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Readings on Manure Management

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2000-2001

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Water Quality Information Center

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This electronic bibliography is intended primarily to provide awareness of recent investigations and discussions of a topic and is not intended to be in-depth and exhaustive. The inclusion or omission of a particular publication or citation should not be construed as endorsement or disapproval. Citations are arranged alphabetically by title and abstracts are included where available.

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page on manure management at www.nal.usda.gov/wqic/manure.shtml and the center's database on online documents covering water and agriculture at <http://riley.nal.usda.gov/wqic/>.

For information on obtaining publications from the National Agricultural Library, please see www.nal.usda.gov/dds/.

Readings on Manure Management

1. 2000 code of practice for responsible livestock development and manure management.: Responsible livestock development and manure management.

Alberta. Alberta Agriculture, Food and Rural Development. Edmonton, Alta. : Alberta Agriculture, Food and Rural Development, [2000] 80 p.: Cover title. Chiefly tables. "November 2000"--T.p. verso. "Agdex 400/27-2."

NAL Call #: TD930.2-.A15-2000

Descriptors: Manure-handling/Animal-culture-Environmental-aspects

2. Ammonia losses from manure.

Meisinger, J. J. and Jokela, W. E.

Proc-Cornell-Nutr-Conf-Feed-Manuf.: 62nd pp.109-116. (2000).

NAL Call #: 389.79-C81

Descriptors: animal-manures/volatilization/sources/diet/grazing/animal-housing/storage/application-to-land/integrated-systems/farming-systems

3. Anaerobic codigestion of hog and poultry waste.

Magbanua, B. S. Jr., Adams, T. T., and Johnston, P.

Bioresour-technol. 76: 2 pp.165-168. (Jan 2001).

NAL Call #: TD930.A32

Descriptors: piggery-effluent/pig-manure/poultry-manure/waste-treatment/anaerobic-digestion

4. Animal, agricultural and food processing wastes: proceedings of the eighth International Symposium, October 9-11, 2000, Des Moines, Iowa.

Moore, James A. and International Symposium on Animal, Agricultural and Food Processing Wastes 8th 2000 Des Moines Iowa American Society of Agricultural Engineers. St. Joseph, Mich. : American Society of Agricultural Engineers, c2000. xv, 752 p. : ill.: Includes bibliographical references.

NAL Call #: TD930-.I58-2000

Descriptors: Animal-waste-Management-Congresses/Agricultural-wastes-Management-Congresses/Food-industry-and-trade-Waste-disposal-Congresses

5. Animal waste BMP impacts on sediment and nutrient losses in runoff from the Owl Run watershed.

Brannan, K. M., Mostaghimi, S., McClellan, P. W., and Inamdar, S. *Trans-ASAE.* 43: 5 pp.1155-1166. (Sept/Oct 2000).

NAL Call #: 290.9-Am32T

Descriptors: animal-wastes/losses-from-soil/sediment/runoff/precipitation/stream-

flow/nitrogen/phosphorus/water-quality/water-pollution/watersheds/environmental-impact/best-management-practices/nutrient-management

6. Application of electronic management tools. Salomons, M. Adv-pork-prod. Edmonton, Alta. : University of Alberta, Faculty of Extension, 1990-. 2000. v. 11 p. 197-203. pp.

URL: <http://www.banffpork.ca/proc/2000pdf/BO4-ApplicElecTools.pdf>

NAL Call #: SF391.3.B36

Descriptors: pig-farming/computer-software/ventilation/farm-budgeting/pig-manure/ultrasonic-fat-meters/ultrasonic-diagnosis

7. Basics of manure management.

Miller, L. Small-farm-today. 17: 4 pp.28-30. (July/Aug 2000).

NAL Call #: S1.M57

Descriptors: animal-manures/waste-disposal/application-to-land/waste-utilization

8. Beneficial use of effluents, wastes, and biosolids.

Sumner, M. E.

Commun-soil-sci-plant-anal. 31: 11/14 pp.1701-1715. (2000).

NAL Call #: S590.C63

Descriptors: application-to-land/sewage-effluent/sewage-sludge/animal-manures/composts/gypsum/food-industry/wastes/paper-mill-sludge/literature-reviews/nutrient-content

Abstract: Anthropogenic wastes are accumulating at ever increasing rates. As an alternative to stockpiling and landfilling, land application of wastes is considered in terms of benefits to agriculture while protecting the environment. Beneficial reuse of wastes such as municipal wastewater, sewage sludge, animal manures, composts, byproduct gypsum, food processing and paper and pulp wastes are discussed both in terms of their benefits to agriculture and requirements from the standpoint of analyses required for monitoring. Clearly, many of these wastes are highly beneficial to crop production as fertilizer substitutes and soil ameliorants.

9. C and N mineralization of composted and anaerobically stored ruminant manure in differently textured soils.

Thomsen, I. K. and Olesen, J. E.

J-agric-sci. 135: pt.2 pp.151-159. (Sept 2000).

NAL Call #: 10-J822

Descriptors: animal-manures/ruminants/urine/feces/straw/composting/anaerobic-treatment/carbon/storage-quality/mineralization/clay-soils/soil-texture/mathematical-models/equations/denmark-

Abstract: Three animal manures cross-labelled with ^{15}N in either the urine, faeces or straw fractions were prepared. After a storage period of 86 days when the manures were exposed to either composting or to anaerobic storage, portions of the manures were incubated in six differently textured soils with clay contents ranging from 11 to 45%. Evolved $\text{CO}_2\text{-C}$ was determined during a 266 day incubation and inorganic N and ^{15}N in soil were measured at the termination of the incubation. The mineralization of C was analysed using first-order kinetics, and two C pools with fast (P1) and slow (P2) turnover rates were estimated. The total conversion of added C (P(s)) was estimated as $P(s) = P1 + P2$. The cumulated CO_2 production was

considerably higher from soils incubated with anaerobically stored manure compared with soils amended with composted manure. CO₂ production levelled off after c. 60 days in the three sandier soils whereas CO₂ continued to be produced throughout the incubation from the three soils with the highest clay content. More C was assigned to the easily decomposable P1 pool in the sandiest soils whereas the more recalcitrant P2 pool was larger in the soils with higher clay content. Because of the different relationships between soil texture and C pools, P(s) ended up being similar for five of the six soils. When taking C losses during the preceding storage into account, the accumulated C losses during storage and after incubation in soil accounted for 60 and 54% of C initially present in the composted and anaerobically stored manure, respectively. Net N mineralization which averaged 16% of applied organic N took place in all soils amended with composted manure. Soils with anaerobically stored manure showed net immobilization after the 266 days of incubation. The amount of N immobilized accounted for up to 30% of the inorganic N applied with the manure. As anaerobically stored manure generally loses less inorganic N during storage, it may contain more inorganic N than composted manure at the time of field application. Because of the immobilization that takes place after application of anaerobically stored manure to soil, the immediate levels of plant available N in soil may not be as different from soil supplied with composted manure as could be expected from the inorganic N content in the two types of manure. However, when considering the manure as a N resource, anaerobic storage is superior to composting.

10. CH₄ fluxes and soil CH₄ concentration following application of pig slurry for the 19th consecutive year.

Rochette, P. and Cote, D.

Can-j-soil-sci. 80: 2 pp.387-390. (May 2000).

NAL Call #: 56.8-C162

Descriptors: pig-slurry/application-to-land/soil-bacteria/methane-production/emission/methane/soil-air/long-term-experiments/agricultural-soils/maize-soils/seasonal-variation/quebec-

11. Changes in biogas production due to different ratios of some animal and agricultural wastes.

Al Masri, M. R.

Bioresour-technol. 77: 1 pp.97-100. (Mar 2001).

NAL Call #: TD930.A32

Descriptors: sheep-manure/animal-wastes/goats/olive-cake/fermentation/anaerobic-digestion/goat-wastes

Abstract: The biogas production and some biochemical parameters of anaerobic fermentation at 30 degrees C for 40 days were studied for eight experimental groups of fermentation media, as affected by two factors: (1) the type of the animal waste (sheep waste, S and goat waste, G), and (2) the ratio of waste to olive cake which constitutes four levels (100:0 for S1 and G1; 80:20 for S2 and G2; 60:40 for S3 and G3 and 40:60 for S4 and G4). The results indicated that there was a significant decrease ($P < 0.05$) in the biogas production with an increase in the proportion of olive cake in place of animal waste. However, there was a significant increase in the biogas production for the S4 treatment compared with G4, reflecting an effect induced by the type of animal waste. The biogas production amounted to (1/kg VS/40 d): 62 (S1), 53 (S2), 49 (S3), 40 (S4), 58 (G1), 50 (G2), 44 (G3) and 25 (G4). The reduction in total solid (TS) weight, volatile

solids (VS), neutral-detergent fiber decreased significantly ($P < 0.05$) with the increase in olive cake proportion in the digester. The reductions in VS were (% in DM): 58.2 (S1), 37.8 (S2), 26.6 (S3), 22.6 (S4), 58.1 (G1), 36 (G2), 33.4 (G3), 14.4 (G4). The rates of energy consumption were (MJ/kg DM/40 d): 15.36 (S1), 10.12 (S2), 7.84 (S3), 6.68 (S4), 14.16 (G1), 9.68 (G2), 8.41 (G3), 3.29 (G4).

12. Changes in swine manure solids during storage may affect separation efficiency.

Zhu, J., Ndegwa, P. M., and Luo, A.

Appl-eng-agric. 16: 5 pp.571-575. (Sept 2000).

NAL Call #: S671.A66

Descriptors: pig-manure/storage/liquids/separation/particle-size/decomposition/waste-treatment/temporal-variation/total-dissolved-solids/total-suspended-solids/total-volatile-suspended-solids

Abstract: A laboratory study revealed the dynamic changes of solids in swine manure during storage in order to determine the best time for efficient solid-liquid separation treatment. Data showed that separation should be conducted within 10 days after manure excretion for particle sizes equal to or greater than 0.5 mm and within five days for particle sizes smaller than 0.5 mm. After the first 10 days of storage, the total suspended solids tended to be decomposed at a higher rate, thus reducing separation efficiency. Particles equal to or smaller than 0.25 mm were biologically decomposed at the same rate without relevance to the particle size during the first 20 days of storage. The level of total volatile solids in liquid manure was linearly correlated with the total solids content with a correlation coefficient of 0.9850 in the 30-day period.

13. Characterization of atmospheric ammonia emissions from swine waste storage and treatment lagoons.

Aneja, Viney P., Chauhan, J. P., Walker, John., and Water Resources Research Institute of the University of North Carolina.

Raleigh, N.C. : Water Resources Research Institute of the University of North Carolina, [2000] viii, 23 leaves : ill., maps: "June 2000" "UNC-WRRI-2000-329"

"The research on which this report is based was financed by the Department of Environment and Natural Resources, Division of Air Quality, through the N.C. Water Resources Research Institute" Includes bibliographical references (leaves 20-23). Water Resources Research Institute. no. 50214.

NAL Call #: TD201-.N6-no.-329

Descriptors: Sewage-lagoons-Environmental-aspects-North-Carolina/Animal-waste-Environmental-aspects-North-Carolina/Manure-gases-North-Carolina

14. Commercial enzymes and their influence on broilers fed wheat or barley.

Leeson, S., Caston, L., Kiaei, M. M., and Jones, R.

J-appl-poult-res. 9: 2 pp.242-251. (Summer 2000).

NAL Call #: SF481.J68

Descriptors: broilers/broiler-performance/diets/wheat/barley/enzyme-preparations/pentosans/beta-glucan/o-glycoside-hydrolases/beta-glucanase/amylases/cellulase/proteinases/body-weight/liveweight-gain/feed-intake/feed-conversion/mortality/poultry-manure/moisture-content/digesta/viscosity/metabolizable-energy/age-differences/litter/arabinoxylans-

15. Comparison of energy inputs for inorganic fertilizer and manure based corn production.

Mclaughlin, N. B., Hiba, A., Wall, G. J., and King, D. J.

Can-agric-eng. 42: 1 pp.9-17. (Jan/Mar 2000).

URL: <http://www.engr.usask.ca/societies/csae/c9915.pdf>

NAL Call #: 58.8-C164

Descriptors: zea-mays/grain-crops/crop-production/npk-fertilizers/pig-manure/liquid-manures/herbicides/seeds/fuel-consumption/grain-drying/energy-cost-of-production/energy-consumption/energy-conservation/soil-types-textural/comparisons/ontario/liquid-swine-manures/starter-fertilizers

16. Comparison of grassland management systems for beef cattle using self-contained farmlets: effects of contrasting nitrogen inputs and management strategies on nitrogen budgets, and herbage and animal production.

Laws, J. A., Pain, B. F., Jarvis, S. C., and Scholefield, D.

Agric-ecosyst-environ. 80: 3 pp.243-254. (Sept 2000).

NAL Call #: S601.A34

Descriptors: beef-cattle/grassland-management/farming-systems/farms/nitrogen/application-rates/nitrogen-balance/herbage/biomass-production/grazing/animal-husbandry/cutting/nutrient-sources/broadcasting/cattle-slurry/animal-housing/trifolium-repens/grass-sward/botanical-composition/soil-injection/sandy-loam-soils/silage/sustainability/fodder/ammonium-nitrate/south-west-england

17. A comparison of N and P inputs to the soil from fertilizers and manures summarized at farm and catchment scale.

Domburg, P., Edwards, A. C., and Sinclair, A. H.

J-agric-sci. 134: pt.2 pp.147-158. (Mar 2000).

NAL Call #: 10-J822

Descriptors: grassland-management/nitrogen-fertilizers/phosphorus-fertilizers/animal-manures/application-rates/watersheds/water-pollution/scotland-

18. Comprehensive model of anaerobic digestion of swine manure slurry in a sequencing batch reactor.

Masse, D. I. and Droste, R. L.

Water-res. 34: 12 pp.3087-3106. (Aug 2000).

NAL Call #: TD420.W3

Descriptors: pig-slurry/anaerobic-digestion/bioreactors/simulation/mathematical-models

19. Confined animal production and manure nutrients.

Gollehon, Noel R. Noel Ray 1954 and United States. Dept. of Agriculture. Economic Research Service.

Washington, DC : U.S. Dept. of Agriculture, Economic Research Service, [2001] iv, 35 p. : col. ill., col. maps: Cover title. "June 2001"--P. [i]. Includes bibliographical references (p. 33-34).

NAL Call #: 1-Ag84Ab-no.-771

Descriptors: Confinement-farms-Waste-disposal-United-States/Livestock-Manure-Handling-

United-States/Poultry-Manure-Handling-United-States/Organic-wastes-as-fertilizer-United-States/Farm-manure-Environmental-aspects-United-States

20. Confined animal production poses manure management problems.

Gollehon, N. and Caswell, M.

Agric-outlook.: 274 pp.12-18. (Sept 2000).

NAL Call #: aHD1751.A42

Descriptors: livestock/animal-manures/poultry-manure/nitrogen/usa-

21. Controlling agricultural nonpoint water pollution: costs of implementing the Maryland Water Quality Improvement Act of 1998.

Parker, D.

Agric-econ. 24: 1 pp.23-31. (Dec 2000).

NAL Call #: HD1401.A47

Descriptors: estuaries/water-pollution/water-quality/environmental-legislation/regulation/economic-impact/waste-disposal/fertilizers/animal-wastes/mathematical-models/maryland/chesapeake-bay,-maryland/nonpoint-source-pollution

Abstract: The Maryland Water Quality Improvement Act of 1998 (WQIA) seeks to create environmental and other benefits to the Chesapeake Bay through reductions in nonpoint source nutrient pollution. This paper analyzes the economic impacts of the WQIA on agricultural users of nutrients (commercial fertilizers or animal manures) and on poultry growers in the state of Maryland. The net economic impacts to each of these groups are estimated along with some discussion of the distribution of the impacts. Recognition of the distribution of the impacts allows for the assessment of potential policies to address negative impacts. Additional sections of the WQIA are discussed in terms of their ability to shift the distribution of the impacts or to provide partial compensation to those most affected. The WQIA is the most restrictive agricultural nonpoint pollution control law in the US. While the WQIA only regulates nutrient use in the state of Maryland, other states, as well as the federal government, are watching how this law is implemented. Many states are considering similar laws. At the national level, the United States Department of Agriculture and the United States Environmental Protection Agency have issued draft guidelines that will control nutrients from animal operations in much the same way as the WQIA. Therefore, analyses of the economic impacts of the WQIA may be important in shaping policies in other states and at the national level.

22. Corn uptake and microbial immobilization of 15N-labeled urea-N in soil as affected by composted pig manure.

Choi, W. J., Jin, S. A., Lee, S. M., Ro, H. M., and Yoo, S. H.

Plant-soil. 235: 1 pp.1-9. (Aug 2001).

NAL Call #: 450-P696

Descriptors: zea-mays/urea/nutrient-availability/pig-manure/composts/immobilization/nutrient-uptake/use-efficiency/nitrogen/nitrogen-metabolism/isotope-labeling/application-rates/soil-flora

23. Dairy lagoon design and management under chronic rainfall.

McFarland, A. M. S., McFarland, M. J., and Sweeten, J. M.

Appl-eng-agric. 16: 3 pp.285-292. (May 2000).

