

THOMAS LEHMAN RICHARD

Curriculum Vitae
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EDUCATION

Ph.D. Cornell University. 1997.

Thesis title: The Kinetics of Solid-State Aerobic Biodegradation
Major: Biological Engineering
Minors: Microbiology, Environmental Engineering

M.S. Cornell University. 1987.

Thesis title: Macropore Influences on Solute Transport
Major: Agricultural Engineering
Minor: Agronomy

B.S. University of California, Berkeley. 1978.

Major: Political Economy of Natural Resources
Phi Beta Kappa.

RESEARCH INTERESTS

Application of systems engineering principles to agricultural and environmental problems. Specific interests include:

- Microbial conversion of biomass, agricultural byproducts and manures for nutrient, energy, and organic matter recovery and value-added manufacturing,
- Nutrient, carbon, and energy flows in agricultural ecosystems.
- Integrated assessment of coupled human-agroecological systems

RESEARCH EXPERIENCE

Professor. Department of Agricultural and Biological Engineering, Pennsylvania State University, State College, PA. 2011-present.

- Director, Penn State Institutes of Energy and the Environment (2008-present)
- Director, Biomass Energy Center (2007-present)
- Research and teaching in biological engineering and agroecosystem design.

Visiting Scholar. Energy Biosciences Institute, University of California Berkeley, Berkeley, CA. Fall 2014. (on sabbatical from Penn State University)

- Research on biomass energy and sustainable technologies and policies.

Associate Professor. Department of Agricultural and Biological Engineering, Pennsylvania State University, State College, PA. 2004 - 2011.

- Research and teaching related to microbial bioconversion processes.

Associate Professor. Department of Agricultural and Biosystems Engineering, Iowa State University, Ames, IA. 2003 - 2004.

- Chair, Graduate Program in Sustainable Agriculture
- Research and teaching related to bioprocessing of organic residuals.

Assistant Professor. Department of Agricultural and Biosystems Engineering, Iowa State University, Ames, IA. 1997 - 2003.

- Research and teaching related to bioprocessing of organic residuals.

Visiting Professor. Department of Environmental Technology, Wageningen University and Research Centre, Wageningen, The Netherlands. 2000.

- Research on manure bioconversion and greenhouse gas emission monitoring.

Research Support Specialist. Department of Agricultural and Biological Engineering, Cornell University, Ithaca, NY. 1987 — 1997.

- Leadership responsibility for research and extension activity in biological waste management.

Hydrologist. U.S. Geological Survey, Water Resources Division. Ithaca, NY. 1987.

- Managed field study of pesticide movement under conventional and no-till corn culture.

Graduate Research Assistant. Department of Agricultural Engineering, Cornell University. Ithaca, NY. 1985-1987.

- Designed and conducted tracer and dye field experiments to study solute transport through biologically induced macropores.

Undergraduate Research Assistant. Chemistry Department, University of California, San Diego. 1974-1975.

- Applied environmental chemistry and simulation modeling to environmental problems as member of ongoing undergraduate research team.
- Proposed and directed a National Science Foundation study of the environmental interactions in the San Diego and Tijuana region.

TEACHING EXPERIENCE

Principal Instructor:

- Ag. and Bio. Eng. 884 – Biomass Energy Systems (2013). Pennsylvania State University – 3 credits – graduate level, distance education.

- Ag. and Bio. Eng. 001S – Freshman Seminar (2005). Pennsylvania State University – 1 credit – undergraduate level. With Roy Young
- Biological Eng. 464 (initially Ag. and Bio. Eng. 497) – Biomass Energy Systems (2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013). Pennsylvania State University – 3 credits – undergraduate level
- Ag. and Bio. Eng. 402 – Transport Processes for Biological Production (2005, 2006, 2007). Pennsylvania State University – 3 credits including lab – undergraduate level
- Ag. and Bio. Eng. 597A – Bioconversion Processes (2005). Pennsylvania State University – 3 credits – graduate level
- Ag. Systems Technology 475 – Manure Management Systems for Livestock Production (1998, 1999, 2000, 2001, 2002, 2004). Iowa State University – 3 credits – undergraduate level
- Ag. Eng. 473/573 – Manure Treatment and Bioconversion (1997, 1998, 2000, 2002, 2004). Iowa State University – 3 credits – graduate level
- Ag. Systems Technology 403 – Senior Seminar (2002, 2003). Iowa State University – 1 credit – undergraduate level
- SustAg/AgEng/AnSci/Agron 515 – Integrated Crop and Livestock Production Systems (2001, 2003). With M. Weidenhoeft and J. Russell. Iowa State University – 3 credits – graduate level
- SustAg/AgEng/Soc 610- Society and Technology in Sustainable Food Systems (2003). With C. Hinrichs. Iowa State University – 3 credits – graduate level.
- Ag. Systems Technology 496 – Agricultural Systems Analysis and Planning (2001). With S. Melvin. Iowa State University – 3 credits – undergraduate level
- Agricultural Waste Management (1995). Seoul National University, Korea – 30 hours – graduate level
- Biomass Refining: Pathways to Sustainability and Security (2007). Penn State University short course – professional audience.

- Midwest Composting School (1998, 1999, 2000, 2002, 2003, 2004). Joint course of University of Wisconsin, University of Minnesota and Iowa State University – professional audience
- Garbage Engineering Short Course (1993). Cornell University – professional audience
- Municipal Compost Management Short Courses (1992, 1993, 1996, 1997, 2003). Cornell Univ., Montana State Univ., San Jose, CA – professional audiences
- Ag. Eng. 672 - Drainage (1987, co-taught with T.S. Steenhuis). Cornell University – 3 credits – graduate level
- Energy Management 100 - Fundamentals of Solar Design (1981). Edmonds (Wa.) Community College – 3 credits – undergraduate level

MANAGEMENT EXPERIENCE

Director, Penn State Institutes of Energy and the Environment. Penn State University. University Park, PA. 2008-present.

- Facilitate research, teaching, and outreach for over 500 faculty and over \$100 million of research expenditures annually
- Develop and implement strategic initiatives in energy and environmental research
- Engage industrial, governmental and foundation partners
- Supervise staff of 11 in accounting, office administration, communications, information technology, and spatial analysis.

Director, Biomass Energy Center. Penn State University, University Park, PA. 2006 - present.

- Coordinate research and outreach activities for over 70 faculty.
- Plan and organize conferences, workshops, and seminar series
- Develop industrial collaborations through the BioEnergy Bridge.
- Supervise associate director and administrative assistant.

Deputy Technical Director. National Risk Assessment Partnership. Department of Energy, National Energy Technology Laboratory, Pittsburgh, PA. 2012 – present.

- Coordinate carbon storage risk assessment among 5 DOE National Labs.

Project Manager. Rebound Building Materials Recycling Project, Central Area Motivation Program. Seattle, WA. 1981-1983.

- Conceived, developed, and managed a non-profit building materials recycling business.
- Developed strategies for advertising, soliciting donations, sales, staffing, inventory, accounting, etc.

Operations Manager. Seattle Recycling, Inc. Seattle, WA. 1978-1981.

- Managed the City of Seattle's home collection of recyclables pilot project.
- Supervised collection and processing of materials from 20,000 homes.

ARTICLES IN REFEREED JOURNALS

Bukowski, N., J.L. Pandey, L. Doyle, **T.L. Richard**, C.T. Anderson and Y. Zhu. 2015. Development of a clickable designer monolignol for interrogation of lignification in plant cell walls. *Bioconjugate Chemistry*. *In press*.

Malcolm, G.M., G.G.T. Camargo, V.A. Ishler; **T.L. Richard** and H.D. Karsten. 2015. Energy and greenhouse gas analysis of northeast U.S. dairy cropping systems. *Agriculture, Ecosystems and Environment* 199:407-417.

Dale, B.E., J.E. Anderson, R.C. Brown, S. Csonka, V.H. Dale, G. Herwick, R.D. Jackson, N. Jordan, S. Kaffka, K.L. Kline, L.R. Lynd, C. Malmstrom, R.G. Ong, **T.L. Richard**, C. Taylor and M.Q. Wang. 2014. Take a closer look: Biofuels can support environmental, economic and social goals. *Environmental Science and Technology*. DOI: 10.1021/es5025433.

Camargo, G.T.T., M.R. Ryan and **T.L. Richard**. 2013. Energy use and greenhouse gas emissions from crop production using the Farm Energy Analysis Tool. *Bioscience* 63(4):263:273.

Feyereisen, G.W., G.T.T. Camargo, R.E. Baxter, J.M. Baker and **T.L. Richard**. 2013. Cellulosic biofuel potential of a winter rye double crop across the U.S. corn-soybean belt. *Agronomy Journal* 105(3):631-642.

Glanville, T.D., H.K. Ahn, **T.L. Richard**, J.D. Harmon, D.L. Reynolds, and S. Akinc. 2013. Effect of envelope material on biosecurity during emergency bovine mortality composting. *Bioresource Technology* 130:543–551.

Tanjore, D., **T.L. Richard** and M.N. Marshall. 2012. Experimental methods for laboratory-scale ensilage of lignocellulosic biomass. *Biomass and Bioenergy* 47:125-133.

Chen, Q., M.N. Marshall, S.M. Geib, M. Tien and **T.L. Richard**. 2012. Effects of laccase on lignin depolymerization and enzymatic hydrolysis of ensiled corn stover. *Bioresource Technology* 117:186-193.

