



FAO European Cooperative
Research Network



Recycling of Agricultural, Municipal and Industrial Residues in Agriculture

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RAMIRAN 2002

**Proceedings of the 10th International Conference
of the RAMIRAN Network**

General Theme: Hygiene Safety

**Štrbské Pleso, High Tatras, Slovak Republic
May 14 - 18, 2002**

Edited by Ján Venglovský and Gertruda Gréserová

ISBN 80-88985-68-4



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EVALUATION OF INCREASED STRAW USE AS A MEANS OF REDUCING AMMONIA EMISSION FROM HOUSED CATTLE AND PIGS

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Livestock production is the major source of the environmentally harmful gas ammonia. The ammonia emissions inventory for UK agriculture estimates that 36% of ammonia emissions (82,000 tonnes) are from the management of solid manures, with c. 43 million tonnes of solid manure handled annually in the UK. Emissions from buildings where animals are bedded with straw are estimated to be responsible for c. 16% (35,000 tonnes) of the inventory total. The major livestock species contributing to this are pigs and cattle, c. 15,000 tonnes and 20,000 tonnes per year, respectively.

Work carried out under a recent one-year DEFRA-funded IGER experiment demonstrated significant reductions in ammonia emission, during livestock housing, with increased straw use for loose housed cattle. The addition of straw can reduce emissions of ammonia from deposited dung and urine by, for example, immobilising ammonium-N because of the high C:N ratio of the straw and by reducing the airflow across the surface of the dung and urine, thereby increasing the surface boundary diffusion layer. However, straw is an expensive commodity therefore it is important to determine the optimal rate of straw use that results in maximal ammonia abatement.

The main objective of this study is to quantify the effect of different amounts of straw bedding on ammonia emission from housed cattle and pigs. Beef cattle, in groups of four, are being housed for 180 days in four specially adapted polytunnels constructed on a concrete base. During the experiment four different rates of straw are being used: i) current use (CU), ii) CU + 25%, iii) CU + 50% and iv) CU + 100%. Similarly, two production cycles of pigs were each housed in a controlled environment house. The straw use treatments for the pigs were i) CU-50%, ii) CU, iii) CU+50% and iv) CU+100%. Using more than twice the 'current use' rate will be prohibitive, therefore the experiment has been designed to determine the optimum straw use rate that results in an effective reduction in ammonia losses. The difference in straw use treatments for the two livestock groups reflects the results of a DEFRA-funded project, the results of which were presented at RAMIRAN 2000, where greater losses of NH₃ were found from pigs housed on straw than those kept on slats. Conversely, losses of NH₃ were found to be greater from the slurry based system than the straw based system for housed cattle. The contrasting results are thought to be due, in part, to the different behaviour characteristics of pigs and cattle.

The cattle houses will be emptied of manure at six-week intervals and at that time both the animal groups and the straw use treatments will be allocated to a different house following a graeco-Latin square experimental design. The manure from the pig houses

was removed every four weeks in each production cycle. Acid traps are used to make measurements of ammonia losses from the housed animals. Nitrogen inputs and outputs will be measured throughout the project in order to compile an N budget. The C:N ratio of the straw and resultant manure will also be determined throughout the experiment. Results of the study will be available for presentation at the RAMIRAN 2002 conference.