



FABRE-TP Country Consultations

UK REPORT

12 and 13 September 2007
New Hall
Cambridge

The UK FABRE TP consultation was held as part of a wider meeting on
“Animal Breeding to Meet Global Challenges” held as the Genesis
Faraday Annual Event



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FABRE TP principles:

1. Technology transfer and technology translation with emphasis on two-way interactions between industry and research, taking into account the global playing field and the views of society;
2. Development and updating of an integrated strategic vision of industrial needs and opportunities in business and research;
3. Working with policymakers to ensure a coherent and workable legal framework for the sector's development;
4. Involvement of national and international policymakers and research funding organisations to stimulate a coherent yet flexible European research climate in animal breeding and reproduction;
5. Transparency and dialogue with society representatives to ensure that research and business are embedded in today's and tomorrow's Europe;
6. Awareness of the global context of animal breeding.

FABRE TP Strategic Research Agenda and an Implementation Plan:

1. Develop and implement pertinent short, medium and long-term research agendas based on identification of the priorities of farm animal breeding and reproduction and of European citizens;
2. Enhance the transparency of R&D at the regional, national, and European levels;
3. Promote collaborative research efforts and a coherent policy and supportive regulatory environment;
4. Address public concerns and strive for societal consensus based on a mutual understanding among all stakeholders, and for more efficient communication among all stakeholders.



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FABRE-TP slide presentations from Chris Haley and Anne-Marie Neeteson can be found in www.genesis-faraday.org members' area.



Program

Wednesday 12th September 2007

- 15:30 Registration and Coffee
16:00 Welcome & Introduction
Dr Graham Plastow, Chairman
Genesis Faraday
Sir Ben Gill CBE MA (Cantab)
- Global warming and energy needs, impacts on animal agriculture in a global context
A Helicopter-view of developments in livestock genetics and genomics
Prof. John Gibson, University of New England, New South Wales, Australia
- 18:15 **Break**
19:15 **Poster session and wine reception**
20:00 **Conference Dinner**

Thursday 13th September 2007

- 09:00 An update on Genesis Faraday
Chris Warkup, Director Genesis Faraday
- Farm Animal Breeding and Reproduction - Technology Platform
A European Strategic Research Agenda
Anne-Marie Neeteson, EFFAB, The Netherlands
Prof. Chris Haley, Roslin Institute
- Coffee Break**
- 11:00 **Breakout Session 1** - Getting the balance right.
Prioritising spend across broad research areas
Faraday Associate Presentations:
Efficient two-colour microarray designs for genetical genomics in livestock
Alex Lam, Roslin Institute/University of Edinburgh and Genus/PIC
Genome Organisation and Evolution in Birds
Ben Skinner, University of Kent and Cherry Valley Farms
- Lunch, Poster session and software demonstrations**
- 13.15 Brief Report back on Breakout Session 1 and briefing for Breakout Session 2
Breakout Session 2: Focusing the Strategic Research Agenda Defining the required projects
Faraday Associate Presentations:
The Genetics of Beef Quality
Jennifer Gill Roslin Institute/University of Edinburgh and Marks & Spencer
Exploiting the host-pathogen genetic interaction to improve disease diagnosis and health of cultured fish
Scott Campbell, University of Aberdeen and Fisheries Research Service Marine Laboratory
- Feedback on Breakout Session 2**
Coffee Break
- 15:30 **Breakout Session 3:** Science into Practice
i) What do we need to do to be ready to exploit these opportunities?
ii) What key questions should business ask to formulate their future technology strategies?
iii) What are the most important training and technology transfer needs?
Feedback on Breakout Session 3
General discussion
Closing remarks
- 17:00 **Close**



Workshop Participants

Delegate

Abigail Diack
Alex Lam
Alex Clop
Alfred de Vries
Andrew Weatherly
Andrew Forbes
Anna Kaliszewska
Anne-Marie Neeteson
Ariel Liu
Ben Skinner
Ben Gill
Carol Didcock
Carol-Anne Duthie
Carole Sargent
Catherine Nakielny
Cecile Massault
Chris Haley
Chris Warkup
Claire Wathes
Claire Wyllie
Claudia Cabrera Cardenas
Colin Baxter Jones
Craig Lewis
Darren Griffin
David Garwes
David Disney
David Telford
Derrick Guy
Dirk-Jan de Koning
Edward Sutcliffe
Eileen Wall
Frances Alink
Gary Evans
Georgia Hadjipavlou
Gert Nieuwhof
Gillian Wilson

