Journal of Advanced Research in Service Management
Volume 4, Issue 2 - 2021, Pg. No. 18-23
Peer Reviewed Journal

Research Article

Management of Agricultural Waste

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How to cite this article:
Parab S, Patel C. Management of Agricultural Waste. *J Adv Res Servi Mgmt* 2021; 4(2): 18-23.

Date of Submission: 2021-11-16
Date of Acceptance: 2021-12-10

A B S T R A C T

Agricultural wastes are non-product outputs of production and process of agricultural goods which will contain material that may profit man however whose economic values are less than the cost of collection, transportation and processing for beneficial use. Estimates of agricultural waste arising are rare, however they're typically thought of as contributory a big proportion of the whole waste material within the developed world. Agricultural development is typically in the midst of wastes from the irrational application of intensive farming ways and therefore the abuse of chemicals utilized in cultivation, remarkably touching rural environments particularly and the global environment in general. Generally, agricultural wastes are generated from variety of sources notably from cultivation, placental and cultivation. These wastes are presently used for variety of applications through the '3R' strategy of waste management. Agricultural waste incorporates a toxicity potential to plant, animals and human through many direct and indirect channels. The effects of these toxic agricultural wastes on the environment were discussed as well as their cure.

Keywords: Agricultural Waste, Generated, Management, Environment, Incorporates, Economic

Introduction

Agricultural wastes are defined as the residues from the growing and processing of raw agricultural products such as fruits, vegetables, meat, poultry, dairy products and crops. Agricultural wastes are non-product outputs of production and process of agricultural goods which will contain material that may profit man however whose economic values are less than the cost of collection, transportation and processing for beneficial use. Estimates of agricultural waste arising are rare, however they're typically thought of as contributory a big proportion of the whole waste material within the developed world.

Agricultural development is typically in the midst of wastes from the irrational application of intensive farming ways and therefore the abuse of chemicals utilized in cultivation, remarkably touching rural environments particularly and the global environment in general. Generally, agricultural wastes are generated from variety of sources notably from cultivation, placental and cultivation. These wastes are presently used for variety of applications through the '3R' strategy of waste management. Agricultural waste incorporates a toxicity potential to plant, animals and human through many direct and indirect channels. Agricultural waste is also called as agro-waste. It comprises of animal waste, food processing waste, crop waste, harmful and toxic agricultural waste. Agricultural waste estimates are arising, but they are generally thought of as contributing a significant proportion of the total waste matter in the developed world. Expanding agricultural production has naturally resulted in inflated quantities of stock waste, agricultural crop residues and agro-industrial by-products. There is possible to be a big increase in agricultural wastes globally if developing countries still intensify farming.

Agricultural Waste Generation

As mentioned earlier, agricultural development is usually accompanied by wastes from the irrational application of intensive farming methods and the abuse of chemicals used in cultivation. Which remarkably affecting rural environments specifically therefore the world environmental normally. The waste generated depends on the sort of agricultural activities administrated.

Wastes from Livestock Production

Waste from farm animal activities include solid waste like manure and organic materials within the slaughterhouse; sewer water like urine, cage wash water, sewer water from the showering of animals and from maintaining sanitation in slaughterhouses, air pollutants like H2S and CH4 and odours. The pollution caused by livestock production is so significant downsides since most of them are typically designed around residential areas. Air pollution includes odours emanating from cages ensuing from the digestion method of livestock wastes. The intensity of the smell depends on animal density, ventilation, temperature, and humidness. The proportion of NH3, H2S and CH4 varies along with the stages of the digestion process and also depends on organic materials, the components of foods, microorganisms, and the status of the animals' health. This untreated and non-reusable waste supply will generate greenhouse gases whereas also having negative effects on the fertility of the soil and inflicting pollution. In livestock waste, water volume accounts for 75-95% of total volume, while the rest includes organic matter, inorganic matter, and many species of microorganisms. Those germs and substances will unfold diseases to humans and cause several negative effects on the environment.

