

POULTRY
RESEARCH
FOUNDATION



THE UNIVERSITY OF
SYDNEY

ANNUAL REPORT 2012

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FOUNDATION OBJECTIVES

OBJECTIVES OF THE FOUNDATION

The objectives of the Poultry Research Foundation are to advise the Senate of the University of Sydney and the Vice-Chancellor on matters associated with poultry research, education and scholarship within the University of Sydney and to provide an interface between the Australian poultry and allied industries and the University.

In doing so, the Foundation shall increase the resources of the University by way of membership to the Foundation and utilising benefits given by members in provision of services and other non-financial contributions.

AIMS OF THE FOUNDATION

1. To provide an interface between the poultry and allied industries in Australia and the University of Sydney.
2. To undertake research of relevance to these industries.
3. To assist in the training of scientific and technical personnel to service the private and public sectors of these industries.
4. To act in an industrial liaison capacity.

PRIORITIES 2012

1. Develop links between the University of Sydney and the Poultry CRC
 - a. Research projects
 - b. Educational programs
 - c. Postgraduate scholarships
2. Develop research projects lead by the Chair of Poultry Science
3. Complete infrastructure maintenance of the Poultry Unit
4. Promote postgraduate opportunities within the Poultry Research Foundation
5. Organise the 2013 Australian Poultry Science Symposium

Management of the Foundation is vested in a Council which comprises the President, Deputy President, Director, Faculty of Veterinary Science Dean and DVC (External Relations) along with elected Industry Members from the categories of Governors and Executive Members, Honorary Governors and Ex Officio Members.

The administrative office and Research Unit are based at Camden.

Faculty of Veterinary Science
University of Sydney
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PRESIDENT'S REPORT

The Poultry Research Foundation truly is a confluence of industry need and technical aptitude. Industry need, as demonstrated by the range and relevance of projects undertaken and aptitude, in terms of facilities, personnel, skills and intellectual excellence.

The Directors report details the health status of the Foundation – it is thriving. The contribution by Aaron Cowieson cannot be praised too highly. His legacy will not just be the work completed during his time with us. Importantly, it will be a momentum that drives the Foundation into the future. There is work in progress and the facilities are booked in advance. The team is deep, talented and motivated to continue the good work. Our search for our next Director is greatly aided by the elevated profile of the Foundation and the Australian Poultry Science Symposium. We thank Aaron for all he has brought to the Foundation and the Australian Poultry Industry. We wish Aaron and his family every success and happiness in the future.

The Membership of the Poultry Research Foundation and attendance at the Australian Poultry Science Symposium both increased in recent years. Commercial sponsorship of

the Symposium and commercially funded research importantly add to the financial position of the Foundation. Vital funding by RIRDC, AECL and the poultry CRC continues as noted in the Director's Report.

Involvement of members in teaching activities via excursions and seminars add to the life and effectiveness of the Foundation. We thank the membership for their contribution and encourage others to get involved in future.

The mission of a viable poultry industry is to produce safe, ethical, healthy, affordable food. It is dynamic and exciting and thrives on innovation. Becoming a Member of the Poultry Research Foundation is committing to making a contribution. Your insight, your ideas are vital to the Foundation's success.

I thank everyone involved for an outstanding year.

Ms. Judy O'Keefe
April 2013

DIRECTOR'S REPORT

This will be my last report as Director of the PRF as I depart the Faculty in June 2013 to pursue new opportunities back in Scotland. Obviously I have mixed feelings about this situation and while my family and I look forward to our new life in Scotland and I am very excited by the new R&D role I will fulfil, we will miss our family and friends in Australia very much indeed. I am delighted however to be leaving the PRF in extremely good shape, both scientifically and financially (further detailed below) and I know that it will continue to evolve and excel long after my short tenure has passed. Sincere thanks go to all who have made my time as Director so enjoyable and fruitful. We can all be very proud of our PRF and the enormous positive contribution we continue to make to the poultry industry.

FACILITIES

PRF facilities continue to run at 100% occupancy in order to satisfy all the demands of student projects, large research projects and one-off collaborative studies for our membership. In 2012 the PRF turned away approximately \$150,000 of commercial and in confidence R&D income due to lack of space in our poultry sheds and laboratory.

Investment in the PRF facilities continues in 2012 with a \$26,000 new storage shed as infrastructure support for our deep litter trial facility and a new bomb calorimeter for \$40,000. Conversion of the old (disused) broiler shed to a free-range laying hen facility has cost an additional \$50,000. The PRF has also borne costs for ongoing repairs and maintenance to the deep litter shed (climate control, brooders), the feed mill (a \$26,000 new automated steam valve and software) and to the cage layer facility.

TEACHING

PRF staff continue to have substantial input into veterinary and veterinary bioscience degree programs. PRF staff co-ordinate 3 of the 4th year AVBS units of study (Feed Technology, Animal Health and Intensive Animal Industries) and all units have been extremely well received by students receiving USE scores of between 4-5. PRF staff also co-ordinate 1 unit of study in the BVSc and 1 unit of study in 3rd year AVBS. Dr. Wendy Muir also co-ordinates the entire 4th year honours project program. PRF staff also contribute to poultry practical classes in 1st year BVSc and 4th year AVBS. This year, PRF members have also become involved in teaching with Mr Tugrul Durali from Red Lea, hosting a free-range broiler excursion as part of Dr. Jeff Downings 4th year AVBS unit. Additionally, guest seminars were delivered to the 4th year AVBS students from Dr. Dave Cadogan from Feedworks and Dr. John Black (consultant to the Pork CRC) as part of the Feed Technology unit of study. Finally, Asian-Agribiz, a major international feed and agriculture publishing house are supporting the PRF and the Faculty via publication initiatives in the 4th year Feed Technology unit of study and an industry professional training course led by A/Prof Cowieson to extend poultry education to SE Asia.

