

POULTRY
RESEARCH
FOUNDATION



THE UNIVERSITY OF
SYDNEY

ANNUAL REPORT 2011

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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.

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
425 Werombi Road
Camden NSW 2570

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.

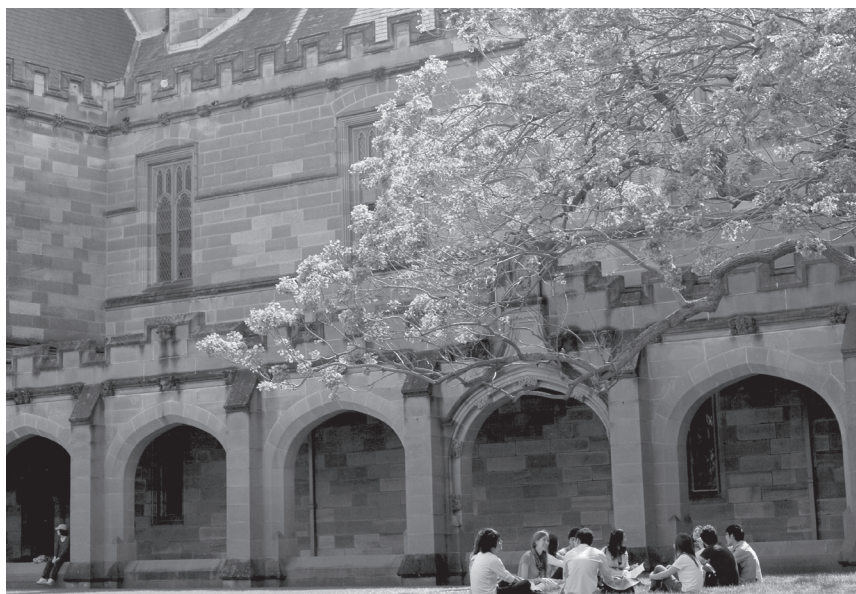
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PRIORITIES 2011

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 2012 Australian Poultry Science Symposium



PRESIDENT'S REPORT

On behalf of the foundation, I thank our former President Linda Browning for her commitment to this Foundation. We wish her every success as one of our PhD students. I also commend Aaron Cowieson on the impact he has made upon arrival.

The Poultry Research Foundation membership and budget are indeed, in a very healthy state. Membership increased during 2011, despite financial pressures experienced by many entities. This speaks volumes for the industry's perception of the importance of this Foundation. To re-iterate my words at our November meeting: Innovation is the antidote to margin decline.

Direct and indirect contribution by the membership to research is reflected by the progression, diversity and relevance of the PRF research programme.

The calibre of individuals we count amongst our dedicated group of academics, students, technicians and administrators provide us with every confidence that this success will be ongoing. By broadening activities in direct training and extension the value derived from the PRF is amplified.

The importance of RIRDC, AECL and the poultry CRC is acknowledged

by this foundation together with commercial sources of funding.

The Australian Poultry Science Symposium has grown in attendance, content in stature to stand alongside the best in the world. It is now a truly international event. Thank you to the PRF and WPSA members of the organizing committee for their generous contribution. Bravo to Aaron Cowieson, Jo-Anne Geist from our PRF for putting on a great show.

Dr Ron MacAlpine has been appointed an Honorary Governor of the Foundation in appreciation of his contributions. We look forward to enlisting his insight and perspective well into the future. We also thank Greg McDonald for stepping into the role of Governor representing Ingham Enterprises.

It is the mission of this Foundation to respond to the challenges that lie ahead, capitalize on opportunities, imagine and realize new concepts to take us forward. We all have a part to play.

Judy O'Keeffe
April 2012

DIRECTOR'S REPORT

2011 has been the first full year for me 'at the helm' of the PRF and it has been an exceptionally busy, challenging and exciting year. From a research point of view we have seen the initiation of five major new research projects funded by the RIRDC, AECL, Poultry CRC and our commercial partners as well as a continuance of an additional five projects that began in 2009-10. In response to this increase in research activity we have expanded our team with the recruitment of Dr. Yumin Bao, Dr. Mini Singh (both post-doctoral fellows), Ms. Mary Tran, Ms. Kate Dehon (full-time technical officers) and Ms. Gina Attard (part-time laboratory technician). The PRF team now consists of 22 members of staff (academic and general) and students (PhD or MSc) which is an increase from only 10 in 2009.

