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Agricultural Research Service, U.S. Department of Agriculture

Constructed Wetlands and Other Approaches to Protecting Water Quality

| Constructed Wetlands | Agricultural Best Management Practices |
| Nutrient Management: Crops | Nutrient Management: Livestock | Environmental Management
Systems for Agriculture |

Quick Bibliography Series: QB 2003-02
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215 citations from the AGRICOLA database
January 2000 - March 2003

Compiled by
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Constructed Wetlands

(Citations 1-91)

| Agricultural Best Management Practices | Nutrient Management: Crops | Nutrient Management: Livestock |
Environmental Management Systems for Agriculture |

1. **Assessment of the extrogenicity and toxicity of a domestic wastewater effluent flowing through a constructed wetland system using biomarkers in the male fathead minnows (*Pimephales promelas* Rafinesque, 1820).**

Hemming, J. M., Waller, W. T., Chow, M. C., Denslow, N. D., and Venables, B.
Environmental Toxicology and Chemistry (Oct 2001) 20 (10): 2268-2275.
NAL Call #: QH545.A1E58; ISSN: 0730-7268.

Descriptors: contaminants/ estrogens/ toxicity/ waste-water/ adverse-effects/ vitellogenins/ pimephales-promelas/ toxicology/ wetlands/ waste-water-treatment/ water-pollution/ xenoestrogens

Abstract: The toxicity and estrogenicity of a final treated municipal effluent was examined while flowing through a constructed wetland in north-central Texas, USA. Fish data were collected, and a baseline wetland characterization was performed to assess wetland treatment potential for these effluent properties. Vitellogenin (VTG), gonadosomatic index (GSI), hepatosomatic index (HSI), and secondary sexual characteristics were biomarkers used in fish models to assess aqueous estrogenicity. Biological indicators used to assess overall fish health included hematocrit and condition factor. Estrogenic nature of final sewage treatment works effluent was screened, concurrent with a three-week fish exposure, via gas chromatography/mass spectrometry for target estrogenic compounds, including 17beta-estradiol, ethynylestradiol, bisphenol A, nonylphenolic compounds, phthalates, and DDT. The VTG in *Pimephales promelas* was measured after exposure at four sites in a treatment wetland and was significantly elevated ($p < 0.0001$) in fish exposed at the inflow site. The GSIs were significantly less ($\alpha = 0.001$) at the inflow site. At wetland sites closest to the inflow, secondary sexual characteristics, tubercle numbers, and fatpad thickness were less ($\alpha = 0.0001$) than in laboratory controls. The HSIs and density of male breeding stripes were not significantly

different from those of laboratory controls. However, elevated HSIs were found at the inflow site. Hematocrit and condition factors were both less ($\alpha = 0.001$) in effluent-exposed fish at wetland sites closer to the inflow than in control fish or fish further downstream.

2. **Assessment of toxicity reduction in wastewater effluent flowing through a treatment wetland using *Pimephales promelas*, *Ceriodaphnia dubia*, and *Vibrio fischeri*.**

Hemming, J. M., Turner, P. K., Brooks, B. W., Waller, W. T., and La Point, T. W. *Archives of Environmental Contamination and Toxicology* (Jan 2002) 42 (1): 9-16. NAL Call #: TD172.A7; ISSN: 0090-4341.

3. **Atrazine remediation in wetland microcosms.**

Runes, H. B., Bottomley, P. J., Lerch, R. N., and Jenkins, J. J. *Environmental Toxicology and Chemistry* (May 2001) 20 (5): 1059-1066. NAL Call #: QH545.A1E58; ISSN: 0730-7268.

Descriptors: atrazine/ wetlands/ pollution-control

Abstract: Laboratory wetland microcosms were used to study treatment of atrazine in irrigation runoff by a field-scale-constructed wetland under controlled conditions. Three experiments, in which 1 ppm atrazine was added to the water column of three wetland, one soil control, and one water control microcosm, were conducted. Atrazine dissipation from the water column and degradate formation (deethylatrazine [DEA]; deisopropylatrazine [DIA]; and hydroxyatrazine [HA]) were monitored. Atrazine dissipation from the water column of wetland microcosms was biphasic. Less than 12% of the atrazine applied to wetland microcosms remained in the water column on day 56. Atrazine degradates were observed in water and sediment, with HA the predominant degradate. Analysis of day 56 sediment samples indicated that a significant portion of the initial application was detected as the parent compound and HA. Most probable number (MPN) assays demonstrated that atrazine degrader populations were small in wetland sediment. Wetland microcosms were able to reduce atrazine concentration in the water column via sorption and degradation. Based on results from this study, it is hypothesized that plant uptake contributed to atrazine dissipation from the water column.

4. **Buffer zones and constructed wetlands as filters for agricultural phosphorus.**

Uusi Kamppa, J., Braskerud, B., Jansson, H., Syversen, N., and Uusitalo, R. *Journal of Environmental Quality* (Jan/Feb 2000) 29 (1): 151-158. NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: phosphorus/ wetlands/ pollution-control

Abstract: Findings concerning P removal in buffer zones (BZs), constructed wetlands (CWs), and ponds in Finland, Norway, Sweden, and Denmark are presented in this paper because most such studies have been published only in Nordic languages. Retention of P was tested in 11 BZs, four CWs (less than 0.5-m deep and vegetated with macrophytes), and seven ponds (deeper than 0.5 m). The grass buffer zone (GBZ) and vegetated buffer zone (VBZ) plots were compared with plots without a BZ; and P retention in CWs,

ponds, and some BZs was estimated by subtracting total phosphorus (TP) mass in the outlet from TP mass in the inlet. Buffer zones decreased loads of TP from agricultural runoff water by 27 to 97% (0.24-0.67 kg ha⁻¹ yr⁻¹). The retention as a percentage increased with increasing BZ width. The BZ's upper part was, however, most effective in mitigating TP mass loads (1.6-4.4 g m⁻²), due to the importance of sedimentation as a retention process. The ponds and CWs reduced TP loads by 17 and 41%, respectively (2-116 g m⁻² yr⁻¹). The retention increased with the surface-area/watershed-area ratio. CWs were more effective in retaining TP than were ponds, possibly due to shallower depths and dense vegetation. The retention of dissolved reactive phosphorus (DRP) was inconsistent, both in BZs and in CWs. Vegetation should be harvested in BZs to decrease the DRP losses. Harvesting of vegetation is not recommended in CWs.

5. **Carbon supply and the regulation of enzyme activity in constructed wetlands.**

Shackle, V. J., Freeman, C., and Reynolds, B.

Soil Biology and Biochemistry (Nov 2000) 32 (13): 1935-1940.

NAL Call #: S592.7.A1S6; ISSN: 0038-0717.

Descriptors: wetlands/ soil-enzymes/ beta-glucosidase/ phosphoric-monoester-hydrolases/ arylsulfatase/ wetland-soils/ waste-treatment/ sewage-effluent/ glucose/cellulose/ enzyme-activity/ Wales/ artificial-wetlands

6. **Comparative economic analysis of using different sizes of constructed wetlands in recirculating catfish pond production.**

Posadas, B. C.

Journal of Applied Aquaculture (2001) 11 (3): 1-19.

NAL Call #: SH135.J69; ISSN: 1045-4438.

Descriptors: ictalurus-punctatus/ wetlands/ fish-ponds/ fish-culture/ water-reuse/ economic-analysis/ evaluation/ size/ investment/ operating-costs/ Mississippi

7. **Comparison of filter media, plant communities and microbiology within constructed wetlands treating wastewater containing heavy metals.**

Scholz, M., Xu, J., and Dodson, H. I.

Journal of Chemical Technology and Biotechnology (Aug 2001) 76 (8): 827-835.

NAL Call #: TP1.J686; ISSN: 0268-2575.

Descriptors: waste-water-treatment/ water-pollution/ polluted-water/ phragmites-australis/ typha-latifolia

8. **Comparison of soil and other environmental conditions in constructed and adjacent palustrine reference wetlands.**

Stolt, M. H., Genthner, M. H., Daniels, W. L., Groover, V. A., Nagle, S., and Haering, K. C.

Wetlands: the Journal of the Society of the Wetlands Scientists (Dec 2000) 20 (4): 671-683.

NAL Call #: QH75.A1W47; ISSN: 0277-5212.

Descriptors: wetlands/ environmental-factors/ edaphic-factors/ hydrology/ soil-properties/ redox-potential/ comparisons/ Virginia/ wetland-mitigation/ hydric-soils/ constructed-wetlands

9. **Comparison of vertical-flow constructed wetlands for the treatment of wastewater containing lead and copper.**

Scholz, M. and Xu, J.

Journal of the Institution of Water and Environment Management (Nov 2001) 15 (4): 287-293.

NAL Call #: TD420.W374; ISSN: 0951-7359.

Descriptors: typha-latifolia/ phragmites-australis/ waste-water-treatment/ lead/ copper/ reduction/ water-flow/ artificial-wetlands

Abstract: Abstract: This paper describes an investigation into the treatment efficiency and capital cost of vertical-flow constructed-wetland filters containing different plant communities and granular media with different adsorption capacities. The media included gravel, sand, granular-activated carbon, charcoal and filtralite (light expanded clay). Lead and copper sulphate were added to a polluted urban beck inflow water to simulate pretreated minewater or highway runoff. The interactions between growth media, microbial and plant composition and the reduction of lead, copper and BOD were investigated. For filters containing traditional media, a breakthrough of copper was recorded during the first nine weeks. After maturation of the biofilm, the wetlands performed well.

10. **Constructed wetlands.**

Sullivan, Preston. and Appropriate Technology Transfer for Rural Areas (Organization). [Fayetteville, Ark.] : ATTRA, [2001] 1 v. (various pagings) : ill.:Caption title. "February 2001." Includes bibliographical references.

NAL Call #: TD756.5-.S94-2001

Descriptors: Constructed-wetlands

11. **Constructed wetlands and reed-beds: mature technology for the treatment of wastewater from small populations.**

Cooper, P.

Journal of the Institution of Water and Environment Management (May 2001) 15 (2): 79-85.

NAL Call #: TD420.W374; ISSN: 0951-7359.

Descriptors: waste-water-treatment/ wetlands/ biological-treatment/ phragmites-australis/ biochemical-oxygen-demand/ removal/ sewage-sludge/ drying/ rural-areas/ literature-reviews/ england/ artificial-wetlands

Abstract: Abstract: This paper reviews the design and performance of constructed wetlands for the treatment of domestic sewage. Horizontal-flow systems have now

become accepted for secondary treatment where only BOD and SS consents are required. However, in recent years there has been increasing interest in systems such as vertical-flow and hybrid systems which are capable of achieving good nitrification. These systems have a greater and more reliable capability for oxygen transfer. As yet, there are only a few systems of this type in the UK, but the number is likely to increase. The paper describes the performance of (a) secondary and tertiary treatment systems, and (b) sludge-drying reed-beds.

12. Constructed wetlands and water quality improvement (II) : January 1997-June 2000.

Gagnon, Stuart. and Water Quality Information Center (U.S.).
[Beltsville, Md.] : Water Quality Information Center at the National Agricultural Library, Agricultural Research Service, U.S. Dept. of Agriculture, [2000]:Caption title. "118 citations from the AGRICOLA database."
NAL Call #: aZ5853.S22-G34-2000

URL: <http://www.nal.usda.gov/wqic/Bibliographies/conwet2.html>
Descriptors: Constructed-wetlands-Bibliography/ Water-quality-management-Bibliography

13. Constructed wetlands for mitigation of atrazine-associated agricultural runoff.

Moore, M. T., Rodgers, J. H. Jr., Cooper, C. M., and Smith, S. Jr.
Environmental Pollution (2000) 110 (3): 393-399.
NAL Call #: QH545.A1E52; ISSN: 0269-7491.

Descriptors: atrazine/ monitoring/ runoff/ wetlands/ pollution-control/ Mississippi/ wetland-mitigation

14. Constructed wetlands for pollution control : processes, performance, design and operation.

International Water Association. IWA Specialist Group on Use of Macrophytes in Water Pollution Control.
London : IWA Pub., 2000. xii, 156 p. : ill.:Includes bibliographical references (p. 141-149) and index.
NAL Call #: TD756.5-.C76-2000

Descriptors: Constructed-wetlands/ Sewage-Purification-Biological-treatment

15. Constructed wetlands for wastewater treatment.

Sundaravadivel, M. and Vigneswaran, S.
Critical Reviews in Environmental Science and Technology (2001) 31 (4): 351-409.
NAL Call #: QH545.A1C7; ISSN: 1064-3389.

Descriptors: pollutants/ wetlands/ artificial-wetlands

16. Constructed wetlands for wastewater treatment in cold climates.

Mander, U. Ulo and Jenssen, P. D.

Southampton, UK ; Boston : WIT Press, c2003. 325 p. : ill., map:Includes bibliographical references.

NAL Call #: QH540-.I67-v.-11

Descriptors: Constructed-wetlands-Cold-weather-conditions/ Sewage-Purification-Biological-treatment/ Sewage-Purification-Cold-weather-conditions

17. Constructed wetlands treatment of high nitrogen landfill leachate.: Final report.

Liehr, Sarah K. and Water Environment Research Foundation.

Alexandria, VA : Water Treatment Research Foundation, 2000, c1999. 1 v. (various pagings) : ill.: "Project 94-IRM-U, 2000, Collection and treatment"--Cover. Includes bibliographical references (p. R-1--R-5).

NAL Call #: TD756.5-.C663-2000

Descriptors: Constructed-wetlands-North-Carolina/ Nitrogen-North-Carolina/ Leachate-North-Carolina

18. Constructed wetlands treatment of municipal wastewaters : manual.

National Risk Management Research Laboratory (U.S.).

Cincinnati, Ohio : National Risk Management Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, [2000]:Title from web page. Description based on content viewed Jan. 31, 2002. "EPA/625/R-99/010" Includes bibliographical references.

NAL Call #: TD756.5-.C665-2000

URL: URL:

<http://www.epa.gov/ordntrnt/ORD/NRMRL/Pubs/2001/wetlands/625r99010.pdf>

Descriptors: Constructed-wetlands/ Sewage-Purification-Biological-treatment

19. Critical role of macrophytes in achieving low iron concentrations in mine water treatment wetlands.

Batty, L. C. and Younger, P. L.

Environmental Science and Technology (Sept 15, 2002) 36 (18): 3997-4002.

NAL Call #: TD420.A1E5; ISSN: 0013-936X.

Descriptors: phragmites-australis/ uptake/ iron

20. The decentralization of private and municipal wastewater treatment through the development of a constructed wetlands policy.

Robinson, M. L.

Reno, Nev. : University of Nevada, Cooperative Extension, [2001] [6] p.:Caption title. Includes bibliographical references (p. [6]).

NAL Call #: S87-.S7-no.-2001-13

21. Dipteran standing stock biomass and effects of aquatic bird predation at a constructed wetland.

Ashley, M. C., Robinson, J. A., Oring, L. W., and Vinyard, G. A.

Wetlands: the Journal of the Society of the Wetlands Scientists (Mar 2000) 20 (1): 84-90.

NAL Call #: QH75.A1W47; ISSN: 0277-5212.

Descriptors: waterfowl/ anas/ predation/ aquatic-invertebrates/ wetlands/ Nevada/ recurvirosta-americana/ phalaropus-tricolor/ anas-cyanoptera/ species-abundance

22. Early development of vascular vegetation of constructed wetlands in northwest Ohio receiving agricultural waters.

Luckeydoo, L. M., Fausey, N. R., Brown, L. C., and Davis, C. B.

Agriculture, Ecosystems and Environment (Jan 2002) 88 (1): 89-94.

NAL Call #: S601.A34; ISSN: 0167-8809.

Descriptors: wetlands/ vegetation/ irrigation-water/ pollution-control/ subsurface-irrigation/ water-management/ water-reservoirs/ seed-germination/ revegetation/ ground-cover/ natural-regeneration/ Ohio

Abstract: Constructed wetlands are currently being explored for use in reducing non-point source (NPS) pollution. The Wetland Reservoir Subirrigation System (WRSIS) project links water management in agricultural fields, constructed wetlands and water storage reservoirs to enhance crop production and reduce delivery of agrichemicals and sediments to local waterways. Three WRSIS demonstration sites have been developed on prior converted cropland in the Maumee River watershed located in northwest Ohio. Construction of the wetlands was completed in 1996 and they were then allowed to passively revegetate while receiving drainage water from adjacent fields. The primary goal of this study was to characterize the initial development of vegetation, and the availability of propagules within these wetlands. Preliminary vegetation inventories conducted in 1998 identified moderate species richness but low percentage of wetland species. A germination study completed on soils from one location showed additional viable wetland species available in the seed bank. Passive revegetation of these three constructed wetlands associated with WRSIS systems has resulted in good vegetation cover, but it is lacking the desired percentage of wetland species to date. Passive revegetation may prove to be an effective and economical method of revegetating constructed wetlands within agricultural landscapes that have suitable propagule availability.

23. Effect of plant fill ratio on water temperature in constructed wetlands.

Hill, D. T. and Payton, J. D.

Bioresource Technology (Feb 2000) 71 (3): 283-289.

NAL Call #: TD930.A32; ISSN: 0960-8524.

Descriptors: sagittaria/ phragmites-australis/ scirpus/ waste-water-treatment/ biological-treatment/ temporal-variation/ sagittaria-lancifolia

Abstract: An existing free-water-surface constructed wetland system at the Auburn University Poultry Science Unit was used to evaluate the effect of plant fill ratio on water temperature. Each wetland consisted of two cells in series. One series was operated with an approximate 10% fill of *Sagittaria lancifolia* (duck-potato). A second series contained *Phragmites australis* (common reed) and *Scirpus* spp. (bulrush) with an approximate 5% fill of plants. A third series was unvegetated and acted as a control. Water temperature was measured using thermographs placed at the midpoint of each cell with temperature readings taken hourly from July 1995 until June 1996. Water temperature was compared between each cell by using paired t-tests for the hourly temperature data. The unvegetated cells had significantly higher temperatures than the vegetated cells year round. The approximate 10% fill ratio series had significantly higher temperatures than the 5% fill ratio during the winter months. The unvegetated cells were significantly warmer than the vegetated cells for 75 of 80 instances. The unvegetated cells also exhibited greater daily variation in temperature than did the vegetated cells.

24. Effect of rain and temperature on the performance of constructed reed beds.

Manios, T., Millner, P., and Stentiford, E. I.

Water Environment Research (May/June 2000) 72 (3): 305-312.

NAL Call #: TD419.R47; ISSN: 1061-4303.

Descriptors: phragmites/ wetlands/ water-pollution/ waste-water-treatment/ rain/ air-temperature/ removal/ biochemical-oxygen-demand/ pollutants/ ammonia/ nitrogen/ england/ constructed-wetlands/ total-suspended-soilds

25. Effectiveness of a constructed wetland for retention of nonpoint-source pesticide pollution in the lourens river catchment, South Africa.

Schulz, R. and Peall, S. K. C.

Environmental Science and Technology (Jan 15, 2001) 35 (2): 422-426.

NAL Call #: TD420.A1E5; ISSN: 0013-936X.

Descriptors: South-Africa

26. Effectiveness of constructed wetlands in reducing nitrogen and phosphorus export from agricultural tile drainage.

Kovacic, D. A., David, M. B., Gentry, L. E., Starks, K. M., and Cooke, R. A.

Journal of Environmental Quality (July/Aug 2000) 29 (4): 1262-1274.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: wetlands/ tile-drainage/ agricultural-land

Abstract: Much of the nonpoint N and P entering surface waters of the Midwest is from agriculture. We determined if constructed wetlands could be used to reduce nonpoint N and P exports from agricultural tile drainage systems to surface waters. Three treatment wetlands (0.3 to 0.8 ha in surface area, 1200 to 5400 m³ in volume) that intercepted subsurface tile drainage water were constructed in 1994 on Colo soils (fine-silty, mixed, superactive, mesic Cumulic Endoaquoll) between upland maize (*Zea mays* L.) and

soybean [*Glycine max* (L.) Merr.] cropland and the adjacent Embarras River. Water (tile flow, precipitation, evapotranspiration, outlet flow, and seepage) and nutrient (N and P) budgets were determined from 1 Oct. 1994 through 30 Sept. 1997 for each wetland. Wetlands received 4639 kg total N during the 3-yr period (96% as NO₃-N) and removed 1697 kg N, or 37% of inputs. Wetlands decreased NO₃-N concentrations in inlet water (annual outlet volume weighted average concentrations of 4.6 to 14.5 mg N L⁻¹) by 28% compared with the outlets. When the wetlands were coupled with the 15.3-m buffer strip between the wetlands and the river, an additional 9% of the tile NO₃-N was apparently removed, increasing the N removal efficiency to 46%. Overall, total P removal was only 2% during the 3-yr period, with highly variable results in each wetland and year. Treatment wetlands can be an effective tool in reducing agricultural N loading to surface water and for attaining drinking water standards in the Midwest.

27. Effects of a vegetated stormwater-detention basin on chemical quality and temperature of runoff from a small residential development in Monroe County, New York.: Effects of a vegetated stormwater detention basin on chemical quality and temperature of runoff from a small residential development in Monroe County, New York.

Sherwood, Donald A. and Monroe County (N.Y.). Dept. of Health. Geological Survey (U.S.).

Ithaca, N.Y. : U.S. Dept. of the Interior, U.S. Geological Survey ; Denver, CO : Branch of Information Services [distributor], [2001] 11 p. : ill. (some col.), col. maps:Cover title. Shipping list no.: 2002-0033-P. "September 2001." Includes bibliographical references (p. 11). SUDOCs: I 19.42/4:01-4099.

NAL Call #: GB701-.W375-no.-2001-4099

Descriptors: Constructed-wetlands-New-York-State-Monroe-County/ Water-quality-management-New-York-State-Monroe-County

28. The effects of cattails (*Typha latifolia* L.) on concentrations and partitioning of metals in surficial sediments of surface-flow constructed wetlands.

Goulet, R. R. and Pick, F. R.

Water, Air, and Soil Pollution (Dec 2001) 132 (3/4): 275-291.

NAL Call #: TD172.W36; ISSN: 0049-6979.

Descriptors: typha-latifolia/ wetlands/ waste-water-treatment/ waste-water/ sediment/ iron/ manganese/ zinc/ copper/ deposition/ redox-potential/ organic-matter/ Ontario/ artificial-wetlands

29. Effects of macrophytes and external carbon sources on nitrate removal from groundwater in constructed wetlands.

Lin, Y. F., Jing, S. R., Wang, T. W., and Lee, D. Y.

Environmental Pollution (2002) 119 (3): 413-420.

NAL Call #: QH545.A1E52; ISSN: 0269-7491.

