



CRC for High Integrity Australian Pork

RESEARCH PROGRAM OBJECTIVES AND MILESTONES

July 2011



Established and supported under
the Australian Government's
Cooperative Research Centres
Program

Program 1 - Confinement-free Sow and Piglet Management

Background

Confinement of pigs particularly sows in stalls during gestation and crates during farrowing and lactation is highly contentious because of perceived animal welfare concerns associated with restrictions in space allowance and social interaction. The development of low-confinement production systems for sows and continuing high animal welfare standards is necessary for the pork industry to access increasingly discerning markets, maintain profitability and promote growth of the industry. The immediate imperative is to develop viable commercial options that allow sows and gilts to be kept in loose housing where they have freedom of movement from five days after service until one week before farrowing. Furthermore Program 1 of the Pork CRC has proposed that effective mating of sows during lactation may provide the industry with an entirely new production system that optimises welfare and production efficiency without the need for sow confinement during lactation, mating and early gestation.

Pork CRC will support research to develop innovative sow and piglet management and housing systems that progressively rely upon less confinement to optimise sow and piglet welfare while maintaining production efficiency and profitability of pork production. The outputs from this Program will reduce and ultimately eliminate the need for sow confinement during farrowing, lactation and gestation. Research outputs will also enhance the welfare and future productivity of piglets through a "gradual" weaning process that stimulates immunity and gut development of the piglet whilst reducing stress.

Research will cover three core areas:

1A - Mating and Lactation Innovations will develop novel techniques for inducing ovulation in sows during lactation and new breeding strategies that are consistent with a reduction or ultimate elimination of sow confinement during lactation and the subsequent gestation, and improved production efficiency.

1B - "Gradual" Weaning Systems will use controlled separation of the sow and piglet during lactation without compromising welfare to reduce weaning stress and eliminate the post weaning growth check. Gradual weaning technologies including new housing systems, multi-suckling strategies and the development of nutritional supplements will ensure optimal gut integrity and high levels of piglet immunity that enhance piglet quality and optimise lifetime productivity.

1C- Management of Sows in Groups investigates the complex and challenging interactions between sows housed in groups. Development of optimum management procedures for group housed sows while accommodating their individual requirements for nutrition, maintenance of health, and well-being is required.

The major program outcomes will revolve around:

- New pig production systems based on confinement-free sow and piglet management.
- Technologies for optimal reproduction, nutrition and health management of sows housed in groups during lactation.
- Modern, robust genotypes (dam lines) suited to confinement-free production systems.
- Higher health-status piglets with enhanced gut development through gradual weaning.
- Effective management of sows housed in groups during gestation.

Program Output Milestones:

Program 1 Milestones	Due date
1A Milestones	
1.1.1 Establish an international research program with University of Alberta. Recruit honours student in reproductive physiology	30 June 2012
1.1.2 Complete Honours project in reproductive physiology. Make first postgraduate award/internship in the subprogram.	30 June 2013