MEMBERSHIP

PRF membership is at 24 (\$79,000 per annum income) and appears to have reached a plateau. Additional growth is possible via more active engagement of the laying hen, duck and game bird industries but approximately 80% of the Australian poultry industry is actively represented.

More engagement by our members in our student education (especially honours and PhD) has occurred in the past 6 months with 3-4 of our members who have not previously

sponsored research getting involved. DSM Nutritional Products, Biomin and RCI have all recently indicated their interest in supporting our research program. We have also been approached by Adisseo and Novus who would like to fund PhD projects in the PRF. This increased engagement is vital to the future of the PRF and to our students.

In order to promote the PRF within Australia and internationally we are working on marketing brochures to present research data, staff profiles and expertise. Some of the photography to support this initiative is presented within this report.

AUSTRALIAN POULTRY SCIENCE SYMPOSIUM

The 2012 APSS was the most successful on record (since its inception in 1989) with 250 delegates and almost 100 original communications. Sponsorship income was strong and feedback on the symposium has been excellent. Plans for the 2013 APSS are already at an advanced stage and we are already beginning to consider the 2014 APSS which is the 25th Anniversary Symposium.

In addition to the very successful APSS the PRF hosted several technical seminars throughout 2012. These included a joint PRF/American Soybean Association seminar where Bill Dozier, Professor of Poultry Science at Auburn University, USA, gave a series of talks on digestive physiology in avian species and also an RCI/PRF seminar on feed enzymes.

Assoc. Prof. Aaron J. Cowieson
April 2013

POULTRY RESEARCH FOUNDATION MEMBERS

GOVERNORS	EXECUTIVE MEMBERS	ASSOCIATE MEMBERS
Baiada	AB Mauri Technology Group	Alltech Biotechnology
Inghams	AB Vista Feed Ingredients	Aviagen
	ADM Australia	BEC Fed Solutions
	Feedworks	Biomim Australia
	DSM Nutritional Products	Bio Processing Australia
	Elanco Animal Health	Cordina Chicken Farms
	Evonik Degussa Australia	Dox-al Australia
	Novus Nutrition	International Animal Health
	Pfizer Australia	Kemin (Aust)
	Phibro Animal Health	The Egg Basket (Sales)
	Ridley Agriproducts	
	Weston Animal Nutrition	

HONORARY GOVERNORS

Emeritus Professor E. Frank Annison

Dr. Balkar S. Bains

Dr. Derick Balnave

Professor Wayne Bryden

Mr. John Darling

Mr. Ern Newton

Dr. Ron MacAlpine

INVITEES

The Deans of Agriculture and Natural Resources

The President, World's Poultry Science Association (Australian Branch)

The Program Manager, RIRDC Chicken Meat Program

The Program Manager, Australian Egg Corporation Ltd

A Representative, NSW Agriculture

A Representative, Poultry CRC

A Representative, Australian Egg Industry Association

The Executive Director, Australian Poultry Industry Association

PRESIDENT	Ms. Judith O'Keeffe
DEPUTY PRESIDENT	Dr. David Cadogan
DIRECTOR	Assoc. Prof. Aaron Cowieson
DEPUTY DIRECTOR	Dr. Peter Groves

GENERAL MEMBERS	UNIVERSITY COUNCIL MEMBERS
ADM Australia Pty Ltd Mr. John McLeish	Executive Dean - Faculties of Science Prof. Rosanne Taylor
Alltech Biotechnology Dr. Andreas Kocher	DVC (External Relations) Prof. Jill Trehwella represented by Ms. Shauna Jarrett
Aviagen Australia Pty. Limited Mr. Peter Hanna	The Pro-Dean - Faculty of Veterinary Science Prof. David Emery
Baiada Poultry Pty. Limited Mr. Greg Hargreave	Associate Dean for Research - Faculty of Veterinary Science Assoc. Prof. Peter Williamson
Evonik Degussa Australia Mr. Ilia Mendeleil	
Inghams Enterprises Pty Ltd Mr. Greg McDonald	
Phibro Animal Health Mr. Greg Manna	
Poultry CRC Dr. Tim Walker	
WPSA President Assoc. Prof. Juliet Roberts	

POULTRY
RESEARCH
FOUNDATION
COUNCIL

POULTRY RESEARCH FOUNDATION STAFF AND STUDENTS

ACADEMIC STAFF

Assoc. Prof. Aaron Cowieson

BTechnol(Hons), PGDip, MSc, PhD
(Aberdeen)
Director Poultry Research Foundation

Dr. Peter Groves BVSc,
MACVSc(Epidemiology), PhD (Sydney)
Deputy Director Poultry Research
Foundation

Dr. Wendy Muir BScAgr, PhD
(Sydney), GradDipEd (UNE)
GradCertEducStud(Higher Education)