Descriptors: water-purification/ aquatic-plants/ denitrification

30. **The effects of varied hydraulic and nutrient loading rates on water quality and hydrologic distributions in a natural forested treatment wetland.**
Blahnik, T. and Day, J. Jr.
Wetlands: the Journal of the Society of the Wetlands Scientists (Mar 2000) 20 (1): 48-61.
NAL Call #: QH75.A1W47; ISSN: 0277-5212.
- Descriptors:* wetlands/ water-quality/ waste-water/ nitrate-nitrogen/ phosphate/ ammonium/ waste-water-treatment/ Louisiana/ hydraulic-loading-rates
31. **Emergence patterns of Culex mosquitoes at an experimental constructed treatment wetland in southern California.**
Workman, P. D. and Walton, W. E.
Journal of the American Mosquito Control Association (June 2000) 16 (2): 124-130.
NAL Call #: QL536.J686; ISSN: 8756-971X.
- Descriptors:* culex-erythrothorax/ culex-tarsalis/ culex-quinquefasciatus/ eclosion/ emergence-traps/ breeding-places/ wetlands/ depth/ spatial-distribution/ water-flow/ schoenoplectus/ plant-density/ California/ artificial-wetlands/ water-depth/ schoenoplectus-californicus
32. **Estimating evapotranspiration in natural and constructed wetlands.**
Lott, R. B. and Hunt, R. J.
Wetlands: the Journal of the Society of the Wetlands Scientists (Dec 2001) 21 (4): 614-628.
NAL Call #: QH75.A1W47; ISSN: 0277-5212.
- Descriptors:* evapotranspiration/ water-balance/ wetlands/ estimation/ Wisconsin/ potential-evapotranspiration
33. **Evaluation of recharge to the Skunk Creek Aquifer from a constructed wetland near Lyons, South Dakota.**
Thompson, Ryan F. and Geological Survey (U.S.). Sioux Falls (S.D.).
Rapid City, SD : U.S. Geological Survey ; Denver, CO : Branch of Information Services [distributor], 2002. iv, 27 p. : ill., maps:Includes bibliographical references (p. 20-21).
SUDOCs: I 19.42/4:02-4133.
NAL Call #: GB701-.W375-no.-2002-4133
- Descriptors:* Aquifers-South-Dakota/ Groundwater-South-Dakota/ Water-balance-Hydrology-South-Dakota
34. **Growth of softstem bulrush (Scirpus validus) in microcosms with different hydrologic regimes and media depths.**
Hunter, R. G., Combs, D. L., and George, D. B.
Wetlands: the Journal of the Society of the Wetlands Scientists (Mar 2000) 20 (1): 15-22.
NAL Call #: QH75.A1W47; ISSN: 0277-5212.

Descriptors: scirpus-validus/ aquatic-plants/ roots/ stems/ growth/ depth/ wetlands/
constructed-wetlands

35. Guidelines for restoring and creating wetlands associated with highway projects in South Dakota.

Berry, Charles R., Juni, Sara C., and South Dakota State University. Dept. of Wildlife and Fisheries Sciences. South Dakota Cooperative Fish and Wildlife Research Unit. South Dakota. Dept. of Transportation. South Dakota State University. Cooperative Extension Service. South Dakota. Dept. of Game, Fish and Parks.
[Brookings, S.D.] : South Dakota State University, [2000] ii, 21 p. : col. ill.:Caption title. "March 2000"--P. 21. "South Dakota State University, College of Agriculture & Biological Sciences, Department of Wildlife & Fisheries Sciences; South Dakota Cooperative Fish & Wildlife Research Unit"--Cover. "This project was jointly funded by the South Dakota Department of Transportation (Study SD95-08), South Dakota Cooperative Extension Service (RREA funds), and the South Dakota Department of Game, Fish and Parks (base funding of the Coop Research Unit)"--P. ii. Includes bibliographical references (p. 21).
NAL Call #: 100-So82-1-no.-734

Descriptors: Wetland-restoration-South-Dakota/ Constructed-wetlands-South-Dakota/
Roadside-improvement-South-Dakota

36. Guiding principles for constructed treatment wetlands : providing for water quality and wildlife habitat. Rev. 06/26/2001.

Interagency Workgroup on Constructed Wetlands (U.S.). United States. Environmental Protection Agency. Office of Wetlands, Oceans and Watersheds.
Washington, DC : U.S. Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds, [2000]-:Title from web page. Developed by Interagency Workgroup on Constructed Wetlands. "October 2000" Description based on content viewed April 11, 2002. "EPA-843-B-00-003" Includes bibliographical references.
NAL Call #: TD756.5-.G85-2000

URL: URL: <http://www.epa.gov/owow/wetlands/constructed/toc.html>

Descriptors: Constructed-wetlands-United-States/ Water-quality-United-States/ Water-quality-management-United-States/ Wetland-ecology-United-States

37. Hydraulic characteristics of a subsurface flow constructed wetland for winery effluent treatment.

Grismer, M. E., Tausendschoen, M., and Shepherd, H. L.
Water Environment Ressearch (July/Aug 2001) 73 (4): 466-477.
NAL Call #: TD419.R47; ISSN: 1061-4303.

Descriptors: wetlands/ waste-water-treatment/ waste-water/ wine-industry/ factory-effluents/ water-flow/ California/ artificial-wetlands

38. Hydrologic influence on stability of organic phosphorus in wetland detritus.

Pant, H. K. and Reddy, K. R.

Journal of Environmental Quality (Mar/Apr 2001) 30 (2): 668-674.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: nucleotides/ sugar-phosphates/ phospholipids/ typha/ wetlands/ hydrology/ flooding/ drainage/ release/ Florida/ polynucleotides/ glycerophosphate/ constructed-wetlands/ reflooding

Abstract: Accretion of organic matter in wetlands provides long-term storage for nutrients and other contaminants. Water-table fluctuations and resulting alternate flooded and drained conditions may substantially alter the stability of stored materials including phosphorus (P). To study the effects of hydrologic fluctuation on P mobilization in wetlands, recently accreted detrital material (derived primarily from *Typha* spp.) was collected from the Everglades Nutrient Removal Project (ENRP), a constructed wetland used to treat agricultural drainage water in the northern Everglades. The detrital material was subjected to different periods of drawdown and consecutive reflooding under laboratory conditions. The ³¹P nuclear magnetic resonance (³¹P NMR) spectroscopy analysis revealed that sugar phosphate, glycerophosphate, polynucleotides, and phospholipids (glycerophosphoethanolamine and glycerophosphocholine) were the major forms of P in the detrital material. After 30 d of drawdown, polynucleotides were reduced to trace levels, whereas sugar phosphate, glycerophosphate, and phospholipids remained the major fractions of organic P. Microorganisms seemed to preferentially utilize nucleic acid P, perhaps to obtain associated nutrients including carbon and nitrogen. At the end of the 30-d reflooding period, cumulative P flux from detritus to water column accounted for 3% of the total P (less than or equal to 15 d of drawdown) and further decreased to 2% at 30 d of drawdown, but increased to 8% at 60 d of drawdown. The drawdown (less than or equal to 30 d) not only reduced P flux to the water column, but also increased the humification and microbial immobilization of P. Excessive drawdown (60 d), however, triggered the release of P into the water column as the water content of detritus decreased from 95 to 11%.

39. Hydrologic model for design and constructed wetlands.

Arnold, J. G., Allen, P. M., and Morgan, D. S.

Wetlands: the Journal of the Society of the Wetlands Scientists (June 2001) 21 (2): 167-178.

NAL Call #: QH75.A1W47; ISSN: 0277-5212.

Descriptors: watersheds/ design/ water-balance/ simulation-models/ Texas/ watershed-models

40. The impact of hydraulic load and aggregation on sedimentation of soil particles in small constructed wetlands.

Braskerud, B. C., Lundekvam, H., and Krogstad, T.

Journal of Environmental Quality (Nov/Dec 2000) 29 (6): 2013-2020.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: wetlands/ erosion-control

Abstract: Loss of soil particles from arable land to streams and lakes negatively affects water quality. When initiatives to mitigate soil erosion are insufficient or fail, constructed wetlands (CWs) could be a last buffer to mitigate pollution. The objectives in this study were to (i) determine the influence of aggregation on clay sedimentation in CWs and (ii) evaluate the prediction performance of two commonly used retention models, based on hydraulic load and particle sedimentation velocity. Retention was measured three ways, with (i) water flow proportional sampling systems in the inlet and in the outlet, (ii) sedimentation traps, and (iii) sedimentation plates. Surface area of the CWs was 0.03 to 0.07% of the watershed, which consisted of silty clay loam (18-33% clay). Some runoff episodes, usually at high runoff rates, accounted for a relatively high proportion of total sedimentation. Thus 80% of the particles were retained from less than 44% of the total runoff. Constructed wetland performance increased with increased hydraulic load or decreased detention time. The clay content in the CW sediment reflected the clay content in the arable soil. Actual CW sediment exceeded model estimates 2.5 to 8.2 times, depending on CW size and runoff. The probable reason for the prediction error is clay particles entering the CWs as aggregates. Constructed wetlands should be located in small streams to avoid break up of aggregates and a reduction in retention efficiency.

41. In vitro propagation of reed grass by somatic embryogenesis.

Lauzer, D., Dallaire, S., and Vincent, G.

Plant Cell, Tissue and Organ Culture (2000) 60 (3): 229-234.

NAL Call #: QK725.P53; ISSN: 0167-6857.

Descriptors: phragmites-australis/ somatic-embryogenesis/ inflorescences/ explants/ culture-media/ 2,4-d/ myo-inositol/ methodology/ waste-water-treatment/ Quebec/ murashige-and-skoog-medium

Abstract: A micropropagation system using regeneration via somatic embryogenesis from immature inflorescence has been optimized. This system is proposed for the production of the macrophyte *Phragmites australis* (Cav.) Trin. for the construction of wetlands used in wastewater purification. Embryogenic calli were produced in florets from inflorescences in the presence of 2,4-dichlorophenoxyacetic acid in the induction media. Up to 28.4% of the calli were embryogenic. Somatic embryos developed into plantlets when transferred to the regeneration medium lacking growth regulators. The addition of myo-inositol to the induction medium resulted in the highest number of plantlets on the regeneration medium. A decrease in the number of plantlets was observed when the embryogenic calli were maintained longer than three months on the induction medium. Plantlets can be further propagated by node culture. Plantlets were successfully acclimatized and developed normally showing no morphological differences when compared to seed-grown plants.

42. The influence of organic carbon on nitrogen transformations in five wetland soils.

Davidsson, T. E. and Stahl, M.

Soil Science Society of America Journal. [Madison, Wis.: Soil Science Society of

America.] (May/June 2000) 64 (3): 1129-1136.
NAL Call #: 56.9-So3; ISSN: 0361-5995.

Descriptors: wetland-soils/ organic-soils/ mineral-soils/ soil-organic-matter/ carbon/
nitrogen-cycle/ nitrate/ transformation/ soil-texture/ nitrogen-content/ soil-ph/
nitrification/ denitrification/ immobilization/ ammonium/ nitrous-oxide/ nitrogen/ losses-
from-soil/ Sweden/ constructed-wetlands/ nitrogen-turnover

Abstract: Today we see an increased use of wetlands for N removal in agricultural catchments. Since the most important process for nitrate (NO₃(-)) removal, denitrification, requires organic C, different soils could be expected to be differently suited for wetland construction. In this study, we evaluate the importance of soil organic C and the effects of added dissolved organic C on N transformations in existing and proposed wetlands. We used ¹⁵N-labeled NO₃(-) to study N transformations in soil columns from five locations (a forest peaty soil, a field peaty soil, a silt loam, a loam, and a sandy loam). All five soils removed NO₃(-) at substantial rates (13-73% of the load). The field peaty soil had highest denitrification rate (11 mmol m⁻² d⁻¹), while sandy loam soil had the lowest rate (2 mmol m⁻² d⁻¹). Dissolved organic C did not seem to limit N removal in the soils, as glucose additions affected N turnover only slightly. The forest peat soil differed from the others by exhibiting low nitrification, and relatively high production of nitrite (NO₂(-)), probably a result of low pH. Nitrate removal in the field peat soil and the sandy loam soil was counteracted by production of ammonium (NH₄(+)) and dissolved organic N, causing net N release. Although there was a positive relationship between soil organic matter and NO₃(-) consumption, we conclude that all soils were suited for N removal. The lack of response to glucose additions indicate that there was no short-term lack of electron donor in any of the soils, including the sandy loam soil.

43. **Invertebrate assemblages and trace element bioaccumulation associated with constructed wetlands.**

Nelson, S. M., Roline, R. A., Thullen, J. S., Sartoris, J. J., and Boutwell, J. E.
Wetlands: the Journal of the Society of the Wetlands Scientists (June 2000) 20 (2): 406-415.
NAL Call #: QH75.A1W47; ISSN: 0277-5212.

Descriptors: aquatic-invertebrates/ species-diversity/ waste-water-treatment/ wetlands/
New-Mexico/ species-richness

44. **Invertebrates inhabiting wetland monocots damaged by Lepidoptera.**

Keiper, J. B., Sanford, M., Jiannino, J., and Walton, W. E.
Entomological News (Nov/Dec 2000) 111 (5): 348-354.
NAL Call #: 421-En88; ISSN: 0013-872X.

Descriptors: invertebrates/ habitats/ wetlands/ insect-communities/ community-ecology/
host-plants/ typha/ schoenoplectus/ damage/ noctuidae/ California/ constructed-wetlands/
schoenoplectus-californicus/ bellura-obliqua-gargantua

45. Lead and zinc removal by laboratory-scale constructed wetlands.

Song, Y., Fitch, M., Burken, J., Nass, L., Chilukiri, S., Gale, N., and Ross, C.
Water Environment Research (Jan/Feb 2001) 73 (1): 37-44.
NAL Call #: TD419.R47; ISSN: 1061-4303.

Descriptors: polluted-water/ water-pollution/ lead/ zinc/ removal/ wetlands/ laboratories/
factory-effluents/ waste-water/ hydraulic-conductivity/ artificial-wetlands/ lead-smelter-
waste-water

46. Management optimization and sustainable technologies for the treatment and disposal/reuse of fish farm effluent with emphasis on constructed wetlands.

Negroni, G.
World Aquaculture (Sept 2000) 31 (3): 16-19, 63.
NAL Call #: SH1.W62; ISSN: 1041-5602.

Descriptors: fish-farms/ fish-culture/ sustainability/ effluents/ waste-water/ waste-water-
treatment/ water-reuse/ wetlands/ biological-filtration/ feeds/ water-quality/ degradation/
ammonification/ nitrification/ denitrification/ sorption/ ultraviolet-radiation

47. Management strategies for nutrient and sediment loss in the Ellen Brook Catchment : with an introduction to constructed wetlands.

Banfield, Kylie.
South Perth, WA : Agriculture Western Australia, [2001] 30, [1] p. : ill. (some col.): "June 2001." Includes bibliographical references (p. [31]).
NAL Call #: S397-.M57-no.-2001/19

48. Manual: constructed wetlands treatment of municipal wastewaters.: Constructed wetlands treatment of municipal wastewaters.

United States. Environmental Protection Agency. Office of Research and Development.
National Risk Management Research Laboratory (U.S.).
Cincinnati, OH : U.S. Environmental Protection Agency, [2000] xi, 154 p. : ill.: "EPA 625/R-99/010." "September 2000"--Cover. Includes bibliographical references.
NAL Call #: TD756.5-.M36-2000

Descriptors: Constructed-wetlands/ Sewage-Purification

49. Mercury removal, methylmercury formation, and sulfate-reducing bacteria profiles in wetland mesocosms.

King, J. K., Harmon, S. M., Fu, T. T., and Gladden, J. B.
Chemosphere (Feb 2002) 46 (6): 859-870.
NAL Call #: TD172.C54; ISSN: 0045-6535.

Descriptors: wetlands/ scirpus/ sulfate-reducing-bacteria/ gypsum/ pollution-control/
water-pollution/ mercury/ removal/ methylmercury/ formation/ sediment/
biogeochemistry/ potamogeton-pusillus/ sulfate/ reduction/ South-Carolina/ constructed-
wetlands/ scirpus-californicus

50. Mitigation of chlorpyrifos runoff using constructed wetlands.

Moore, M. T., Schulz, R., Cooper, C. M., Smith, S. Jr., and Rodgers, J. H. Jr.
Chemosphere (Feb 2002) 46 (6): 827-385.
NAL Call #: TD172.C54; ISSN: 0045-6535.

Descriptors: wetlands/ pollution-control/ chlorpyrifos/ insecticide-residues/ water-pollution/ runoff-water/ agricultural-land/ sorption/ aquatic-plants/ sediment/ South-Africa/ Mississippi/ artificial-wetlands

51. Mitigation of metolachlor-associated agricultural runoff using constructed wetlands in Mississippi, USA.

Moore, M. T., Rodgers, J. H. Jr., Smith, S. Jr., and Cooper, C. M.
Agriculture, Ecosystems and Environment (Apr 2001) 84 (2): 169-176.
NAL Call #: S601.A34; ISSN: 0167-8809.

Descriptors: metolachlor/ distance-travelled/ simulation/ agricultural-land/ runoff/ pollution-control/ wetlands/ water-quality/ application-rates/ rain/ plants/ water-management/ Mississippi

Abstract: A loss of marginal wetland acreage adjoining agricultural fields has created a potential problem with water quality enhancement of agricultural runoff via wetlands. Current research is investigating the utility of constructed wetlands for pesticide mitigation purposes, thereby restoring water quality enhancement capability to the area. Constructed wetland mesocosms (59-73 m x 14 m), located at the University of Mississippi Field Station (Lafayette County, MS), were amended with metolachlor to simulate a cropland runoff event. Target concentrations for wetlands were 73 and 147 microgram/l metolachlor in addition to an unamended control (0 microgram/l). Water, sediment, and plant samples were collected weekly for 35 days following metolachlor amendment. Samples were collected from sites, longitudinally distributed within each wetland, and analyzed for metolachlor using gas chromatography. Between 7 and 25% of measured metolachlor mass was in the first 30-36 m (from inflow) of wetlands immediately following application and simulated rainfall. Approximately 10% of measured metolachlor mass was in plant samples. Suggested wetland travel distances for effective mitigation of metolachlor runoff ranged from 100 to 400 m. According to the results from this research, aquatic receiving system impacts due to metolachlor runoff could be mitigated by using constructed wetlands as buffers. Landowners and government agencies can integrate this information into a water management plan, allowing for better control of both quantity and quality of runoff water from individual agricultural fields.

52. Model prediction of the effects of changing phosphorus loads on the Everglades Protection Area.

Munson, R. K., Roy, S. B., Gherini, S. A., MacNeill, A. L., Hudson, R. J. M., and Blette, V. L.
Water, Air, and Soil Pollution (Feb 2002) 134 (1/4): 255-273.
NAL Call #: TD172.W36; ISSN: 0049-6979.

Descriptors: phosphorus/ water-pollution/ runoff/ agricultural-land/ mathematical-models/ simulation-models/ water-flow/ wetlands/ water-quality/ pollution-control/ Florida/ everglades-agricultural-area/ everglades-phosphorus-and-hydrology-model/ stormwater-treatment-areas

53. Natural wetlands for wastewater treatment in cold climates.

Mander, U. Ulo and Jenssen, P. D.

Southampton : WIT, c2002. 248 p. : ill., maps:Includes bibliographical references.

NAL Call #: QH540-.I67-v.-12

Descriptors: Wetland-ecology/ Sewage-Environmental-aspects

54. Nature and transformation of dissolved organic matter in treatment wetlands.

Barber, L. B., Leenheer, J. A., Noyes, T. I., and Stiles, E. A.

Environmental Science and Technology (Dec 15, 2001) 35 (24): 4805-4816.

NAL Call #: TD420.A1E5; ISSN: 0013-936X.

55. Nitrogen, phosphorus, and organic carbon removal in simulated wetland treatment systems.

Hunter, R. G., Combs, D. L., and George, D. B.

Archives of Environmental Contamination and Toxicology (Oct 2001) 41 (3): 274-281.

NAL Call #: TD172.A7; ISSN: 0090-4341.

56. The nutrient assimilative capacity of maerl as a substrate in constructed wetland systems for waste treatment.

Gray, S., Kinross, J., Read, P., and Marland, A.

Water Research (June 2000) 34 (8): 2183-2190.

NAL Call #: TD420.W3; ISSN: 0043-1354.

57. Nutrient attenuation by a riparian wetland during natural and artificial runoff events.

Casey, R. E. and Klaine, S. J.

Journal of Environmental Quality (Sept/Oct 2001) 30 (5): 1720-1731.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: nitrate/ phosphate/ pollutants/ runoff/ storms/ wetlands/ simulation-

Abstract: Due to chronic nutrient enrichment of surface water, wetlands adjacent to land managed with fertilizer have been studied to determine their role in nutrient dynamics. We sampled golf course runoff and determined the loads of NO₃⁻ and PO₄(3⁻) transported during storms and the attenuation of those loads when runoff passed through a riparian wetland. All sampled storm events contained NO₃⁻ (2 to 1470 g NO₃-N per event) and PO₄(3⁻) (1 to 4156 g PO₄-P per event). Extensive nutrient attenuation occurred when water passed through the riparian wetland. In 11 events, NO₃⁻ and PO₄(3⁻) attenuation averaged 80 and 74%, respectively. In subsequent experiments, we created a stream of water flowing into the wetland and amended it with NO₃⁻, PO₄(3⁻) and Br⁻, creating an artificial runoff event. The experiments were conducted using conditions similar to those of natural runoff events. We observed rapid and complete attenuation of PO₄(3⁻) immediately after runoff water infiltrated into the wetland subsurface. No

PO₄(³⁻) was observed in discharge from the wetland. Nitrate attenuation occurred following a lag phase of several hours that was probably due to reactivation of denitrifying enzymes. Nitrate attenuation was initially less than 60% but increased to 100% in all experiments. We observed extensive dilution of runoff water in the wetland subsurface indicating mixing with pre-event ground water in the wetland. The results indicated that intermittent inputs of NO₃⁻ and PO₄(³⁻) could be successfully attenuated in the wetland on the time scale of natural storm events.

58. Nutrient removal from polluted river water by using constructed wetlands.

Jin, S. R., Lin, Y. F., Lee, D. Y., and Wang, T. W.
Bioresource Technology (Jan 2001) 76 (2): 131-135.
NAL Call #: TD930.A32; ISSN: 0960-8524.

Descriptors: rivers/ Taiwan/ Erh-Ren-River

59. Nutrient retention in a northern prairie marsh (Frank Lake, Alberta) receiving municipal and agro-industrial wastewater.

White, J. S. and Bayley, S. E.
Water, Air, and Soil Pollution (Feb 2001) 126 (1/2): 63-81.
NAL Call #: TD172.W36; ISSN: 0049-6979.

