WP2.5: Livestock genetics & management for product quality & sustainability

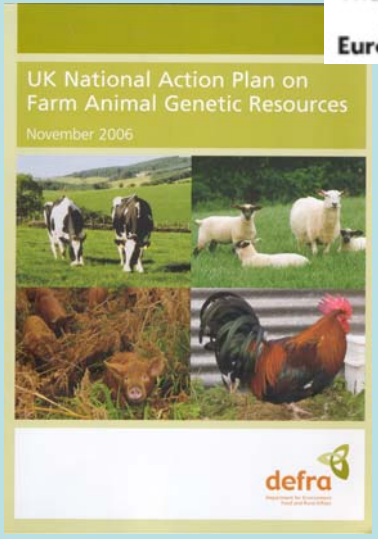
Geoff Simm

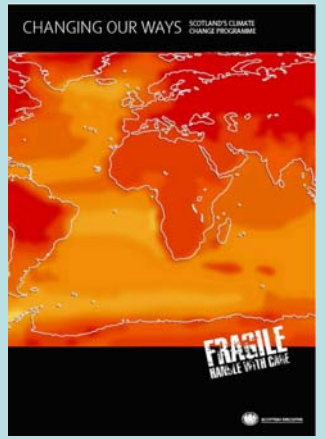
WP2.5

- 7 ‘Required Outputs’ in support of [then] SEERAD Policy
  - ***A Forward Strategy for Scottish Agriculture (& ‘Next Steps’)***
  - ***Animal Health & Welfare Strategy for Great Britain***
  - ***Scotland’ Biodiversity - It’s In Your Hands***
- Met by 4 strands of activity...

WP2.5

- New policy areas relevant to WP2.5
  - *UK National Action Plan on Farm Animal Genetic Resources*
  - *Changing our ways: Scotland's Climate Change Programme*
  - *Scottish Rural Development Plan (SRDP)*
  - *Choosing the Right Ingredients: The Future for Food in Scotland: Discussion Paper*





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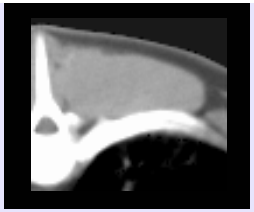
Improved measurement techniques for carcass & meat eating quality in beef & sheep

Designing & testing breeding programmes for carcass & MEQ

[Livestock products & human health]

Progress - Strand 1

- Evaluation of live animal & carcass measures to predict beef carcass & eating quality
- 2 years experimental work complete – data collation & analysis underway
- Analysis of equivalent sheep data
- NIR, CT, VIA look promising in beef & sheep
- See posters from Roehe et al (x2) Ross et al; Rooke et al