Dr. Jeff Downing WDA (Wagga
Agr. Col.), BSc, PhD (Macquarie),
GradCertEducStud(Higher Education)

Dr. Greg Cronin BAgSc, MAgSc
(Melbourne), PhD (Wageningen NL),
GradCertEducStud(Higher Education)

POSTDOCTORAL RESEARCH ASSOCIATES

Dr. Yumin Bao BAgSc, MAgSc (Inner
Mongolia), PhD (Armidale)

Dr. Stuart Wilkinson BScAgr,
MScVetSc, PhD (Sydney)

Dr. Mini Singh BScGen (India),
MScVetSc, PhD (Sydney)

HONORARY RESEARCH FELLOWS

Adjunct Assoc. Prof. Peter Selle
BVSc, PhD (Sydney)

FOUNDATION STAFF

Mrs. Jo-Ann Geist

Administrative Officer

Mr. Benjamin Geist

Assistant Administrative Officer

PROJECT MANAGEMENT STAFF

Mrs. Joy Gill

Mrs. Melinda Hayter

PROJECT SUPPORT STAFF

Ms. Kate Dehon

Mr. Todd Gill

Ms. Gina Attard

Ms. Mary Tran

Mr. Don Nicholson

Mr. Duwei (Wade) Chen

POSTGRADUATE & MASTERS STUDENTS

Ms. Emma Bradbury – Ca, P and
phytase and the effects on broiler
welfare.

Ms. Linda Browning – Vitamin D, Ca, P
and phytase in poultry

Mr. Tugrul Durali – Free range broiler
production

Ms. Sonia Yun Liu – Starch and protein
digestion kinetics in broilers

Ms. Kate Hartcher – Effect of rearing
conditions on the development of
feather-pecking behaviours in free-
range laying hens

Mr. Dean Powell - Investigating the
effect of nutritional status on chicken
satellite cell fate, proliferation and
differentiation and their implications on
muscle development

HONOURS STUDENTS

(CONDUCTING THESIS PROJECTS
UNDER THE SUPERVISION OF THE
POULTRY RESEARCH FOUNDATION)

Ms. Jessica Edington (BAnVetBioSc)
(Supervisor: Cowieson)

'Comparative performance of free
range and conventionally reared
broilers'

Mr. Chris Kostrzewa (BAnVetBioSc)
(Supervisor: Muir/Groves)

'Leg weakness in broilers'

Ms. Shenara Somasundaram

(BAnVetBioSc) (Supervisor: Downing)
'Alleviating heat stress in commercial
ducks'

Ms. Gabriella Vogt (BAnVetBioSc)

(Supervisor: Cronin)
'Welfare of free range laying hens'.

Ms. Melissa Watson (BAnVetBioSci)

(Supervisors: Cronin)
'Environmental enrichment during rearing
and feather pecking in laying hens'

Ms. Christine Wu (BAnVetBioSci)

(Supervisors: Cowieson)
'Calcium and phosphorus appetite
and geometric framework in chicken
nutrition'

Mr. Hamish Irvine (BAnVetBioSci)

(Supervisors: Downing)
'Alleviating transport stress in
commercial ducks'

EXTERNAL PhD STUDENTS

(co-supervised by Assoc. Prof. Aaron
Cowieson)

Ms. Ruvini Mutucumarana – Massey
University, NZ



STAFF MEMBER- SHIPS AND AFFILIATIONS

MEMBERSHIPS

Assoc. Prof. Aaron Cowieson:

Member: Worlds Poultry Science Association

Member: Poultry Science Association

Member: Embrex Fundamental Science Award Committee

Chair: Australian Poultry Science Symposium Organising Committee

Associate Editor: Animal Production Science

Member: Nutrition Society

Dr. Peter Groves:

Vice President: Australian Veterinary Poultry Association

President: Commercial Poultry Veterinarians (an SIG of AVA)

Adjunct Senior Lecturer: Charles Stuart University - Department Agriculture & Veterinary Sciences

Adjunct Senior Lecturer: James Cook University - Veterinary Science

Member: RIRDC Chicken Meat Advisory Committee

Member: National Newcastle Disease Technical Working Group

Member: National Avian Influenza Vaccination Expert (NAIVE) group

Dr. Jeff Downing:

Member: Worlds Poultry Science Association

Member: Pork CRC Research and Development Committee

Member: Pork CRC Education Committee

Member: Australasian Pig Science Association

Dr. Wendy Muir:

Member: International Society of Mucosal Immunology

Member: Australian Poultry Science Symposium Organising Committee

Dr. Stuart Wilkinson

Member: Worlds Poultry Science Association

Member: Australian Poultry Science Symposium Organising Committee

Dr. Greg Cronin

Member: Editorial Advisory Board, Applied Animal Behaviour Science

Member: Australian Society for Animal Production

Associate of the Animal Welfare Science Centre

Dr. Yumin Bao

Member: Worlds Poultry Science Association

Adj. Assoc. Prof. Peter Selle::

Associate Editor: Poultry Science

Member: Australian Poultry Science Symposium Organising Committee



CONFERENCE ATTENDANCE, PRESENTA- TIONS, ACKNOWL- EDGEMENTS AND AWARDS

CONFERENCE ATTENDANCE AND PRESENTATIONS BY PRF STAFF AND STUDENTS

Australian Poultry Science Symposium -

Sydney, Australia, February 2012
Presentations by Peter Groves, Peter
Selle, Stuart Wilkinson, Yumin Bao, Greg
Cronin, Tugrul Durali, Sonia Yun Liu,
Linda Browning and Emma Bradbury.
Attended by Aaron Cowieson, Wendy
Muir, Jeff Downing, Mini Singh, Kate
Hartcher.