Descriptors: marshes/ waste-water-treatment/ sewage-effluent/ meatworks-effluent/ waste-water/ water-quality/ ammonium-nitrogen/ nitrate-nitrogen/ phosphorus/ water-flow/ winter/ summer/ seasonal-variation/ retention/ nitrogen-retention/ removal/ surface-water/ Alberta/ soluble-reactive-phosphorus/ total-phosphorus

60. Occurrence of *Anopheles hermsi* (Diptera: Culicidae) in Arizona and Colorado.

Hayden, C. W., Fink, T. M., Ramberg, F. B., Mare, C. J., and Mead, D. G.
Journal of Medical Entomology (Mar 2001) 38 (2): 341-343.
NAL Call #: 421-J828; ISSN: 0022-2585.

Descriptors: anopheles-hermsi/ anopheles-freeborni/ DNA/ chemotaxonomy/ identification/ geographical-distribution/ new-geographic-records/ habitats/ wetlands/ disease-vectors/ malaria/ Arizona/ Colorado/ constructed-wetlands

Abstract: Historically, malaria was a significant cause of morbidity and mortality throughout the western United States, and *Anopheles freeborni* Aitken was thought to be the vector west of the Continental Divide. In 1989, *Anopheles hermsi* Barr & Guptavanij was described and subsequently found to be an effective laboratory vector of *Plasmodium*. The adults of these two species are morphologically indistinguishable, and therefore polymerase chain reaction was used to analyze the DNA from 48 mosquitoes collected in Arizona and Colorado (identified morphologically as *An. freeborni*). All specimens were identified as *An. hermsi*. This was the first report of *An. hermsi* in Arizona and Colorado and indicated that this *Anopheles* species historically may have been a malaria vector in these two western states.

61. Oxygen fluxes and ammonia removal efficiencies in constructed treatment wetlands.

Wu, M. Y., Franz, E. H., and Chen, S.

Water Environment Research (Nov/Dec 2001) 73 (6): 661-666.

NAL Call #: TD419.R47; ISSN: 1061-4303.

Descriptors: wetlands/ waste-water-treatment/ typha-latifolia/ roots/ oxygen/ diffusion/ ammonia/ nitrification/ artificial-wetlands

62. Pathogen and pathogen indicator organism removal in subsurface flow constructed wetlands.

Jillson, Steven J.

2000. *Vii, 85 Leaves : Ill. (Some Col.)*

NAL Call #: NBU LD3656-2000-J555

63. Performance comparison of experimental constructed wetlands with different filter media and macrophytes treating industrial wastewater contaminated with lead and copper.

Scholz, M. and Xu, J.

Bioresource Technology (June 2002) 83 (2): 71-79.

NAL Call #: TD930.A32; ISSN: 0960-8524.

Descriptors: phragmites/ typha/ waste-water/ waste-water-treatment

Abstract: The aim of this study was to investigate the treatment efficiency of passive vertical-flow wetland filters containing different macrophytes (Phragmites and/or Typha) and granular media with different adsorption capacities. Gravel, sand, granular activated carbon, charcoal and Filtralite (light expanded clay) were used as filter media. Different concentrations of lead and copper sulfate were added to polluted urban stream inflow water to simulate pretreated mine wastewater. The relationships between growth media, microbial and plant communities as well as the reduction of predominantly lead, copper and five-day biochemical oxygen demand (BOD5) were investigated. An analysis of variance showed that concentration reductions (mg l⁻¹) of lead, copper and BOD5 were significantly similar for the six experimental wetlands. Microbial diversity was low due to metal pollution and similar for all filters. There appears to be no additional benefit in using adsorption media and macrophytes to enhance biomass performance during the first 10 months of operation.

64. Performance of a constructed wetlands in treating urban stormwater runoff.

Carleton, J. N., Grizzard, T. J., Godrej, A. N., Post, H. E., Lampe, L., and Kenel, P. P.

Water Environment Research (May/June 2000) 72 (3): 295-304.

NAL Call #: TD419.R47; ISSN: 1061-4303.

Descriptors: wetlands/ aquatic-plants/ water-pollution/ pollution-control/ runoff/ overland-flow/ storms/ rain/ urban-areas/ water-purification/ removal/ pollutants/ phosphorus/ ammonia/ Virginia/ artificial-wetlands/ orthophosphate-phosphorus

65. Phosphorus adsorption characteristics of a constructed wetland soil receiving dairy farm wastewater.

Jamieson, T. S., Stratton, G. W., Gordon, R., and Madani, A.
Canadian Journal of Soil Science (Feb 2002) 82 (1): 97-104.
NAL Call #: 56.8-C162; ISSN: 0008-4271.

Descriptors: dairy-farms/ dairy-effluent/ waste-water/ waste-water-treatment/ wetlands/ wetland-soils/ phosphorus/ adsorption/ Nova-Scotia

66. Phosphorus saturation potential: a parameter for estimating the longevity of constructed wetland systems.

Drizo, A., Comeau, Y., Forget, C., and Chapuis, R. P.
Environmental Science and Technology (Nov 1, 2002) 36 (21): 4642-4648.
NAL Call #: TD420.A1E5; ISSN: 0013-936X.

67. Phytoremediation, wetlands and sediments : the Sixth International In Situ and On-Site Bioremediation Symposium : San Diego, Calif., June 4-7, 2001.

Leeson, Andrea 1962 and International In Situ and On Site Bioremediation Symposium (6th : 2001 : San Diego, Calif.

Columbus, Ohio : Battelle Press, c2001. viii, 383 p. : ill., maps:Includes bibliographical references and indexes.

NAL Call #: TD192.5-.I59-2001-v.5

Descriptors: Phytoremediation-Congresses/ Constructed-wetlands-Congresses/ Hazardous-waste-site-remediation-Congresses/ Bioremediation-Congresses

68. Plant availability of phosphorus sorbed to potential wastewater treatment materials.

Hylander, L. D. and Siman, G.
Biology and Fertility of Soils (July 2001) 34 (1): 42-48.
NAL Call #: QH84.8.B46; ISSN: 0178-2762.

Descriptors: hordeum-vulgare/ waste-water-treatment/ phosphorus/ nutrient-availability/ soil-fertility/ sorption/ wetlands/ infiltration/ sustainability/ rocks/ slags/ limestone/ spodic-horizons/ clay/ nutrient-uptake/ ammonium-lactate/ magnesium/ aluminum/ iron/ calcium/ heavy-metals

Abstract: Ecologically engineered wastewater treatment facilities, such as constructed wetlands and infiltration plants, can be further improved in their P retention by using reactive media with a high P-retention capacity. In a sustainable system, the sorbed P should be recycled in agricultural production. The objective of the present study was to determine the plant availability of P sorbed to different P-retention media. The studied media were: crystalline and amorphous blast furnace slag, natural and burned opoka (a bedrock from Poland), limestone, burned lime, soil from a spodic B horizon, and light expanded clay aggregates (LECA). They were soaked in a P solution, rinsed and dried before incorporation into soil. An additional aim was to compare P taken up by barley with amounts chemically extracted for the estimation of plant-available soil P. P sorbed to the crystalline slag was delivered to the barley plants more efficiently than P added in K₂HPO₄ fertiliser. Soil extraction with acid ammonium lactate correlated well with P taken up by barley and indicated that P bound to Ca is more available to plants than P

bound to Al and Fe. The Mg content of the used slag may replace Mg fertilisation in certain soils. It was concluded that among the investigated filter materials, crystalline slag was the most suitable sorbent from an agricultural point of view, since it possessed a large P-sorption capacity and the sorbed P was largely plant available. The heavy metal content of sorption materials must be examined carefully before their application to agricultural soils.

69. Quantifying time-varying ground-water discharge and recharge in wetlands of the northern Florida Everglades.

Choi, J. and Harvey, J. W.

Wetlands: the Journal of the Society of the Wetlands Scientists (Sept 2000) 20 (3): 500-511.

NAL Call #: QH75.A1W47; ISSN: 0277-5212.

Descriptors: wetlands/ groundwater-recharge/ discharge/ water-balance/ Florida/ constructed-wetlands

70. Regulatory implications of using constructed wetlands to treat selenium-laden wastewater.

Lemly, A. D. and Ohlendorf, H. M.

Ecotoxicology and Environmental Safety (May 2002) 52 (1): 46-56.

NAL Call #: QH545.A1E29; ISSN: 0147-6513.

Descriptors: wetlands/ waste-water-treatment/ toxicity/ wildlife-

71. Removal of dimethyl disulfide and p-cresol from swine facility wastewater using constructed subsurface-flow wetlands.

Wood, S. L., Wheeler, E. F., and Berghage, R. D.

Transactions of the ASAE (July/Aug 2000) 43 (4): 973-979.

NAL Call #: 290.9-Am32T; ISSN: 0001-2351.

Descriptors: pig-slurry/ odor-abatement/ waste-water-treatment/ wetlands/ pollution-control/ constructed-wetlands

Abstract: Anecdotal evidence suggests that constructed wetlands can remove odors from veal, dairy, and swine wastes (Murphy and George, 1997; McCaskey, 1995). However, the use of constructed wetlands as an odor control treatment will be more successful after malodor reduction in wetland systems has been quantified. This study quantified odor removal from swine facility wastewater (feces, urine, and flushwater) in constructed subsurface-flow wetlands. Four wetlands planted with wetland grasses and four unplanted wetlands received swine facility waste. The relationship between wetland treatments (planted vs unplanted) and reductions of malodorous dimethyl disulfide and p-cresol in wastewater were examined. Reductions in odor intensity and offensiveness as perceived by a human sensory panel were also studied. Gas chromatography analysis indicated that planted wetlands removed 80 and 83% of dimethyl disulfide (DMDS) and p-cresol, respectively. Unplanted wetlands removed 52 and 64% of dimethyl disulfide

and p-cresol, respectively. The reductions in DMDS and p-cresol did not differ significantly ($p > 0.05$) between the two treatments. A human sensory panel, using the cloth swatch technique, assigned a median odor intensity and offensiveness rating of 4 (identifiable odor-offensive, but tolerable) to untreated swine facility wastewater. Median odor ratings for both planted and unplanted effluent were 1 (faint odor-nonidentifiable, not offensive). These median odor ratings were significantly ($p < 0.05$) lower than the median odor rating for untreated wastewater, indicating that constructed wetlands were effective in removing malodor from swine facility wastewater.

72. Removal of N, P, BOD5, and coliform in pilot-scale constructed wetland systems.

Jin, G., Kelley, T., Freeman, M., and Callahan, M.

International Journal of Phytoremediation (2002) 4 (2): 127-141.

NAL Call #: TD192.75-.I58; ISSN: 1522-6514.

Descriptors: wetlands/ aquatic-plants/ waste-water-treatment/ biological-treatment/ sewage-effluent/ nitrogen/ phosphorus/ ammonium-nitrogen/ nitrate-nitrogen/ biochemical-oxygen-demand/ coliform-bacteria/ escherichia-coli/ biodegradation/ Illinois/ tertiary-effluent

73. Removal of solids and oxygen demand from aquaculture wastewater with a constructed wetland system in the start-up phase.

Lin, Y. F., Jing, S. R., Lee, D. Y., and Wang, T. W.

Water Environment Research (Mar/Apr 2002) 74 (2): 136-141.

NAL Call #: TD419.R47; ISSN: 1061-4303.

Descriptors: fish-culture/ waste-water/ effluents/ fish-ponds/ waste-water-treatment/ wetlands/ phragmites-australis/ ipomoea-aquatica/ paspalum-vaginatum/ plant-density/ removal/ chemical-oxygen-demand/ algae/ particles/ Taiwan/ artificial-wetlands/ suspended-soilds

74. The role of vines in the successional development of constructed reclaimed forested wetlands in the Central Florida Phosphate District.

Reiss, Kelly Chinnners 1976

2000. *Xiii, 167 Leaves : Ill.*

NAL Call #: FU LD1780-2000-.R378

Descriptors: Forested-wetlands-Florida/ Constructed-wetlands-Florida/ Phosphate-industry-Florida/ Climbing-plants

75. Self-organization and successional trajectories of constructed forested wetlands.

Carstenn, Susan McFarlane 1957

2000. *Xiv, 224 Leaves : Ill.*

NAL Call #: FU LD1780-2000-.C321

Descriptors: Biological-diversity-conservation/ Ecosystem-health/ Constructed-wetlands-Florida-Planning/ Forested-wetlands-Florida

76. Soil development in phosphate-mined created wetlands of Florida, USA.

Nair, V. D., Graetz, D. A., Reddy, K. R., and Olila, O. G.

Wetlands: the Journal of the Society of the Wetlands Scientists (June 2001) 21 (2): 232-239.

NAL Call #: QH75.A1W47; ISSN: 0277-5212.

Descriptors: soil-organic-matter/ carbon-nitrogen-ratio/ soil-compaction/ phosphate-mined-land/ wetlands/ Florida/ wetland-age

77. Soil infiltration and wetland microcosm treatment of liquid swine manure.

Prantner, S. R., Kanwar, R. S., Lorimor, J. C., and Pederson, C. H.

Applied Engineering in Agriculture (July 2001) 17 (4): 483-488.

NAL Call #: S671.A66; ISSN: 0883-8542.

Descriptors: pig-manure/ liquid-manures/ waste-treatment/ infiltration/ topsoil/ loam-soils/ wetlands/ typha/ removal/ ammonium-nitrogen/ nitrate-nitrogen/ phosphorus/ ammonia-

Abstract: Management systems are needed to minimize water quality concerns associated with liquid swine manure from large swine production facilities. Experiments were conducted to investigate the removal of ammonium-N, nitrate-N, and total phosphorus from liquid swine manure through the use of a soil infiltration and wetland system. Experimental treatments applied directly to the soil infiltration areas included a full-rate application of liquid swine manure, a mixture of 3/4 manure and 1/4 water, and a control application of water only. For three months during both summers of 1998 and 1999, nutrient concentrations were determined in the infiltration area influent, the infiltration area effluent, and the wetland effluent on a weekly basis. Approximately 93% of the ammoniacal nitrogen (NH₃-N and NH₄-N) from the applied swine manure was removed by the soil infiltration areas with a corresponding 99% increase in the nitrate nitrogen (NO₃-N) concentrations were found. The wetland systems removed 94% of the remaining NH₃-N and NH₄-N and 95% of the NO₃-N. The total P levels were decreased in the soil infiltration areas and wetlands by 89 and 84%, respectively.

78. Spatio-temporal variation of salt marsh seedling establishment in relation to the abiotic and biotic environment.

Noe, G. B. and Zedler, J. B.

Journal of Vegetation Science (Feb 2001) 12 (1): 61-74.

NAL Call #: QK900.J67; ISSN: 1100-9233.

Descriptors: salt-marshes/ seedlings/ establishment/ spatial-variation/ temporal-variation/ soil-salinity/ soil-water-content/ seed-germination/ soil-texture/ altitude/ introduced-species/ rain/ regrowth/ salt-marsh-soils/ California

79. Stability of phosphorus within a wetland soil following ferric chloride treatment to control Eutrophication.

Sherwood, L. J. and Qualls, R. G.

Environmental Science and Technology (Oct 15, 2001) 35 (20): 4126-4131.
NAL Call #: TD420.A1E5; ISSN: 0013-936X.

Descriptors: wetland-soils/ Florida/ everglades

80. Subsurface flow constructed wetland performance at a Pennsylvania campground and conference center.

Shannon, R. D., Flite, O. P. III., and Hunter, M. S.

Journal of Environmental Quality (Nov/Dec 2000) 29 (6): 2029-2036.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: nitrogen/ phosphorus/ subsurface-drainage/ water-flow/ wetlands

Abstract: A constructed wetland treatment system consisting of subsurface flow (SSF) wetland cells, sand filters, and final effluent wetlands was found to be effective in removing carbonaceous biochemical oxygen demand (CBOD) and total suspended solids (TSS) to below 30 and 10 mg L⁻¹, respectively. Removal efficiency of total nitrogen (TN) loads improved from 60.1 to 88.5% over the 2-yr study, primarily due to increased vegetation densities in the SSF wetland cells. In both years, parallel wetland treatment cells had significantly different ($p < 0.001$) plant densities of broadleaf cattail (*Typha latifolia* L.) and softstem bulrush [*Schoenoplectus tabernaemontani* (K.C. Gmel.) Palla], with significantly more TN removed from the more densely vegetated cell. Overall, the assimilation of N by plants removed less than 25% of the TN load, regardless of plant density, indicating that the primary role of deeply rooted macrophytes is supporting sequential nitrification-denitrification within the anaerobic wetland substrate. More than 99% of the dissolved phosphate (PO₄(3-)-P) was removed within the entire system in both years, but removal efficiencies within the wetland cells decreased from 91.2% the first year to 66.1% the second year, indicating that adsorption sites for PO₄(3-)-P may be saturated despite increased plant assimilation. Experimental manipulation of waste applied to the sand filters demonstrated that a header-type distribution system promoting horizontal flow was more effective at nitrifying ammonium (NH₄(+)-N) discharged to the sand filters than the surface application of waste promoting vertical flow.

81. Subsurface flow constructed wetlands performance evaluation, modeling, and statistical analysis.

Liu, Wenxin.

Thesis (Ph. D.) -- University of Nebraska -- Lincoln, 2002. Includes bibliographical references.

82. Trace element removal from coal ash leachate by a 10-year-old constructed wetland.

Ye, Z. H., Whiting, S. N., Qian, J. H., Lytle, C. M., Lin, Z. Q., and Terry, N.

Journal of Environmental Quality (Sept/Oct 2001) 30 (5): 1710-1719.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: fly-ash/ trace-elements/ leachates/ uptake/ typha-latifolia/ juncus-effusus/ wetlands/ Alabama

Abstract: This study investigated the ability of a 10-yr-old constructed wetland to treat metal-contaminated leachate emanating from a coal ash pile at the Widows Creek electric utility, Alabama (USA). The two vegetated cells, which were dominated by cattail (*Typha latifolia* L.) and soft rush (*Juncus effusus* L.), were very effective at removing Fe and Cd from the wastewater, but less efficient for Zn, S, B, and Mn. The concentrations were decreased by up to 99% for Fe, 91% for Cd, 63% for Zn, 61% for S, 58% for Mn, and 50% for B. Higher pH levels (>6) in standing water substantially improved the removing efficiency of the wetland for Mn only. The belowground tissues of both cattail and soft rush had high concentrations of all elements; only for Mn, however, did the concentration in the shoots exceed those in the belowground tissues. The concentrations of trace elements in fallen litter were higher than in the living shoots, but lower than in the belowground tissues. The trace element accumulation in the plants accounted for less than 2.5% of the annual loading of each trace element into the wetland. The sediments were the primary sinks for the elements removed from the wastewater. Except for Mn, the concentrations of trace elements in the upper layer (0-5 cm) of the sediment profile tended to be higher than the lower layers (5-10 and 10-15 cm). We conclude that constructed wetlands are still able to efficiently remove metals in the long term (i.e., >10 yr after construction).

83. Treatment of domestic wastewater by three plant species in constructed wetlands.

Coleman, J., Hench, K., Garbutt, K., Sexstone, A., Bissonnette, G., and Skousen, J.
Water, Air, and Soil Pollution (June 2001) 128 (3/4): 283-295.
NAL Call #: TD172.W36; ISSN: 0049-6979.

Descriptors: wetlands/ juncus-effusus/ scirpus-validus/ typha-latifolia/ waste-water-treatment/ biological-treatment/ sewage-effluent/ biochemical-oxygen-demand/ fecal-coliforms/ ammonia/ phosphate/ artificial-wetlands

84. Treatment of greenhouse wastewater using constructed wetlands.

Prystay, W. and Lo, K. V.
Journal of Environmental Science and Health : Part B: Pesticides, Food Contaminants and Agricultural Wastes (2001) B36 (3): 341-353.
NAL Call #: TD172.J61; ISSN: 0360-1234.

Descriptors: waste-water-treatment/ nitrogen/ phosphorus/ removal/ wetlands/ design/ water-pollution/ pollution-control

85. Treatment of high-strength winery wastewater using a subsurface-flow constructed wetland.

Shepherd, H. L., Grismer, M. E., and Tchobanoglous, G.
Water Environment Research (July/Aug 2001) 73 (4): 394-403.
NAL Call #: TD419.R47; ISSN: 1061-4303.

Descriptors: wetlands/ waste-water-treatment/ wine-industry/ factory-effluents/ chemical-oxygen-demand/ nitrogen/ volatile-fatty-acids/ tannins/ phenols/ lignin/ phosphorus/ sulfur/ ammonia/ California/ artificial-wetlands

86. Treatment of swine wastewater using a saturated-soil-culture soybean and flooded rice system.

Szogi, A. A., Hunt, P. G., and Humenik, F. J.
Transactions of the ASAE (Mar/Apr 2000) 43 (2): 327-335.
NAL Call #: 290.9-Am32T; ISSN: 0001-2351.

Descriptors: pig-slurry/ waste-water-treatment/ saturated-conditions/ wetlands/
constructed-wetlands

87. Using a wetland bioreactor to remediate ground water contaminated with nitrate (mg/L) and perchlorate (microgram/L). [Erratum: 2002, v. 4 (2), p. unnumbered.].

Krauter, P. W.
International Journal of Phytoremediation (2001) 3 (4): 415-433.
NAL Call #: TD192.75-.I58; ISSN: 1522-6514.

Descriptors: nitrate-nitrogen/ perchlorates/ typha/ scirpus/ cyperus/ groundwater-pollution/ bioremediation/ bioreactors/ wetlands/ phytoremediation

88. A water chemistry assessment of wastewater remediation in a natural swamp.

Zhang, X., Feagley, S. E., Day, J. W., Conner, W. H., Hesse, I. D., Rybczyk, J. M., and Hudnall, W. H.
Journal of Environmental Quality (Nov/Dec 2000) 29 (6): 1960-1968.
NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: waste-water-treatment/ wetlands/ Louisiana

Abstract: Various aspects of water chemistry of a natural forested wetland were studied in order to determine the possibility of using the wetland for advanced wastewater treatment in Louisiana and to evaluate the wastewater effect on swamp water quality. The study was carried out by comparing treatment and control cypress-tupelo forests separated by a bottomland hardwood forest ridge. The treatment area (231 ha) received secondarily treated municipal wastewater at a rate of 6.3×10^6 L d⁻¹. The calculated hydraulic detention time of the wastewater was 120 d. Electrical conductivity (EC), pH, and concentrations of 5-d biological oxygen demand (BOD₅), dissolved oxygen (DO), solids, nutrients, and trace metals were monitored. Mean concentrations for the wastewater were 14.6 mg L⁻¹ for total N and 2.5 mg L⁻¹ for total P. The dominant form of N in the wastewater was NO₃-N. The swamp system attenuated the NO₃-N by 100%, total Kjeldahl nitrogen (TKN) by 69%, and total P by 66%. It appears that tertiary wastewater treatment was achieved due to the nutrient attenuations. Based upon our findings, we predict that the high N attenuation efficiency would enable the swamp to work well if the N loading rate were doubled. However, P removal was dependent on loading rate, hydraulic retention time, and temperature. The swamp was more efficient in treating wastewater during warm seasons than cool seasons. During the monitoring period, trace metals were not significantly increased in the swamp water because of very low concentrations in the wastewater.