Speer, M.A. and **T.L. Richard**. 2011. Amplified insert assembly: an optimized approach

- to standard assembly of BioBrick™ genetic circuits. *Journal of Biological Engineering* 5:17.
- Lee, R.L., R.A. Aziz, C.H. de Brito Cruz, A.F.A. Chimphango, L.A.B. Cortez, A. Faaij, N. Greene, M. Keller, P. Osseweijer, **T.L. Richard**, J. Sheehan, A. Chugh, L. van der Wielen, J. Woods, and W.H. van Zyl. 2011. A global conversation about energy from biomass: the continental conventions of the global sustainable bioenergy project. *Interface Focus* 1(2):271-279.
- Baxter, R., G. Feyereisen, Y. Yu, and **T.L. Richard**. 2011. Winter crop and residue biomass potential in China. *Biofuels* 2(5):503-513.
- Durre, P and **T. Richard**. 2011. Microbial energy conversion revisited. *Current Opinion in Biotechnology* 22(3): 309-311.
- Webber, D.F., S.K. Mickelson, B.D. Whitman **T.L. Richard**, and H.K. Ahn. 2011. Livestock manure composting runoff and infiltration characteristics from laboratory rainfall simulations. *Compost Science and Utilization* 19(1):6-14.
- Richard, T.L.** 2010. Challenges in scaling up biofuels infrastructure. *Science* 329: 793 – 796.
- Webber, D.F., S.K. Mickelson, L.W. Wulf, **T.L. Richard**, and H.K. Ahn. 2010. Hydrologic modeling of runoff from a livestock manure windrow composting site with a fly ash pad surface and vegetative filter strip buffers. *Journal of Soil and Water Conservation* 65(4): 252-260.
- Chaoui, H., F. Montes, C. A. Rotz, and **T. L. Richard**. 2009. Volatile ammonia fraction and flux from thin layers of buffered ammonium solution and dairy cattle manure. *Transactions of the ASABE* 52(5):1695-1706.
- Chianese, D.S., C. A. Rotz, and **T. L. Richard**. 2009. Simulation of nitrous oxide emissions from dairy farms to assess greenhouse gas reduction strategies. *Transactions of the ASABE* 52(4): 1325-1335.
- Chianese, D.S., C. A. Rotz, and **T. L. Richard**. 2009. Simulation of methane emissions from dairy farms to assess greenhouse gas reduction strategies. *Transactions of the ASABE* 52(4): 1313-1323
- Chianese, D.S., C. A. Rotz, and **T. L. Richard**. 2009. Simulation of carbon dioxide emissions from dairy farms to assess greenhouse gas reduction strategies. *Transactions of the ASABE* 52(4): 1301-1312
- Chianese, D.S., C. A. Rotz, and **T. L. Richard**. 2009. Whole-farm greenhouse gas emissions: A review with application to a Pennsylvania dairy farm. *Applied Engineering in Agriculture* 25(3):431-442.

- Rezaei, F., D. Xing, R. Wagner, J.M. Regan, **T.L. Richard**, and B.E. Logan. 2009. Simultaneous cellulose degradation and electricity production by *Enterobacter cloacae* in a microbial fuel cell. *Applied and Environmental Microbiology* 75(11):3673–3678.
- Rezaei, F., **T.L. Richard**, and B.E. Logan. 2009. Analysis of chitin particle size on maximum power generation, power longevity, and Coulombic efficiency in solid–substrate microbial fuel cells. *Journal of Power Sources* 192:304–309
- Webber, D.F., S.K. Mickelson, **T.L. Richard**, and H.K. Ahn. 2009. Effects of a livestock manure windrow composting site with a fly ash pad surface and vegetative filter strip buffers on sediment, nitrate, and phosphorus losses with runoff. *Journal of Soil and Water Conservation* 64(2):163-171.
- Ahn, H.K., T.J. Sauer, **T.L. Richard**, and T.D. Glanville. 2009. Determination of thermal properties of composting bulking materials. *Bioresource Technology* 100:3974-3981.
- Glanville, T.D., H.K. Ahn, **T.L. Richard**, and J.D. Harmon. 2008. Soil contamination caused by emergency bio-reduction of catastrophic livestock mortalities. *Water, Air, and Soil Pollution* 198(1):285-296.
<http://www.springerlink.com/content/0741054891354460/fulltext.html>
- Rezaei, F., **T.L. Richard**, and B.E. Logan. 2008. Enzymatic hydrolysis of cellulose coupled with electricity generation in a microbial fuel cell. *Biotechnology and Bioengineering* 101(6): 1163-1169.
- Weiss LE, J.P. Badalamenti, L.J. Weaver, A.R. Tascone, P.S. Weiss, **T.L. Richard**, and P.C. Cirino. 2008. Engineering motility as a phenotypic response to LuxI/R-dependent quorum sensing in *Escherichia coli*. *Biotechnology and Bioengineering* 100(6):1251-1255.
- Norman, H., H.M. Hanna, and **T.L. Richard**. 2008. Solid manure distribution by rear- and side-delivery spreaders. *Transactions of the ASABE*. 51(3):831-843.
- Ahn, H.K., **T.L. Richard** and T.D. Glanville. 2008. Optimum moisture levels for biodegradation of mortality composting envelope materials. *Waste Management* 28(8):1411-1416.
- Ahn, H.K., **Richard, T.L.**, Glanville, T.D., 2008. Laboratory determination of compost physical parameters for modeling of airflow characteristics. *Waste Management* 28(3):660-670.
- Leuer, E.R., J. Hyde, and **T.L. Richard**. 2008. Investing in methane digesters on Pennsylvania dairy farms: implications of scale economies and environmental programs. *Agricultural and Resource Economics Review* 37(2): 1-16

- Murphy, P.T., K.J. Moore, **T.L. Richard**, and C.J. Bern, and T.J. Brumm. 2007. Use of swine manure to improve solid-state fermentation in an integrated storage and conversion system for corn stover. *Transactions of the ASABE* 50(5):1901-1906.
- Badalamenti, J.P., L.E. Weiss, C.J. Buckno, **T.L. Richard**, P.S. Weiss, and P.C. Cirino. 2007. Synthetic sports: a bacterial relay race. *IET Synthetic Biology* 1(1.2):61-63
- Rezaei, F., **T.L. Richard**, R.A. Brennan, and B.E. Logan. 2007. Substrate-enhanced microbial fuel cells for improved remote power generation from sediment-based systems. *Environmental Science and Technology* 41(11):4053-4058.
- Ren, H., **T.L. Richard**, and K.J. Moore. 2007. The impact of enzyme characteristics on corn stover fiber degradation and acid production during ensiled storage. *Appl. Biochem. Biotechnol.* 136-140:221-238.
- Murphy, P.T., K.J. Moore, **T.L. Richard**, and C.J. Bern. 2007. Enzyme enhanced solid-state fermentation of kenaf core fiber for storage and pretreatment. *Bioresource Technology* 98(16):3106-3111.
- Ahn, H.K., **T.L. Richard**, and H.L. Choi. 2007. Mass and thermal balance during composting of a poultry manure - wood shavings mixture at different aeration rates. *Process Biochemistry* 42 (2): 215-223.
- Bennett., A.S., C.J. Bern, **T.L. Richard**, and R.P. Anex. 2007. Corn grain drying using corn stover combustion and CHP systems. *Transactions of the ASABE* 50(6):2161-2170.
- Richard, T.L.**, L.P. Walker, and J.M. Gossett. 2006. Effects of oxygen on aerobic solid-state biodegradation kinetics. *Biotechnology Progress* 22(1):60-69
- Richard, T.L.** and L.P. Walker. 2006. Modeling the temperature kinetics of aerobic solid-state biodegradation. *Biotechnology Progress* 22(1):70-77.
- Sadaka, S.S., **T.L. Richard**, T.D. Loecke, and M. Liebman. 2006. Determination of compost respiration rates using pressure sensors. *Compost Science and Utilization* 14 (2): 124-131.
- Ren, H., **T.L. Richard**, Z. Chen, M. Kuo, Y. Bian, K.J. Moore, and P. Patrick. 2006. Ensiling Corn Stover: Effect of Feedstock Preservation on Particleboard Performance. *Biotechnology Progress* 22(1):78-85.
- McAndrews, G.M., M. Liebman, C.A. Cambardella, and **T.L. Richard**. 2006. Residual effects of composted and fresh solid swine (*Sus scrofa* L.) manure on soybean [*Glycine max* (L.) Merr.] growth and yield. *Agronomy Journal* 98 (4): 873-882.

- Rosentrater, K.A., **T.L. Richard**, C.J. Bern and R.A. Flores. 2005. Small-scale extrusion of corn masa by-products. *Cereal Chemistry* 82(4):436-446.
- Persyn, R.A., T.D. Glanville, **T.L. Richard**, J.M. Laflen, P.M. Dixon. 2005. Environmental effects of applying composted organics to new highway embankments – Part 3– Rill erosion. *Transactions of the ASAE*, 48(5):1765-1772.
- Garrison, M.V. and **T.L. Richard**. 2005. Methane and manure: Feasibility analysis of price and policy alternatives. *Trans. ASAE* 48(3): 1287-1294.
- Richard, T.L.**, A.H.M. Veeken, V. De Wilde, and H.V.M. Hamelers. 2004. Air-filled porosity and permeability relationships during solid-state fermentation. *Biotechnology Progress* 20(5):1372-1381.
- Liang, Y., H. Xin, S.J.Hoff, **T.L. Richard** and B.J. Kerr. 2004. Performance of single point monitor in measuring ammonia and hydrogen sulfide gases. *Applied Engineering in Agriculture* 20(6):863-872.
- Persyn, R.A., T.D. Glanville, **T.L. Richard**, J.M. Laflen, and P.M. Dixon. 2004. Environmental effects of applying composted organics to new highway embankments - Part 1 - Interrill runoff and erosion. *Trans. ASAE* 47(2): 463–469.
- Glanville, T.D., R.A. Persyn, **T.L. Richard**, J.M. Laflen, and P.M. Dixon. 2004. Environmental effects of applying composted organics to new highway embankments - Part 2 - Water quality. *Trans. ASAE* 47(2): 471-478.
- Singer, J.W., K.A. Kohler, M. Liebman, **T.L. Richard**, C. Cambardella, and D.D. Buhler. 2004. Tillage and compost affect yield of corn, soybean, and wheat and soil fertility. *Agronomy Journal* 96:531-537.
- Loecke, T.D., M. Liebman, C.A. Cambardella, and **T.L. Richard**. 2004. Time of application and composting affect corn (*zea mays* L.) yield response to solid swine (*sus scrofa* L.) manure. *Agronomy Journal* 96: 214-223.
- Loecke, T.D., M. Liebman, C.A. Cambardella, and **T.L. Richard**. 2004. Corn growth responses to composted and fresh solid manures. *Crop Science* 44:177-184.
- Liebman, M., F. Menalled, D. Buhler, **T.L. Richard**, D. Sundberg, C. Cambardella, and K. Kohler. 2004. Impacts of composted swine manure on weed and corn nutrient uptake, growth, and seed production. *Weed Science* 52:365-375.
- Richard, T.L.** and C.C. Hinrichs. 2003. Management and maintenance of earthen manure structures: implications and opportunities for water quality protection. *Applied Engineering in Agriculture* 18(6):727-734.

