SUSANE - Sustainable, sanitary and efficient management of animal manure for plant nutrition

Identification of needs for development of biotechnologies for climate friendly and sustainable manure management in Vietnam – opportunities for a SUSANE II

By Sven G. Sommer

2009 will be the last whole year of research work in the PhD programmes launched in the SUSANE project. During the foregoing years the project has contributed to awareness in Vietnam about opportunities and risks related to manure management or mismanagement. The PhD research has provided knowledge needed for developing decision support in manure management and for development of technologies.

In 2009 three planned newsletters will present knowledge gained through experimental studies in 2008-2009. This will be followed up by a final training workshop, which is planned to be launched in the beginning of 2010, and will mark the conclusion of this first phase of the project.

A second phase of the project

Like in most studies this project has identified needs for new research aiming at developing efficient and sustainable manure management, tools providing simple advises for improving manure management, system models to assess effect of livestock production etc.

In consequence the SUSANE partners decided to prepare for a phase II of the project. MARD officials, universities, NGOs and research institutions were therefore invited to a workshop the 25th September 08 to identify needs for research and development.

Further, the author of this newsletter visited Dak Lak province for the purpose of establishing contact to the province management unit of the Danida funded ARDSPS programme (Agricultural and Rural Development Sector Programme Support). The vision for this visit was that knowledge gained in the SUSANE project may be adapted to the local farming systems, soil and climate through applied research in the province.

This newsletter will give a brief overview of the general objectives and activities for the SUSANE phase II, which were proposed at the workshop. An overview of the Dak Lak province farmers and research institutional needs are presented below with the objective of setting the ideas generated at the workshop into the perspectives of farmers need in a mountainous province.

Workshop

The small and medium size farms are at present and in the foreseeable future the farm sector producing most livestock in Vietnam. These farms experience a very dynamic change, which should be reflected in the advices and technologies that are the outcome of the project. Farmer perception of manure use is different between regions, e.g. South Vietnamese farmers consider cattle manure most valuable in contrast to North Vietnamese farmers valuing pig manure highest. A sociological or anthropological analysis of these differences may facilitate that the outcome of the project are presented in a format which can be adapted by the farmers.

Manure management technologies on Vietnamese farms, left to right; tube biogas digester, sedimentation tanks and channel transport of slurry directly discharged to recipient.

The participants recognize that Vietnam has to focus on renewable energy production and greenhouse gas (GHG) reduction. Fermentation of animal manure in biogas digesters provides low tech energy productions for farmers, that also have the potential to reduce emission of the potent climate gases methane (CH_4) and nitrous oxide (N_2O) from manure management. However, biogas digesters will produce slurry that cannot be handled with existing technologies, therefore, the increasing use of the technology increases demands for liquid manure transport technologies.

It is the impression that the digester is not maintained properly by all the farmers. This encompasses PVC-tube biogas digesters and bags for storing biogas, the plastic material is degraded with time and is not replaced, digester retention time is low and sediments accumulated are not removed. The identification of digester management problems was also mentioned at the SUSANE network meeting (Newsletter no. 6). Thus there is a need for new digester technology and improved management of digesters adapted for small and medium sized farmers. At present NGOs are supporting biogas digester construction so this shall not be the objective of SUSANE II, but development of efficient management and local adapted design may be an option.

Further, it was mentioned that due to low temperatures during winter in North Vietnam little biogas is produced when the need of energy is high, therefore, a need for developing simple digesters working efficiently during winter was pointed out. There is also a need of knowing the composition of the manure to assess energy content in addition to assessing plant nutrient composition of the digester effluent.

Greenhouse gas emission was an issue mentioned by most participants. There is a need of knowledge on how to quantify GHG emission from Vietnamese livestock production, especially considered that the IPPC emission algorithms originate from west European studies. It was proposed that GHG emission quantification algorithms are developed for local livestock production systems. The system approach must take the whole chain of manure management into account, and include CH_4 emission from livestock and manure during storage and nitrous oxide (N_2O) from field applied manure.

