

# Eugene McGahan

BE (Agr), Meng, RPEQ (6837), MASABE, Cert IV Training and Workplace Assessment

## CAREER SUMMARY

Since 2001, Eugene has worked as a Senior Engineering Consultant with Feedlot Services Australia Pty Ltd (trading as FSA Consulting).

Eugene's work focuses on environmental management issues related to agricultural and agro-industrial industries. This includes research and development projects, environmental impact assessment and environmental management, Life Cycle Assessment, greenhouse gas emissions, effluent treatment system design and management, effluent reuse, nutrient management, odour impact assessment and environmental management training.



From 1995 to 2001, Eugene was a Senior Environmental Engineer with the Intensive Livestock Environmental Management Services group, Department of Primary Industries (Queensland). His primary role was to conduct research in the area of intensive livestock environmental management, including: waste estimation, treatment and reuse; odour measurement, dispersion and modelling; land planning of intensive animal industries on a regional scale; computer model development and housing systems for intensive pig production.

From 1994 to 1995, Eugene was a design engineer with Feedlot Services Australia Pty Ltd. In this position, he designed feedlots (including pens, induction/receival/dispatch facilities, water and drainage system and infrastructure), irrigation systems (head ditches and ring tanks), modelled the odour impact of feedlots, prepared feedlot licence applications and environmental impact statements for piggeries.

From 1988 to 1994, Eugene was a Research Engineer for the Agricultural Engineering Section, Department of Primary Industries. His primary role was working on three research projects; Drying optimisation of agricultural products; Depth control of broadacre seeders and Solar drying hay for export.

Eugene owns a beef cattle grazing enterprise and is also a partner in a native grass seed harvesting business.

## QUALIFICATIONS

- Bachelor of Engineering (Agricultural): Darling Downs Institute of Advanced Education.
- Master of Engineering: University of Southern Queensland. "Depth Control of Broadacre Seeders: Performance and Economic Consequences".
- Registered Professional Engineer of Queensland.
- Certificate IV in Assessment and Workplace Training.

## PROFESSIONAL AFFILIATIONS

- Registered Professional Engineer of Queensland (6837)
- Member, American Society of Agricultural Engineers (0202686)

## EMPLOYMENT DETAILS

## **Fields of Special Competence**

- Livestock and other organic waste management.
- Greenhouse gas assessment and abatement.
- Life cycle assessment.
- Odour research and modelling.
- Design of cattle feedlots.
- Design and modelling of effluent irrigation systems.
- Nutrient management.
- Intensive livestock housing.
- Environmental impact assessments.
- Environmental management training.
- Native grass seed harvesting and establishment.
- Beef cattle husbandry and crop production.

## **Professional Experience**

May 2001 to date

Senior Engineering Consultant, Feedlot Services Australia Pty Ltd (trading as FSA Consulting)

This consultancy specialises in two areas - environmental management and assessment of industries producing organic effluents (particularly intensive livestock facilities); and irrigation design. Eugene's work has involved:

- Life cycle assessment for the egg, meat chicken, pork and red meat industries.
- Environmental Guidelines for the Australian Egg Industry.
- Best Practice Guidelines for the Meat Chicken Industry in Queensland.
- Environmentally Sustainable Piggeries – A national environmental management certification system for the pig industry.
- Development of National Environmental Guidelines for the pig industry.
- Development of Sustainability Indicators for Effluent Reuse: Piggeries and Cattle Feedlot.
- Development of an Environmental Management System for the Meat Chicken Industry.
- Environmental Management Tools for the Australian Egg Industry.
- Piggery Odour Emissions Review.
- Air Quality Management Manual for New South Wales Councils.
- Reviewing and evaluating solids separation systems for the pig industry
- Field testing of a solids removal system for piggeries on-farm.
- Preparation of licence and development applications for piggeries, dairies, cattle feedlots and poultry developments
- Training both pig and poultry producers in environmental awareness and environmental management plans

- Odour modelling of piggeries and meat chicken farms
- Nutrient mass balance and water balance modelling for piggeries, feedlots, dairies, aquaculture operations and meat chicken farms.

