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UTILIZATION OF EFFLUENTS

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Agricultural wastes are excesses of agricultural production that have not been effectively utilised. Most waste management approaches are methods of concentration or relocation of wastes such as source separation, biological waste treatment, incineration, or land disposal. Recycling, reprocessing and utilisation of the wastes in a positive manner offers the possibility of refusing the excesses to beneficial use as opposed to the traditional methods of waste disposal and relocation. The keys to successful process of this nature are a beneficial use, an adequate market, and an economical, although not necessarily profit making process.

Composting

Composting offers an opportunity to recover and reuse a portion of the nutrient and organic fraction in agricultural wastes. Composting should be thought of as a treatment process and not as a profit making operation.

Important factors in the process include intimate mixing of the wastes, small particle size, oxygen for the microbial degradation of the wastes, time to accomplish the composting and moisture. The composting can be done in open windows or in enclosed environmentally controlled units. With the use of the controlled units, composting can be accomplished in 5-7 days while in open windrows, it may take 3-8 weeks or more to produce satisfactory compost. Small particle size is important to increase the rate of microbial decomposition. The moisture content of compost should be in the 50-60% range on a wet weight basis for optimum composting rates.

Under normal agricultural conditions, the cost of applying compost to the land has been greater than the benefits received. The value of the increased nutrients in compost are likely to be less than the cost of preparing, transporting, the distributing the compost. However, there is no doubt that agricultural wastes can be stabilised by composting.

Methane generation

During the anaerobic digestion of most agricultural wastes, gases containing 60-80% methane can be produced when consistently high rates of digestion are maintained. These gases can be an energy source close to the generation site.

All organic wastes can be fermented to produce methane. The amount of methane which can be generated during anaerobic digestion is a function of the fraction of the total waste that is available to the anaerobic bacteria, ie., the biodegradable fraction and the operating, environmental conditions of the process. The biodegradable fraction of agricultural wastes will vary being a factor of how the wastes were generated and handled prior to

In: Workshop manual on treatment of effluen digestion. To use digester capacity effectively, the inclusion of inert material such as sand and dirt in wastes should be minimised and fresh wastes should be used.

One of the important factors in the performance of anaerobic digesters and methane digestion is the solid retention time (SRT). Methane production is related to SRT. The design of a system with a longer SRT would have only increased digester size and system costs without obtaining appreciably more methane per unit of biodegradable solids.

The feasibility of energy recovery from agricultural wastes depends on many factors including (1) the amount of recoverable energy remaining in the wastes and its relation to the total energy needed in the operation; (2) compatibility of the form of energy to the uses for it; (3) the availability of equipment and the skills needed to maintain the process and (4) the cost of using the system and of the resultant energy.

Water reclamation

Agriculture is a major user of water, primarily for water used in the processing industry and through irrigation. A major reusable by-product of the processing industry is water. These waters can be reused in the processing plants and for irrigation and recharge of ground water provided some in-plant operational charges are made.

Waste waters have been used for crop irrigation in almost all the countries in the world. Till recently, while such systems were in operation, the soil conditions were not studied in adequate details nor was an attempt made to know the effects of the waste water irrigation on the environment including the ground water, surface water, plants, animals and man. The result of these lacunae was that many of these systems were discontinued on account of ground water pollution, soil deterioration and crop failures. Therefore, for successful agricultural utilisation of waste waters, the user must know some of the basic principles and criteria and get necessary guidance from those to develop a dependable and consistent systems.

Use of waste waters for crop irrigation can produce various effects in the environment depending upon the characteristics of the waste water, those of the site where it is used, the climate and the management. Soil and waste water properties, therefore, have a direct or indirect influence upon the planning and management of waste water utilisation system.

Some of the physical properties like, soil texture, porosity and pore size distribution, permeability, soil structure etc. greatly influence the chemical and biological properties and also directly influence the waste water irrigation schedule. Soil pH, exchange reactions and sorption and precipitation reactions are some of the important chemical properties which influence various chemical reactions with the waste waters applied on soil.

The conposition of soils as regards micro-organisms protozoa and other small animals, and organic matter living and unclassified or difficult to classify and dead, imparts the soils specific properties and reactions. These will be treated as 'biological' properties of soils which are also influenced by the waste waters applied on soil.

Each time water goes through a cycle of domestic or agricultural use, the salt content increases. Upon continual reuse or recycling, the salt increase may be a problem with reclaimed water since high salt concentrations are undesirable for human consumption and crop production. Management techniques are necessary to apply processing waste waters to soils at the proper rate to avoid developing saline soils.

Pisciiculture

Waste waters generated from rural and urban areas and certain processing industries could be considered as a resource since appreciable amount of nutrients in the form of nitrogen, phosphorus and potash are present. A well ecologically balanced system would put back the nutrients of the waste waters to the natural cycle. The effective utilisation of organic waste water through fish production is a very profitable proposition. By this process, it is possible to achieve not only purification of waste water to a desirable degree, but also provide if not all, part of the protein requirements through fish production.

Algal cells have a tremendous capacity to trap solar energy very efficiently during the course of photosynthesis wherein the radiated light is converted in to total energy. This phenomena can be very profitably utilised in the treatment of organic waste. One such simple waste treatment for treatment of organic waste waters is a stabilisation pond (oxidation pond). This is specially favourable in countries like India where abundant sunshine is available. By this process, it is possible to purify sewage in shallow lagoons on the principles of algal bacterial relationship. During this process, algae release oxygen through its photosynthetic activity and bacteria in turn oxidise the organic matter in to a simpler inorganic nutrients. The stabilisation pond water contains rich nutrients, crop of phyto and zoo and bottom fauna which are ideal fish food. By adopting various aspects of fish culture practice, it is possible to increase fish production and thus the effluents can be very effectively utilised. The algal laden waters from the oxidation ponds are led in to ancillary fish ponds which still contain the algae, nutrients and this algae have biofertiliser value and can bed discharged in land for irrigation. Thus the effluents . from the waste stabilisation pond can be very effectively utilised. Many methods are attempted to in this direction. However, the proposition appears to be very profitable by making use of the effluents coming out of the stabilisation pond for aquaculture, algal harvest and subsequent utilization of the effluents for agricultural purposes.

Water reuse in processing

Water reuse does not change the use by industry, only the source. Water from any source can be treated for the specific qualities for reuse. The solution of the source water is based primarily on economics. If it costs less to rense waste water than to by fresh water from an outside source, an industry's waste water will become one of its sources. Recycling is a special case of water reuse. It is upgrading waste water from a use and returning it to the same use.

The reuse of waste water may be an effective means of reducing the volume of liquid wastes discharged. Recycling of waste water within an industrial plant may be especially feasible when water is used for cooling, washing of raw materials or of manufactured products etc. and when the treatment of the waste water for reuse is not too costly.

Large quantity of water is used, especially in the crumb and crepe rubber processing factories. Water with less pollutants can be separated and after some simple treatments it could be recycled.

Waste water management is no longer being conceived as consisting of the conventional and non-conventional approaches of the in-plant waste water treatment only. The concept now also covers the unconventional alternatives consisting of production oriented recycling and reuse of the waste waters after a certain degree of in-plant treatment.