Smarter

SMAll RuminanTs breeding for Efficiency and Resilience

WP6

Practical Selection Tools to Benefit from International Cooperation

Jean-Michel Astruc (IDELE) & Donagh BERRY (TEAGASC)

INSTITUT DE L'ELEVAGE idele

teagasc
AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY

Final meeting Toledo - Tue. 23rd May 2023

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement n°772787

Agenda of the WP6 session

WP6 overview	Jean-Michel Astruc	10 min
SNP panel in sheep from allele frequencies in SMARTER breeds	Donagh Berry	15+3 min
Across-country evaluation: Latxa x Manech case	Andrés Legarra	15+3 min
International initiative for harmonisation and international evaluation	Jean-Michel Astruc	15+3 min
Discussion	Room	10 min

Synthetic overview of the achievements in each task

Task 6.1 Lead ICAR

Harmonisation of phenotypes, genotypes and pedigree to facilitate international evaluations

Task 6.2 Lead TEAGASC

International genetic and genomic **evaluations**

Task 6.3 Lead IDELE

Practicalities of international evaluations

Task 6.4 Lead TEAGASC

Cost-benefit of international evaluations

Task 6.1: Harmonisation of phenotypes, genotypes and pedigree to facilitate international evaluations

- Overview on selection programs and genetic/genomic evaluation (survey) – 19 countries x breeds
- 10 sharing agreements for pooling data signed → MS23
- File format for exchanging data (international ID, pedigree, phenotypes, genotypes) → D6.1
- Exchanged genomic data and completed research on allele frequency across country x breeds – 18 breeds, 5 countries → Panel SNP on SMARTER website

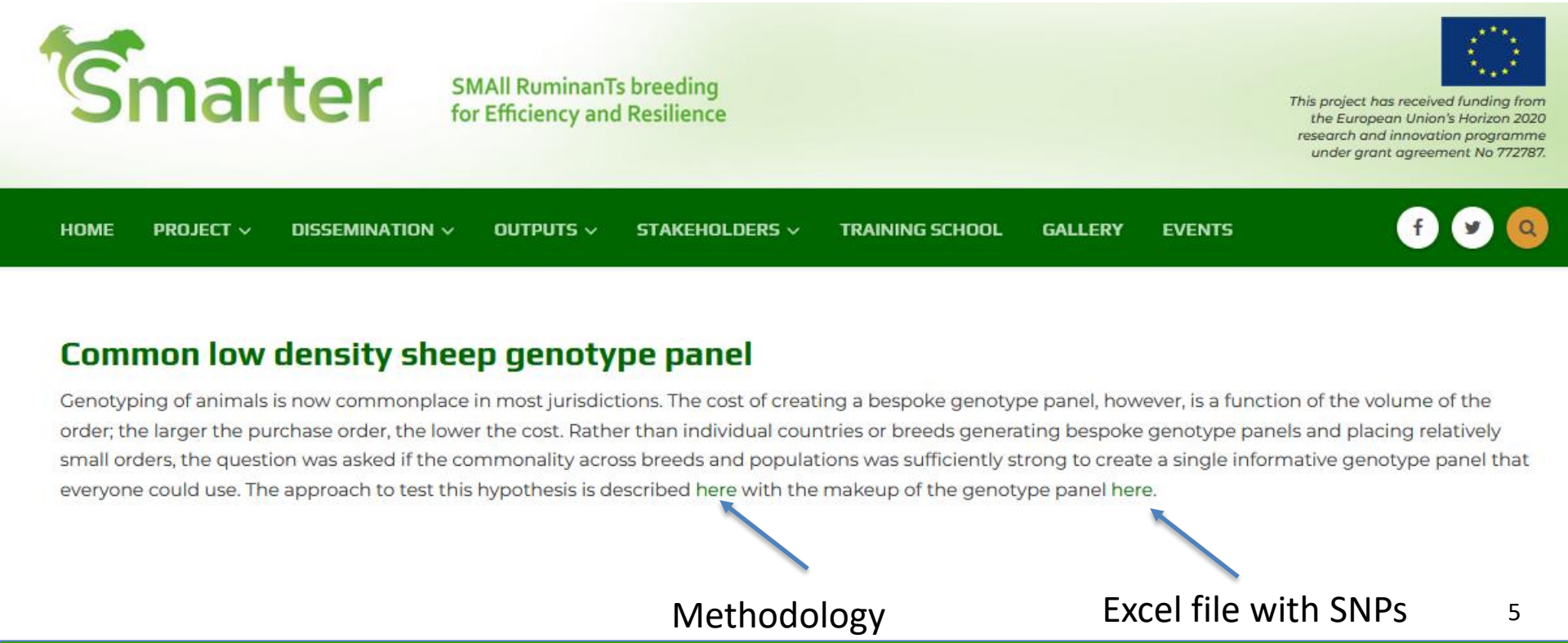
Focus (Donagh Berry)