89. Wetlands and remediation II : proceedings of the Second International Conference on Wetlands & Remediation, Burlington, Vermont, September 5-6, 2001.: Wetlands and remediation 2. Wetlands and remediation two.

Nehring, Karl W. 1949, Brauning, Susan E. 1956, and International Conference on Wetlands and Remediation (2nd : 2001 : Burlington, Vt. Columbus, Ohio : Battelle Press, c2002. viii, 386 p. : ill., maps:Includes bibliographical references and indexes.
NAL Call #: QH87.3-.I55-2001

Descriptors: Wetland-management-Congresses/ Wetland-conservation-Congresses

90. Wetlands & remediation: An International Conference, Salt Lake City, Utah, November 16-17, 1999.: Wetlands and remediation.

Means, Jeffrey L., Hinchee, Robert E., and Wetlands & Remediation: An International Conference (1999 : Salt Lake City, Utah Columbus, Ohio : Battelle Press, c2000. viii, 445 p. : ill., maps:Includes bibliographical references and indexes.
NAL Call #: QH87.3-.W465-1999

Descriptors: Wetland-management-Congresses/ Wetland-conservation-Congresses

91. Xenobiotics removal from polluted water by a multifunctional constructed wetland.

Cheng, S., Vidakovic Cifrek, Z., Grosse, W., and Karrenbrock, F.
Chemosphere (July 2002) 48 (4): 415-418.
NAL Call #: TD172.C54; ISSN: 0045-6535.

Descriptors: wetlands/ colocasia-esculenta/ ischaemum-aristatum/ pollutants/ removal/ waste-water-treatment/ polluted-water/ water-pollution/ parathion/ insecticide-residues/ mcpa/ dicamba/ herbicide-residues/ biomass-production/ bioremediation/ artificial-wetlands

Agricultural Best Management Practices

(Citations 91-146)

| Constructed Wetlands | Nutrient Management: Crops | Nutrient Management: Livestock
|
Environmental Management Systems for Agriculture |

92. Advances in urban stormwater and agricultural runoff source controls.

Marsalek, J. Jiri 1940
Boston : Kluwer Academic Publishers, 2001. xvii, 319 p. : ill., maps:Papers presented at the NATO Advanced Research Workshop on "Source Control Measures for Stormwater

Runoff," held in St. Marienthal-Ostritz, Germany. Includes index.
NAL Call #: TD657-.A348-2001

Descriptors: Runoff-Management-Congresses/ Flood-control-Congresses/ Best-management-practices-Pollution-prevention-Congresses

93. **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.
Transactions of the ASAE (Sept/Oct 2000) 43 (5): 1155-1166.
NAL Call #: 290.9-Am32T; ISSN: 0001-2351.

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

94. **Best management practice and crop monitoring for alfalfa in Southern Australia.**

Lattimore, M. A. E.
Proc-Am-Forage-Grassl-Counc. Georgetown, Tex. : American Forage and Grassland Council. (2000) 9: 339.
NAL Call #: SB193.F59

95. **Best management practices. 2.**

Hartin, J., Pittenger, D., and Henry, J. M.
Turf Grass Trends (Dec 2000) 9 (12): 1-7.
NAL Call #: SB433.T874; ISSN: 1076-7207.

Descriptors: lawns-and-turf/ trees/ fertilizers/ application-rates/ irrigation/ pruning/ guidelines

96. **Best management practices for animal feeding operations (AFOs and CAFOs).**

Tyson, Ted W.
[Auburn, Ala.] : Alabama Cooperation Extension System, [2000] [4] p.:Caption title.
"New Aug 2000"--P. [4].
NAL Call #: S544.3.A2-C47-no.-1188

97. **Best management practices to reduce non-point source pollution in the town of Plainfield, Connecticut : a guidance manual.**

American Ground Water Trust. Plainfield (Conn. : Town). Planning and Engineering Dept. United States. Environmental Protection Agency. Region I.
Plainfield, Conn. : American Groundwater Trust, [2000]:Title from web page.
"December 2000." Description based on content viewed June 25, 2002. Includes bibliographical references. USEPA X981114-01-0.
NAL Call #: TD225.P6-B47-2000

URL: URL: <http://www.agwt.org/manual.pdf>

Descriptors: Nonpoint-source-pollution-Connecticut-Plainfield/ Best-management-practices-Pollution-prevention-Connecticut-Plainfield/ Water-quality-management-

98. A conceptual approach for integrating phosphorus and nitrogen management at watershed scales.

Heathwaite, L., Sharpley, A., and Gburek, W.

Journal of Environmental Quality (Jan/Feb 2000) 29 (1): 158-166.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: phosphorus/ nitrogen/ losses-from-soil/ watershed-management/ nutrient-management/ best-management-practices

Abstract: Since the late 1960s, point-sources of water pollution have been reduced due to their ease of identification and treatment. As water quality problems remain and further point-source measures become less cost-effective, attention is directed toward reducing agricultural nonpoint-sources of P and N. In the past, separate strategies for P and N were developed and implemented at farm or watershed scales. Because of differing biology, chemistry, and flow pathways of P and N in soil, these narrowly targeted strategies may lead to mixed results. In some cases, N management of manures has increased soil P and subsequent P enrichment of surface runoff, while no-till has reduced P losses but increased nitrate leaching. Thus, an integrated approach to nutrient management is needed, with best management practices (BMPs) targeted to critical areas of a watershed that contribute most of the P and N exported. We have developed indices that identify critical sources and transport pathways controlling P and N export. These indices are applied to a mixed land use watershed in Pennsylvania. Areas most vulnerable to P loss are limited to small, well-defined areas of the watershed (<20% of area) near the stream channel. In contrast to P, larger areas contribute to nitrate leaching and generally occur on the upper boundaries of the watershed (60%), where freely draining soils and high manure and fertilizer N applications are made. Thus, differing levels of nutrient management may be appropriate for different areas of a watershed.

99. Cost effectiveness of agricultural BMPs for sediment reduction in the Mississippi Delta.

Yuan, Y., Dabney, S. M., and Bingner, R. L.

Journal of Soil and Water Conservation (Sept/Oct 2002) 57 (5): 259-267.

NAL Call #: 56.8-J822; ISSN: 0022-4561.

Descriptors: water-erosion/ erosion-control/ tillage/ minimum-tillage/ no-tillage/ sediment-yield/ crop-production/ glycine-max/ gossypium-hirsutum/ cover-crops/ winter-wheat/ triticum/ triticum-aestivum/ grass-strips/ ponding/ pipes/ cost-effectiveness-analysis/ Mississippi/ best-management-practices/ water-impoundment/ edge-of-field-pipes

100. Defeat runoff with BMPs and buffer strips.

Baird, J. H.

Grounds Maintenance (Apr 2001) 36 (4): g1-g2, g16.
NAL Call #: SB476.G7; ISSN: 0017-4688.

Descriptors: lawns-and-turf/ golf-courses/ fertilizers/ runoff/ water-pollution/ pollution-control/ grass-strips/ best-management-practices

101. **Effectiveness of three best management practices for highway-runoff quality along the Southeast Expressway, Boston, Massachusetts.**

Smith, Kirk P. and Geological Survey (U.S.). United States. Federal Highway Administration. Massachusetts. Highway Dept. Northborough, Mass. : U.S. Dept. of the Interior, U.S. Geological Survey ; Denver, CO : U.S. Geological Survey, Branch of Information Services [distributor], 2002. vii, 62 p. : ill. (some col.), maps 1 CD-ROM (4 3/4 in.):CD-ROM contains Appendix 1: Summary statistics and analytical results. Includes bibliographical references (p. 59-62).
NAL Call #: GB701-.W375-no.-2002-4059

Descriptors: Runoff-Massachusetts-Boston/ Roads-Environmental-aspects-Massachusetts-Boston/ Water-quality-management-Massachusetts-Boston

102. **Environmental management best practice guidelines for the nursery industry.**

[South Perth, WA] : Dept. of Agriculture, Water and Rivers Commission, Government of Western Australia, [2002] ii, 44 p. : ill.: "April 2002"--Cover. Includes bibliographical references (p. 39).
NAL Call #: S397-.M57-no.-2002/2

103. **Estimation of nitrate leaching in an Entisol under optimum citrus production.**

Paramasivam, S., Alva, A. K., Fares, A., and Sajwan, K. S. *Soil Science Society of America Journal*. [Madison, Wis.: Soil Science Society of America.] (May/June 2001) 65 (3): 914-921.
NAL Call #: 56.9-So3; ISSN: 0361-5995.

Descriptors: nitrate/ leaching/ estimation/ nitrate-nitrogen/ entisols/ citrus-soils/ ammonium-nitrate/ liquid-fertilizers/ broadcasting/ fertigation/ application-rates/ soil-fertility/ rooting-depth/ irrigation/ losses-from-soil/ Florida/ dry-granular-fertilizers/ nitrogen-best-management-practices

Abstract: Leaching of fertilizer nutrients and widespread NO₃-N contamination of drinking water wells in proximity to citrus growing regions of central Florida are a serious concern. We evaluated NO₃-N distribution in soil solution at various depths in the vadose zone, and N leaching below the root zone for two cropping seasons under the canopy of 21-yr-old Hamlin orange [*Citrus sinensis* (L.) Osbeck] trees on Cleopatra mandarin (*Citrus reticulata* Blanco) rootstock, on an entisol of central Florida. The treatments included 112, 168, 224, and 280 kg N ha⁻¹ yr⁻¹ as either dry granular fertilizer (DGF; broadcast, in 4 equal doses) or fertigation (FRT; 15 applications yr⁻¹), and 56, 112, and 168 N kg ha⁻¹ yr⁻¹ as controlled-release fertilizer (CRF; single

application yr⁻¹). Irrigation was scheduled using recommended tensiometer set points as guidelines, with a target wetting depth of 90 cm. The NO₃-N was measured in soil solutions bi-weekly at 60-, 120-, and 240-cm depths using suction lysimeters (SLs) installed under the tree canopy. The 240-cm depth sample represented soil solution below the rooting depth of the trees, and the NO₃-N at this depth could contaminate groundwater. At the 60- or 120-cm depths, the NO₃-N concentrations occasionally peaked at 12 to 100 mg L⁻¹, but at 240 cm NO₃-N concentrations mostly remained below 10 mg L⁻¹. The careful irrigation management, split fertilizer application, and timing of application contributed to the low leaching of NO₃-N below the root zone. Calculated NO₃-N leaching losses below the rooting depth increased with increasing rate of N application and the amount of water drained, and accounted for 1 to 16% of applied fertilizer N.

104. **Evaluation of nitrate-nitrogen transport in a potato-barley rotation.**

Delgado, J. A., Riegenbach, R. R., Sparks, R. T., Dillon, M. A., Kawanabe, L. M., and Ristau, R. J.

Soil Science Society of America Journal. [Madison, Wis.: Soil Science Society of America.] (May/June 2001) 65 (3): 878-883.

NAL Call #: 56.9-So3; ISSN: 0361-5995.

Descriptors: rotations/ solanum-tuberosum/ hordeum-vulgare/ nitrate-nitrogen/ leaching/ losses-from-soil/ irrigated-soils/ sandy-soils/ arid-soils/ semiarid-soils/ nitrogen-fertilizers/ application-rates/ groundwater-pollution/ soil-fertility/ Colorado/ NLEAP-model/ best-management-practices

Abstract: Well water NO₃(-)-N concentrations have been found to exceed 10 mg L⁻¹ of NO₃(-)-N for some areas of the San Luis Valley (SLV) of South-Central Colorado. The region's predominant soils are sandy soils, with a dominant potato (*Solanum tuberosum* L.) followed by malting barley (*Hordeum vulgare* L.) crop rotation. There is limited knowledge about how much NO₃(-)-N is lost by leaching from these systems, and protocols need to be developed to evaluate the NO₃(-)-N transport out of these coarse textured soils from these arid and semiarid irrigated cropping systems. Management information, N content at harvest, initial and final NO₃(-)-N in the soil profile, and other supportive data were collected at 14 commercial fields and used as inputs for the Nitrate Leaching and Economic Analysis Package (NLEAP) model, version 1.20. NLEAP simulated available soil water for the root zone as well as the transport of NO₃(-)-N in the soil profile, and can be used as part of the protocol to evaluate the NO₃(-)-N transport of these systems. Best recommended practices in this region, such as application of N fertilizer rates on the basis of soil test analysis and split applications of N fertilizers, kept the net transport of NO₃(-)-N out of the potato-barley systems to a minimum. Our approach of applying simulation models to assess management scenarios showed that barley served as a scavenger for the NO₃(-)-N that was added with irrigation water and the residual soil nitrate from the potato growing period.

105. **An evaluation of soil water status using tensiometers in a sandy soil profile under citrus production.**

Paramasivam, S., Alva, A. K., and Fares, A.
Soil Science (Apr 2000) 165 (4): 343-353.
NAL Call #: 56.8-So3; ISSN: 0038-075X.

Descriptors: citrus-soils/ sandy-soils/ water-content/ monitoring/ available-water/
microirrigation/ water-management/ irrigation-scheduling/ tensiometers/ Florida/ best-
management-practices

106. **Farm economics to support the design of cost-effective Best Management Practice (BMP) programs to improve water quality: nitrogen control in the Neuse River Basin, North Carolina.**

Wossink, G. A. A. and Osmond, D. L.

Journal of Soil and Water Conservation (July/Aug 2002) 57 (4): 213-220.

NAL Call #: 56.8-J822; ISSN: 0022-4561.

Descriptors: agricultural-land/ watersheds/ rivers/ runoff/ nitrogen/ water-pollution/
water-quality/ pollution-control/ cost-analysis/ grass-strips/ North-Carolina/ cost-
effectiveness-analysis/ grass-buffers/ cost-share-programs

107. **Georgia homeowner survey of landscape management practices.**

Varlamoff, S., Florkowski, W. J., Jordan, J. L., Latimer, J., and Braman, K.

HortTechnology (Apr/June 2001) 11 (2): 326-331.

NAL Call #: SB317.5.H68; ISSN: 1063-0198.

Descriptors: homeowners/ surveys/ landscape-gardening/ land-management/ fertilizers/
herbicides/ insecticides/ fungicides/ application-rates/ home-gardens/ extension-
education/ runoff/ water-quality/ surface-water/ watersheds/ weeds/ georgia

Abstract: A survey of Georgia homeowners provided insights about their use of fertilizers and pesticides. Knowledge of current homeowner practices is needed to develop a best management practices manual to be used by Master Gardeners to train the general public through the existing outreach programs. The objective of the training program is to reduce nutrient runoff and garden chemicals and improve the quality of surface water in urban watersheds. Results showed three of four homeowners did their own landscaping and, therefore, fully controlled the amount of applied chemicals and the area of application. Fertilizers were primarily applied to lawns, but a high percentage of homeowners also applied them to trees, shrubs, and flowers. Insecticides were applied by a larger percentage of homeowners than herbicides. Control of fire ants (*Solenopsis invicta*) was likely the reason behind the frequent use of insecticides. The desire for a weed free lawn was the plausible motivation behind the use of herbicides, which were used mostly on lawns. Fungicide use was infrequently reported by Georgia homeowners. The pattern of fertilizer and pesticide use suggests that the developed manual should emphasize techniques and cultural practices, which could lower the dependence on chemicals, while ultimately assuring the desired appearance of turf and ornamental plants.

108. **Groundwater quality beneath irrigated vegetable fields in a north-central U.S. sand plain.**

Stites, W. and Kraft, G. J.

Journal of Environmental Quality (Sept/Oct 2000) 29 (5): 1509-1517.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: water-quality/ horticultural-crops/ irrigated-conditions/ groundwater-pollution/ Wisconsin

Abstract: The dramatic expansion of irrigated agriculture since about 1970 in the north-central USA has been accompanied by NO₃ and pesticide pollution of groundwater. The expansion has been concentrated in areas with sandy soils and shallow water tables, such as the Wisconsin central sand plain. In some parts of this sand plain, most wells contain detectable pesticide residues and NO₃-N concentrations that exceed the 10 mg L⁻¹ U.S. drinking water maximum contaminant level (MCL). To evaluate the effects on groundwater quality of this agricultural system, we monitored solutes 23 times during a 2-yr period in the upper 3 m of the aquifer beneath and immediately upgradient of four irrigated vegetable fields. Groundwater beneath fields had significantly greater concentrations of most solutes and lower pH than upgradient groundwater. Especially pronounced were Ca, Cl, K, Mg, and NO₃ differences, with concentrations 5 to 26 times greater under fields. Nitrate N concentrations averaged 21 mg L⁻¹ under fields, compared with 1 mg L⁻¹ upgradient. Pesticide residues were ubiquitous beneath fields, and generally persisted for many months after application. Pesticide concentrations often exceeded Wisconsin preventive-action limits (PALs), but seldom exceeded federal MCLs. Even when agricultural management approximated best management practice (BMP) recommendations, the NO₃ concentration beneath these fields approached double the MCL, indicating a need for new approaches to control agricultural groundwater pollution.

109. **A guide for best management practice (BMP) selection in urban developed areas.**

Environmental and Water Resources Institute (U.S.). American Society of Civil Engineers. Task Committee for Evaluating Best Management Practices.

Reston, Va. : American Society of Civil Engineers, c2001. vii, 51 p.:Includes bibliographical references (p. 46-48) and index.

NAL Call #: TD657-.G85-2001

Descriptors: Urban-runoff-Management/ Water-quality-management/ Best-management-practices-Pollution-prevention-Evaluation

110. **Improved land-management practices protect watershed lakes.**

Core, J.

Agricultural Research [U.S. Department of Agriculture, Agricultural Research Service] (Oct 2002) 50 (10): 20-22.

NAL Call #: 1.98-Ag84; ISSN: 0002-161X.

Descriptors: watershed-management/ water-quality/ water-conservation/ cropping-systems/ herbicides/ water-pollution/ riparian-vegetation/ runoff-water/ Mississippi/ Mississippi-Delta-management-systems-evaluation-area/ best-management-practices

111. **Innovative management of agricultural phosphorus to protect soil and water resources.**

Sharpley, A. N., Kleinman, P., and McDowell, R.

Communications in Soil Science and Plant Analysis (2001) 32 (7/8): 1071-1100.

NAL Call #: S590.C63; ISSN: 0010-3624.

Descriptors: phosphorus/ phosphorus-fertilizers/ nitrogen/ nitrogen-fertilizers/ animal-manures/ losses-from-soil/ pollution-control/ leaching/ runoff/ transport-processes/ crop-management/ application-rates/ application-methods/ soil-fertility/ literature-reviews/ best-management-practices

Abstract: Agriculture, particularly livestock agriculture, is receiving increasing public scrutiny due to non-point source phosphorus (P) pollution and eutrophication. Much of today's situation may be attributed to system level trends in specialization and intensification that result in excess P entering livestock farms. Balancing P at the farm gate represents a necessary step for long-term soil and water quality protection. Remedial P management combines source and transport control that confront critical areas of P export in surface and subsurface runoff from agricultural landscapes. Source management seeks to immobilize P in the environment through such strategies as reducing soluble P in manure, targeting P application to soils with high retention capacities, and managing soil P. Transport controls employ an understanding of loss or transfer mechanisms to avoid P application on areas with a high transport potential. Also, the potential for P transport can be reduced by implementation of conservation practices such as reduced tillage, terracing, and stream buffers. However, implementation of agricultural management strategies that minimize P export must consider the cost effectiveness of alternative measures, as low practice adoption may limit or impede water quality benefits.

112. **Integrating soil phosphorus testing into environmentally based agricultural management practices.**

Sims, J. T., Edwards, A. C., Schoumans, O. F., and Simard, R. R.

Journal of Environmental Quality (Jan/Feb 2000) 29 (1): 60-71.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: phosphorus/ soil-testing/ agricultural-soils/ best-management-practices

Abstract: Soil testing has been an accepted agricultural management practice for decades. Interpretations and fertility recommendations based on soil analyses and the information obtained with soil samples on cropping systems, tillage practices, soil types, manure use, and other parameters have contributed to the increased efficiency of agricultural production. Recently, however, analyses of long-term trends in soil test P values have shown that soil P in many areas of the world is now excessive, relative to crop P requirements. The role of P in the eutrophication of surface waters and emerging

concerns about the human health impacts of toxic algal/dinoflagellate blooms have heightened public awareness of nonpoint source pollution by agricultural P. The greatest concerns are with animal-based agriculture, where farm and watershed-scale P surpluses and over-application of P to soils are common. The need for nutrient-management plans based on N and P is now an issue of intense debate in the U.S. and Canada. This paper addresses three issues: Should the applications of organic wastes and fertilizers be based on soil P and, if so, what is the most appropriate testing method to assess environmental risk? How can our knowledge of soil P chemistry be integrated with the expertise of hydrologists, agronomists, aquatic ecologists, and others to assess the risks that P in agricultural soils poses to surface waters? And, finally, how can we use soil P testing to evaluate new best management practices (BMPs) now being developed to reduce P transport from soil to water.

113. **Irrigation and nitrate movement evaluation in conventional and alternate-furrow irrigated cotton.**

Rice, R. C., Hunsaker, D. J., Adamsen, F. J., and Clemmens, A. J.
Transactions of the ASAE (May/June 2001) 44 (3): 555-568.
NAL Call #: 290.9-Am32T; ISSN: 0001-2351.

Descriptors: furrow-irrigation/ nitrate-nitrogen/ leaching/ evapotranspiration/ gossypium-hirsutum/ irrigated-conditions/ Arizona/ irrigation-efficiency

Abstract: One of the important criteria in determining best management practices for irrigated agriculture is understanding the interaction between irrigation system performance and the movement of water and solutes through the soil. The objective of this four-year study was to evaluate the irrigation efficiency (IE) and the potential movement of applied nitrogen for a commercial cotton field in Arizona. In the first two cotton seasons, the grower used a conventional furrow irrigation practice consisting of 1.0-m row spacing and irrigation in every furrow. To reduce the amount of surface water runoff (RO) observed during the first two seasons, the grower changed to alternate-furrow irrigation and narrowed the row spacing to 0.8 m in the third and fourth seasons. Measurements of irrigation inflow and outflow and estimates of daily crop evapotranspiration were used to calculate the amount of RO, deep percolation (DP), and soil water storage during each irrigation event, which in turn were used to estimate the IE attained in each cotton season. Potassium bromide (KBr) was applied to 15 sample sites at the start of the growing season in each year to monitor the movement of bromide (Br⁻). Prior to the application of KBr and after harvest for each year, soil samples were taken from the sample plots to a depth of 2.7 m and analyzed for bromide and nitrate. Runoff of applied irrigation water decreased from an average of 21% under the conventional practice to 13% after changing to alternate furrows. However, since the average fraction of irrigation water lost to DP was increased from 18% to 22% under the alternate-furrow practice, the overall gains in IE (3% to 4%) were small. Furthermore, bromide and nitrate leaching below the cotton root zone appeared to be somewhat increased with the alternate-furrow practice. Implementing a tailwater recovery system and improving irrigation scheduling would potentially increase IE and reduce the over-irrigation and nitrate leaching observed for the commercial cotton production system.