- Cambardella, C.A., **T.L. Richard**, and A. Russell. 2003. Compost mineralization in soil as a function of composting process conditions. *European Journal of Soil Biology* 39:117-127.
- Rosentrater, K.A., **T. L. Richard**, C. J. Bern, and R. A. Flores. 2003. Economic simulation modeling of reprocessing alternatives for corn masa byproducts *Resources, Recycling and Conservation* 39(4):341-367.
- Richard, T.L.**, H.V.M. Hamelers, A.H.M. Veeken and T. Silva. 2002. Moisture relationships in composting processes. *Compost Science and Utilization* 10(4):286-302.
- Tiquia, S.M., **T.L. Richard** and M.S. Honeyman. 2002. Carbon, nutrient and mass loss during composting. *Nutrient Cycling in Agricultural Ecosystems*. 62(1):15-24.
- Choi, H.L., **T.L. Richard**, and H.K. Ahn. 2001. Composting high moisture materials: biodrying poultry manure in a sequentially fed reactor. *Compost Sci. and Util.* 9(4):303-311.
- Honeyman, M.S., J.D. Harmon, J.B. Kliebenstein, and **T.L. Richard**. 2001. Feasibility of hoop structures for market swine in Iowa: pig performance, pig environment, and budget analysis. *Applied Engineering in Agriculture* 17(6):869-874.
- Tiquia S.M., **T.L. Richard** and M.S. Honeyman. 2000. Effect of windrow turning and seasonal temperatures on composting of hog manure from hoop structures. *Environ. Technol.* 20(9):1037-1046.
- Richard, T.L.**, and H.L. Choi. 1999. Eliminating Waste: Strategies for sustainable manure management. *Asian-Aus. J. Anim. Sci.* 12(7):1162-1169.
- Richard, T.L.**, L.P. Walker, and J.M Gossett. 1999. The effects of oxygen on solid-state biodegradation kinetics. *Proceedings of the Inst. of Biological Engineering* 2:A10-A30. IBE Publications, Athens, GA.
- Rosentrater, K.A., R. A. Flores, **T. L. Richard**, and C. J. Bern. 1999. Characterization of agribusiness residues: physical and nutritional properties of corn masa byproduct streams. *Applied Engineering in Agriculture* 15(5):515-523.
- Richard, T.L.** and L.P. Walker. 1998. Temperature kinetics of aerobic solid-state biodegradation. *Proceedings of the Inst. of Biological Engineering* 1:A22-A39. IBE Publications, Athens, GA.
- Choi, H.L., **T.L. Richard** and H.T. Kim. 1996. Composting high moisture materials: bio-drying poultry manure in a sequentially fed reactor. *Korean J. of Anim. Sci.* 38(6):649-658.

- Richard, T.L.** 1992. Municipal solid waste composting: physical and biological processing. *Biomass and Bioenergy* 3(3-4):163-180.
- Richard, T.L.** and P.B. Woodbury. 1992. The impacts of separation on heavy metal contamination in municipal solid waste composts. *Biomass and Bioenergy* 3(3-4):195-211.
- Harrison, E.Z. and **T.L. Richard**. 1992. Municipal solid waste composting: policy and regulation. *Biomass and Bioenergy* 3(3-4):127-143.
- Haith, D.A., P. Landre, J.E. Reynolds and **T.L. Richard**. 1992. Sludge loading rates for forest land. *Journal of Environmental Engineering*. 118(2):196-208.
- Steenhuis, T.S., W. Staubitz, M.S. Andreini, J. Surface, **T.L. Richard**, R. Paulsen, N.B. Pickering, J.R. Hagerman, and L.D. Geohring. 1990. Preferential movement of pesticides and tracers in agricultural soils. *Journal of Irrigation and Drainage Engineering*. 116(1):50-66.
- Richard, T.L.** and T.S. Steenhuis. 1988. Tile drain sampling of preferential flow on a field scale. In: P. F. Germann (Editor), Rapid and Far Reaching Hydrologic Processes of the Vadose Zone. *Journal of Contaminant Hydrology*. 3:307-325.
- Steenhuis, T.S., **T.L. Richard**, M.B. Parlange, S.O. Aburime, L.D. Geohring, and J. -Y. Parlange. 1988. Preferential flow influences on drainage of shallow sloping soils. *Agricultural Water Management*. 14:137-151.

BOOKS AND BOOK CHAPTERS

- Richard, T.L.**, D. Brownell, K. Ruansook, J. Liu and E. Thomchick. 2012. Biomass harvest and logistics. pp. 119-132. In: Handbook of Bioenergy Crop Plants, C. Kole, C.P. Joshi, and D. Shonnard (eds.). CRC Press, Boca Raton, FL.
- Richard, T.L.** and P.G. Magalhães. 2011. Logistics—harvest, storage and transportation. Pages 69-81 in: *Biofuels: Reasonable Steps Towards a Renewable Energy Future*. M.J. Davis and T.R. Coser (eds.). Fulbright Commission, Sao Paulo, Brazil.
- Darku, I.D. and **T.L. Richard**. 2011. Biofuels: ethanol producers. In: *Wiley on-line library: eLS*. Microbiology section. John Batista (ed.). <http://onlinelibrary.wiley.com/doi/10.1002/9780470015902.a0020373/abstract>

- Richard, T.L.** 2004. Compost. Pages 294-301 in: *Encyclopedia of Soils in the Environment*. D. Hillel, C. Rosenzweig, D. Powlson, K. Scow, M. Singer, and D. Sparks (eds.). Academic Press., London.
- Richard, T.L.** 2004. Fundamental parameters of aerobic solid-state bioconversion processes. Pages 262-277 in: *Organic solid waste management: from waste disposal to resource recovery*. P. Lens, H.V.M. Hamelers, H. Hoitink and W. Bidlingmeier (eds.). IWA, London.
- Richard, T.L.** 2003. Gas phase kinetics. pp 431-435. In: *The Encyclopedia of Agricultural, Food and Biological Engineering*. D.R. Heldman (Editor). Marcel Dekker, Inc., New York.
- Rynk, R. and **T.L. Richard**. 2001. Commercial composting production systems. Pp. 51-93 in: *Compost Utilization in Horticultural Cropping Systems*, P.J. Stoffella and B.A. Kahn (Editors). Lewis Publishers, Boca Raton, Florida, USA. 414 pp.
- Kashmanian, R.M., D. Kluchinski, **T. L. Richard**, and J. M. Walker. 2000. Quantities, Characteristics, Barriers, and Incentives for Use of Organic Municipal By-products. Pp. 127-167 in: *Land Application of Agricultural, Industrial, and Municipal By-Products*. SSSA Book Series: 6. J.F. Power and W.A. Dick (Editors). Soil Science Society of America. Madison, WI. 653 pp. (refereed)
- Honeyman, M.S., W. Koenig, J.D. Harmon, D.C. Lay, J.B. Kliebenstein, **T.L. Richard**, and M.C. Brumm. 1999. Managing Market Pigs in Hoop Structures, PIH-138. In: *Pork Industry Handbook*. Purdue University Cooperative Extension Service, West Lafayette, IN. (refereed)
- Richard, T.L.** 1998. Composting Strategies for High Moisture Materials: Theoretical Analysis and Optimization. In: *Composting for Manure Management*. J.G. Press. Emmaus, PA. 77 pp.
- Kuter, G.A, Blackwood, K.R., L.F. Diaz, J.F. Donovan, D.D. Durfee, E. Epstein, J.C. Hay, M. Lang, **T.L. Richard**, G.M. Savage, R.G Stratton, R.J. Tardy, T.K. Walsh, C.Wilber III, and T.O. Williams. 1995. *Biosolids Composting*. Water Environment Federation, Alexandria, VA. 187 pp.
- Richard, T.L.** and M. Chadsey. 1994. Environmental Impact Assessment. In: *Composting Source Separated Organics*. Edited by BioCycle staff. J.G. Press, Inc. Emmaus, PA. pp 232-237.
- Richard, T.L.**, P.B. Woodbury, V. Breslin, and S. Crawford. 1992. Municipal Solid Waste Composts: Impacts of Separation on Trace Metal Contamination. In: *Proceedings of the International Composting Research Symposium*. H.A.J. Hoitink and H. Keener (Editors). Renaissance Publications, Columbus, OH. Reprinted in: *Composting Frontiers*, 1993. 1(3):13:22.

Rynk, R., M. van de Kamp, G.B. Willson, M.E. Singley, **T.L. Richard**, J.J. Kolega, F.R. Gouin, L. Laliberty, Jr., K. Day, D.W. Murphy, H.A.J. Hoitink, and W.F. Brinton. 1992. *On-Farm Composting Handbook*. NRAES, Cornell University, Ithaca, NY. 186 pp. (refereed)

Walter, M.F., **T.L. Richard**, and P.D. Robillard. 1987. Manure Management with Conservation Tillage. In: *Effects of Conservation Tillage on Groundwater Quality*. Edited by T.J. Logan, J.M. Davison and M. R. Overcash. Lewis Publishers. Chelsea, MI.

RESEARCH PUBLICATIONS (NOT PEER-REVIEWED)

Glanville, T.D., **T.L. Richard**, J.D. Harmon, D.L. Reynolds, H.K. Ahn, and S. Akinc. 2006. Composting livestock mortalities: assessing the feasibility. *BioCycle* 47 (11): 42-48.

Richard, T.L., D. Nicholls and B.T. Kim. 2003. Windrow design for high rainfall conditions: the southeast Alaska challenge. *BioCycle* 44(12): 31-33.

Richard, T.L., K.J. Moore, C. Tobia and T. Patrick. 2002. Enzyme enhanced ensilage for biomass pretreatment. *Proceedings of the Institute of Biological Engineering* 3:45-53.

Montiero da Rocha, S., R. Haldeman and **T. L. Richard**. 1998. Implementation of a solid-state sequencing batch reactor strategy with paper mill sludge and a biotechnology byproduct sludge. *Proceedings of the Inst. of Biological Engineering* 1:B102-B108.

Richard, T.L. 1997. The kinetics of solid-state aerobic biodegradation. Ph.D. Thesis. Cornell University. Ithaca, NY. 357 pp.

Richard, T.L. 1992. Contaminant separation: the key to successful msw compost marketing. *BioCycle* 33(4):62-64.

Richard, T.L. and M. Chadsey. 1990. Environmental monitoring at a yard waste composting facility. *BioCycle*. 31(4):42-46.

Richard, T.L. 1990. Composting and water quality. *Engineering: Cornell Quarterly*. 25(1):20-24.

Steenhuis, T.S., van Es, H.M., Parlange, J.-Y., Baveye, P.C., Walter, M.F., Geohring, L.D., Hutson, J.L., **Richard, T.L.**, Bell, J.L., Boll, J., Gannon, J., Liu, Y., Sanford, W.E., Alexander, M., Bryant, R.B., Selker, J.S., Tan, Y., Vandevivere, P., and Verheyden, S.M.L. 1990. Hydrology and the environment. *New York's Food & Life Sciences Quarterly* 20(3):15-19.

Parlange, J. -Y., T.S. Steenhuis, R.J. Glass, **T.L. Richard**, N.B. Pickering, W.J. Waltman, N.O. Bailey, M.S. Andreini, and J.A. Troop. 1988. The flow of pesticides through preferential paths in soils." *New York's Food & Life Sciences Quarterly*. Vol. 18 Nos. 1 & 2.

Carlton, B., **T.L. Richard**, K.R. Wilson, M. Becker, W. Reiher, A. Stanonik, L. Myrabo, and C. Wilson. 1976. San Diego-Tijuana: Plans across the border. *Cry California*. 2(3):29-35.