Wastes from Cultivation Activities

While tropical climate is favorable for growing crops, it also supports the generation and development of insects and weeds. This situation creates a high demand for pesticides so as to kill insects and defend against the unfold of epidemic diseases; this would like usually cause the abuse of pesticides by farmers. After using pesticides, most of the bottles and packages holding these pesticides are thrown into fields or ponds. According to an estimate made by the Plant Protection Department (PPD), about 1.8% of the chemicals remain in their packaging. These wastes have the potential to cause unpredictable environmental consequences like food poisoning, unsafe food hygiene and contaminated farmland due to their potentially lasting and toxic chemicals. In addition to the current, existing stagnant or unused chemicals and pesticide packages with residue from the first contents poses serious environmental consequence therein they might be kept or buried within the wrong method which can leak or enter the environment through diffusion and thereby affecting the environment. In agricultural production for instance, fertilizers play an important role in maintaining the productivity and quality of plants. Inorganic chemical is cheap and characterized by high productivity. However, several farmers apply a lot of chemical to their crops than the quantity required by the plants. The serious consequence of such associate excessive application of chemical is that it's wont to the purpose of abuse so as to extend the annual agricultural output. The rate of absorption of such fertilizer compounds (nitrogen, phosphorus and potassium) varies depending on the land characteristics, plant types and method of fertilization. Among the fertilizer excess, a portion is maintained within the soil, a portion enters ponds, lakes or rivers as a result of either surface runoff or the irrigation system adopted, which results in the pollution of surface water, a little enters the bottom water and a little evaporates or becomes de-nitrated, inflicting pollution.

Waste from Aquaculture

The growth in cultivation has led to a rise within the use of feeds for improved production. The amount of feed employed in a system is the most significant issue employed in decisive the amount of waste generated. One of the key wastes generated in cultivation is metabolic waste which could be dissolved or suspended. Feeding rates are dependent on the ambient temperature. Increase in temperature leads to increased feeding which provides rise to increased generated waste. Water flow patterns in production units are vital for waste management as a result of a correct flow can minimize the fragmentation of fish body waste and permit for fast sinking and concentration of the settleable solids. This is vital as a result of a high proportion of non-fragmented body waste can be quickly captured which can greatly reduce the dissolved organic waste.

Waste Utilization Process

Agricultural waste utilization technology must either use the residues rapidly, store the residues under conditions that do not cause spoilage or render the residues unsuitable for processing to the desired end product. There are a number of applications to which these wastes can be used they include.

Animal Feed

In most developing countries, the drawback with animal feed is in the restricted accessibility of protein sources though nice efforts are being created to seek out different supplements. Crop residues have high fibre content and are low in super molecule, starch and fat. Therefore, the ancient methodology of increasing livestock production by supplementing forage and pasture with grains and protein concentrate might not meet future meat protein

desires. Use of the grain and super molecule for human food can contend with such use for animal feed. These issues could also be circumvented by utilizing residues to feed domesticated animals.[1]

Anaerobic Digestion

Methane gas can be produced from agricultural wastes particularly manures. The gas is best suited for heating purposes as in broiler operation, water heating, grain drying, etc. The anaerobic digestion of agricultural waste to form methane-rich gas is a two-step microbial fermentation. Initially, acid-forming bacteria break down the volatile solids to organic acids which are then utilized by methanogenic organisms to yield methane-rich gas. Some of the major disadvantages of the digestion system are the high capital costs and the explosive properties of the methane gas. However, the advantages far outweigh the above-mentioned disadvantages. Anaerobic digestion makes the treatment and disposal of large poultry, swine and diary waste feasible, minimizing the odour problem. It stabilizes the waste and the digestion sludge is relatively odour-free and yet retains the fertilizer value of the original waste.[2]