NAL Call #: S671.A66

Descriptors: dairy-wastes/lagoons/design/waste-treatment/anaerobic-digestion/rain/runoff/water-flow/leakage/risk-assessment/water-balance/simulation-models/texas/anaerobic-lagoons/overflow-

24. Development and revision of national recommendations for the use of fertilisers and organic manures in England and Wales.

Dampney, Peter M. R. and International Fertiliser Society.

York : International Fertiliser Society, [2000] 40 p. : ill.: "Paper presented to The International Fertiliser Society at a meeting in London, on 28th November 2000" Includes bibliographical references (p. 35-38).

NAL Call #: S631-.P76-no.-457

Descriptors: Fertilizers-Wales-Congresses/Fertilizers-England-Congresses

25. Development document for the proposed revisions to the National Pollutant Discharge Elimination System regulation and the effluent guidelines for concentrated animal feeding operations.

Browner, Carol M. and United States. Environmental Protection Agency. Office of Science and Technology. Engineering and Analysis Division. United States. Environmental Protection Agency. Office of Water.

Washington, D.C. : Engineering and Analysis Division, Office of Science and Technology, U.S. Environmental Protection Agency, [2001] 1 v. (various pagings) : ill., map: "January 2001." "Office of Water"--Cover. "EPA 821-R-01-003"--Cover. Includes bibliographical references.

NAL Call #: TD930.2-.D48-2001

Descriptors: Animal-waste-Environmental-aspects/Animal-feeding-Environmental-aspects/Effluent-quality/Feedlot-runoff/Livestock-Manure-Environmental-aspects

26. Development of improved advice for farmers and advisers.

Dampney, P. M. R., Lord, E. I., and Chambers, B. J.

Soil-use-manage. 16: suppl. pp.162-166. (June 2000).

NAL Call #: S590.S68

Descriptors: nitrate/leaching/losses-from-soil/pollution-control/diffusion-of-information/farmers/decision-making/nitrogen-fertilizers/animal-manures/application-rates/application-methods/field-crops/programs/uk/maff-nitrate-program

Abstract: The MAFF Nitrate Programme has provided policy makers and the agricultural industry with a much improved understanding of soil nitrogen cycling, and the cost-effectiveness of a range of nitrate reduction strategies. This understanding has been disseminated a improved economically-based advice on fertilizer N inputs to arable and grass crops, and information on the N value of livestock manures as affected by timing and method of application. In addition, strategies for reducing nitrate losses have been developed, including the use of over-winter cover crops, the management of cultivations and crop residues, and the conversion of arable land to low-input grassland. A wide variety of information dissemination methods have been used, including face-to-face discussions, demonstrations, articles in the farming press, booklets aimed at farmers, technical information for advisers and consultants, recommendation reference books and computer-based fertilizer recommendation systems.

27. Digesters bring energy and fertilizer to dairy farms.

Biocycle. 41: 5 pp.76-79. (May 2000).

NAL Call #: 57.8-C734

Descriptors: cattle-manure/waste-utilization/anaerobic-digestion/methane-production/minnesota/animal-manure-management

28. Dynamic simulation of cyclic batch anaerobic digestion of cattle manure.

Keshtkar, A., Ghaforian, H., Abolhamd, G., and Meyssami, B.

Bioresour-technol. 80: 1 pp.9-17. (Oct 2001).

NAL Call #: TD930.A32

Descriptors: waste-treatment/dynamic-models

Abstract: Cyclic batch reactors with periodical feeds and extractions, are often used in cattle manure anaerobic digestion. The dynamic behavior of this type of reactor was simulated in this study. The kinetic model developed by I. Angelidaki et al. [Biotechnol. Bioeng. 42 (1993) 159], together with microbial growth kinetics, conventional material balances for an ideally cyclic batch reactor, liquid-gas interactions, and liquid phase equilibrium chemistry were used in this study. The model showed good agreement with the experimental data of R.I. Mackie and M.P. Bryant [Appl. Microbiol. Biotechnol. 43 (1995) 346], and R. Borja et al. [Chem. Eng. J. 54 (1994) B9]. The effects of hydraulic retention time (HRT), organic loading rate, reactant concentrations, feeding interval, and initial conditions such as pH and ammonia concentration on process performance can be evaluated by the dynamic model. Also simulation results show that the equilibrium conditions can be considered for CO₂ distribution between liquid and gas phases, especially for processes with long retention times.

29. The economics of livestock waste and its regulation.

Innes, R.

Am-j-agric-econ. 82: 1 pp.97-117. (Feb 2000).

NAL Call #: 280.8-J822

Descriptors: animal-wastes/regulation/ externalities/environmental-impact/agricultural-land/rain/manures/cost-benefit- analysis/ runoff/econometric-models

Abstract: This article develops a spatial model of regional livestock production and three attendant environmental effects: spills from animal waste stores; nutrient runoff due to the application of manure to croplands; and direct ambient pollution, including odors, pests, and gases. Assuming that neither environmental outcomes nor operators' manure-spreading practices can be monitored and regulated, constrained efficient production arrangements and waste-handling practices are described. The efficiency effects of several regulatory policies are then explored, including (a) scale regulations that limit animal inventories, (b) chemical fertilizer taxes, and (c) waste storage and handling standards that affect storm protections and manure transport.

30. Effect of antibiotics on psychrophilic anaerobic digestion of swine manure slurry in sequencing batch reactors.

Masse, D. I., Lu, D., Masse, L., and Droste, R. L.

Bioresour-technol. 75: 3 pp.205-211. (Dec 2000).

NAL Call #: TD930.A32

Descriptors: pig-manure/pig-slurry/feed-additives

Abstract: The effect of antibiotics of the psychrophilic anaerobic digestion (PAD) of swine manure slurry in sequencing batch reactors (SBRs) was investigated. Six antibiotics, tylosin, lincosamin, tetracycline, sulphamethazine, penicillin and carbadox, were individually added to the pig diet at their maximum prescribed level. Manure slurries collected from pigs receiving control and medicated diets were individually fed to pairs of SBRs at organic loading rates (OLRs) ranging from 2.2 to 3.5 g total chemical oxygen demand (TCOD) per litre of bioreactor initial sludge volume per day. Three mixtures of slurries from pigs fed on individual antibiotics were also tested at OLRs varying between 2.5 and 3.2 g TCOD/l/d. The presence of penicillin and tetracycline in manure slurries reduced methane production by 35% and 25%, respectively. However, the slurries from pigs receiving the other antibiotics and the slurry mixtures did not significantly affect ($P>0.05$) methane production. In addition, the presence of individual and combined antibiotics did not have noticeable adverse effects on process stability and treatment efficiency. Total and soluble COD (TCOD and SCOD) reduction, total and volatile solids (TS and VS) removal, pH and volatile fatty acid (VFA) concentrations in experimental units were not statistically different ($P>0.05$) than in the controls. In all bioreactors, the TCOD, SCOD, TS and VS removal exceeded 62%, 76%, 65% and 75%, respectively.

31. Effect of composting on nutrient loss and nitrogen availability of cattle deep litter.

Sommer, S. G.

Eur-J-agron. 14: 2 pp.123-133. (Mar 2001).

NAL Call #: SB13.E97

Descriptors: dairy-cattle/cattle-manure/nutrient-availability/nitrogen/ammonia/nitrous-oxide/methane-production/emission/carbon/litter/composts/composting/denitrification/volatilization/potassium/efficiency-

32. The effect of energy supplementation on nitrogen utilization in lactating dairy cows fed grass silage diets.

Castillo, A. R., Kebreab, E., Beever, D. E., Barbi, J. H., Sutton, J. D., Kirby, H. C., and France, J. J-anim-sci. 79: 1 pp.240-246. (Jan 2001).

NAL Call #: 49-J82

Descriptors: dairy-cows/nitrogen-balance/grass-silage/fiber-content/concentrates/feed-intake/digestibility/starch/sugars/maize/barley/excretion/feces-composition/nitrogen-content/urine/milk-yield/milk-fat-yield/lactose/milk-fat-percentage/milk-protein-percentage/pollution-control/cattle-manure/cattle-dung

33. The effect of limited aeration on swine manure phosphorus removal.

Zhu, J., Luo, A., and Ndegwa, P. M.

J-environ-sci-health,-Part-B,-Pestic-food-contam-agric-wastes.

B36: 2 pp.209-218. (2001).

NAL Call #: TD172.J61

Descriptors: pig-manure/phosphorus/aeration/ph/waste-treatment/intermittent-aeration/continuous-aeration/manure-management

34. The effectiveness of aerobes used as manure additives for swine manure odor control.

Zhu, J.

Swine-health-prod. 8: 1 pp.5-9. (Jan/Feb 2000).

NAL Call #: SF971.N472

Descriptors: pig-manure/additives/aerobes/growth/odor-abatement/aeration-

35. Effects of ammonia nitrogen on H₂ and CH₄ production during anaerobic digestion of dairy cattle manure.

Sterling, M. C. Jr., Lacey, R. E., Engler, C. R., and Ricke, S. C.

Bioresour-technol. 77: 1 pp.9-18. (Mar 2001).

NAL Call #: TD930.A32

Descriptors: hydrogen/methane/methane-production/gas-production/hydrogen-gas-production

Abstract: A number of researchers have verified the inhibitory effects of elevated H₂ concentrations on various anaerobic fermentation processes. The objective of this work was to investigate the potential for using hydrogen gas production to predict upsets in anaerobic digesters operating on dairy cattle manure. In an ammonia nitrogen overload experiment, urea was added to the experimental digesters to obtain increased ammonia concentrations (600, 1500, or 3000 mg N/l). An increase in urea concentration resulted in an initial cessation of H₂ production followed by an increase in H₂ formation. Additions of 600, 1500, or 3000 mg N/l initially resulted in the reduction of biogas H₂ concentrations. After 24 h, the H₂ concentration increased in the 600 and 1500 mg N/l digesters, but production remained inhibited in the 3000 mg N/l digesters. Both methane and total biogas production decreased following urea addition. Volatile solids reduction also decreased during these periods. The digester effluent pH and alkalinity increased due to the increased NH₄⁺ formed with added urea. Based on these results, changes in H₂ concentration could be a useful parameter for monitoring changes due to increased NH₃ in dairy cattle manure anaerobic digesters.

36. The effects of calcium benzoate in diets with or without organic acids on dietary buffering capacity, apparent digestibility, retention of nutrients, and manure characteristics in swine.

Mroz, Z., Jongbloed, A. W., Partanen, K. H., Vreman, K., Kemme, P. A., and Kogut, J. J-anim-sci. 78: 10 pp.2622-2632. (Oct 2000).

NAL Call #: 49-J82

Descriptors: pigs/pig-manure/benzoates-salts/buffering-capacity/formic-acid/fumaric-acid/butyric-acid/diets/digestibility/amino-acids/calcium/nutrient-retention/urine/osmolarity/feed-intake/water-intake/liveweight-gain/feces/weight/ph-

37. Effects of dietary carbohydrates and buffering capacity on nutrient digestibility and manure characteristics in finishing pigs.

Mroz, Z., Moeser, A. J., Vreman, K., Diepen, J. T. M. van., Kempen, T. van., Canh, T. T., and Jongbloed, A. W.

J-anim-sci. 78: 12 pp.3096-3106. (Dec 2000).

NAL Call #: 49-J82

Descriptors: dietary-minerals/pigs/dietary-carbohydrate/finishing/buffering-capacity/digestibility/tapioca/soybean-husks/beet-pulp/calcium-sulfate/limestone/pig-

manure/ammonia/nitrogen-balance/urine/ph/feces-composition/environmental-impact

Abstract: A 2 x 3 factorial experiment was conducted with 24 finishing pigs (Yorkshire x [Finnish Landrace x Dutch Landrace]) to determine the effects of dietary buffering capacity (BC) and carbohydrate sources on apparent total tract digestibility (TD), N retention, and manure

characteristics. Twelve of these pigs were fitted with steered ileo-cecal valve cannulas to measure the apparent ileal digestibility (ID) of N. Experimental variables were two levels of BC (High = 600 mEq/kg and Low = 530 mEq/kg) and three dietary carbohydrates (tapioca [28%], soybean hulls [25%], and sugar beet pulp [25%]). The two levels of BC were achieved by adjusting the amounts of alkalogenic limestone and acidogenic Ca sulfate in the diet. Pigs were fed twice daily at 2.4 x maintenance requirement for metabolizable energy (418 kJ ME/BW^{0.75}). Chromic oxide was used as an indigestible marker. Feces and urine were collected over 5 d for nutrient balance and in vitro measurements of pH and ammonia emission over 7 d. No significant interactions between BC and dietary carbohydrates on the ID, TD, N retention, or manure characteristics were observed. Lowering BC with Ca sulfate did not affect digestibility of most nutrients, except for a negative impact on the TD of Ca (P = 0.015) and Mg (P = 0.003). Although all pigs receiving Ca sulfate had more acidic urine (by 0.49 pH units; P = 0.001), ammonia emission from manure was not lowered, irrespective of the carbohydrate source. Carbohydrates affected significantly the ID and TD of most nutrients, whereas N retention remained similar (P > 0.10). Urinary N:fecal N ratios in manure of pigs fed diets with tapioca, soybean hulls, and beet pulp were 2.09, 1.35, and 1.67, respectively. These ratios corresponded with in vitro ammonia emission (169, 125, and 148 mmol/7 d; P = 0.023). In conclusion, these results indicate that the acidification of urine in pigs fed Ca sulfate in the presence of NSP-rich carbohydrates was achieved. However, acidity of manure and ammonia emission were not affected. The addition of NSP from soybean hulls and (or) sugar beet pulp reduced ratios of urinary:fecal N, and thereby ammonia emission.

38. Efficient use of animal manure on cropland--economic analysis.

Araji, A. A., Abdo, Z. O., and Joyce, P.

Bioresour-technol. 79: 2 pp.179-191. (Sept 2001).

NAL Call #: TD930.A32

Descriptors: transport-costs/costs/application-to-land/mineralization/analysis-of-covariance/usa-

Abstract: Manure contains all the macro- and microelements needed for plant growth; however, it represents one of the most underutilized resources in the US. The major problem with the use of manure on cropland is the direct effect of its composition on application cost. This cost is a function of the mineralization process of organic matter. The mineralization process is influenced by the properties of the manure, properties of the soil, moisture, and temperature. This study evaluates the simultaneous effect of these variables on the optimal use of manure on cropland. The results show that the properties of manure and soil significantly affect the mineralization of organic nitrogen and thus the optimal quantity of manure required to satisfy the nutrient requirement of crops in a given rotation system. Manure application costs range from a low of 18% of the cost of commercial fertilizer for chicken manure applied to one type of soil, to a high of 125% of the cost of commercial fertilizer for cow manure applied to another type of soil. The maximum distance to transfer manure to the field, that will equate its application cost to the cost of commercial fertilizer, ranges from a high of 35 km (22 miles) for chicken manure applied to one type of soil, to a low of 1 km (0.62 miles) for cow manure applied to another type of soil. For rotation system 2, manure application costs range from a low of 37% of the cost of commercial fertilizer for chicken manure applied to one type of soil, to a high of 136% of the cost of commercial fertilizer for cow manure applied to another type of soil. The maximum distance to transfer manure to the field, that will equate its cost to the cost of commercial

fertilizer, ranges from a high of 20 km (12.5 miles) for chicken manure applied to one type of soil, to a low of 0 km (0 miles) for cow manure applied to another type of soil.

39. Emission of greenhouse gases during composting of deep litter from pig production--effect of straw content.

Sommer, S. G. and Moller, H. B.

J-agric-sci. 134: pt.3 pp.327-335. (May 2000).

NAL Call #: 10-J822

Descriptors: air-pollution/methane/nitrous-oxide/carbon-dioxide/emission/measurement/pig-manure/barley-straw/composting/temperature/greenhouse-effect/denmark-

Abstract: Of the anthropogenic greenhouse gas emission in Denmark animal manure contributes an estimated 40% of methane (CH₄) and 20% of nitrous oxide (N₂O). Livestock production systems undergo changes for the purpose of increasing animal welfare, and such changes often include increasing the amounts of bedding manure. Emission of greenhouse gases from composting pig deep litter was studied during a 4-month period. Effects of increasing the amount of straw used in deep litter (reducing litter density) were included in the study. Methane was produced at a high rate in the centre of the heap at high density during the thermophilic phase of composting, and CH₄ emission was only measured during this phase. In this treatment N₂O was also produced in the centre both initially and after the temperature of the compost had dropped to below 45 degrees C. Emissions of N₂O were only significant in the low temperature phases. Production of N₂O was probably restricted to the surface layers during the thermophilic phase of composting. Total carbon dioxide (CO₂) emissions were 7.37 and 0.09 kg C/t fresh weight from the heaps with bulk densities of 0.44 and 0.23 kg/l, respectively. Methane emission from the high density compost heap was 191 g C/t and N₂O emission was 58 g N/t. Emissions of CH₄ and N₂O from the low density heap were not detected. The greenhouse effect of gas emission from the high density compost heap was calculated by multiplying the climate force efficiencies and the cumulated gas emission. This calculation showed that CH₄ contributes almost as much to the global warming potential as CO₂ and N₂O contributed twice as much as CO₂.

40. Emissions of greenhouse gases from stored raw and anaerobically digested dairy manure slurry.

Umetsu, K., Kimura, Y., Takahashi, J., and Young, B. A.

Asian-australas-j-anim-sci. 13: Suppl. pp.179-182. (July 2000).