**Feedworks Animal Nutrition and
Production Systems Workshop -**
Cooloom, Australia, September 2012
Presentations by Stuart Wilkinson,
Sonia Yun Liu and Peter Selle.

Feed QC Poultry Conference -
Bangkok, Thailand, July 2012
Presentation by Aaron Cowieson.

DSM Technical Seminar -
Sydney, Australia, July 2012
Presentation by Aaron Cowieson.

Arkansas Nutrition Conference -
Arkansas, USA, September 2012
Presentation by Aaron Cowieson.

**New Zealand Poultry Industry
Conference -**
Hamilton, New Zealand, October 2012
Presentation by Aaron Cowieson and
Tugrul Durali

2nd International Phytase Summit -
Rome, Italy, December 2012
Presentations by Aaron Cowieson and
Stuart Wilkinson.

**Joint Conference of the New Zealand
& Australian Societies of Animal
Production -**
Lincoln, New Zealand, July 2012
Presentation by Greg Cronin

Feed Grains Partnership (Sorghum) Meeting -

Brisbane, Australia, December 2012
Presentations by Sonia Yun Liu and
Peter Selle.

**Department of Plant and Food
Sciences Seminar (Faculty of
Agriculture and Environment) -**
Sydney, Australia, September 2012
Presentation by Peter Selle

Pig Feed Quality Conference -
Ho Chi Minh City, Vietnam
Presentation by Stuart Wilkinson

Poultry Information Exchange -
Gold Coast, Australia, May 2012
Workshop by Peter Groves.
Presentation by Jeff Downing

**Australasian Veterinary Poultry
Association Scientific Meeting -**
Gold Coast, Australia, May 2012
Presentation by Peter Groves

**ISAE (International Society for Applied
Ethology) Australasian Region
Meeting -**
Melbourne, Australia, October 2012
Presentations by Greg Cronin, Emma
Bradbury and Kate Hartcher

2012 Post-Graduate Conference -
Sydney, Australia, November 2012
Presentation by Kate Hartcher

ACKNOWLEDGMENTS AND AWARDS

Thankyou to all of our research partners
who funded projects and student
scholarships throughout 2012.

- RIRDC
- Poultry CRC
- AECL
- Feedworks

Australian Poultry Award 2012 - Won
by Dr. Peter Groves

The 23rd Annual Australian Poultry Science Symposium was held 19th-22nd February, 2012. The Poultry Research Foundation in conjunction with the World's Poultry Science Association (Australian Branch) organised this combined meeting which presented subjects of "Free range compared with conventional poultry production" and "Feed additives: Mythbusters" along with hot topic sessions on "Laying hens: Current issues and opportunities" and "Retailer pressure and global commodity markets - a ticking time bomb". 2012 also saw a special address by the Global Presidents of the WVPA and the WPSA. We had 9 internationally acclaimed speakers and 5 local authorities who presented their recent research outcomes and concepts for a crowd of approximately 245 attendees. In total, there were 63 contributed and invited speaker papers presented along with an electronic poster session containing another 16 presentations. We introduced the e-posters and a 2 Short Communication sessions (5 minute presentations) to allow us to be able to present all the submitted papers that we recieved.

INVITED SPEAKERS:

Dr. Mamduh Sifri – ADM

Mr. Nan-Dirk Mulder – Rabobank

Professor Birger Svihus – Norwegian University of Life Sciences, Norway

Dr. Brook Humphrey – Cargill Animal Nutrition, USA presented by Dr. Eugene Roura - University of Queensland

Dr. Juha Apajalahti – Alimetrix, Finland

Professor Michael Kidd – University of Arkansas, USA

Dr. Michael Bedford – AB Vista, UK

Dr. Greg Siragusa – Danisco, USA

Dr. Trevor Bagust – Global President WVPA, Australia

Dr. Robert Pym – Global President WPSA, Australia

Mr. James Kellaway – Australian Egg Corporation Limited, Australia

Dr. Michael Elliot – A & E Nutrition Services, USA

Dr. Ian Lean – SBS Scibus, Australia

Mr. Dean Smith – Rabobank, Australia

Sponsorship of the APSS 2012 was kindly supported by:

Invited Speaker Sponsors	AB Vista Feed Ingredients AECL Egg Program ADM International Danisco Poultry Research Foundation Provimi America Latina RIRDC Chicken Meat Program
Gold Sponsors	DSM Nutritional Products Pty. Limited Feedworks / Danisco Poultry CRC
Silver Sponsors	AB Vista Alltech Biotechnology Pty. Ltd BEC Feed Solutions Evonik Degussa Australia Pty. Ltd Kemin (Aust) Pty. Ltd Novus International Pty. Ltd Pfizer Animal Health
Bronze Sponsors	Aviagen Australia Pty. Ltd Biomim Australia Elanco Animal Health JEFO Australia Kemira Phibro Animal Health
Alternative Sponsors	Taylor & Frances