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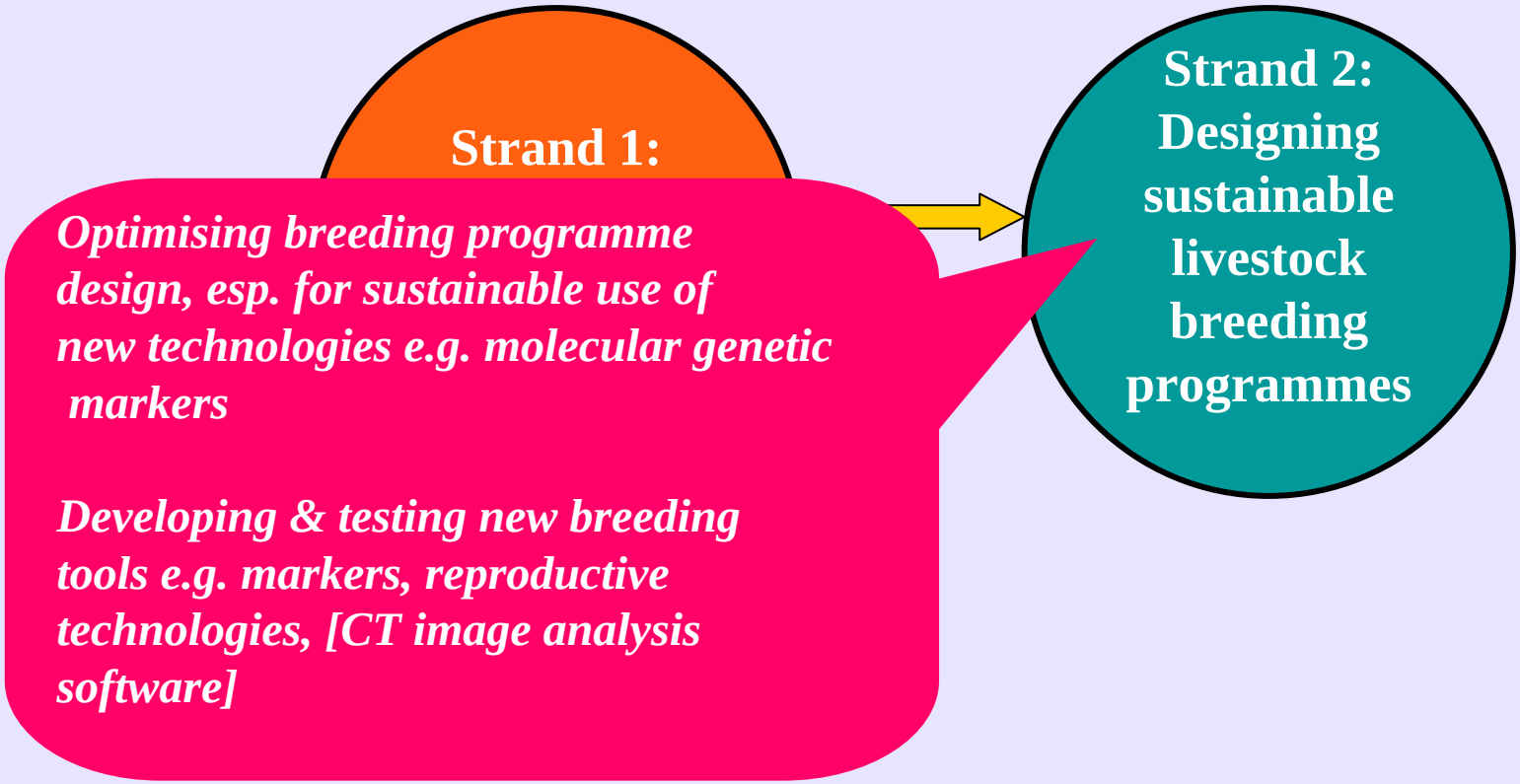
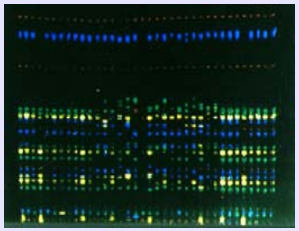


Progress - Strand 2

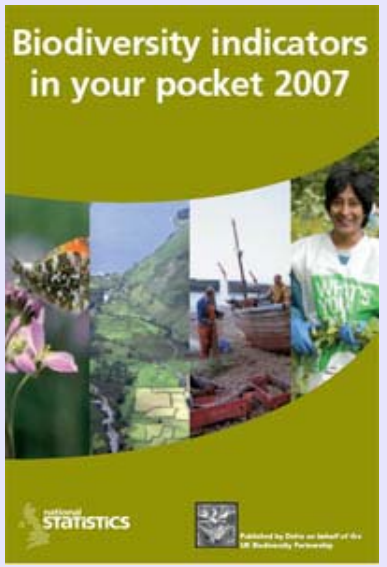
- Optimising breeding programme design
  - Use of genetic markers to increase gain while controlling inbreeding
    - Applying genome wide selection (GWS) in sheep (collaboration with AgResearch/Abacus Biotech NZ)
    - Prediction of rate of inbreeding under GWS obtained
      - lower rate of inbreeding than BLUP (PhD EU)
    - Optimisation method developed to control inbreeding at specific genome regions
  - Review & web-based tool to assess value of DNA parentage testing in sheep (+ GFP Spark)