NAL Call #: SF55.A78A7

Descriptors: methane-

41. Enhancement of the thermophilic stage in cattle waste composting by addition of tofu residue.

Hanajima, D., Kuroda, K., and Haga, K.

Bioresour-technol. 78: 2 pp.213-216. (June 2001).

NAL Call #: TD930.A32

Descriptors: cattle-manure/temperature/waste-utilization

Abstract: The microbial degradation and temperature rise during the composting of a cattle waste and rice straw mixture blended with tofu (soybean curd) residue was investigated using an insulated and unheated in-vessel composter (effective volume, 12 l) and a static pile with passive aeration. The addition of 11% (dry weight basis) of tofu residue shortened the time required for

temperature to reach the thermophilic phase and increased the duration of the temperatures above 55 degrees C significantly, but the maximum temperature was not affected by the additive level. As shown by the change in BOD, most of the easily biodegradable matter in the tofu residue was consumed during 12 days of composting. The same results were observed in the temperature profile of the static pile with passive aeration. Tofu residue addition yielded a higher maximum temperature and a nearly two times longer duration of temperatures above 55 degrees C in almost all locations of the pile. The use of tofu residue as a co-composting material would promote thermophilic degradation throughout the entire composting mass.

42. Environmental and economic benefit analysis of the proposed revisions to the National Pollutant Discharge Elimination System regulation and the effluent guidelines for concentrated animal feeding operations.: Concentrated animal feeding operations.

United States. Environmental Protection Agency. Office of Water.

Washington, D.C. : U.S. Environmental Protection Agency, [2001] 1 v. (various pagings) : ill., map: "EPA 821-R-01-002"--Cover. "January, 2001." "Office of Water"--Cover. Includes bibliographical references.

NAL Call #: TD899.F4-E58-2001

Descriptors: Animal-feeding-Environmental-aspects/Effluent-quality-Cost-effectiveness/Feedlots/Livestock-Manure-Environmental-aspects/Animal-waste

43. Environmental assessment of proposed revisions to the National Pollutant Discharge Elimination System regulation and effluent limitations guidelines for concentrated animal feeding operations.: Concentrated animal feeding operations.

Browner, Carol M. and United States. Environmental Protection Agency. Office of Water.

United States. Environmental Protection Agency. Office of Science and Technology.

Washington, D.C. : Engineering and Analysis Division, Office of Science and Technology, U.S. Environmental Protection Agency, [2001] 1 v. (various pagings) : ill., maps: "January 2001." "EPA-821-B-01-001"--Cover. Includes bibliographical references.

NAL Call #: TD380-.E69-2001

Descriptors: Effluent-quality/Animal-feeding-Environmental-aspects/Feedlots/Livestock-Manure-Environmental-aspects/Animal-waste

44. Environmental impacts of swine, poultry nutrition discussed.

Baidoo, S. K.

Feedstuffs. 72: 26 pp.12-15. (June 26, 2000).

NAL Call #: 286.81-F322

Descriptors: pig-feeding/poultry-feeding/nutrient-content/excreta/diet/digestibility/amino-acids/manures/odors/environmental-impact

45. Environmentally superior waste management technologies.

Williams, C. M.

Proc-Agric-Outlook-Forum. Washington, D.C. : U.S. Dept. of Agriculture, World Agricultural Outlook Board,. 2001. p. n/a. pp.

URL: http://www.ncsu.edu/project/swine_extension/ncporkconf/2001/williams.htm

NAL Call #: aHD1755.A376

Descriptors: animal-wastes/north-carolina

46. Evaluation of two-stage anaerobic sequencing batch reactor systems for animal wastewater treatment.

Zhang, R. H., Tao, J., and Dugba, P. N.
Trans-ASAE. 43: 6 pp.1795-1801. (Nov/Dec 2000).
NAL Call #: 290.9-Am32T

Descriptors: animal-manures/anaerobic-digestion/odor-abatement/waste-water-treatment

Abstract: Anaerobic treatment of screened swine and dairy manure was studied in the laboratory with two-stage anaerobic sequencing batch reactor (ASBR) systems. The effects of anaerobic treatment on odor control in subsequent manure storage units were evaluated. One thermophilic (55 degrees C) mesophilic (35 degrees C) system (II) was evaluated against one mesophilic (35 degrees C) mesophilic (35 degrees C) system (I) at a system hydraulic retention time (HRT) of six days and four volatile solid (VS) loading rates (1, 2, 3, 4 g/L/day). Generally, anaerobic digestion under all the test conditions resulted in higher solids reduction in swine manure than in dairy manure. The thermophilic-mesophilic system had a better performance in treating dairy and swine manure with 6 to 15% more VS removal than the mesophilic-mesophilic system. The headspace gas analysis results using manure storage jars showed that both systems were effective in reducing the generation of odorous sulfur gases during storage. The untreated dairy and swine manure exhibited strong offensive odors with high hydrogen sulfide (H₂S) and mercaptan concentrations detected in the headspaces of storage jars. The anaerobically treated manure, however, showed minimal residual odors while in many cases, H₂S and mercaptans were not detectable. With the consideration of its better capability for destructing fecal bacteria in animal manure, the thermophilic-mesophilic ASBR system is more advantageous than the mesophilic-mesophilic ASBR system for treating animal manure. However, the higher energy requirement for heating the reactors in the former system needs to be considered when selecting thermophilic vs. mesophilic anaerobic digestion systems.

47. Factor analysis for the study of water resources contamination due to the use of livestock slurries as fertilizer.

Vidal, M., Lopez, A., Santoalla, M. C., and Valles, V.
Agric-water-manage. 45: 1 pp.1-15. (June 2000).
NAL Call #: S494.5.W3A3

Descriptors: water-pollution/wells/drainage-channels/rivers/pastures/fertilizers/cattle-slurry/water-quality/chemical-composition/seasonal-variation/spain-

48. Gaseous nitrogen emissions from anaerobic swine lagoons: ammonia, nitrous oxide, and dinitrogen gas.

Harper, L. A., Sharpe, R. R., and Parkin, T. B.
J-environ-qual. 29: 4 pp.1356-1365. (July/Aug 2000).
NAL Call #: QH540.J6

Descriptors: pig-slurry/lagoons/ammonia/nitrous-

oxide/nitrogen/emission/denitrification/anaerobic-conditions/nutrient-loading/waste-management

Abstract: Seventy-five percent of swine (*Sus scrofa*) production systems in North America use anaerobic or liquid-slurry systems for waste holding or disposal. Accurate emissions data and emission factors are needed for engineering, planning, and regulatory agencies. These data are used for system design and evaluation of the effect of animal concentrations on the regional soil, surface and ground waters, and atmospheric environments. Noninvasive techniques were used to

evaluate trace gases without disturbing the meteorology or lagoon system being measured. Micrometeorological and gas sensors were mounted on a submersible barge in the center of the lagoon for use with flux-gradient methodology to determine trace gas fluxes, without disturbing atmospheric transport processes, over extended periods. Collateral measurements included lagoon nutrient, dissolved gas concentrations, and sludge gas mass flux. Ammonia emissions varied diurnally and seasonally and were highly correlated with windspeed and water temperature. Nutrient loading measurements showed that mobile ions, which were nonvolatile, were constant throughout four successive lagoons. Immobile ions concentrated primarily in the sludge layer of the first lagoon. Measurements of denitrification N₂ losses suggest as much N₂-N lost as from NH₃-N. Ammonia gas emissions are not as large a percentage of total nitrogen input to the lagoons as previously thought but unaccounted-for nitrogen requires further research.

49. Greenhouse gas emission from stored livestock slurry.

Sommer, S. G., Petersen, S. O., and Sogaard, H. T.
J-environ-qual. 29: 3 pp.744-751. (May/June 2000).

NAL Call #: QH540.J6

Descriptors: air-pollutants/emission/cattle-slurry/greenhouse-gases

Abstract: Animal manure contributes about 40% of the total methane (CH₄) and 20% of the total nitrous oxide (N₂O) emissions in Denmark. We measured the CH₄ and N₂O emissions from stored cattle slurry and fermented slurry during fall 1996 and summer 1997 and evaluated the effect of surface covers consisting of straw, floating leca pebbles, or a natural surface crust on the patterns of these emissions. No emission of N₂O was measured during periods with more rain than evaporation from the slurry stores and no emission was measured from uncovered slurry, irrespective of climatic conditions. During the summer storage with drying conditions, N₂O emissions of up to 25 mg N m⁻² h⁻¹ were recorded from slurry with surface covers. Total N₂O emission was highest from digested slurry. The emission of CH₄ from stored fermented slurry and cattle slurry varied between

50. High solid anaerobic digestion of chicken manure.

Bujoczek, G., Oleszkiewicz, J., Sparling, R., and Cenkowski, S.
J-agric-eng-res. 76: 1 pp.51-60. (May 2000).

NAL Call #: 58.8-J82

Descriptors: poultry-manure/mixtures/methane-production/organic-matter/anaerobic-digestion

51. Hydraulic agitation of an earthen manure storage : final report.

Stock, Wayne F. and Prairie Agricultural Machinery Institute (Canada). Saskatchewan.
Agriculture Development Fund.

[Regina] : The Fund, [2000] 15 p. : ill. : Cover title. "19980116." "February 2000." Project Technologist Wayne Stock ... [et al.]. Cf. prelim.

NAL Call #: TD930.2-.H92-2000

52. Hydraulic conductivity reduction due to ponded hog manure.

Maule, C. P., Fonstad, T. A., Vanapalli, S. K., and Majumdar, G.
Can-agric-eng. 42: 4 pp.157-163. (Oct/Dec 2000).

URL: <http://www.engr.usask.ca/societies/csae/c0010.pdf>.

NAL Call #: 58.8-C164

Descriptors: pig-manure/storage/ponds/hydraulic-conductivity/depth/infiltration/earthen-manure-storage-ponds

53. Hydrogen sulfide production from stored liquid swine manure: a laboratory study.

Arogo, J., Zhang, R. H., Riskowski, G. L., and Day, D. L.

Trans-ASAE. 43: 5 pp.1241-1245. (Sept/Oct 2000).

NAL Call #: 290.9-Am32T

Descriptors: hydrogen-sulfide/gas-production/liquid-manures/pig-manure/ph/sulfates/storage/pollution-control

54. Impact of feeders and drinker devices on pig performance, water use, and manure volume.

Brumm, M. C., Dahlquist, J. M., and Heemstra, J. M.

Swine-health-prod. 8: 2 pp.51-57. (Mar/Apr 2000).

NAL Call #: SF971.N472

Descriptors: pigs/nipple-drinkers/bowl-drinkers/pig-feeders/water-intake/pig-manure/fattening-performance

55. Implementation of a livestock systems environmental assessment tool.

Koelsch, R., Howard, L., Pritchard, S., and Hay, P.

J-ext. 38: 1 pp.n/a. (Feb 2000).

URL: <http://www.joe.org/joe/2000february/a3.html>

NAL Call #: LC45.4.J682

Descriptors: animal-husbandry/cooperative-extension-service/assessment/environmental-impact/risk-factors/surveys/manures/silage/storage/milking/waste-water/application-to-land/odors/feedlot-effluent/nebraska-

56. Increased animal waste production from concentrated animal feeding operations (CAFOs) : potential implications for public and environmental health.

Bowman, Angella., Mueller, Keith J. 1951, Smith, Melanie., and Nebraska Health & Human Services System.

Nebraska Center for Rural Health Research. Omaha, NE : Nebraska Center for Rural Health

Research, University of Nebraska Medical Center, Dept. of Preventative & Societal Medicine,

[2000] 17 p.: "This report was prepared for the Nebraska Health and Human Services System,

Public Health Assurance Division, Division of Environmental, Disease and Vector Surveillance

by the Nebraska Center for Rural Health Research ..." "January, 2000." Includes bibliographical references (p. 14-17).

NAL Call #: TD930.2-.B68-2000

Descriptors: Animal-waste-Environmental-aspects/Feedlots-Environmental-aspects/Manure-handling

57. Influence of different natural zeolite concentrations on the anaerobic digestion of piggery waste.

Milan, Z., Sanchez, E., Weiland, P., Borja, R., Martin, A., and Ilangovan, K.

Bioresour-technol. 80: 1 pp.37-43. (Oct 2001).

NAL Call #: TD930.A32

Descriptors: pig-manure/piggery-effluent/waste-water/waste-water-treatment/waste-treatment

Abstract: The effect of different natural zeolite concentrations on the anaerobic digestion of

piggery waste was studied. Natural zeolite doses in the range 0.2-10 g/l of wastewater were used in batch experiments, which were carried out at temperatures between 27 degrees C and 30 degrees C. Total chemical oxygen demand (COD), total and volatile solids, ammonia and organic nitrogen, pH, total volatile fatty acids (TVFA), alkalinity (Alk) and accumulative methane production were determined during 30 days of digestion. The anaerobic digestion process was favored by the addition of natural zeolite at doses between 2 and 4 g/l and increasingly inhibited at doses beyond 6 g/l. A first-order kinetic model of COD removal was used to determine the apparent kinetic constants of the process. The kinetic constant values increased with the zeolite amount up to a concentration of 4 g/l. The values of the maximum accumulative methane production (G(m)) increased until zeolite concentrations of 2-4 g/l. The addition of zeolite reduced the values of the TVFA/Alk ratio while increasing the pH values, and these facts could contribute to the process failure at zeolite doses of 10 g/l.

58. Innovative technologies for planning animal feeding operations : comprehensive nutrient management planning : program and proceedings : the Renaissance Denver Hotel, December 4-5-6, 2000, Denver, Colorado.

Vigil, Merle.

[United States : s.n., 2000?] iv, 200 p. : ill. : Cover title. Includes bibliographical references.

NAL Call #: TD899.F4-I55-2000

Descriptors: Feedlots-Waste-disposal-United-States-Congresses/Animal-feeding-United-States-Congresses/Manure-handling-United-States-Congresses

59. Inventory of emissions of greenhouse gases in Israel.

Koch, J., Dayan, U., and Mey Marom, A.

Water-air-soil-pollut. 123: 1/4 pp.259-271. (Oct 2000).

NAL Call #: TD172.W36

Descriptors: air-pollution/carbon-dioxide/methane-production/methane/emission/gas-production/nitrous-oxide/animal-wastes/decomposition/landfills/intestinal-microorganisms/livestock/biological-activity-in-soil/soil-bacteria/agricultural-soils/fuels/combustion/forestry/israel-

60. Laboratory estimates of trace gas emissions following surface application and injection of cattle slurry.

Flessa, H. and Beese, F.

J-environ-qual. 29: 1 pp.262-268. (Jan/Feb 2000).

NAL Call #: QH540.J6

Descriptors: cattle-slurry/application-to-land/soil-injection/nitrous-oxide/methane/carbon-dioxide/greenhouse-gases

Abstract: Applying cattle slurry to soil may induce emissions of the greenhouse gases N₂O and CH₄. Our objective was to determine the effects of different application techniques (surface application and slit injection) of cattle (*Bos taurus*) slurry on the decomposition of slurry organic matter and the emissions of N₂O and CH₄. The effects of slurry application (43.6 m³ ha⁻¹) were studied for 9 wk under controlled laboratory conditions using a soil microcosm system with automated monitoring of the CO₂, N₂O, and CH₄ fluxes. The soil used was a silty loam (Ap horizon of a cambisol) with a constant water-filled pore space of 67% during the experiment. About 38% of the organic matter applied with the slurry was decomposed within 9 wk.

Production of CO₂ was not affected by the application technique. Emissions of N₂O and CH₄ from the injected slurry were significantly higher than from the surface-applied slurry, probably because of restricted aeration at the injected-slurry treatment. Total N₂O-N emissions were 0.2% (surface application) and 3.3% (slit injection) of the slurry N added. Methane emission occurred only during the first few days following application. The total net flux of CH₄-C for 2 wk was -12 g ha⁻¹ for the control (CH₄ uptake), 2 g ha⁻¹ for the surface-applied slurry, and 39 g ha⁻¹ for the injected slurry. Slurry injection, which is recommended to reduce NH₃ volatilization, appears to increase emissions of the greenhouse gases N₂O and CH₄ from the fertilized fields.

61. Laboratory procedures for characterizing manure phosphorus.

Dou, Z., Toth, J. D., Galligan, D. T., Ramberg, C. F. Jr., and Ferguson, J. D.

J-environ-qual. 29: 2 pp.508-514. (Mar/Apr 2000).

NAL Call #: QH540.J6

Descriptors: phosphorus/chemical-analysis/cattle-manure/dairy-wastes/poultry-manure/characterization/losses-from-soil/runoff-water/water-pollution/control-

Abstract: Phosphorus runoff from agricultural land contributes to accelerated eutrophication of surface waters. In areas with intensive animal farming, P loss from manured fields may be elevated due to high concentrations of soluble P in manure. We characterized P in dairy and poultry manure of soluble P in manure. We characterized P in dairy and poultry manure for the relative dissolution and fraction distribution using deionized water (H₂O), 0.5 M NaHCO₃, 0.1 M NaHCO₃, 1.0 M NaOH, 1.0 M HCl, and 5% trichloroacetic acid (TCA). Two extraction procedures were tested: (i) independent, with dried, ground samples being extracted repeatedly and P measured for each extractant; and (ii) sequential, with each sample being repeatedly extracted by H₂O, NaHCO₃, NaOH, and HCl, in that order. For the independent procedure, H₂O extracted 53 to 64%, NaHCO₃, 64 to 72%, NaOH 33 to 54%, HCl 90 to 97%, and TCA 84 to 96% of the total P in manure. Sequentially, H₂O, NaHCO₃, NaOH, and HCl extracted 70, 14, 6, and 5% of the total P in the dairy, and 49, 19, 5, and 25% of the total P in the poultry sample, respectively. Manure P release was not greatly affected by shaking time but decreased rapidly with increasing number of repeated extractions. A large portion of P in manure being extractable by H₂O or NaHCO₃ suggests weak binding energy of P and hence a high susceptibility for loss to waters when conditions favor runoff. A 1-h shaking of manure with H₂O may provide a quick measure of the relative magnitude of P that is most susceptible. Further investigation relating manure P fractions with P in runoff would help identify management alternatives for reduced P losses.

