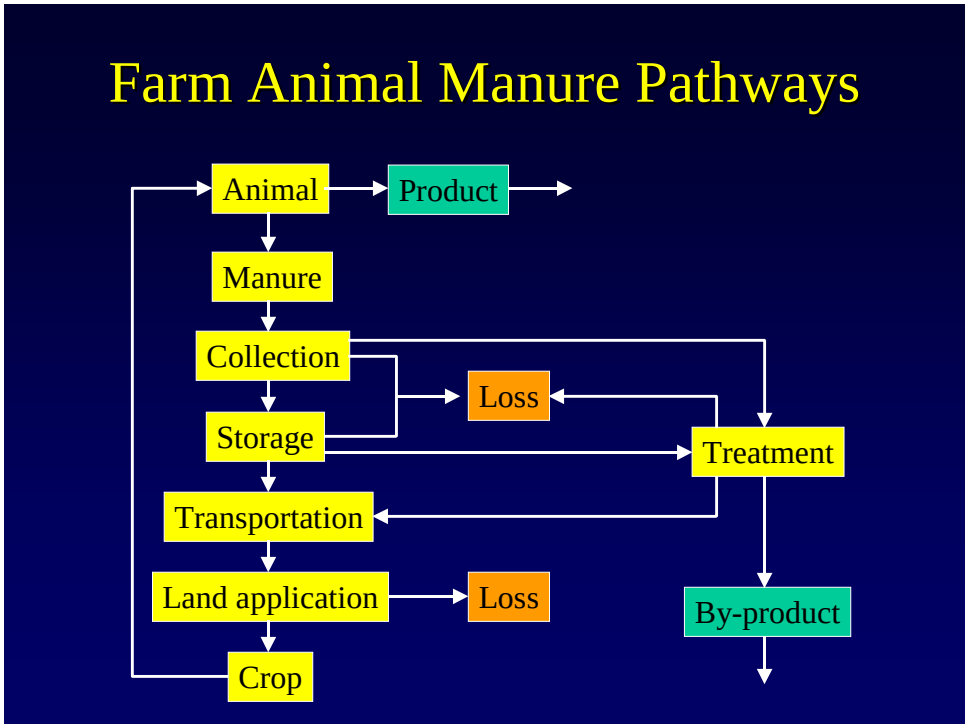
Canadian hog industry has attracted considerable public attention lately, mainly because of issues of air and water quality degradation. The trend since the seventies has been a shrinking number of hog farms but an increasing number of hogs produced. When a large number of hogs are raised at a farm, they are usually kept in total confinement and the manure is handled in a liquid or slurry form to save on labour cost because of automation of the manure handling systems.

Manure Production and Characteristics

Although the manure, as excreted, has about 90% water, the manure as handled at the farm typically has 94% to 98% water due to dilution and loss of organic matter during handling. More than 75% of the nitrogen (N), phosphorus (P) and potassium (K) in the feed is excreted. Production of one kilogram of pork is associated with about 15 kg of manure production. In 2001, the standing pig population (no. of pigs at farms) in Canada was 14 million. This large population of pigs is estimated to produce annually about 19 million cu. m. of manure, and 160,000, 100,000 and 87,000 tonnes of nitrogen, phosphate and potash, respectively. This represents a valuable resource that should be conserved and utilized as far as possible. In addition to the plant nutrients, the manure also provides about 1.6 million tonnes of organic matter annually which, when applied to land, improves soil quality by improving soil tilth and water holding capacity. When managed improperly, this manure can also lead to an impairment of the quality of air, water and soil in the vicinity of the hog production sites.

Manure Handling Pathways

The figure below shows the manure pathway from the barn to the land. For production efficiency, manure has to be managed properly at each stage. Animal diet can be controlled to reduce the excretion of nitrogen and phosphorus. During collection, storage, transportation and land application, manure has to be managed for conserving its fertility value, and reducing its impact on the quality of air, water and soil. Air quality can be impaired in terms of odour and ammonia emissions. Hazardous manure gases, dust from dried feces, and greenhouse gases are other undesirable emissions. Improper land application can have adverse effects on the physical, chemical and microbial quality of surface and subsurface water and cause excessive accumulation of N, P and K in the soil which can be harmful to water supplies and to the animals fed on crops from such soils. Treatment of manure becomes necessary for reducing its nutrient and potential pathogen content when the available land base is insufficient to receive manure at agronomically acceptable rates. Treatment of manure adds extra cost to handling of manure, and so far, indications are that by-products produced from treatment do not cover the cost of treatment.



Manure Treatment Systems – History

The general objective is to handle manure in ways that would reduce cost and improve production efficiency, while meeting environmental requirements. Manure management and treatment has been a subject of numerous conferences, meetings, workshops, symposia and publications in Canada, the U.S. and Europe, many of which are listed in the bibliography at the end. The interest in proper management of manure has been there since the middle of the nineteenth century but has increased much more since the sixties with the advent of confinement raising of hogs. Several technologies have been reported for manure treatment. These can be classified as: physical treatment for solid-liquid separation (screening, pressing, freeze separation, centrifuging); bio-filters to reduce odour and gases; drying to reduce water content (solar, composting); nutrient removal (reverse osmosis), etc.; chemical treatment by additives to reduce odour, volatile emissions, improve solid liquid separation, etc.; biochemical treatment in aerobic (aeration, composting) or anaerobic (biogas) systems. Most advanced treatment systems use a combination of the above. The cost of treatment systems increases as the number of treatment unit processes and unit operations increase. Manure land application equipment has been improved to conserve crop nutrients and reduce odour and gas emissions by controlling the rate and method of application.