FACILITIES

Facilities in the PRF are running close to 100% occupancy in order to fulfil all obligations to our members and our research projects as well as teaching (BVSc and BSc). In 2011 the PRF invested \$130,000 in 192 new metabolism cages for the 'red brick building'. This investment was urgently required in order to replace old cages that were no longer compliant with AEC requirements or in a serviceable condition. This new facility is now world-class and we can run sophisticated nutrition and health experiments for our funding partners. In addition to this infrastructure investment the PRF has invested \$35,000 in a new FLIR thermal imaging camera, \$28,000 in a 50% share in a new LECO nitrogen analyser (shared with DRF), \$6,000 upgrade to our mineral analysis equipment and more than \$20,000 in ongoing repair and upgrade to our feed manufacturing facility. All of this investment has come directly from PRF reserves via

our membership. Maintaining a fit-for-purpose research farm for teaching and research is costly and it is thanks to the support of the PRF Council and membership that we are able to continue to provide this facility for the benefit of the Faculty and our students.

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 Dr. Santiago Ramirez from Farmpride and Mr. Tugrul Durali from Redlea, hosting a free-range laying hen and 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 Mr. Todd Middlebrook from Weston Animal Nutrition 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.

MEMBERSHIP

The PRF membership base has grown to a record high of 26 (approx. \$83,000 per annum income) and this covers a wide range of primary producers, feed companies and ancillary health and

nutrition businesses. It is anticipated that membership will reach 30 by the end of 2012, with a total income associated with this membership base of around \$100,000 per annum. This money is used to support the administrative and financial activities of the Foundation.

AUSTRALIAN POULTRY SCIENCE SYMPOSIUM

The premier poultry science conference in the Southern Hemisphere is the Australian Poultry Science Symposium, organised by the PRF in co-operation with WPSA (Australian Branch), and this symposium is ranked in the top 3 global poultry science conferences. The 2011 APSS was very successful with almost 190 delegates and a memorable social program centred round Taronga Zoo. The PRF are primarily responsible for the logistics, costs and scientific organisation of this meeting but the support of the Australian branch of WPSA and the program committee continues to be of vital importance.

A/Prof. Aaron J. Cowieson
April 2012

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
	Danisco Animal Nutrition	Biomim Australia
	DSM Nutritional Products	Bio Processing Australia
	Elanco Animal Health	Cordina Chicken Farms
	Evonik Degussa Australia	Dox-al Australia
	Novus Nutrition	Farmpride Foods
	Pfizer Australia	International Animal Health
	Phibro Animal Health	Kemin (Aust)
	Ridley Agriproducts	The Egg Basket (Sales)
	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
A representative, NSW Agriculture
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, Australian Egg Industry Association
The Executive Director, Australian Poultry Industry Association

PRESIDENT	Ms. Judith O'Keeffe
DEPUTY PRESIDENT	Dr. David Cadogan
DIRECTOR	Dr. Aaron Cowieson

GENERAL MEMBERS	UNIVERSITY COUNCIL MEMBERS
ADM Australia Pty Ltd Mr. John McLeish	Executive Dean – Faculties of Science Professor Rosanne Taylor
Alltech Biotechnology Dr. Andreas Kocher	DVC (External Relations) Professor Jill Trehwella represented by Ms. Shauna Jarrett
Aviagen Australia Pty. Limited Dr. Kim Huang	The Pro-Dean Faculty of Veterinary Science Professor David Emery
Baiada Poultry Pty. Limited Mr. Greg Hargreave	Associate Dean for Research Faculty of Veterinary Science Associate Professor 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 Associate Professor Juliet Roberts	

**POULTRY
RESEARCH
FOUNDATION
COUNCIL**

POULTRY UNIT STAFF AND STUDENTS

ACADEMIC STAFF

Dr. Aaron Cowieson BTechnol(Hons), PGDip, MSc, PhD (Aberdeen)

Director Poultry Research Foundation

Dr. P. Groves BVSc. (Sydney) MACVSc. (Epidemiology) PhD (Sydney)

Dr. W.I. Muir, B.Sc.Agr., PhD (Sydney), GradDipEd(UNE) Grad. Cert. Educ. Stud. (Higher Educ.)