62. Management of nutrients in ornamental plant production systems in Florida: an overview.

Stamps, R. H.

Proc-Soil-Crop-Sci-Soc-Fla. [S.1.] : Soil and Crop Science Society of Florida. 2000. v. 59 p. 27-31. pp.

NAL Call #: 56.9-So32

Descriptors: ornamental-plants/ornamental-crops/composts/manures/application-rates/soil-fertility/horticulture-

63. Management of organic amendments in Florida citrus production systems.

Obreza, T. A. and Ozores Hampton, M.

Proc-Soil-Crop-Sci-Soc-Fla. [S.I.] : Soil and Crop Science Society of Florida. 2000. v. 59 p. 22-27. pp.

NAL Call #: 56.9-So32

Descriptors: fruit-growing/composts/manures/application-rates

64. Management of organic amendments in vegetable crop production systems in Florida.

Li, Y. C., Stoffella, P. J., and Bryan, H. H.

Proc-Soil-Crop-Sci-Soc-Fla. [S.I.] : Soil and Crop Science Society of Florida.

2000. v. 59 p. 17-21. pp.

NAL Call #: 56.9-So32

Descriptors: vegetable-growing/composts/manures-

65. Managing livestock wastes to preserve environmental quality. 1st ed.

Miner, J. Ronald., Humenik, F. J., and Overcash, Michael R.

Ames : Iowa State University Press, c2000. vii, 318 p. : ill.: Includes index.

NAL Call #: TD930.2-.M55-2000

Descriptors: Animal-waste-Environmental-aspects/Animal-waste-Management

66. Manure and wastewater management for cattle feedlots.

Sweeten, J. M.

Rev-environ-contam-toxicol. New York : Springer-Verlag, 1987-. 2000. v. 167 p.121-153. pp.

NAL Call #: TX501.R48

Descriptors: cattle-manure/runoff/waste-utilization/application-to-land/pollution-control/water-quality/water-pollution/literature-reviews

67. Manure characteristics. Lorimor, Jeffery.

Ames, Iowa : Iowa State University, 2000. 23 p. : ill.: Includes bibliographical references (p. [24]).

NAL Call #: S655-.M35-2000

Descriptors: Farm-manure/Farm-manure-Composition

68. Methane emission factors from cattle manure in Mexico.

Gonzalez Avalos, E. and Ruiz Suarez, L. G.

Bioresour-technol. 80: 1 pp.63-71. (Oct 2001).

NAL Call #: TD930.A32

Descriptors: mexico-

Abstract: Factors responsible for methane emission from cattle manure representing diverse climates, systems and functions of cattle production are presented. These factors were obtained by means of an experimental methodology developed for this project. It was considered that the temperature, moisture, handling of manure and the animals' feed ration affect methane production. Drying conditions and fermentation of manure in cool, temperate and warm climates were simulated in the laboratory. Cattle manure was obtained from animals in intensive, semi-intensive and extensive production systems; for dairy, non-dairy and double purpose cattle production functions. Also handling of manure in dry lot, pasture and solid storage was considered. Results suggest that the dominant factor in methane emissions is the feed ration, followed by fermentation temperature and the excreta moisture content. The emission factors

obtained in this work are at least a factor of five smaller than those proposed in the revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories for countries like Mexico.

69. Methane production from low solid concentration liquid swine waste using conventional anaerobic fermentation.

Hill, D. T. and Bolte, J. P.

Bioresour-technol. 74: 3 pp.241-247. (Sept 2000).

NAL Call #: TD930.A32

Descriptors: pig-slurry/liquid-wastes/anaerobic-digestion/waste-utilization

Abstract: A study was conducted to determine the methane production characteristics of low concentration liquid swine waste using conventional dispersed growth anaerobic fermentation at 35 degrees C. Raw waste was obtained from a conventional under floor flushing system and screened using an 18 mesh vibrating liquid-solid separator. The volatile solid (VS) concentration of the influent waste used in the study was 15 g/l. Hydraulic retention times (HRTs) of 5, 3, 2, and 1 days were replicated three times with one 300 l bench scale fermenter. Results from the study show that conversion to methane is practical for the 5 and 3 day HRT but that considerable stress occurred at the 2 day HRT. One replicate failed during the 2 day HRT and all three replicates failed at the 1 day HRT. Failure of digestion was determined based on steady-state gas production. Methane productivity (LCH₄/g VS added) ranged from 0.36 to 0.22 for the 5 and 2 day HRTs, respectively. VS reduction showed a high of 51.6% for the 5 day HRT and a low of 34.5% for the 2 day. Steady-state operating levels of ammonia and total volatile fatty acids (TVFA) suggest no inhibition from either at any of the HRTs. Alkalinity levels were low (1200-2000 mg/l as CaCO₃) when compared to digestion studies using longer HRTs. Although foaming occurred at the 2 and 1 day HRT. TVFA levels remained low (< 700 mg/l as acetic) and pH was > 7. This suggests the failure mechanism was bacterial washout, not organic overloading.

70. Milk production, reproductive performance, and fecal excretion of phosphorus by dairy cows fed three amounts of phosphorus.

Wu, Z., Satter, L. D., and Sojo, R.

J-dairy-sci. 83: 5 pp.1028-1041. (May 2000).

NAL Call #: 44.8-J822

Descriptors: dairy-cows/milk-yield/dietary-minerals/phosphorus/feed-intake/dry-matter/milk-fat-percentage/milk-fat-yield/milk-protein-yield/milk-protein-percentage/lactose/solids-not-fat/somatic-cell-count/body-weight/liveweight-gain/body-condition/lactation-curve/calcium/cattle-manure/feces-composition/urine/digestibility/postpartum-interval/conception-rate/repeat-breeders/calving-interval/abortion/foot-diseases/bovine-mastitis/incidence/nutrient-requirements

Abstract: Milk production was measured and phosphorus (P) excretion in feces was estimated in dairy cows fed three amounts of P. A basal diet was formulated to contain 0.31% P (DM basis). Sodium monophosphate replaced corn in the basal diet to give two additional diets containing 0.40 and 0.49% P. The diets were fed to eight, nine, and nine multiparous Holsteins from the beginning to the end of lactation. Milk yields for the 308-d lactation were 10,790, 11,226, and 11,134 kg for the three treatments, respectively. The lowest milk yield resulted from decreased milk production during late lactation with the 0.31% P group. Reproductive performance of the cows was not related to dietary P content. Fecal P concentration, determined in wk 2, 4, 6, 8, 23,

and 40 of lactation, increased as dietary P intake was increased. Cows fed the lowest P diet conserved P by minimizing P excretion in feces and urine, whereas cows in the other two treatments excreted more P through these routes. A reduction in dietary P from 0.49 to 0.40% reduced fecal P excretion by 23%. Apparent P digestibilities of less than 40% are indicative of surplus dietary P. Feeding 0.40% P appeared sufficient to maintain P balance and the level of milk production achieved in this experiment. An example is given which illustrates the relationship between dietary and fecal P.

71. Modeling effects of moisture content and advection on odor causing vocs volatilization from stored swine manure.

Liao, C. M. and Liang, H. M.

J-environ-sci-health,-Part-B,-Pestic-food-contam-agric-wastes. B35: 3 pp.357-378. (2000).

NAL Call #: TD172.J61

Descriptors: pig-manure/volatile-compounds/moisture-content/odors/volatilization/mathematical-models/air-profiles

72. Modeling traditional manuring practice: soil organic matter sustainability of an early Shetland community.

Adderley, W. P., Simpson, I. A., Lockheart, M. J., Evershed, R. P., and Davidson, D. A.

Hum-ecol. 28: 3 pp.415-431. (Sept 2000).

NAL Call #: HM206.A1H8

Descriptors: soil-organic-matter/carbon/plaggen-soils/manures/land-management/islands/history/prediction/sustainability/ethnography/models/uk/century-agroecosystem-model

73. Near-infrared sensing of manure nutrients.

Millmier, A., Lorimor, J., Hurburgh, C. Jr., Fulhage, C., Hattey, J., and Zhang, H.

Trans-ASAE. 43: 4 pp.903-908. (July/Aug 2000).

NAL Call #: 290.9-Am32T

Descriptors: animal-manures/nutrient-content/chemical-composition/infrared-spectroscopy/pollution-control/nutrient-management

Abstract: The effectiveness of near-infrared (NIR) technology for quickly analyzing the nutrient content of three types of animal manure was evaluated. Swine lagoon effluent, liquid swine pit manure, and solid beef feedlot manure were tested. An NIRSystems 6500 scanning monochromator unit was calibrated against wet chemistry data. Total solids (TS), total Kjeldahl nitrogen (TKN), ammonia nitrogen (NH₃-N), total phosphorus (P), and potassium (K) were measured. Correlation coefficients (r) ranged from 0.688 to 0.976, Ratios of data range: standard error of prediction (SEP) varied from 7.0 to 13.6 for the various chemical constituents and manure sources. Based on the individual ratios we conclude that NIR techniques will allow us to predict TS, TKN, NH₃-N, and K in all three manure types. Further work will be required before P is predictable.

74. Nitrogen and phosphorus management on Dutch dairy farms: legislation and strategies employed to meet the regulation.

Neeteson, J. J.

Biol-fertil-soils. 30: 5/6 pp.566-572.(2000).

NAL Call #: QH84.8.B46

Descriptors: pollution-control/dairy-farms/cattle-manure/application-to-land/spreading/agricultural-land/application-date/storage/emission/control/environmental-legislation/regulations/nitrogen/phosphorus/nitrate/leaching/farm-inputs/grasslands/arable-land/sandy-soils/groundwater-pollution/netherlands/nutrient-management-legislation

Abstract: The high input of nutrients through the use of fertilizers, manure and animal feed make it possible to reach high levels of agricultural production. However, high nutrient inputs may also result in large nutrient losses and thus have adverse effects on groundwater, surface water, and the atmosphere. To minimize nutrient emissions from agriculture, the Dutch government has introduced regulations on nutrient use. These include: (1) a ban on spreading animal manure on agricultural land during the winter, (2) the obligation to cover storage facilities for animal manure, (3) compulsory low-emission applications of animal manure to land, and (4) applying levies when the maximum permissible annual N and P surpluses for farms are exceeded. The nutrient surplus is the difference between nutrient input into the farm and nutrient output from the farm. The maximum permissible N surpluses for 2000 are 250 kg N ha⁻¹ year⁻¹ and 125 kg N ha⁻¹ year⁻¹ for grassland and arable land, respectively, and for P, 35 kg P₂O₅ ha⁻¹ year⁻¹ for both grassland and arable land. When the annual permissible levels are exceeded, farmers are charged with a levy. Results obtained at the experimental dairy farm "De Marke" showed that a reduction in nutrient inputs via fertilizers and purchased food, in combination with restricted grazing, reduced the N surplus in such a way that the NO₃(-) concentration in the groundwater decreased to about the maximum permissible level of 50 mg NO₃(-) l⁻¹. Since these results were obtained on a sandy soil that is very sensitive to NO₃(-) leaching, it is suggested that all dairy farmers should be able to sufficiently reduce NO₃(-) leaching by improving their farm management.

75. Nitrogen (N) management in the 'De Marke' dairy farming system.

Aarts, H. F. M., Habekotte, B., and Keulen, H. van.

Nutr-cycl-agroecosyst. Dordrecht, The Netherlands ; Boston : Kluwer, c1996-. Mar 2000. v.56 (3) p. 231-240. pp.

NAL Call #: S631.F422

Descriptors: dairy-farming/nitrogen/farming-systems/farming-systems-research/sandy-soils/nitrate/ammonia/groundwater/soil-fertility/water-quality/leaching/intensive-production/feeds/nitrogen-fertilizers/milk/cattle/crops/growth/cattle-slurry/feeding/zeamays/grasslands/water-pollution/pollution-control/netherlands-

76. Nitrogen strategies in poultry: dietary changes to decrease environmental losses.

Patterson, P. H.

Proc-Md-Nutr-Conf-Feed-Manuf.: 48th pp.12-28. (2001).

NAL Call #: 389.9-Un342

Descriptors: chickens/poultry-feeding/nitrogen/amino-acids/crude-protein/dietary-protein/growth/digestibility/nutrient-retention/excretion/ingredients/feeds/enzyme-preparations/feed-additives/poultry-manure/protein-digestibility/antinutritional-factors/nutrition-physiology/diet/ideal-protein

77. Nitrous oxide and methane emissions following application of animal manures to grassland.

Chadwick, D. R., Pain, B. F., and Brookman, S. K. E.

J-environ-qual. 29: 1 pp.277-287. (Jan/Feb 2000).

NAL Call #: QH540.J6

Descriptors: nitrous-oxide/ethane/emission/animal-manures/application-to-land/grasslands/global-warming

Abstract: Nitrous oxide (N₂O) and methane (CH₄) emissions were measured from grassland following manure applications at three times of the year. Pig (*Sus scrofa*) slurry and dairy cow (*Bos taurus*) slurry were applied in April, at equal rates of ammoniacal-N (NH₄(+)-N), and in July, at equal volumetric rates (50 m³ ha⁻¹). In October, five manure types were applied to grassland plots at typical application rates: pig slurry, dilute dairy cow effluent, pig farm yard manure (FYM), beef FYM and layer manure. Emissions were measured for 20, 22, and 24 d, respectively. In April, greater cumulative emissions of N₂O-N were measured following application of dairy cow slurry (1.51 kg ha⁻¹) than pig slurry (0.77 kg ha⁻¹). Cumulative CH₄ emissions following application in April were significantly greater from the dairy cow slurry treatment (0.58 kg ha⁻¹) than the pig slurry treatment (0.13 kg ha⁻¹) (P < 0.05). In July, significantly greater N₂O-N emissions resulted from pig slurry-treated plots (0.57 kg ha⁻¹) than dairy cow slurry-treated plots (0.34 kg ha⁻¹). Cumulative net CH₄ emissions were very low following July applications (

78. Nitrous oxide flux from solid dairy manure in storage as affected by water content and redox potential.

Brown, H. A., Wagner Riddle, C., and Thurtell, G. W.

J-environ-qual. 29: 2 pp.630-638. (Mar/Apr 2000).

NAL Call #: QH540.J6

Descriptors: nitrous-oxide/pollutants/emission/dairy-wastes/storage/water-content/redox-potential/nitrate-nitrogen/ammonium-nitrogen

Abstract: The current global N₂O budget estimates that animal production contributes one third of agricultural emissions. A study was conducted on solid dairy manure to determine the potential for N₂O emission during storage. A laboratory flow-through chamber and tunable diode laser analyzer were employed to continuously quantify the N₂O flux in a temperature-controlled environment. Water, NO₃-N and NH₄-N contents and redox potential (E(h), using a platinum and Ag-AgCl reference electrode) also were monitored. In Experiment 1, manure samples were collected (4.3 kg wet weight) from three layers near the surface of the pile (0-15, 15-30, and 30-45 cm) and incubated at 22 degrees C for 20 d. The mean daily N₂O-N fluxes were between 0 and 0.33 g N m⁻² d⁻¹, and N₂O was only generated in samples from the top two layers of the pile. In Experiment 2, samples from the 30- to 45-cm depth were adjusted by amendment with chopped straw to 70, 75, and 80% water content (WC). These samples showed less variable fluxes and produced twice as much N₂O-N as the unamended samples. Levels of straw-amendment had no significant effect on N₂O emissions. Combined results from both experiments revealed that fluxes were highest at 55 to 70% WC and 150 to 250 mV E(h). The N₂O emission was limited by low NO₃-N levels in samples with high WC and low E(h). Increasing WC and decreasing E(h) with depth and increasing levels of NO₃ in the surface layer over time revealed that the exterior of solid manure piles is crucial to the flux of N₂O.

79. Nitrous oxide production by manure samples collected from six manure-handling systems.

Tenuta, M., Barry, D. A. J., Fairchild, G., and Beauchamp, E. G.
Can-j-soil-sci. 81: 1 pp.33-38. (Feb 2001).

NAL Call #: 56.8-C162

Descriptors: poultry-manure/cattle-manure/storage/nitrous-oxide/emission/denitrification/carbon-dioxide/nitrogen-content/nitrite/nitrate-

80. Nutrient excretion by outdoor pigs: a case study of distribution, utilization and potential for environmental impact.

Eriksen, J. and Kristensen, K.

Soil-use-manage. 17: 1 pp.21-29. (Mar 2001).