Program 1 Milestones	Due date
1.1.3 At least two producer workshops and two field days delivered on new management options. International exchange program established with University of Alberta. 5 papers published at APSA biennial conference.	30 June 2014
1.1.4 Recruit second postgraduate student in the subprogram. Critical research review completed and public recognition of progress provided from RSPCA and at least one of the major retailers.	30 June 2015
1.1.5 Publish developed management procedures and industry manual for confinement-free sows supplemented with farrowing crate use for the first 7-14 days. Complete first Postgraduate project in reproductive physiology. 5 papers published at APSA.	30 June 2016
1.1.6 Woolworths and RSPCA actively promote Australian confinement-free production systems to consumers and the general public. Certificate II and IV training programs introduced.	30 June 2017
1.1.7 Complete second PhD program or Masters Internship in reproductive physiology. 5 papers published at APSA.	30 June 2018
1.1.8 Established confinement-free systems for sows supplemented with specialised accommodation for farrowing. Adoption by 50% of the Australian sow herd. Australian pork recognised internationally for production in confinement-free systems.	30 June 2019
1A Milestones	
1.2.1 Appoint a Postdoctoral Research Fellow. Recruitment of first postgraduate student in lactation/reproductive physiology	30 June 2012
1.2.2 Demonstration sites for multi-suckling systems and piglet separation techniques established on key end-user farms. Recruit first honours student in the subprogram.	30 June 2013
1.2.3 Implement new oestrus and mating management techniques and new housing systems on 20% of commercial farms (minimum 80% viable pregnancies). 2 patents applied for on induced oestrus/ovulation and detection technologies. Prototypes for group gestation and farrowing housing systems. SME and end-user engagement over prototype testing and implementation. Complete Honours project in lactational/reproductive physiology.	30 June 2014
1.2.4 Complete first PhD program or Masters Internship in reproductive or lactation physiology. Refit of existing facilities in 30% of the Australian herd to accommodate multi-suckling and group gestation. Recruit second postgraduate student in the subprogram.	30 June 2015
1.2.5 Develop and deliver training in oestrus/ovulation induction and mating management techniques on 35% of commercial farms (target a minimum pregnancy rate of 80%). 5 papers published at APSA.	30 June 2016
1.2.6 SME delivery of new products for the measurement of feed intake of individual lactating sows housed in groups.	30 June 2017
1.2.7 Complete second postgraduate project in reproductive/lactational physiology. 5 papers published at APSA.	30 June 2018
1.2.8 SME and corporate delivery of health management products for sows in groups. Oestrus/ovulation induction and mating management techniques on 50% of commercial farms with minimum pregnancy rate of 85%.	30 June 2019
1B Milestones	
1.4.1 First honours student recruited and first postgraduate project or internship in the subprogram awarded.	30 June 2012
1.4.2 Demonstration sites for multi-suckling systems and piglet separation techniques established on key end-user farms. Post-doctoral research fellow appointed. Optimal piglet/sow separation times defined. Complete first Honours project in neonatal nutrition or weaning management.	30 June 2013

Program 1 Milestones	Due date
1.4.3 Implement first commercial "gradual" weaning systems with growth rates in the first two weeks post weaning to be at least 150 g/d and pre-weaning mortality beyond the first 7 days after farrowing to be less than 4%. 5 papers published at APSA.	30 June 2014
1.4.4 New creep diets developed and delivered by SME's and corporate mills. Patents applied for creep production processes. Complete first PhD program or Masters Internship in neonatal nutrition. Second postgraduate student recruited	30 June 2015
1.4.5 Implement commercial "gradual" weaning systems with growth rates in the first two weeks post weaning to be at least 200 g/d and pre-weaning mortality beyond the first 7 days after farrowing to be less than 3%. 5 papers published at APSA. Second honours award granted in the subprogram.	30 June 2016
1.4.6 Complete second Honours project in neonatal nutrition or weaning management.	30 June 2017
1.4.7 Complete second postgraduate project in neonatal nutrition. 5 papers published at APSA.	30 June 2018
1.4.8 Implement commercial "gradual" weaning systems with growth rates in the first two weeks post weaning to be at least 250 g/d and pre-weaning mortality beyond the first 7 days after farrowing to be less than 3%.	30 June 2019
1C Milestones	
1.3.1 National and international genetic selection process and genomics programs underway. Engagement with Smithfield Premium Genetics and/or the Hanor Group over genetic assessment program.	30 June 2012
1.3.2 Commence commercial breeding programs based on genomics and heritable trait research. 5 papers published at APSA.	30 June 2014
1.3.3 30% reduction in culling rates in Australian herds as a result of management of new genotypes. 5 papers published at APSA.	30 June 2016
1.3.4 First new dam lines introduced in 30% of Australian herds.	30 June 2017
1.3.5 Enhanced longevity of sows and reduction in culling rates as a result of lameness or poor reproductive performance in Australian herds using confinement-free systems. 5 papers published at APSA.	30 June 2018
1.3.6 New dam lines in confinement-free systems in 50% of Australian herds.	30 June 2019
1C Milestones	
1.5.1 Engagement with Ohio State University and Monash University in the research program through the University of Melbourne Animal Welfare Science Centre. Recruitment of first Honours student in the subprogram and first postgraduate scholarship awarded in the group housing/management of sows.	30 June 2012
1.5.2 Complete first Honours program on sow behaviour. Commercial Implement grouping techniques. 5 papers published at APSA.	30 June 2014
1.5.3 Complete first postgraduate project on group management of sows. Second postgraduate scholarship awarded.	30 June 2015
1.5.4 Reduced culling of sows by 25% as a result of aggression and interactions alleviated through new grouping techniques. 2 patents on feed intake measurement and control applied for. 5 papers published at APSA. Recruitment of second honours student in the subprogram. Develop Certificate II and IV training programs in new group housing management systems.	30 June 2016
1.5.5 Complete second Honours project on sow behaviour. Certificate II and IV training programs introduced.	30 June 2017

