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The Byproducts of Agricultural Activities and their Management Practices

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Abstract

The byproducts of agricultural activities are usually referred to as “agricultural waste” because they are not the primary products. It includes both natural (organic) and non-natural wastes, is a general term used to describe waste produced on a farm through various farming activities. Agriculture may include some activities such as Horticulture, Fruit growing, Seed growing, Diary farming and livestock breeding and keeping as well as use of land as grazing land, meadow land, market gardens and nursery grounds and use of land for woodlands where that use is ancillary to the farming of land for other agricultural purposes. It is a large generator of waste materials. Agricultural practice covers all activities that can occur on a farm or croft and includes activities such as slurry spreading, chemical and waste storage, silage making and waste pesticide disposal. The waste stream may include a range of items and materials that are not specific to agriculture such as packaging waste, tyres, batteries, scrap machinery and oil. In addition there will be waste that is more specific to the sector such as pesticide containers, silage wrap etc. The present study deals with how best management practices can be used on the firm to protect , conserve and reuse resources while minimizing negative impacts on environment. Many firm by-products can be economically valuable resources when manage correctly. Horticultural waste can be economically recycled. Farm plastics can be recycled and reused. Composting of poultry and other small agricultural animals is considered a low cost, environmentally acceptable method of disposal of dead stock. We can recover Methane gas (Biogas) from manure waste. Potato and vegetable waste which pause a plant health issue for industry as diseases such as Ring rot , Blight and Virus can be spread from culls that are not properly disposed of should have proper storage and disposal to protect ground and surface water. Hence management that put into practices the principle of the four Rs of Reduce, Reuse, Recycle and Recover is the best first option to be more environmentally responsible and gain maximum return from the waste resources.

Keywords: *Agricultural Waste, Reduce, Reuse, Recycle and Recover*.

Introduction

Agriculture is the largest contributor of any resource sector, to the economy of a country. The by products of agricultural activities are usually referred to as “agricultural waste” because they are not the primary products. It includes both natural (organic) and non-natural wastes, is a general term used to describe waste produced on a farm through various farming activities. These wastes chiefly take the form of crop residues (residual stalks, straw, leaves, roots, husks, shells, etcetera and animal waste . Agriculture may include some activities such as Horticulture, Fruit growing, Seed growing, Diary farming and Livestock breeding and keeping as well as use of land as grazing land, meadow land, market gardens and nursery grounds and use of land for woodlands where that use is ancillary to the farming of land for other agricultural purposes. It is a large generator of waste materials. Agricultural practice covers all activities that can occur on a farm or croft and includes activities such as slurry spreading, chemical and waste storage, silage making and waste pesticide disposal. The waste stream may include a range of items and materials that are not specific to agriculture such as packaging waste, tyres, batteries, scrap machinery and oil. In addition there will be waste that is more specific to the sector such as pesticide containers, silage wrap etc. The animal agriculture and various practices adopted at farm-scale impact on the environment. When discharged to the environment, agricultural wastes can be both beneficial and detrimental to living matter. It has variously been estimated that these wastes can account for over 30% of world wide agricultural productivity. Good waste management on farms is essential to ensure a healthy, safe

and productive farming enterprise. Inappropriate disposal of wastes on farms can cause contamination, pollution and increase our liability. As the agricultural wastes are widely available, renewable and virtually free, hence they can be an important resource (Sabiiti *et al.,* 2005).They can be converted into heat, steam, charcoal, methanol, ethanol, bio diesel as well as raw materials (animal feed, , energy and biogas construction and so on. . However, many of the agricultural wastes are still largely underutilized, and left to rot or openly burned in the field, especially in developing countries. All these wastes are known to contain high nutrient levels of Nitrogen, Potassium, Phosphorus that would improve soil fertility and increase crop yields such as vegetables, maize that fetch high prices and hence enhance food security. This alternate method of utilization by farmers for agricultural production has also reduced the rate of accumulation with subsequent reduction on environmental pollution thus improving environmental health. According to Ezcurra et al., agricultural waste burning releases pollutants such as carbon monoxide, nitrous oxide, nitrogen dioxide and particles (smoke carbon). These pollutants are accompanied by the formation of ozone and nitric acid (Hegg *et al.,*1087), hence contributing to acid deposition (Lacauy et al.,1992) thereby posing risk to human and ecological health .This calls for a greater awareness of the public and farmers of the benefits of proper management and utilization of organic wastes in agriculture. This will lead to diminished fears and preconceived notions of nuisance problems that decrease land values and environmental degradation (Westerman and Bicudo, 2005).The goal should be to make the agricultural waste a resource that can be utilized and not just discarded. It is also very important to set up institutions that can harness the large potential of agricultural wastes as a resource in farming and in energy production. Using appropriate conversion technologies, animal and crop wastes can be turned into useful resources. The present study deals with how best management practices can be used on the firm to protect, conserve and reuse resources while minimizing negative impacts on environment.

