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Title:

Rethinking Sustainable Resource Recycling for Food Security - Recovery and Use of Manure Nutrients, Energy and Organic Matter

Authors & affiliations:

Lars Stoumann Jensen & Myles Oelofse
Dept. of Plant and Environmental Sciences, University of Copenhagen, Denmark, lsj@life.ku.dk

Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 1000 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

Livestock production is developing dramatically on a global scale, with trends towards increasing concentration on large specialised production units to improve profitability (Steinfeld et al., 2006; 2010). These changes in production systems have resulted in increased pollution of air, aquifers, surface waters and soil. A major concern is also the uncoupling of the sites of animal feed production and animal production, through the (economic) driving forces specialization, intensification and up-scaling. This leads to surplus amounts of animal manure in areas where livestock are produced. As a consequence, an increasing number of livestock farms have insufficient land for efficient use of manure nutrients. There is a strong relationship between the livestock density and N surplus with great risk of loss to the environment (Olesen et al., 2006, Velthof et al., 2009) and in the European Union, the maximum amount of manure to be applied to agricultural land is regulated, through the Nitrates Directive and the IPPC Directive.

Livestock production also contributes 70-80% of the anthropogenic ammonia emissions in Europe (Hutchings et al., 2001; Oenema et al., 2007) and is estimated to contribute 18% of the global GHG emissions according to Steinfeld et al. (2006). A recent estimate is that livestock production contributes up to 51% of the global GHG emission (Goodland and Anhang, 2009). In addition, livestock production contributes with about 80% of the N and 45% of the P lost to the aquatic environment and is also a significant source of malodours.

If used appropriately, manure can replace large amounts of mineral fertilisers, indicating the high economic value of manure as a raw material for bio-fertiliser production and in addition manure will contribute to maintain or improve soil organic C stocks (Schröder, 2005). On the other hand, improper management and utilisation of manure will result in wasting plant nutrients which are a limited resource and there will be a risk to the global feed and food supply. For example, phosphorus is a limited resource, with the mineable phosphate-rich rocks used for P fertiliser production projected to be exhausted within the next few centuries. In addition, manure contains large amounts of organic material that, with the right technologies, can be used for energy production. At the same time, European soil organic matter levels are generally decreasing and especially in southern Europe soils are greatly depleted in soil C. This is threatening soil fertility to the point of desertification. Removing manure organic matter for energy recovery may therefore jeopardize the maintenance of soil organic matter and fertility.

As a consequence, there is increasing need for manure processing in the most

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livestock intensive regions, and for the recovery and utilization of valuable compounds from the manure. There is a need for new bio-energy technologies capable of recovering energy from manures, while at the same time recycling nutrients and supplying the more recalcitrant fraction of organic matter to the soil. New technologies for reducing emissions to the atmospheric and aquatic environment are also needed.

In order for the sustainable development of agricultural crop and livestock sectors we therefore need to

i) rethink the current, established animal manure management systems to produce both bioenergy and ”green” bio-fertilisers, leading to improved soil, water and air quality,
ii) unite researchers from both biological, agronomic and engineering disciplines in developing the needed new technologies and solutions for improved and sustainable utilisation of valuable organic matter and plant nutrient resources in animal manure.

At the conference we will summaries results and perspectives from an on-going EU-FP7 Marie Curie Initial Training network focusing on manure organic matter and nutrients characterization, treatment and management technologies, energy and P recovery, land recycling and utilisation of carbon and nutrients as well as integrated systems assessments and stakeholders' dialogues. See more info at www.reusewaste.eu

Cayuela ML, Oenema, O, Kuikman, PJ, Bakker RR, van Groenigen JW 2010. Bioenergy by-products as soil amendments? Implications for carbon sequestration and greenhouse gas emissions. Global Change Biology Bioenergy, 2, 201-213.

Goodland R. and Anhang J., 2009. Livestock and Climate Change. World Watch Mag, 22, 10-19.

Hjorth M., Nielsen A.M., Nyord T., Hansen M.N., Nissen P. and Sommer S.G. 2009. Nutrient value, odour emission and energy production of manure as influenced by anaerobic digestion and separation. Agron. Sust. Dev. 29, 329-338

Hutchings N.J., Sommer S.G., Andersen J.M. and Asman, W.A.H. 2001. A detailed ammonia emission inventory for Denmark. Atmos. Environ. 35, 1959-1968.

Lehmann, J. & Joseph, S. (Eds.) 2009. Biochar for Environmental Management. EarthScan, London, Sterling,VA. 416 p.

Masse L., Masse D.I., Pellerin Y. 2007.The use of membranes for the treatment of manure: a critical literature review Biosyst. Eng. 98, 371-380.

Olesen, J.E., Schelde, K., Weiske, A., Weisbjerg, M.R., Asman, W.A.H. and Djurhuus, J. 2006. Modelling greenhouse gas emissions from European conventional and organic dairy farms. Agric. Ecosys. Environ. 112, 207-220.

Sommer, S. G., Petersen S. O.; Møller, H.B., 2004. Algorithms for calculating methane and nitrous oxide emissions from manure management. Nut. Cycl. Agroecosyst. 69, 143-154.

Sommer, S.G., Olesen, J.E., Petersen, S.O., Weisbjerg, M.R., Valli, L., Rohde, L. and Béline, F. 2009. Region-specific assessment of greenhouse gas mitigation with different manure management strategies in four agroecological zones. Global Change Biology, 15, 2825–2837.

Steinfeld H., Gerber P., Wassenaar, T., Castel V., Rosales M., de Haan C. 2006. Livestock long shadow – Environmental issues and options. FAO – Rome.

Steinfeld H., Mooney H.A., Schneider F. 2010. Livestock in a Changing Landscape, Volume 1: Drivers, Consequences, and Responses. Island Press, 416 pp.

Velthof, G. L., D. A. Oudendag, H. P. Witzke, W. A. H. Asman, Z. Klimont, and O. Oenema. 2009. Integrated assessment of nitrogen emissions from agriculture in EU-27 using MITERRA-EUROPE. J. Env. Qual. 38, 402–17.

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