Program 1 Milestones	Due date
1.5.6 Complete second postgraduate project on sow behaviour/management. SME delivery of products to assist with measurement and control of feed intake of gestating sows in groups. 5 papers published at APSA.	30 June 2018
1.5.7 Measured reduction in variation in body condition between grouped sows during gestation by 20%, based on new grouping procedures.	30 June 2019

Contacts

Program Manager

Dr Ray King r.h.king@bigpond.net.au 0412 322 047

Sub Program Managers

1A - George Foxcroft George.Foxcroft@ales.ualberta.ca
1B - John Pluske J.Pluske@murdoch.edu.au 08 9360 2012
1C - Paul Hemsworth phh@unimelb.edu.au 03 8344 8383

Program 2 - Herd Health Management

Background

The research will involve new and novel diagnostic tools to monitor enteric and respiratory pathogen loads in production units and better characterisation and understanding of the virulence genes which cause disease. These technologies and information will enable the development of new strategies which will include new quantitative genetic methodology and the strategic use of genomics to identify and develop robust genetic lines more resilient to environmental constraints, including disease. The aim of the program is to enhance animal health, while reducing routine antibiotic use in commercial pork production.

Research will cover three core areas:

2A - Novel Disease Diagnostics will involve the refinement of quantitative PCR and other diagnostic tools developed for enteric pathogens in the current Pork CRC and investment with the University of Melbourne on the development of methodologies for rapid detection and quantification of airborne pathogens. Non-specific measures can be used to identify acute changes in herd health in real time. Conventional diagnostics which fail to separate commensal, pathogenic, host-restricted and ubiquitous, enteric organisms such as *E.coli* and Salmonella also require improvement.

2B - Healthy, Robust Pig Genotypes will arise from selection strategies that focus on welfare and health status of highly productive pigs across multiple commercial grow-out systems with varying environmental stressors, with the development of new selection criteria, statistical methodology and molecular, genetic strategies to improve disease resilience and robustness in current Australian genotypes. Collaborative research programs with Iowa State University and INRA (through AGBU) both of whom have unique selection lines (for immune responsiveness and disease tolerance) and expertise in strategic genomics will be integral in this program.

2C - Replacement of Antibiotics with Effective Integrated Health Strategies will allow reduction in expenditure on therapeutics while maintaining or enhancing production efficiency. This approach also reduces concerns for human health associated with antibiotic use in livestock production. Research results from Program 2.1 will be utilised to produce eco-suppressive agents, which may include nutrients (nutriceuticals) such as organic acids, beneficial bacteria such as *Lactobacilli*, and virulence, gene based vaccines, probiotics, and bacteriophages, all of which are designed to alter the ecology of the gut or respiratory microbial populations, thus suppressing pathogens. New vaccine technology (vectors) and integrated management systems will be developed.