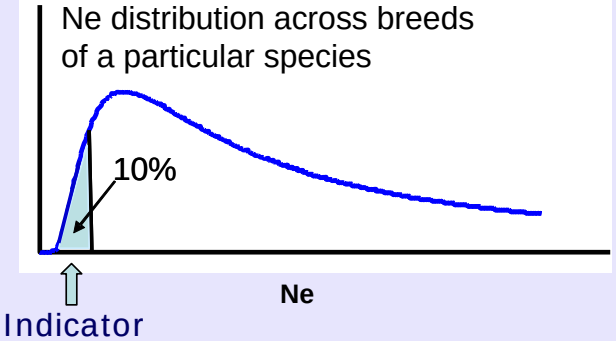


Net Benefit 1 (Includes Increased Value From Genetic Gain)			
Increased Survival (%)	5	10	15
DNA cost	£10.00	£10.00	£10.00
Flock Cost	£16,500.00	£17,000.00	£17,500.00
Net Benefit			
10% rams born sold	-£3,312.51	-£1,411.36	£501.63
20% rams born sold	£19.99	£3,227.28	£6,458.26
40% rams born sold	£6,684.97	£12,504.56	£18,371.52
60% rams born sold	£13,654.96	£21,781.84	£29,979.78

Progress - Strand 2

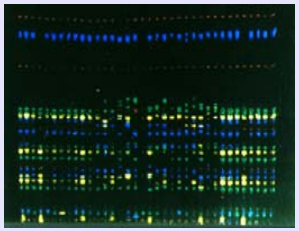
- Optimising breeding programme design
  - Simple genetic indicator of biodiversity for livestock developed
    - Villanueva, Roughsedge, Woolliams (RI)
    - Calculate ‘effective population size’ (Ne) for each breed
    - Plot distribution of Ne
    - Calculate average Ne for lower 10% tail
  - see Villanueva & Roughsedge poster

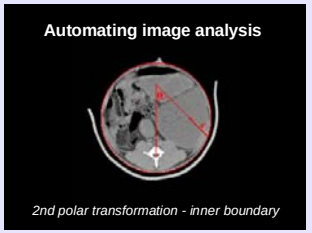




Progress - Strand 2

- Genetic markers
  - library of DNA/tissue samples organised
  - Initial sheep SNP chip order placed
  - See Bünger et al poster
- Biosecure reproductive technologies
  - Medium for maturation of bovine oocytes formulated – avoids animal products
  - Oocyte vitrification/evaluation procedures identified
  - See McEvoy et al poster
- Automating CT image analysis (BioSS)
  - See Glasbey poster