Historically the trend of manure management objectives, other than reducing costs has evolved chronologically from: treatment for reducing nutrients (particularly N and P) and biochemical oxygen demand; reduce water pollution; produce biogas and single cell protein for re-feeding to animals (the latter aspect is unlikely to be acceptable any more in view of incidents such as “mad-cow” disease); odour and air pollution; pollutant and pathogen transport to water. Greenhouse gas emissions from manures is now attracting attention.

It is clear that there are several technologies available to manage manure. The need is to increasingly adopt a holistic view of manure management to try to simultaneously improve the quality of air, water, soil and crops.

Manure Treatment Technology Assessments

Manure treatment technology assessments have been ongoing in Canada, Europe and the U.S. In Canada, manure treatment technology assessments, have been made recently by BC Pork, CETAC-West and Pork Producers in Quebec. More assessments are underway in other provinces. In the U.S., the U.S. Pork Producers Council has been active in technology assessment. Several universities (in Iowa, N. Carolina, Indiana, Ohio, Illinois, and others) have been developing and assessing technologies. Similarly, assessments have been underway in Europe, western Europe in particular.

Technology Adoption

The main constraint to adoption of manure treatment technology has been the cost, which tends to increase as the complexity of the system increases. The cost per unit amount of manure treated would decrease with the size of the operation. Unlike some countries in Europe where hog farms are located in close proximity, farms in Canada are generally located far apart. It is therefore difficult to visualize that the concept of centralized treatment plants would be successful in Canada. The need therefore would be for site-specific manure management and treatment systems, based on local conditions of landscape, cropping management (if any crops are grown on site), water and feed supplies, local regulations and other factors. Inadequate communication and technology transfer is becoming less of an issue with the ongoing efforts of the provincial and national pork councils.

The main incentive for technology adoption by producers would be economic. For medium-sized producers, availability of low-tech, simpler treatment systems would be helpful as these would not necessarily require skilled labour to maintain and operate treatment systems. Producers with environment-friendly management and treatment systems could be issued a 'green' logo as is reportedly being done in a few European countries. Development of demonstration treatment systems, possibly with some assistance from public funds would tend to increase interest in producers. Education and extension would be always required. The threat of legislation perhaps should always be the last resort to persuade producers to adopt treatment technologies to protect the environment.

Future Directions/Needs

Great strides have been made, particularly in the last ten years, in managing manure properly even though we have been discussing and planning for better manure management for the last thirty years in Canada. Substantial improvements in hog manure management technology have been made since the first conference in Canada in 1981 on this topic. However, there is always a scope for improvement as hog production is increased nationally at fewer and fewer farms. Some of the future needs that are recommended for consideration at this workshop are:

1. Improved co-ordination among all stakeholders for manure management research and technology development. The stakeholders include industry representatives, federal and provincial governments (departments of agriculture, environment and resources), the National Research Council (NRC), universities and technology developers. To keep the size manageable, a co-ordination group could initially start with representatives from main funding agencies, which would be industry, federal-provincial governments and the NRC.

2. Government policies could provide economic incentives for adoption of environment friendly technologies by producers. This could be in the form of direct financial assistance for improving manure management (as has been done under some programs in the past), or tax relief for technology installed at farms.

3. Development of promising cost-effective treatment technologies is required. As far as can be established, all advanced treatment technologies proposed or demonstrated until now, would increase the cost of production which would be difficult to sustain.

4. There is a need for a central inventory of all manure-related research and technology development. Agriculture and Agri-Food Canada has an excellent ManureNet web site at http://res2.agr.gc.ca/initiatives/manurenet/ . Additional information on this web site is included at the end. The role of this web site could be expanded with additional resource input. The support would need to come from all stakeholders. Another central inventory location, managed by the Canadian Agri-Food Research Council (CARC) is the Inventory of Canadian Agri-Food Research or ICAR. ManureNet is devoted exclusively to manure issues whereas ICAR has a much broader scope.

5. Continuing technology transfer to producers is essential in the long term, and this is being done effectively by the Canadian and provincial pork councils, the federal and provincial governments, universities and research establishments such as the Dairy and Swine Research and Development Centre in Quebec and the Prairie Swine Centre in Saskatchewan.

Lastly, let us hope that the networking amongst stakeholders initiated at this Workshop will lead to a good beginning in our efforts to continually improve management and utilization of the manure resources in Canada. Thank you.

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ManureNet

http://res2.agr.gc.ca/initiatives/manurenet/

ManureNet is a national web site focusing on issues related to the manure / nutrient management issue. Information is also gathered on related environmental issues, including greenhouse gas emissions, social, health and sustainable development issues.

There are extensive lists of contact information for many organizations, agencies and individuals, as well as a list of funding agencies for the sector.

Although ManureNet focuses on Canadian information, there is also a great deal of European and American information included for reference.

Upwards of 300 reports in pdf format are available through the site.

A Few Stats

> 6,500 hyperlinks (> 3,700 external links)

- list of Acts, Regulations and Guidelines
- list of Fact Sheets from various Canadian jurisdictions.
- list of excellent Review Documents on various topics
- Links to Farm Markets, Weather, Farm Press and Web Search Utilities!
- NEW section on advanced manure treatment technologies including Digesters, Solid-liquid separation, Composting

Fully searchable data base

Search by: Key Word, Issue, Organization, Personnel

> 600 listed Organizations /w contact information
> 600 listed personnel /w contact information
> 4,900 records

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