NUTRITION
GUT HEALTH
ENVIRONMENT

Chicken Nutrition, Gut health and Environment Consortium

Inaugural showcase, 5th September 2023

Brisbane's Customs House

Acknowledgment of Country

- The University of Queensland (UQ) acknowledges the Traditional Owners and their custodianship of the lands on which we meet.

- We pay our respects to their Ancestors and their descendants, who continue cultural and spiritual connections to Country.

- We recognise their valuable contributions to Australian and global society.

How it all started

(October 2020)

AgriFutures™ Chicken Meat

Nutrition, Gut Health and Environment

Program goal

A diet that enhances feed conversion and broiler growth, reduces the reliance on inputs (such as vaccination and medicines) and optimises the shed environment (including maintenance of litter quality and reduction of odour).

Scope

Collaborative, multi-institution teams that demonstrate complementary skills including research, development, adoption, and extension together with expertise in specific technologies and products are encouraged to apply. While this program of research is national in scope, international collaboration that leverages relevant knowledge and experience is encouraged.

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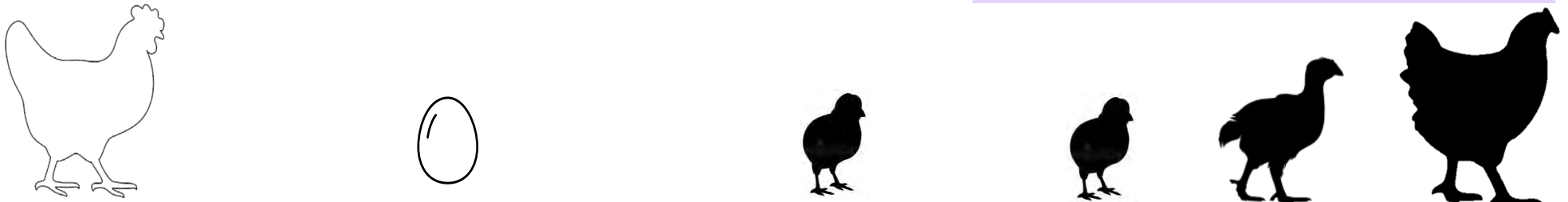
Research Programs

Program 1 MATERNAL PROGRAMMING & AMINO ACID PRECISION FEEDING

Program 2 CARBOHYDRATE PRECISION FEEDING

Program 3 INNOVATIVE FORMULATIONS



Breeder → *In ovo* → Hatching → Starter-grower

Program 4 EARLY GUT MICROBIOTA

Program 5 ENVIRONMENT

Program 6 INTEGRATION

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Research Program 1

Maternal programming and Amino Acid precision feeding in broiler chickens

Prof Eugeni Roura

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

	Subprogram 1	Subprogram 2	Subprogram 3	Subprogram 4
Research themes	MATERNAL PROGRAMMING	"IN OVO" AA SUPPLEMENTS	ESSENTIAL AA FOR MICROBES	EAA/NEAA IN LOW CP DIETS
Associate Chief Investigators	Kumar/Cozzolino	Niknafs/Akter	Turni/Omaleki	Soumeh/Navarro
	Chiara Palmieri			
Priorities & deliverables	Broiler breeder nutrition; reduce reliance on SBM; enhance gut health, immune function, in-shed environment	Role of EAA & NEAA in broiler growth & gut development; early lifetime enhancement of gut health, immune function	Early-life gut microbiota establishment and gut health;	Role of EAA and NEAA in broiler growth and gut development; choice feeding; reduce reliance on SBM; improve in-shed environment
	Breeder	"in ovo" & early feeding	Early seeding	Starter-grower

AgriFutures Chicken Meat

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Research Program 2

Carbohydrate and amino acid precision feeding

Em Prof Mike Gidley

The University Of Queensland AUSTRALIA

Sub-program 1: what is left in undigested feed

Detailed structural analysis of molecular composition and microscopic architecture in residual feed by using digesta samples from program 3

Sub-program 2: *in vitro* carbohydrate and protein assays

- Rate and extent of digestion in alternative feed ingredients
- How particle size, feed processing and exogenous enzymes change digestion

Sub-program 3: *in vitro* batch fermentation to predict microbiome development and prevent growth of pathogenic organism

To find 'sweet spots' of diet formulation that nourishes the gut microbiota while maintaining feed efficiency

Research Program 3a

Innovative diet formulations

A/P Sonia Liu

A/P Peter Selle

THE UNIVERSITY OF SYDNEY

Sub-program 1: Reduce dietary crude protein

- Non-essential amino acids
- Digestive dynamics
- Feed additives

Short-term and long-term industry applicable broiler diet with reduced SBM and CP content that can be delivered using existing and future feed mills