Dr J.A. Downing, WDA (Wagga Agr. Col.), B.Sc., PhD (Macquarie) Grad. Cert. Educ. Stud. (Higher Educ. Sydney)

Dr G.M. Cronin, BAgrSc (Melb), MAgrSc (Melb), PhD (Wageningen NL), Grad. Cert. Educ. Stud. (Higher Educ.)

POSTDOCTORAL RESEARCH ASSOCIATES

Dr. Yumin Bao BAgrSc, MAgrSc (Inner Mongolia) PhD (Armidale)

Dr. Stuart Wilkinson BScAgr, MScVetSc PhD (Sydney)

HONORARY RESEARCH FELLOWS

Adjunct Professor P.H. Selle, B.V.Sc, PhD (Sydney)

FACULTY SUPPORT STAFF

Mrs. R.J. Gill

Mrs. M.E. Hayter

FOUNDATION STAFF

Mrs. J. Geist (Administrative Assistant)

SUPPORT STAFF

Ms. Kate Dehon

Mr. Todd Gill

Ms. Mini Singh

Ms. Mary Tran

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

HONOURS STUDENTS

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

Mr. Jason Tang (AnVetBioSc) (Supervisor: Cowieson)

'Choice feeding of Calcium'

Ms. Amber Chen (BAnVetBioSc) (Supervisor: Downing)

'The effects of strain, density and light on feather pecking in commercial ducks'

Ms. Michelle Chou (BAnVetBioSc) (Supervisor: Downing) The use of electrolytes and betaine as supplements to alleviate heat stress in ducks.

Mr. Tieu Trieu (AnVetBioSc) (Supervisor: Downing) Maintaining water balance to alleviate heat stress in ducks and improving carcass yield using electrolyte supplementation.

Ms. Hannah Lum (BAnVetBioSci) (Supervisors: Muir and Groves)

'The effect of altered incubation temperature on bone composition and leg weakness in a fast feathering dam Cobb line of broilers'

Ms. Kieu Tuyet Nga (Mary) Tran (BAnVetBioSci) (Supervisors: Muir and Groves)

'A comparative study investigating the influence of incubation conditions on commercial broiler leg integrity'

Ms. Hyo Jung (Jenny) Chun (BAnVetBioSci) (Supervisors: Muir and Groves)

'Incubation conditions and their effect on broiler leg health'

External PhD Students (co-supervised by Associate Professor Aaron Cowieson)

Ms. Ruvini Mutucumarana – Massey University, NZ

Ms. Gina Lehman – Virginia Tech University, USA

MEMBERSHIPS**AARON COWIESON:**

Member: Worlds Poultry Science
Association

Member: Poultry Science Association

Member: Embrex Fundamental Science
Award Committee

Chair: Australian Poultry Science
Organising Committee

Associate Editor: Animal Production
Science

PETER GROVES:

Vice President – Australian Veterinary
Poultry Association

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: Newcastle Disease Technical
Working Group

Member: National Avian Influenza
Vaccination Expert (NAIVE) group

JEFF DOWNING:

Member: Worlds Poultry Science
Association

Pork CRC Program 1 Expert Scientific
Group

Pork CRC Research and Development
Committee

Pork CRC Education Committee



CONFERENCE ATTENDANCE, ACKNOWLEDGEMENTS AND AWARDS

CONFERENCE ATTENDANCE

Australian Poultry Science Symposium

– Sydney February 2011 attended by Drs. Aaron Cowieson, Peter Groves, Wendy Muir, Peter Selle, Jeff Downing and Greg Cronin. Presentations were given by Drs. Aaron Cowieson, Jeff Downing, Peter Selle, Greg Cronin and Peter Groves.