114. **Linking stormwater BMP designs and performance to receiving water impact mitigation : proceedings of an Engineering Foundation conference, August 19-24, 2001, Snowmass Village, Colorado.**

Urbonas, Ben. and Engineering Foundation (U.S.).

Reston, Va. : American Society of Civil Engineers, c2002. xiii, 572 p. : ill., maps:Includes bibliographical references and index.

NAL Call #: TD657-.L55-2002

Descriptors: Urban-runoff-Management-Congresses/ Water-quality-management-Congresses/ Best-management-practices-Pollution-prevention-Congresses

115. **Nitrapyrin behavior in soils and environmental considerations.**

Wolt, J. D.

Journal of Environmental Quality (Mar/Apr 2000) 29 (2): 367-379.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: nitrapyrin/ crop-management/ use-efficiency/ adsorption/ desorption/ nitrate-nitrogen/ leaching/ environmental-fate/ soil-metabolism

Abstract: Using nitrification inhibitors is a well-established fertilizer best management practice affording improved fertilizer use efficiency in crop production that may benefit profitability, crop quality, and the environment. The environmental benefit of nitrification inhibitor use in terms of managing N mobility in agroecosystems must be balanced against any environmental costs associated with the practice itself. Nitrapyrin exhibits multiple routes of degradation in the environment (hydrolysis, aerobic and anaerobic metabolism), which along with sorption and volatilization restrict its ability to mobilize to ground or surface water. Management practices (timing, rate, and method of application) that maximize nitrapyrin efficacy, additionally, favor the ultimate fate of nitrapyrin to occur by the linked processes of sorption and degradation within the upper soil profile. Thus, when nitrapyrin is used as a best management practice conducive of optimal fertilizer use efficiency, its environmental fate and behavior attributes minimize potential environmental exposure.

116. **Nitrate leaching from arable and horticultural land.**

Goulding, K.

Soil Use and Management (June 2000) 16 (suppl.): 145-151.

NAL Call #: S590.S68; ISSN: 0266-0032.

Descriptors: nitrate/ leaching/ losses-from-soil/ agricultural-land/ agricultural-soils/ horticultural-soils/ arable-land/ nitrogen-fertilizers/ application-rates/ pollution-control/ application-date/ application-methods/ programs/ UK/ maff-nitrate-programme

Abstract: Arable crops in the UK make a large contribution to nitrate leaching by virtue of the land area they cover (> 4.5 million ha). By contrast horticultural crops occupy only a small area (< 0.2 million ha) but can leach very large amounts of nitrogen. The application of nitrogen fertilizer to arable and horticultural crops is very cost-effective,

stimulating its use. MAFF's Nitrate Research Programme for arable and horticultural crops aims to reduce nitrate leaching and maintain productive farming through Best Management Practice. The Programme has led to the development and testing of methods to measure nitrate leaching, the identification of 'leaky' crops, soils and practices, and strategies to optimize the use of fertilizer nitrogen. Data have been used to construct and test models of nitrate leaching, which in turn have been used to evaluate the leakiness of potential rotations. Current best practice to minimize nitrate leaching requires measures to improve the efficiency of nitrogen use by crops, combined with measures to protect soil nitrogen from leaching during the late autumn to spring drainage period. This involves consideration of many factors: an appropriate crop variety must be chosen; a green cover must be maintained for as much of the year as is practicable; crops should be drilled early; fertilizer requirements should be calculated using a recommendation system and allowing for soil mineral nitrogen and any manures applied; fertilizers should be spread evenly with a properly calibrated spreader, perhaps using split applications; starter fertilizers and banding of fertilizers should be used where appropriate to reduce losses from vegetables; pest and disease infestation must be minimized; any irrigation must be applied carefully with scheduling. Research is now moving on to study whole farm systems and the interactions between losses of nitrogen and other pollutants to the environment with the aim of minimizing total environmental impact.

117. **Nitrogen-15 and bromide tracers of nitrogen fertilizer movement in irrigated wheat production.**

Ottman, M. J., Tickes, B. R., and Husman, S. H.

Journal of Environmental Quality (Sept/Oct 2000) 29 (5): 1500-1508.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: nitrate-nitrogen/ leaching/ triticum/ irrigated-conditions/ pollution-control/ Arizona/ best-management-practices

Abstract: In irrigated agricultural systems, NO₃ leaching is believed to result from high fertilizer rates combined with the need to periodically leach salts from surface soil horizons. The purpose of this research is to estimate N fertilizer movement in the soil of commercial fields of flood-irrigated wheat (*Triticum* spp.) while documenting best management practices (BMPs). Potassium bromide and 15N labeled ammonium sulfate were applied as tracers of N fertilizer movement to 1- X 1-m microplots replicated 9 or 10 times in three commercial fields of flood-irrigated wheat. The soil was sampled at harvest to a depth of 2.4 to 4.0 m. More fertilizer was applied at two out of three sites and more irrigation water was applied at all sites than recommended by BMPs. Bromide recovery in the soil and plant tissue at harvest was 29, 68, and 61% of that applied at the three sites. Most of the 15N measured in the soil profile was contained in the 0- to 0.3-m increment of soil. Recovery on 15N in the soil and plant tissue at harvest was 54, 54, and 69% of that applied. The Br recovery data suggests that 32 +/- 28% (standard deviation) of the 15N applied may have leached. The highest leaching potential was measured at the site that adhered to BMPs for N fertilizer management but had the most permeable soil. Nitrate leaching in flood-irrigated wheat production seems inevitable even if BMPs for N fertilizer management are followed.

118. **Nitrogen and phosphorus management on Wisconsin farms: lessons learned for agricultural water quality programs.**

Shepard, R.

Journal of Soil and Water Conservation (First Quarter 2000) 55 (1): 63-68.

NAL Call #: 56.8-J822; ISSN: 0022-4561.

Descriptors: livestock-farming/ mixed-farming/ zea-mays/ crop-production/ nitrogen/ phosphorus/ management/ water-quality/ environmental-protection/ surveys/ Wisconsin/ nutrient-management/ manure-management/ best-management-practices

119. **Nitrogen fertigation of young navel oranges: growth, N status, and uptake of fertilizer N.**

Weinert, T. L., Thompson, T. L., White, S. A., and Maurer, M. A.

HortScience (Apr 2002) 37 (2): 334-337.

NAL Call #: SB1.H6; ISSN: 0018-5345.

Descriptors: citrus-sinensis/ nitrogen/ fertigation/ nitrogen-content/ growth/ nutrient-uptake/ sprinkler-irrigation/ irrigation-scheduling/ isotope-labeling/ diameter/ leaves/ Arizona

Abstract: Microsprinkler irrigation may result in increased efficiency of N and water application to citrus. However, best management practices (BMPs) have not yet been developed for microsprinkler use, particularly on newly established citrus. Experiments were conducted during 1997-98 in central Arizona to evaluate the effects of N rate and fertigation frequency on 'Newhall' navel oranges (*Citrus sinensis*) planted in Mar. 1997. Two experiments were conducted, each with factorial combinations of N rate (0 to 204 g/tree/year) and fertigation frequency (weekly to three times per year). In one experiment, nonlabeled N fertilizer was used, and in the other ¹⁵N-labeled fertilizer was used. Trunk diameter, leaf N, and ¹⁵N partitioning in the trees were monitored. During 1997, neither trunk diameter nor leaf N were affected by N rate or fertigation frequency. No more than 6% of N applied was found in the trees. During 1998, leaf N in fertilized plots was significantly higher than in nonfertilized plots, but leaf N in all trees remained above the critical N concentration of 25 mg(.)g⁻¹. During 1998, no more than 25% of the fertilizer N applied was taken up by the trees. Results suggest that N applications are not needed during the first growing season after planting for microsprinkler-irrigated citrus in Arizona. Only low rates of N (less than or equal to 68 g/tree/yr) may be needed during the second growing season to maintain adequate tree N reserves.

120. **Nitrogen losses from outdoor pig farming systems.**

Williams, J. R., Chambers, B. J., Hartley, A. R., Ellis, S., and Guise, H. J.

Soil Use and Management (Dec 2000) 16 (4): 237-243.

NAL Call #: S590.S68; ISSN: 0266-0032.

Descriptors: nitrogen/ nitrate-nitrogen/ leaching/ ammonia/ volatilization/ nitrous-oxide/ emission/ losses-from-soil/ sandy-loam-soils/ pig-farming/ stocking-density/ drainage-water/ balance-studies/ england/ nitrogen-balance

Abstract: Nitrogen losses via nitrate leaching, ammonia volatilization and nitrous oxide emissions were measured from contrasting outdoor pig farming systems in a two year field study. Four 1-ha paddocks representing three outdoor pig management systems and an arable control were established on a sandy loam soil in Berkshire, UK. The pig management systems represented: (i) current commercial practice (CCP)--25 dry sows ha(-1) on arable stubble; (ii) 'improved' management practice (IMP)--18 dry sows ha(-1) on stubble undersown with grass, and (iii) 'best' management practice (BMP) 12 dry sows ha(-1) on established grass. Nitrogen (N) inputs in the feed were measured and N offtakes in the pig meat estimated to calculate a nitrogen balance for each system. In the first winter, mean nitrate-N concentrations in drainage water from the CCP, IMP, BMP and arable paddocks were 28, 25, 8 and 10 mg NO₃ l(-1), respectively. On the BMP system, leaching losses were limited by the grass cover, but this was destroyed by the pigs before the start of the second drainage season. In the second winter, mean concentrations increased to 111, 106 and 105 mg NO₃-N l(-1) from the CCP, IMP and BMP systems, respectively, compared to only 32 mg NO₃-N l(-1) on the arable paddock. Ammonia (NH₃) volatilization measurements indicated that losses from outdoor dry sows were in the region of 11 g NH₃-N sow(-1) day(-1). Urine patches were identified as the major source of nitrous oxide (N₂O) emissions, with N₂O-N losses estimated at less than 1% of the total N excreted. The nitrogen balance calculations indicated that N inputs to all the outdoor pig systems greatly exceeded N offtakes plus N losses, with estimated N surpluses on the CCP, IMP and BMP systems after 2 years of stocking at 576, 398 and 264 kg N ha(-1), respectively, compared with 27 kg N ha(-1) on the arable control. These large N surpluses are likely to exacerbate nitrate leaching losses in following seasons and make a contribution to the N requirement of future crops.

121. **Nonpoint-source pollutant load reductions associated with livestock exclusion.**

Line, D. E., Harman, W. A., Jennings, G. D., Thompson, E. J., and Osmond, D. L. *Journal of Environmental Quality* (Nov/Dec 2000) 29 (6): 1882-1890.
NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: pastures/ cattle/ pollution-control/ North-Carolina/ livestock-exclusion/ best-management-practices

Abstract: Cattle (*Bos taurus*) grazing on unimproved pastures can be a significant, yet often overlooked, source of pollutants to surface waters, especially when the cattle have unlimited access to streams in the pastures. Livestock exclusion from streams has been demonstrated to reduce sediment and possibly nutrient yield from streams draining pastures. The purpose of this study was to evaluate the effects of excluding dairy cows from, and planting trees in, a 335-m-long and 10- to 16-m- wide riparian corridor along a small North Carolina stream. Analysis of 81 wk of pre-exclusion and 137 wk of post-exclusion fencing data documented 33, 78, 76, and 82% reductions in weekly nitrate + nitrite, total Kjeldahl nitrogen (TKN), total phosphorus (TP), and sediment loads, respectively, from the 14.9-ha pasture area adjacent to the fenced section of stream. Statistical analyses by t-tests and analysis of variance suggested that the reductions in mean weekly loads post-fencing were significant ($P < 0.05$) for all pollutants except

nitrate + nitrite. Thus, the results indicated that livestock exclusion and subsequent riparian vegetation establishment was effective at reducing pollutant export from an intensively grazed pasture.

122. **Nutrient use efficiency in plants.**

Baligar, V. C., Fageria, N. K., and He, Z. L.

Communications in Soil Science and Plant Analysis (2001) 32 (7/8): 921-950.

NAL Call #: S590.C63; ISSN: 0010-3624.

Descriptors: plants/ plant-nutrition/ mineral-nutrition/ nutrition-physiology/ use-efficiency/ nutrient-uptake/ nutrient-transport/ cultivars/ genotype-nutrition-interaction/ fertilizers/ application-methods/ application-rates/ literature-reviews/ crop-management/ best-management-practices

Abstract: Invariably, many agricultural soils of the world are deficient in one or more of the essential nutrients needed to support healthy plants. Acidity, alkalinity, salinity, anthropogenic processes, nature of farming, and erosion can lead to soil degradation. Additions of fertilizers and/or amendments are essential for a proper nutrient supply and maximum yields. Estimates of overall efficiency of applied fertilizer have been reported to be about or lower than 50% for N, less than 10% for P, and about 40% for K. Plants that are efficient in absorption and utilization of nutrients greatly enhance the efficiency of applied fertilizers, reducing cost of inputs, and preventing losses of nutrients to ecosystems. Inter- and intra-specific variation for plant growth and mineral nutrient use efficiency (NUE) are known to be under genetic and physiological control and are modified by plant interactions with environmental variables. There is need for breeding programs to focus on developing cultivars with high NUE. Identification of traits such as nutrient absorption, transport, utilization, and mobilization in plant cultivars should greatly enhance fertilizer use efficiency. The development of new cultivars with higher NUE, coupled with best management practices (BMPs) will contribute to sustainable agricultural systems that protect and promote soil, water and air quality.

123. **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.

Communications in Soil Science and Plant Analysis (2000) 31 (5/6): 553-565.

NAL Call #: S590.C63; ISSN: 0010-3624.

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 (NaHCO₃). 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.

124. **Phosphorus load reductions under best management practices for sugarcane cropping systems in the Everglades agricultural area.**

Rice, R. W., Izuno, F. T., and Garcia, R. M.
Agricultural Water Management (July 2, 2002) 56 (1): 17-39.
NAL Call #: S494.5.W3A3; ISSN: 0378-3774.

Descriptors: saccharum-officinarum/ crop-production/ crop-management/ agricultural-soils/ drainage/ runoff/ soil-chemistry/ phosphorus/ water-pollution/ water-quality/ Florida

125. **Phosphorus research strategies to meet agricultural and environmental challenges of the 21st century.**

Sharpley, A. and Tunney, H.
Journal of Environmental Quality (Jan/Feb 2000) 29 (1): 176-181.
NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: phosphorus/ losses-from-soil/ pollution-control/ research

Abstract: The accumulation, management, and transfer of P in intensive farming systems has increased P export from agricultural watersheds and accelerated eutrophication of surface waters. Even though much research on P has been done in the last 20 years, there are still too few answers to the many questions now being asked regarding agricultural production and environmental quality. To address these concerns, four areas of research are suggested: (i) Soil P testing for environmental risk assessment--What losses are acceptable and can these losses be determined by plot-scale or watershed-scale studies? Threshold P levels in soil and water should be established in combination with an assessment of site vulnerability to P loss. (ii) Pathways of P transport--An analysis of the relative importance of different flow pathways is needed at a watershed scale. (iii) Best Management Practice (BMP) development and implementation--Overall, BMPs must attempt to bring P inputs and outputs into closer balance and should be targeted first to critical source areas within a watershed. Alternative management recommendations, uses,

and market demand for manures must be developed. (iv) Strategic initiatives to manage P--To initiate lasting changes, research should focus on consumer-supported programs that encourage farmer performance and steward-ship to achieve agreed-upon environmental goals.

126. **Phosphorus transport into subsurface drains by macropores after manure applications: implications for best manure management practices.**

Geohring, L. D., McHugh, O. V., Walter, M. T., Steenhuis, T. S., Akhtar, M. S., and Walter, M. F.

Soil Science (Dec 2001) 166 (12): 896-909.

NAL Call #: 56.8-So3; ISSN: 0038-075X.

Descriptors: phosphorus/ transport-processes/ losses-from-soil/ subsurface-drainage/ tile-drainage/ macropore-flow/ cattle-manure/ liquid-manures/ broadcasting/ irrigation/ plowing/ incorporation/ soil-water/ New-York

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

Shipitalo, M. J. and Gibbs, F.

Soil Science Society of America Journal. [Madison, Wis.: Soil Science Society of America.] (Nov/Dec 2000) 64 (6): 2103-2109.

NAL Call #: 56.9-So3; ISSN: 0361-5995.

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.

128. **Practical and innovative measures for the control of agricultural phosphorus losses to water: an overview.**

Sharpley, A., Foy, B., and Withers, P.

Journal of Environmental Quality (Jan/Feb 2000) 29 (1): 1-9.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: phosphorus-fertilizers/ runoff/ water-pollution/ pollution-control/ conferences

Abstract: Inputs of P are essential for profitable crop and livestock production. However, its export in watershed runoff can accelerate the eutrophication of receiving fresh waters. The specialization of crop and livestock farming has created regional imbalances in P inputs in feed and fertilizer and output in farm produce. In many areas, soil P exceeds crop needs and has enriched surface runoff with P. This paper provides a brief overview of P management strategies to maintain agricultural production and protect water quality that were discussed at the conference, "Practical and Innovative Measures for the Control of Agricultural Phosphorus Losses to Water," sponsored by the Organization for Economic Cooperation and Development and held in Antrim, Northern Ireland, June 1998. The purpose of the conference was to assess current strategies for reducing the loads and concentrations of P from agricultural land to surface waters. Topics discussed at the interdisciplinary conference and reviewed here included sustainable P management in productive agriculture; assessing land application of P; evaluating and modeling P transport and transformations in soil, runoff, streams, and lakes; and implementation of integrated best management practices (BMPs). From these discussions, measures to control agricultural P transfer from soil to water may be brought about by optimizing fertilizer P use-efficiency, refining animal feed rations, using feed additives to increase P absorption by the animal, moving manure from surplus to deficit areas, and targeting conservation practices, such as reduced tillage, buffer strips, and cover crops, to critical areas of P export from a watershed.

129. **Reducing long-term atrazine runoff from south central Nebraska.**

Gorneau, W. S., Franti, T. G., Benham, B. L., and Comfort, S. D.

Transactions of the ASAE (Jan/Feb 2001) 44 (1): 45-52.

NAL Call #: 290.9-Am32T; ISSN: 0001-2351.

Descriptors: atrazine/ losses-from-soil/ runoff/ water-quality/ tillage/ weed-control/ crop-management/ simulation-models/ Nebraska/ best-management-practices

Abstract: Heavy reliance on chemical weed control in field crops of South Central Nebraska has resulted in the appearance of atrazine at concentrations greater than established drinking water standards. Our objective was to evaluate the best management practices for atrazine runoff for the tillage and herbicide management practices common to the region under study. Field experiments were performed to measure edge-of-field

atrazine and water loss from disk-till, ridge-till, and slot plant (no-till) management systems. Results indicated less water runoff from no-till (34% less) and ridge-till (36% less) than from disk-till. Similarly, atrazine loss was also less: 24% less for no-till and 17% less for ridge-till than for disk-till. GLEAMS (Groundwater Loading Effect of Agricultural Management Systems) simulations were calibrated using field-measured inputs and verified against observed data from two independent sites. Fifteen different combinations of herbicide application and tillage practices were simulated using 50 years of rainfall data. Compared to pre-emergent broadcast + post application on corn with disk-till, annual reductions in simulated atrazine mass loss for the alternative practices ranged from 17% to 77%. The percent of annual atrazine lost ranged from 0.57% to 1.2%. During the 50-year simulation, annual losses from 7 to 10 years constituted >50% of the cumulative 50-year loss for broadcast and banded application. Based on recurrence interval evaluation, pre-emergent incorporation and pre-emergent banding were most effective at reducing long-term atrazine losses.

130. **Reducing nitrate in water resources with modern farming systems.**

Management Systems Evaluation Areas (Project).

Ames, Iowa : Iowa State University, Extension Distribution, [2000] 1 sheet : col. ill., col. maps:Caption title. At head of title: MSEA, Management Systems Evaluation Areas.
NAL Call #: S587.5.N5-W533-2000

Descriptors: Nitrogen-in-agriculture-Middle-West/ Water-quality-management-Middle-West/ Water-Nitrogen-content-Middle-West/ Agricultural-systems-Middle-West/ Best-management-practices-Pollution-prevention-Middle-West/ Nitrogen-fertilizers-Control-Middle-West/ Soils-Middle-West-Leaching

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

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

Journal of Environmental Quality (Jan/Feb 2000) 29 (1): 37-49.

NAL Call #: QH540.J6; ISSN: 0047-2425.

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 NH₃ volatilization, which led to reductions in atmospheric NH₃ 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.

132. **REMM: The Riparian Ecosystem Management Model.**

Lowrance, R., Altier, L. S., Williams, R. G., Inamdar, S. P., Sheridan, J. M., Bosch, D. D., Hubbard, R. K., and Thomas, D. L.
Journal of Soil and Water Conservation (First Quarter 2000) 55 (1): 27-34.
NAL Call #: 56.8-J822; ISSN: 0022-4561.

Descriptors: water-quality/ environmental-management/ riparian-vegetation/ simulation-models/ ecosystems/ evaluation/ water-pollution/ hydrology/ cycling/ nutrients/ sediment/ transport-processes/ geological-sedimentation/ pollution-control/ nutrient-dynamics/ riparian-zones/ model-evaluation/ riparian-buffers/ best-management-practice/ riparian-buffers/ best-management-practice/ nonpoint-source-pollution

133. **A review and assessment of the results of water monitoring for herbicide residues for the years 1991 to 1999--USFS Region Five.**

Bakke, D.
Proceedings - Forest Vegetation Management Conference (2001) (22nd): 42-65.
NAL Call #: QH541.5.F6F67; ISSN: 1057-2147.

Descriptors: water-quality/ monitoring/ herbicide-residues/ surface-water/ groundwater-pollution/ environmental-impact/ hexazinone/ national-forests/ USDA/ glyphosate/ triclopyr/ USA/ United-States-Forest-Service/ best-management-practices

134. **Riparian vegetation effectiveness.**

Castelle, Andrew J., Johnson, A. W., and National Council for Air and Stream Improvement.
Research Triangle Park, NC : National Council for Air and Stream Improvement, Inc., c2000. 26 p. : ill.:"February 2000." Includes bibliographical references (p. 20-26).
NAL Call #: TD899.P3-N34-no.-799

Descriptors: Buffer-zones-Ecosystem-management/ Streambank-planting/ Riparian-plants/ Grassed-waterways/ Best-management-practices-Pollution-prevention

135. **Small ranch projects guide: a how-to guide on implementing best management practices on your property.**

Donaldson, Susan. and Nevada Cooperative Extension.
Reno, NV : University of Nevada Cooperative Extension, [2000] 160 p. : ill. (some col.):"February, 2000." Issued with: Small ranch manual, a guide to management for

green pastures and clean water. Includes bibliographical references (p. 158-159). Funded by a U.S. EPA Clean Water Act grant through the Nevada Division of Environmental Protection.