Sub-program 3: Evaluation of intestinal populations of *Clostridium perfringens*

- Zinc bacitracin and an ionophore
- standard and reduced-CP diets

Knowledge to manage and reduce the risk of necrotic enteritis and improve litter quality

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Research Program 3b

A/P Tim Wester

A/P Reza Abdollahi

TE KUNENGA KI PŪREHUROA | MASSEY UNIVERSITY
UNIVERSITY OF NEW ZEALAND

Innovative diet formulations

Sub-program 2: local protein-rich ingredients

- Canola meal
- Canola seed
- MBM
- chickpeas, lupins, lentils and faba beans
- Protein concentrate
- Other protein meals

Short-term and long-term industry applicable broiler diet with reduced SBM and CP content that can be delivered using existing and future feed mills

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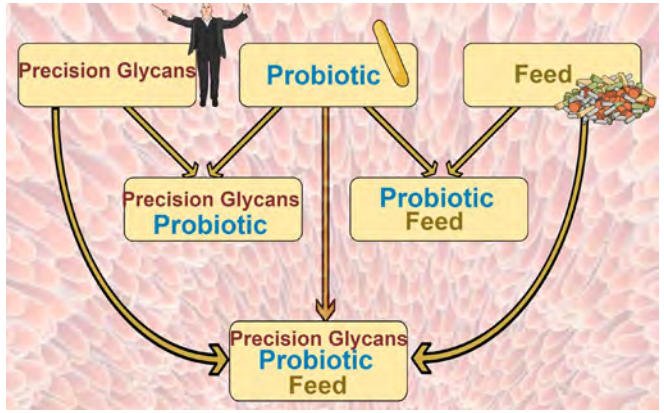
Research Program 4



Precision Early Gut Microbiota Development

Prof Dana Stanley

CQ University AUSTRALIA

Paradigm shift from microbiota (taxa) to function

Total control of the first 3 days of colonisation by

- Using precision-made glycans to control pathogenic functional groups
- Providing environment enriched with beneficial bacteria
- Providing pathogen free feed in the fist 3 days of gut colonisation

Focus points:

- Vegetarian diet; immune function modeling
- Control of leaky gut and diarrhea
- Total gut colonization control including upper GIT

Fully controlled colonisation of the broiler gut with beneficial, pathogen resistant microbial community for improved gut health and impeccable immune response

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Research Program 5

Litter management

QUEENSLAND GOVERNMENT
Department of Agriculture and Fisheries

Dr Mark Dunlop

Sub-program 1: Reducing water addition to litter

- Monitor water intake and excretion during nutrition trials
- Quality score litter using AGF protocol
- Correlate with welfare measures

Sub-program 2: Increasing water evaporation - develop algorithms to relate evaporation to in-shed conditions and activity (build on PPRJ-011502) and test strategies to enhance evaporation

Sub-program 3: Litter amendments and reused litter and their impact on ammonia emissions

Sub-program 4: Spatial and temporal environment monitoring and faecal assessment using commercially available robot in research facility and commercial trial site

Reduce litter moisture through reduced excretion by chickens and optimised removal from litter to reduce environmental impacts whilst supporting production and improving welfare

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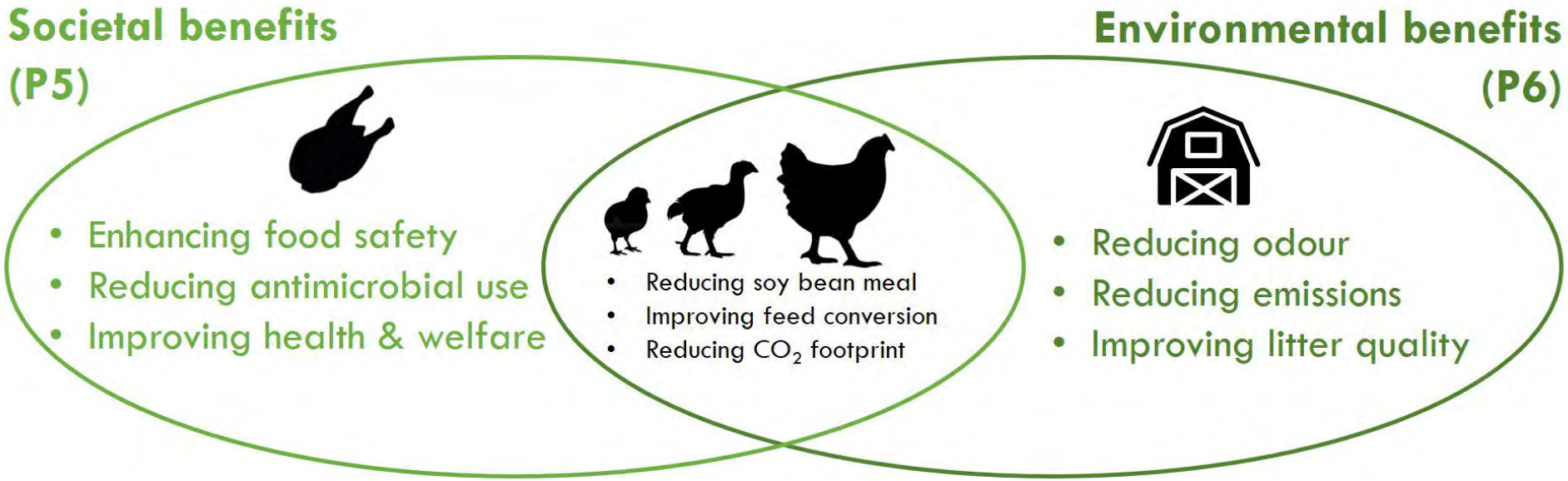
Research Program 6