Aaron Cowieson attended and presented at the following conferences during 2011:

Mid-Atlantic Nutrition Symposium, Baltimore, USA, March

Massey Technical Conference, Palmerston North, New Zealand, June

Recent Advances in Animal Nutrition Australia, Armidale, NSW, July

Feedworks Technical Symposium, Sydney, September

Colegio Brasileiro de Nutricao Animal, Campinas, Brazil, December

2011 Spatially Enabled Livestock Management Workshop, Surfers Paradise, September – attended by Dr Greg Cronin (presentation given).

2011 Australasian Pig Science Association (Adelaide) – attended by Dr. Jeff Downing

Peter Groves attended and presented at the following conferences during 2011:

Australasian Veterinary Poultry Association scientific meeting, Sydney, February

Australasian Veterinary Poultry Association scientific meeting, Melbourne, Vic, November

Workshop, Sydney, June 2010 – attended by Dr. Peter Groves

New Zealand Poultry Industry Conference, Palmerston North, NZ. October 2010 – attended by Dr. Peter Groves

Australasian Veterinary Poultry Association scientific meeting, Christchurch, NZ. October 2010 – attended by Dr. Peter Groves

ACKNOWLEDGMENTS & AWARDS

Monetary support is given to the Veterinary Science Postgraduate Conference annually.

The 22nd Annual Australian Poultry Science Symposium was held 14th-16th February, 2011. The Poultry Research Foundation in conjunction with the World's Poultry Science Association (Australian Branch) organised this combined meeting which presented valuable information under the theme of "Tangible solutions from innovative poultry science" this covered subjects of "Management of bird health through good nutrition" and "Opportunities and risks associated with modern genotypes" along with hot topic sessions on "Living with Sorghum" and "Coping with heat stress". We had 5 internationally acclaimed speakers and 6 local authorities who presented their recent research outcomes and concepts for a crowd of approximately 190 attendees. In total, there were 49 contributed and invited speaker papers presented.

Invited speakers were:

Dr. Ed Moran – Auburn University, USA

Dr. Rob Moore – CSIRO Livestock Industries, Australia

Dr. Roslina Angel – University of Maryland, USA represented by Professor William Saylor

Dr. Mario Penz – Provimi Brazil

Dr. Dominick Elfick – Aviagen International, Australia

Dr. Greg Parkinson – Livorno Consulting, Australia

Dr. Avigdor Cahaner – The Hebrew University, Israel

Dr. Mike Gidley – University of Queensland, Australia

Dr. Peter Selle – University of Sydney, Australia

Dr. Pierre Cronje – Cronje Consulting and Editing, Australia

Dr. Sebastian Borges – University of Tuiuti do Parana, Brazil

Dr. Peter Groves – University of Sydney, Australia

AUSTRALIAN POULTRY SCIENCE SYMPOSIUM 2010

Sponsorship of the APSS 2011 was kindly supported by:

Invited Speaker Sponsors	AECL Egg Program Poultry Research Foundation Provimi America Latina RIRDC Chicken Meat Program
Gold Sponsors	Australian Poultry CRC BEC Feed Solutions / Adisseo DSM Nutritional Products Pty. Limited Feedworks / Danisco
Silver Sponsors	ADM Australia Pty. Limited JEFO Australia
Bronze Sponsors	Alltech Biotechnology Pty. Limited Biomim Australia Elanco Animal Health Evonik Degussa Australia Pty. Limited Kemin (Australia) Kemira Pfizer Animal Health Steggles
Alternative Sponsors	Zootechny Pty. Limited

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

DR. 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.

Two new projects will commence shortly (Poultry CRC, free-range poultry) and AECL (calcium appetite in layers).