NAL Call #: SF85.35.N3-S64-2000

Descriptors: Range-management-Nevada-Handbooks,-manuals,-etc

136. **Soybean management & the land : a best management practices handbook for growers.: Soybean management and the land.**

Coleman, Denise. and American Soybean Association.

Saint Louis, MO : American Soybean Association, [2000] 1 portfolio : ill. (somme col.):Cover title. Contains 1 workbook (64 p.) and 1 resource book (86 p.). "7/00"--P. [3] of cover.

NAL Call #: SB205.S7-C56-2000

Descriptors: Soybean-Handbooks,-manuals,-etc/ Best-management-practices-Pollution-prevention-Handbooks,-manuals,-etc/ Farm-management-Handbooks,-manuals,-etc

137. **Survey of best management practices in container production nurseries.**

Fain, G. B., Gilliam, C. H., Tilt, K. M., Olive, J. W., and Wallace, B.

Journal of Environmental Horticulture (Sept 2000) 18 (3): 142-144.

NAL Call #: SB1.J66; ISSN: 0738-2898.

Descriptors: nurseries/ container-grown-plants/ surveys/ coastal-areas/ crop-management/ runoff/ water-reuse/ ponds/ grass-strips/ water-management/ controlled-release/ fertilizers/ plant-oils/ herbicides/ application-date/ water-pollution/ pollution-control/ water-erosion/ Alabama

138. **Transport and fate of atrazine and lambda-cyhalothrin in an agricultural drainage ditch in the Mississippi Delta, USA.**

Moore, M. T., Bennett, E. R., Cooper, C. M., Smith, S. Jr., Shields, F. D. Jr., Milam, C. D., and Farris, J. L.

Agriculture, Ecosystems and Environment (Dec 2001) 87 (3): 309-314.

NAL Call #: S601.A34; ISSN: 0167-8809.

Descriptors: agricultural-land/ drainage-channels/ atrazine/ lambda-cyhalothrin/ water-pollution/ water-quality/ runoff/ sediment/ plants/ uptake/ polygonum/ leersia/ sporobolus/ sorption/ Mississippi

Abstract: Drainage ditches are integral components of agricultural production landscape, yet their contaminant mitigation capacity has been scarcely examined. If ditches are indeed capable of contaminant mitigation, then their use may serve as an alternative agricultural best management practice (BMP). A 50 m portion of an agricultural drainage ditch, located in the Mississippi Delta Management Systems Evaluation Area (MDMSEA), USA, was amended with a mixture of water, atrazine (2-chloro-4-ethylamino-6-isopropylamino-s-triazine) (herbicide) and lambda-cyhalothrin (lambda-

cyano-3-phenoxybenzyl-3-(2-chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethyl cyclopropanecarboxylate) (insecticide), simulating a storm runoff event. Pesticide amendment was achieved using a diffuser to disperse the mixture at an inflow point along the ditch (designated as "0 m"). Pesticide concentrations in water, sediment, and plants were monitored for 28 days. One hour following initiation of simulated runoff, mean percentages of atrazine concentrations measured in water and sediment were 37 and 2%, respectively, while mean percentages of lambda-cyhalothrin concentrations in water and sediment were 12 and 1%, respectively. Atrazine and lambda-cyhalothrin mean percentage concentrations in plants (*Polygonum* (water smartweed), *Leersia* (cutgrass), and *Sporobolus* (smutgrass)) were 61 and 87%, respectively. Therefore, plants serve as an important site for pesticide sorption during runoff events. Aqueous concentrations of both pesticides decreased to levels which would not elicit non-target toxicological effects by the end of the 50 m portion of the drainage ditch. This research provides fundamental answers concerning the capability of vegetated agricultural drainage ditches to mitigate pesticide-associated storm water runoff.

139. **Trends in surface-water quality during implementation of best-management practices in Mill Creek and Muddy Run Basins, Lancaster County, Pennsylvania.:**
Trends in surface water quality during implementation of best management practices in Mill Creek and Muddy Run Basins, Lancaster County, Pennsylvania.

Koerkle, Edward H. and Pennsylvania. Dept. of Environmental Protection. Geological Survey (U.S.).

Lemoyne, PA : U.S. Geological Survey, [2000]:Title from title screen. "January 2000." Includes bibliographical references.

NAL Call #: TD224.P4-K64-2000

URL: URL: <http://pa.water.usgs.gov/reports/fs168-99.pdf>

Descriptors: Water-quality-Pennsylvania-Lancaster-County/ water-quality---WTXX70/ Mill-Creek-Lancaster-County,-Pa

140. **Urban small sites best management practice manual.: Minnesota urban small sites BMP manual : stormwater best management practices for cold climates.**

Metropolitan Council of the Twin Cities Area.

St. Paul, MN : Metropolitan Council, c2002.:At head of title: Metropolitan Council. Title from access page. Description based on content viewed June 24, 2002. Includes bibliographical references.

NAL Call #: TD657-.U73-2002

URL: URL: <http://www.metrocouncil.org/environment/Watershed/bmp/manual.htm>

Descriptors: Urban-runoff-United-States-Management/ Urban-ecology-United-States-Management/ Best-management-practices-Pollution-prevention-United-States/ Water-quality-management-United-States

141. **Use of best management practices to increase nitrogen use efficiency and protect environmental quality in a broccoli-corn rotation of central Mexico.**

Castellanos, J. Z., Villalobos, S., Delgado, J. A., Munoz Ramos, J., Sosa, A., Vargas, P.,

Lazcano, I., Alvarez Sanchez, E., and Enriquez, S. A.
Communications in Soil Science and Plant Analysis (2001) 32 (7/8): 1265-1292.
NAL Call #: S590.C63; ISSN: 0010-3624.

Descriptors: zea-mays/ brassica-oleracea-var-italica/ crop-management/ nitrogen/
nutrient-uptake/ nitrogen-metabolism/ use-efficiency/ rotations/ crop-yield/ nitrogen-
fertilizers/ application-rates/ nitrate/ nitrogen-content/ trickle-irrigation/ fertilizer-
requirement-determination/ Mexico

Abstract: Underground water reserves in Central Mexico have been declining and NO₃(-)-N concentrations of some irrigation wells have been found to exceed 10 ppm. There is the need to develop best management practices (BMPs) that can increase N and water use efficiency by vegetables such as broccoli (*Brassica oleracea* L. *Italica* Group) in this region. Three field experiments were conducted during 1996 through 1998 at the Experimental Station of INIFAP in Celaya, Gto., Mexico to develop BMPs for the region. To determine the N sufficiency levels in the most recently fully expanded leaf (MRFEL), dry midrib and press sap were analyzed for total N and NO₃(-)-N. Maximum marketable yields of 24.5 to 27.0 ton ha⁻¹ were attained with rates of 400 to 425 kg N ha⁻¹. Sufficiency levels for N in the MRFEL were in the range of 5.5 to 6.5% at the beginning of the season, and then it was reduced to 5.5 to 6.0% at heading and then to 4.0-5.0% during the preharvest stage. The critical NO₃(-)-N concentration in the midrib ranged from 15,000 to 20,000 mg kg⁻¹ at the beginning of the season to 3,500-5,000 mg kg⁻¹ for the pre-harvest stage of development. The adequate levels of NO₃(-)-N in press sap ranged from 1,600-2,000 mg L⁻¹ at the beginning of the season to 500-800 mg L⁻¹ during pre-harvest growth stage. Broccoli fertilized with 400 kg N ha⁻¹ provided residual effects in the following crop of maize (*Zea mays* L.), equivalent to 60% of that produced with N fertilizer. This study shows that drip irrigation, spoon feeding of N, monitoring of N status during the growing season and crop rotations with grains has the potential to increase the N fertilizer use efficiency for. vegetables-grain cropping systems and contribute to protecting environmental quality in Central Mexico.

142. **Use of innovative tools to increase nitrogen use efficiency and protect environmental quality in crop rotations.**

Delgado, J. A., Ristau, R. J., Dillon, M. A., Duke, H. R., Stuebe, A., Follett, R. F., Shaffer, M. J., Riggensbach, R. R., Sparks, R. T., and Thompson, A.
Communications in Soil Science and Plant Analysis (2001) 32 (7/8): 1321-1354.
NAL Call #: S590.C63; ISSN: 0010-3624.

Descriptors: crops/ solanum-tuberosum/ hordeum-vulgare/ malting-barley/ lactuca-sativa/ nitrogen/ use-efficiency/ nutrient-uptake/ soil-fertility/ nutrient-availability/ cropping-systems/ rotations/ crop-management/ secale-cereale/ cover-crops/ winter/ simulation-models/ losses-from-soil/ literature-reviews/ Colorado/ best-management-practices/ NLEAP-model

Abstract: Cropping systems grown over sandy coarse soils are susceptible to nutrient leaching due to local thunderstorms and irrigation. Additionally, erosion can contribute to

removal of nutrients, soil organic matter, and fine particles. Balancing nutrients for these systems while protecting water and soil quality requires best management practices (BMPs). Crop rotations with deeper rooted small grains and winter cover crops reduced potential losses of fine particles, soil organic matter, nitrogen, and other nutrients due to wind erosion and protected soil and water quality. The cropping system N status can be monitored by assessing chlorophyll, sap NO₃(-)-N concentrations and N indexes of the canopy. The Nitrogen Leaching Economic Analysis Package (NLEAP) model simulated residual soil NO₃(-)-N and soil water and showed that there is potential to use precision farming to improve NUE. Simulations of the system showed that BMPs increased NUE and that NO₃(-)-N can potentially be removed from the shallow underground water table protecting water quality. These results show that with the application of models, and tools to monitor the N status of the above-ground canopy, such as chlorophyll readings, sap NO₃(-)-N concentrations, N indices, and other new technologies such as precision farming and remote sensing, nutrient use efficiency in the new millennium will be significantly increased, environmental quality will be conserved, and product quality will be improved at the farm level for the benefit of producers, processors and consumers.

143. **Using insurance to enhance nitrogen fertilizer application to reduce nitrogen losses to the environment.**

Huang, W. Y., Heifner, R. G., Taylor, H., and Uri, N. D.

Environmental Monitoring and Assessment (May 2001) 68 (3): 209-233.

NAL Call #: TD194.E5; ISSN: 0167-6369.

Descriptors: nitrogen-fertilizers/ agricultural-insurance/ insurance-premiums/ application-date/ nitrogen/ risk/ low-input-agriculture/ incentives/ decision-making/ production-functions/ seasons/ case-studies/ equations/ decision-analysis/ farm-results/ innovation-adoption/ Iowa/ best-nitrogen-management-practices/ adoption-insurance-programs/ expected-value-variance-analysis/ growing-season

144. **Using stream bioassessment to monitor best management practice effectiveness.**

Vowell, J. L.

Forest Ecology and Management (Apr 1, 2001) 143 (1/3): 237-244.

NAL Call #: SD1.F73; ISSN: 0378-1127.

Descriptors: forest-management/ efficacy/ evaluation/ ecosystems/ nature-conservation/ aquatic-environment/ intensive-silviculture/ streams/ clearcutting/ site-preparation/ artificial-regeneration/ planting/ Florida

145. **Water quality changes from riparian buffer restoration in Connecticut.**

Clausen, J. C., Guillard, K., Sigmund, C. M., and Dors, K. M.

Journal of Environmental Quality (Nov/Dec 2000) 29 (6): 1751-1761.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: riparian-vegetation/ nitrate-nitrogen/ water-quality/ water-pollution/ pollution-control/ connecticut/ best-management-practices

Abstract: One-half of a 35- by 250-m riparian buffer cropped in corn (*Zea mays* L.) was seeded with fine leaf fescue (*Festuca* spp.) and allowed to remain idle to determine water quality changes resulting from riparian buffer restoration. A corn control was also used in this paired watershed design located in Connecticut. Water, N, and P fluxes were determined for precipitation, overland flow, and ground water. Also, an N mass balance was calculated. Total Kjeldahl nitrogen (TKN) and total phosphorus (TP) concentrations significantly ($P < 0.05$) increased as ground water flowed through the restored buffer. Nitrate N (NO₃-N) concentrations declined significantly but most (52%) of the decrease occurred within a 2.5-m wetland adjacent to the stream. An N mass balance for the 2.5-m strip indicated that denitrification only accounted for 1% of the N losses and plant uptake was from 7 to 13% of the N losses annually. Ground water was the dominant source of N to the buffer and also the dominant loss. Restoration of the riparian buffer decreased ($p < 0.05$) overland flow concentrations of TKN by 70%, NO₃-N by 83%, TP by 73%, and total suspended solids (TSS) by 92% as compared with the control. Restoration reduced ($p < 0.05$) NO₃-N concentrations in ground water by 35% as compared with the control. Underestimated denitrification and dilution by upwelling ground water in the wetland area adjacent to the stream were believed to be primarily responsible for the decreasing NO₃-N concentrations observed.

146. **Water quality protection : best management practices for cropland.: Best management practices for cropland.**

Devlin, Daniel L. and Kansas State University. Agricultural Experiment Station and Cooperative Extension Service.

[Manhattan, Kan.] : Kansas State University, Agricultural Experiment Station and Cooperative Service, [2000]:Title from web page. "August 2000." Description based on content viewed July 2, 2002.

NAL Call #: S544.3.K2-K3-no.-2462

URL: URL: <http://www.oznet.ksu.edu/library/h20ql2/MF2462.pdf>

Descriptors: Water-quality-management-Kansas/ Best-management-practices-Pollution-prevention-Kansas

Nutrient Management: Crops

(Citations 147-173)

| Constructed Wetlands | Agricultural Best Management Practices | Nutrient Management: Livestock |

Environmental Management Systems for Agriculture |

147. **Developing answers and learning in extension for dryland nitrogen management.**

Lawrence, D. N., Cawley, S. T., and Hayman, P. T.

Australian Journal of Experimental Agriculture (2000) 40 (4): 527-539.
NAL Call #: 23-Au792; ISSN: 0816-1089.

Descriptors: dry-farming/ nitrogen/ soil-management/ crop-management/ extension/
adult-learning/ agricultural-research/ technology-transfer/ workshops/ learning/
information-systems/ knowledge/ farms/ nitrogen-cycle/ nitrogen-balance/ paddocks/
evaluation/ decision-making/ workshops-programs/ nitrogen-fertilizers/ Queensland

148. **Influence of straw management, nitrogen fertilization and dosage rates on the dissipation of five sulfonylureas in soil.**

Menne, H. J. and Berger, B. M.
Weed Research (June 2001) 41 (3): 229-244.
NAL Call #: 79.8-W412; ISSN: 0043-1737.

Descriptors: sulfonylurea-herbicides/ metsulfuron/ tribenuron/ triasulfuron/ crop-residues/ nitrogen/ application-rates/ half-life/ persistence/ soil-ph/ hydrolysis/ degradation/ duration/ detection/ thifensulfuron-methyl/ amidosulfuron

149. **Irrigation- and nitrogen-management impacts on nitrate leaching under potato.**

Waddell, J. T., Gupta, S. C., Moncrief, J. F., Rosen, C. J., and Steele, D. D.
Journal of Environmental Quality (Jan/Feb 2000) 29 (1): 251-261.
NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: nitrate-nitrogen/ leaching/ irrigated-conditions/ solanum-tuberosum/ crop-production/ crop-yield

Abstract: As potato (*Solanum tuberosum* L.) production increases in the North-Central Region of the USA, so does the potential for deep seepage of nitrogenous compounds into the ground water. The objectives of this 2-yr study were to determine how different irrigation schemes (sprinkler and drip), irrigation triggers (70 and 40% of the available soil water [AW] remaining), drip placement (at the soil surface or buried at 25-cm depth), and various N sources (urea, sulfur-coated urea [SCU], and turkey [*Meleagris gallopavo*] manure) and timings (three- vs. five-N splits) affect percolation and NO₃ leaching. As expected, water percolation was generally higher from the sprinkler-irrigation than from the drip-irrigation treatments. Within the sprinkler irrigation, percolation was higher when irrigated at 70% than at 40% of AW remaining. Small but frequent irrigation in drip treatments helped reduce water percolation. Within irrigation treatments, 70% AW had the most N leaching, followed by 40% AW and the drip, the last two treatments being about the same. The trend in N leaching among fertilizer treatments was similar for various irrigation methods. Splitting N applications five times vs. three times reduced N leaching from unforeseen rains. Sulfur-coated urea reduced N leaching, whereas turkey manure-amended treatments showed no significant difference in N leaching compared with the urea-N treatment. In conclusion, alternatives such as 40% deficit irrigation, five-N application splits, drip irrigation, S-coated urea, and turkey manure not only reduce N leaching but also have a minimal impact on potato tuber yield and tuber quality.

150. **Method for precision nitrogen management in spring wheat. II.**

Implementation.

Long, D. S., Engel, R. E., and Carlson, G. R.

Precision Agriculture (Sept 2000) 2 (1): 25-38.

NAL Call #: S494.5.P73P743; ISSN: 1385-2256.

Descriptors: triticum-aestivum/ site-specific-crop-management/ harvesting/ nitrogen/ removal/ nutrient-requirements/ fertilizer-requirement-determination/ nitrogen-fertilizers/ variable-rate-application/ crop-yield/ protein-content/ Montana/ nitrogen-deficit

Abstract: By accounting for spatial variation in soil N levels, variable-rate fertilizer application may improve crop yield and quality, and N use efficiency within fields. The main purpose of this study was to demonstrate how site-specific wheat yield and protein data, and a geographic information system may be used in developing precision N-recommendations for spring wheat. The three steps in the procedure include: (1) estimate the amount of N-removed in wheat in the year in which the crop is harvested, (2) estimate the N-deficit, defined as the amount of additional N needed for raising protein concentration in a future crop to a specified target level, and (3) estimate the total N-recommendation by summing the mapped values of the N-removed and the N-deficit. A map for variable-rate application of fertilizer is derived by specifying cutoff values to divide the range in the total N-recommendation into classes representing N management zones. A field experiment was conducted within an annually cropped wheat field (101 ha) in northern Montana to determine whether the proposed method could improve grain yields and protein levels. The N-removal and N-deficit were estimated from site-specific wheat yield and protein data that were acquired during harvest of 1996. In 1997, which was a dry year, an experiment was conducted in the same field that consisted of a randomized complete block design arranged as pairs of strip plots. Variable- or uniform-rate N treatments were randomly assigned to each pair of strips. Both treatments received nearly the same amount of fertilizer, however, N in the variable treatment was varied to match patterns in grain yield and protein levels that previously existed in 1996. Yields were not significantly different between management systems, but proteins were significantly enhanced by spatially variable N application. In addition, variability in proteins levels was reduced within the whole field. Field areas deficient in N fertility could be identified without having to sample for soil profile N.

151. **Nitrogen management for different soils and cropping systems.**

Boquet, D. J. and Moore, S. H.

Proceedings - Beltwide Cotton Conference. [Memphis, Tenn.: National Cotton Council of America] (2000) 1: 40-42.

NAL Call #: SB249.N6; ISSN: 1059-2644.

Descriptors: gossypium

152. **Nitrogen management for pumpkin and squash.**

Ashley, R. A.

Sustainable Agriculture Research and Education SARE Research Projects Northeast

Region. (2001)
NAL Call #: S441.S855

Descriptors: nitrogen-fertilizers/ guidelines/ cucurbita/ winter-squash/ sidedressing/ field-experimentation/ nitrogen/ nitrates/ crop-yield/ soil-testing/ Connecticut/ New-Hampshire/ New-York/ pre-sidedress-soil-nitrate-test (PSNT)

153. **Nitrogen management in no-tillage sorghum production. I. Rate and time of application.**

Khosla, R., Alley, M. M., and Davis, P. H.
Agronomy Journal (Mar/Apr 2000) 92 (2): 321-328.
NAL Call #: 4-AM34P; ISSN: 0002-1962.

Descriptors: sorghum-bicolor/ crop-management/ no-tillage/ application-rates/ application-date/ urea-ammonium-nitrate/ yield-response-functions/ crop-yield/ water-stress/ Virginia

154. **Northeast Kingdom nutrient management project.**

Machell, D.
Sustainable Agriculture Research and Education SARE Research Projects Northeast Region. (2000)
NAL Call #: S441.S855

Descriptors: soil-management/ crop-management/ pest-management/ watersheds/ water-quality/ pollution-control/ community-action/ sustainability/ farms/ Vermont

155. **Nutrient management.**

Iowa State University. University Extension.
Ames, Iowa : Iowa State University, University Extension, [2002] 1 v. (loose-leaf):Consists of 11 information sheets. Caption title. "January 2002."
CONTENTS NOTE: 1. Soil testing -- 2. Phosphorus application -- 3. Manure resources -- 4. Residue management -- 5. Crop rotation -- 6. Crop yields -- 7. Nitrogen application -- 8. Nutrient management plan -- 9. Equipment calibration -- 10. Conservation Reserve Program (CRP) -- 11. Conservation practices.
NAL Call #: S596.5-.N87-2002

Descriptors: Soils-and-nutrition/ Soil-management/ Crops-and-soils

156. **Nutrient management for improving upland rice productivity and sustainability.**

Fageria, N. K.
Communications in Soil Science and Plant Analysis (2001) 32 (15/16): 2603-2629.
NAL Call #: S590.C63; ISSN: 0010-3624.

Descriptors: oryza-sativa/ upland-rice/ crop-yield/ nutrient-requirements/ fertilizers/ trace-element-fertilizers/ potassium/ phosphorus/ macronutrients/ application-rates/ soil-

fertility/ nutrient-availability/ genotypes/ genotype-nutrition-interaction/ yield-response-functions/ oxisols/ nutrient-uptake/ mineral-uptake/ nitrogen/ trace-elements/ literature-reviews/ Brazil

Abstract: Upland rice also known as aerobic rice is mainly grown in Asia, Africa, and Latin America. Brazil is the largest producer of upland rice in the world. At world level, average yield of this crop is less than 2000 kg ha⁻¹. The important yield limiting factors are water stress, mineral stress, diseases, insects and weeds. To improve and/or stabilize yield, these yield limiting factors should be alleviated. Research data related to yield limiting factors are scarce and much work is needed to improve upland rice yield under different agroecosystems. In this paper some basic principles to improve yield of this important crop with special reference to water and nutrient management, control of diseases, insects, weeds, and erosion, maintenance of organic matter and crop rotation are suggested. The basic principles to increase yield are similar for different ecosystems, although the technological packages based on these principles vary depending on local specific constraints and socio-economic considerations.