AUSTRALIAN POULTRY SCIENCE SYMPOSIUM 2012

FOUNDATION RESEARCH IN REVIEW

The Poultry Research Unit has been very active in both the broiler and layer research fields for more than 50 years here at Camden. Some major contributions to research and industry during this time have been in the areas of:

1. Amino Acid Digestibility Studies (RIRDC)
2. Modulation of lean tissue deposition by dietary fatty acids (RIRDC; ARC)
3. Development of a non-invasive test for stress in laying hens (RIRDC)
4. Mucosal immunity in chickens (RIRDC)
5. Nutritional and toxicological evaluation of transgenic plants (CSIRO Division of Plant Industry)
6. Application of feed enzymes (Industry)
7. Mycotoxins in poultry feeds (ADAB)
8. Egg Shell Quality (RIRDC)
9. Amino acid balance for heat stressed broilers (Industry)
10. Nutritional requirements of recently imported layer stock (RIRDC)

We will continue to serve the needs of research, industry and teaching over years to come.

CURRENT RESEARCH PROJECTS

ASSOC. PROF. AARON COWIESON:

1. Exploration of optimum calcium and phosphorus concentrations for broilers (RIRDC funded project) using a novel geometric and choice-feeding approach.
2. Assessing the anti-nutritional effects of phytate in poultry diets in collaboration with the Australian Synchrotron and the University of Sheffield, UK.
3. Prediction of the effects of carbohydrases and proteases in poultry feeds using nutritional geometry.
4. Additional 3 projects (RIRDC, AECL and Feedworks) for part support of the Directors position within the Faculty.
5. Improving the performance of free-range poultry (Poultry CRC)

DR. PETER GROVES:

RIRDC-CME Project No. 6193 "Effects of incubation differences on broiler chicken skeletal integrity" was completed in late 2012. This was an 18 month study working with Dr. Wendy Muir. The project looked at actual incubation temperature recordings using sensors attached to eggs in each incubator, measuring egg shell temperatures (EST). Variations in EST proved to be associated with changes in bone ash and serum ca and P levels at hatch. There was also an association between bone ash at hatch and later ability of the birds to stand in a Latency-To-Lie test at 6 weeks of age. The most interesting finding was that of time of hatch, which is controlled by incubation temperature to a large extent, and effects of the hatched chicks remaining in the incubator for some time. A further project following on from these findings has reached Full Proposal stage with RIRDC.

DR. WENDY MUIR:

1. RIRDC Chicken Meat Project No: PRJ-6193 "Effects of incubation conditions on broiler chicken skeletal integrity" was started in October 2011, with senior investigator Dr Peter Groves. Dr Groves has provided an outline of this project above.
2. Australian Poultry CRC Project – in association with Professor Sandra Velleman at Ohio State University and PhD student Dean Powell, "Investigating the effect of nutritional status on chicken satellite cell determination, proliferation and differentiation". Dean has spent this year in Dr Velleman's laboratory, establishing in-vitro assays, and then undertaking an assessment of the impact of nutrient status on satellite cell development.

DR. JEFF DOWNING:

Continued work on the following research projects in 2012:

1. RIRDC New Animal Industries- (Project No: PRJ 003776). 'Improving the production efficiency, welfare and processing of commercial ducks.' All studies have been completed and the final report is due end of April 2013. In 2012, a summer trial continued to revisit the use of electrolytes and betaine to alleviate the poor performance of ducks during high temperature. In winter, a trial investigating aspects of feather pecking was completed
2. The final report for AECL project US 108 was submitted in March 2012.

Work continues with funding from the Pork CRC on the induction of oestrus during lactation in sows.

DR. GREG CRONIN:

In 2012 Dr Cronin commenced the first experiment in a three year project funded by AECL to investigate factors in the rearing environment associated with the development of feather pecking in free range laying hens. The first experiment, which investigated the effects of beak trimming and environmental enrichment on the development of feather pecking, was completed in December. The experiment formed the main research component of Ms Kate Hartcher's post-graduate research project.

Greg is also conducting a research project funded by Australian Pork Limited and the Pork CRC to evaluate non-confinement farrowing/lactation housing systems for pigs.

DR. YUMIN BAO:

In 2012, Dr Bao continued investigation into prediction of the effects of carbohydrases and proteases in poultry feeds using nutritional geometry, with chief investigator Dr. Aaron Cowieson. Two experiments with total 32 dietary treatments were conducted to confirm and modify prediction equations and a review paper arising out of this study has been accepted for publication by World's Poultry Science Journal.

Yumin also organized and completed a commercial layer hen trial to study the effect of carbohydrates and protease

on egg production, demonstrating that feed enzyme addition may improve FCR regardless of feed apparent metabolisable energy levels.

DR. STUART WILKINSON:

In 2012, Dr Wilkinson continued working on the RIRDC funded project (PRJ 006015) exploring calcium and phosphorus requirements of broilers. Conducting the second in a series of experiments, Stuart oversaw a nutritional study investigating calcium and phosphorus intake targets in broilers. Based on the Geometric Framework model, a total of 19 dietary treatments were used to determine whether broilers prioritised intake of either calcium or phosphorus. Results of this study will be used to provide recommendations to industry on the appropriate dietary calcium and phosphorus concentrations. Three research papers are currently being prepared based on the results of this study.

Stuart has also commenced preliminary work on an AECL funded project (1US112) investigating the separate feeding of calcium. The first study is due to commence early 2013 and will investigate whether modern commercial layers have retained their calcium specific appetite.

