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## Enhancing diversity in livestock farming system to strengthen their resilience: a review of evidence

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**The effect of storage time of slurry on the concentration of odorous compounds in manure**O. Hwang<sup>1</sup>, S.B. Cho<sup>1</sup>, K.Y. Park<sup>1</sup>, S.H. Yang<sup>1</sup>, D.Y. Choi<sup>1</sup>, J.H. Cho<sup>2</sup> and I.H. Kim<sup>2</sup><sup>1</sup>National Institute of Animal Science, RDA, 77 Chuksan-gil, Gwonsungu, Suwon, Republic of Korea, 441-706, Korea, South, <sup>2</sup>Dankook University, 29 Anseodong, Cheonan, Choognam, 330-714, Korea, South; hoh1027@korea.kr

This study was conducted to investigate the effect of italian rye grass (IRG) supplementation in feed and storage time of slurry on the concentration of odorous compounds in manure. Ten pigs weighed 80~120 kg were fed basal diet (control) or IRG diet (basal diet + IRG powder). Manure was collected after 3 wk feeding trial. Levels of odorous compounds were analyzed from the manure incubated at 20 °C in the pilot chamber which is similar to slurry pit at 0, 2, and 4 wk period. Levels of odorous compounds at incubation times of 0, 2 and 4 wk were as follows: phenol compounds were 193.15, 172.01, 146.23 ppm, indole compounds were 6.57, 5.54, 8.36 ppm, VFA was 9,594, 8,354 and 6,775 ppm, I-VFA was 1,030, 1,060 and 1,356 ppm, NH<sub>4</sub>-N level was 1,230, 1,574 and 1,083 ppm, respectively. Levels of phenol compounds and VFA were decreased ( $P<0.01$ ) as incubation period increased. Levels of phenol compounds were lower ( $P<0.01$ ) in IRG group compared to control group: 215.06, 187.40, 153.79 ppm in basal diet group and 171.23, 156.62, 138.68 ppm in IRG treatment group at 0, 2 and 4 wk, respectively. However, concentration of indole compounds was higher in IRG than control group: 3.78, 4.11 and 7.29 ppm in control group and 9.37, 6.98, 9.43 ppm in IRG group at 0, 2 and 4 wk, respectively. VFA levels were lower ( $P<0.01$ ) in IRG than control group: 10,423, 9,185, 7,516 ppm in control group and 8,766, 7,523, 6,033 ppm in IRG group at 0, 2, and 4 wk, respectively. In conclusion, levels of VFA and phenol compounds were decreased as slurry was stored for longer periods as well as when pigs were fed with diet containing IRG. More studies are needed to reduce the indole level in the manure.

**Enhancing diversity in livestock farming system to strengthen their resilience: a review of evidence**M. Tichit<sup>1</sup>, L. Fortun-Lamothe<sup>2</sup>, E. Gonzalez-Garcia<sup>3</sup>, M. Jouven<sup>3</sup>, M. Thomas<sup>4</sup> and B. Dumont<sup>5</sup><sup>1</sup>INRA, UMR1048 SADAPT, 75231 Paris, France, <sup>2</sup>INRA, UMR1289 Tandem, 31326 Castanet Tolosan, France, <sup>3</sup>SupAgroM, UMR868 Selmet, 34060 Montpellier, France, <sup>4</sup>INRA, USC0340 AFPA, 54505 Vandoeuvre-les-Nancy, France, <sup>5</sup>INRA, UMR1213 Herbivores, 63122 Saint-Genès-Champanelle, France; muriel.tichit@agroparistech.fr

Agricultural intensification has reduced the diversity of both plant and animal species and the variety of management practices. Recent empirical evidence suggests that we have underestimated the potential for diversity in livestock farming systems (LFS) to strengthen their resilience. Here, we review the major results from research that has analyzed the issue of how and why diversity in LFS could increase their resilience. At herd level, diversity in animal species, genetic strains, physiological status and management practices offers a risk-spreading strategy against droughts, disease outbreaks and market price fluctuations. Combining several species at pasture or in fish ponds enables higher overall resource capture, liveweight gain and production per unit area because contrasted feeding behaviors enable the use of multiple spatial niches and food resources. Managing diversity over time becomes a central issue in large herds where management strategies targeted at different herd segments are expected to increase overall herd performance. Diversity in lifetime performance emerged from complex interactions between herd management practices and individual biological responses. A diversity of forage resources also helps secure the feeding system against seasonal and long-term climatic variability. Finally, recent work has emphasized that a diversity of grazing management practices, i.e. in terms of stocking rate and grazing periods, can enhance the ability of grassland-based systems to overcome drought events. We conclude on research needs that could reduce knowledge gap and better serve strategies for the empowerment of farmers in resilience management.