RESEARCH PROJECT REPORTS

Richard, T.L., P. Woodbury, B. Dale and S. Joshi. 2010. Biomass feedstock production in the Northeast: economic and environmental implications. 25 pp. NE Sun Grant, Cornell University, Ithaca, NY.

Glanville, T.D., **T.L. Richard**, J.D. Harmon, D.L. Reynolds, H.K. Ahn, and S. Akinc. 2006. Environmental Impacts and Biosecurity of Composting for Emergency Disposal of Livestock Mortalities. Final Report for Contract #03-7141-08. Iowa Dept. of Natural Resources, Des Moines, IA.

Richard, T.L., C. Cambardella, M. Liebman and D. Exner. 2003. Optimizing swine hoop manure management of soil quality and crop system performance. Final Report for Project # 2000-42. Leopold Center for Sustainable Agriculture, Ames, IA.

Hanna, H.M., **T.L. Richard** and G.R. Quick. 2003. Optimizing solid manure application by improving distribution. Final Report for Project # 2001-24. Leopold Center for Sustainable Agriculture, Ames, IA.

Liebman, M., and **T.L. Richard**. 2003. Soil amendment effects on crop-weed interactions. Final Report for Project # 2000-11. Leopold Center for Sustainable Agriculture, Ames, IA.

Harmon, J.D., D.S. Bundy, **T.L. Richard**, S.J. Hoff and A. Beatty. 2003. Survey monitoring of environmental factors from bedded swine systems. Final Report for Project #01-161, National Pork Board, Des Moines, IA.

Glanville, T.D., **T.L. Richard** and R.A. Persyn. 2003. Impacts of compost blankets on erosion control, revegetation, and water quality at highway construction sites in Iowa. Final Report for Contract 00-G550-02-TCG, Iowa Dept. of Natural Resources, Des Moines, IA.

Richard, T.L., M. Liebman, C.A. Cambardella, and T. Loecke. 2002. Land application of biotechnology byproduct compost and other organic matter amendments. Final

Report for Contract 00-G550-01CG, Iowa Dept. of Natural Resources, and Project 1221, Chamness Technology, Blairsburg, IA.

- Harmon, J.D., T. Glanville and **T.L. Richard**. 2001. Demonstration of swine carcass composting as part of an environmentally friendly production system. Final Report for Project 00-33, Leopold Center for Sustainable Agriculture, Ames, IA.
- Garrison, M.V., and **T.L. Richard**. 2001. Iowa livestock industry waste characterization and methane recovery information dissemination project. Final Report for Contract 00-6147-01. Iowa Dept. of Natural Resources, Des Moines, IA.
- Richard, T.L.**, C.A. Cambardella and T.E. Loynachan. 2000. Nitrogen conservation in swine manure composting – land application systems. Final Report for Project 99-62. Leopold Center for Sustainable Agriculture, Ames, IA.
- Hinrichs, C.C. and **T.L. Richard**. 2000. Socio-technical and environmental dimensions of swine manure management decisions. Final Report for Project 99-69. Leopold Center for Sustainable Agriculture, Ames, IA.
- Moncrief, J.F., D.J. Mulla, H.H. Cheng, N.S. Eash, N.C. Hansen, J.S. Strock, M.A. Schmitt, G.W. Randall, H. Chester-Jones, C.J. Rosen, A. DiCostanzo, C.J. Clanton, P.R. Bloom, P.R. Goodrich, C.C. Sheaffer, **T.L. Richard**, M.P. Russelle, D. Ginting, and M. Mozaffari. 1999. Generic environmental impact statement on animal agriculture: environmental topics – J – manure and crop nutrients. Report to the Minnesota Environmental Quality Board, St. Paul, MN.
- Richard, T.L.**, S. Pollard and K. Shears. 1999. Management and maintenance of earthen manure structures: implications and opportunities for water quality protection. In: *Earthen Waste Storage Structures in Iowa: A Study for the Iowa Legislature*. Iowa State University publication EDC-186. Ames, IA. pp 26-35.
<http://www.ag.iastate.edu/iaexp/reports/>
- Richard, T.L.**, C.J. Bern, K. Rosentrater, R. Flores, A. Trenkle and M. Al-Mahasneh. 1998. Development of value-added by-product alternatives for waste slurries from corn masa production. Final report to the Recycling and Reuse Technology Transfer Center at The University of Northern Iowa. Cedar Falls, IA. 40 pp.
- Richard, T.L.**, S. Montiero da Rocha, R. Haldman and S. Baker. 1998. Composting process improvement strategies for Bluestem Solid Waste Agency. Project Report. Dept. of Ag. and Bio. Eng., Iowa State University, Ames, IA. 8 pp.
- Richard, T.L.**, C.J. Bern, and K. A. Rosentrater. 1997. Development of value-added by-product alternatives for waste slurries from corn masa production. Annual report to the Recycling and Reuse Technology Transfer Center at The University of Northern Iowa. Cedar Falls, IA. 17 pp.

- Fabian, E.E., **T.L. Richard**, D. Kay, D. Allee, and J. Regenstein. 1993. Agricultural composting: a feasibility study for New York farms. Staff Report 1-93. Dept. of Ag. & Bio. Eng., Cornell University, Ithaca, NY.
- Rymshaw, E., M.F. Walter, and **T.L. Richard**. 1992. Agricultural composting: environmental monitoring and management practices. Dept. of Ag. & Bio. Eng., Cornell University, Ithaca, NY.
- Richard, T.L.** 1991. Land Application of Paper Mill Sludge: Physical-chemical effects on soil structure and plant growth - field experiments: 1990. Dept. of Ag. & Bio. Eng., Cornell University, Ithaca, NY. 20 pp.
- Richard, T.L.**, Dickson, N.M. and S.J. Rowland. 1990. Yard waste management - a planning guide for New York State. New York State Dept. of Environmental Conservation, Albany, New York. 164 pp.
- Richard, T. L.**, and M. Chadsey. 1989. Croton point compost site environmental monitoring program. Final Report. Westchester County Dept. of Public Works. 15 pp.
- Dickson, N. M, and **T.L. Richard**. 1989. Yard waste composting: a planning guide for Westchester County. Westchester County Dept. of Public Works. 112 pp.
- Pickering, N.B., **T.L. Richard**, J. -Y. Parlange, W.J. Waltman, and L. Kromm. 1988. Dye tracer analysis of preferential flow to groundwater. Dept. of Ag. & Bio. Eng., Cornell University, Ithaca, NY.
- Reinemann, D.J., **T.L. Richard**, A.K. Datta, D.J. Allee, and R. Mayer. 1988. Review and evaluation of environmental regulations affecting the food processing industry of New York State. Dept. of Ag. & Bio. Eng., Cornell University, Ithaca, NY.

INVITED LECTURES

- Richard, T.L.** Five myths? A look “under the hood” and common assumptions about biofuels. University of California Berkeley, Energy Biosciences Institute. Sept. 9, 2014. Berkeley, CA.
- Richard, T.L.**, M. Jahn and D. Lazaks. Knowledge Systems for Sustainability: Lessons learned from a global community of practice. Annual Meeting, Ecological Society of America. August 13, 2014, Sacramento, CA.
- Richard, T.L.** Food vs. Fuel: Ecological Intensification and the Diet Nexus. University of California Berkeley, Energy Biosciences Institute. June 13, 2013. Berkeley, CA.

- Richard, T.L.** Double Crops: Linking Sustainable Energy and Sustainable Agriculture. Michigan State University. May 13, 2013. East Lansing, MI.
- Richard, T.L.** NEWBio: Growing Sustainable Bioenergy Crops in the Northeast. Pennsylvania Association of Environmental Professionals Annual Conference. May 8, 2013. State College, PA.
- Richard, T.L.** The NEWBio Consortium – Scaling-up for the Region. Northeast Biomass Heating Seminar. April 3, 2013. Saratoga Springs, NY.
- Richard, T.L.** Smart Energy. American Physical Society March Meeting. March 18, 2013. Baltimore, MD.
- Richard, T.L.** NEWBio: The Northeast Woody/Warmseason Biomass Consortium. Washington State University. January 22, 2013. Pullman, WA.
- Richard, T.L.** Diversity Just in Time: Winter Crops as Energy Crops. January 8, 2013. New Brunswick, NJ.
- Richard, T.L.** The Northeast Woody/Warmseason Biomass Consortium – New Business Models for Perennial Biofuels. ASA, CSSA, and SSSA International Annual Meetings. October 21, 2012. Cincinnati, OH.
- Richard, T.L.** Global sustainable bioenergy: Project overview. North American Convention of the Global Sustainable Bioenergy Project. September 15, 2010. Minneapolis, MN.
- Richard, T.L.** Biomass Energy: Feast or Famine in a Carbon-Constrained World. Babcock and Wilcox Energy Summit. September 14, 2010. Akron, OH.
- Richard, T.L.** Re-imagining Northeast Farms and Forests for Sustainable Bioenergy. NE Sun Grant Annual Conference. May 16, 2010. Syracuse, NY
- Richard, T.L.** Windows of opportunity: Re-imagining agriculture for Food, Fuel, and the Environment. University of California Berkeley. May 4, 2010. Berkeley, CA.
- Richard, T.L.** Synthetic silage: Engineering a Microbial Platform for Biomass Pretreatment. DOE Lawrence Berkeley National Lab. May 4, 2010. Berkeley, CA.
- Richard, T.L.** Global sustainable bioenergy: Project overview. European Convention of the Global Sustainable Bioenergy Project. March 18, 2010. Stellenbosch, South Africa.

- Richard, T.L.** Global sustainable bioenergy: Project overview. European Convention of the Global Sustainable Bioenergy Project. February 25, 2010. Delft, The Netherlands.
- Richard, T.L.** Sustainable Cellulosic Biofuels 101. February 15, 2010. Ag 160 class. University Park, PA.
- Richard, T.L.** Managing Motility: A Bacterial Relay Race. February 12, 2010. NSF Synthetic Biology Lecture Series. Missouri Western University. St. Joseph, MO.
- Richard, T.L.** Penn State's Bioenergy Bridge. RETECH Annual Conference. February 5, 2010. Washington, DC.
- Richard, T.L.** Bioenergy: Science, technology, sustainability. Renewable Natural Resources Foundation. December 9, 2009. Reston, VA.
- Richard, T.L.** Biofuels and the Bay – an Update. Chesapeake Bay Program Science and Technology Advisory Board. December 8, 2009. Annapolis, MD.
- Richard, T.L.** Energy and environmental impacts of on-farm bioenergy production. Reimagining Sustainable Bioenergy Landscapes. December 3, 2009. University Park, PA.
- Richard, T.L.** Energy and environmental impacts of on-farm bioenergy production. Growing the Bioeconomy: Solutions for Sustainability conference. December 1, 2009, East Lansing, MI.
- Richard, T.L.** Bioenergy and sustainability. World Energy Engineering Conference. November 5, 2009. Washington, DC.
- Richard, T.L.** Biomass conversion 101. Cooperative Extension In-service. Cornell University. November 4, 2009, Ithaca, NY.
- Richard, T.L.** Challenges and Opportunities for Bioenergy Production in Maine and the Northeast. University of Maine. October 8, 2009, Orono, ME.
- Richard, T.L.** Sustainable feedstock infrastructure. Biofuels for Aviation Summit. September 1, 2009. Arlington, VA.
- Richard, T.L.** Harvest, storage and transportation; Pretreatment; Fermentation; Systems Analysis (four lectures). US-Brazil Fulbright Short Course. August 1-10, 2009. Sao Paulo, Brazil.
- Richard, T.L.** Feedstock infrastructure: another gathering storm. Keystone Symposium: The Future of Biofuels. April 4-8, 2009. Snowmass, CO.