Program Output Milestones:

Program 2 Milestones	
2A Milestones	Due date
2.1.1 Recruitment of postgraduate into gene virulence studies.	30 June 2012
2.1.2 IgA ELISA systems developed for <i>Actinobacillus pleuropneumonia</i> (APP) to allow more precise diagnosis and enhance treatment systems developed in current Pork CRC. Recruitment of Honours student into gene virulence studies.	30 June 2013
2.1.3 Health monitoring system incorporating real time feed and water intake commercialised. First round virulence genes identified. Complete honours project. 2 papers published at APSA.	30 June 2014
2.1.4 At least 2 patents relating to new diagnostics technologies applied for. Postgraduate project completed.	30 June 2015
2.1.5 Second round of virulence genes identified. Quantitative PCR technologies for direct measurement of pathogen loads available. 4 papers published at APSA.	30 June 2016
2.1.6 Industry internship awarded. 5 papers published at APSA.	30 June 2018
2B Milestones	Due date
2.2.1 Establish international research projects/partnerships with Iowa State University (ISU) and INRA (through AGBU). Recruit a postgraduate and an Honours student into research projects.	30 June 2012
2.2.2 Identification of potential immune competence traits for disease resilience using existing overseas lines. Complete honours project.	30 June 2013

Program 2 Milestones		
2.2.3	Determine genetic parameters for immune competence traits in Australian genotypes. Establishment of genomic and phenotypic relationships for robustness traits using overseas and Australian genetics. 2 papers published at APSA.	30 June 2014
2.2.4	Statistical methodology developed for incorporating environmental pathogen challenge data in current BLUP programs. Complete postgraduate project /internship.	30 June 2015
2.2.5	Genomic technologies incorporated into Australian genetics. First new genetics with increased disease resilience and robustness, commercially available. 4 papers published at APSA.	30 June 2016
2.2.6	Development of molecular genetics strategy for improved disease resilience.	30 June 2017
2.2.7	Second release of new genetics with increased disease resilience and robustness to industry. At least 4 papers published at APSA.	30 June 2018
2C Milestones		Due date
2.3.1	Postdoctoral position in new generation health management awarded. Recruitment of first postgraduate and first Honours students into the project.	30 June 2012
2.3.2	Gene based probiotics and bacteriophages developed and tested. Complete first honours program in alternative health management. Madec-like health scoring systems and auditing manuals developed for Australian conditions.	30 June 2013
2.3.3	First suite of Eco-suppressive agents developed and tested. Certificate III and IV training programs commence. Second Honours student recruited into subprogram. 5 research papers published at APSA.	30 June 2014
2.3.4	Misting technologies for disinfectants based on real time monitoring of pathogen challenge commercialised. 2 patents applied for on new health therapies. First postgraduate project and second Honours project completed. Second postgraduate recruited into subprogram.	30 June 2015
2.3.5	New vaccines composed entirely of virulence gene antigens developed. 5 research papers published at APSA.	30 June 2016
2.3.6	Two patents applied for on new vaccines and alternative health strategies.	30 June 2017
2.3.7	Second postgraduate project in integrated health management completed. 5 research papers published at APSA.	30 June 2018
2.3.8	Implement integrated health programs on commercial farms resulting in a 50% reduction in the use of antibiotics	30 June 2019

Sub Program 2A

The key pathogens/diseases identified by the group were:

- Agents responsible for high volumes of antibiotic usage (diseases predominantly of growers and finishers. *Lawsonia intracellularis* , *Actinobacillus pleuropneumoniae*, *Mycoplasma sp*, *Salmonella sp*)
- Agents responsible for lower volumes of antibiotic usage, but which are of concern in the generation of antibiotic resistance: *E coli* of weaners
- Other agents: *Haemophilus parasuis* (Glässer's)