DR. MINI SINGH:

A new Poultry CRC project, "Improving the performance of free-range poultry production" commenced in June 2012. The main objectives of the project are:

1. To establish the principle reasons for the performance gap between free-range and conventionally reared broilers and layers.
2. To evaluate a range of nutritional interventions that will reduce the magnitude of the performance gap.

Two studies were completed in 2012. The first was a 2x2 factorial deep litter shed trial with 1440 birds to determine the effects of AGP +/- diets in free-range vs. conventional systems and the interactions between these. Grass consumption was also measured and correlated to performance, ileal digestibility and nutrient evaluation. Gene expression analysis to identify biological pathways responsible for the production gap was performed

using Affymetrix gene chip array on 24 ileal tissue samples collected from contrasting birds based on their performance and range access. The second was a 6 x 2 factorial trial consisting of 576 birds to determine the effects of six levels of grass dilution in two different energy matrices on performance, digestibility and nutrient uptake. The results from these trials will indicate the underlying reasons for the production gap and the implications of grass consumption on free range poultry.

ADJ. ASSOC. PROF. PETER SELLE:

In 2012, Dr Selle continued his investigations into the sorghum conundrum or the sub-optimal/inconsistent performance of broiler chickens offered sorghum-based diets.

The RIRDC Chicken-meat project to investigate the effects of steam-pelleting temperatures of sorghum-based diets on growth performance and nutrient utilisation in broilers concluded in the middle of the year. Four papers arising out of the project have been published or accepted for publication in Animal Production Science and Animal Feed Science and Technology. It is anticipated that at least another four papers will be published in these or similar journals from the steam-pelleting temperatures project. However, a new RIRDC Chicken-meat project commenced in the middle of 2012 to evaluate the inclusion of a reducing agent (sodium bisulphite) in sorghum-based diets. Sodium bisulphite has the capacity to cleave disulphide cross-linkages. Their presence, especially in beta- and gamma-kafrin protein fractions located in the periphery of protein bodies in sorghum endosperm, are believed to be important limiting factors on protein and starch digestion. While sodium bisulphite is a reducing agent it is also an antioxidant and it appears that it has positive, direct effects on starch digestion in addition to its positive, direct effects on protein digestion. Overall, the progressive results of the sodium bisulphite project are very promising.

In addition, Peter Selle conducted several contract R&D projects for several client companies involving both feed enzymes and organic selenium supplements.



RESEARCH COLLABORA- TION AND INDUSTRY SERVICES

The PRF continues to collaborate with the Charles Perkins Centre and have a joint post-doctoral fellowship planned that will start in late 2012 or early 2013 to extend the Geometric Framework to broiler nutrition.

Collaboration also continues with the Australian Synchrotron in Melbourne and the University of Sheffield, England, on the chemistry of the interaction between phytate and protein.

A new collaborative relationship has been established between the PRF and the University of Maryland in the US. A/Prof. Aaron Cowieson and Dr. Stuart Wilkinson (USyd) are working on a joint project (calcium nutrition) with Prof. Roselina Angel (Maryland).

Further collaboration between A/Prof. Peter Selle and Dr. Tiago Santos (AB Vista Feed Ingredients – PRF member) exists where exploration into in vitro protein solubility of sorghum is underway. Sorghum is a shared interest of Prof. Bob Caldwell from the Faculty of Agriculture and the Environment and A/Prof. Selle is also collaborating with him and one of his PhD students to quantify disulphide bonds and free sulphydryl groups in sorghum.

A/Prof Cowieson and Dr. Wilkinson are collaborating with Dr. Joy Becker and the Faculty of Agriculture and the Environment on an ARC Linkage proposal involving sustainable aquaculture and hydroponics. One of the commercial partners (in cash contribution) is a PRF member.

Dr. Greg Cronin is collaborating with Prof. Paul Helmsworth and Dr. Jean Loup Rault (both from the University of Melbourne) on free-range laying hen behaviour and welfare.

Dr. Peter Groves is starting collaboration with Prof. Steve Walkden-Brown from UNE on Mareks Disease and is co-supervising two postgraduate students, including one at UNSW.

Dr. Wendy Muir is collaborating with Dr. Joanne Devlin (UMelb) on Salmonella vaccines and also with Prof. Sandra Velleman (Ohio State University) on meat quality.

Dr. Jeff Downing is collaborating with Dr. Anthony Keyburn (CSIRO) on a CRC grant on a new test for poultry welfare.

COMMUNICATIONS

PUBLICATIONS FROM PRF STAFF AND STUDENTS FOR 2012:

Cronin GM, Barnett JL, Storey TH, Thomson PC & Hemsworth PH (2012) The relationship between pre-laying activity and corticosterone concentrations, and interpretation for laying hen welfare. Proceedings of the Australian Poultry Science Symposium, **23**: 168-171.

Cronin GM, Barnett JL & Hemsworth PH (2012) The importance of pre-laying behaviour and nest boxes for laying hen welfare: a review. Animal Production Science, **52**: 398-405.

Bradbury EJ, Wilkinson SJ, Cronin GM, Walk CL & Cowieson AJ (2012) The effect of marine calcium source on broiler leg integrity. Proceedings of the Australian Poultry Science Symposium, **23**: 85-88.