- Richard, T.L.** After abundance: sustainable biofuel production in a carbon-constrained world. Feb. 16, 2009. West Virginia University. Morgantown, WV.
- Karsten, H., E. Sanchez, **T.L. Richard**, and E. Swackhamer. Using organic nutrient sources and interpreting soil and compost analysis. PASA Annual Farming for the Future Conference. Feb. 5-7, 2009. University Park, PA.
- Richard, T.L.**, and John Esslinger. Using organic nutrient sources. NOFA-NY Annual Organic Farming and Gardening Conference. Jan. 23-35, 2009. Rochester, NY.
- Richard, T.L.** and G. Roth. New renewable energy technologies and their impact on agriculture. 2009 Pennsylvania Agronomic Education Conference. Jan. 21-23, 2009. State College, PA.
- Richard, T.L.** After abundance: multi-functional agriculture for a carbon-constrained world. Geography Coffee Hour. Jan. 16, 2009. University Park, PA.
- Richard, T.L.** Lean and Green: Reimagining agriculture for the 21st century. Maine Agricultural Trade Show. Jan. 13-14, 2009. Augusta, ME.
- Richard, T.L.** After Abundance: multi-functional agriculture for a carbon-constrained world. Northeast Weed Science Society Annual Meeting. January 5-8, 2009. Baltimore, MD.
- Richard, T.L.** Sustainable strategies for biofuel production. AIChE Annual Meeting. Nov. 16-21, 2008. Philadelphia, PA.
- Richard, T.L.** Biofuel opportunities and impacts for NY farms, NYS, and the Northeast. Empire Chapter of the Soil and Water Conservation Society Annual Meeting. Nov. 13, 2008. Waterloo, NY.
- Richard, T.L.** Compost engineering: linking microbial kinetics with transport phenomena. CEMAGREF Symposium. Oct. 20, 2008. Rennes, France.
- Richard, T.L.** Compost by design. Veolia Environnement Research Centre. Oct. 16, 2008. Lemay, France.
- Logan, B.E. and **T.L. Richard**. Energy sustainability of the water infrastructure and agriculture. KAUST Global Research Partnership Technical Symposium. May 28. Jeddah, Saudi Arabia.
- Richard, T.L.** Penn State Institutes of Energy and the Environment: building bridges for transformative research. University of Kentucky Environmental Initiative. May 14, 2008. Lexington, KY

- Richard, T.L.** Materials, energy and the environment: what matters? Materials Day, Penn State. April 15, 2008. State College, PA.
- Richard, T.L.** Roadmap for a clean energy future: sustainable agriculture for a sustainable society. New American Farm Conference. March 25-27, 2008. Kansas City, MO.
- Richard, T.L.** Biofuels: tapping Nature's abundance. Frontiers of Science Lecture Series. Feb. 16, 2008. University Park, PA.
- Richard, T.L.** Science and entrepreneurship in alternative energy technologies. Pennsylvania Biotechnology Center Seminar Series. Feb. 29, 2008. Doylestown, PA.
- Richard, T.L.** Biomass to biofuels: innovations for the next generation. Energy from Biomass from Waste Conference. Sept. 26-27, 2007. Pittsburgh, PA.
- Richard, T.L.** Biofuels: agriculture's ticket to the head of the table? American Forage and Grassland Council Annual Meeting. June 25, 2007. State College, PA.
- Richard, T.L.** Challenging technologies: toward a sustainable bioenergy system. DOE Workshop on Economic, Environmental, and Societal Implications of Bioenergy. June 21-22, 2007. Washington, DC.
- Richard, T.L.** Sustainable Energy and Sustainable Agriculture. Annual International Meeting of the American Society of Agricultural and Biological Engineers. July 9-12, 2006. Portland, OR.
- Richard, T.L.** Biomass use in energy production: new opportunities for agriculture. United States Senate Committee on Agriculture, Nutrition, and Forestry. May 6, 2004
- Richard, T.L.** Composting wood and fish waste: applications to Alaska. USDA Forest Service Conference – Linking Healthy Forests and Communities: Successful Strategies and Future Directions. Oct. 19-21, 2003. Anchorage, AK.
- Richard, T.L.** Aerobic bioprocess concepts. European Summer School on Biotechnology in Organic Waste Management. June 29 - July 4, 2003. Wageningen, The Netherlands.
- Richard, T.L.** Innovations in Fermentations: Ecological Engineering on a Microbial Scale. Midwest Rural Energy Council. Sept. 12, 2003. Redwing, MN.
- Richard, T.L.** Thinking Outside the Box: Building Materials and other Products from Animal Processed Fiber. In: *Proceedings of the 2003 Agricultural Outlook Forum*. Feb. 21-22, 2003. Arlington, VA.

Richard, T.L. Nutrient cycling and environmental impacts of deep-bedded swine production. National Livestock Research Institute and Seoul National University. Dec. 3, 2002. Suwon, Korea.

Richard, T.L., H.V.M. Hamelers, A.H.M. Veeken and T. Silva. Moisture relationships in composting processes. In: *2002 International Symposium on Composting and Compost Utilization*. Michel, F.C., R. Rynk, and H.A.J. Hoitink (Editors). J.G. Press, Emmaus, PA. May 6- 8, 2002. Columbus, Ohio.

Richard, T.L. Composting process for organic feedstocks. Renewable Energy from Organics Recycling National Conference. Oct. 29, 2001. Des Moines, IA.

Richard, T.L. Practical technologies for wood and fish waste composting. U.S. Forest Service Wood and Fish Waste Composting Workshops, April 9 and 11, 2001. Ketchikan and Anchorage, AK.

Richard, T.L. Making money with manure: efficient manure and compost utilization. BioCycle Midwest Conference. October 26-27, 1999. Cedar Rapids, IA.

Richard, T.L. Eliminating waste: strategies for sustainable manure management. In: *Proceedings of the 8th World Conference on Animal Production: Special Symposium and Plenary Sessions*, pp. 488 - 496. June 28 – July 4, 1998. Seoul National University, Seoul, Korea.

Richard, T.L. and S. Baker. Biodrying strategies for high moisture materials. BioCycle National Conference. May 5-6, 1998. Kansas City, MO.

Richard, T.L. Bioenergetics of environmental bioprocessing. Institute of Biological Engineering 1997 Annual Conference, August 13, 1997. Minneapolis, MN.

Richard, T.L. 1995. Animal waste management: challenges and opportunities. In: *Proceedings of the National Instrumentation Center for Environmental Management (NICEM) Symposium*. NICEM, Seoul National University. Suwon, Korea. pp. 13-21.

Richard, T.L. 1991. Municipal solid waste composting: a simple solution? Presented at the Tenth National Congress of the National Recycling Coalition. Milwaukee, WI. October 24, 1991. Also presented at the Solid Waste Management and Materials Policy Conference. New York, NY. Jan. 29-31, 1991.

PROFESSIONAL PAPERS

Ramcharan, A., A. Kemanian and **T.L. Richard**. 2013. A model for the decline in percentage nitrogen of *Miscanthus x giganteus* with increasing plant mass. Presented at NABEC Annual meeting June 17-18th Altoona, PA

- Pandey, J.L., **T. L. Richard**, and M. N. Marshall. 2010. Effects of pre-treatment conditions on downstream bioconversion of poplar. ASABE Paper No. 1009065. ASABE, St. Joseph, MI.
- Yi, H., M. N. Marshall, J.L. Pandey, V. Puri, and **T.L. Richard**. 2010. Three-scale approach for fluid transport through plant cell assemblies: model development and measurement of properties. ASABE Paper No. 1009028. ASABE, St. Joseph, MI.
- Schwartz, J. I.D. Darku, T. Smith, M.N. Marshall, and **T.L. Richard**. 2010. From fields to fuels: student workshop on conversion of biomass to ethanol. ASABE Paper No. 1008874. ASABE, St. Joseph, MI.
- Darku, I.D. M.N. Marshall, and **T.L. Richard**. 2010. Implications of Organic Acids in Wet Storage and Bioconversion of Corn Stover to Ethanol. ASABE Paper No. 1008748. ASABE, St. Joseph, MI.
- Marshall, M.N., J. Greening, N. Davitt, R. Graves, and **T.L. Richard**. 2010. Correlating physical, chemical, and biological properties of composts produced in windrow and lab-scale systems. ASABE Paper No. 1009154. ASABE, St. Joseph, MI.
- Richard, T.L.**, G. Camargo, E. van Ouwerkerk, and R.P. Anex. 2009. Food and fuel: Integrating bioenergy crops with conventional agriculture. Presented at the AIChE Annual Meeting. Nov. 9, 2009. Nashville, TN.
- Brownell, D.K., J. Liu, J.W. Hilton, **T.L. Richard**, G.R. Cauffman, and B.R. Macafee. 2009. Evaluation of two forage harvesting systems for herbaceous biomass harvesting. ASABE Paper No. 097390. ASABE, St. Joseph, MI.
- Anex, R., K. J. Moore, S. Birrell, K.R. Lamkey, M.P. Scott, K.M. Bryden, **T.L. Richard**, K.J. Shinnars, J. Coors, R.E. Muck, and L. Marshall. 2009. Sourcing stover: Results from the ISU Integrated Corn Stover Feedstock Supply Systems Project. 31st Symposium on Biotechnology for Fuels and Chemicals. May 3-7, San Francisco, CA.
- Williams, M.K., **T.L. Richard**, and E.F. Wheeler. 2008. Evaluating the interaction of transport mechanisms through dairy manure to determine the effects on ammonia and greenhouse gas emission. Presented at: *ORBIT 2008: Moving Organic Waste Recycling towards Resource Management and for the Biobased Economy*. pp. 314-321 in: Proceedings of the International Conference ORBIT 2008. W. Bidlingmaier, J. Barth, L. Rodic-Wiersma and A. Veeken (Eds.). ORBIT e.V., Weimar, Germany.
- Gea, T., and **T.L. Richard**. 2008. Evolution of physical properties during the composting process of wastes of different biodegradable organic matter content and their influence on biodegradation kinetics. Presented at: *ORBIT 2008: Moving Organic*

Waste Recycling towards Resource Management and for the Biobased Economy. pp. 188-196 in: Proceedings of the International Conference ORBIT 2008. W. Bidlingmaier, J. Barth, L. Rodic-Wiersma and A. Veeken (Eds.). ORBIT e.V., Weimar, Germany.