DR. PETER GROVES:

1. AECL Project No: 1US091 "Salmonella control in commercial layer flocks". This two year project looks at approaches to reduction in intestinal colonisation of layer chickens by Salmonella with the use of a live and an inactivated vaccine in various combinations. A follow on study was conducted looking at selected vaccination regimes which showed the most promise from the 2010 studies. One floor reared flock was established and birds were challenged at various ages to determine vaccine efficiency and duration of immunity. The challenge model showed an interesting age related phenomenon and is supportive of published results indicating relaxation of resistance in birds around point of lay. This may be extremely important in the epidemiology of salmonella colonisation and shedding from adult chicken flocks and has particular application to vaccination approaches. An association between serological response to vaccines and subsequent protection against colonisation was shown. Advice on the most cost effective approaches for Salmonella vaccine use by the egg industry in controlling Salmonella colonisation of hens.
2. RIRDC-CME Project No. 6193 "Effects of incubation differences on broiler chicken skeletal integrity" was initiated. This an 18 month study following on from the earlier

CRC-funded scoping study (2010), again working with Dr. Wendy Muir. The approach is to refine the actual incubation characteristics which are associated with observed bone integrity (hatch bone ash and serum Ca and P levels and later Latency To Lie findings. The Foundation has purchased four new small scale incubators to continue these studies and temperature sensors which can be attached to monitor individual egg shell temperatures during incubation were ordered.

DR. WENDY MUIR:

1. Meat and Livestock Australia project A.COP.0047: Strategies to identify and develop bioactive peptides in meat and bone meal (MBM):
2. Initial chick studies assessed the effect of in-ovo delivery of peptide fractions on early chick growth and performance. In the later part of 2010 and early 2011 the peptide fractions were delivered to young chicks during the early post-hatch period, and their subsequent growth and performance was assessed. The project was completed in June 2011, with a final report submitted and accepted by MLA.
3. "Salmonella control in commercial layer flocks" (AECL Project No: 1US091) with senior investigator Dr Groves is outlined under his report.
4. RIRDC Chicken Meat Project No: PRJ-006193 "Egg incubation and broiler leg weakness" was started in October 2011, with senior investigator Dr Peter Groves.

DR. JEFF DOWNING:

Continued work on the following research projects in 2011

1. A new RIRDC New Animal Industries- (Project No: PRJ 003776) commenced in 2010. 'Improving the production efficiency, welfare and processing of commercial ducks.'
2. Three studies were completed in 2011. The first was in summer continued to refine the use of electrolytes and betaine to alleviate

the poor performance of ducks during high temperature. The second looked at the provision of electrolytes and betaine prior to slaughter to prevent the loss of carcass water and the third investigate aspects of feather pecking in ducks.

3. AECL project US 108 continued throughout 2011. In this project the corticosterone concentration in egg albumen is being determined as a non-invasive measure of stress in hens maintained in different housing systems. The final report was released in 2012.

Work continues with funding from the Pork CRC on the induction of oestrus during lactation in sows. A new project in the second Pork CRC has just commenced.

DR. PETER SELLE:

In 2011, Dr Selle continued his investigations into the sorghum conundrum or the sub-optimal/inconsistent performance of broiler chickens offered sorghum-based diets. Peter was invited to present a paper on "The protein quality of sorghum" at APSS in February.

His role as the Principal Investigator of 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 continued throughout the year. The fourth of six feeding studies involving red, white and yellow sorghums generated interesting results and a paper arising out of this study has been accepted for publication by Animal Production Science. Steam-pelleting sorghum-based diets reduced their protein solubility and this was accompanied by increases in concentrations of disulphide bonds and decreases in concentrations of free sulphydryl groups. Moreover, protein solubility, disulphide bonds and free sulphydryl groups were appropriately correlated with N retention while steam-pelleting did not compromise N

digestibility along the small intestine. However, steam-pelleting markedly increased starch digestibility in the proximal jejunum but this response was far more pronounced in red than white sorghum with yellow sorghum being intermediate. Investigations into the reason(s) for this significant interaction between sorghum seed colour and starch digestibility following steam-pelleting are underway and will include analyses of the phenolic compounds in the three sorghums. In addition, it may be that starch digestibility, glucose absorption and insulin secretion has a greater impact on N retention than digestion/absorption of protein/ amino acids. Interestingly, phytate concentrations in the three sorghums were negatively correlated with N digestibility coefficients in the proximal jejunum and proximal ileum.

In addition, Peter Selle conducted several contract R&D projects for various client companies. Also a literature review of the prospects of the inclusion of a "single cell protein" in poultry diets was completed.