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Groves PJ, Pavic A, Sharpe SM & Cox JM (2012) Vaccination as an aid to control Salmonella in meat chickens and egg layers. Proceedings of the Australian Veterinary Poultry Association Conference, Gold Coast Convention Centre, Broadbeach, Queensland, Pp 37-38.

INVITED PRESENTATIONS FROM PRF STAFF AND STUDENTS IN 2012:

Cowieson AJ (2012) Feed energy and the nutritional geometry of macronutrients for poultry. **Feed QC Poultry Conference, Bangkok, Thailand, July 2012.**

Cowieson AJ (2012) Feed enzymes – current trends and technology. **DSM Technical Seminar, Sydney, NSW, July 2012.**

Cowieson AJ (2012) Enzymes beyond phytase. **Arkansas Nutrition Conference, Arkansas, USA, September 2012.**

Cowieson AJ, Wilkinson SJ, Bradbury EJ & Bedford MR (2012) Exploration of the interactions between calcium and phosphorus in broiler nutrition using nutritional geometry. **New Zealand Poultry Industry Conference, Hamilton, NZ, October 2012.**

Cowieson AJ, Masey-O'Neill HV & Bedford MR (2012) Modelling calcium and phosphorus requirements of poultry. **2nd International Phytase Summit, Rome, Italy, December 2012.**

Bedford MR & Cowieson AJ (2012) Superdoing phytases – constraints on phytate destruction, benefits of phytate destruction from a theoretical and mechanistic viewpoint. **2nd International Phytase Summit, Rome, Italy, December 2012.**

Cronin GM, Barnett JL & Hemsworth PH (2012) The importance of pre-laying behaviour and nest boxes for laying hen welfare: a review. **Joint Conference of the New Zealand & Australian Societies of Animal Production, Lincoln, New Zealand, July 2012**

Groves PJ (2012) Free range poultry meat industries and health challenges in Australia. **Australian Veterinary Poultry Association Conference, Gold Coast Convention Centre, Broadbeach, Queensland, May 2012**

Groves PJ, Pavic A, Sharpe SM and Cox JM (2012) Vaccination as an aid to control Salmonella in meat chickens and egg layers. **Australian Veterinary Poultry Association Conference, Gold Coast Convention Centre, Broadbeach, Queensland, May 2012**

Wilkinson SJ, Newman RE & Downing JA (2012) The importance of dietary fatty acids: A perspective on fatty acid balance in pig production. **Pig Feed Quality Conference, Ho Chi Minh City, Vietnam, March 20-21 2012.**

Browning LC, Vitamin D in laying hens. **DSM Technical Seminar, Sydney, NSW, July 2012.**

Wilkinson, S.J. & Cowieson, A.J. (2012) Animals eat protein not carbs. **Feedworks conference, Coolum, QLD, Australia, September 12-15 2012.**

Wilkinson SJ & Downing JA (2012) Omega 3 fatty acids and the importance in productivity. **Feedworks conference, Coolum, QLD, Australia, September 12-15 2012.**

Durali T (2012) Free Range Poultry Production in Europe, Australia and New Zealand. **New Zealand Poultry Industry Conference, Hamilton, NZ, October 2012.**

Downing JA (2012) Barn, Free Range and Cage systems – Where's all the stress? **Poultry Information Exchange, Gold Coast, Australia, May 2012**

Selle PH (2012) Sorghum: an enigmatic grain for chicken-meat production. **Department of Plant and Food Sciences Seminar (Faculty of Agriculture and Environment), September 2012**

Liu, SY (2012) The Tai Chi of starch and protein digestion dynamics in poultry. **Feedworks Conference, Coolum, QLD, Australia, September 2012**

Selle, PH (2012) Phytate and Phytase: A personal perspective of the past, present and phuture. **Feedworks Conference, Coolum, QLD, Australia, September 2012**

Liu, SY (2012) Asynchronous absorption of starch and protein (N) in sorghum-based broiler diets. **Feed Grains Partnership (Sorghum) Meeting, Brisbane, December 2012.**

Selle PH (2012) Characteristics of grain sorghum that impact on its nutritive value for (pigs and) poultry. **Feed Grains Partnership (Sorghum) Meeting, Brisbane, December 2012.**

Selle PH (2012) Effects of pelleting and pelleting temperatures on the nutritional value of sorghum for broilers. **Feed Grains Partnership (Sorghum) Meeting, Brisbane, December 2012.**

In 2012, we have continued to gain momentum under the leadership of Assoc. Prof. Aaron Cowieson, our membership base has steadied but our outside industry and membership trials have kept everyone very busy.

You will note from the following income statements and balance sheet, that we again made another surplus for 2012 of \$109,058. This is due largely to the increase in trial work for our members and industry partners.

Of course along with increased income comes increased expenditure to cover the associated costs. Costs within the PRF have risen substantially since 2009/10 due to an increase in student and staff numbers and research projects. Furthermore there was essentially no investment in PRF infrastructure from 1999-2009. The new feed mill (commissioned in August 2010) was the first significant investment since the mid/late 1990s. In 2012, PRF again spent a significant amount of money upgrading equipment and facilities as outlined in the director's report. The graph below shows income and expenditure for the PRF from 1990 to 2012.

The increase in the salary figure over 2012 can also be attributed to the our rapid growth. The figures shown reflect the administrative officer position along with the new assistant administration position, part of the director's salary, postdoctoral positions and some casual labour (support staff) required for the additional workload of the large number of trials that were completed in 2012.