- Chaoui, H.I., and **T.L. Richard**. 2008. Effect of mixing frequency on biogas yield in anaerobic digesters. ASABE Paper No. 083255. ASABE, St. Joseph, MI.
- Chianese, D.S., C.A. Rotz, and **T.L. Richard**. 2008. Simulating Methane Emissions from Dairy Farms. ASABE Paper number 084098. ASABE, St. Joseph, MI.
- Williams, M. K., **T. L. Richard** and E. F. Wheeler. 2008. The use of bio-drying and composting as a method for improving the handling of sand-laden dairy manure. ASABE Paper No. 085171. ASABE, St. Joseph, MI.
- R.E. Muck, J.G. Coors, **T.L. Richard**, and M.P. Scott. 2008. Effect of treatment and cultivar on the ensiling of corn stover. ASABE Paper No. 085001. ASABE, St. Joseph, MI.
- Richard, T.L.**, Q. Chen, D. Tanjore, F. Rezaei, W. Curtis, M. Tien, D. Cosgrove, H. Ren, K.J. Moore, C. Radtke, P. Scott and R. Muck. 2007. Interactions of ensiled storage with biomass pretreatment. Presented at the AIChE Annual Meeting, November 4-9, 2007. Salt Lake City, UT.
- van Ouwerkerk, E., R.P. Anex, and **T.L. Richard**. 2007. I-FARM: A decision tool for biomass production. Presented at the AIChE Annual Meeting, November 4-9, 2007. Salt Lake City, UT.
- Malinska, K.A., E.D. White, J.M. Perez, A.C. Srebro, and **T.L. Richard**. 2007. Bioremediation of biodiesel and biohydraulic oils by food waste composting. In: CD-ROM Proceedings of the International Symposium on Air Quality and Waste Management for Agriculture. ASABE, St. Joseph, MI.
- Srebro, A.C., K.A. Malinska, E.D. White, J.M. Perez, and **T.L. Richard**. 2007. Effects of moisture content and soil additions on physical properties and transport phenomena for compost windrow design. In: CD-ROM Proceedings of the International Symposium on Air Quality and Waste Management for Agriculture. ASABE, St. Joseph, MI.
- Wheeler, E. F., P. A. Topper, and **T. L. Richard**. 2007. Validation of Flux Chamber Technique for Estimating Gas Emission in Situ from Naturally-Ventilated Facilities. In: CD-ROM Proceedings of International Symposium on Air Quality and Waste Management for Agriculture. ASABE Publication Number 701P0907cd, St. Joseph, MI.
- Sedorovich, D.M, C.A. Rotz, and **T.L. Richard** . 2007. Greenhouse gas emissions from dairy farms. ASABE Paper No. 074096. ASABE, St. Joseph, MI.

- Shore, S., **T.L. Richard**, and R. Thomas. 2007. Monitoring and control systems for dairy anaerobic manure digestors. ASABE Paper No. 077039. ASABE, St. Joseph, MI.
- Starovoytov, A., R. Galagher, J. Kaye, **T.L. Richard**, J. Cook, and W. McCoy. 2007. Management alternatives to enhance sequestration of legume-based nitrogen. Presented at the ASA-CSSA-SSSA 2007 Annual Meeting. Nov. 4-8, 2007, New Orleans, LA.
- Richard, T.L.**, R.P. Anex, E. van Owerkerk. 2007. I-FARM: A decision tool for biomass production. Presented at the 29th Symposium on Biotechnology for Fuels and Chemicals April 30 - May 2nd, 2007. Denver, CO.
- Tanjore, D., **T.L. Richard** and M. Tien. 2007. Pretreatment effects of white-rot fungi during ensiled storage of corn stover biomass. Presented at the 29th Symposium on Biotechnology for Fuels and Chemicals April 30 - May 2nd, 2007. Denver, CO.
- Chen, Q. and **T.L. Richard**. 2007. The effect of harvest date on corn stover silage for bioconversion into ethanol. Presented at the 29th Symposium on Biotechnology for Fuels and Chemicals April 30 - May 2nd, 2007. Denver, CO.
- Rezaei, F., **T.L. Richard**, and B.E. Logan. 2007. Enzymatic hydrolysis of cellulose for electricity generation in a microbial fuel cell. Presented at the 29th Symposium on Biotechnology for Fuels and Chemicals April 30 - May 2nd, 2007. Denver, CO.
- Malinska, K.A., and **T.L. Richard**. 2006. The effect of moisture content, bulking agent ratio and compaction on permeability and air-filled porosity in composting matrices. pp 181 – 190 in: *ORBIT 2006: Biological Waste Management - From Local to Global*. Proceedings of the International Conference ORBIT 2006. E. Kraft, W. Bidlingmaier, M. de Bertoldi, L. F. Diaz, and J. Barth (Eds.). ORBIT e.V., Weimar, Germany.
- Malinska, K.A., and **T.L. Richard**. 2006. The impact of physical properties and compaction on biodegradation kinetics during composting. pp 125 – 132 in: *ORBIT 2006: Biological Waste Management - From Local to Global*. Proceedings of the International Conference ORBIT 2006. E. Kraft, W. Bidlingmaier, M. de Bertoldi, L. F. Diaz, and J. Barth (Eds.). ORBIT e.V., Weimar, Germany.
- Wheeler, E.F., P.A. Topper, G.A. Varga, N. Brown, R.E. Graves, V. Ishler, A.J. Heinrichs, V. Blanes-Vidal, and **T.L. Richard**. 2006. Ammonia emission monitoring from dairy housing using flux chamber methods. In: Proceedings AgEng 2006 World Congress. Bonn, Germany. 6 pp.on CD.

- Hinrichs, C., A. Meyer and **T.L. Richard**. 2006. Fuelish Dreams? Producing Sustainable Energy Feedstocks from Agriculture. Presented at annual meeting of the Rural Sociological Society. Louisville, Kentucky, August 10-13, 2006.
- Ahn, H.K., T.J. Sauer, **T.L. Richard**, and T.D. Glanville. 2006. [Determination of thermal properties of compost bulking materials by using various methods](#). ASABE Paper No. 064065. ASABE, St. Joseph, MI.
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- Richard, T.L.**, and L.P. Walker. 1990. Composting: trends and technologies. *Cornell Food and Life Science Quarterly* 20(3):11-14.
- Richard, T.L.**, N.M. Dickson, and S.J. Rowland. 1990. Yard waste management: a planning guide for New York State. New York State Department of Environmental Conservation, Albany, NY. 163 pp.
- Richard, T.L.** 1990. Controlling the contaminants: clean compost production. *BioCycle* 31(2):46-47.
- Ackerman, S.E. and **T.L. Richard**. 1990. Composting the mortalities from cage layer flocks. *Canada Poultryman*. March. 1 p.
- Richard, T.**, R. Kozlowski, N. Dickson, and R. Kline. 1989. "Home composting slide set." Forty six slides and script.
- Richard, T. L.** 1989. "Composting as a waste management strategy: new directions, new questions." Cornell Waste Management Institute. *Viewpoint* # 2.
- Richard, T. L.**, and K. Skelton. 1989. "Yard waste composting." Cornell Waste Management Institute. *Fact Sheet* #2.
- Dickson, N. and **T.L. Richard**. 1989. "Municipal yard waste composting." Seventy slides with script. Cornell Resource Center, Ithaca, NY.
- Dickson, N., V. Wishart and **T.L. Richard**. "Home composting." 1989. A set of seven posters. Cornell Resource Center, Ithaca, NY.
- Richard, T.L.** and G. Ferenz. 1988. Composting landscape wastes. *Grounds Maintenance* 23(9). 4 pp.
- Richard, T.L.** 1988. Composting on the farm deserves a fresh look. Agricultural News Service, Cornell Cooperative Ext.
- Richard, T.L.** 1983. *Rebound: a model for community based building materials recycling*. Central Area Motivation Program. Seattle, WA.

PROFESSIONAL ACTIVITIES

Technical Reviewer

Advances in Environmental Research
American Journal of Alternative Agriculture
Applied Engineering in Agriculture
Transactions of the ASABE (Editorial Board 2003 - 2006)
BioCycle (Editorial Board)
Biomass and Bioenergy (Guest Editor, Vol.3 (3-4))
Bioprocessing of Solid Waste and Sludge (Editorial Board 2000 - 2002)
Biotechnology Progress
Compost Science and Utilization (Editorial Board 1993 - present)
Environmental Practice
Geomicrobiology
Journal of Biological Engineering (Editorial Board 2007 - present)
Journal of Environmental Quality
Waste Management (Editorial Board 2000 - present)
Waste Management and Research
Water Resources Research

Professional Affiliations

American Society of Agricultural and Biological Engineers (ASABE)
Institute Of Biological Engineering (President-Elect 2006; President 2007; Treasurer, 1998-2001, 2004-2005; Council, 2003)
Sigma Xi

Consulting

City of San Jose, California
County of Santa Clara, California
Federal Trade Commission
Iowa State University
McDonalds Corporation
Montana State University
Organic Recycling Inc.
Seoul Dairy Cooperative, Korea
State of Arkansas
State of Texas
University of Florida
University of Wisconsin

University of Minnesota
United States Environmental Protection Agency
United States Forest Service
World Bank

HONORS AND AWARDS

Fellow, Institute of Biological Engineering (2008)
Honorary Scientist, Korean Rural Development Administration (1996-2008)
ASABE – Blue Ribbon Awards (1991, 1993, 2001, 2003, 2005)
Iowa State University College of Agriculture Team Award (2002)
AAAS – Science NetLinks On-line (2001)
ASABE – Newcomer Engineer of the Year, Iowa Section (2001)
New York State Assoc. of County Agricultural Agents – Special Citation (1993)
Cornell Community and Rural Development Institute – Innovator Award (1992)
New York State Assoc. of County Agricultural Agents – Award for outstanding new extension publication (1990)

GRANTS AND CONTRACTS

Demirci A. D. Ciolkosz, **T.L. Richard**, J. Liu, J. Carlson and S. Wurzbacher. Course Development for Innovative Online Bioenergy Education. USDA-NIFA. \$136,500. 9/1/2014 to 8/31/2016.

Smith, P., **T.L. Richard** and Caroline Burgess Clifford. PSU's Role in the Techno-Market Analysis of U.S. Biorefinery Supply Chains from Feedstock to Alternative Jet Fuels. FAA. \$200,000. 8/1/2014 to 7/31/2015.