#### April 1995 – May 2001

Senior Environmental Engineer, Department of Primary Industries (Queensland), Intensive Livestock Environmental Management Services.

- Conducted research in the area of intensive livestock environmental management. Specialist areas included waste estimation, treatment and reuse; odour measurement, dispersion and modelling; land planning of intensive animal industries on a regional scale; computer model development and housing systems for intensive pig production.
- Prepared environmental management guidelines for the pig industry.
- Conducted PRDC project on Odour Emissions from Piggery Anaerobic Ponds.
- Developed a nutrient and water mass balance model for dairy farms – DairyBal.
- Completed PRDC review on Sow and Boar Housing Systems, including authoring two books.
- Completed PRDC project into waste estimation from intensive piggeries.
- Conducted NHT funded project on Waste Reuse Strategies and Decision Support System for Rural Development and Sustainability.
- Completed PRDC project on Packaging Pig Waste Management Information.
- Awarded PRDC scholarship to travel to North America and attend three conferences papers.
- Presented seminars to producers and overseas visitors.
- Supervised technical staff employed in the group.

#### June 1994 – March 1995

Design Engineer, Feedlot Services Australia Pty Ltd

- Designed feedlots, including pens, induction/ receival / dispatch facilities, water and drainage system and infrastructure. This involved the extensive use of Civilcad and Autocad.
- Irrigation design (head ditches and ring tanks)
- Costed feedlot construction.
- Modelled the odour impact of feedlots using the odour modelling package AUSPLUME.
- Prepared feedlot licence applications.
- Prepared environmental impact statements for piggeries.

#### May 1994 - June 1994

Design Engineer, Department of Primary Industries (Queensland), Intensive Livestock.

- Designed an automatic environmental control system for the three DPI research piggeries at Wacol. This involved sourcing appropriate equipment to suit the specific requirements at the facilities.

#### April 1992 – May 1994

Research Engineer, Department of Primary Industries (Queensland), Agricultural Engineering Section.

- Participated in a multidisciplinary research team on the Energy Research and Development Corporation (ERDC) funded project "Less Fuel for More Hay Export Income."
- Design, construction and testing of a hay drier and compactor for the production of high quality hay for export to Japan.
- Presented this new technology through the media (television, radio, newspapers)
- Extended knowledge to primary producers involved in the hay industry.
- Supervised workshop staff, overseas Masters and Phd students, undergraduate students and casual employees.

#### September 1989 - June 1992

Research Engineer, Department of Primary Industries (Queensland), Agricultural Engineering Section.

- Worked with a research team on the Grains Research and Development Corporation (GRDC) project titled "Depth Control of Broadacre Seeders: Performance and Economic Consequences".
- Investigated the problems associated with poor depth control on current broad acre seeders and recommended improvements in design and operation.
- Investigated new research areas and submitted funding and project applications.
- Extended knowledge to farmers in the cereal cropping industry.
- Transferred knowledge to other technical staff through participation at conferences and workshops.

#### December 1988 – September 1989

Technical Assistant, Department of Primary Industries (Queensland), Agricultural Engineering Section.

- Conducted drying tests in an experimental, micro-processor controlled thin layer drier to determine the optimum drying conditions for grain wheat and lucerne hay. Interpreted data so it could be used in crop drying models

#### 1994 – Present

Partner, Grass Seeds Australia

- Eugene is a partner in a business that specialises in harvesting and marketing grass seed (predominantly native) for the revegetation of denuded agricultural land and urban development
- Design and construct machinery for the harvesting, cleaning and packaging of these grasses.

#### 1998 – Present

Partner, McGahan Pastoral

- Eugene is a partner in family grazing enterprise. Duties include cropping, beef cattle handling, general farm work, financial planning and bookkeeping.

#### 1986-1988

- Eugene was employed for a total of 5 months work experience with the Department of Primary Industries in the areas of the production of new seed varieties of cereal and pulse crops; and the design of research equipment.

### **OVERSEAS EXPERIENCE**

- 1998: 3 weeks in USA and Canada. Presented papers at the American Society of Agricultural Engineers conference, Orlando, Florida and the Animal Production Systems and Environment conference, Des Moines, Iowa. Attended the Canadian Society of Agricultural Engineers conference, Vancouver, British Columbia and inspected/consulted with staff at the intensive livestock environmental management research facilities, North Carolina State University, Raleigh, USA.