NAL Call #: S590.S68

Descriptors: pig-farming/paddocks/pig-manure/soil-fertility/nitrogen/phosphorus/exchangeable-potassium/spatial-variation/feed-dispensers/topsoil/seasonal-variation/crop-production/solanum-tuberosum/dry-matter-accumulation/nutrient-content/nitrogen-content/feed-dispenser-areas

Abstract: An increasing number of breeding sows is kept outdoors in Europe. Outdoor pig production has benefits in terms of animal welfare but may have hidden costs through nutrient losses. We investigated the distribution of nutrients in sow paddocks and the consequence for losses and utilization in the succeeding crop. Significant correlation between soil inorganic N and the distance to feeding sites was observed after the paddocks had been used by lactating sows for 6 months (P

81. Nutrient flows for poultry production in The Netherlands.

Boer, I. J. M. de., Togt, P. L. van., Grossman, M., and Kwakkel, R. P.

Poultry-sci. 79: 2 pp.172-179. (Feb 2000).

NAL Call #: 47.8-Am33P

Descriptors: poultry-farming/pollution-control/ammonia/emission/nitrogen/phosphorus/potassium/egg-production/broiler-production/equations/application-to-land/feed-conversion/poultry-housing/excreta/poultry-manure/eu-regulations/battery-cages/aviaries/netherlands-

Abstract: Government targets for ammonia emission and for N and P loss per hectare (ha) of agricultural land were used to assess carrying capacity for poultry production in The Netherlands with data from 1990. In addition, the effect of alternative management strategies on carrying capacity was determined. Ammonia emission from poultry production in 1990 [20.5 gigagrams (Gg) N] exceeded the target for 2000 (i.e., 6.9 Gg N). Targets defined for 2000 and 2010 (i.e., 4.6 Gg N) can be achieved, however, without reducing poultry numbers, assuming national introduction of measurements studied. Measures that reduced ammonia emission directly, i.e., introduction of low-emission housing or manure application techniques, were most effective. In 1990, N and P losses equalled 215 kg/ha for N and 31 kg/ha for P. The N loss was slightly lower than the target for 2000 (219 kg N/ha) but exceeded the target for 2010 (144 kg N/ha). Reduction of application of artificial N fertilizer, however, reduced N loss effectively from 215 to 22 kg/ha. National P loss in 1990 exceeded the target for 2000 (15.3 kg P/ha). Reduction of application of artificial P fertilizer reduced P loss most effectively from 31 to 14 kg/ha. To achieve the target for 2010 (8.7 kg P/ha), additional reduction in P excretion by poultry is required. This reduction can be achieved by use of phytase in layer and broiler feed and by use of a coarse Ca source in layer feed. Unlike pig production, carrying capacity for poultry production in The Netherlands is

not limited by governmental targets for acidification, eutrophication, or drinking water contamination.

82. Nutrient management comes of age in the poultry industry.

Carpenter, G. H.

Biocycle. 41: 11 pp.61-63. (Nov 2000).

NAL Call #: 57.8-C734

Descriptors: poultry-manure/waste-utilization

83. Nutrient management practices among swine operations of various sizes.

Hassinger, W. J. II., Monahan, K. A., Scanlon, T. L., and Parsons, T. D.

J-Am-Vet-Med-Assoc. 217: 10 pp.1526-1530. (Nov 15, 2000).

NAL Call #: 41.8-Am3

Descriptors: pigs/pig-feeding/nutrients/cycling/environmental-impact/pig-manure/pig-farming/waste-disposal/farm-size/pennsylvania-

84. Nutritional implications for manure nutrient management planning.

Powers, W. J. and Van Horn, H. H.

Appl-eng-agric. 17: 1 pp.27-39. (Jan 2001).

NAL Call #: S671.A66

Descriptors: animal-manures/nutrient-content/mineral-content/prediction/balance-studies/planning/feeds/livestock/feed-intake/excretion/digestion/nitrogen/phosphorus/potassium/chemical-composition/application-to-land

Abstract: Nutrient management planning is necessary for many livestock producers. In order for producers to accurately plan on-farm nutrient generation and utilization, reasonable estimates of manure production and composition must be available. Amounts of manure nutrients (e.g., N, P, and K) originally excreted are predicted more accurately with a nutritionally based input-output model than are the amounts recovered because the amounts that are recovered vary depending on climate, storage and handling practices, and other site-specific influences. Records of amounts of manure collected and composition determined from manure sampling are essential to determine the total of manure nutrients that must be managed in the plan. It is important to compare recovered amounts with manure production estimates to determine if losses are reasonable and acceptable. Using nutritional inputs in the prediction of manure nutrient outputs permits nutrient management planners to interact with producers to assess the environmental cost of overfeeding critical nutrients. Manure management planners to interact with producers to assess the environmental cost of overfeeding critical nutrients. Manure nutrients (e.g., N, P, and K) equal the amounts in feed consumed minus the amounts in products produced (e.g., milk, eggs, meat, or offspring) whereas, the amount of manure dry matter is an inverse function of the ration digestibility. The indigestible dry matter is the expected amount of fecal dry matter; additional dry matter in urine is small. The percentage compositions of nutrients in manure recovered (accounting for nutrient losses as well as uncollected portions) are much more difficult to predict than total amounts that should be collected because anaerobic digestion of carbon-containing compounds that was initiated in the large intestines of animals continues after excretion or the fermentation shifts to aerobic. Volume reduction occurs as carbon dioxide and methane are emitted and non-volatile nutrients such as P and K are concentrated in the remaining dry matter.

From 40% to 75% of excreted N is in the urine as urea or uric acid (birds) and can be quickly volatilized as ammonia. Some losses of N to the atmosphere are unavoidable, at least 35% of excreted N in best case scenarios and 60%, or more, in most situations. Losses of non-volatiles such as P and K are small. Due to these changes, manure becomes increasingly P-rich relative to plant fertilization needs with N:P ratios usually below 3:1; whereas, ratios based on plant needs are much wider. Thus, acreages of crop production needed to recycle manure P are much greater than acreages needed for manure N. In the future, priority will be on reducing excretion of P and on retaining a higher percentage of excreted N. Dietary measures to impact P excretion will be increasingly important. To achieve environmentally acceptable nutrient balances, many animal production facilities will have to export manure or manure products or manipulate nutrient production to match nutrient needs. The role of diet will become increasingly important as producers establish whole-farm nutrient balance plans.

85. Open-vessel microwave digestion of animal waste samples for multi-element analysis.

Zhang, H. and Hattey, J. A.

Commun-soil-sci-plant-anal. 31: 17/18 pp.2959-2967. (2000).

NAL Call #: S590.C63

Descriptors: cattle-manure/poultry-manure/sample-processing/microwave-treatment/acid-treatment/nitric-acid/inorganic-acids/containers/hydrolysis/nutrient-content/chemical-composition/elements/phosphorus/potassium/copper/manganese/zinc/iron/calcium/sulfur/magnesium/perchloric-acid

Abstract: Wet acid digestion on a heat block or in a closed-vessel microwave digestion system normally use half a gram to 1 gram of organic samples, but it is difficult to take a small quantity of representative sample from animal waste materials due to their heterogeneity. This study investigated an alternative microwave digestion system to prepare animal manure samples for plant nutrient analysis. Two types of solid animal manure and two reference plant samples were digested with an open-vessel microwave digestion system and with the conventional nitric/perchloric acid block digestion, and analyzed for macro-and micronutrients. Results of the open-vessel microwave digested samples were comparable to those digested by conventional block digester and in high agreement with the certified values of reference materials. The open-vessel microwave can reduce digestion time from about 4 hours to about 30 minutes. Fresh samples up to 10 grams can be completely digested directly by the open-vessel microwave without sample drying and grinding. Sample representation of bulk manure should be better when sample size increased from 1 to 10 grams. Eliminating drying and grinding before digestion improves lab efficiency.

86. Operating temperature and retention time effects on the thermochemical conversion process of swine manure.

He, B. J., Zhang, Y., Yin, Y., Funk, T. L., and Riskowski, G. L.

Trans-ASAE. 43: 6 pp.1821-1825. (Nov/Dec 2000).

NAL Call #: 290.9-Am32T

Descriptors: pig-manure/waste-utilization/biomass-energy

Abstract: A thermochemical conversion (TCC) reactor was developed to process swine manure for waste reduction and energy production. The operating temperature and retention time are the two key parameters affecting the process. Carbon monoxide (CO) was employed as the reductive reagent. The investigated ranges of the operating temperature and retention time were 275

degrees C approximately 350 degrees C (corresponding operating pressures were 7 approximately 18 MPa) and 5 approximately 120 min, respectively. The pH value of the fresh swine manure (pH = 6.1), CO to VS ratio (CO:VS = 0.07 by weight or CO initial pressure P(ini) = 690 kPa), and total solids content (TS = 20%) were kept constant for all the experiments in this study. No extra catalyst was added in the experiments because of the presence of plentiful minerals and carbonates. The operating temperature was the most important factor affecting the TCC process. No substantial oil product yield was achieved unless the temperature reached 285 degrees C or above. Temperature higher than 335 degrees C led to solid char formation. Retention time affected the completeness of the TCC process. The retention time for achieving high oil yield and quality was largely dependent upon the operating temperature levels. The suggested operating temperature and retention time for the TCC process are 295 degrees C to 305 degrees C and 15 to 30 min, respectively.

87. An operational strategy for improved biomethanation of cattle-manure slurry in an unmixed, single-stage, digester.

Ong, H. K., Greenfield, P. F., and Pullammanappallil, P. C.
Bioresour-technol. 73: 1 pp.87-89. (May 2000).

NAL Call #: TD930.A32

Abstract: In the quiescent state, cattle-manure slurry stratifies into three discernible layers; a floating "scum" layer, a bottom "sludge" layer and a watery middle layer, with most of the biologically degradable component of the slurry being contributed by the particulate matter in these layers. The top layer has the highest biochemical methane potential and the middle layer the least. In a single-stage digester, an improved operational strategy to enhance methane production was determined. This strategy took advantage of the different rates of biomethanation and biochemical methane potentials of the different layers of the slurry. This was achieved by allowing the slurry to digest without mixing and discharging the digested material from the middle liquid layer rather than from the bottom or top layers.

88. Optimal use of the Hosoya system in composting poultry manure.

Georgakakis, D. and Krintas, T.
Bioresour-technol. 72: 3 pp.227-233. (May 2000).

NAL Call #: TD930.A32

Abstract: A study was undertaken to optimize the use of the Hosoya system in composting poultry manure in a typical layer poultry farm in Greece. The farm is located about 50 km north of Athens with a Hosoya system installed which has been in operation for more than 4 years. During the study the performance of the system was investigated and samples of the material under process were taken for moisture determination and total and volatile solids analyses. The temperature of the material, as well as the temperature and the relative humidity of the surrounding air, were also monitored. The results showed that the composting process could not be completed in the oval Hosoya installation. This could be attributed to the required intensive daily turning and pushing of the manure in the installation, in order to reach the exit at the desired rate. As a result, an early drastic temperature drop of the material occurred. A further step is then necessary for efficient completion of the composting process of this type of manure. In such a case, the Hosoya system can be considered as the necessary mechanical precomposting step required for the high moisture and muddy-textured layer poultry manure prior to its being fully composted in piles or windrows.

89. Organic farming: challenge of timing nitrogen availability to crop nitrogen requirements.

Pang, X. P. and Letey, J.

Soil-Sci-Soc-Am-j. [Madison, Wis.] Soil Science Society of America. Jan/Feb 2000. v. 64 (1) p. 247-253. pp.

NAL Call #: 56.9-So3

Descriptors: zea-mays/triticum-aestivum/poultry-manure/cattle-manure/nitrogen/mineralization/nutrient-availability/nutrient-uptake/synchronization/simulation-models/seasonal-variation/crop-yield/leaching/organic-farming/enviro-gro-model

Abstract: Groundwater has become increasingly degraded by NO₃, and this degradation has been partially attributed to the use of commercial inorganic N fertilizers. Conversion from conventional fertilizer management to organic farming has been proposed as a means to reduce groundwater degradation. Matching soil inorganic N supply with crop N requirement on a temporal basis is important to achieve high yield and low water degradation. Dynamics of N mineralization from two manures and N-uptake dynamics for two crop were derived from published data, and multi year simulations were done using the ENVIRON-GRO computer model, which accounts for N and irrigation management effects on crop yield and N leaching. The temporal N-mineralization and N-uptake curves did not match well. The potential N uptake for corn (*Zea mays* L.) exceeded the cumulative mineralized N during a significant period that would cause reduced yield. Wheat (*Triticum aestivum* L.) has a low and flat N-uptake peak, so that the cumulative mineralized N met N demand by wheat during the growing season. A crop with a very high maximum N-uptake rate, such as corn, would be difficult to fertilize with only organic N to meet peak demands without excessive N in the soil before and after crop growth. In order to satisfy crop N demand, a large amount of manure, which would leave much N or subsequent leaching, must be applied. It took two or more years after conversion to organic sources of N to reach maximum yield because of carryover of unmineralized manure and accumulation of mineralized N after crop uptake which was not completely leached during the winter. High initial applications to build up the organic pool. followed by reduced inputs in subsequent years would be appropriate.

90. Phosphorus distribution and availability in response to dairy manure applications.

Gale, P. M., Mullen, M. D., Cieslik, C., Tyler, D. D., Duck, B. N., Kirchner, M., and McClure, J. *Commun-soil-sci-plant-anal.* 31: 5/6 pp.553-565. (2000).

NAL Call #: S590.C63

Descriptors: silt-loam-soils/loess-soils/dairy-cattle/cattle-manure/liquid-manures/application-rates/application-to-land/triple-superphosphate/phosphorus/fractionation/nutrient-availability/movement-in-soil/tennessee/soil-phosphorus-pools

Abstract: As livestock operations become larger and concerns about water quality become greater, attention must be paid to the composition of animal manure and its potential impact on the environment. One current concern involves the amount and forms of phosphorus (P) being added to land with manure. The objective of this experiment was to determine the forms and availability of P in soils receiving 4 years of continuous dairy manure applications. Soil samples were collected from lysimeter plots established in 1991 to study the impact of dairy manure applications on surface water and groundwater. Soil P was fractionated into available (NaHCO₃), iron (Fe)-and aluminum (Al)-bound (NaOH), and calcium (Ca)-bound (HCl) forms. These data were related to manure application rates, soluble P concentrations, and anion

exchange membrane (AEM) bound P. Results indicate that the potential to move P by leaching through these loessial soils is very low even at high manure application rates. Large manure additions resulted in increases in all P forms; however, the inorganic pools increased more than the organic pools. The AEM values were a good tool for predicting potential P movement by soil erosion or runoff with membrane bound P being strongly correlated with manure application rate ($r^2=0.82$) and available P (NaHCO_3). Best management practices for manure disposal need to consider the potential for P movement through erosion and runoff, and the AEM technique provides a means for evaluating this potential.

91. Phosphorus forms in manure and compost and their release during simulated rainfall. [Erratum: Nov/Dec 2000, v. 29 (6), p. 2053.]

Sharpley, A. and Moyer, B.

J-environ-qual. 29: 5 pp.1462-1469. (Sept/Oct 2000).

NAL Call #: QH540.J6

Descriptors: phosphorus/animal-manures/composts/losses-from-soil/runoff/solubility/rain/simulation-

Abstract: The large accumulation of P in manure from animal feeding operations in localized areas has increased the potential for P export following land application. Impairment of freshwater quality by accelerated eutrophication has focused attention on manure management and the potential for P loss in runoff. Thus, we investigated the amounts and relative solubilities of P in manures and their composts using a modified Hedley fractionation and release of P during simulated rainfall (70 mm h⁻¹ for 30 min) in laboratory columns (15-cm diameter). Twenty-four samples each of dairy manure, dairy manure compost, poultry manure, poultry manure compost, poultry litter, and swine manure were collected over 2 yr. Total P concentration ranged from 2600 to 40 000 mg kg⁻¹, mostly as inorganic P (63 to 92%). The distribution of inorganic and organic P fractions depended on manure and compost type. Most of the inorganic P, 80%, was water extractable (2030 mg kg⁻¹), while 55% was hydroxide extractable in swine slurry (16620 mg kg⁻¹) and 38% acid extractable in poultry manure (9320 mg kg⁻¹). The dissolved inorganic P concentration in leachate from manure and compost (10 Mg ha⁻¹ manure application rate) during a 30-min rainfall ranged from 34 (poultry litter) to 75 mg L⁻¹ (poultry manure). The amount of P leached by five simulated rainfall events was significantly correlated to respective water extractable inorganic ($r^2 = 0.98$) or organic P ($r^2 = 0.99$) of each material. This suggests that water extractable P may be used to estimate the potential for land-applied manures or composts to enrich leachate and surface runoff P.

92. Phosphorus (P) management in the 'De Marke' dairy farming system.

Aarts, H. F. M., Habekotte, B., and Keulen, H. van.

Nutr-cycl-agroecosyst. Dordrecht, The Netherlands ; Boston : Kluwer, c1996-. Mar 2000. v.56 (3) p. 219-229. pp.

NAL Call #: S631.F422

Descriptors: dairy-farming/phosphorus/farming-systems/farming-systems-research/sandy-soils/soil-fertility/water-quality/leaching/intensive-production/feeds/phosphorus-fertilizers/milk/cattle/crops/growth/cattle-slurry/zea-mays/pollution-control/cattle-feeding/water-pollution/netherlands-

93. Phosphorus reduction techniques used in broiler nutrition.

Saylor, W. W.

Feedstuffs. 72: 33 pp.11-15. (Aug 7, 2000).