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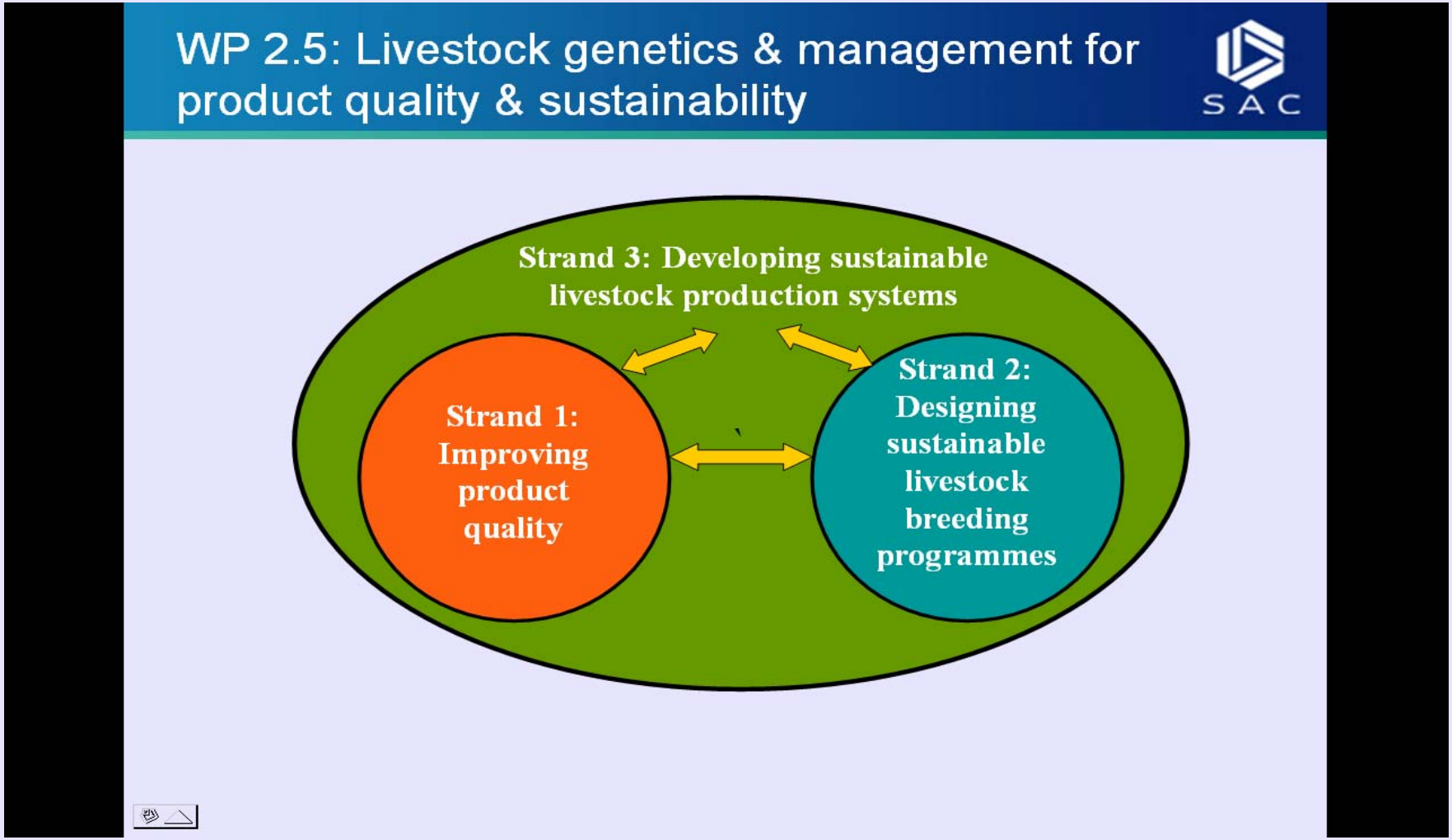