### **PUBLICATIONS**

#### **Journal Papers**

- Hudson, N., **McGahan, E.**, Casey, K., Lowe, S., Galvin, G., Jeston, P. and Dunlop, M. 2007. Odour emissions from anaerobic ponds. 2. Improving estimates of emission rate through recognition of spatial variability. *Bioresource Technology*, Vol 98, Issue 10, pp 1888-1897.
- Hudson, N., Bell, K., **McGahan, E.**, Lowe, S., Galvin, G. and Casey, K. 2006. Odour emissions from anaerobic ponds. 1. Results of a three season, 14-month survey. *Bioresource Technology*, Vol 98, Issue 10, pp 1877-1887.
- Chinivasagam, H.N., Thomas, R.J., Casey, K., **McGahan, E.**, Gardner, E.A., Rafiee, M. and Blackall, P.J. 2004. Microbiological status of piggery effluent from thirteen piggeries in the South East Queensland Region of Australia. *J. Appl. Microbiol.* **97**:883-891.
- Radajewski, W., Gaydon, D., **McGahan, E.J.**, 1990, "Optimization of Solar Hay Drying in a Step Flow Dryer", *Transactions of the ASAE* 33(5):1423-1431.
- Radajewski, W., Jensen, T.A., Abawi, G.Y., **McGahan, E.J.**, 1992, "Drying Rate and Damage to Navy Beans", *Transaction of ASAE* 35(2):583-590.

#### **International Conference Papers**

- Wiedemann, SG & **McGahan, EJ** 2010, 'Review of water assessment methodologies and application to Australian agriculture', in *Proceedings of the Icafood 2010 VII international conference on life cycle assessment in the agri-food sector*, B Notarnicola, et al. (eds.), Bari, Italy, pp. 425-432.
- Wiedemann, S, **McGahan, E**, Grist, S & Grant, T 2010, 'Life cycle assessment of two Australian pork supply chains', Paper submitted to the *7th International Conference on LCA in the Agri-Food Sector*, Bari, Italy, 22-24 September.

- Galvin, G., K.D. Casey, S.A. Lowe, N.A. Hudson, M.A. Atzeni and **E.J. McGahan**. 2003. "Spatial Variability of Odor Emissions from Anaerobic Piggery Lagoons in Queensland". Proceedings of the Third International Conference on Air Pollution from Agricultural Operations, Research Triangle Park, North Carolina, October 12-15, 2003, North Carolina.
- Galvin, G, Casey, K. D., **McGahan, E. J.**, Lowe, S. A., and Atzeni, M. G. 2002. Effect of season and loading rate on odour emission from piggery anaerobic lagoons in Australia, 2002 ASAE Annual International Meeting / CIGR XVth World Congress.
- McGahan, E.J.**, K.D. Casey, D Duperouzel and R.J. Smits. 2000. "Validation of Waste Estimation Theory for Intensive Pig Production Systems". Proceedings of the Eighth International Symposium on Animal, Agricultural and Food Processing Wastes, October 9-11, 2000, Des Moines Iowa. Pp 96-102.
- McGahan, E.J.**, K.D. Casey, A.S. Skerman and P.J. Nicholas. 2000. "A Method for Siting Piggeries Based on Odour Generation, Dispersion and Impact". In Proceedings of the Air Pollution 2000 Conference, October 2000, Des Moines, Iowa pp 361-368.
- Rafiee, M., Chinivasagam, H.N., Thomas, R.J., Gardner, E.A., Casey, K., **McGahan, E.** and Blackall, P.J. 2000. Characterisation of *Erysipelothrix* isolates from Australian piggery effluent. 16<sup>th</sup> International Pig Veterinary Society Congress, Melbourne.
- McGahan, E.J.**, Casey, K.D and Streeten, T.A., 1998. "Environmental Management Practices of Piggeries in Queensland, Australia". In Proceedings of Animal Production Systems and Environment Conference, Des Moines, Iowa.
- McGahan, E.J.**, and Casey, K.D., 1998. "Use of a Modified Version of the DAMP Model to Define the Size of Pig Production Enterprises (Standard Pig Units). Presented at the ASAE Annual International Meeting, Orlando, Florida, USA.