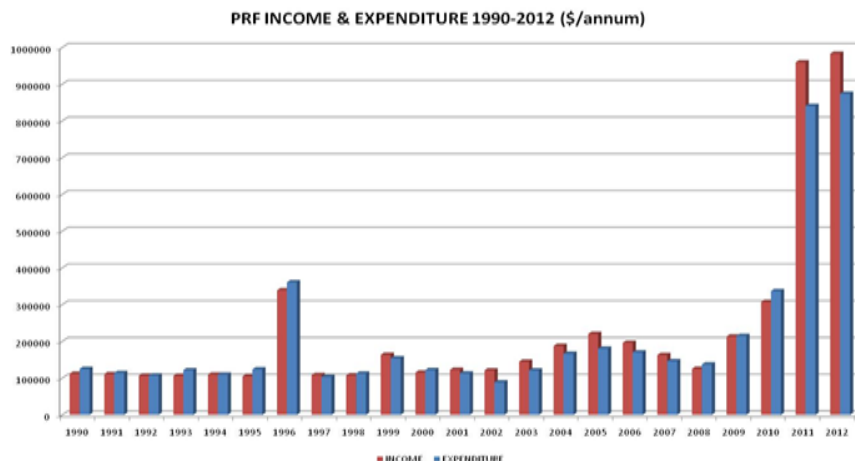
You will observe a considerable increase in our Travel, Conferences and Entertainment expenditure for 2012. As per Note 4 on the Balance Sheet, this included \$110,250 of costs associated with the Australian Poultry Science Symposium, which can be attributed to PRF sponsorship of 5 international invited speakers, as well as a record number of attendees. The remainder of this expenditure includes PRF staff presentations and attendance at a number of international conferences throughout 2012.

The other notable increase in expenditure is in the 'Contributions to University areas' – due to the University's reporting system, the monies that we transfer by Journal are recorded under this heading, so all the transfers that we made to the DRF for Leco Analysis for our projects throughout the year (\$11,060), are shown here, with the other \$1000 being for the PRF's sponsorship of the Post Graduate Conference.

Overall, 2012 has been another prosperous year and we hope that the growth within the PRF will continue into 2013 and beyond.

Mrs. Jo-Ann Geist
April 2013

FINANCIAL REPORT AND STATEMENTS

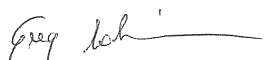


The University of Sydney
The Poultry Research Foundation

Income Statement
for the year ended 31st December 2012

	Notes	2012 \$	2011 \$
INCOME			
Business and Investment Income	2	488,854	186,666
Scholarships, Donations & Bequests		150,000	216,000
Memberships and Subscriptions		78,720	83,000
Symposium Income		150,823	177,868
Other Income		114,664	296,106
Total Income		983,061	959,640
EXPENDITURE			
Salaries	3	482,759	382,426
Consumables		84,676	49,709
Equipment and Repairs & Maintenance		119,156	221,475
Services and Utilities		13,272	47,544
Travel, Conferences and Entertainment	4	113,772	30,459
Contributions to University areas		12,060	1,572
Other Expenses		48,308	107,628
Total Expenditure		874,003	840,813
SURPLUS / (DEFICIT)		109,058	118,827
Accumulated Funds as at 1st January		268,185	149,358
ACCUMULATED FUNDS AS AT 31ST DECEMBER		377,242	268,185

I certify that the Income Statement and Balance Sheet of the Foundation have been prepared in accordance with the University's accounting practices and procedures. These Foundation accounts form part of The University of Sydney's financial reports which have been audited by the Auditor-General, New South Wales.



Greg Robinson
Finance Director
Divisions of Natural Sciences, Engineering & Information Technologies and Business
25th March 2013

The University of Sydney
The Poultry Research Foundation

Balance Sheet
as at 31st December 2012

	Notes	2012 \$	2011 \$
ASSETS			
Receivables		-	5,000
Funds Participating in University Pool Interest		-	263,806
Short Term Investments		<u>377,242</u>	<u>-</u>
Total Current Assets		<u>377,242</u>	<u>268,806</u>
TOTAL ASSETS		<u>377,242</u>	<u>268,806</u>
LIABILITIES			
Payables		-	621
Total Current Liabilities		<u>-</u>	<u>621</u>
TOTAL LIABILITIES		<u>-</u>	<u>621</u>
NET ASSETS		<u>377,242</u>	<u>268,185</u>
EQUITY			
Accumulated Funds		<u>377,242</u>	<u>268,185</u>
TOTAL EQUITY		<u>377,242</u>	<u>268,185</u>

Notes to the Financial Statements

1. Accounting Policies
 - The financial statements have been prepared on a modified accrual accounting basis.
 - All fixed assets are expensed in the year of purchase.
 - Employee entitlements for Long Service Leave are held centrally in the University's accounts.
 - The University (including the Foundations) is exempt from income tax.
2. Business and Investment Income includes \$276,600 outside trial work for Research Foundation and Industry members.
3. Salaries increase due to increase in casual labour to cover outside trial work and an additional staff working two days per week.
4. Travel, Conferences and Entertainment includes \$110,250 of costs associated with the Symposium and additional travel of students and staff for conferences.



The University reserves the right to make alterations to any information contained within this publication without notice. UPS50683

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