Effective population diagnostics enable the interpretation of the dynamics of a disease in a population, the contribution of risk factors, and so the management of the timing and intensity of intervention. Diagnostic technology can be used at different levels (in descending order of difficulty/cost, and accuracy, more or less):

- Identification of the biology of the pathogen from the tissues of the pig (endogenous), e.g. PCR on blood or saliva, serology, identification of virulence determinants or antimicrobial resistance of isolates

- Identification, using similar technologies, for other organisms that may be inhibiting or amplifying the activity of the pathogen (ecological), e.g. lactobacilli which may inhibit *E coli*
- Identification of pathogens in the air or faeces, outside the pig (exogenous) e.g. pen side test of faeces for *Lawsonia*
- Identification of factors external to the pig or pathogen (environmental) e.g. ambient temperature

Obviously an optimal mix of these technologies will usually provide the best outcome in disease control, particularly through real time monitoring of microbial loads and other risk factors.

Sub Program 2B

Quantifying environmental sensitivity and evaluating its potential association with health, stress and welfare status of pigs is a broad topic. Therefore, it was recommended to review the literature as a first activity. This review will include information on methodology and models used to quantify environmental sensitivity. There is limited information available about this aspect in pigs and information from other species will be useful in this regard. Primary guidelines will be provided concerning the type of information and data structures required for genetic analyses of environmental sensitivity.

Evidence of the interaction of disease with environmental parameters should be explored. Economic modelling is relevant for the whole of program 2 and the model would incorporate traditional performance traits in addition to aspects of robustness, which include environmental sensitivity as well as health and welfare of pigs. Ideally, the whole pig supply chain would be modelled. Options to develop a software tool that could be used more widely within the industry should be explored. Mean performance of a contemporary group is currently used to measure environmental effects. Variation in mean performance of a group of pigs should be quantified for existing data sets. For example, a difference in winter versus summer performance has been observed in some populations and could be explored as a simple genotype by season interaction.

Sub Program 2C

The major objective of this sub program is the integration of strategies to better manage pig health while reducing antibiotic usage. It was pointed out that the volume of antibiotic used by the pig industry is poorly understood, as is the range of resistance patterns of the common bacterial pig pathogens. It was argued that a surveillance program to generate baseline data should be a priority.

A relatively simple method for reducing antibiotic usage in the industry would be the adoption of medication systems which ensured that only at risk pigs are treated, e.g. water medication systems. A further development would be the segregation of high risk pigs from production batches, so that low risk pigs are not medicated to the same level as high risk. It was proposed that demonstration and economic projects should be supported, to encourage the industry to adopt these strategies of more focussed antibiotic usage.

There was discussion about resistance of micro-organisms to disinfectants, and whether these were innate or acquired, in particular *E coli*, *Salmonella*, *Klebsiella*. An exploratory study to demonstrate the extent of the problem was suggested, as was a project to enable better discrimination between inferior and effective disinfectants.

Develop and evaluate probiotics, bacteriophages, vaccines, management strategies (hygiene) and nutraceuticals as alternatives to antibiotics for the control of disease. In terms of vaccine development, completion of the evaluation of the live APP vaccine was considered a priority. Other technologies discussed included water based and other methods of mass delivery, as well as vector vaccines (these may have GM implications). The view was expressed that in most cases, vaccine development should be the province of pharmaceutical companies/joint ventures.

Contacts

Program Manager

Dr Brian Luxford bluxford@rivalea.com.au (02) 6033-8203 or 0418 261 844

Subprogram Managers

2A - Dr Pat Mitchell pat.mitchell@australianpork.com.au

2B - Dr Susanne Hermesch susanne.hermesch@une.edu.au

2C - Dr Eric Thornton amulet@amuletvineyard.com.au

Program 3 - Healthy Pork Consumption

Background

Central to the concept of High Integrity Australian Pork is the capacity to produce pork with minimal collateral impacts to the welfare of the pig, the environment and the health of the consumer. These product credence values, however, must be coupled with consistent quality and the target markets if we are to successfully influence consumer demand and consumption, both domestically and in targeted Asian markets. Preliminary research initiated within the current Pork CRC will be expanded to demonstrate the inherent properties of pork that contribute to improved consumer health when pork is consumed as part of a total diet.