### Invited Conference Papers

- Wiedemann, SG, **McGahan, EJ** & Zadow, EN 2010, 'Literature review and rapid life cycle assessment of chicken meat production in Australia', in *Proceedings 2010 Poultry Information Exchange*, Gold Coast, 23-26 May 2010, pp. 77-84.
- Wiedemann, SG, **McGahan, EJ** & Zadow, EN 2010, 'Energy and greenhouse gas assessment and review of industry exposure to greenhouse gas regulations for the egg industry', in *Proceedings 2010 Poultry Information Exchange*, Gold Coast, 23-26 May 2010, pp. 145-157.
- H.N. Chinivasagam, HN, **McGahan, EJ** and Blackall, PJ. 2007. Food-borne pathogens and pig waste products – the spoke in the wheel? In proceedings of manipulating Pig Production XI. Australian Pig Science Association conference, Brisbane, Australia, 25-28 November 2007.
- McGahan, E.J.** Planning Issues for Gaining Approval for New Sheds. 2006. In Proceedings of 2006 Poultry Information Exchange – Making the Most of the Future, 2 - 5 April 2006, Gold Coast, Australia. pp 93-116.
- McGahan, E.J.**, Nicholas, P.J., Klepper, K., Redding, M.R., Deveraux, J., Blackall, P., Chinivasagam, N and Runge, G. 2006. The Safe and Sustainable Utilisation of Spent Litter. In Proceedings of 2006 Poultry Information Exchange – Making the Most of the Future, 2 - 5 April 2006, Gold Coast, Australia. pp 79-91.
- McGahan, E.J.** 2006. Environmental Systems for Egg Farms. In Proceedings of 2006 Poultry Information Exchange – Making the Most of the Future, 2 - 5 April 2006, Gold Coast, Australia. pp 01-08.

- McGahan, E.J.** and Tucker, R.W. 2005. Implementing EMS to Meet Community Expectations. In Proceedings of the 13<sup>th</sup> Australian Poultry Convention – Climate Change., 09-12 October 2005, Gold Coast, Australia. pp 33-36.
- McGahan, E.J.** and Nicholas, P.J. 2004. Managing Urban Encroachment. In Proceedings of 2004 Poultry Information Exchange – Striving for a Green Efficient Industry, 18-21 April 2004, Gold Coast, Australia. pp 73-81.
- McGahan, E.J.** and Nicholas, P.J. 2004. Update of Managing Odour Emissions and Environmental Management Systems. In Proceedings of 2004 Poultry Information Exchange – Striving for a Green Efficient Industry, 18-21 April 2004, Gold Coast, Australia. pp 23-32.
- McGahan, E.J.** and Williamson, W.D. 2003. Surface Management and Making the Most of Feedlots By-Products, ALFA BeefEX Conference, Casino, NSW, Australia October 2003.
- McGahan, E.J.**, Kolominskas, C., Bawden, K. and Ormerod, R. 2002. “Environmental Management System for Chicken Growers” Presented at the 12<sup>th</sup> Australian Feed Convention, 6-10 October 2002, Gold Coast, Australia.
- McGahan, E.J.**, Kolominskas, C., Bawden, K. and Ormerod, R. 2002. “Strategies to Reduce Odour Emissions from Meat Chicken Farms” In Proceedings of 2002 Poultry Information Exchange – Thinking in a Sustainable World, 14-16 April 2002, Gold Coast, Australia.
- McGahan, E.J.**, Kolominskas, C., Bawden, K. and Ormerod, R. 2002. “Strategies to Reduce Odour Emissions from Meat Chicken Farms” In Proceedings of 2002 Poultry Information Exchange – Thinking in a Sustainable World, 14-16 April 2002, Gold Coast, Australia.
- Watts, P.J., Nicholas, P.J. and **McGahan, E.J.** 2001. Australian and International Developments in the assessment and management of piggery odours. In Proceedings of Manipulating Pig Production VIII – Australasian Pig Science Association. Adelaide, South Australia. pp51-65.
- McGahan, E.J.**, van Sliedregt, H. 2000. “The Effect of Diet on Waste Output from Piggeries”. Second National Pig Environment Conference, 29-30 June 2000, Gatton, Queensland.
- McGahan, E.J.** 2000. “Reducing Piggery Impacts – What Distance is the Answer”. Second National Pig Environment Conference, 29-30 June 2000, Gatton, Queensland.
- P.J. Blackall, H.N. Chinivasagam, R.J. Thomas, A. M. Veritz, E.A. Gardner, **E.J. McGahan** and K.D. Casey. 2000. Pathogens and Piggery Effluent – Using Science to Guide Safe, Re-use Strategies. Second National Pig Environment Conference, 29-30 June 2000, Gatton, Queensland.