DR. GREG CRONIN:

Towards the end of 2011 Dr Greg Cronin was awarded funding from AECL for a three year project to investigate factors in the rearing environment associated with the development of feather pecking in free range laying hens. Refurbishment of a disused shed at the Camden Poultry Unit commenced in November 2011, to enable the conduct of replicated experiments with free range laying hens.

Also, in 2011 Greg Cronin was invited to present the John Barnett Memorial Lecture at the Australian and New Zealand Societies of Animal Production joint conference at Lincoln University (NZ) in July 2012. A review by Greg Cronin on the importance of pre-laying behaviour and nest boxes for layer hen welfare has been accepted for publication in the journal Animal Production Science.



RESEARCH COLLABORA- TION AND INDUSTRY SERVICES

The PRF carries out crucial research on behalf of our members throughout the year and this has continued so far in 2011 and is projected to continue through 2012. This consultancy provides some income for the PRF to support PhD projects and facilities but the real value is in the close alignment with our industry partners, without whom there would be no PRF. Indeed, in 2011 there was \$950,000 in income from our partners for research, consultancy and bequests. This contrasts to a long-term historical average of around \$120,000 per annum and is indicative of the considerable increase in activity in the past few years.

Prof. Stephen Simpson from the Faculty of Science and newly appointed head of the Centre for Obesity, Diabetes and Cardio-vascular Disease, is collaborating with the PRF in the area of Nutritional Geometry. This has culminated in a new ARC Linkage proposal for the next round (late 2012) on the extension of geometric framework models to avian nutrition. This project is of substantial interest to CODCD as well as PRF members. ARC Linkage partners have been identified and include Feedworks and Baiada Poultry.

PRF staff have recently received training by the Australian Centre for Microscopy. This training was financially supported by the PRF and will allow staff within the PRF to utilise this unique facility in their

research. Access to scanning electron microscopy, x-ray analysis and other techniques will greatly expand the value of PRF-led research.

Collaboration between the PRF and the Australian Synchrotron in Melbourne continue with x-ray crystallography and isothermal calorimetry approaches to explore the interactions between dietary phytate and protein.

Collaborations are also emerging between the PRF and Farm Animal Health with PRF staff contributing to a new ARC Linkage proposal in the area of fish nutrition and hydroponics.

Finally, the Pork CRC have approached the PRF in the past few months to discuss collaborative research in the area of feed processing for pigs. This has culminated in the offer of base funding to the PRF from the Pork CRC for use of the new pellet mill on the PRF research farm at Camden. This is currently under negotiation.

Dr Peter Groves continues in his advisory capacity to the RIRDC Chicken Meat Program. He also contributes to the National Newcastle Disease management technical steering committee and is a member of the National Avian Influenza Vaccination Expert group (NAIVE). He is also currently supervising an external Master of Philosophy through the University of NSW in association with Professor Julian Cox.

COMMUNICATIONS

PUBLICATIONS:

Publications from PRF staff and students for 2011:

Walk, C.L., Cowieson, A.J., Remus, J., Novak, C. & McElroy, A. (2011) **Effects of dietary enzymes on performance, goblet cells and apparent ileal amino acid digestibility of broilers exposed to a live coccidian oocyst vaccine.** *Poultry Science*, **90**: 91-98.

Selle, P.H., Ravindran, V., Cowieson, A.J. & Bedford, M.R. (2011) **Phytate and phytase.** In: *Enzymes in Farm Animal Nutrition 2nd Edition*. Bedford, M.R. & Partridge, G.G. (Eds.), CABI, UK. Pp. 160-205.

Faurschou-Isaksen, M., Cowieson, A.J. & Kragh, K.M. (2011) **Starch and protein-degrading enzymes – biochemistry, enzymology and characteristics relevant to animal feed use.** In: *Enzymes in Farm Animal Nutrition 2nd Edition*. Bedford, M.R. & Partridge, G.G. (Eds.), CABI, UK. Pp. 85-95.