Biogas digestion and composting are technologies that will affect the GHG emission. These technologies will affect the efficiency of the manure as a fertilizer. Quantification of GHG gas

emission as affected by a biotechnology must include considering manure as a fertilizer and a carbon source to soils. Efficient “fertilizer” use reduce need of mineral fertilizers and thereby greatly reduce fossil fuel consumption for the production of mineral fertilizers and addition of organic material to soil will reduce atmospheric CO_2 by increased carbon sequestration i.e. retention of carbon dioxide (CO_2) in the soil.

A new project spotted during the meeting was examination of the hygienic risk related to biogas plants fermenting a mix of manure and human excretion. Will the fermentation and storage time in the biogas digester also reduce pathogens at low temperatures during winter time?

It is considered that decision support systems or kits may be a central component bringing the results of the experiment together, biogas digestion, manure management technologies, sanitation, fertilizer value etc. The models behind supporting development of decision support systems may also be used for quantification of national emissions of GHG and the potential for reducing the emission

Photos:
To the left - Traditional composting of manure in northern Vietnam
To the right - Field experiment in Bac Giang

Report from the Dak Lak mission

In parts of the province the energy infrastructure is missing and in these regions local energy production may be a solution. Medium-sized livestock farms with biogas digester technology were visited. Small and poor farmer cannot afford to build digesters and often these farms have no livestock (pigs), and consequently no manure to feed the digester.

On the visited medium sized livestock farms, liquid manure was led out from the animal houses or biogas digesters to backyards or unlined soil. On one farm the manure was leaking to a ditch where the liquid infiltrated the soil or evaporated. After the liquid had disappeared the solid was scraped of the soil and used for composting. Wells providing drinking water was seen near the animal houses and if not sealed properly, they may easily be contaminated and a source of disease spreading .

Composting of solid manure collected in animal houses or on the pastures is much used. The crop production reduces soil organic matter content and addition of manure and compost will add much

needed carbon to the soil. Untreated rice straw is used to cover soil around the perennial crops. The straw cover (5 cm) reduce weed and at the same time water evaporation. There was no knowledge about the fertilizer value of manure.

The Deputy director Dr. Truong Hang from the Western Highland Agro-Forestry Science and Technical Institute (WASI) expressed very clearly the need for research activities directed towards improved management of manure applied to crops like coffee, cacao, pepper, which are grown on lateritic mountain soils. For these crops grown on the disintegrated ferralsole soils (Lateritic soils) , there is a need of developing technology for improved storage and application of manure and also technology and knowledge aiming at optimising manure collection with focus on reducing nutrient loss and improving the fertilizer value.

Dr Hang proposed that the outcome of studies should be 1) Improved soil fertility, i.e. carbon content of the soil, 2) Increased crop yield and better quality of crop and 3) reduced pollution – including assessment of pollution level.

Summary

Outcomes of both the project identification workshop and the visit to Dak Lak province indicated a need for continuing the development of new and improved manure management strategies. The focal point of the research should be GHG reduction and production of renewable energy through biogas production. NGO's are already supporting farmers who are constructing biogas plants so the objective of SUSANE research should be optimisation of biogas digester management and efficient use of manure resources. Well managed biogas digestion is an efficient technology for reducing GHG emission from animal manure, so biogas digestion may be linked to research quantifying GHG emission from Vietnamese livestock farms. The GHG emission study should encompass other technologies like composting, which is a technology used by most livestock farmers. Further, efficient use of manure as a fertiliser and a source to carbon in soil will benefit both crop yield and the reduction in GHG emission; therefore, technologies for storage, transport, application to soil should be developed to ensure that the plant nutrients are taken up efficiently by crops. Efficient uptake can only be achieved through timeliness of application and knowledge of fertiliser efficiency of manure. Digestion of slurry is regarded as efficient in reducing hygienic risks related to manure application for e.g. vegetables. However, the question is whether in-proper management in fact increases risks as farmers trust the sanitation efficiency of digesters too much even if retention time is low. These questions need to be answered in the SUSANE phase II. The results of SUSANE research will be used for developing decision support models and algorithm for national emission inventories.