NAL Call #: 286.81-F322

Descriptors: broilers/animal-wastes/phosphorus/excretion/environmental-impact/diet/poultry-feeding/nutrient-requirements

94. Physical, chemical and bimethanation characteristics of stratified cattle-manure slurry.

Ong, H. K., Pullammanappallil, P. C., and Greenfield, P. F.

Asian-australas-j-anim-sci. 13: 11 pp.1593-1597. (Nov 2000).

NAL Call #: SF55.A78A7

Descriptors: cattle-slurry/digesters/methane-production/particle-size-distribution/cell-wall-components/nitrogen-content/chemical-composition/biogas-slurry

95. The potential impact of imposing best management practices for nutrient management on the US broiler industry.

McIntosh, C. S., Park, T. A., and Karnum, C.

J-environ-manage. 60: 2 pp.145-154. (Oct 2000).

NAL Call #: HC75.E5J6

Descriptors: broiler-production/poultry-industry/poultry-manure/animal-wastes/waste-disposal/economic-impact/production-costs/regulations/multivariate-analysis/time-series/usa-

96. Potential of earthworm burrows to transmit injected animal wastes to tile drains.

Shipitalo, M. J. and Gibbs, F.

Soil-Sci-Soc-Am-j. [Madison, Wis.] Soil Science Society of America. Nov/Dec 2000. v. 64 (6) p. 2103-2109. pp.

NAL Call #: 56.9-So3

Descriptors: agricultural-soils/animal-manures/application-to-land/soil-injection/placement/lumbricus-terrestris/animal-burrows/transport-processes/movement-in-soil/tile-drainage/no-tillage/infiltration/flow-to-drains/ohio/animal-manure-management/best-management-practices/preferential-flow/distance-to-tile-drain

Abstract: Subsurface injection of animal manure is a best management practice (BMP) that reduces odors and promotes efficient nutrient usage. In tile-drained fields, however, injected wastes have been observed emerging from tile outlets shortly after application. This appears to be a particular concern in no-till fields where *Lumbricus terrestris* L. are often numerous. Our objective was to determine if burrows created by this earthworm species can contribute to rapid movement of injected wastes to tile drains. A turbine blower was used to force smoke into a 0.6 m-deep tile line in a no-till field and 20 burrows 0.02 to 0.5 m from the tile that emitted smoke, and 18 burrows 0.8 to 4.7 m from the tile that did not produce smoke were flagged. A Mariotte device filled with dyed water was then used to measure infiltration rate for each burrow. Afterwards, plastic replicas of the burrows were made so their proximity to the tile and geometrical properties could be determined. Average infiltration rate for smoke-emitting burrows (128 mL min⁻¹) was twice that of the more distant burrows. Moreover, dyed water was observed in the tile when added to smoke-emitting burrows, but not when added to burrows that did not produce smoke. Thus, earthworm burrows in close proximity to tile lines may expedite

transmission of injected wastes offsite. Movement of injected wastes to tiles via earthworm burrows and other preferential flow paths may be reduced by using precision farming to avoid waste application near tile lines or by modifying application procedures.

97. Private manure applicator implementation study.

Minnesota. Dept. of Agriculture.

St. Paul, MN : Minnesota Dept. of Agriculture, [2001] 48 p. : ill., map: Cover title. "January 30, 2001." Includes bibliographical references (p. 45-48). NAL Call #: S655-.P75-2001

Descriptors: Manure-handling/Farm-manure

98. Proceedings, 2000 National Poultry Waste Management Symposium.: 2000 National Poultry Waste Management Symposium.

Blake, John John P., Patterson, Paul H., and National Poultry Waste Management Symposium (7th : 2000 : Ocean City, Md. [Auburn University, AL?] : National Poultry Waste Management Symposium Committee, 2000. xv, 390 p. : ill.: Symposium held in Ocean City, MD. Includes bibliographical references.

NAL Call #: TD899.P65-N3-2000

Descriptors: Animal-waste-Recycling-Congresses/Poultry-Manure-Handling-Congresses/Animal-waste-Congresses/Poultry-industry-Waste-disposal-Congresses

99. Quantitative effects of feed protein reduction and methionine on nitrogen use by cows and nitrogen emission from slurry.

Krober, T. F., Kulling, D. R., Menzi, H., Sutter, F., and Kreuzer, M.

J-dairy-sci. 83: 12 pp.2941-2951. (Dec 2000).

NAL Call #: 44.8-J822

Descriptors: dairy-cows/swiss-brown/dietary-protein/methionine/feed-additives/nitrogen-metabolism/cattle-slurry/ammonia/volatility/air-quality/milk-composition/urea/milk-yield/amino-acids/nitrogen-balance/rumen-protected-methionine

Abstract: The effects on N use and N volatilization from slurry were investigated in 24 early-lactation Brown Swiss cows (32 kg/d milk) fed four diets with 128, 124, 147 and 175 g/kg DM of crude protein (CP). All diets were supplemented with 0.75 g/kg of rumen-protected Met except for one of the low-protein rations (128 g/kg of CP). The unsupplemented low-protein ration was calculated to be deficient in Met by approximately 20%. No significant treatment effects on performance, water intake and excretion, and slurry quantities were observed. Differences in N intake were closely reflected in the daily excretions of total and urea N via urine, and in urine N as a proportion of total excretory N. These values were higher for the unsupplemented low-protein ration than for the Met-supplemented low-protein ration. The treatment effects on fecal N excretion were generally smaller, and milk N excretion and N balance were not affected. Feed N utilization for milk N excretion increased with decreasing CP content from 27% for the high-protein group to about 35% for the two low-protein groups. Comparing the Met supplemented rations only, ammonia N emission from fresh slurry (excreta:water = 1:0.5) decreased from 231 to 160 and 55 microgram/s per square meter of surface with 175, 147 and 124 g/kg of CP, respectively, and the corresponding total N losses during 7 wk of slurry storage declined from 89 to 57 and 25 g/d per cow. Regression analysis demonstrated the basic suitability of milk urea N excretion to estimate urine N excretion and, consequently, potential N emissions.

100. **Recovering costs of managing manure.** *Biocycle*. 41: 3 pp.80, 82. (Mar 2000).

NAL Call #: 57.8-C734

Descriptors: cattle-manure/anaerobic-digestion/methane-production/on-farm-processing/vermont/manure-management

101. **Reduced levels of alum to amend broiler litter.**

Worley, J. W., Cabrera, M. L., and Risse, L. M.

Appl-eng-agric. 16: 4 pp.441-444. (July 2000).

NAL Call #: S671.A66

Descriptors: litter/wood-shavings/aluminum-sulfate/application-rates/propane/broilers/mortality/performance/liveweight/feed-conversion/population-density/alphitobius-diaperinus/chemical-composition/energy-consumption/water-content/nitrogen-content/nitrate-nitrogen/ammonium-nitrogen/phosphorus/heating-costs/insect-control

102. **Reducing dairy manure odor and producing energy.**

Wilkie, A. C.

Biocycle. 41: 9 pp.48-50. (Sept 2000).

NAL Call #: 57.8-C734

Descriptors: dairy-cattle/cattle-manure/anaerobic-digestion/biogas/odor-abatement

103. **Reducing phosphorus runoff and inhibiting ammonia loss from poultry manure with aluminum sulfate.**

Moore, P. A. Jr., Daniel, T. C., and Edwards, D. R.

J-environ-qual. 29: 1 pp.37-49. (Jan/Feb 2000).

NAL Call #: QH540.J6

Descriptors: poultry/phosphorus/runoff/ammonia/aluminum-sulfate/pollution-control/poultry-manure

Abstract: Applications of aluminum sulfate ($\text{Al}_2(\text{SO}_4)_3 \cdot 14\text{H}_2\text{O}$), commonly referred to as alum, to poultry litter have been shown to decrease P runoff from lands fertilized with litter and to inhibit NH_3 volatilization. The objectives of this study were to evaluate the effects of alum applications in commercial broiler houses on: (i) NH_3 volatilization (in-house), (ii) poultry production, (iii) litter chemistry, and (iv) P runoff following litter application. Two farms were used for this study: one had six poultry houses and the other had four. The litter in half of the houses at each farm was treated with alum; the other houses were controls. Alum was applied at a rate of 1816 kg/house, which corresponded to 0.091 kg/bird. Each year the houses were cleaned in the spring and the litter was broadcast onto paired watersheds in tall fescue at each farm. Results from this study showed that alum applications lowered the litter pH, particularly during the first 3 to 4 wk of each growout. Reductions in litter pH resulted in less NH_3 volatilization, which led to reductions in atmospheric NH_3 in the alum-treated houses. Broilers grown on alum-treated litter were significantly heavier than controls (1.73 kg vs. 1.66 kg). Soluble reactive phosphorus (SRP) concentrations in runoff from pastures fertilized with alum-treated litter averaged 73% lower than that from normal litter throughout a 3-yr period. These results indicate that alum-treatment of poultry litter is a very effective best management practice that reduces nonpoint source pollution while it increases agricultural productivity.

104. The relationship of land use practices to surface water quality in the Upper Oconee Watershed of Georgia.

Fisher, D. S., Steiner, J. L., Endale, D. M., Stuedemann, J. A., Schomberg, H. H., Franzluebbers, A. J., and Wilkinson, S. R.

For-ecol-manage. 128: 1/2 pp.39-48. (Mar 15, 2000).

NAL Call #: SD1.F73

Descriptors: land-use/water-quality/surface-water/watersheds/spatial-distribution/contamination/water-conservation/nature-conservation/dairy-farming/beef-production/poultry-farming/urbanization/phosphorus/nitrogen/fecal-coliforms/water-supply/urban-areas/microbial-flora/bioassays/escherichia-coli/enterococcus/manures/water-flow/turbidity/georgia-

105. Resource mapping and analysis of farm livestock manures--assessing the opportunities for biomass-to-energy schemes.

Dagnall, S., Hill, J., and Pegg, D.

Bioresour-technol. 71: 3 pp.225-234. (Feb 2000).

NAL Call #: TD930.A32

Descriptors: farmyard-manure/energy-sources/anaerobic-digestion/combustion/mapping/geographical-information-systems/uk-

Abstract: Livestock farms produce manure, and this has a high potential for pollution.

Alternative, environmentally acceptable disposal routes with potential financial benefits might lie in the development of biomass-to-energy schemes, which often provide fertiliser as a by-product. Two options are being seriously considered by industry in Europe: centralised anaerobic digestion (AD) and direct combustion. This paper outlines the use of resource mapping to assist in the siting of centralised AD schemes; similar techniques may also be used to site other types of biomass to energy schemes, including direct combustion of farm manures. The paper uses a study in the UK to show how resource mapping and analysis can be used to identify sources of collectable farmyard manure in order to determine the potential for AD plants. With the forthcoming introduction of the European Commission (EC) Integrated Pollution Prevention and Control (IPPC) Directive, this could prove a valuable tool to highlight the priority areas where the potential for pollution could be a problem.

106. A review of methods for measuring emission rates of ammonia from livestock buildings and slurry or manure stores. 1. Assessment of basic approaches.

Phillips, V. R., Scholtens, R., Lee, D. S., Garland, J. A., and Sneath, R. W.

J-agric-eng-res. 77: 4 pp.355-364. (Dec 2000).

NAL Call #: 58.8-J82

Descriptors: ammonia/emission/pollutants/animal-manures/storage/slurries/animal-housing/measurement/odor-abatement/pollution-control

Abstract: Ammonia emissions to the atmosphere are environmentally important, not only because of their role in the chemistry of air pollutants present in the atmosphere, but also because of the undesirable ecological effects of N compounds subsequently deposited from the atmosphere back to land. The great majority of ammonia emissions stem from livestock farming, and so there is an urgent need for improved methods for measuring emission rates of ammonia from livestock buildings and slurry or manure stores, e.g. to guide research on abatement strategies. In this paper, the possible approaches to this measurement task have been reviewed.

Four basic approaches were identified: I--feed and manure nitrogen balance (ammonia by difference); II--summation of local ammonia sources; III--determining ammonia fluxes, either directly or indirectly, using an envelope more or less remote from the ammonia source; IV--measurement of ammonia sources to air e.g. by a tracer ratio method. An important objective of this review was to identify the best approach(es) for development to give a robust method for on-farm determination of ammonia emission rates. (Robust was defined basically as able to give an accurate result without an excessive level of operator skill.) A ranking exercise covering 11 aspects of each of the above approaches was carried out. Top rank was awarded to the measurement of ammonia sources to air (Approach IV), and second rank to one of the several possible embodiments of determining ammonia fluxes (Approach III).

107. A review of methods for measuring emission rates of ammonia from livestock buildings and slurry or manure stores. 2. Monitoring flux rates, concentrations and airflow rates.

Phillips, V. R., Lee, D. S., Scholtens, R., Garland, J. A., and Sneath, R. W.

J-agric-eng-res. 78: 1 pp.1-14. (Jan 2001).

NAL Call #: 58.8-J82

Descriptors: ammonia/emission/slurries/animal-manures/stores/concentration/air-flow/ventilation/animal-housing/monitoring-

108. A review of microbiology in swine manure odor control.

Zhu, J.

Agric-ecosyst-environ. 78: 2 pp.93-106. (Apr 2000).

NAL Call #: S601.A34

Descriptors: pig-manure/odors/odor-abatement/odor-emission/microbial-flora/volatile-compounds/storage/bacteria/interactions/species-differences/biological-control/eubacterium/clostridium/volatile-fatty-acids/anaerobic-conditions/methane-production/temperature/additives/aeration/literature-reviews

Abstract: Generation of odors is a complex process that involves many bacterial species, producing an extensive array of volatile organic compounds under different manure storage systems currently used. A lack of understanding of the basic microbiology in manure leads to a poor odor prevention and control from animal wastes. This review covers pertinent available information about the indigenous bacterial genera in swine manure and their potentials of producing odorous volatile compounds. It addresses not only the odorous compounds in swine manure but also the inherent relations between the bacterial species and the related compounds. It also discusses several odor control techniques that have been developed based on microbial activities and the limitations with these techniques. Two bacterial genera, Eubacterium and Clostridium, are most likely the major contributors to odorous volatile fatty acids. It appears that anaerobic lagoons may not be an appropriate choice for treating swine manure for odor control due to the reduced methanogenic activities resulted from the low temperatures in lagoon liquid. Also, it seems questionable that the microbial-based manure additives will work, without aeration, in a real storage system for the purpose of odor control.

109. The role of qualified credentialed professionals under Alabama's AFO/CAFO rules.

Tyson, Ted W.

[Auburn, Ala.] : Alabama Cooperative Extension System, [2001] 3, [1] p.: Caption title. "New April 2001."--P. [4]. NAL Call #: S544.3.A2-C47-no.-1206

110. Runoff and soil loss as affected by the application of manure.

Gilley, J. E. and Risse, L. M.

Trans-ASAE. 43: 6 pp.1583-1588. (Nov/Dec 2000).

NAL Call #: 290.9-Am32T

Descriptors: animal-wastes/erosion/runoff/application-to-land/losses-from-soil

Abstract: Manure has been used effectively to improve crop production and soil properties because it contains nutrients and organic matter. While it is generally accepted that the improved soil properties associated with manure application lead to changes in runoff and soil erosion, few studies have quantified these impacts. Water quality models used to assess watershed management and estimate total maximum daily load must accurately predict loading rates from fields where manure has been applied. This study was conducted to assemble and summarize information quantifying the effects of manure application on runoff and soil loss resulting from natural precipitation events, and to develop regression equations relating runoff and soil loss to annual manure application rates. For selected locations at which manure was added annually, runoff was reduced from 2 to 62%, and soil loss decreased from 15 to 65% compared to non-manured sites. Measured runoff and soil loss values were reduced substantially as manure application rates increased. Regression equations were developed relating runoff and soil loss to manure application for rates ranging from 11 to 45 Mg ha⁻¹, and slope lengths varying from 21 to 24 m. The equations can be used in estimating environmental impacts or to account for manure applications in water quality modeling efforts.

111. Runoff water quality from poultry litter-treated pasture and forest sites.

Sauer, T. J., Daniel, T. C., Nichols, D. J., West, C. P., Moore, P. A. Jr., and Wheeler, G. L.

J-environ-qual. 29: 2 pp.515-521. (Mar/Apr 2000).

NAL Call #: QH540.J6

Descriptors: poultry-manure/application-to-land/runoff/water-quality/site-factors/phosphorus/nitrate-nitrogen/pastures/forests/arkansas/nutrient-transport

Abstract: In the Ozark Highlands of the USA (36-38 degrees N, 91-95 degrees W), annual application of poultry litter to pasture land is a routine waste management practice. The objective of this study was to measure the effect of site characteristics and poultry litter application on runoff and nutrient transport from grazed pasture and forest sites at different landscape positions. Sixteen pairs of 1 X 2 m plots were established on Nixa (loamy-skeletal, siliceous, active, mesic Glossic Fragiudults) and Clarksville (loamy-skeletal, siliceous, semiactive, mesic Typic Paleudults) cherty silt loams. One plot of each pair received 4.5 Mg ha⁻¹ of poultry litter. Rainfall was simulated at 75 mm h⁻¹ for 1 h (25-yr return period storm) one month after litter application. A composite runoff sample was analyzed for dissolved reactive phosphorus (DRP), total phosphorus (TP), ammonia N (NH₃-N), nitrate N (NO₃-N), total Kjeldahl nitrogen (TKN), and total suspended solids (TSS). Poultry litter-treated plots had consistently higher concentrations of all water quality parameters tested compared to untreated plots. Concentration of DRP in runoff from untreated plots was linearly correlated with three soil P tests ($0.35 < r^2 < 0.85$). Soil P on litter-treated plots had little effect on runoff DRP, which averaged 2.20 mg L⁻¹. High variation in runoff resulted in only NO₃-N showing significantly greater losses due to

poultry litter treatment at two pasture sites. Results indicate that variation in runoff has a significant effect on nutrient transport from grazed pastures receiving poultry litter.

