ANNALS OF FACULTY ENGINEERING HUNEDOARA
- INTERNATIONAL JOURNAL OF ENGINEERING
Tome IX (Year 2011). Fascicule 3. (ISSN 1584 - 2673)

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SOME ECONOMIC QUESTIONS OF ECOLOGICAL FOOTPRINT

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ABSTRACT: Most of the territorial organic waste management systems include a "back to soil" basic strategy, through spreading of more or less treated (denitrified, digested, composted, limed) products. The limits of this basic option come from crops and soils needs and from environmental policies based on nitrogen or phosphorus loads. The adequate territorial level is the local agriculture area. It is relevant for the most aqueous organic wastes including a wide part of soluble elements. The solid wastes or the extracted solid part of wastes can also be managed with the same strategy but at a larger space scale. An energy strategy based on combustion or incineration in local supplying energy plants. The good scale covers several municipal territories depending on the local activity pressure and the energy corresponding networks. Anaerobic digestion can supply energy but remains a biological strategy as the final digested products is mainly spread on lands. Landfilling is still widely practised. But, the future of organic waste landfilling is under discussion and most of environmental policies aim to reduce or ban it. Direct organic wastes landfilling needs methane recovery and, if profitable, utilisation.
KEYWORDS: ecological footprint, environmental management

❖ INTRODUCTION

We will conclude on the future of the "back to soil" strategy applied to all kind of wastes. And finally the fourth point is analyzes the management considerations for organic waste use in agriculture (Fiscer et al., 2005). Traditionally, management strategies of manufactured products cover the wide range of technical, economical and social considerations, which have learned to live together more or less quietly. The emergence of environmental considerations is relatively recent and leads to troubles (Burton et al., 2007).

Applied to waste management, the level of difficulty increases of several points, because waste management is, more than other subjects, a conflict area. Further if you add "organic" to "waste", you again increase difficulty because of the complexity of the organic matter, of its reactive potential and of psychological considerations (Parafit, 2006).

These questions must be asked with a frequency depending on the speed of evolution of context, situation and position. However, this evolution is rather rapid because we actually live a period of construction under uncertainties. It means that the questions related to organic waste management must be answered through a prospective analysis, and with a proactive management policy as strategy means that you want to anticipate, to predetermine events and not to stay running after them (Eaton, 2007).

❖ MATERIAL AND METHODS

Organic wastes are utilized in agriculture mainly for improving the soil physical and chemical properties and for nutrient sources for growing crops. The major source of organic waste used in agriculture is animal manure, but small amounts of food processing and other industrial wastes (along with municipal wastes) are also applied to land. In the last 40 years, and especially in the last 15 years, there have been increasing environmental regulations affecting farms that have resulted in more animal manure treatment options, and thus affecting characteristics of residues that are subsequently applied to land. Farms are being assessed for nutrient balances, with the entire nutrient and manure management system evaluated for best management alternatives. Because of inadequate available land on the animal farm in some cases, organic wastes must be treated and/or transported to other farms, or utilized for horticultural or other uses (Menzi, 2002).

Organic wastes include animal manures, crop residues, food processing wastes, municipal biosolids and wastes from some industries. Organic wastes are typically by-products of farming, industrial or municipal activities, and are usually called “wastes” because they are not the primary product (Tejeda et al., 2009). However the goal is to make the “waste” a resource that can be utilized and not just discarded. Possible uses of organic wastes include use as fertilizer and soil amendment, energy recovery (heat, liquid fuels, electricity), and production of chemicals (volatile organic acids, ammonium products, alcohols). Agriculture has traditionally used animal manures for fertilizer and improving soil physical and chemical properties, and to a much lesser degree has also utilized municipal biosolids and industrial organic wastes for this purpose (Chambers, 2000).