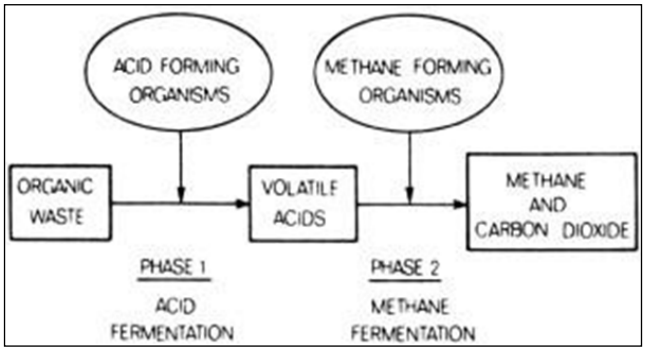

Figure 1.Methane Production by Microbial Fermentation

Pyrolysis

In shift systems, agricultural waste is heated to a temperature of 400-600°C within the absence of oxygen to vaporize a little of the fabric, leaving a char behind. this is often thought of to be a better technology procedure for the use of agricultural wastes. Others are hydro-gasification, and reaction. they're used for the preparation of chemicals from agricultural waste yet as for energy recovery. Of explicit interest to agriculture are the preparation of alcohols for fuel, ammonia for fertilizers, aldohexose for food and feed. shift of agricultural waste yields oil, char and low heating price gas.[1]

Adsorbents in the Elimination of Heavy Metals

Excessive release of heavy metals into the environment due to industrialization and urbanization has posed a great problem worldwide. Unlike organic pollutants, the majority of which are susceptible to biological degradation, heavy metal ions such as copper, cadmium, mercury, zinc, chromium and lead ions do not degrade into harmless end products. The presence of serious metal ions could be a major concern thanks to their toxicity to several life forms. Studies on the treatment of effluent bearing serious metal have unconcealed sorption to be an extremely effective technique for the removal of serious metal from waste stream and activated carbon has been widely used. In recent years, agricultural wastes have verified to be a coffee value various for the treatment of effluents containing serious metals through the adsorption method. The low-cost agricultural waste such as sugarcane bagasse, rice husk, sawdust, coconut husk, oil palm shell, neem bark, etc., for the elimination of heavy metals from wastewater have been investigated by various researchers.[1]

Fertilizer Application

The utilization of animal manures for fertilizer incorporates a definite impact on input energy needs at the farm level. Manure may offer 19, 38 and 61 of nitrogen, phosphorus and potassium in chemical fertilizer. However, fertilizer use of manures from massive confinement is related to high energy prices for transport, distribution, storage facility needs, odour issues and risk of groundwater contamination, reported that poultry manure contains high phosphorus that has positive impact on the expansion and productivity of crops. It is additionally effective once combined with mineral phosphorus chemical for farm use. Adding manure to soil increases its fertility because it increases the nutrient retention capacity, improves the physical condition, the water-holding capacity and the soil structure stability.

Agricultural Waste Management System (AWMS)

Recently, Agricultural Waste Management (AWM) for ecological agriculture and property development has become a difficulty of concern for policy manufacturers. The usual approach to agricultural waste management has been discharge to the atmosphere with or while not treatment. There is got to think about wastes as potential resources instead of undesirable and unwanted, to avoid contamination of air, water, land resources and to avoid transmission of hazardous materials. This will need higher use of technology and incentives, a change in philosophy and attitudes and better approaches to agricultural waste management. The organic wastes, especially manure generated by animals, if improperly managed or left untreated can result in significant degradation of soil, water and air quality. Stagnant wastes offer a medium during which flies breed and diseases area unit transmitted. Uncontrolled decomposition of organic wastes produces odorous gases additionally as ammonia volatilization, leading to acid rain. Because of the intensification of animal production on a little space of land, there are increasing concerns about:

- Water quality resulting from higher nitrogen and phosphorous loadings
- Pathogens and antimicrobial compounds in the manure
- Foul odours and air quality from ammonia, methane and nitrous oxide emissions
- Soil quality because of potassium and phosphorous loading

An Agricultural Waste Management is a planned system in which all necessary components are installed and managed to control and use by-products of agricultural production in a manner that sustains or enhances the standard of air, water, soil, plant and animal resources. Such a system is developed victimization total systems approach, i.e. it is designed to cater for all the waste related to agricultural production to utilization throughout the year spherical. The Total Solids (TS) concentration of agricultural wastes is the main characteristic that determines the handling of the material. For excreted manure for example, the following factors affect the TS concentration and they include the climate, type of animal, amount of water consumed by the animal and the feed types. In most systems the consistency of the waste is anticipated or determined. The TS concentration of the waste can be increased by adding beddings or other solid waste to the waste, decreased by adding water and stabilized by protecting it from additional water. The TS concentration is important in that it affects the total volume of the waste to be handled. Liquid waste management systems area unit typically easier to automatism and manage than those for solid wastes; but, the initial value of the liquid handling instrumentation could also be larger than that for solid waste systems.

AWMS consist of six basic functions as unit production, collection, storage, treatment, transfer and utilization. Production may be a operate of the number and nature of agricultural waste generated. The waste needs management if quantities created are ample enough to become a resource concern. A complete analysis of production includes the type, consistency, volume, location and timing of the waste produced. Collection refers to the initial capture and gathering of the generated waste from the purpose of origin or deposition. The AWMS plan should identify the method of collection, location of the collection points, scheduling of the collection, labour requirements, necessary equipment or structural facilities, management and installation prices of the parts, and therefore the impact that assortment has on the consistency of the waste. The storage operate must do with the temporary containment or holding of the waste. The storage facility of a waste management system provides management over the programming and temporal order of the system functions like the treatment and application or use of the waste that might be littered with weather or interfered with by alternative operations.

The waste management system ought to establish the storage period, the specified storage volume, the sort, estimated size, location and installation cost of the storage facility; the management cost of the storage process and therefore, the impact of the storage on the consistency of the waste.

Treatment is any operate designed to cut back the pollution or deadly potential of the waste, including physical, biological and chemical treatment and increases its potential beneficial use. It includes pre- treatment activities like analysis of the characteristics of the waste before treatment, a determination of the required characteristics of the waste following treatment, the choice of the sort, estimated size, location and the installation cost of the treatment facility and therefore, the management value of the treatment method. Transfer refers to the movement and transportation of the waste throughout the system from the gathering to the use stage either as a solid, liquid or slurry, depending on the total solids concentration. Utilization is that the application of the waste for useful use and it includes exercise reusable waste product and reintroducing non-reusable waste product into the atmosphere.

The '3R'Approach to AWM

The thought of minimizing waste reduces amount ill-effects of waste generation by reducing quantity of wastes, reusing the waste merchandise with easy treatments and recycling the wastes by exploitation it as resources to provide same or changed merchandise. This is usually referred to as '3R'. Some waste merchandise may be consumed as resources for production of various products or a similar product that means utilization a similar resource. When wastes are reused time and once more, it offsets gathering of recent similar or same merchandise. This saves contemporary resources exploitation and reduces waste generation. All in all, the 3Rs severally or jointly saves contemporary resources exploitation, add value to the already exploited resources and very importantly minimizes the waste quantity and its ill effects.

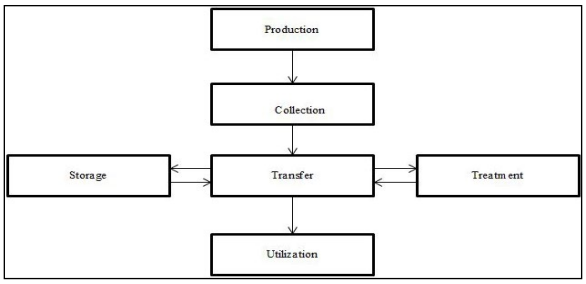

Figure 2.Agricultural Waste Management Functions

The principle of reducing waste, reusing and utilization resources and merchandise (3Rs) aims at achieving economical minimization of waste generation by.

