Waste Management in Aquaculture

Waste Management Issues

Protecting the Environment

"Best Practicable Environmental Option" (BPEO) forms the basis of any waste managmement plan. This strategy can be carried out through the implementation of the Waste Hierarchy below.

Waste Management Planning
A Waste Management Plan on a farm can be as simple as arranging for the separation and storage of different waste types (solid, liquid, organic) or a full-scale program of on-site treatment and disposal of waste. Grant aid is usually available for the implementation of Waste Management plans.

Costs
Most aquaculture businesses operate in isolated areas where the costs of tranporting wastes may be extremely high. Increased land fill charges mean cost-efficient methods of disposing of waste are in great demand.

Research
Research into new methods of waste utilisation is critical to maintaining and improving a waste management system. The main problem to be overcome is to find waste management techniques which are economically viable in rural areas where there is not a lot of aquaculture activity.

Aquaculture processes produce significant amounts of waste and dealing with this waste is a challenge for the sector. The growth of aquaculture has meant that it has outgrown the seasonal and traditional waste solutions used by the fishing industry. Additionally national and EU regulations on animal by-products have limited the number of waste outlets to the industry or put them out of the financial reach of most operators.

Recent environmental legislation emphasises the "Polluter pays" principle which places the responsibility on the individual that creates the waste to pay for its treatment, containment, transportation and disposal of the waste material in a manner that does not cause harm to the environment. The legislation also requires that individuals carrying out activities of an agricultural nature must take all reasonable steps to implement a waste management system to reduce, reuse and recycle waste.

Conversely, these new regulations have also opened up new opportunities to re-use and recycle aquaculture material that would previously have been regarded as waste (oils, shells, skins). Where in the past waste disposal/treatment was seen as an added expense, there is now potential for cost reduction and added income by managing waste products effectively.

OPERATIONAL PRACTICES

The hierarchial method of Minimising, Reusing, Recycling, Energy Recovery and Disposal should be applied to every product or material in use on a farm. This method of consideration will result in the most efficent waste management practices at the grower's disposal.

SITE FACTORS

The location of a site in relation to relevant infrastructures will have a major influence on a waste management plan. Proximity to agricultural land which is available for the application of collected wastes or access to land that can be utilised for water treatment eg. wetlands, will also enhance waste management options.

KEY FACTORS EFFECTING ON-SITE WASTE MANAGEMENT

WASTE COLLECTION & DISPOSAL OPTIONS

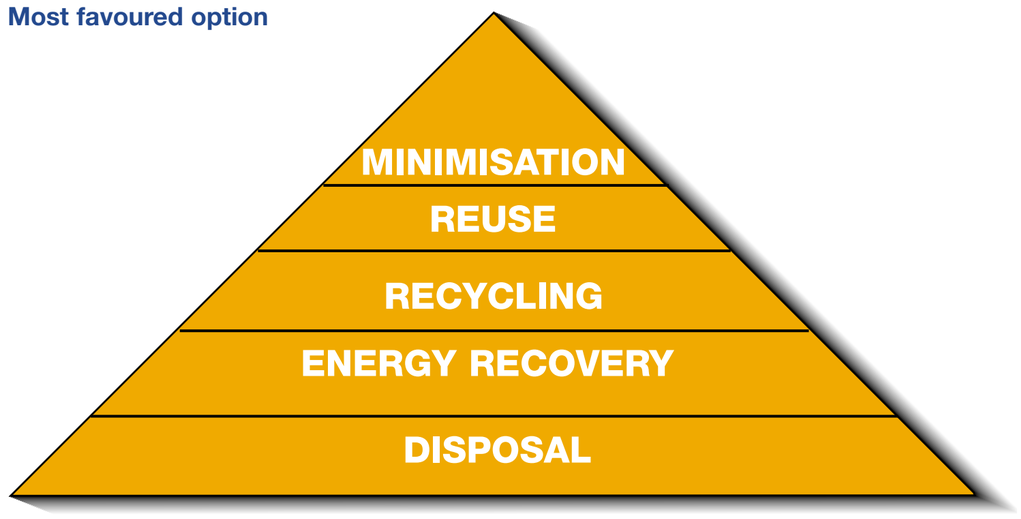
Responsible waste management is promoted through the use of efficient operational practices and best available technology in the collection and disposal processes.