Gillian Hunter
Graham Plastow
Grant Walling
Hein van der Steen

Organisation

University of Glasgow
Roslin Institute
Genesis Faraday
HG bv
Pfizer
Merial
Roslin Institute
European Forum of Farm Animal Breeders
Roslin Institute
University of Kent
Independent
Genesis Faraday
Scottish Agricultural College
University of Cambridge
Innovis Genetics Ltd
Roslin Institute
Roslin Institute
Genesis Faraday
Royal Veterinary College
University of Cambridge
Roslin Institute
GenoTypers Ltd
Roslin Institute
University of Kent
Defra
Sheep Improvement Group
Genesis Faraday
Landcatch Natural Selection Ltd
Roslin Institute
ACMC Ltd
Scottish Agricultural College
Scottish Agricultural College
Genus plc.
Roslin Institute
Meat and Livestock Commission
University of Edinburgh
Royal (Dick) School of Veterinary Studies,
University of Edinburgh
Genesis Faraday
JSR Genetics Ltd
Stonebridge Breeding



Huw Jones	Genesis Faraday
Ingela Velander	Danish Meat Association
Ivan Morrison	University of Edinburgh
Jackie Turner	Compassion in World Farming
Jennifer Gill	Roslin Institute
Jennifer Smeed	The University of Edinburgh
Jenny Howie	Scottish Agricultural College
Jessica Brickell	Royal Veterinary College
John Gibson	University of New England
Kate Fowler	University of Kent
Ken Laughlin	Aviagen
Laura Kreciala	Genesis Faraday
Lawrence Alderson	Rare Breeds Survival Trust
Lewis McClinton	Livestock and Meat Commission
Linzi Gilmour	Roslin Institute
Louise Sherlock	Royal Veterinary College
Lyndsey Dance	University of Bristol
Marco Winters	MDC Breeding +
Marie-Anne Robertson	Genesis Faraday
Mark Needham	Hybu Cig Cymru
Nabeel Affara	University of Cambridge
Nia Ball	Scottish Executive
Nigel Otter	Merial Animal Health
Nigel Holmes	Animal Health Trust
Peter Baber	Suffolk & Texel Sheep Breeder
Rebecca Baxter	Roslin Institute
Rebecca Ward	University of Bristol
Richard Leach	Roslin Institute
Robin Thompson	Roslin Institute/Rothamsted Research
Samantha Llewellyn	Royal Veterinary College
Sarah Blott	Animal Health Trust
Scott Campbell	FRS Marine Laboratory
Steven Laing	University of Glasgow
Theo Kanellos	Pfizer
Toine Roozen	Genesis Faraday
Tony Hall	Cherry Valley Farms Ltd
Wendy Smith	Compassion in World Farming
Wiepk Voskamp	HG bv
William Luff	World Guernsey Cattle Federation
William Thorpe	Consultant



Event Summary

The Sustainable Farm Animal Breeding and Reproduction Platform (FABRE-TP) UK consultation took place in conjunction with Genesis Faraday's fourth Annual Event on 12th and 13th September 2007 in New Hall, Cambridge and was attended by 82 delegates.

FABRE-TP's current key objective is the development of a Strategic Research Agenda (SRA); open and inclusive to consultations from all 27 Member States of EU plus Norway, Switzerland, Iceland and Israel.

Chris Haley (Roslin Institute) and Anne-Marie Neeteson (EFFAB) gave an introduction to the Strategic Research Agenda (SRA) explaining its aim to facilitate and accelerate Research and Development in animal breeding and reproduction, preventing loss of opportunities in Europe by achieving competitiveness with imported food, leading animal breeding with balanced goals benefiting both production and animal welfare, managing biodiversity and optimising land use. The SRA was prepared from proposals of 13 expert groups in cattle, sheep/goats, pigs, poultry, horses, aquaculture; around themes of food quality and safety; health, welfare and performance; diversity and distinctiveness; and in technologies relating to genomics, genetics and reproduction.

UK experts were given opportunities to contribute to the SRA through an open session and breakout sessions during the second day. In the SRA open discussion, delegates were generally supportive of the themes identified. It was acknowledged that there was need for the SRA to be prioritised into more focused objectives.

Delegates thought it important that the research continue on biotechnologies so that the EU had the expertise to understand the potential risks and rewards. Concern was expressed that the priorities of the Vision Document, on which the SRA was built did not visibly place sufficient emphasis on the environmental impact of animal agriculture.