Cowieson, A.J., Bedford, M.R., Ravindran, V. & Selle, P.H. (2011) **Increased dietary sodium chloride concentrations reduce endogenous amino acid flow and influence the physiological response to the ingestion of phytic acid by broiler chickens.** *British Poultry Science*, **52**: 613-624.

Bedford, M.R. & Cowieson, A.J. (2011) **Exogenous enzymes and their effects on intestinal microbiology.** In press.

Cowieson, A.J., Wilcock, P. & Bedford, M.R. (2011) **Super-dosing effects of phytase in poultry and other monogastrics.** *World's Poultry Science Journal*, **67**: 225-236.

Adeola, O. & Cowieson, A.J. (2011) **Opportunities and challenges in using exogenous enzymes to improve non-ruminant animal diets.** *Journal of Animal Science*, In press (Board Invited Review: available online).

Cowieson, A.J. & Cowieson, N.P. (2011) **Phytate and the thermodynamics of water.** *Proceedings of the Australian Poultry Science Symposium*, **22**: 22-25.

Liu, N. & Cowieson, A.J. (2011) **Effect of phytic acid and pH on the activation of chicken pepsinogen *in vitro*.**

Proceedings of the Australian Poultry Science Symposium, **22**: 84-87.

Gehring, C.K., Bedford, M.R., Cowieson, A.J. & Dozier, W.A. (2011) **Effects of corn source on the relationship between *in vitro* protein solubility and ileal nutrient digestibility.** *Proceedings of the International Poultry Scientific Forum*, Atlanta, GA, January 2011.

Olukosi, O.A., Bolarinwa, O., Cowieson, A.J. & Adeola, O. (2011) **The digestibility marker used and their inclusion level influence the magnitude of ileal amino acid digestibility response to phytase supplementation of a swine diet.** *Proceedings of the Joint Animal Meeting*, New Orleans, USA.

Cowieson, A.J., Wilkinson, S. & Bedford, M.R. (2011) **Exploiting calcium-specific appetite in broiler nutrition.** *Proceedings of the Mid-Atlantic Nutrition Symposium*, Baltimore, USA, March 2011.

Cowieson, A.J., Wilkinson, S. & Bedford, M.R. (2011) **Exploiting calcium-specific appetite in broiler nutrition.** *Mid-Atlantic Nutrition Symposium*, Baltimore, USA, March 2011.

Cowieson, A.J. (2011) **Exogenous enzymes and amino acid digestibility.** *American Society of Animal Science – David Baker Amino Acid Symposium*, Des Moines, USA, March 2011.

Cowieson, A.J., Gehring, C.K. & Dozier, W.A. (2011) **Know your maize.** *Massey Technical Conference*, Palmerston North, New Zealand, June 2011.

Cowieson, A.J. & Selle, P.H. (2011) **Environmental impact of low FCR in poultry.** *Recent Advances in Animal Nutrition*, University of New England, Armidale, NSW, July 2011.

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INVITED PRESENTATIONS:

Cowieson, A.J., Wilkinson, S. & Bedford, M.R. (2011) Exploiting calcium-specific appetite in broiler nutrition. Mid-Atlantic Nutrition Symposium, Baltimore, USA, March 2011.

Cowieson, A.J. (2011) Exogenous enzymes and amino acid digestibility. American Society of Animal Science – David Baker Amino Acid Symposium, Des Moines, USA, March 2011.

Cowieson, A.J., Gehring, C.K. & Dozier, W.A. (2011) Know your maize. Massey Technical Conference, Palmerston North, New Zealand, June 2011.

Cowieson, A.J. & Selle, P.H. (2011) Environmental impact of low FCR in poultry. Recent Advances in Animal Nutrition Australia, Armidale, NSW, July 2011.

Cowieson, A.J. (2011) Update on the effect of phytase on litter moisture in broilers. Feedworks Technical Symposium, Sydney, September 2011.

Cowieson, A.J. (2011) Phytases: mode of action and critical points. Colegio Brasileiro de Nutricao Animal, Campinas, Brazil, December 2011.

Cronin G.M. (2011) Spatially Enabled Livestock Management Workshop, Surfers Paradise, September 2011 – attended by Dr Greg Cronin (presentation given).