COSTS & AVAILABLE CAPITAL

Optimal waste management methods may not always be a cost effective step. However a trade-off between minimising costs and sustainable management must be met. Government grants and joint work programs can aid in reconciling these conflicting factors.

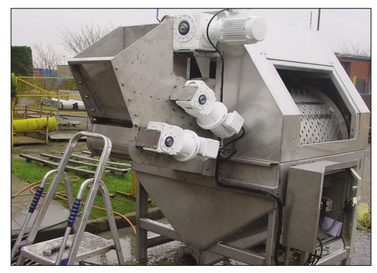
HIERARCHY OF BEST PRACTICE IN WASTE MANAGEMENT

Most favoured option



Least favoured option

Waste Management Examples



Mesh Reuse & Recycling
Pergolari mesh is widely used by the Irish rope mussel industry. This mesh is 100% polyethylene and is usually discarded after one use. After harvesting, fouling organisms remain on the mesh. Bulk washing of this material has shown it is possible to clean the material to the extent that it is acceptable for reuse.

Reed System
Constructed wetlands are artificial shallow wastewater treatment systems (ponds or channels) that have been planted with aquatic plants, and rely on natural processes to treat wastewater. Once constructed, they require little or no energy to operate and water can be recycled.

Composting
Most fish by-products can be composted successfully. Composting can be done using a variety of methods, from low tech to highly sophisticated. For animal by-products such as fish waste the use of closed window composting or in-vessel technologies is recommended.

Compacting
Compacting is a standard industry technique which can be used to reduce the volume of waste on a fish farm. This is especially useful in the volume reduction of cardboard and polystyrene fish boxes.

Minimisation

Reducing the production of waste through efficient operational practices and use of best available technology is a key step in any waste management plan.

Examples

Feed management technology
- Use of correctly proportioned feeds to minimise wastage.
- Optimal feeding practices to prevent unnecessary waste.

Best available technology
- Efficient removal of solids from effluent.
- By-product extracts through bio-technological techniques.

Water use
- Economic use of water at all times.

Reuse

Reuse of materials for the same or alternative purposes can result in high reductions in waste output. Local initiatives can promote the reuse of materials that might otherwise be discarded.

Examples

Farming materials
- Rope mussel mesh reuse.
- Reuse of oyster bags and netting.
- Pharmaceutical & nutraceutical. reutilisation of organic farm wastes.

Recirculation technology
- Reuse of water in a culture tank through filtration, skimming and aeration techniques offer an alternative to "flow through" systems which only use water once.

Recycling

Recycling of waste products to serve new purposes is becoming an increasingly viable option as more innovative ideas are developed to utilise wastes. Organic recycling on site is highly encouraged.

Examples

Organic Recycling
- Composting.
- Ensiling (two phase method of fermentation: aerobic and anerobic).
- Recycling of Protein Oil.

Inorganic Recycling
- Bulk feed bags.
- Metals such as steel & aluminium.
- Plastics of all form.
- Glass of all form.

Energy Recovery

Energy recovery methods such as anaerobic digestion, oil extraction and incineration allow for the extraction of a usable fuel source from aquaculture organic wastes.

Examples

Biofuel
- An efficient fuel source can be extracted from fish waste with a high oil content.

Biogas
- Methane can be extracted from the anaerobic digestion of organic waste and used as a fuel.

Incineration
- Waste quantities are not large enough to warrant the costs associat-ed with waste to energy schemes.

Disposal

Disposal methods isolate wastes from production in such a way that reuse or retrieval of the waste for the forseeable future is not considered. Conventional disposal methods have mainly involved landfill dumping.

Drawbacks

Disposal represents poor use of materials that could serve alternative uses. Legislation and environmental pressures mean disposal of both organic and inorganic waste from aquaculture is employed only as a last resort. Strict waste management legislation, means that inorganic material is the only aquacultuure waste accepted for dumping in most EU states.

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