# Managing liquid manure through micro-aeration

***by Lawrence Andres***

Adding oxygen & carbon to liquid manure enables microbes to feed on the ammonia in the manure. The result is a product which not only does not stink, but enhances rather than destroys soil life.

During the past 18 years I have been actively involved in the development of liquid manure composting. Back in Switzerland, we had conducted several farm-scale experiments in a number of different situations and with a variety of types of aeration equipment. It was soon apparent that we were dealing with a very demanding task and we experienced a lot of confusion and frustration!

One has to be aware of the complexity of such a process. The wide spread in results is caused by a huge number of variables affecting the final outcome of the process. The quality of the finished product also has to be evaluated from many different points of view.

Liquid manure can be one of your most valuable resources to enhance soil fertility or it can be one of your biggest problems. When stored under anaerobic conditions it gives off harmful gases such as ammonia, methane, and hydrogen sulphide. Sludge build up makes it difficult to clean out.

It can also enrage neighbours to the point where the farmer may be sued. If it's spread on the land in this state, it's doing more harm than good.

The poisonous gases and toxic substances endanger the life in the soil, resulting in damage to soil structure and plant growth. Due to a very unbalanced nutrient content, massive losses - especially of nitrogen - will occur. Some of this is by leaching (nitrates and nitrites) and some of it is in gaseous form (ammonia).

The alert observer will notice after spreading such manure, that depending on the potency/concentration of such a slurry, considerable numbers of dead earthworms will appear. This should be an alarming sign that something has to be done! This biological disaster is caused by a combination of drowning the worms and gassing them out with lethal doses of ammonia (which, incidentally, also kills people). Of course, the earthworms belong to the more visible members of the soil life; just imagine what it will do to the rest of the countless different species contained in the soil.

**What can be done with liquid manure?**

Just like in a solid manure composting process, we want to promote an aerobic fermentation. To achieve such a decomposition in a liquid mass, we employ a micro-aeration technique to incorporate minute bubbles of air throughout the entire storage facility of liquid manure during calculated time periods.

The bubbles are so small that few are seen to reach the surface. A cover (natural or artificial of straw, compost, etc.) should be maintained at all times to prevent the escape of ammonia during the process. A light milky whine foam may be noticed at exposed areas. This is because the air is either absorbed into the liquid, being used immediately by bacteria, or clings to particles in the liquid.

The micro-aeration unit itself consists of a submersible diffusion pump which injects the air by creating a vacuum at the very bottom of the tank. The unit is operated on a timer, running a few minutes every half an hour, depending on various factors. The objective is to supply an adequate amount of oxygen to enhance the right level of microbial activity in relationship to available carbon and nitrogen in the slurry.

**A careful balance**

The aerobic bacteria which break down carbon material, feed on the ammonia, thereby tying it up biologically in their bodies (protein compounds) and stabilizing H. So the balance between carbon, nitrogen and air is essential and depends a lot on the type and consistency of the slurry.

Manure from cattle on high grain rations, as well as pig manure, often lacks carbon and also has a higher ammonia content than slurry from animals on a high roughage diet. This influences the C/N ratio dramatically. Ideally we would like to see this ratio between 12 and 14:1 to start out with. It will narrow down during the process to 3-4:1 in the finished product.

Carbon-source materials, such as finely ground-up straw or partially decomposed manure, are best suited to solve the ratio imbalance. It is a good practice to provide a source of readily available carbon such as feed grade molasses at a low rate each day of the processing period. This measure has an explosive-like impact on the growth of the microbial activity in the slurry.

If the bacteria are growing with the right proportions of the three key ingredients, they stabilize the nitrogen and other nutrients so that the liquid may contain as much nitrogen and other nutrients as it did when it was fresh from the animal.

Nutrient preservation is the main objective and as a result the liquid manure will not have the unpopular offensive smell of conventionally harmful slurry. Because up to 85% of the nitrogen (compared to 3560% in untreated slurry) is in its organic form, the liquid can be top-dressed on plants without causing burning of tissue. K is more stable in the soil and

enhances rather than destroys soil life. This manure can effectively contribute to humus production, a key ingredient in a healthy soil.

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