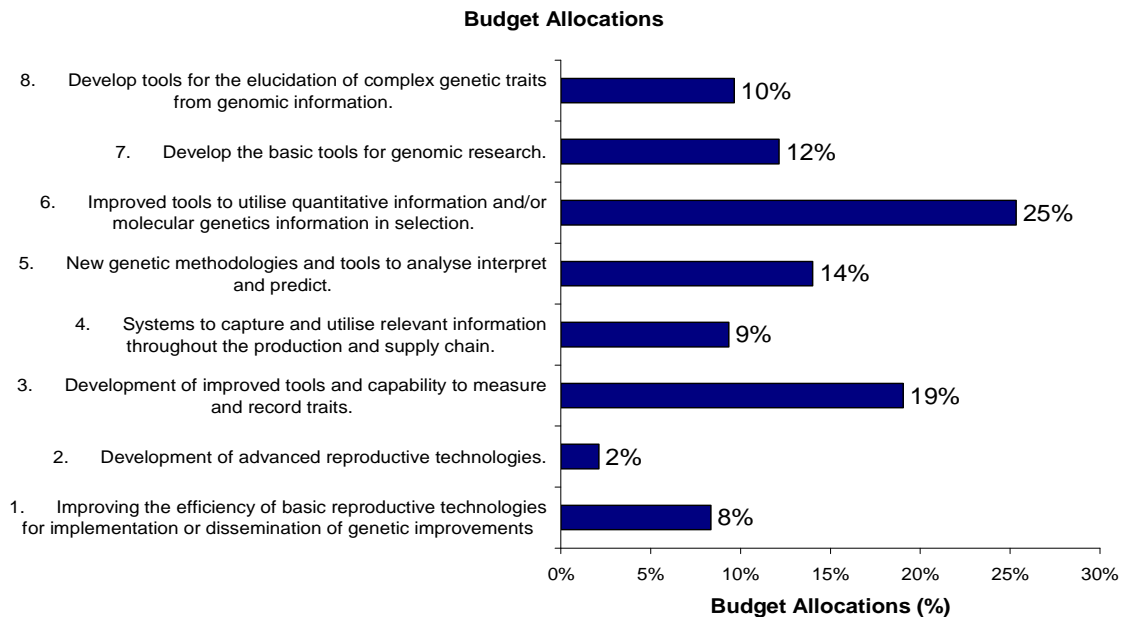
Results from breakout sessions showed those main research priorities among UK experts lay with environmental interests and more development of predictive and measurement genetic tools. All sectors agreed that in order to exploit future priorities there is requirement for more collaboration between sectors and increased knowledge of market trends. Businesses need to improve their future outlook in relation to changes in policies and consumer needs. All sectors agreed that to develop in such areas more linkage is needed between industry, academia and government with the knowledge transferred in a more simplified language. More details can be seen on pages 10 to 13.



Getting the Balance Right

Delegates were grouped according to their area of expertise and in total given the opportunity to spend approximately €20 million in “Genesis Euro bank notes” on what they identified as research priority for coming years.

A total of 8 research headings were provided from the draft SRA of FABRE-TP along with a more detailed description of each one. Within their syndicates delegates discussed the various research topics then individually allocated money to research areas.



The top three research priorities identified were:

- Improving tools to utilise quantitative information and/or molecular genetics information in selection
- Development of improved tools and capability to measure and record traits
- New genetic methodologies and tools to analyse interpret and predict

Research priorities were orientated towards using predictive and measurement tools, in a more quantitative research area rather than molecular.

- Beef and Pig groups favoured “Improving tools to utilise quantitative information and/or molecular genetics information in selection”
- Sheep and Dairy groups favoured “Development of improved tools and capability to measure and record traits”
- Poultry favoured “Develop tools for the elucidation of complex genetic traits from genomic information”
- The Aquaculture group favoured “Improving the efficiency of basic reproductive technologies for implementation or dissemination of genetic improvements”

Delegates from Industry, academia and Faraday Associates (all PhD students) selected “Improving tools to utilise quantitative information and/or molecular genetics information in selection” as their research first research priority.

A complete breakdown of these results by academics, industry and Faraday Associates can be seen in Annex 1.