157. **Nutrient management planning: justification, theory, practice.**

Beegle, D. B., Carton, O. T., and Bailey, J. S.

Journal of Environmental Quality (Jan/Feb 2000) 29 (1): 72-79.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: crop-management/ soil-management/ nutrients

Abstract: Traditionally, nutrient management has been concerned with optimizing the economic return from nutrients used for crop production. Today, the agronomic and economic requirements of nutrient management remain central, but in addition, the process must consider the potential impact of these nutrients on environmental quality. The nutrient-management process is critical for maximizing the economic benefit from nutrients while minimizing the environmental impact. This process includes assessment, analysis, decision making, evaluation and refinement. A tactical nutrient-management plan developed from this process must be based on a firm set of strategic objectives agreed upon by the farmers and society. The nutrient-management process must also be practical to implement, if the performance goals are to be met. While nutrient-management plans have resulted in benefits to farmers and society, implementation has not been as great as desired. Several factors have been identified as key to the successful implementation of nutrient-management planning: the full participation of a broad range of stakeholders, the use of established infrastructure, targeted nutrient-management planning efforts, voluntary vs. mandatory programs, and the economics of nutrient management. Experiences in Pennsylvania, the Republic of Ireland, and Northern Ireland illustrate aspects of the implementation of the nutrient management process.

158. **Nutrient removal by grasses irrigated with wastewater and nitrogen balance for reed carnarygrass.**

Geber, U.

Journal of Environmental Quality (Mar/Apr 2000) 29 (2): 398-406.
NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: phalaris/ phalaris-arundinacea/ alopecurus-pratensis/ bromus-inermis/
waste-water-treatment/ nitrogen-balance/ nitrate-nitrogen/ soil-profiles/ waste-utilization/
biofuels

Abstract: To develop complementary wastewater treatment systems that increase nutrient reduction and recycling, an experiment was conducted to evaluate the efficiency of three grass species as catch crops for N, P, and K at Surahammar wastewater treatment plant (WWTP) in the southern part of Sweden. Another objective was also to assess soil accumulation of N, P, and K and the risk of N leaching by drainage. Three grasses-reed canarygrass (*Phalaris arundinacea* L.), meadow foxtail (*Alopecurus pratensis* L.), and smooth brome (*Bromus inermis* Leyss.)--were irrigated with a mixture of treated effluent and supernatant at two levels of intensity [optimum level (equal to evapotranspiration) and over-optimal level] and at two nutrient levels, approximately 150 and 300 kg N ha⁻¹. There were small differences in dry matter (DM) yield between grass species and no difference in N removal among species. The amount of N removed in harvested biomass to N applied was 0.58 in 1995 and 0.63 in 1996. The amount of N removed increased with increased nutrient load. Applied amounts of P were the same as P in harvested biomass. All species removed K amounts several times greater than applied amounts. Increased nutrient load increased overall K removal. The low amount of mineral N and especially NO₃(-)-N in the soil profile in autumn samplings indicate the risk for leaching is small. Soil water NO₃(-) contents were also low, <2.5 mg NO₃(-)-N L⁻¹ during the growing season, with a mean value of <1 mg NO₃(-)-N L⁻¹.

159. **On-farm experiments on integrated nutrient management in rice-wheat cropping systems.**

Yadav, R. L.

Experimental Agriculture (Jan 2001) 37 (1): 99-113.

NAL Call #: 10-Ex72; ISSN: 0014-4797.

Descriptors: oryza-sativa/ NPK-fertilizers/ green-manures/ crop-management/ crop-yield/ phosphorus/ potassium/ nutrient-availability/ returns/ economic-analysis/ farming-systems-research/ triticum-aestivum/ Indian-Punjab/ Uttar-Pradesh/ fertilizer-management

160. **Optimal phosphorus management strategies for wheat-rice cropping on a loamy sand.**

Yadvinder Singh., Dobermann, A., Bijay Singh., Bronson, K. F., and Khind, C. S.

Soil Science Society of America Journal. [Madison, Wis.: Soil Science Society of America.] (Jul/Aug 2000) 64 (4): 1413-1422.

NAL Call #: 56.9-So3; ISSN: 0361-5995.

Descriptors: triticum-aestivum/ oryza-sativa/ rotations/ phosphorus-fertilizers/ application-rates/ timing/ crop-yield/ nutrient-availability/ nutrient-uptake/ profitability/ sustainability/ phosphorus/ use-efficiency/ India/ soil-phosphorus-balance

Abstract: Knowledge about optimal P rates for wheat (*Triticum aestivum* L.)-rice (*Oryza sativa* L.) cropping is insufficient because of nutrient availability differences between aerobic and anaerobic soil. We assessed P management strategies in a wheat-rice rotation on a Typic Ustochrept at Ludhiana, India. Seven P fertilizer treatments applied to wheat and rice, respectively, (P0-0, P0-26, P13-13, P26-0, P26-13, P39-0, and P26-26; treatment abbreviations used include P applied to wheat followed by P applied to rice, both in kg ha⁻¹) were compared from 1990 to 1997. Grain yield and seasonal P accumulation by wheat were highest for higher P rates and remained stable in treatments with P applied to wheat. Phosphorus application to rice increased P accumulation by rice, but did not consistently increase rice yields because flooding decreased soil P sorption and increased P diffusion resulting in higher P supply to rice relative to wheat. Indigenous soil P supply measured in wheat was 5.8 to 8.0 kg P ha⁻¹, as compared with 14.9 to 18.1 kg P ha⁻¹ in rice. Phosphorus adsorbed by ion-exchange resin capsules placed in situ was five times greater under rice than under wheat. Applying only 26 kg P ha⁻¹ to wheat and no P to rice was not economical and led to a negative P balance and a decline in soil P. Applying 32 kg P ha⁻¹ to wheat and 15 kg P ha⁻¹ to rice was optimal for achieving short-term economic and long-term agronomic goals when both grain and straw were removed from the field. These findings require further validation at other sites, at higher rice yield levels, and for different straw management.

161. **Performance of site-specific nutrient management for irrigated rice in southeast China.**

Wang, G., Dobermann, A., Witt, C., Sun, Q., and Fu, R.
Agronomy Journal (July/Aug 2001) 93 (4): 869-878.
NAL Call #: 4-AM34P; ISSN: 0002-1962.

Descriptors: oryza-sativa/ irrigation/ site-specific-crop-management/ soil-fertility/ application-rates/ crop-yield/ field-experimentation/ NPK-fertilizers/ nutrient-requirements/ nutrient-nutrient-interactions/ nitrogen/ phosphorus/ potassium/ inbred-lines/ hybrid-varieties/ split-dressings/ application-date/ use-efficiency/ Zhejiang

Abstract: Rice (*Oryza sativa* L.) yield increases in Zhejiang, China have slowed since 1985 despite the increasing use of hybrids and fertilizers. On-farm experiments at 21 sites were conducted to evaluate a new approach for site-specific nutrient management (SSNM). Field- and season-specific N-P-K applications were calculated by accounting for the indigenous nutrient supply, yield targets, and nutrient demand as a function of the interactions between N, P, and K. Nitrogen applications were fine-tuned based on season-specific rules and field-specific monitoring of crop N status. The performance of SSNM was tested for four successive rice crops. Compared with the current farmers' fertilizer practice (FFP), average grain yield increased from 5.9 to 6.4 Mg ha⁻¹ while plant N, P, and K uptake increased by 8 to 14%. The gross return over fertilizer cost was about 10% greater with SSNM than with FFP. Yields were about 20% greater in late rice (hybrid

cultivars) than in early rice (inbred cultivars), but SSNM performed equally better than FFP in both seasons. Improved timing and splitting of fertilizer N increased N recovery efficiency from 0.18 kg kg⁻¹ in FFP plots to 0.29 kg kg⁻¹ in SSNM plots. The agronomic N use efficiency (grain yield increase per kilogram fertilizer applied) was 80% greater with SSNM than with FFP. As defined in our study, SSNM has potential for improving yields and nutrient efficiency in irrigated rice. Future research needs to develop a practical approach for achieving similar benefits across large areas without field-specific modeling and with minimum crop monitoring.

162. **Phosphorus management in continuous wheat and wheat-legume rotations.**

Amrani, M., Westfall, D. G., and Moughli, L.

Nutrient Cycling in Agroecosystems (Jan 2001) 59 (1): 19-27.

NAL Call #: S631.F422; ISSN: 1385-1314.

Descriptors: triticum-aestivum/ cicer-arietinum/ rotations/ phosphorus/ crop-management/ residual-effects/ sustainability/ soil-management/ crop-yield/ arid-zones/ semiarid-zones/ application-rates/ soil-fertility/ maximum-yield/ yield-response-functions/ Morocco

163. **Precision agriculture : economics of nitrogen management in corn using site-specific crop response estimates from a spatial regression model.**

Bongiovanni, R., Lowenberg DeBoer, James., and American Agricultural Economics Association. Meeting (2001 : Chicago, Ill.

[Ames, Iowa?] : American Agricultural Economics Association, 2001.:Title from caption. "Selected paper: American Agricultural Economists Association Annual Meeting, August 5-8, 2001." "May 11, 2001." "Area #11: production economics." Includes bibliographical references.

NAL Call #: S494.5.P73-B65-2001

URL: <http://agecon.lib.umn.edu/cgi-bin/pdf%5Fview.pl?paperid=2536&ftype=.pdf>

Descriptors: Precision-farming/ Corn/ Soils-Nitrogen-content/ Soil-management-Economic-aspects

164. **Precision farming protocols. Comparison of sampling approaches for precision phosphorus management.**

Clay, D. E., Chang, J., Carlson, C. G., Malo, D., Clay, S. A., and Ellsbury, M.

Communications in Soil Science and Plant Analysis (2000) 31 (19/20): 2969-2985.

NAL Call #: S590.C63; ISSN: 0010-3624.

Descriptors: site-specific-crop-management/ phosphorus/ fertilizer-requirement-determination/ variable-rate-application/ mapping/ sampling/ zea-mays/ continuous-cropping/ glycine-max/ rotations/ profitability/ crop-yield/ simulation-models/ South-Dakota/ uniform-versus-variable-rate-application/ nutrient-management/ crop-simulation-models

165. **Residual phosphorus and management strategy for grain sorghum on a Vertisol.**

Sahrawat, K. L.

Communications in Soil Science and Plant Analysis (2000) 31 (19/20): 3103-3112.

NAL Call #: S590.C63; ISSN: 0010-3624.

Descriptors: vertisols/ phosphorus-fertilizers/ application-rates/ residual-effects/ sorghum-bicolor/ crop-yield/ phosphorus/ nutrient-uptake/ cropping-systems/ fertilizer-requirement-determination/ India/ rainfed-cropping/ residual-phosphorus-value/ nutrient-management

166. **A review of the Federal Clean Water Act and the Maryland Water Quality Improvement Act: the rationale for developing a water and nutrient management planning process for container nursery and greenhouse operations.**

Lea Cox, J. D. and Ross, D. S.

Journal of Environmental Horticulture (Dec 2001) 19 (4): 226-229.

NAL Call #: SB1.J66; ISSN: 0738-2898.

Descriptors: nurseries/ greenhouse-crops/ water-quality/ pollution/ water-conservation/ economic-analysis/ leaching/ environmental-protection/ nitrogen/ phosphorus/ eutrophication/ USA/ maryland

167. **Site-specific considerations for managing phosphorus.**

Schepers, J. S., Schlemmer, M. R., and Ferguson, R. B.

Journal of Environmental Quality (Jan/Feb 2000) 29 (1): 125-130.

NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: phosphorus/ crop-management/ soil-management/ site-factors/ nutrient-management

Abstract: Nutrient management can be difficult for land receiving nonuniform and sometimes very large applications of animal manure. The objective of this research was to document spatial variability in soil P status and develop a management strategy to help producers avoid problems related to past manure management practices. A 60-ha center-pivot sprinkler irrigated cornfield was intensively sampled (12.2 by 24.4 m alternate grid) and analyzed for Bray-1 P. The average Bray-1 P concentration showed that only a maintenance application would be sufficient; however, 74% of the individual data points indicated a positive response to P fertilizer could be expected. A map revealed unusually high soil P concentrations around a previous farmstead. Other spatial patterns were related to depositional areas with relatively high organic matter content. Consultants are beginning to collect soil samples on a 100 by 100 m grid (1.0-ha cells). The study field was separated into 1.0-ha cells from which P availability maps were generated using data from a single point in the center of each hypothetical cell and compared to the map using data from the cell corners. These maps were similar in some respects but would result in considerably different variable-rate P application maps. Results document the limitations and potential fallacies associated with grid sampling. A more reasonable approach might

be to use a bare-soil photograph, crop canopy image, or yield map to identify sampling areas with similar characteristics to define sampling zones. Every effort should be made to identify past manure history prior to soil sampling.

168. Site-specific nitrogen management of irrigated maize: yield and soil residual nitrate effects.

Ferguson, R. B., Hergert, G. W., Schepers, J. S., Gotway, C. A., Cahoon, J. E., and Peterson, T. A.

Soil Science Society of America Journal. [Madison, Wis.: Soil Science Society of America.] (Mar/Apr 2002) 66 (2): 544-553.

NAL Call #: 56.9-So3; ISSN: 0361-5995.

Descriptors: zea-mays/ irrigated-farming/ site-specific-crop-management/ anhydrous-ammonia/ variable-rate-application/ soil-fertility/ spatial-variation/ fields/ soil-organic-matter/ algorithms/ Nebraska/ reduced-variable-rate-application

Abstract: Site-specific N management (SSNM) has been suggested as one means of further increasing the efficiency with which N fertilizers are used and reducing environmental impact. Field studies to evaluate the potential for SSNM to reduce NO₃-N leaching from irrigated maize (*Zea mays* L.) were conducted from 1994 to 1997. Uniform management (UM) was compared with a SSNM strategy (variable rate technology, VRT) based on an existing N recommendation algorithm for maize using grid sampled soil organic matter and root zone soil residual NO₃-N. A third treatment (reduced variable rate technology, RVRT) evaluated the potential for a reduced rate of N to adequately supply crop N demand when combined with variable rate application. Averaged across all site-years, there was no significant difference in the total amount of N applied, 142 kg N ha⁻¹ with UM, 141 kg N ha⁻¹ with VRT. Treatment mean grain yields ranged from 4.5 to 13.9 Mg ha⁻¹ and were influenced relatively little by treatment, with VRT yield significantly reduced compared with UM in two site-years, and UM yield significantly reduced compared with VRT in one site-year. Treatment mean soil residual NO₃-N in the 0.9-m root zone ranged from 2.7 to 14.0 mg kg⁻¹, and was low (<6 mg kg⁻¹) for eight site-year, with no effect of treatment on NO₃-N concentration. For the five site-years with elevated NO₃-N concentrations (>6 mg kg⁻¹), there were no significant differences between UM and VRT treatments, while RVRT treatment reduced residual NO₃-N for three site-years. We conclude that the spatial application of the existing recommendation algorithm developed for uniform application may be inappropriate, at least for these sites, and that unique recommendation equations for major soils and climatic regions may be necessary to achieve substantial increases in N-use efficiency. This study also suggests that improved recommendation algorithms may often need to be combined with methods (such as remote sensing) to detect crop N status at early, critical growth stages followed by carefully timed, spatially adjusted supplemental fertilization to achieve optimum N-use efficiency.

169. Site-specific nutrient management for intensive rice cropping systems in Asia.

Dobermann, A., Witt, C., Dawe, D., Abdulrachman, S., Gines, H. C., Nagarajan, R.,

Satawathananont, S., Son, T. T., Tan, P. S., and Wang, G. H.
Field Crops Research. [Amsterdam, Elsevier.] (Feb 15, 2002) 74 (1): 37-66.
NAL Call #: SB183.F5; ISSN: 0378-4290.

Descriptors: oryza-sativa/ intensive-farming/ cropping-systems/ irrigation/ crop-yield/
yield-increases/ field-experimentation/ site-specific-crop-management/ fertilizers/ soil-
fertility/ nitrogen/ phosphorus/ potassium/ seasonal-variation/ nutrient-uptake/ efficiency/
Philippines/ Thailand/ Vietnam/ Indonesia/ Tamil-Nadu/ Zhejiang

170. **Tillage and nitrogen management effects on crop yield and residual soil nitrate.**

Bakhsh, A., Kanwar, R. S., Karlen, D. L., Cambardella, C. A., Colvin, T. S., Moorman, T. B., and Bailey, T. B.
Transactions of the ASAE (Nov/Dec 2000) 43 (6): 1589-1595.
NAL Call #: 290.9-Am32T; ISSN: 0001-2351.

Descriptors: tillage/ glycine-max/ nitrate-nitrogen/ soil-management/ crop-yield/ zeamays/ Iowa

Abstract: Tillage and N management can have great impact on crop yield and off-site transport of nitrate-nitrogen (NO₃-N). This six-year field study on tile-drained Clyde-Kenyon-Floyd soils in northeast Iowa was conducted to quantify corn (*Zea mays* L.) and soybean (*Glycine max* (L.) Merr.) yield and residual soil NO₃-N. Eight treatments (chisel plow vs no-tillage by preplant versus late-spring N-management for both corn and soybean phases of a rotation) were evaluated using a randomized complete block design. Preplant N was applied by injecting liquid urea-ammonium nitrate solution (UAN) at a rate of 110 kg N ha⁻¹. Late-spring soil-test based N-rates averaged 179 and 156 kg N ha⁻¹ for no-till and chisel treatments, respectively. No additional N was applied to soybean. Average corn yield on chisel plots was significantly (P = 0.05) higher than with no-tillage for both preplant (7.9 vs 6.9 Mg ha⁻¹) and late-spring (8.6 vs 8.1 Mg ha⁻¹) N-management. Average soybean yield where corn had received preplant N (3.6 Mg ha⁻¹) was significantly (P = 0.05) greater than where late-spring N-management (3.4 Mg ha⁻¹) was used. Residual tillage effects did not significantly (P = 0.05) affect soybean yield. The average residual soil NO₃-N to a depth of 1.2 m following corn was significantly (P = 0.05) lower for preplant (21 kg N ha⁻¹) than late spring (29 kg N ha⁻¹) N-management under no-till system, presumably reflecting differences in N application rates. Residual soil NO₃-N following soybean was significantly (P = 0.05) lower in no-till (28 kg N ha⁻¹) than chisel (37 kg N ha⁻¹) plots. Average over-winter changes in residual soil NO₃-N were greatest in corn plots previously fertilized with a single preplant application (+13 to 18 kg N ha⁻¹) and most variable following soybean in plots where corn was fertilized based on late-spring nitrate test (LSNT) values (-8.5 to +6.3 kg N ha⁻¹). Therefore development of efficient N-management strategies may require complete understanding of N-cycling processes taking place in the soil profile over winter months. The results of the study demonstrate that chisel plow increased corn yield with late-spring N-management and with preplant N when compared to no-till system.

171. **Use of chlorophyll meter sufficiency indices for nitrogen management of irrigated rice in Asia.**

Hussain, F., Bronson, K. F., Yadvinder Singh., Bijay Singh., and Peng, S.

Agronomy Journal (Sept/Oct 2000) 92 (5): 875-879.

NAL Call #: 4-AM34P; ISSN: 0002-1962.

Descriptors: oryza-sativa/ chlorophyll/ plant-composition/ measurement/ nitrogen/ nitrogen-fertilizers/ crop-management/ nutrient-requirements/ cultivars/ application-date/ fertilizer-requirement-determination/ philippines/ indian-punjab

Abstract: Low N fertilizer recovery efficiency (RE) remains a problem in rice (*Oryza sativa* L.) production in Asia. The chlorophyll meter has been shown to identify when rice is in need of a N top-dressing, that if applied would result in greater agronomic efficiency (AE) of N fertilizer than commonly practiced, pre-set timing schemes. Critical chlorophyll meter readings have been used to match N top-dressing with plant demand for the cultivar IR72, but fixed critical readings may not apply to multiple cultivars and locations. Our objective was to test the approach of using sufficiency indices, calculated from chlorophyll meter readings relative to well-fertilized reference plots, with several rice cultivars in the Philippines and in India by comparing with local fixed N timing recommendations. Chlorophyll meter readings were significantly affected by N management practice, cultivar, and time of application at both locations. Similar rice yields were produced with chlorophyll meter sufficiency indices compared with the fixed N timing treatment with 30 kg less N ha⁻¹ in the wet season in all cultivars at both locations. Compared with fixed-timing, 45 kg less N ha⁻¹ was used with the chlorophyll meter in the Philippines dry season without a yield reduction in three of four cultivars. In conclusion, chlorophyll meter sufficiency indices identified when several rice cultivars at two locations needed a N top-dressing, which resulted in greater AE of N fertilizer than local, pre-set splits.

172. **The value of presidedress soil nitrate testing as a nitrogen management tool in irrigated vegetable production.**

Hartz, T. K., Bendixen, W. E., and Wierdsma, L.

HortScience (July 2000) 35 (4): 651-656.

NAL Call #: SB1.H6; ISSN: 0018-5345.

Descriptors: lactuca-sativa/ apium-graveolens/ nitrate/ soil-fertility/ nitrogen/ soil-management/ irrigation/ sidedressing/ application-rates/ precipitation/ nutrient-availability/ crop-yield/ biomass-production/ mineralization/ nitrate-nitrogen/ leaves/ nitrogen-content/ California

Abstract: The utility of presidedress soil nitrate testing (PSNT) in irrigated lettuce (*Lactuca sativa* L.) and celery (*Apium graveolens* L.) production was evaluated in 15 commercial fields in California from 1996 to 1997. Fields were selected in which soil NO₃-N (5- to 30-cm depth) was > 20 mg(.)kg⁻¹ at the time the cooperating grower made the first sidedress N application. The grower's N regime was compared with reduced N treatments established by reducing or eliminating one or more sidedress applications. All

fields were sprinkler and/or furrow irrigated, with minimal in-season precipitation. Reductions in seasonal N application averaging 143 and 209 kg(.)ha-1 N in lettuce and celery trials, respectively, had no effect on marketable yield in any field. Crop biomass N at harvest in the lowest N treatment in each field averaged 94% (lettuce) and 88% (celery) of that in plots receiving the full grower N program. Based on controlled-environment aerobic incubation of soil from 30 fields in long-term vegetable rotations, in-season N mineralization averaged 1% to 2% of soil organic N. A soil NO₃-N "quick test" procedure utilizing a volumetric extraction of field-moist soil and measurement by nitrate-sensitive colorimetric test strips was evaluated and proved to be a practical on-farm method to estimate soil NO₃-N concentration. Lettuce midrib NO₃-N concentration at cupping stage was poorly correlated with current soil NO₃-N level. We conclude that PSNT can reliably identify fields in which sidedress N application can be delayed or eliminated without affecting crop performance.