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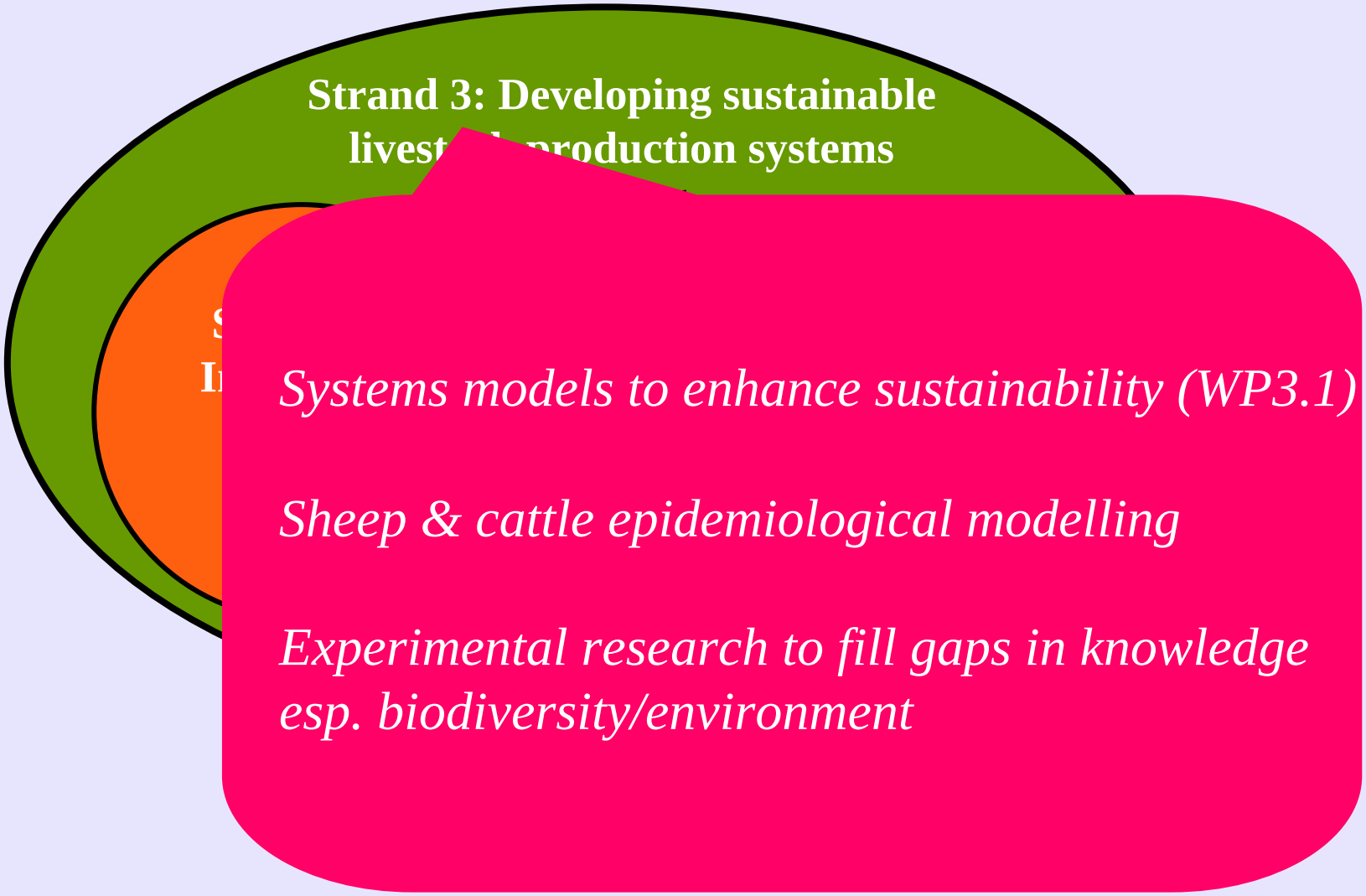

Progress - Strand 3

- Farming systems models (WP3.1
  - Increased emphasis on Climate Change
  - ‘Retreat from the Hills’ policy paper identifying a particular Scottish issue
  - Progress in modelling economic, biodiversity and GHG impacts of different stakeholder-led farm scenarios
  - Poster from Morgan-Davies et al
  - Presentation/posters from Chagunda, Wall, Bell & colleagues
- Modelling sheep & cattle diseases
  - Models for lameness, EAE, ectoparasites in sheep; Johne’s and BVD in cattle
  - Presentation/poster from Gunn, McCormick & colleagues