Focusing the Strategic Research Agenda

During Breakout Session 2, the same species orientated groups as Breakout Session 1 were asked to write a summary for suggested projects for two of the three highest ranking research areas as defined in Breakout Session 1. The project summaries were intended to be in the style of research topics as might appear in the EU Framework 7 Programme.

The two project proposal summaries from each group were later presented to all delegates. By the use of a ranking system, delegates were asked to vote on their favourite projects.

Choices of projects were (in order of rank):

Optimal Integration of Molecular Data for Long Term Breeding Efficiency - mEBVs

Aimed at finding the optimal breeding strategies for lifetime efficiency and balancing short and long term improvements this project would ultimately restrict inbreeding and the loss of genetic variation. Breeding goals would be segmented to incorporate genetics x environment x market along with other non-economic factors.

Detection and Identification of Predictors of Livestock Lifetime Efficiency

This project focuses on the development of methods that can identify traits determining overall efficiency when incorporating limitations in land, water and labour and the efficiency of lifetime from birth. By approaching socio-economic aspects involved in farmers' collaboration with data recording; this project aims to develop new technologies and tools to be used for data recording, capture and storage and to develop algorithms that can analyse captured data and feed back usable recommendations in real time.

New Traitomics

Aimed at coping with new challenges and defining traits and tools for meat quality, environmental footprint, robustness plus health and disease and setting out new industry standards for traits and measurements and how to measure these on multiple animal populations this project aims to increase the competitiveness on the European industry whilst reducing the environmental impacts.

The complete list of project proposal summaries can be found in Annex 2



Science into Practice

Groups were redefined in Breakout Session 3 according to their work background:

- Academics
- Industry
- Faraday Associates (PhD students)

Breakout Sessions 1 and 2 formed prioritisations of Technology Research Areas. In Breakout Session 3 delegates were asked to discuss these prioritisations whilst focusing on three questions:

- What do we need to do to be ready to exploit these opportunities?
- What are the key questions that businesses should be asking to formulate their future technology strategies?
- What are the most important training and technology transfer needs?

Response Summaries:

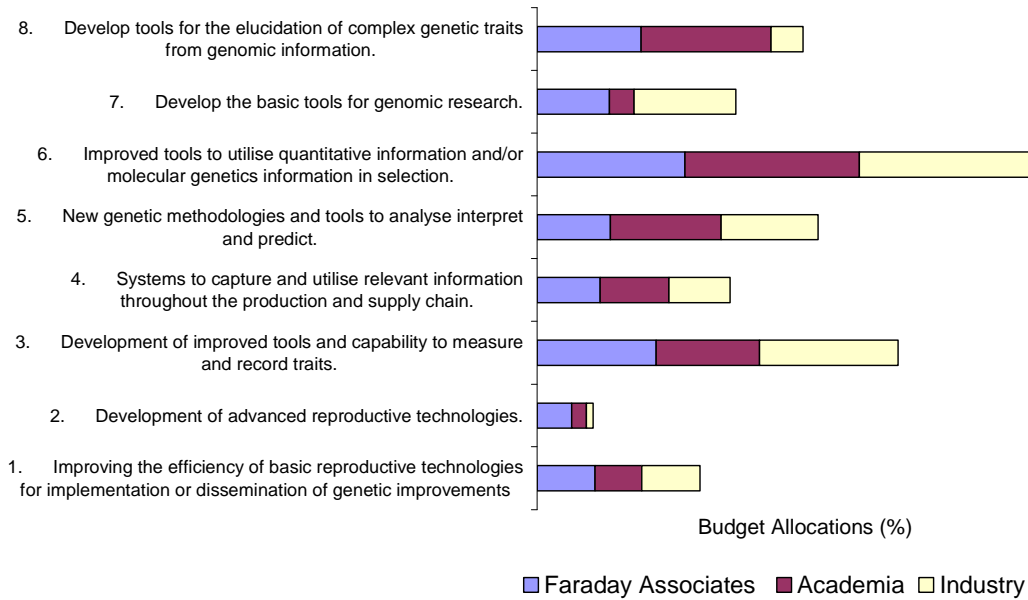
- **INDUSTRY:**
 - *Work closer with other agriculture sectors; animal feed producers and plant breeders to identify common challenges*
 - *Increase awareness of work already done in similar and different species; recognise different challenges in different species*
 - *Simplify knowledge language when transferring between sectors*
 - *Clear explanation of benefits and returns improving feedback loops*
 - *Businesses question the accuracy of future predictions*
 - *Plan to take path of lowest risk*
 - *Consumers' response to change, changes expected in EU and government policy*
 - *Importance of the implementation of a sensitivity analysis with a clear definition of what technological information is needed in metrical terms*
 - *Market and technology changes need recording and efficient and effective response*
 - *Breeders should seek to have in place the tools to respond rapidly to market changes*
- **ACADEMIA:**
 - *Develop a mechanism to exploit opportunities, pool resources and help fund a large collaborative project, generating user friendly tools able to exploit multiple sources of information*
 - *Industry to do more to translate market needs to academia*
 - *Businesses should question the "Genome-Wide Selection" issue*