173. **A water and nutrient management planning process for container nursery and greenhouse production systems in Maryland.**

Lea Cox, J. D., Ross, D. S., and Tefteau, K. M.

Journal of Environmental Horticulture (Dec 2001) 19 (4): 230-236.

NAL Call #: SB1.J66; ISSN: 0738-2898.

Descriptors: nurseries/ container-grown-plants/ greenhouse-crops/ water-management/ crop-management/ nitrogen/ phosphorus/ water-pollution/ water-quality/ watersheds/ law/ irrigation/ fertilizers/ leaching/ runoff/ USA/ maryland

Nutrient Management: Livestock

(Citations 174-198)

| Constructed Wetlands | Agricultural Best Management Practices | Nutrient Management: Crops |
| Environmental Management Systems for Agriculture |

174. **Assessing potential phosphorus loss for manure management (phosphorus index assessment).**

Kucera, M. J., Shapiro, C. A., Koelsch, R., and Eghball, B.

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 / (2000): 181-191.

NAL Call #: TD899.F4-I55-2000

Descriptors: phosphorus/ indexes

175. **Comparing phosphorus management strategies at a watershed scale.**

McDowell, R. W., Sharpley, A. N., Beegle, D. B., and Weld, J. L.

Journal of Soil and Water Conservation (Fourth Quarter 2001) 56 (4): 306-315.
NAL Call #: 56.8-J822; ISSN: 0022-4561.

Descriptors: phosphorus/ losses-from-soil/ runoff/ pollution-control/ watersheds/ water-pollution/ soil-fertility/ cattle-manure/ poultry-manure/ pig-slurry/ application-rates/ fertilizer-requirement-determination/ risk-assessment/ phosphorus-fertilizers/ Pennsylvania/ nonpoint-source-pollution/ agronomic-soil-test-phosphorus-recommendation/ environmental-soil-test-phosphorus-threshold/ phosphorus-index

176. **Development and application of the Cornell University Nutrient Management Planning System.**

Fox, D. G., Tylutki, T. P., Czymmek, K. J., Rasmussen, C. N., and Durbal, V. M.
Proceedings - Cornell Nutrition Conference for Feed Manufacturers (2000) (62nd): 167-179.
NAL Call #: 389.79-C81; ISSN: 0885-7687.

Descriptors: dairy-farming/ water-quality/ sustainability/ computer-software/ cattle-feeding/ nutrient-requirements/ nutrient-balance/ farming-systems/ program-evaluation/ project-implementation/ New-York/ cornell-net-carbohydrate-and-protein-system/ cropware

177. **Financial and environmental tradeoffs of phosphorus management practices on Vermont dairy farms.**

Parsons, R.
Selected Papers From the Annual Meeting of the American Agricultural Economics Association American Agricultural Economics Association. Meeting. [United States: The Association] (2002)

Descriptors: Simulation modeling system/ Geographic information system/ Phosphorus loading model/ Little Otter Creek Watershed/ Dairy farms/ Farm management/ Phosphorus/ Pollution control/ Lakes/ Economic impact/ Farm size/ Mixed farming/ Livestock numbers/ Cropping systems/ Cost analysis/ Environmental protection/ Vermont

178. **Financial impacts of alternative phosphorus management practices: the case of Vermont dairy farms.**

Zhang, W. and Parsons, R.
Selected Papers From the Annual Meeting of the American Agricultural Economics Association [United States: American Agricultural Economics Association.] (2001)

Descriptors: Farm level income and policy/ Simulation modeling system/ Dairy farms/ Farm management/ Phosphorus/ Pollution control/ Lakes/ Economic impact/ Simulation models/ Farm size/ Livestock numbers/ Mixed farming/ Cropping systems/ Vermont

179. **Impact of conservation tillage and nutrient management on soil water and yield of cotton fertilized with poultry litter or ammonium nitrate in the Georgia**

Piedmont.

Endale, D. M., Cabrera, M. L., Steiner, J. L., Radcliffe, D. E., Vencill, W. K., Schomberg, H. H., and Lohr, L.

Soil and Tillage Research (June 2002) 66 (1): 55-68.

NAL Call #: S590.S48; ISSN: 0167-1987.

Descriptors: gossypium-hirsutum/ crop-yield/ ammonium-nitrate/ poultry-manure/ secale-cereale/ cover-crops/ no-tillage/ tillage/ sandy-loam-soils/ soil-water-content/ plant-height/ leaf-area/ biomass/ water-deficit/ georgia

180. **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

181. **Integrated approach for a comprehensive nutrient management plan at Pahrump Dairy, Nevada.**

Ratcliff, C. D., Lazarus, J., and Goedhart, E.

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 / (2000): 157-163.

NAL Call #: TD899.F4-I55-2000

Descriptors: dairies/ dairy-effluent/ recycling/ farm-planning/ animal-feeding/ data-collection/ environmental-protection/ application-to-land/ Nevada

182. **Iowa manure matters, odor and nutrient management: Odor and nutrient management.**

Iowa State University. University Extension.

Ames, Iowa : Iowa State University, University Extension, V. : Ill.

NAL Call #: S655-.I69

Descriptors: Manure-handling-Iowa-Periodicals/ Farm-manure-Iowa-Periodicals/ Manure-handling-Periodicals/ Farm-manure-Periodicals

183. **Managing nitrate and bacteria in runoff from livestock confinement areas with vegetative filter strips.**

Fajardo, J. J., Bauder, J. W., and Cash, S. D.

Journal of Soil and Water Conservation (Third Quarter 2001) 56 (3): 185-191.

NAL Call #: 56.8-J822; ISSN: 0022-4561.

Descriptors: water-pollution/ runoff/ nitrate-nitrogen/ coliform-bacteria/ fecal-coliforms/ pollution-control/ grass-strips/ festuca-arundinacea/ silt-loam-soils/ cattle-manure/ runoff-water/ Montana

184. **Managing nutrients and pathogens from animal agriculture : proceedings of a Conference for Nutrient Management Consultants, Extension Educators, and Producer Advisors, Camp Hill, Pennsylvania, March 28-30, 2000.**

Conference for Nutrient Management Consultants, Extension Educators and Producer Advisors 2000 Camp Hill Pa.

Ithaca, NY : Natural Resource, Agriculture, and Engineering Service, 2000. viii, 508 p. : ill., maps:Includes bibliographical references.

NAL Call #: S675-.N72-no.-130

Descriptors: Animal-nutrition-Congresses/ Livestock-Ecology-Congresses/ Agricultural-waste-Congresses/ Agricultural-pollution-Congresses

185. **Near-infrared sensing of manure nutrients.**

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

Transactions of the ASAE (July/Aug 2000) 43 (4): 903-908.

NAL Call #: 290.9-Am32T; ISSN: 0001-2351.

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.

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

Neeteson, J. J.

Biology and Fertility of Soils (2000) 30 (5/6): 566-572.

NAL Call #: QH84.8.B46; ISSN: 0178-2762.

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.

187. **Nutrient management comes of age in the poultry industry.**

Carpenter, G. H.

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

NAL Call #: 57.8-C734; ISSN: 0276-5055.

Descriptors: poultry-manure/ waste-utilization

188. **Nutrient management for manure produced by swine fed low phytate corn.**

Paschold, J. S., Wienhold, B. J., Gilley, J. E., Miller, P., and Ferguson, R.

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 / (2000): 91-98.

NAL Call #: TD899.F4-I55-2000

Descriptors: pig-feeding/ pig-manure/ maize/ phytic-acid/ highly-available-phosphorus-corn

189. **Nutrient management practices among swine operations of various sizes.**

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

Journal of the American Veterinary Medical Association (Nov 15, 2000) 217 (10): 1526-1530.

NAL Call #: 41.8-Am3; ISSN: 0003-1488.

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

190. **Nutritional implications for manure nutrient management planning.**

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

Applied Engineering in Agriculture (Jan 2001) 17 (1): 27-39.

NAL Call #: S671.A66; ISSN: 0883-8542.

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.

191. **Nutritional management practices worth adopting from California.**
Robinson, P. H.
Advances in Dairy Technology. [Edmonton: University of Alberta, Faculty of Extension.]
(2000) 12: 17-25.
NAL Call #: SF223.W478; ISSN: 1184-0684.
- Descriptors:* dairy-industry/ cattle-feeding/ dry-period/ disease-control/ feed-formulation
192. **Phosphorus requirements for broilers and effect of phytase, citric acid, and 25-hydroxycholecalciferol on phosphorus availability for broilers and turkeys.**
Angel, R., Christman, M., and Applegate, T.
Proceedings - Maryland Nutrition Conference for Feed Manufacturers (2001) (48th): 72-86.
NAL Call #: 389.9-Un342; ISSN: 0542-8386.
- Descriptors:* broilers/ turkeys/ chicks/ poult/ poultry-feeding/ phosphorus/ nutrient-requirements/ phytase/ feed-additives/ enzyme-preparations/ citric-acid/ cholecalciferol/ bioavailability/ phytic-acid/ antinutritional-factors/ excretion/ diet-treatment/ nutrient-management
193. **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.
Journal of Environmental Management (Oct 2000) 60 (2): 145-154.
NAL Call #: HC75.E5J6; ISSN: 0301-4797.
- Descriptors:* broiler-production/ poultry-industry/ poultry-manure/ animal-wastes/ waste-disposal/ economic-impact/ production-costs/ regulations/ multivariate-analysis/ time-series/ USA
194. **Proceedings : Hawaii nutrient management education plan : January 9-11, 2001.: Hawaii nutrient management education plan. CTAHR proceedings.**
Ching, Lincoln., DuPonte, Michael W., and Hawaii Cooperative Extension Service.
University of Hawaii at Manoa. College of Tropical Agriculture and Human Resources.
[Honolulu, Hawaii] : Cooperative Extension Service, College of Tropical Agriculture & Human Resources, University of Hawaii at Manoa, [2001] 51 p. : ill.:Cover title. "July 2001." "P-7/01."
NAL Call #: TD930.2-.P76-2001
- Descriptors:* Animal-waste-Hawaii-Congresses/ Manures-Hawaii-Congresses
195. **Proposed requirements for manure nutrient management: potential sector impacts.**
Kaplan, J. D., Johansson, R., and Peters, M. A.
Agricultural Outlook [AO - U.S. Department of Agriculture, Economic Research Service]

(Apr 2002) (290): 22-25.
NAL Call #: aHD1751.A42; ISSN: 0099-1066.

Descriptors: regulations/ environmental-impact/ economic-impact/ USA

196. **Prospects for minimizing phosphorus excretion in ruminants by dietary manipulation.**

Valk, H., Metcalf, J. A., and Withers, P. J. A.
Journal of Environmental Quality (Jan/Feb 2000) 29 (1): 28-36.
NAL Call #: QH540.J6; ISSN: 0047-2425.

Descriptors: cattle/ excretion/ phosphorus/ diets/ pollution-control/ Netherlands

Abstract: In most intensive dairy farms, P input exceeds output, causing potential P losses to the environment, which results in leaching to ground water and eutrophication. Phosphorus in fertilizer and purchased feeds are the main contributors to P input, whereas milk P is the main output. In the Netherlands, new legislation has been introduced to substantially reduce P surpluses. However, since P is essential for maintenance and milk production, the dietary P supply must be maintained, especially for high-yielding dairy cows. This paper reviews how dairy cow diets can be manipulated to reduce potential P-loss to the environment without negative effects on animal health, feed intake, or milk production. The availability of P in forages, purchased feed, and inorganic phosphate supplements for ruminants may differ substantially and more research work is needed to elucidate the relevant factors influencing feed P availability. There is a lack of understanding of how and to what extent P is absorbed from the small intestine and the relationship to hydrolysis and microbial P utilization in the rumen. Comparing national P requirement systems indicates that the systems used in the UK and Italy should be revised to minimize unnecessary P accumulation in the soil. In addition, the impact of manipulating the dietary P supply to decrease P losses from dairy farming systems is evaluated. Whole farm system studies have illustrated the potential environmental benefits of more closely monitoring imports of purchased feeds onto the farm.

197. **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.
Journal of Dairy Science (Apr 2001) 84 (4): 966-973.
NAL Call #: 44.8-J822; ISSN: 0022-0302.

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.

198. **What's your role as a nutrient management consultant.**

Harrison, J.

Feedstuffs (Oct 2, 2000) 72 (41): 14-15, 27.

NAL Call #: 286.81-F322; ISSN: 0014-9624.

Descriptors: animal-nutrition/ dairy-farms/ consultants/ roles/ Washington/ Idaho/ Oregon

Environmental Management Systems for Agriculture

(Citations 199-215)

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| Nutrient Management: Crops | Nutrient Management: Livestock |

199. **Agriculture and ISO 14000.**

Wall, E., Weersink, A., and Swanton, C.

Food Policy 26 (1): 35-48.

NAL Call #: HD9000.1.F66

Descriptors: ISO/ Environmental management/ Standards/ Feasibility studies/ Agricultural production/ Certification/ Cost benefit analysis

200. **Assessing the operational cost of streamside management zones.**

Kluender, R., Weih, R., Corrigan, M., and Pickett, J.

Forest Products Journal (Feb 2000) 50 (2): 30-34.

NAL Call #: 99.9-F7662J; ISSN: 0015-7473.

Descriptors: forest-management/ logging/ streams/ environmental-protection/ land-use-planning/ land-classification/ bridges/ cost-benefit-analysis/ operating-costs/ opportunity-costs/ geographical-information-systems/ Arkansas/ harvesting-exclusion-zones/ best-management-practices/ portable-bridging

Abstract: A geographic information system (GIS) is a set of powerful, computer-based, analytical algorithms applied to solving spatial data problems. Recently, due to increases in memory, computing speed, and programming advances, personal computers have increased in use in solving spatial analysis problems. This study reports the benefits of applying a PC-based GIS to solve a common, but complicated, problem in forest management assignment of harvesting areas with harvesting exclusion zones. Two stands each from the USDA Crossett Experimental Forest, and the University of Arkansas Forest, and four stands each from the Ouachita National Forest, and the Ozark National Forest (total 12) were analyzed to determine the changes in operational costs due to following best management practices by excluding sensitive areas from harvesting activity with streamside management zones (SMZs). In a one-time loss, land averaging 6.3 percent of the forest land was taken out of production due to the implementation of SMZs. Benefit/cost ratios of harvestable timber value to harvesting cost decreased with the imposition of SMZs, but the judicious use of portable bridging to span SMZs at critical locations mitigated losses considerably.

201. **A decision support process to compare riparian revegetation options in Scheu Creek, Queensland.**

Qureshi, M. E. and Harrison, S. R.

Journal of Environmental Management 62 (1): 101-112.

NAL Call #: HC75.E5J6

Descriptors: Multicriteria analysis/ Riparian vegetation/ Watersheds/ Social costs/ Cost benefit analysis/ Decision making/ Multivariate analysis/ Comparisons/ Environmental policy/ Interest groups/ Natural resources/ Queensland

202. **Developing an environmental management system (EMS) for viticulture: A practical guide for wine grape producers**

Nind, Catherine and Taylor, Lucy

Perth, Australia: Department of Agriculture, Western Australia, 2002.

NAL Call #: S397 .M57 no. 2002/15

URL: URL:

http://agspsrv34.agric.wa.gov.au/agency/pubns/miscpubs/mp15_2002/mp15_2002.pdf

Descriptors: W000 POLLUTION, GENERAL

203. **Developing decision support systems for integrated coastal management in the tropics: Is decision-making environment too complex for the useable and useful DSS?**

Westmacott, S.

Journal of Environmental Management 62 (1): 55-74.
NAL Call #: HC75.E5J6

Descriptors: Coastal areas/ Tropics/ Ecosystems/ Decision making/ Expert systems/
Simulation models

204. **Environmental management systems in agriculture: Proceedings of a national workshop, May 26-28, 1999: A report for the Rural Industries Research and Development Corporation.**

Carruthers, Genevieve., Tinning, Gavin., and Rural Industries Research and Development Corporation. Land and Water Resources Research and Development Corporation (Australia). NSW Agriculture.

Barton, ACT : RIRDC, [1999] vi, 232 p. : ill.:"Land & Water Resources Research & Development Corporation, NSW Agriculture, RIRDC." "Shaping the future"--Cover. "October 1999." "RIRDC project no. DAN 172A." Includes bibliographical references.
NAL Call #: S589.76.A8-E58-1999

Descriptors: Agriculture-Environmental-aspects-Australia-Congresses/ Environmental-management-Australia-Congresses

205. **Evaluating nonpoint pollution policy using a tightly coupled spatial decision support**

Bennett, D. A. and Vitale, A. J.

Environmental Management 27 (6): 825-836.

NAL Call #: HC79.E5E5

Descriptors: Watersheds/ Erosion/ Water pollution/ Land use/ Expert systems/ Illinois/
Land reclamation/ Pollution/ Land economics

206. **A framework for assessing the impact of the IPPC directive on the performance of the pig industry.**

Pellini, T. and Morris, J.

Journal of Environmental Management (Nov 2001) 63 (3): 325-333.

NAL Call #: HC75.E5J6; ISSN: 0301-4797.

Descriptors: pigs/ meat-and-livestock-industry/ economic-impact/ legislation/ pollution-control/ cost-benefit-analysis/ environmental-assessment/ regulations/ UK/ integrated-pollution-prevention-and-control

207. **Innovations in public participation and environmental decision making: examples from the Great Lakes region.**

Konisky, D. M. and Beierle, T. C.

Society and Natural Resources (Oct 2001) 14 (9): 815-826.

NAL Call #: HC10.S63; ISSN: 0894-1920.

Descriptors: lakes/ watershed-management/ environmental-protection/ social-participation/ decision-making/ regional-planning/ innovations/ study-circles/ citizen-juries/ round-tables/ collaborative-watershed-management

208. **Integrated environmental management: improving implementation through leverage point mapping.**

Margerum, R. D. and Hooper, B. P.

Society and Natural Resources (Jan 2001) 14 (1): 1-19.

NAL Call #: HC10.S63; ISSN: 0894-1920.

Descriptors: watershed-management/ mapping/ environmental-management/ land-use-planning/ plan-implementation-and-evaluation/ case-studies/ USA/ Australia

209. **Land use, agronomic management and water quality in a small Northern Italian watershed.**

Gardi, C.

Agriculture, Ecosystems and Environment (Oct 2001) 87 (1): 1-12.

NAL Call #: S601.A34; ISSN: 0167-8809.

Descriptors: watersheds/ land-use/ land-management/ agriculture/ agronomy/ water-quality/ rotations/ farming-systems/ herbicides/ nitrate/ geographical-information-systems/ simulation-models/ crops/ pedology/ leaching/ emilia-romagna

Abstract: European union (EU) agricultural policy has induced significant changes in crop rotations, especially in marginal areas. The evaluation of the impact on water quality induced by this new agronomic framework is presented in this paper. The discharge, the sediment content and the concentrations of herbicides and nitrates in the Centonara creek, draining a hilly watershed near Bologna, were measured from October 1994 to September 1996. A geographic information system (GIS) and the crop simulation model CropSyst were used to characterize the relationships between cropping systems, land use, pedological and morphological properties of the watershed as well as nitrate losses. Hydrological results showed that the Centonara creek discharge was characterized by low base flows and by fast increments during flooding. Herbicide concentrations were above the EU 0.1 microgram l(-1) limit on several occasions, whereas nitrate concentrations were always below the 50 mg l(-1) limit established by EU for drinking waters. It was estimated that more than 30% of the nitrogen input in the watershed is due to atmospheric depositions. The purpose of GIS was to subdivide the watershed in 86 "agronomically homogeneous areas", which were then utilized as the basis for the application of CropSyst. Simulations obtained by the model showed that the greatest leaching losses of nitrates were higher than 10 kg ha(-1) yr(-1) exclusively in the agronomically homogeneous areas characterized by coarser textured soils. Overall nitrate and herbicide losses were low, mainly due to the differentiation of the cropping systems in the watershed. The combined use of GIS and CropSyst enabled the characterization of the environmental vulnerability in relation to the land use in the watershed by means of pedologic cartography, land use maps and meteorological data. In particular, erosion and herbicide losses were higher in sloping areas planted with spring-summer crops. The

increase in row crops cultivations, determined by EU agricultural policy, represents the main impact on water quality of the investigated area.

210. **Managing for sustainable agriculture.**

Harrison, J. D.

Journal of Extension 40 (4)

NAL Call #: LC45.4.J682; ISSN: 1077-5315.

Descriptors: Environmental management systems/ ISO 14000/ Farm management/ Farming systems/ Sustainability/ Environmental management/ Standards/ Farmers' attitudes/ Models/ Improvement/ Value added/ Extension/ Extension education/ Profitability/ Agricultural policy/ Assessment/ Farm planning/ Project implementation/ Evaluation/ Reviews/ Pollution

211. **Potential and perspectives for application of environmental management system food industries.**

Boudouropoulos, I. D. and Arvanitoyannis, I. S.

Food Reviews International 16 (2): 177-237.

NAL Call #: TX341.F662; ISSN: 8755-9129.

Descriptors: Food industry/ Pollution/ Agricultural wastes/ Standards/ ISO/ Energy sources/ Food science

212. **A quantitative evaluation of monitoring networks for region-specific nitrate reduction policies.**

Soest, F. van., Stein, A., Dekkers, A. L. M., and Duijvenbooden, W. van.

Journal of Environmental Management (Mar 2001) 61 (3): 215-225.

NAL Call #: HC75.E5J6; ISSN: 0301-4797.

Descriptors: nitrate-reduction/ leaching/ environmental-policy/ regionalization/ monitoring/ evaluation/ maps/ Netherlands

213. **A system dynamics approach for regional environmental planning and management: a study for the Lake Erhai Basin.**

Guo, H. C., Liu, L., Huang, G. H., Fuller, G. A., Zou, R., and Yin, Y. Y.

Journal of Environmental Management (Jan 2001) 61 (1): 93-111.

NAL Call #: HC75.E5J6; ISSN: 0301-4797.

Descriptors: lakes/ environmental-management/ water-pollution/ pollution-control/ planning/ simulation-models/ water-quality/ rivers/ Yunnan

214. **Towards participatory environmental management.**

Kapoor, I.

Journal of Environmental Management (Nov 2001) 63 (3): 269-279.

NAL Call #: HC75.E5J6; ISSN: 0301-4797.

Descriptors: environmental-management/ social-participation/ development-planning/
resource-management/ community-involvement

215. **Which decision support tools for the environmental management of nitrogen?**

Meynard, J. M., Cerf, M., Guichard, L., Jeuffroy, M. H., and Makowski, D.
Agronomie 22 (7/8): 817-829.
NAL Call #: SB7.A3

Descriptors: Nitrogen/ Decision making/ Simulation models/ Pollution control/ Losses from soil/ Agricultural land/ Farming systems/ Cropping systems/ Nitrogen fertilizers/ Application rates/ Low input agriculture/ Water pollution

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