Program 3 will conduct research to produce consistently high quality pork and pork products, demonstrate that the consumption of pork can improve the health status of consumers and investigate paths to market for High Integrity Australian pork, both domestically and in Asia.

Research will cover three core areas:

3A - Optimal Pork Quality for Multiple Markets will develop pork quality predictive models for a range of supply chains, on-line screening tests for taint markers and other quality parameters, carcass assessment technologies to define carcass and primal cuts for different markets, and trace element traceability technologies to underpin integrity of Australian pork.

3B - Inherent Properties of Australian Pork to Enhance Consumer Health will research the inherent health properties of pork to address key issues such as obesity, cardiovascular disease and diabetes. Human health models will be developed to validate the effects of pork consumption and new value added products benefiting consumer health.

3C - Market Demand for High Integrity Australian Pork will undertake research to define and validate the market traction of High Integrity Australian pork attributes, consumer quality and product requirements (carcass and primal cut) specifications for the different Asian markets. The forecast growth in imported pork from 2009 to 2019 for the two major Asian importing countries has been estimated to be 35% for China and 49% for South Korea giving Australia tremendous opportunity to expand exports to these countries if the markets are understood.

Program Output Milestones

Program 3 Milestones	
3A Milestones	
3.1.1 Generic pork quality predictive model developed. National pork quality survey completed. Post-doctoral research fellow appointed.	30 June 2013
3.1.2 PorkScan carcass and primal classification technologies on-line Physi-Trace™ technology to guarantee integrity for further manufactured products made with High Integrity Australian pork. First honours student recruited. 2 papers published at APSA.	30 December 2013
3.1.3 Pork quality predictive model for established supply chains validated. First Honours project completed. First postgraduate student/intern recruited. Patent applied for on-line screening test for assessing the success of Improvac vaccination.	30 June 2015
3.1.4 An on-line screening test for markers to determine whether male pigs have received a second dose of the boar taint vaccine, Improvac. 3 papers published at APSA. Second Honours student recruited.	30 June 2016
3.1.5 Postgraduate project and second Honours project completed.	30 June 2017
3.1.6 2 papers published at APSA.	30 June 2018
3B Milestones	
3.2.1 Improved water holding capacity of pork by developing cost-effective processing technologies, including modified chilling procedures and pre-slaughter interventions. 2 papers published at APSA. First Honours student in subprogram recruited.	30 June 2014
3.2.2 Fresh Australian pork with improved display life and colour stability achieved by supplementing pigs with natural products. First honours project completed.	30 June 2015