- *Cattle and sheep industry to obtain more influence over research agendas and allocation of research funds*
- *People training to understand/exploit multiple sources of information*
- *Recruit people with numerical skills linking genetics, mathematics and computing*
- *Increase academia to academia technology transfer, linking mathematics and computing to genetic research requirements*
- *Resolve conflicts associated with academic requirements, deal with IP*
- **FARADAY ASSOCIATES:**
 - *Exploit opportunities through more international collaboration and building common issue consortiums*
 - *Increase Government spending on research and technology transfer organisations*
 - *Identify and exploit more opportunities, turn knowledge into research vertically integrating, dictating new policies*
 - *Identify key experts. Increase industry-academia integration, generating secondments and exchanges*
 - *Increase market knowledge and research trends through increase consumer communication and consumer awareness*
 - *Businesses focus where markets may change through population and environmental influences*
 - *Consider opportunities for integrating more scientific fields, where financial incentives are for technology uptake and technologies and methods are in the pipeline*
 - *Increase knowledge using other species with more developed research*
 - *Future outlooks in line with new policies and legislations*
 - *Funding availability for industry technology training*
 - *Improved system transferring research findings in farmer friendly format, increase farmer co-operation when research decision making*
 - *Increased industry/academia/government links, more industry-academia training, increased industry in-house research*

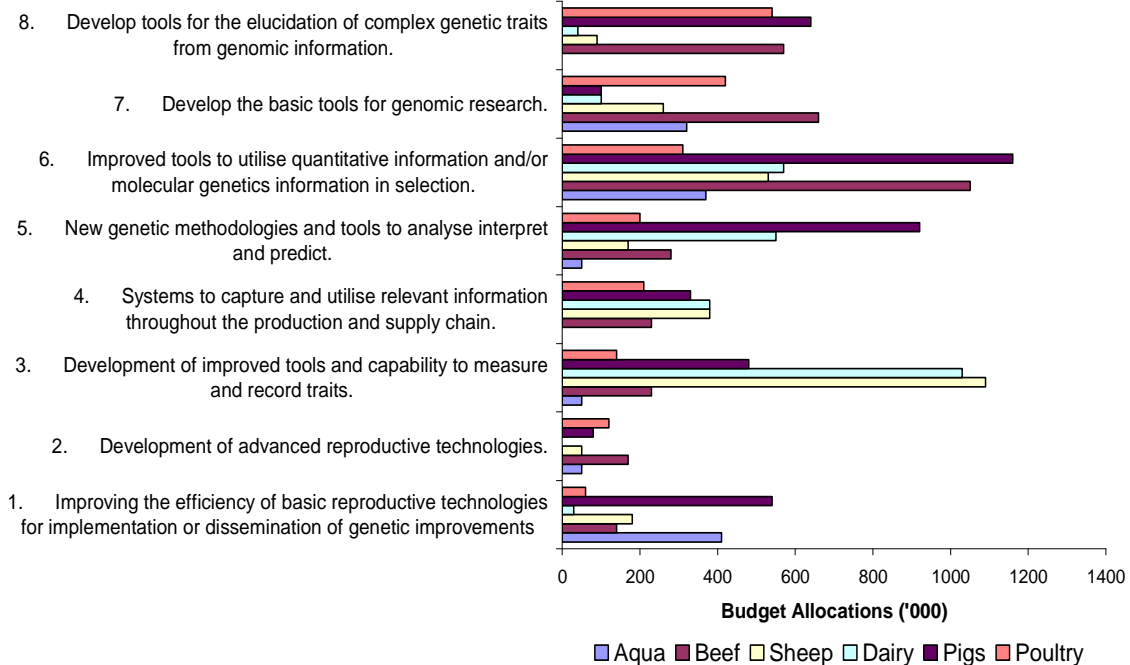
In summary all groups agree that to be ready to exploit these priorities more collaboration between different sectors and an increased knowledge of market trends is required. Businesses should be looking into where future markets may change in relation to new government policies and consumer needs. All agree that to develop in these areas more linkage is needed between industry, academia and government with the knowledge transferred in a more simplified language, using simple and clear definitions.