112. Setting the animal waste management policy context.

Norris, P. E. and Batie, S. S.

Proc-Agric-Outlook-Forum. Washington, D.C. : U.S. Dept. of Agriculture, World Agricultural Outlook Board,. 2000. p. n/a. pp.

URL: <http://ageconsearch.umn.edu/bitstream/33455/1/fo00no01.pdf>

NAL Call #: aHD1755.A376

Descriptors: animal-wastes/waste-disposal/agricultural-policy/usa-

113. Simulation of low temperature anaerobic digestion of dairy and swine manure.

Hill, D. T., Taylor, S. E., and Grift, T. E.

Bioresour-technol. 78: 2 pp.127-131. (June 2001).

NAL Call #: TD930.A32

Descriptors: cattle-manure/pig-manure/methane/methane-production

Abstract: The data reported by L.M. Safley, P.W. Westerman [Bioresource Technology 47 (2) (1994) 165-171] from the laboratory digestion of dairy and swine manure at psychrophilic temperatures (i.e., 10-23 degrees C) have been used to determine the response of the latest comprehensive dynamic mathematical model of methanogenesis [D.T. Hill, S.A. Cobb, Transactions of the ASAE 39 (2) (1996) 565-573] in this low temperature range. Extensive performance data from digesters using animal waste in this temperature range have been lacking, thus allowing limited validation of the comprehensive model. The results of the comprehensive model simulations were compared with the actual data reported by Safley and Westerman (loc. cit.) and with their empirical regression models. Results indicate that the comprehensive model is as accurate as Safley and Westerman's models for three of the four cases reported, but shows a great dissimilarity for the fourth case.

114. The soil management series.: Soil management. Compaction. Manure management. Organic matter management. Soil biology and soil management.

Lewandowski, Ann., Morse, Debra Elias., and Minnesota Extension Service. Minnesota Institute for Sustainable Agriculture. United States. Natural Resources Conservation Service.

[St. Paul, MN : University of Minnesota Extension Service, 2000] 5 v. : ill.: Cover title. "MISA; USDA NRCS"--P. [4] of cover. Includes bibliographical references. CONTENTS NOTE: 1. Soil management -- 2. Compaction -- 3. Manure management -- 4. Organic matter management -- 5. Soil biology and soil management.

NAL Call #: S591-.L48-2000

Descriptors: Soil-management/Soil-stabilization/Manures/Humus/Soil-biology

115. Soil-plant-animal relations in nutrient cycling: the case of dairy farming system 'De Marke.'

Keulen, H. van., Aarts, H. F. M., Habekotte, B., Meer, H. G. van der., and Spiertz, J. H. J.

Eur-J-agron. 13: 2/3 pp.245-261. (Aug 2000).

NAL Call #: SB13.E97

Descriptors: dairy-farming/farming-systems/cycling/livestock/soil/fodder-crops/milk/nutrient-availability/losses/sustainability/sandy-soils/quantitative-analysis/volume/dry-

matter/phosphorus/grasses/zea-mays/beta-vulgaris/animal-manures/feeds/meat/farm-management/soil-fertility/netherlands-

116. Soil solution chemistry of a fly ash-, poultry litter-, and sewage sludge-amended soil.

Jackson, B. P. and Miller, W. P.

J-environ-qual. 29: 2 pp.430-436. (Mar/Apr 2000).

NAL Call #: QH540.J6

Descriptors: fly-ash/poultry-manure/sewage-sludge/soil-amendments/application-to-land/trace-elements/solubility/soil-chemistry/waste-utilization

Abstract: Mixing coal fly ash (FA) with organic wastes to provide balanced soil amendments offers a potential viable use of this industrial by-product. When such materials are land-applied to supply nutrients for agronomic crops, trace element contaminant solubility must be evaluated. In this study, major and trace element soil solution concentrations arising from application of fly ash, organic wastes, and mixtures of the two were compared in a laboratory incubation. Two fly ashes, broiler poultry litter (PL), municipal sewage sludge (SS), and mixtures of FA with either PL or SS were mixed with a Cecil sandy loam (fine, kaolinitic, thermic Typic Kanhapludult) at rates of 32.3, 8.1, and 16.1 g kg⁻¹ soil for FA, PL, and SS, respectively. Treatments were incubated at 22 degrees C at 17% moisture content and soil solution was periodically extracted by centrifugation over 33 d. Initial soil solution concentrations of As, Mo, Se, and Cu were significantly greater in FA/PL treatments than the respective FA-only treatments. For Cu, increased solution concentrations were attributable to increased loading rates in FA/PL mixtures. Solution Cu concentrations were strongly correlated with dissolved C ($R^2 > 0.96$) in all PL treatments. Significant interactive effects for solution Mo and Se concentrations were observed for the FA/PL and may have resulted from the increased pH and competing anion concentrations of these treatments. Solution As concentrations showed a significant interactive effect for one FA/PL mixture. For the individual treatments, As was more soluble in the PL treatment than either FA treatment. Except for soluble Se from one FA/SS mixture, trace element solubility in the FA/SS mixtures was not significantly different than the respective FA-only treatment.

117. Soybean varietal response to liquid swine manure application.

Schmidt, J. P., Lamb, J. A., Schmitt, M. A., Randall, G. W., Orf, J. H., and Gollany, H. T.

Agron-j. 93: 2 pp.358-363. (Mar/Apr 2001).

NAL Call #: 4-AM34P

Descriptors: glycine-max/pig-slurry/pig-manure/cultivars/crop-management/crop-yield/dry-matter-accumulation/nitrogen/lodging/field-experimentation/soil-injection/seed-output/genotype-environment-interaction/sclerotinia-sclerotiorum/minnesota-

Abstract: Applying manure to soybean [*Glycine max* (L.) Merr.] as a routine management practice requires additional information about cultivar-dependent responses. Our objective was to determine seed yield, dry matter accumulation, N accumulation, and lodging responses for a cross-section of adapted public and private soybean cultivars when liquid swine (*Sus scrofa*) manure was applied. Field studies were conducted at seven locations in southern Minnesota during 1996 and 1997. Whole-plot treatments included three swine manure rates (zero, low, and high) injected with sweeps to a soil depth of 13 cm before planting. Split-plot treatments consisted of 12 public and private soybean cultivars. Average seed yield for all cultivars at three of seven locations was generally positive, increasing on average 1.4 kg kg⁻¹ of applied available N. A significant manure rate X cultivar interaction was observed for lodging scores, but

increased lodging was not related to any change in yield. Seed yield decreased with increasing manure rates at a seventh location, where there was a history of white mold [*Sclerotinia sclerotiorum* (lib.) d. By.] incidence. At this location, seed yield for the control was 0.20 Mg ha⁻¹ greater than seed yield from either manure rate, and response to manure application was not the same for every cultivar. Except for this latter site, seed yield response to increasing manure rate was either favorable or innocuous, despite increased lodging. Manure application to soybean appears to be an acceptable management practice regardless of cultivar, except when the application exacerbated an already present disease pressure.

118. Spatial and temporal dynamics of methane emissions from agricultural sources in China.

Verburg, P. H. and Gon, H. A. C. D. van der.

Glob-chang-biol. 7: 1 pp.31-47. (Jan 2001).

NAL Call #: QC981.8.C5G6323

Descriptors: agriculture/methane/emission/spatial-variation/temporal-variation/land-use/livestock/crop-management/history/simulation-models/oryza-sativa/fermentation/manures/flooded-rice/paddy-soils/china-

119. State legislation regulating animal manure management.

Metcalf, M.

Rev-agric-econ. 22: 2 pp.519-532. (Fall/Winter 2000).

NAL Call #: HD1773.A3N6

Descriptors: manures/water-quality/regulations/legislation/state-government/environmental-protection

120. Strategies to encourage better use of nitrogen in animal manures.

Chambers, B. J., Smith, K. A., and Pain, B. F.

Soil-use-manage. 16: suppl. pp.157-161. (June 2000).

NAL Call #: S590.S68

Descriptors: animal-manures/nitrate/leaching/losses-from-soil/application-rates/application-methods/ammonia/volatilization/mineralization/organic-nitrogen-compounds/application-date/nutrient-uptake/crops/nutrient-availability/programs/maff-nitrate-program

Abstract: Research conducted in the MAFF Nitrate Programme has been used to formulate new and improved guidelines on the efficient use of manure nitrogen (N). In order to reduce nitrate leaching losses, manures containing large amounts of available N (i.e. slurries and poultry manures) should not be applied to free-draining soils in the period from autumn to early winter. Also, for efficient nutrient utilization manure application rates should be consistent with agronomic requirements (up to 250 kg total N ha⁻¹ yr⁻¹). Existing farm machinery was shown to be capable of applying manures evenly to grassland and arable stubbles, but required an accurate estimate of application rate and the careful matching of spreading widths. To provide growers with detailed guidance on the fertilizer N replacement value of manures the computer-based decision support system MANNER (MANure Nitrogen Evaluation Routine) has been developed. The much improved understanding of manure N losses and availability has been summarized in a series of 'Managing Livestock Manures' booklets, the MAFF Fertilizer Recommendation booklet and the Codes of Good Agricultural Practice.

121. Straw chopper systems for manure pipelines : final report.

Boyden, Alan. and Prairie Agricultural Machinery Institute (Canada). Saskatchewan. Agriculture Development Fund. [Regina] : Agriculture Development Fund, [2000] 14, 28, 21, 1 p. : ill.:

"ADF #9700326." "March 2000." "Prepared by: PAMI"--Cover. Includes bibliographical references (p. 1, 4th group).

CONTENTS NOTE: Efficient injection for sustainable nutrient management of manure / Alan Boyden ... [et al.] -- Development of a hog manure pipeline control system / Alan Boyden ... [et al.].

NAL Call #: TD930.2-.S77-2000

Descriptors: Manure-handling-Equipment-and-supplies

122. Subsurface drip irrigation using livestock wastewater: dripline flow rates.

Trooien, T. P., Lamm, F. R., Stone, L. R., Alam, M., Rogers, D. H., Clark, G. A., and Schlegel, A. J.

Appl-eng-agric. 16: 5 pp.505-508. (Sept 2000).

NAL Call #: S671.A66

Descriptors: trickle-irrigation/microirrigation/subsurface-irrigation/irrigation-equipment/emitters/design/water-flow/blockage/water-reuse/waste-water/lagoons/waste-water-treatment/animal-wastes/irrigation-water/cleaning/beef-cattle

Abstract: Using subsurface drip irrigation (SDI) with lagoon wastewater has many potential advantages. The challenge is to design and manage the SDI system to prevent emitter clogging. The objective of this study was to measure the flow rates of five types of driplines (with emitter flow rates of 0.57, 0.91, 1.5, 2.3, and 3.5 L/h/emitter) when used with lagoon wastewater. A disk filter with openings of 55 micrometer (200 mesh) was used and shock treatments of chlorine and acid were injected periodically. During the 1998 growing season, 530 mm of wastewater were applied through the SDI system and 390 mm were applied in 1999. During the growing seasons, the two lowest flow rate emitter designs decreased in flow rate, indicating that some emitter clogging had occurred. The magnitudes of the decreases were 15% and 11% of the original flow rates in 1998 and 22% and 14% in 1999 for the 0.57 L/h/emitter and 0.91 L/h/emitter driplines, respectively. After the winter idle period, the flow rates of both driplines returned to the initial flow rates. The three emitter designs with higher flow rates showed little sign of clogging; their flow rates decreased by 4% or less through both growing seasons. Observations showed that the disk filter and automatic backflush controller performed adequately in 1998 and 1999. Based on these preliminary results, the use of SDI with lagoon wastewater shows promise. However, the smaller emitter sizes (0.91 L/h/emitter or less) may be risky for use with wastewater and the long-term (greater than two growing seasons) effects are untested.

123. Sulfur compounds in gases emitted from stored manure.

Clanton, C. J. and Schmidt, D. R.

Trans-ASAE. 43: 5 pp.1229-1239. (Sept/Oct 2000).

NAL Call #: 290.9-Am32T

Descriptors: animal-manures/storage/sulfur/concentration/hydrogen-sulfide/methyl-sulfide/carbon-disulfide/biochemical-pathways/anaerobic-conditions/air-quality

124. A survey of dairy farming in Pennsylvania: nutrient management practices and implications.

Dou, Z., Galligan, D. T., Ramberg, C. F. Jr., Meadows, C., and Ferguson, J. D. J-dairy-sci. 84: 4 pp.966-973. (Apr 2001).

NAL Call #: 44.8-J822

Descriptors: dairy-farming/dairy-farms/watersheds/watershed-management/farm-surveys/cattle-manure/application-to-land/soil-test-values/water-pollution/nitrogen-cycle/phosphorus/cycling/cattle-slurry/chemical-analysis/pennsylvania/chesapeake-bay-watershed

Abstract: A survey was conducted to collect information on nutrient management practices on dairy farms in south-central Pennsylvania. Of the 994 responding farms, the average farm consisted of 64 lactating cows, 10 dry cows, 41 heifers, and 17 calves with 69.7 ha of tillable land. Manure from lactating cows was mainly collected on a daily basis (84% of the farms) and stored as slurry or liquid (73%), while dry cow and heifer manure was collected weekly or less frequently (69 and 85% of the farms) and stored as solid stack or bedded pack (67 and 82%). Manure utilization featured consistent use of on-farm spreading, with limited incorporation, to corn or small grain fields before planting. Spreading on perennial forages or pasture was also common. Irrigation or injection of manure occurred on less than 5% of the farms. Only 20% of the farms reported manure nutrient testing, contrasting to over 90% for soil testing. Farm advisors and their services can be of vital importance in helping producers make conscientious management decisions for enhanced nutrient utilization. For example, ration balancing involved the services of feed and mineral sales representatives (85% of the farms), independent consultants (12%), and veterinarians (5%). Manure nutrient crediting to determine manure application rates was made by fertilizer dealers (40%), crop advisors and independent consultants (31%), and others. Nutrient management strategies and efforts must address the specific needs of farms with different animal densities and nutrient balances in order to be effective and applicable on the majority of farms.

125. A survey of the production and use of animal manures in England and Wales. I. Pig manure.

Smith, K. A., Brewer, A. J., Dauven, A., and Wilson, D. W.

Soil-use-manage. 16: 2 pp.124-132. (June 2000).

NAL Call #: S590.S68

Descriptors: pig-manure/pig-slurry/farmyard-manure/storage/tanks/lagoons/application-to-land/surveys/farmers'-attitudes/pig-farmers/wales/england-

Abstract: A survey was undertaken in 1996, by postal questionnaire sent to a stratified sample of 1500 pig producers in England and Wales; 576 (37%) responded. The survey provided data on manure production, manure storage and application strategies (timing, techniques and nutrient recycling to crops). Total pig manure production, in England and Wales is estimated to be at about 10.03 m t per year, with about 45% as slurry and 55% as FYM, according to this survey, where calculations have been based on undiluted outputs of excreta. About 45% of slurry is stored in above-ground tanks or earth-banked lagoons. Above-ground tanks most commonly held an amount of slurry equivalent to 3-6 months production, but earth-banked lagoons were more variable in capacity and over 20% could hold more than 9 months production of slurry. Annual statistics on fertilizer use indicate that farmers make little allowance for the nutrient content of manures. However, the results of this survey suggest that farmers generally make a genuine effort to allow for the nutrients applied, but that they currently fail to be assured by the advice

available to them or their confidence is lacking for other technical reasons. Autumn represents the peak period for spreading, with 30% of slurry and 50% of FYM applied at that time.

126. A survey of the production and use of animal manures in England and Wales. II.

Poultry manure.

Smith, K. A., Brewer, A. J., Crabb, J., and Dauven, A.

Soil-use-manage. 17: 1 pp.48-56. (Mar 2001).

NAL Call #: S590.S68

Descriptors: poultry-

manure/storage/spreading/fields/autumn/grasslands/incorporation/application-to-land/surveys/farmers'-attitudes/wales/england-

Abstract: A survey of manure management practice was undertaken in 1996, by postal questionnaire submitted to a stratified sample of egg and broiler producers in England and Wales. Out of a target of 500 laying hen and 500 broiler (chickens produced for meat) production units in the survey sample, 356 (36%) returned questionnaires. The survey provided information on amount and type of manure production, manure storage and land application strategies (timing, techniques and awareness of nutrient content). Within the survey, no attempt was made to differentiate between organic and conventional production systems. About 45% of manure production was estimated to come from layer holdings, 55% from broiler litter. It was estimated that 70% of the national manure production is litter-based and about 30% are droppings collected without litter. Sawdust/shavings are the most popular bedding material, with an average final depth of 100 mm for broilers and 140 mm on litter-based layer units.