Chopra, S., J. Carlson and **T.L. Richard**. Advanced Development of Novel Maize and Sorghum Bioenergy Plants Using Lignolink Technology. NSF-SBIR prime contract to LignoLink, Inc. Penn State subcontract \$85,988. 4/1/14 – 3/31/16.

Shortle, J. et al. (**T.L. Richard** one of 12 Penn State co-PIs, Penn State prime). Center for Multi-Scale Nutrient Pollution Solutions. USEPA. \$2,220,649. 9/1/13-8/31/16.

Richard, T.L. et al. (Project Director T.L. Richard) NorthEast Woody/warmseason Biomass Consortium. USDA-NIFA Sustainable Bioenergy Coordinated Agricultural Project. \$9,998,000. 9/1/12 – 8/31/17.

Ruark, M. et al. (**T.L. Richard** one of five Penn State co-PIs, U. Wisconsin prime). Climate Change Mitigation and Adaptation in Dairy Production Systems of the Great Lakes Region. USDA-NIFA Climate Change Coordinated Agricultural Project. \$10,000,000. 1/1/13 – 12/31/17

Tuana, N., **T.L. Richard**, E. Schienke. Graduate Pedagogy for Ethical Dimensions of Coupled Natural and Human Systems Research. National Science Foundation. \$296,736. 8/15/11-6/30/14

Richard, T.L. National Risk Assessment Partnership (NRAP) Deputy Technical Director. DOE-NETL. \$60,000. 1/1/12-2/28/15

Cosgrove, D. et al. (**T.L. Richard** one of 18 Co-PIs). Energy Frontiers Research Center for Lignocellulose Structure and Formation. DOE EFRC DE-SC0001090. \$21,000,000. 8/1/09 – 7/31/14.

Karsten, H.K., **T.L. Richard**, W. Curran, J. Tooker, C. Altenose, D. Beegle, R. Hoover, V. Ishler, T. Beck. Integrating Strategies and Institutions for Investigating the Long-Term Sustainability of Cropping Systems. Northeast Sustainable Agriculture Research and Education/LNE09-291. \$800,000. 5/15/09-10/31/16.

Karsten, H.K., D. Beegle, **T.L. Richard**, and W. Curran. Promoting adoption of innovative conservation cropping systems on livestock farms. USDA-NRCS Conservation Innovation Grant. \$223,927. 10/1/2009-9/30/2010.

Richard, T.L. Keystone Innovation Starter Kit: Bioenergy Production Systems. Pennsylvania DCED. \$130,000. 3/15//09 – 3/14/10.

Richard, T.L. Keystone Innovation Starter Kit: Electrical Storage Technologies. Pennsylvania DCED. \$150,000. 3/15//09 – 3/14/10.

Richard, T.L. PSIEE Energy Faculty Recruitment Program. Ben Franklin Technology Development Authority. \$750,000. 1/1/08 – 6/30/10.

Richard, T.L., L. Lynd and R.P. Anex. Sustainable Bioenergy Agroecosystems. Morgan Family Foundation. \$220,000. 4/1/08 – 3/31/10.

Richard, T.L. and R. Wallace. Business plan for the BioEnergy Bridge. R.K. Mellon Foundation. \$40,000. 2/15/09 – 8/14/09.

Richard, T.L. and R. Wallace. Business plan for the BioEnergy Bridge. Heinz Endowments. \$20,000. 12/15/08 – 5/1/09.

Richard, T.L. Biofuels Fermentation Facility. Heinz Endowments. \$150,000. 6/1/08 – 5/31/09.

- Heinrichs, A.J., G. Zanton, and **T.L. Richard**. Use of distiller's grains in dairy diets: Effects on milk components in lactating cows and maximizing the use in calf and heifer diets. Pennsylvania Dept. of Agriculture. \$106,500. 1/1/08 – 12/31/10.
- Richard, T.L.**, M. Tien and D. Cosgrove. Biocatalytic approaches to biomass pretreatment. Morgan Family Foundation. \$150,000. 5/1/07 – 4/30/08.
- Richard, T.L.**, P. Woodbury, G. Hansen, B. Dale, S. Joshi, K Harting, R. Ready, P. Norris and M. Sarrantonio. Biomass feedstock production in the Northeast: economic and environmental implications. NE Sun Grant contract pending. \$439,000. 8/1/07 to 7/30/09.
- Logan, B.E. and **T.L. Richard**. Treatability study of American Eagle Paper effluent stream for use as feedstock for Microbial Fuel Cell operation. American Eagle Paper Mill. \$7,500. 7/1/08 – 12/31/08.
- Richard, T.L.** Solid state fermentation for biomass storage. DOE Idaho National Laboratory. \$20,000. 9/7/07 – 9/30/08.
- Sanchez, E.E., H.D. Karsten, **T.L. Richard** and R.C. Stehouwer. Whole farm nutrient planning for organic farms. USDA- SARE. \$96,756 5/1/07 – 5/31/10
- Brown, N., J. Catchmark, **T.L. Richard**, et al. USDA national needs fellowship for nanoscale science and engineering in forest resources. USDA. \$229,500. 1/1/07 – 12/31/11.
- Hyde, J., J. Shortle, **T.L. Richard**, J. Regan, and R.E. Graves. Improving profitability and performance of dairy manure digesters. USDA Dairy Farm Profitability Program. \$462,110. 8/1/06 to 07/31/08.
- Wheeler, E.F., R. Brandt, **T.L. Richard**, G. Varga, J. Heinrichs, R. Graves, M.A. Bruns, and C. Abdalla. Odor emission evaluations of dairy nutrient management strategies. USDA Improving Dairy Management Practices Program. \$325,325. 8/1/06 to 07/31/08.
- Richard, T.L.**, E. F. Wheeler, J. P. Kaye, M. A. Bruns, and G. A. Varga. Integrated strategies for reducing gas emissions from dairy farms. USDA Improving Dairy Management Practices Program. \$328,726. 8/1/05 to 07/31/07.
- Richard, T.L.** and K.M. Bryden. Development of computational mass and energy balance models for animal waste treatment processes. \$48,000. Korean Rural Development Administration. 4/1/2005 to 3/31/2007.
- Richard, T.L.**, R.P. Anex, K. Lamkey, K. Shinnors, S. Birrell, R. Coors, K. Moore, R. Muck, P. Scott, J. Euken, and S Greenhaugh. Integrated feedstock supply systems

- for corn stover biomass. USDA-DOE Biomass R&D Program. \$1,999,724. 12/1/05 – 11/30/08 .
- Anex, R.P., S. Greenhalgh, C.C. Hinrichs, L. Lynd, and **T.L. Richard**. Biocomplexity in the bioeconomy: The natural and industrial ecology of biobased products. National Science Foundation. \$\$1,799,758. 8/15/04 – 8/14/08.
- Honeyman, M.S., J.B. Kliebenstein, C.C. Hinrichs, **T.L. Richard**, J. Harmon, S. Lonegran. Hoop barns for livestock: an innovative housing system. \$272,088. USDA. 10/1/2004 to 9/30/2006.
- Richard, T.L.** and K.J. Moore. Ensiled storage and conversion of biotechnology byproducts. Iowa Biotechnology Byproducts Consortium. \$99,100. 8/1/04 – 7/31/06.
- Richard, T.L.** and K.J. Moore. Ensiled pretreatment and bioconversion of corn stover and swine manure. Iowa Energy Center. \$25,400. 5/1/04 – 8/31/04.
- Richard, T.L.** and K.M. Bryden. Development of computational mass and energy balance models for animal waste treatment processes. \$23,000. Korean Rural Development Administration. 4/1/2004 to 12/31/2005.
- Euken, J., L. van Ervelde, M. Kennett, R. van Ervelde, M. Hanna, D. Stokke, **T.L. Richard**, B. Kackley, B. Erickson, R. Murphy, S. Waage, R. Leudeman, and E. Olsen. Technical and economic feasibility of growing and pre-processing kenaf in Iowa. \$50,000. USDA Rural Development. 3/1/2004 to 12/15/2005.
- K.M. Bryden and **T.L. Richard**. Developing virtual engineering tools for hoop swine housing. National Pork Board. \$30,020. 12/15/03 – 6/1/04
- Bryden, K.M. and **T.L. Richard**. Developing virtual engineering tools for livestock production. \$45,346. IPRT. 10/1/03 to 6/30/04.
- Richard, T.L.**, B. Shanks, M.L. Kuo, K. Moore. Corn stover recovery for chemicals and fiber composites. Iowa Biotechnology Byproducts Consortium. \$191,000. 8/1/02 – 7/31/04.
- Richard, T.L.** Demonstration of a integrated modular biopower system and commercial burner for drying biomass and agricultural products using agricultural residues. Community Power Corporation. \$10,000. 8/1/03 – 12/31/03
- Honeyman, M., J. Kliebenstein, C.C. Hinrichs, **T.L. Richard**, J. Harmon, S. Lonegran. Hoop barns for livestock: an evolving housing system. USDA. 5/1/03 to 12/30/05. \$135,183.

- Richard, T.L.** Testing composting technologies as a way to improve soil quality in organic production systems. USDA – ARS. \$10,000. 4/29/03 – 9/30/03
- Xin, H., S.J. Hoff, **T.L. Richard** and B. Kerr. Laboratory evaluation and field verification of single point monitors (SPM's) for measuring aerial ammonia and hydrogen sulfide associated with swine operations. National Pork Board. \$80,532. 1/1/03 – 9/31/03.
- Hoff, S.J., H. Xin, **T.L. Richard**, and J. Harmon. Air quality research team lab support for the development of effective measurement techniques and protocols for quantifying source emissions and downwind concentration levels and mitigation strategies. Iowa Pork Producers Association. \$100,000. 4/1/03 – 6/31/05.
- Johnson, S., R.C. Brown, L. Johnson, G. Kraus, **T.L. Richard**, B. Shanks, and B. Nikolau. Creating the bioeconomy of the 21st century. ISU President's Initiative. \$421,512. 7/1/02 – 6/30/05.
- Glanville, T.D., **T.L. Richard**, J. Harmon and D. Reynolds. Evaluation of composting for emergency animal mortality disposal during livestock disease outbreaks: design & operation; environmental impact; & biosecurity. IA DNR. \$250,000. 7/1/02 to 6/30/05.
- Honeyman, M., J. Kliebenstein, **T.L. Richard**, C.C. Hinrichs, J. Harmon, S. Lonergan, B. Thacker. Hoop barns for livestock: an alternative, sustainable housing system. USDA. 5/1/02 to 12/30/04. \$187,072.
- Mickelson, S., **T.L. Richard**. Developing and implementing a compost/vegetative filter strip demonstration site at the ISU dairy farm. \$124,654. Iowa DNR. 10/1/01 – 9/30/04.
- Richard, T.L.** Core-sampling equipment for solid manure systems. National Animal and Poultry Waste Management Center, NC State Univ. \$15,432. 11/1/01 – 8/31/02.
- Richard, T.L.** Composting of Wood and Fish Wastes with Applications to Southeast Alaska. USDA Forest Service. \$41,769. 9/21/01 – 12/31/02.
- Smith, S., J.R. Black, T.J. Dalton, C.B. Flora, R. Kersbergen, M. Liebman, S. Snapp, and G.K. White (**T.L. Richard**, collaborator). Re-integrating crop and livestock enterprises in three northern states. USDA-IFAFS Grant Number: 2001-52101-11308). Project Director: Smith, S. University of Maine; Subcontractors: Michigan State University, North Central Region Center for Rural Development, Iowa State University. \$2,000,000 (TLR collaborator share \$254,939). 9/15/01 – 9/14/04.