### **Conference and Seminar Papers**

- Galvin, G., Lowe, S., Atzeni, M., Casey, K. and **McGahan, E.** 2002. ‘The effect of loading rate on odour emissions from anaerobic effluent ponds in south-east Queensland.’ Presented at the 4<sup>th</sup> Queensland Environmental Conference, 30-31 May, 2002.
- Galvin, G., Lowe, S., Atzeni, M., Casey, K. and **McGahan E.J.** 2002. Spatial Variability of Odour Emissions from Anaerobic Piggery Ponds, Proceedings: Enviro2002 Conference and Exhibition, Melbourne.

- McGahan, E.J.**, Nicholas, P.J., and Watts, P.J. 2002. Nuisance criteria for impact assessment, National Workshop for Odour Assessment from Piggeries, Sydney, Australia.
- Nicholas, P.J., **McGahan, E.J.**, and Watts, P.J. 2002. Application of emission data in modelling and assessment, National Workshop for Odour Assessment from piggeries,
- van Sliedregt, H., K.D. Casey and **E.J. McGahan**. 2001. Cleaner Production: Waste Characterisation and Minimisation, In: *Proceedings of Production and Environmental Monitoring Workshop*, Paper No. PEM009. 17-19 Oct, University of New England, Armidale, NSW.
- McGahan, E. J.**, Jeston, P., Galvin, G., and Casey, K. D. 2001. Quantifying anaerobic pond odour emissions, Queensland Pig Science Seminar, Wondai, Queensland.
- Blackall, P.J., H N Chinivasagam, K Casey, **E McGahan**, E A Gardner, A Vieritz, Z Ristovski, V Agranovski. 2001. An evaluation of the effect of flushing with effluent on the bacterial load in the air of Queensland piggeries. Queensland Pig Science Seminar, Wondai, Queensland.
- McGahan, E.J.**, K.D. Casey, P.J. Nicholas and A.S. Skerman. 2000. "Odour Modelling Used as a Tool to Improve Landuse Planning for Piggeries" In Proceedings of Enviro 2000 – Towards Sustainability Conference, 9-13 April 2000, Sydney.
- Skerman, A.S., K.D. Casey, and **E.J. McGahan**. 2000. "Analysis of Complaints Records for Queensland Feedlots". In Proceedings of Enviro 2000 – Towards Sustainability Conference, 9-13 April 2000, Sydney.
- McGahan, E.J.**, and Skerman, A.S. 2000. "Waste Utilisation – How Much to Apply – The Basics". Presented at the Waste Utilisation – Making it Work for You Seminar Series. Australian Lot Feeders Association and the Cattle and Beef CRC for Meat Quality, Chinchilla, Quirindi and Narranderra, March 2000. pp 15-19.
- McGahan, E.J.**, K.D. Casey, A.S. Skerman, T.A. Streeten and P.J. Nicholas. 1999. "Guidelines to Determine Separation Distances for the Queensland Pig Industry". In Proceedings of the Queensland Pig Science Seminar – Queensland Pig Consultancy Group. Gatton. pp 34-35.
- van Sliedregt, H., K.D. Casey and **E.J. McGahan**. 1999. "Cleaner Production: Waste Characterisation and Minimisation", In: *Proceedings of Production and Environmental Monitoring Workshop*, Paper No. PEM007. 17-19 Mar, University of New England, Armidale, NSW.
- Vieritz, A.M., Gardner, T., Littleboy, M., Atzeni, M.G., Beecham, R.E., Casey, K.D., Farley, T., Davis, J.R., Sharma, P.K., **McGahan, E.J.**, Dillon, P.J. (1998). MEDLI – A model for designing sustainable irrigation systems for the reuse of effluent.. Environmental Benefits of Soil Management, Conference Proceedings. National Soil Science Conference, Brisbane, 27-29 April 1998. pp 154-161.
- McGahan, E.J.** & Nicholas, P.J., 1998. "Sow and Boar Housing Systems" - ", International Conference of Engineering in Agriculture, Perth Australia, Institute of Engineers Australia.
- McGahan, E.J.**, 1998. "Key Environmental Issues for Intensive Livestock Production in North America – An Aussies Perspective in 1998. National Pig Environment Conference, Gold Coast.
- Atzeni, M.G., Veritz, A.M., Gardner, E.A., **McGahan, E.J.**, Casey, K.D., and Redding, M.R., 1998. "Using MEDLI to Predict the Effects of Diet on Sludge Accumulation and Sustainable Reuse Area". National Pig Environment Conference, Gold Coast.