- Selection of things to use with care to reduce the amount of waste generated
- Perennial use of things or elements of things that still have usable aspects
- The use of waste itself as resources[2]

The 3R Hierarchy in AWM

Waste step-down potency is explicit to be higher achieved applying 3Rs in an exceedingly graded order- cut back, utilize and Recycle. The waste hierarchy refers to the "3Rs" i.e., reduce, utilize and recycle, that classify waste management methods in step with their desirability. The 3Rs square measure meant to be a hierarchy, so as of importance. The waste hierarchy has taken several forms over the past decade; however, the essential conception has remained the inspiration of most waste step-down methods. The aim of the waste hierarchy is to extract the most sensible advantages from merchandise and to get the minimum quantity of waste.

The 3R approach as noted by is conventionally expressed through a pyramid hierarchy in which increase in environmental benefits of each approach is placed from bottom to top.

Typical Poultry Waste Management Options

A poultry farm is employed here to explain a typical waste management system showing the appliance of every part operate of an AWMS. The poultry waste management system is as described. A holistic read of the assorted waste management choices for poultry production in shown.

Production: Wastes related to poultry operations embrace manure and dead poultry. Depending upon the system, waste also can embrace litter, wash-flush water and waste feed.[3]

Collection: The manure from poultry operations is allowed to accumulate on the ground wherever it's mixed with the litter. The manure litter pack forms a "cake" that typically is removed between flocks. The litter pack are often removed oft to stop malady transfer between flocks. In layer houses, the manure that drops below the cage is collected in deep stacks or is removed frequently using either a shallow pit located beneath the cages for flushing or scraping or belt scrapers positioned directly to a lower place the cages.

Storage: Litter from poultry operations is stored on the floor of the housing facility or outside the housing facility. When it's removed, it can be transported directly to the field for land application. In some areas the litter is also compacted in a very pile and hold on within the open for a restricted time; but it generally is better to cover the manure with a plastic or different waterproof cowl till the litter may be used. But if it's required to be hold on for a protracted time, the litter should be stored in a roofed facility. If the manure from layer operations is kept reasonably dry, it can be stored in a roofed facility. If it is wet, it should be stored in a structural tank or an earthen storage pond.

Treatment: Poultry litter can be composted. This stabilizes the litter into a relatively odourless mass and helps to kill disease organisms so that the litter can be reused as bedding or supplemental feed to livestock. The litter can also be dried and burned directly as a fuel. Liquid manure may be placed into an aerobic digester to produce methane gas.

Transfer: The tactic used to transfer the waste depends on the whole solid content of the waste. Liquid waste can be transferred in pipes, gutters, tank wagons, dried litter can be scraped, loaded, hauled as a solid and transported using trucks.

Utilization: The waste from poultry facilities can be used for agricultural land application or sold because of the high nutrient value of the litter. Furthermore, poultry waste can also be used for the production of methane gas, buried directly as a fuel, reused as bedding or used as a feed supplement to livestock.[5,6]

Conclusion

Agricultural wastes are residues from the growing and process of raw agricultural products are non-product outputs of production and process and will contain material that may profit man. These residues are generated from variety of agricultural activities and that they embrace cultivation, livestock production and aquaculture. These wastes when managed properly through the application of the knowledge of agricultural waste management systems such as the "3Rs" can be transformed into beneficial materials for human and agricultural usage. It is vital to not from the findings to this point that correct waste collection, storage, treatment, transfer and utilization may be a cure-all to a healthy environment. Proper waste utilization can assist in developing our agricultural sector and supply viable biofuel resource for several.

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