Humenik, F., R. von Bernuth, **T.L. Richard** and F. Michel. Comparison of new swine manure collection techniques for improved utilization and environmental quality protection. Missouri Agricultural Experiment Station (U.S. EPA). \$215,439 (ISU share \$49,244). 9/1/01 – 8/31/03.

Richard, T.L., S.J. Hoff, D.S. Bundy, and J. Harmon. Ammonia, nitrous oxide and methane emissions from deep-bedded hoop structures. National Pork Board. \$60,492. 9/1/01 – 10/1/02.

Harmon, J., D.S. Bundy, **T.L. Richard** and S.J. Hoff. Survey monitoring of environmental factors from bedded swine systems. National Pork Producers Council. \$57,240. 9/1/01 – 10/1/02.

Harmon, J., C.C. Hinrichs, M. Honeyman, J. Kliebenstein, S. Lonergan, **T.L. Richard**, and B. Thacker. Swine industry hoops initiative. Leopold Center for Sustainable Agriculture. \$50,000. 1/1/01 - 12/31/03.

Hanna, M., **T.L. Richard** and G. Quick. Optimizing solid manure application by improving distribution. Leopold Center for Sustainable Agriculture. \$84,020 7/1/2000 – 6/30/2003

Richard, T.L., R.C. Brown, and K. Moore. Ensilage technology for biomass storage. Iowa Energy Center. \$10,000. 6/1/00 – 5/31/02.

Richard, T.L., M. Liebman, C.A. Cambardella. Land application of biotechnology byproduct compost. Chamness Technology, Inc. \$69,281. 12/1/99 – 2/28/2002.

Richard, T.L. Professional Development Travel to Wageningen, The Netherlands. Iowa State University Foreign Travel Grant. \$1153. 6/26/00 – 12/19/00.

Richard, T.L., D. Myers, and M.L. Kuo. Composting strategies for biotechnology byproducts. Iowa Biotechnology Byproducts Consortium. \$133,220 6/1/00 – 5/31/2002.

Richard, T.L., W. Powers-Schilling, M. Burkart. Iowa livestock industry waste characterization and methane recovery information dissemination. Iowa Dept. of Natural Resources. \$43,483 1/20/2000 – 4/30/2001.

Glanville, T., **T.L. Richard**, and J. Laflen. Impacts of compost amended soils on revegetation and soil erosion at highway construction sites in Iowa. Iowa Dept. of Natural Resources. \$189,000 1/24/00 – 12/31/2002.

Lorimor, J., C. Hurburgh, S. Birrell, J. Sawyer, **T.L. Richard**, H. Zhang, J. Hattey, and C. Fulhage. Near infrared technology to determine manure nutrients. Multi State Consortium on Animal Waste Management. \$89,100. 11/1/99 – 10/31/2001.

- Harmon, J., T. Glanville, **T. Richard**. Demonstration of swine carcass composting as part of an environmentally-friendly production system. Leopold Center for Sustainable Agriculture. \$35,500 7/1/99 – 6/31/2002
- Richard, T.L.**, C. Cambardella, M. Liebman and D. Exner. Optimizing swine hoop manure management for soil quality and crop system performance. Leopold Center for Sustainable Agriculture. \$86,884. 7/1/99 – 6/30/2002.
- Liebman, M.L. and T.L. Richard. Soil amendment effects on crop-weed interactions. Leopold Center for Sustainable Agriculture. \$56,311. 7/1/99 – 6/30/2002.
- Richard, T.L.**, L. Jackson and C.C. Hinrichs. Risk analysis of manure management systems: normal practices, normal accidents, and impacts on water quality. Iowa State Legislature. \$35,000 1/1/99 – 12/31/2000.
- Richard, T.L.** Composting strategies for biotechnology byproducts (Iowa Biotechnology Byproducts Consortium, Chamness Technology, Inc, Bluestem Solid Waste Agency) \$80,816 6/1/99 – 5/31/2000.
- Richard, T.L.** Earthen basin management survey. Iowa State Legislature. \$20,000 6/1/98 – 12/31/98.
- Richard, T.L.** Korea scientific exchange. Iowa State University Foreign Travel Grant. \$825 6/8/98 – 7/5/98.
- Richard, T.L.**, C. Bern and K. Rosentrater. Development of livestock feed products from corn masa byproduct slurries. Iowa Biotechnology Byproducts Consortium. \$32,811 5/1/98 - 4/30/99.
- Richard, T.L.**, C.A. Cambardella and T.E. Loynachan. Nitrogen conservation in swine manure composting - land application systems. Leopold Center for Sustainable Agriculture. \$49,500 7/1/98 - 6/31/00.
- Hinrichs, C.C. and **T.L. Richard**. Socio-technical and environmental dimensions of swine manure management decisions. Leopold Center for Sustainable Agriculture. \$21,125 7/1/98 - 12/31/99.
- Harmon, J., M. Honeyman, J. Kliebenstein, **T.L. Richard**, and D. Lay, Jr. Swine industry hoops initiative. Leopold Center for Sustainable Agriculture. \$200,000. 1/1/98 - 12/31/00.
- Richard, T.L.** Accelerated composting of paper mill sludge. Bluestem Solid Waste Agency. \$17,414. 12/1/97 - 3/15/98.

- Richard, T.L.** and H. Person. Process development for composting swine manure with minimum amendment. Multi-State Consortium on Animal Waste. \$62,000. 7/1/97 - 6/30/99.
- Richard, T.L.**, J.C. Lorimor, and T.D. Glanville. Integrated composting systems for swine manure treatment. Iowa Pork Producers Association. \$59,710. 7/1/97 - 6/30/98
- Bundy, D.S. and **T.L. Richard**. Evaluation of organic and inorganic floating covers on manure storage structures to reduce odor emission. Iowa Pork Producers Association. \$12,000. 1/1/98 - 6/30/98.
- Harmon, J., M. Honeyman, J. Kliebenstein, **T.L. Richard**, and D. Lay, Jr. Swine industry hoops initiative. Leopold Center for Sustainable Agriculture. \$100,000. 10/13/98 - 6/30/98.
- Honeyman, M., J. Kliebenstein, J. Harmon, **T.L. Richard** and D. Lay, Jr. Hoop structures for grow-finish swine in Iowa. Iowa Pork Producers Association. \$10,000. 7/1/97 - 6/31/99.
- Richard, T.L.**, C. J. Bern, and K. Rosentrater. Development of value-added by-product alternatives for waste slurries from corn masa production. Resource Reuse Technology Transfer Center. \$21,795. 7/1/97 - 6/31/98.
- Richard, T.L.** Compost engineering technology transfer. Cornell Waste Management Institute. \$19,269. 7/1/95 - 3/31/96.
- Richard, T.L.**, and S.A. Fredenberg. Composting on the World Wide Web. Cornell Waste Management Institute. \$20,659. 7/1/95 - 3/31/96.
- Walker, L.P., J.M. Gossett, and **T.L. Richard**. Controlling odors and waste stabilization in composting systems through process design, analysis and monitoring. New York State Energy Research and Development Authority. \$857,069. 6/1/93 - 5/31/96.
- Harrison, E.Z., **T.L. Richard**, J. Gillett, and P. Woodbury. Municipal solid waste composting Program. Clark Engineers and Associates. \$73,057. 3/1/91- 5/31/92.
- Walter, M.F. and **T.L. Richard**. Cornell waste characterization. Cornell University College of Agriculture and Life Sciences. \$10,000. 6/1/91 - 8/30/91.
- Walker, L.P. and **T.L. Richard**. Composting food waste: A Feasibility Study. Tompkins County, New York. \$25,002. 1/1/91 - 5/31/91.
- Allee, D.J. and **T.L. Richard**. Agricultural composting: a feasibility study for New York farms. NYS Dept. of Agriculture and Markets. \$34,500. 11/1/89 - 10/31/91.

Walter, M.F. and **T.L. Richard**. Agricultural composting: environmental monitoring and management. NYS Dept. of Agriculture and Markets. \$45,000 5/1/90 - 12/31/91.

Allee, D.J., **T.L. Richard** and K. Cobb and E.Z. Harrison. Yard waste management technology transfer program. New York State Energy Research and Development Authority. \$169,176 11/1/88 - 3/31/92.

Richard, T.L. Land application of paper-mill sludge. Scott Paper Co. \$10,000 gift. 1989.

Richard, T.L. and J.-Y. Parlange. Physical chemical interactions of diatomaceous earth/brewery filtration residuals with soils. Anheuser Busch, Inc. \$30,000 gift. 1988.

Petrovic, M. and **T.L. Richard**. Recycling of yard wastes and municipal sewage sludge by co-composting for use in sod production and turf maintenance. New York State Energy Research and Development Authority. \$46,320. 11/1/89 - 11/30/90.

Regenstein, J.M., D. White and **T.L. Richard**. Salmonid fish waste compost pile demonstration. New York SEA-Grant. \$5,000. 8/1/88 - 7/30/89.

Allee, D.J., **T.L. Richard** and K. Cobb. Leaf and yard waste composting in Westchester County, New York. Westchester County, New York: \$83,024. 8/1/88 - 7/30/89.

Nally, T. and **T.L. Richard**. Land application of leaves. Town of Pittsford, New York. \$2,347. 3/31/88 - 10/31/88.

Richard, T.L. and J.-Y. Parlange. Dye tracer analysis of preferential flow to groundwater. New York State Dept. of Agriculture and Market. \$5,150. 10/1/87 - 8/31/89.

Richard, T.L. and A.K. Datta. Review and evaluation of environmental regulation of the food processing industry. New York State Dept. of Agriculture and Markets. \$30,000. 8/1/87 - 1/28/88.

Carlton, B., **T.L. Richard** and K. Wilson. Environmental interactions in the San Diego - Tijuana basin. National Science Foundation - Student Originated Studies. \$20,000 5/1/75 - 12/31/75.