Program 3 Milestones		
3.2.3	2 papers published at APSA. Second Honours student recruited.	30 June 2016
3.2.4	Second Honours project completed.	30 June 2017
3.2.5	2 papers published at APSA.	30 June 2018
3B Milestones		
3.3.1	Human health models for prostrate, bowel and colon cancer established. New value added pork products that benefit the health of target domestic & export consumers. 2 papers published at APSA and at least 1 at Nutrition Society meeting. First postgraduate student recruited.	30 June 2015
3.3.2	Demonstrate that Vitamin B5 derivatives present in pork can lower low-density lipoprotein, triglyceride levels and total cholesterol of humans. Pork Nutritional and Health information packages developed for health professionals. Demonstrate the effects of the nutrients in pork on the rate of digestion and absorption on satiation of people. Define the longer term benefits of high protein, high pork diets on cardio-metabolic health and weight maintenance. 2 papers published at APSA	30 June 2016
3.3.3	Postgraduate project completed At least 2 papers published at Nutrition Society meeting. Define the role of high protein, high pork meals in the control of postprandial glucose responses and body composition of people with Type 2 diabetes. 2 papers published at APSA.	30 June 2018
3.3.4	Demonstrate the role of pork in children's diets. Understand the mechanisms and synthesis of haemoglobin. Updated Pork Nutritional and Health information packages for health professionals developed and distributed.	30 June 2019
3C Milestones		Due date
3.4.1	Define High Integrity Australian pork's quality attributes. Define the relative importance of consumer drivers and how the perception of Australian pork products differs in different markets.	30 June 2014
3.4.2	New tools developed for the mapping and assessment of behaviour of the general public and consumers towards "High" Integrity pork production systems. First honours student recruited.	30 June 2015
3.4.3	Models developed that define domestic and export opportunities, in food service and/or retail segments, for Australian pork and pork products. First Honours project in the subprogram completed. At least 1 paper published at APSA	30 June 2016
3.4.4	Re-mapping and assessment of behaviour of the general public and consumers towards "High Integrity" pig production systems.	30 June 2017
3.4.5	At least 2 papers published at APSA.	30 June 2018

Contacts

Program Manager

Dr Darryl D'Souza darryl.dsouza@australianpork.com.au 02 6285 2200

Subprogram Managers

3A - Prof. Frank Dunshea

fdunshea@unimelb.edu.au

3B - Assoc Prof Karen Charlton

karenc@uow.edu.au

3C- Ms Heather Channon

heather.channon@australianpork.com.au 0423 056 045

Program 4 - Carbon-Conscious Nutrient Inputs and Outputs

Background

Program 4 will develop commercially viable feeding and effluent management systems for pig production that significantly reduce the net carbon footprint whilst maintaining production efficiency. In particular, the research program will establish pork production systems that are carbon neutral through novel use of nutrient sources such as algae. The research program will transform the Australian pig industry to specifically address critical environmental and economic issues that confront its sustainability.

Research will cover three core areas:

4A - Future Feeds for Future Needs will reduce competing demand on feed grains by establishing commercial quantities of algae products that meet the nutrient requirements of pigs. This program will also facilitate replacement of 10% of existing feed with ingredients that have been derived from waste streams. Two sources of algal products will be investigated - algae specifically grown using nutrients from piggery waste streams and processed on farm and algae or co-products that are derived from large scale production involved with industrial CO₂ mitigation or biodiesel production.

4B - Enhanced Use of Traditional Protein and Energy Sources will build on specific outcomes from the current Pork CRC including development of real-time near infra-red analysis of feed ingredients and better use of this information in new plant breeding programs. Further development of innovative processing methods will improve the nutritional yield from ingredients.

4C - Carbon-Neutral Pork Production will involve highly novel research to maximise methane production from effluent ponds so that collection and use of gas is economically viable. Alternative approaches to waste management will also be studied to develop solid-waste pork production systems that mitigate carbon outputs.

Program Output Milestones

Program 4 Milestones		
4A Milestones		
4.1.1	Desk top studies and reviews conducted to determine the feasibility and economics of various algae production systems. Recruit first postgraduate student.	30 June 2012
4.1.2	Identification and selection of algae species that most closely match the nutrient requirements of pigs.	30 June 2013
4.1.3	Collaboration with commercial partners to identify and examine suitability for pigs of algae produced from industrial systems relying upon waste water and CO ₂ capture.	30 June 2014
4.1.4	Pilot algae production systems established on piggeries. Complete first postgraduate project. Recruitment of second postgraduate student.	30 June 2015
4.1.5	5 papers published at APSA.	30 June 2016
4.1.6	Established systems for growing, harvesting and processing algae for inclusion in pig diets.	30 June 2017
4.1.7	Commercial "non-piggery" algae production systems that produce algae suitable for inclusion in pig diets. Complete second postgraduate project. 5 papers published at APSA.	30 June 2018
4.1.8	Commercial algae production systems established on several piggeries that produce algae for pig diets and/or successfully treat piggery effluent.	30 June 2019
4B Milestones		
4.2.1	Postdoctoral fellow appointed in plant breeding.	30 June 2012
4.2.2	New cereal grain variety commercially released. Recruitment of first postgraduate student.	30 June 2013
4.2.3	New pulse variety commercially released.	30 June 2014
4.2.4	First postgraduate project in plant breeding completed. Second postgraduate student recruited.	30 June 2016
4.2.5	At least 1 new cereal grain variety released.	30 June 2017