ANNEX 1 - Breakout Session 1 Results

Budget Allocations - Total (by sector)



Budget Allocations - by Species



ANNEX 2 - Project Summaries from Breakout Session 2 (in order of rank):

Optimal Integration of Molecular Data for Long Term Breeding Efficiency - mEBVs

Aim:

- To find optimal breeding strategies for lifetime efficiency
- Balancing short and long term improvements
- Restricting inbreeding and loss of genomic variation
- Segmented breeding goals; Genetics x Environment x Market
- Incorporation of non-economic factors in breeding goals

Detection and Identification of Predictors of Livestock Lifetime Efficiency

Aim:

- To develop methods to identify traits determining overall efficiency
- Efficiency to include use of:
 - i. Limiting land, water, labour
 - ii. Lifetime from birth
- Socio-economic aspects of farmer collaboration for recording
- Developing new technologies and tools for data recording, capture and storage
- Developing algorithms to analyse captured data and feed back usable recommendations in real time

New Traitomics

Aim:

- To cope with new challenges
- We will define traits and tools for:
 - i. Meat Quality
 - ii. Environmental Foot Print
 - iii. Robustness
 - iv. Health and Disease
- Set industry standards for traits and measurements
- How to measure on multiple animals/ populations

Expected Impact:

- More competitive European industry with reduced environmental impact

Investigate Ideal Structures For Collecting Deep Phenotype Information

- Take into account current industry structures
- Improved links between on-farm and genetic evaluation unit (e.g. on-farm recording on hand held p.c. to evaluation unit)
- Knowledge transfer back to producers
- Proof to producers of benefits (i.e. cost-benefit analysis)
- Understanding barriers to uptake



Reduction of Nitrogen Emissions in Poultry by Systems Biology

Background:

- NH₃ and N₂O have an impact on the environment and economy. Therefore the industry needs to optimise protein accretion to minimise this impact on the environment and economics.

Aim:

- Use cutting edge genetics and genomics to elucidate genetic differences on nitrogen efficiency
- Screen commercial populations with several generations on genome-wide genotyping and selection to determine the underlying genetic variation
- Map, characterise and annotate genetic networks affecting Nitrogen emissions

Metagenomics of Gut Flora in Poultry

Aim:

- To understand interactions of feed efficiency, gut flora and non-carbon emissions (ammonia and nitrous oxide) using metagenomics
- To look at the metagenomics of broilers, layers, ducks, turkeys and geese
- Predict ideal combinations of breed, metagenomics and diet to reduce non-carbon emissions
- Test universality of best gut flora scenarios by inoculation in different breeds

Laptomics

Aim:

- Develop a methodology that will:
 - i. Per trait/ species define the optimum number of markers to be used in line development
 - ii. Software to run BLUP programme including an economically optimised number of marker, and which can run on a laptop with output within 24 hours

Expected Impact:

- Greater levels of improvement
- Greater uptake of new technology

Enhanced Robustness Against Viral Diseases in Salmonids

The Problem:

- Disease is the major limiting factor in sustainable, commercial fish production

Aim:

- Provide the genomic tools to select for resistance to a range of viral diseases in fish.
- Genetically categorise the pathogens. Conduct disease challenges on pedigree fish to establish susceptibility to viruses.
- Collect DNA to perform tail analysis of all individuals. Carry out enhanced QTL search for whole range of diseases.

Expected Impact:

- Sustainable expansion of industry in a welfare friendly manner
- Improved quality of fish/ naturally healthy fish



- Less chemical use/ environmental benefits

High Throughput Genotyping for Pedigree Assignment in Farmed Fish

The Problem:

- Current breeding programmes are very expensive and complicated and so only carried out with economically viable species
- Absence of pedigree breeding information limits the future growth of aquaculture

Aim:

- To facilitate pedigree breeding structures in major farmed fish species

Species:

- Salmonids, Tilapia, Catfish, Seabass, Seabream and Cod
- Obtain genome sequences of these species to identify SNP panels in order to assign individuals to pedigree

Expected Impact:

- Viable breeding programmes can be run at an appropriate scale for a variety of species