- Van Sliedregt, H., Casey, K.D. and **McGahan, E.J.** 1998. A Review of Waste Minimisation Through Environmental Nutrition. The Second production and Environmental Workshop – Environmental Monitoring in Rural Landscapes. Armidale, NSW. 16 pp.
- McGahan, E.J.** and Casey, K.D., 1997. “A New Unit for Defining the Size of a Pig Enterprise for Environmental Management Purposes”. In Proceedings of Manipulating Pig Production V – Australasian Pig Science Association. Canberra. p 298.
- Atzeni, M.G., Casey, K.D., **McGahan, E.J.** and M.R. Redding. 1997. “Using MEDLI to investigate the sustainability of changing piggery production systems”. In: *Proceedings of Queensland Pig Science Seminar*, Gatton, QLD. Australasian Pig Institute.
- Casey, K.D., E.A. Gardner and **E.J. McGahan.** 1995. “Characterisation of piggery anaerobic lagoons in Southern Queensland”. In: *Proceedings of Manipulating Pig Production V*, pg202, Canberra, ACT. eds D.P Hennessy and P.D Cranwell. (Australian Pig Science Association: Werribee).
- McGahan, E.J.** and Casey, K.D., 1997. “Defining the Size of a Pig Production Unit by its Waste Production (Standard Pig Units)”. In Proceedings of Queensland Pig Science Seminar – Queensland Pig Consultancy Group. Gatton. p 46.
- McGahan, E.J.**, Casey, K.D. and Streeten, T.A., 1997. “A Survey of the Environmental Management Practices of Queensland Piggeries”. In Proceedings of Queensland Pig Science Seminar – Queensland Pig Consultancy Group. Gatton. pp 43-44.
- Redding, M.R., Casey, K.D., Atzeni, M.G. and **McGahan, E.J.**, 1997. “Investigation of Soil Sampling for the Monitoring of Effluent Application Areas”. In Proceedings of Queensland Pig Science Seminar – Queensland Pig Consultancy Group. Gatton. p 47.
- Atzeni, M.G., Casey, K.D., **McGahan, E.J.**, Gardner, E.A., and Redding, M.R., 1997. “Using MEDLI to Investigate the Sustainability of Changing Piggery Production Enterprises”. In Proceedings of Queensland Pig Science Seminar – Queensland Pig Consultancy Group. Gatton. p 45.
- Jensen, T.A., **McGahan, E.J.** and Loch, D.S. 1996. Development of a hand-held grass seed harvester. *In: Bellairs, S.M. and Osborne, J.M. (eds.) Proceedings of the Second Australian Workshop on Native Seed Biology for Revegetation*, Newcastle, NSW (11-12 October 1996). Australian Centre for Minesite Rehabilitation, Kenmore, Australia, pp. 213-216
- Gardner, E.A., Atzeni, M. A., **McGahan, E.J.**, Vieritz, A.M. and Casey, K.D. 1996. MEDLI - a computer model to help resolve environmental conflict in intensive rural industries. In proceedings from the conference ‘Resolving Environmental Conflict’. Institution of Engineers Australia, Brisbane: November 1996, 17pp.
- Gardner, E.A., Vieritz, A.M., Atzeni, M.A., Beecham, R., Littleboy, M., Casey, K.D., Sharma, P., Farley, T., Davis, R., **McGahan, E.J.** and Dillon, P. 1996. MEDLI: A computer based design model for sustainable effluent disposal from intensive rural industries using land irrigation. In ‘Land Application of Wastes in Australia and New Zealand: Research and Practice’ (Eds. P.J. Polglase & W.M. Tunningley), pp. 114-124. Proceedings 14th Land Treatment Collective Meeting, Canberra 30 September-1 October.
- Atzeni, M.G., **McGahan, E.J.** and Casey, K.D. 1995. Modelling sustainable piggery effluent disposal. Queensland Pig Research and Development Seminar, 1995, Gatton, Queensland Pig Consultancy Group, p 44.