Program 4 Milestones		
4.2.6	New pulse variety commercially released. 5 papers published at APSA.	30 June 2018
4.2.7	Second postgraduate project completed.	30 June 2019
4B Milestones		
4.3.1	Establish the key drivers for grain growers to grow feed grains for the pork industry.	30 June 2012
4.3.2	Real-time NIR technology used on-line in commercial situation. Enhanced NIRS calibrations for cereal grains, including corn.	30 June 2013
4.3.3	Robust NIRS calibrations for nutritional quality accepted by the feed milling industry.	30 June 2014
4.3.4	Effective and efficient supply chain system established for triticale in particular regions in southern Australia. Feed grain beginning to be traded on nutritional quality aspects.	30 June 2015
4.3.5	Effective supply chain system operational in NSW/Qld for field peas. 3 papers published at APSA.	30 June 2016
4.3.6	The purchase of at least 50% of the feed grains by the feed and pork industries will be on nutritional quality basis.	30 June 2017
4.3.7	Several effective supply chain systems established for the efficient purchase of feed grains. 3 papers published at APSA.	30 June 2018
4B Milestones		
4.4.1	Fractionation studies of grains and pulses established. First postgraduate student in the subprogram recruited.	30 June 2013
4.4.2	Influence of particle size homogeneity and moisture integrity of grains on milling efficiency and pig performance established.	30 June 2014
4.4.3	Novel feed processing methods to improve nutritional value by up to 10%. Recruitment of second postgraduate student in the subprogram	30 June 2015
4.4.4	At least 1 new feed ingredient established by innovative processing technology. First postgraduate project in feed processing completed. 5 papers published at APSA.	30 June 2016
4.4.5	Novel feed processing methods established in commercial feed mills.	30 June 2017
4.4.6	Second postgraduate project completed. 5 papers published at APSA.	30 June 2018
4C Milestones		
4.5.1	Appoint post doctoral fellow in methane production in anaerobic ponds.	30 June 2012
4.5.2	Establish pilot/demonstration sites for carbon reduction and greenhouse gas mitigation studies. Recruitment of first postgraduate student in the subprogram	30 June 2013
4.5.3	Strategies to maximise methane production from anaerobic ponds.	30 June 2014
4.5.4	On-farming training begins in revised effluent management systems. Run LCA to confirm expected reductions in greenhouse gas emissions. Recruitment of second postgraduate student in the subprogram	30 June 2015
4.5.5	Viable system established for production, capture and utilisation of methane from anaerobic ponds. First postgraduate project completed. 5 papers published at APSA.	30 June 2016
4.5.6	Strategies established in solid waste and aerobic systems to minimise greenhouse gas emissions.	30 June 2017
4.5.7	Second postgraduate project completed. 5 papers published at APSA.	30 June 2018
4.5.8	Run LCA to confirm expected reductions in greenhouse gas emissions.	30 June 2019

Contacts

Program Manager

Dr Rob Wilson rob@robwilsonconsulting.com.au 0418 486 141

Subprogram Managers

4A - Mr David Henman dhenman@rivalea.com.au

4B - Dr John Black jblack@pnc.com.au

4C - Ms Janine Price janine.price@australianpork.com.au