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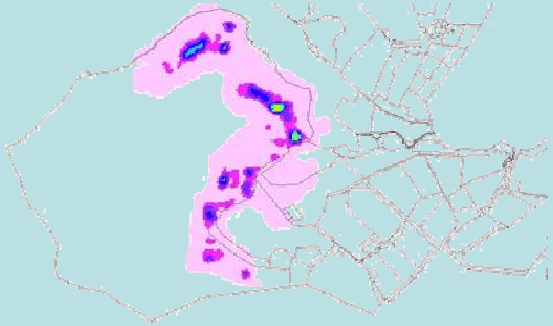
Progress - Strand 3

- Biodiversity/environment
  - First large-scale study of breeds - foraging and performance in hills
  - Field studies attempting for first time to identify biodiversity impact of cattle on hill grazing
  - Linked by surveys of farmer's experiences of breeds and their performance records benchmarked using 'BREEDS' software
  - Impacts of farming options on biodiversity and GHG
    - Environmental audits; frameworks for assessing biodiversity & GHG emissions; workshops
  - See 3 posters: Umstätter, Pollock, Holland & colleagues



Location density map for Charoliais

Progress - Strand 3

- Financially viable mixed habitats on dairy farms (field margins/seed mixes)
  - 22 sites being monitored on 7 Ayrshire dairy farms
  - Invertebrates; vegetation composition, density, height complete
  - Fenced better - leatherjackets, sawfly larvae, harvestmen
  - Grazed better - ground beetles
  - Grazing or cutting necessary to allow bird foraging
  - See poster of Cole et al
- Dairy genotype x systems experiment ongoing
  - High & av. genetic merit for milk solids
  - Divergent systems (High input/High forage)
  - Impact on health, welfare, environment, economics
  - GHG emissions and N losses compared
  - See posters: Roberts, Chagunda & colleagues

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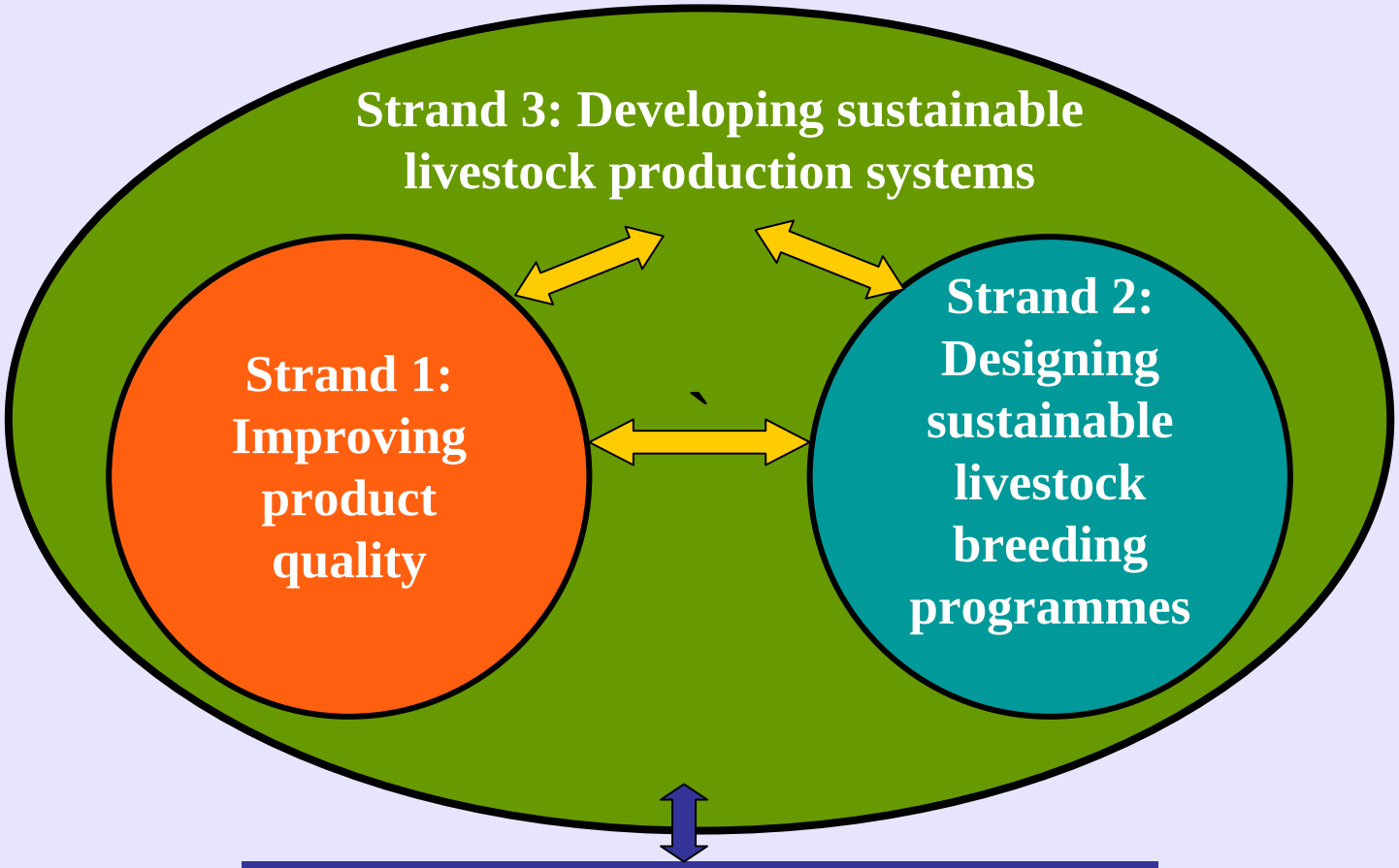