Prof Ruth Zadoks

THE UNIVERSITY OF SYDNEY

Integration program



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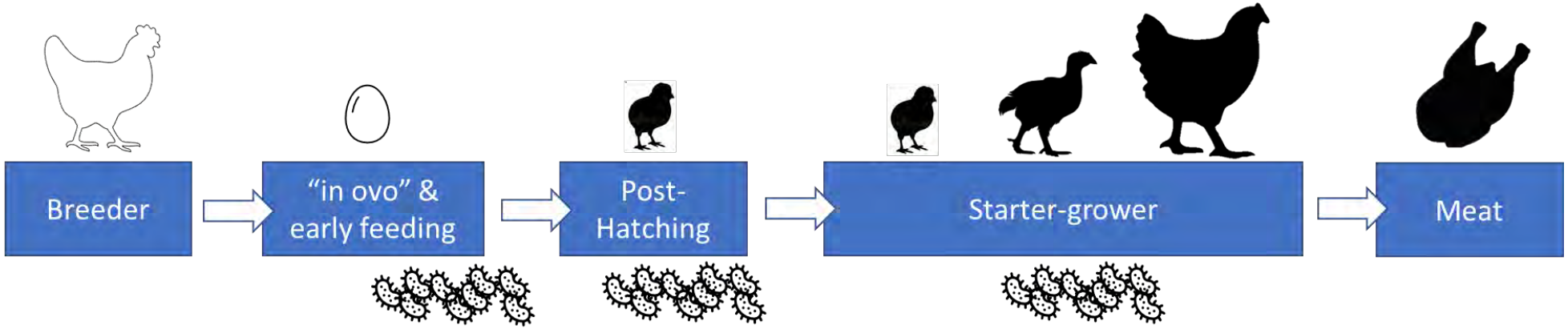
HDR & IPP programs



PhD 1: Maternal programming

PhD 2: in ovo

PhD 3: early feeding

PhD 4: from maternal programming to finisher

PhD 5: feeding microbiota

PhD 6: Gut microbiome

PhD 7: Carbohydrate precision feeding

PhD 8: Innovative formulations

PhD 9: Innovative formulations

PhD 10: Environmental impacts

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Who's involved

AgriFutures® Chicken Meat

The University of Queensland AUSTRALIA

The University of Sydney

Te Kunenga ki Pūrehuroa | Massey University
University of New Zealand

CQUniversity AUSTRALIA

Queensland Government
Department of Agriculture and Fisheries

Aviagen®

dsm-firmenich

MELNOOVISTA

Lucta

LALLEMAND
LALLEMAND ANIMAL NUTRITION

PRF
Enhancing poultry performance

The World's Poultry Science Association
education organization research
NEW ZEALAND BRANCH