Energy production from animal manures, crop residues, and/or other organic wastes has been utilized in agriculture to varying degrees in different parts of the world. Utilization of various organic wastes in agriculture depends on several factors, including the characteristics of the waste such as nutrient and heavy metal content, energy value, odor generated by the waste, availability and transportation costs, benefits to agriculture, and regulatory considerations. The importance of these factors can vary by type of organic wastes, but many of the considerations for utilizing organic wastes are similar for most organic wastes. We show some of the challenges affecting organic waste utilization in agriculture, main factors providing impetus for changing organic waste management strategies, how those changes may affect utilization of organic wastes, and management options and possible approaches to addressing challenges to utilizing organic wastes in agriculture.

❖ THE ECOLOGICAL FOOTPRINT

The ecological footprint is a measure of human demand on the Earth's ecosystems. An ecological footprint is a standard measurement of a unit's influence on its habitat based on consumption and pollution (Tinsley, 2006). It compares human demand with planet Earth's ecological capacity to regenerate. It represents the amount of biologically productive land and sea area needed to regenerate the resources a human population consumes and to absorb and render harmless the corresponding waste. Using this assessment, it is possible to estimate how much of the Earth (or how many planet Earths) it would take to support humanity if everybody lived a given lifestyle. For 2006, humanity's total ecological footprint was estimated at 1.4 planet Earths – in other words, humanity uses ecological services 1.4 times as fast as Earth can renew them (Fiala, 2008). Every year, this number is recalculated — with a three year lag due to the time it takes for the UN to collect and publish all the underlying statistics. While the term ecological footprint is widely used, methods of measurement vary. However, calculation standards are now emerging to make results more comparable and consistent (Grazi et al, 2007.)

❖ RESULTS – MANAGEMENT OF ENERGY PRODUCTION

In some cases, energy recovery from anaerobic or aerobic digestion of organic wastes can be beneficial for certain objectives, but may have minimal benefit for nutrient management. Nutrient content generally remains unchanged, but nutrient availability may be increased and soluble organic matter reduced. Another benefit can be reduction of odor (Lawrence et al., 2006). The type of farm and number of animals greatly affect whether the energy can be used on-farm, but the payment for selling the energy often determines whether this is a viable management scheme. Other possible energy recovery schemes are being researched, such as gasification of manure solids and conversion of gases to methanol or ethanol. This will require expensive processing plants, and likely some government subsidy to be developed. These energy recovery schemes offer opportunity to combine farm animal wastes and municipal or industrial organic wastes, however the transportation and hygiene factors present challenges. Generally, biogas recovery is considered potentially economical for only large farms and for regional facilities, and even then government subsidy and tipping or gate fees may be needed to be successful. If government energy policies were improved to support more “green energy” production, then more farms might consider anaerobic digestion for manure treatment and energy recovery.

❖ RESULTS – ECONOMICS OF WASTE TREATMENT

Inherent in considering alternative management schemes for organic wastes are the costs and benefits. If regulations or environmental factors require additional treatment that increases costs of production and operation, then the farmer loses profit unless costs are shared with the government or other agencies. It is not easy to determine environmental costs and benefits of alternative waste management policies. The costs of additional waste treatment are more easily passed to the consumer for industrial waste treatment (or to taxpayers for municipal waste treatment) than for farm waste treatment (Wiedmann et al, 2010). As commodity producers, farmers cannot, for all practical purposes, pass on increased production costs to consumers. Government can offer incentives such as cost sharing of equipment or guarantee of not changing regulations for a period of time for improved waste treatment, but this is the exception more than the norm. Also, in the global trade environment, trade agreements between countries can restrict the use of government money to financially support farmers through cost-sharing arrangements. Economics may also suggest that a cooperative or regional facility is needed for certain waste management schemes. However, farmer and public acceptance of this is important because odor from large treatment plants and transportation of organic wastes on public roads may present more community concerns, and farmers may choose other alternatives if the regional treatment system is not clearly advantageous both economically and for management efficiency.