Progress - Strand 4

Success through **Knowledge**

<u>Land based industy:</u> Scotgrass;
Beef Open Day; Royal Highland Show; Northsheep;
LEAF Innovation Centre;
Future Dairy Systems videoconference;
Herdsman's day;
Livestock breeding decision support software;
Dairy crossbreeding & sheep breeding workshops

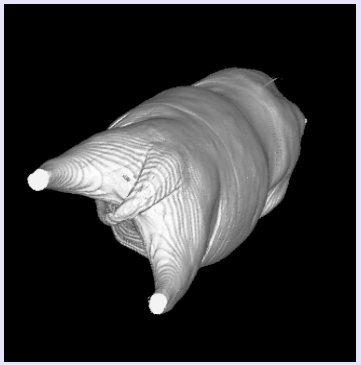
Public: Farm Sunday

+ KT embedded in projects

(KT campaigns agreed for 2008/09)

Studies on value of genetic improvement

- Retrospective (Amer et al , 2007):
  - 10 years sheep improvement - £29m
    - £111m possible
  - 10 years beef improvement - £23m
  - Internal rate of return on investment - 32%
- Prospective (Moran et al, 2007):
  - Value animal and plant genetics R&D - likely future policy priorities inc. climate change
  - Public good rates of return 11-18% for animal case studies
  - c.f. 3.5% recommended Treasury rate



Adding value to WP2.5

- Complementary R&D projects
  - Sheep muscling QTL/VIA (LINK)
  - Live cattle VIA (LINK)
  - Sheep & cattle genomics
    - AgResearch; Abacus (NZ); Iowa State University; EU
  - Several under review
- 6 PhD studentships …
  - sheep VIA (MLC, QMS, HCC, Eblex)
  - bird ecology (SAC, SNH, GCT)
  - genetics of piglet survival (links to WP2.4) (EU)
  - use of molecular information in selection (EU, with Roslin Institute)
  - dairy breeding to mitigate climate change (Scottish Govmnt, links to WP3.1)
  - genome wide selection in sheep & beef (GFP CASE, with Roslin Institute)
- New SEERAD ‘development fund’ activity
  - Genetic epidemiological modelling
    - » link to other Programme 2 WPs
  - Livestock breeding to mitigate climate change

Supporting the
land-based industries
for over a century

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