Casey, K.D., Gardner, E.A. and **McGahan, E.J.**, 1995. "Characterization of Piggery Anaerobic Lagoons in Southern Queensland". In Proceedings of Manipulating Pig Production IV – Australasian Pig Science Association. Canberra. p 202.

**McGahan, E.J.** & Robotham, B.G., 1992, "Effect of Planting Depth on Yield in Cereals", In Proceedings of Conference on Agricultural Engineering, Albury Australia, Institute of Engineers Australia, pp:121-126.

## Books

Tucker, R.W., **E.J. McGahan**, P.J. Nicholas and M.R. Howard (principal authors). 2004. "National Environmental Guidelines for Piggeries", Australian Pork Limited Canberra.

**McGahan, E.J.**, Nicholas, P., McIntosh, B. and Casey, K.D., 1998. Improved Pig Breeding Using AI. Department of Primary Industries, Queensland Publication. ISBN 0-7345-0001-7. ISSN 0727-6273. Agdex 440/47. 57 pages.

Nicholas, P., **McGahan, E.J.**, Casey, K.D. and Hopper, R., 1998. Housing Systems for Dry Sows and Boars. Department of Primary Industries, Queensland Publication. ISBN 0-7345-0000-9. ISSN 0727-6273. Agdex 440/720. 86 pages.

## Reports and Thesis

Playsted, C, Wiedemann, S & **McGahan, E** 2011, *Biochar manufacture from poultry litter - Final Report*, RIRDC Project No. PRJ-005548, February 2011, Rural Industries Research and Development Corporation, Sydney.

Wiedemann, S, **McGahan, E** & Poad, G In Press, *Environmental assessment of chicken meat production using life cycle assessment*, Final Report, RIRDC Project No PRJ-004596, Rural Industries Research and Development Corporation, Barton, ACT.

Wiedemann, SG & **McGahan, EJ** 2011, *Environmental assessment of an egg production supply chain using life cycle assessment*, Australian Egg Corporation Limited.

Zadow, EN, Tucker, RW, **McGahan, EJ**, O'Keefe, MF & Wiedemann, SG 2010, *Caring for our Country - Nutrient management plan development (Summary Report)*, Final report prepared for Australian Pork Ltd Project No. 2262.02, FSA Consulting, Australian Pork Limited, Deakin.

Wiedemann, SG & **McGahan, EJ** 2010, 'Review of International Water Usage Methodologies and Application to Australian Agriculture', Paper submitted to the *7th International Conference on LCA in the Agri-Food Sector*, Bari, Italy, 22-24 September 2010.

Davis, RJ, Watts, PJ & **McGahan, EJ** 2010, *Quantification of feedlot manure output for BEEF-BAL model upgrade*, RIRDC Project No. PRJ-004377, Rural Industries Research and Development Corporation, Canberra.

**McGahan, E**, Barker, S, Poad, G, Wiedemann, S & Batstone, D 2010, *Conversion of waste to energy in the chicken meat industry - Final Report*, RIRDC Project No PRJ-002964, 21 December, 2010, Rural Industries Research and Development Corporation, Canberra.