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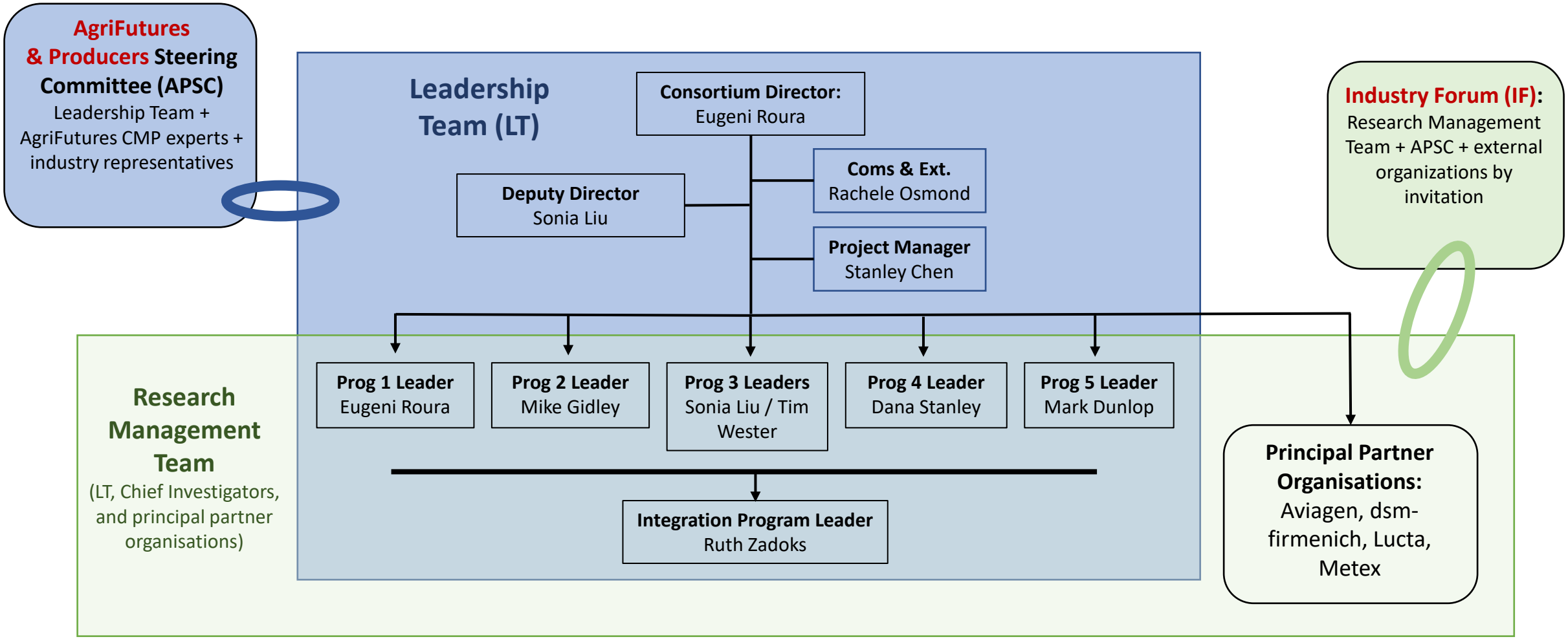
Governance & Management structure



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Steering Committee

Members	Representative	Comments/expertise
Katherine Balding	Chair Chicken Meat Panel / Baiada	Nutrition & Production Chain
Karen Gurney	Chicken Meat Panel / Golden Cockerel	Nutrition
Nick Rodgers	Inghams	Nutrition
Peter Chrystal	Consultant	Nutrition
Matt Hilliar	Turosi	Production Chain
Mary Wu	Australian Chicken Meat Federation	Production Chain
Christine Sydenham	Ridley	Nutrition
Sheridan Alfirevich	Inghams	Pathology (gut health) in ovo
Brian Astridge	Chicken Meat Panel / Turosi	Sustainability and welfare
Amanda Olthof	AgriFutures Australia	Management
Sarika Pandya	AgriFutures Australia	Management
Eugeni Roura	Consortium Director/Program 1 Lead	Nutrition
Sonia Liu	Consortium Deputy Director/Program 3 Lead	Nutrition
Mike Gidley	Consortium Program 2 Lead	Nutrition
Tim Wester	Consortium Program 3 Lead	Nutrition
Peter Selle	Consortium Program 3 Advisor	Nutrition
Reza Abdollahi	Consortium Program 3 Advisor	Nutrition
Dana Stanley	Consortium Program 4 Lead	Gut microbiome
Mark Dunlop	Consortium Program 5 Lead	Animal production environment
Ruth Zadoks	Consortium Program 6 Lead	Production animal health
Stanley Chen	Consortium Manager	Management
Rachele Osmond	Communication and Extension Manager	Communication and Extension

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International Collaborators

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Consortium Leadership Team

Name	Role	Contact
Prof Eugeni Roura	Consortium Director & Program 1 Lead	e.roura@uq.edu.au
A/Prof Sonia Yun Liu	Consortium Deputy Director & Program 3 Lead	sonia.liu@sydney.edu.au
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Ms Rachele Osmond	Communication & Extension Manager	rachele.osmond@daf.qld.gov.au