Commonly, storage is available within housing for at least the length of the cropping cycle (6 weeks in broiler production, or 12 months in deep pit laying houses); around 60% of poultry manure is stored for a period following removal from the house, most commonly for 3-6 months. Overall, autumn was the peak period for manure spreading, with over 40% of laying hen manure and 50% of broiler manure applied at that time. On grassland, spreading was reasonably evenly distributed throughout the year but autumn application was favoured for arable crops, especially before the establishment of cereals and root crops; overall, almost 50% of layer and broiler manure was applied in the autumn. In the survey, up to 10% of manures were claimed to be incorporated within a day of application and about 60% within a week of application, presumably because of concern about odour nuisance. Around 25% of poultry manure was applied by contractors. A high proportion of farmers (c. 40% with layers; c. 60% with broilers) exported manures from their holdings, the proportion removed amounting to almost 90% on these farms. Although evidence elsewhere indicates that farmers make little allowance for manures in planning crop fertilizer inputs, the survey responses suggested that farmers do make an effort to allow for manures but that their confidence in the advice available to them is lacking, or they may have other technical reasons for not taking advantage of the manurial value. Information provided by the survey is of significant importance to policy makers (e.g. for the construction of environmental emissions inventories), researchers, consultants and farmers.

127. Swine manure management plans in North-Central Iowa: nutrient loading and policy implications.

Jackson, L. L., Keeney, D. R., and Gilbert, E. M.

J-soil-water-conserv. 55: 2 pp.205-212. (Second Quarter 2000).

NAL Call #: 56.8-J822

Descriptors: pig-manure/agricultural-policy/ammonia/volatilization/livestock/pollutants/phosphorus/animal-husbandry/pigs/water-quality/nitrogen/nitrogen-content/crop-yield/glycine-max/field-size/nutrient-requirements/iowa-

128. Swine Odor and Manure Management Research Unit.

National Swine Research and Information Center (U.S.). [Ames, Iowa] : National Swine Research & Information Center, [2001]-: Title from caption. Includes bibliographical references. URL: http://www.ars.usda.gov/main/site_main.htm?modecode=36251520
NAL Call #: aSF395.8.A1-S95-2001

Descriptors: Swine-Research-United-States

Abstract: Swine Odor and Manure Management Research Unit: The mission of the Swine Odor and Manure Management Research Unit is to solve critical problems in the swine production industry that impact production efficiency, environmental quality, and human health.

129. Synergistic effects of natural and modified zeolites on the methanogenesis of acetate and methanol.

Milan, Z., Sanchez, E., Borja, R., Weiland, P., and Cruz, M.
Biotechnol-lett. 23: 7 pp.559-562. (Apr 2001).
NAL Call #: QR53.B56

Descriptors: pig-manure/anaerobic-digestion

Abstract: The addition of Mg(2+) modified zeolite at 0.1 g-1 of volatile suspended solids (VSS) increased the potential specific methanogenic activity (PSMA) and the apparent kinetic constant, k₀ showing PSMA and k₀ values 15 and 2 times higher than those observed for control reactors during the methanogenesis of acetate and methanol, respectively. In addition, the population of hydrolytic, acetogenic and methanogenic bacteria increased 100, 10 and 100 times compared to that observed in the controls. The anaerobic degradation of methanol and acetate occurred in one and two stages, respectively.

130. Thermochemical conversion of swine manure: an alternative process for waste treatment and renewable energy production.

He, B. J., Zhang, Y., Funk, T. L., Riskowski, G. L., and Yin, Y.
Trans-ASAE. 43: 6 pp.1827-1833. (Nov/Dec 2000).
NAL Call #: 290.9-Am32T

Descriptors: pig-manure/waste-utilization/energy-sources/thermochemical-processes/biomass-energy

Abstract: A thermochemical conversion (TCC) process was applied to the treatment of swine manure slurry for oil production and waste reduction. The objectives of the first stage study were to explore the feasibility of oil production from swine manure and to determine the waste reduction rates through the TCC process. A bench TCC reactor was developed and tested at operating temperatures of 275 degrees C to 350 degrees C. The corresponding operating pressures ranged from 5.5 to 18 Mpa. Carbon monoxide was used as a reducing agent at pressures from 0.34 to 2.76 MPa. The oil product was evaluated by element analysis, heating value, and benzene solubility. The waste reduction rate was evaluated in terms of chemical oxygen demand (COD) before and after the TCC process. The highest oil yield was 76.2% of the total volatile solids of the feedstock. The hydrogen to carbon molar ratio was 1.53. The TCC oil product had a similar quality as that of pyrolysis oils from liquefaction of other biomass such as

wood sludge and newspaper waste. The average heating value of the oil product was estimated at 34 940 kJ/kg. The COD in the post-processed water after the TCC process was reduced as much as 75.4%. Carbon dioxide was the sole detected gaseous by-product. The solid by-product of the TCC process was only 3.3% of the total solids input by weight.

131. Upflow biological aerated filters for the treatment of flushed swine manure.

Westerman, P. W., Bicudo, J. R., and Kantardjieff, A.

Bioresour-technol. 74: 3 pp.181-190. (Sept 2000).

NAL Call #: TD930.A32

Descriptors: pig-manure/waste-treatment/aerobic-treatment/odor-emission/biofilters-

Abstract: A pilot plant with capacity to treat up to 8 m³/day of supernate from settled flushed swine wastes was monitored for 12 months. The main system is composed of two upflow aerated biofilters connected in series. The aerated biofilters, operated under warm weather conditions (average temperature of 27 degrees C), were able to remove about 88% of biochemical oxygen demand (BOD), 75% of chemical oxygen demand (COD), and 82% of total suspended solids (SS) with loading of 5.7 kg COD/m³/day of biofilter media. The total Kjeldahl nitrogen (TKN), total ammonia nitrogen (NH₃-N), and total nitrogen (Total-N) reductions averaged 84%, 94% and 61%, respectively, during warm weather, with a significant portion of the NH₃-N being converted to nitrite plus nitrate nitrogen (NO₂ + NO₃-N). At higher organic loading (over 9 kg COD/m³/day) during September, the biofilters had only slightly lower percentage removal rates. Operation at lower temperatures (average of 10 degrees C) resulted in lower performances. The COD, TKN, NH₃-N, and Total-N removal averaged 56%, 49%, 52%, and 29%, respectively, in December through March. The COD mass removal rate was linear with loading rate over the range of approximately 2-12 kg COD/m³/day of filter. A mass balance average for the 12 months indicated that about 30% of the influent volume, 35% of Total-N and 60% of total phosphorus (Total-P) are removed with the biofilter backwash. Management and utilization of the backwash are important factors in implementing this type of system on farms. The unaccounted-for nitrogen was about 24% and could have been lost as ammonia volatilization or possibly through denitrification within the biofilm.

132. Use of a fractionation procedure to assess the potential for P movement in a soil profile after 14 years of liquid pig manure fertilization.

Hountin, J. A., Karam, A., Couillard, D., and Cescas, M. P.

Agric-ecosyst-environ. 78: 1 pp.77-84. (Mar 2000).

NAL Call #: S601.A34

Descriptors: pig-manure/phosphorus/movement-in-soil/fractionation/nutrient-

availability/placement/leaching/agriculture/ecosystems/application-rates/soil-depth/soil-organic-matter/soil-profiles/liquid-manures/quebec-

133. Use of aluminum- and iron-rich residues to immobilize phosphorus in poultry litter and litter-amended soils.

Codling, E. E., Chaney, R. L., and Mulchi, C. L.

J-environ-qual. 29: 6 pp.1924-1931. (Nov/Dec 2000).

NAL Call #: QH540.J6

Descriptors: phosphorus/immobilization/poultry-manure/waste-disposal/pollution-control/maryland-

Abstract: Poultry production is concentrated on Maryland's eastern shore on areas with sandy soils low in sesquioxides. Water quality has been affected by runoff and leaching of phosphorus from poultry litter-amended fields. Phosphorus movement is of major concern because P is a limiting nutrient for eutrophication in surface water. The objectives of this study were to (i) evaluate the ability of Al-rich drinking water treatment residue (DWTR) and iron-rich residue (IRR) to reduce water-soluble P and Bray and Kurtz no. 1-extractable phosphorus (BK-1 P) in poultry litter and three long-term litter-amended soils and (ii) determine the effects of these residues on pH and electrical conductivity (EC) in the amended litter and soils. Poultry litter and soils were treated with four rates of DWTR and IRR and incubated for 7 wk at 25 degrees C. Litter and soils were sampled at 2, 4, and 7 wk. Both residue materials increased the pH of the litter and the soils. The DWTR was more effective in reducing both water-soluble P and BK-1 P in litter at all rates. At the 25 and 50 g kg⁻¹ rates, reductions in water-soluble P with IRR were comparable with that of DWTR, but DWTR was twice as effective as IRR in reducing BK-1 P concentration. The results showed that water-soluble P and BK-1 P in poultry litter and long-term litter-amended soils can be substantially reduced by incorporating residues rich in Al and Fe; these residues may be useful for reducing P runoff and leaching from poultry litter and litter-amended fields.

134. Use of carbonate and alkali to eliminate Escherichia coli from dairy cattle manure.

Diez Gonzalez, F., Jarvis, G. N., Adamovich, D. A., and Russell, J. B.

Environ-sci-technol. 34: 7 pp.1275-1279. (Apr 1, 2000).

NAL Call #: TD420.A1E5

Descriptors: urine/feces/antimicrobial-properties/pathogens/waste-treatment

135. Use of effective microorganisms to suppress malodors of poultry manure.

Li, W. and Ni, Y.

J-crop-prod. 3: 1 pp.215-221. (2000).

NAL Call #: SB1.J683 *Descriptors:* poultry-manure/odor-emission/odor-abatement/microorganisms/sustainability/waste-treatment/waste-utilization/poultry/drinking-water/feeds/ammonia/amino-acids/chemical-composition/fermentation/growth/disease-resistance/oral-administration/probiotics-

136. Use of flocculants in dairy wastewaters to remove phosphorus.

Sherman, J. J., Van Horn, H. H., and Nordstedt, R. A.

Appl-eng-agric. 16: 4 pp.445-452. (July 2000).

NAL Call #: S671.A66

Descriptors: cattle-manure/dairy-wastes/waste-water/waste-water-treatment/phosphorus/removal/flocculation/aluminum-sulfate/chlorides/polyacrylamide/dairy-effluent/elements/chemical-composition/ferric-chloride/dairy-manure-flushwater

137. Use of GIS to determine the effect of property line and water buffers on land availability.

Worley, J. W., Rupert, C., and Risse, L. M.

Appl-eng-agric. 17: 1 pp.49-54. (Jan 2001).

NAL Call #: S671.A66

Descriptors: geographical-information-systems/pollution-control/water-pollution/surface-

water/runoff/animal-wastes/land-use/animal-production/animal-feeding/land-capability/georgia/land-buffer-strips

Abstract: Animal feeding operations are experiencing increasing pressure from neighbors, regulators, and legislative authorities to improve air and water quality. One of the most popular tools used in legislation and regulations is the placement of buffers between odor emitting sites and property lines and between potential water pollution sources and water bodies. This study was done to demonstrate how a GIS system can be used to study the effects of placing such buffers around surface water bodies and setbacks from property lines where confined animal feeding operations and their associated waste application fields would be banned. Data from three counties in southern Georgia were analyzed to determine how much land would be made unavailable by the placement of various buffers. "Available land" after restrictions ranged from 63% of total land for 30.5 m (100 ft) buffers and setbacks, to 7% of total land with 152.5 m (500 ft) buffers and setbacks. "Available land" was based strictly on the size of properties after restrictions were placed and did not include consideration of whether the property owner was interested in starting an animal feeding operation or selling the land. The possibility of combining properties to make larger tracts was also not analyzed. Although it did not provide answers to all questions that need to be asked, the GIS system was demonstrated as a useful tool in obtaining some objective data on the cost to society of placing protective buffers.

138. Use of ion exchange membrane to assess soil N supply to canola as affected by addition of liquid swine manure and urea.

Qian, P. and Schoenau, J. J.

Can-j-soil-sci. 80: 1 pp.213-218. (Feb 2000).

NAL Call #: 56.8-C162

Descriptors: soil-fertility/nitrogen/soil-analysis/membranes/urea/pig-manure/liquid-manures/application-rates/nutrient-content/brassica-napus/ammonium/nutrient-availability/clay-loam-soils/sandy-loam-soils/ammonium-nitrogen/nitrate-nitrogen/saskatchewan-

139. Use of phytase and high available phosphorus corn in broiler diets: impact of litter phosphorus levels and solubility.

Saylor, W. W., Sims, J. T., Malone, G. W., and Lavahun, M. F.

Proc-Md-Nutr-Conf-Feed-Manuf.: 48th pp.43-57. (2001).

NAL Call #: 389.9-Un342

Descriptors: broilers/poultry-feeding/phytase/enzyme-preparations/phosphorus/bioavailability/maize/diet/poultry-manure/solubility/feed-additives/excretion/nutrient-intake/performance/body-weight/phytic-acid/antinutritional-factors

140. Using growing degree days to predict nitrogen availability from livestock manures.

Griffin, T. S. and Honeycutt, C. W.

Soil-Sci-Soc-Am-j. [Madison, Wis.] Soil Science Society of America. Sept/Oct 2000. v. 64 (5) p. 1876-1882. pp.

NAL Call #: 56.9-So3

Descriptors: sandy-loam-soils/nitrogen/nutrient-availability/prediction/poultry-manure/cattle-manure/pig-manure/decomposition/mineralization/heat-sums/equations/nitrate/ammonium/temperature-

Abstract: Predictive tools are needed to better match N release from manure with crop demand.

Growing degree days (GDD) have been successfully used to predict N release from crop residues and other amendments. A 112-d incubation experiment was conducted at 10, 17, and 24 degrees C to evaluate GDD (0 degrees C base temperature) predictions of N transformations from beef (*Bos taurus*), dairy, poultry (*Gallus gallus*), and swine (*Sus scrofa*) manure. Manure was incorporated at rates estimated to provide 150 kg N ha⁻¹ (or 75 mg N kg⁻¹ soil). Soil NO₃ and NH₄ concentrations were determined at weekly or biweekly intervals. The rate of NO₃ accumulation increased with increasing temperature, and could be predicted across temperature regimes using GDD. This predictive ability could be generalized across dairy, poultry, and swine manures using an exponential equation, $NO_3 = 54.10[1 - \exp(-0.006GDD)]$, while N was immobilized by incorporation of beef manure. The disappearance of NH₄ was a linear function of time and of GDD. A single predictive equation was sufficient for dairy, poultry, and swine manures, in the form NH_4 (as percentage of input) = $0.703 - 0.0021GDD$ ($R^2 = 0.66$), with soil NH₄ reaching zero at approximately equal to 350 GDD. These laboratory data indicate that GDD can be used for predicting NO₃ accumulation and NH₄ disappearance from a range of livestock manures. If successfully extended to the field, this predictive capability may allow for improved management of N from animal manures.

141. Utilization of waste materials to promote hardwood tree growth.

Thornton, F. C., Bock, B. R., Behel, A. D., Houston, A., and Tyler, D. D.

South-j-appl-for. 24: 4 pp.230-237. (Nov 2000).

NAL Call #: SD1.S63

Descriptors: platanus-occidentalis/populus-deltoides/scrubber-sludge/gypsum/wood-ash/refuse/sludges/growth/volume/mulches/liming/nitrogen/weed-control/ammonium-nitrate/pig-slurry/sewage-sludge/alabama/tennessee/containerboard-sludge

Abstract: Land application of wastes can increase the growth of crops. This study was conducted to evaluate the influence of various waste products on the growth of trees. Two sites, one in northeast Alabama growing sycamore (*Platanus occidentalis* L.) and the other in west Tennessee growing cottonwood (*Populus deltoides* Bartr. ex Marsh.), were studied. At the Alabama site, 3 yr of replicated field plots were evaluated to assess the influence of scrubber gypsum, wood ash, and containerboard sludge on the growth of sycamore on a Decatur soil. Compared to the control treatment, a mulch application of scrubber gypsum at a rate of 672 Mg/ha improved the volume response of sycamore after 3 yr. There was no volume response to liming, whether agricultural lime or wood ash was used, and sycamore did not respond to nitrogen (N) in the containerboard sludge treatment. Further investigations into the use of scrubber gypsum applied at high rates as a mulch in combination with weed control appear warranted from these studies. On a Memphis-Loring soil at the Tennessee site, organic N amendments, whether swine waste or sewage, were superior to ammonium nitrate in terms of volume response of cottonwood. Averaged across the three application rates, swine effluent increased volume growth of cottonwood by nearly 18% relative to comparable N additions from ammonium nitrate whereas municipal sewage sludge increased volume growth by almost 4% compared to ammonium nitrate treatments.

142. Working trees for treating waste : a natural alternative for using nutrients from livestock and farm operations, municipalities, and industries.: Natural alternative for using nutrients from livestock and farm operations, municipalities, and industries.

National Agroforestry Center Lincoln, Neb. : National Agroforestry Center, USDA, [2000?] 1 folded sheet (6 p.) : col. ill.: Caption title.

NAL Call #: aTD1061-.W67-2000

Descriptors: Hazardous-wastes-Biodegradation/Irrigation-water-Biodegradation/Animal-waste-Biodegradation/Factory-and-trade-waste-Biodegradation/Sewage-Purification-Nutrient-removal/Woodlots-Multiple-use/Tree-farms-Environmental-aspects/Trees-Physiology

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