Aims of the Study

1. To reduce the amount of waste product generated.
2. To reuse the waste product on the farm or provide it for others to use.
3. After reducing and reusing as much of the waste product as possible, recycle the product either on-farm, such as with land application of manure, or off-farm, such as with plastic recycling programs.
4. Recover methane gas from manure waste. Only after considering the four Rs should farm waste be disposed of.

Waste Types and How to Manage Them

Scrap metals/used wire

Metal that can be reused for future works should be safely stored. Any metal that cannot be reused may have recycling potential, even if it is rusted or burnt. Some companies will pay for and collect scrap metal. Other wastes that can be collected or recycled include used fencing wire, vehicle bodies, and corrugated iron.

Masonry – concrete, bricks and tiles

Concrete and clean bricks may be reused for engineering works on the farm, provided the material is suitable for the purpose and is free from contamination from metal, plastics, chemicals and asbestos. Acceptable engineering works include the construction of farm tracks and pads. If we accept wastes for disposal from other sources, reuse materials that are unsuitable for the purpose (industrial wastes etc) or fill areas of the farm with demolition material, we may be liable for illegal dumping, contamination, pollution and clean up.

Asbestos

Asbestos products found on farms include: AC sheeting, buildings, cladding, lagging, roofing and pipes. Particularly friable asbestos products, poses health risks during removal, transport and disposal. It is important, therefore, that asbestos be handled appropriately during these operations. The disposal of waste asbestos, whether of industrial or domestic origin, is controlled by EPA (Environmental Protection Agency) . In addition, EPA controls the transportation of asbestos of industrial (including commercial or trade) origin. Products made from asbestos should not be reused and cannot be recycled. These wastes must be handled appropriately and disposed of safely at a licensed landfill. There are licensed removal contractors available to perform this task. If we are unsure or suspect we have asbestos materials, get someone to confirm this prior to removal.

Empty chemical drums and used containers

All empty chemical drums should be triple-rinsed immediately after use to prevent the chemical residue from solidifying in the drum. Triple-rinsing should be directly into the spray tank or, if this is not possible, it should be performed in an area that will not contaminate the environment or impact on people, stock or produce. Used containers can often be reused for repackaging and should be returned to the retailer. Where containers are non-returnable, the following disposal option can be availed.

Drum Muster

It is a national program for the collection and recycling of non-returnable, empty, cleaned crop production and on-farm animal health chemical containers. Eligible containers are identified by a DrumMUSTER logo (sticker, label or embossed).

Oil and oil filters

Used oil is a valuable resource and can be collected from the farm by waste oil collection contractors (there may be minimum volumes for collection) or we can deliver it to approved premises. Used oil filters have a classification that prohibits their disposal to landfill as used oil filters can be recycled to recover both the metal and oil. Using waste oil as a dust suppressant will cause contamination of the land and may cause pollution of surface or ground waters. The clean up cost and potential impact on property value may result in significant liability to our farm.

Tyres

Tyres can be used for legitimate on-farm use (for example, on silage stacks), but should not be

brought onto the farm for disposal. When not being used, tyres should be stored to minimise fire risk. Tyres lying around on a farm can become a breeding site for snakes predators and other vermin.

Dead Stock

Dead stock should be sent to the knackery or rendering plant for reuse or to an appropriately licensed landfill for disposal. If this is not possible, limited numbers of dead stock can be buried on a farm, as long as the burial site does not adversely impact the land, surface waters, ground waters or the air (odour).

Treated timber

Treated timber contains toxic chemicals such as arsenic, chromium and copper. It must not be burnt, as the smoke and ash can impact on human health and contaminate soil and waters. Animals that consume residual ash may also be harmed. Treated timber (CCA pine, creosote hardwoods) should be safely stored and reused for future works on your farm. Where this is not practical, it should be disposed off at a transfer station or landfill.

Tree and plant waste

Tree wastes can be left in place for natural habitation or used as firewood. Stubble can enhance soil structure and reduce erosion due to rainfall. Burning tree, plant and stubble is an appropriate management practice where impacts are controlled. Air quality may be affected by the smoke and impact on human health.

Recyclables

Deposit recyclables such as aluminium, glass and paper at the recycling depot, local recycling contractor or at the community recycling facility.

Manure management.

Manure contains about 75% of the nutrients fed to livestock including nitrogen, phosphorus and potassium. Animals use only about 25% of nutrients and excrete the rest. About 50% of nitrogen and 75% of potassium in manure is found in the liquid portion. Therefore, it is important to contain the liquids for land application. Almost all the phosphorus is in the solids. When manure is diluted by water, nutrient concentrations are reduced (Sabaiiti, 2006) .

a. Manure Treatment

Treatment of manure is designed to reduce the pollution potential, make handling easier and/or increase the value of manure. Treatment can be either physical, biological or chemical. Physical treatments such as separation of solids from liquids are usually considered primary treatment. Biological treatment methods are usually categorized as either anaerobic or aerobic to describe the type of bacteria that are encouraged to break down the solids in the manure. Composting, naturally aerated lagoons, oxidation ponds, mechanical agitation, or pumping and air injection are examples of aerobic treatment methods. Anaerobic methods include anaerobic ponds and digesters

b. On-Farm Composting of Manure

Composting is the aerobic decomposition of organic materials by microorganisms under controlled conditions. During decomposition, the microorganisms consume oxygen while feeding on organic matter. Composting reduces both the volume and mass of the raw materials while transforming them into a valuable soil conditioner (Jakobsen, 1995).