Utilization of organic wastes occurs more easily if there are clear economic incentives. However, the economic incentives are often marginal and sometimes negative. Better organization through farmer cooperatives, organic waste sellers, and government or other agencies could improve the economics. At least initially, more government subsidies may be needed to help distribute nutrients over a larger region by helping with transportation or costs of further processing.

❖ RESULTS – NECESSITY OF REGULATIONS IN AGRICULTURE

Development of government policy and laws that consider environmental impacts, economic survival of agricultural producers of food, and food prices for consumers is difficult to formulate to satisfy the public. In some aspects, more regulation on organic waste products might be advantageous, such as setting specific but reasonable criteria for quality control, such as nutrient content and level of pathogen treatment (Martinez et al., 2000). Such criteria will likely be required for certification of organic farming enterprises, and having a uniform product that meets certain standards can lead to a more stable market. In order to determine regional policies and regulations, there needs to be more analyses done on watershed, and airshed, basis for nutrient distribution and environmental impacts. With a regional analysis, it may be determined that additional treatment can reduce air emissions and result in value-added products that can be successfully distributed to satisfy nutrient concerns. However, it may also become obvious that the concentration of animals or other organic waste sources is too great for a region, that processing and transportation costs are too high to transport the nutrients to other regions, and thus the number of animals in the region must be decreased. But if the number of animals must be decreased, who is going to pay the farmer for the loss of income? Farmers may have to absorb the costs, but possibly the government (or tax payers) will have to pay the bill. Also, large integrator companies that contract with growers may seek to move their business to other regions, thus affecting regional economies. Alternately, it might also be concluded that a regional composting plant or incineration plant might be economically feasible, with energy recovery and production of a mineral fertilizer from the ash. Development of strategies for using various mixes of agricultural (e.g., animal wastes) and industrial/municipal waste (e.g., food wastes) could enable a more economical solution, as well as a more balanced and consistent product.

❖ RESULTS – PUBLIC ACCEPTANCE

Better education of the public and the farmers of the benefits of proper management and utilization of organic wastes in agriculture are important to diminish fears and preconceived notions of nuisance problems, decrease in land values and environmental degradation. In the case of municipal and industrial organic wastes, utilization in agriculture can be presented as more sustainable than landfilling (Monfreda et al., 2004). Examples of successful utilization with support of the farmer and neighbors can promote acceptance by others. However, one bad experience can be difficult to overcome. Therefore, it is important to have proper management to control flies, odors, and generally prevent degradation of air quality or water quality. Obtaining public acceptance also requires having adequate regulations that can protect the public from nuisances and air or water pollution. Education efforts can be national or regional, but must be effective at the local level where the organic wastes utilization is occurring. Education can be funded and conducted by a variety of organizations, including government agencies, cooperative extension service, farmer cooperatives, and commodity organizations. Regardless of the benefits of utilizing organic wastes in agriculture, public acceptance of the practices of organic waste utilization is critical to continuing this activity and developing expanded programs.

❖ CONCLUSIONS

Management strategies for utilization of organic wastes start with the source, such as animal housing and corresponding manure handling and treatment, because this determines the nature of the organic residues and by-products to be utilized. Selection of manure management and treatment options increasingly depends on environmental regulations for preventing pollution of land, water and air. For example, regulated reductions in ammonia emissions could influence the housing management, the storage and treatment, and method of land application. To better utilize organic wastes other than animal manure, better organization and cooperation is needed between waste producers and waste users to schedule the appropriate application times and rates. More analysis needs to be conducted on a regional basis to develop regional management schemes to handle nutrients and protect the environment.

Further development, validation and acceptance of expert systems and computer programs for regional analysis are needed to assist in making policies and decisions. The validity of the models will depend not only on the model construction but also on the accuracy of the data input to the model. Thus, researchers should continue to attempt to do economic analysis of research projects and case studies to supply data to these models.

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