**McGahan, EJ**, Watts, P & Wiedemann, SG 2010, *Validation and Development of PIGBAL model - Literature Review*, FSA Consulting, Australian Pork Limited.

Poad, GD, **McGahan, EJ** & Redding, MR 2010, *Low cost options for reducing effluent pond methane*, Project No. 2299, June 2010, Australian Pork Limited, Canberra.

- Tucker, RW, **McGahan, E**, Galloway, JL & O'Keefe, MF 2010, *National environmental guidelines for piggeries - Second Edition*, APL Project 1832, Australian Pork Ltd, Deakin, Australia.
- Wiedemann, SG, Davis, RJ, Zadow, EN, **McGahan, EJ**, Watts, PJ & Nielsen, WM 2010, *Review of GHG and Water in the Red Meat Industry - Report 1*, Meat and Livestock Australia Ltd, Sydney.
- Wiedemann, SG, **McGahan, EJ**, Grist, S & Grant, T 2010, *Environmental assessment of two pork supply chains using life cycle assessment*, Project No PRJ-003176 & PRJ-004519, RIRDC Publication No 09/176, January 2010, Rural Industries Research and Development Corporation, Barton, ACT.
- Wiedemann, SG, **McGahan, EJ** & Watts, PJ 2010, *A scoping life cycle assessment of the Australian lot feeding sector*, Meat and Livestock Australia Ltd, Project number B.FLT.0360, Sydney, NSW.
- McGahan, EJ**, Ouellet-Plamondon, C & Watts, PJ 2009, *Estimates of Manure Production from Animals for Methane Generation*, RIRDC Project No PRJ-002831, December 2009, Rural Industries Research and Development Corporation, Barton, ACT.
- Wiedemann, SG, **McGahan, EJ** & Zadow, EN 2009, *Environmental assessment of chicken meat production using life cycle assessment*, Annual progress report 1 : Literature review and rapid impact assessment, RIRDC Publication No 08/ xxxx, RIRDC Project No. PRJ-004596, October 2009, FSA Consulting, Rural Industries Research and Development Corporation, Toowoomba, Qld.
- McGahan, EJ**, Barker, SJ & Tucker, RW 2008, *Environmental Guidelines for the Australian Egg Industry*, A report for the Australian Egg Corporation Limited as part of the DAFF EMS Pathways to Sustainable Agriculture Program, AECL Publication No. 08/01, June 2008, AECL Project No. EM01.
- Wiedemann, SG, **McGahan, EJ** & Burger, M 2008, *Layer hen manure analysis report*, Australian Egg Corporation Limited, Sydney.
- Wiedemann, SG, **McGahan, EJ**, Runge, G & Chinivasagam, N 2008, *Composting every day mortality and other wastes from layer farms*, August 2008, Australian Egg Corporation Ltd.
- FSA Consulting 2007, 'Review of Emission Factors for the Estimation of Ammonia Emissions from Poultry', Prepared for Environment and Sustainability Reporting Section, Department of the Environment and Heritage, FSA Consulting report no. 6896/1, December 2007. (Authors **E.J McGahan** & S.G Wiedemann).
- FSA Consulting 2007, 'Reviewing ammonia emission factors for deep litter piggeries', Prepared for Environment and Sustainability Reporting Section, Department of the Environment and Heritage, FSA Consulting report no. 6731/1, February 2007. (Authors **E.J McGahan** & S.G Wiedemann).
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### **Extension Material**

Eugene has produced a large number of fact sheets and case studies covering a wide range of materials. These include:

- *Recycled Organics Reuse the Condamine Catchment* – 21 fact sheets produced for the Condamine Alliance.
- *Making the Most of Animal By-Products* – 16 fact sheets & 4 farmer case studies produced for Queensland Dairyfarmers Organisation.
- *Composting piggery by-products* – 6 fact sheets produced for Australian Pork Limited.
- *By-products reuse in the Egg Industry* – 7 fact sheets produced for the Australian Egg Corporation.

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(Many of these fact sheets are available at [www.fsaconsulting.net/publications](http://www.fsaconsulting.net/publications))