Milkhouse Waste

Handling milkhouse wastewater has become increasingly important as dairy operations become larger and more automated. Quantities and strength of wastewater from milking parlours vary from farm to farm. Modern milking parlours and pipeline milking systems utilize large quantities of water. The volume of water used depends on the management practices associated with the milking facility; The disposal of this washwater has become a major environmental concern. Wastewater contains milk solids, fat, detergents, acid cleaners and sanitizers, manure, soil particles, and other substances (Jacob, 1994)

a. Reduce

1. Manual washing and prepping of cows uses less water than automated systems.
2. Mechanically removing manure and wasted feed from the parlour prior to wash down reduces waste volume and strength.
3. Manually check water hardness and iron content, and calibrate cleaning equipment annually.
4. Adjust chemical cleanser concentrations based on the quality of the washwater.
5. Design the milking parlour to minimize washwater requirements. Drain locations and floor slopes are important.

b. Reuse

1. Feed the first rinse of milking equipment to calves. This will reduce the amount of milking centre washwater by 15-20%.
2. Feed pre-cooler water to livestock. Pre-coolers are used to lower milk temperature before it enters the bulk tank.
3. Many new dairy operations have underground tanks to store washwater. Use this water to wash parlour floors and drain to manure storage.
4. Recycling washwater reduces the amount of chemical cleansers required. Washwater can be used from one cleaning cycle to the next.
5. Make sure that reused water does not increase bacterial counts.

Waste Forage

For age is a normal by-product of any livestock feeding system. It includes waste hay, waste silage and silage effluent.

a. Hay

When hay is harvested, it is allowed to dry to less than 15% moisture. When it is stored and fed, it poses no environmental hazard. Hay that is wasted during feeding usually becomes incorporated with the straw and manure.

b. Silage

The potential for waste from silage feeding systems also exists. However, because silage is harvested and stored at a much higher moisture content than hay, there is also the potential for leachate or seepage waste from storage areas. Silage can be stored in vertical silos, horizontal silos, or in round bales wrapped in plastic.

Best Management Practices

Reduce waste forage by:

1. Storing bales of hay under cover.
2. Harvest and store only as much forage as will be required for the coming year.
3. Harvest silage at the optimum moisture content to minimize the potential for seepage.
4. Use waste forage as a mulch to provide protection from soil erosion in recently harvested potato fields rather than hauling it to the woods or burning it. It will add organic matter to cultivated soils.
5. Compost waste hay and silage. This will require addition of a nitrogen source such as manure.

Potato/Vegetable wastes

1. Potato/Vegetable wastes pose industry as diseases such as ring rot, blight and viruses can be spread from culls that are not properly disposed of.
2. Proper storage and disposal is required to protect ground and surface water.
3. Odour generation from decomposing waste can be a nuisance to neighbours.

The composting of cull potatoes and other vegetable wastes including diseased products is an environmentally acceptable method of disposal.

Farms generate a number of other waste materials. These include plastics, chemicals, empty containers, building materials, old machinery, animal health care products and petroleum wastes.

Farm Plastics

Plastics are used on the farm in a variety of manners. These include silage wrap and nylon twine. Plastic film placed on the surface of the soil to enhance heat retention is a new technique used in agriculture. It is also used for cover and storage of forages. The most ideal method of disposal of farm plastics is to convert the waste into a usable by-product such as building materials, fence posts, recreational furniture or recycled silage wrap.

Methane Recovery

Methane, which is the principal component of natural gas (95-98 percent), is removed commercially from deposits deep within the earth. This methane was formed millions of years ago in swampy areas (hence it is sometimes called "swamp gas") by the biological conversion of organic matter (Auerbach *et al*.1996).

The technology needed to generate methane from livestock waste and other farm refuse has been known for about 100 years. But due to inexpensive and abundant petroleum energy, its use has been limited in the U.S. Today, however, high energy costs and low profit margins experienced in some livestock enterprises as well as recent digester improvements through research are causing many farmers to re-evaluate the feasibility of on-farm production of methane gas from livestock waste (Don, *et al*.)

The main one is that a useful end-product, methane gas, is produced. Also, the odor potential of a well digested livestock waste is considerably reduced. Although digested waste has slightly less fertilizer value than nondigested waste, it is more readily available to plants. It is simply converted to a more useful form.

Conclusion

Agricultural wastes can be a valuable resource for improving food security, however, if not treated, kept or disposed of properly, agricultural wastes are likely to cause pollution to the environment or even harm to human health. Environmental pollution from animal waste is a global concern and is much more acute and serious in countries with high concentrations of animals on a limited land base for manure disposal This calls for increased public awareness on the benefits and potential hazards of agricultural wastes, especially in developing countries. There is also an urgent need to set up Centres of Excellence in waste management in developing countries.

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