Selle P.H. (2011) A geometrical interpretation of whole grain feeding. Feedworks Poultry Workshop. 30th September, 2011. Brighton-Le-Sands, NSW

FINANCIAL REPORT AND STATEMENTS

2011 has certainly been a big year, welcome to our new PRF members, AB Mauri, Bio Processing Australia and Farmpride you have helped strengthen our membership base.

You will note from the Income statement that our total surplus for 2011 was \$118, 827 and that our income into the PRF had tripled. This is due mainly to the monies being received as Scholarships, Donations and Bequests which is support from Industry for post doctoral research associates and an increase in Business and Investment income due to the large number of industry lead trial work we have completed. Also a very well attended and successful APSS 2011.

Along of course with increase income comes the increase in expenditure to cover the associated costs. The Salaries figure covers the administrative assistant position, part of the director's salary, postdoctoral positions and some casual labour required from time to time for industry trial work we were commissioned to do. The large increase in Equipment and Repairs and Maintenance is due to the co-funded purchase with the Dairy Research Foundation of a new Leco nitrogen analyser amounting to \$29,000. Also the PRF has purchased a thermal imaging camera, new incubators, further additions and upgrades to our pellet mill, the completion of the purchase of new cages for the red brick building, a new block heater and water bath for the lab and extensions to the poultry shed office to accommodate additional staff.

Other expenses include feed, fuel and stock etc which has all increased in line with all the additional trials we have completed for PRF and industry members. Overall though it has been an extremely interesting year and we hope that the growth within the PRF will continue.

The University of Sydney
The Poultry Research Foundation

Income Statement
for the year ended 31st December 2011

	Notes	2011 \$	2010 \$
INCOME			
Business and Investment Income		186,666	33,335
Scholarships, Donations & Bequests	2	216,000	-
Memberships and Subscriptions		83,000	53,767
Symposium Income		177,868	64,393
Business Medical Testing Income		-	28,973
Other Income	3	296,106	126,954
Total Income		959,640	307,423
EXPENDITURE			
Salaries		382,426	190,374
Consumables		49,709	16,830
Equipment and Repairs & Maintenance	4	221,475	56,536
Services and Utilities		47,544	6,861
Travel, Conferences and Entertainment		30,459	45,578
Contributions to University areas		1,572	737
Other Expenses		107,628	20,027
Total Expenditure		840,813	336,944
SURPLUS / (DEFICIT)		118,827	(29,521)
Accumulated Funds as at 1st January		149,358	178,879
ACCUMULATED FUNDS AS AT 31ST DECEMBER		268,185	149,358

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 the Business School
5th April 2012

The University of Sydney
The Poultry Research Foundation

Balance Sheet
as at 31st December 2011

	Notes	2011 \$	2010 \$
ASSETS			
CURRENT ASSETS			
Receivables		5,000	4,961
Deposit	3	-	69,988
Funds Participating in University Pool Interest		263,806	101,027
Total Current Assets		268,806	175,976
TOTAL ASSETS		268,806	175,976
LIABILITIES			
CURRENT LIABILITIES			
Payables		621	26,618
Total Current Liabilities		621	26,618
TOTAL LIABILITIES		621	26,618
NET ASSETS		268,185	149,358
EQUITY			
Accumulated Funds		268,185	149,358
TOTAL EQUITY		268,185	149,358

Notes to the Financial Statements

- 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.
- Scholarships, Donations & Bequests includes \$150,000 in industry Donations for Research (Danisco Ltd) and \$66,000 in industry Sponsorships (AB Vista Feed Ingredients) for continued support of a 4-year Post-Doctorate appointment.
- Other Income includes \$366,094 in industry support, partially offset by an adjustment of (\$69,988) due to reporting in the Prior Year for partial support of a 4-year Post-Doctorate appointment, receipted by the University in December 2010, but mis-credited by the Central Cashiers Office.
- Equipment and Repairs & Maintenance includes \$79,631 in Capital Expense for a Leco nitrogen analyser (co-funded with The Dairy Research Foundation), thermal imaging camera and pelleting mill.



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

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