- Recommendations/guidelines for recording novel traits → D6.3

Focus (J.M. Astruc)

Task 6.1: Harmonisation of phenotypes, genotypes and pedigree to facilitate international evaluations

https://www.smarterproject.eu/common-low-density-sheep-genotype-panel/



Methodology

Excel file with SNPs

Task 6.1: Harmonisation of phenotypes, genotypes and pedigree to facilitate international evaluations

Session 61. **SMARTER: small ruminants breeding for efficiency and resilience**

Chair: Conington / Moreno

Theatre Session 61	Book of Abstracts page

9:15 Genetic evaluation systems and breeding programs in sheep and goats: an international perspective
L.F. Brito, D. Berry, H. Larroque, F.S. Schenkel, G. Ciappesoni, A. O'Brien, F. Tortereau, E. Ugarte, I. Palhiere, B. Bapst, J. Jakobsen, G. Antonakos, A. Kominakis, V. Clement, G. Bruni, V. Loywyck, E. Massender, H.R. Oliveira, J. Posta and J.M. Astruc

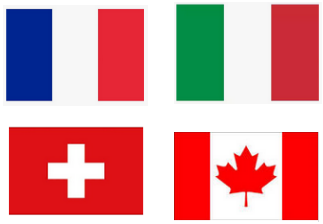
61.18 Comparison of sheep genotype metrics across breeds and countries
A.C. O'Brien, J.M. Astruc, A. Tolkamp and D.P. Berry

Task 6.2: International genetic and genomic evaluations

- **Implementation of across country evaluation in 3 case studies**

Meat sheep 

Weights, muscle & fat depth

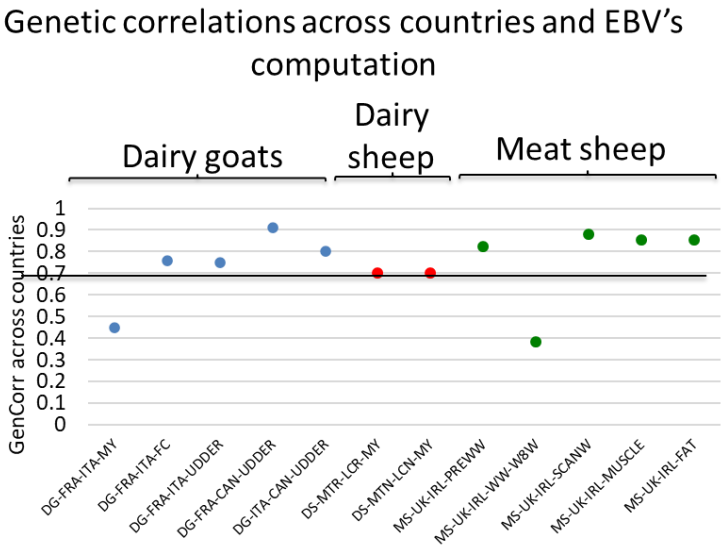
Dairy goat 

Milk yield & udder traits

Dairy sheep 

Milk yield

Focus (Andrés Legarra)



MS24 – level of connectedness across country

MS26 – proof of concept int'l evaluation

D6.2 – submitted scientific publications

Task 6.2: International genetic and genomic evaluations

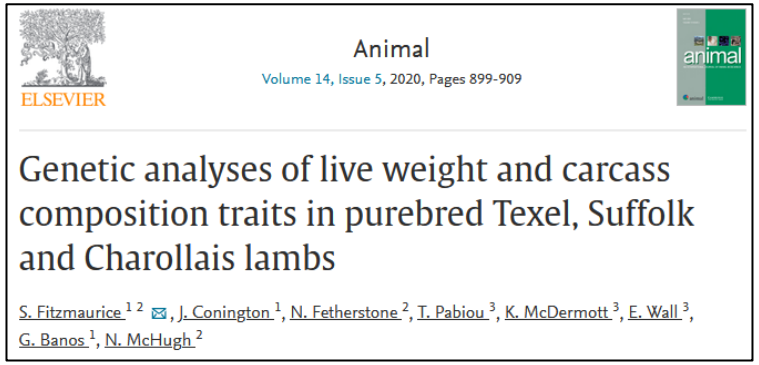
Journal of Animal Breeding and Genetics

ORIGINAL ARTICLE | Open Access

Across-country genetic evaluation of meat sheep from Ireland and the United Kingdom

Shauna Fitzmaurice, Joanne Conington, Kevin McDermott, Noirin McHugh, Georgios Banos

First published: 01 February 2022 | https://doi.org/10.1111/jbg.12668



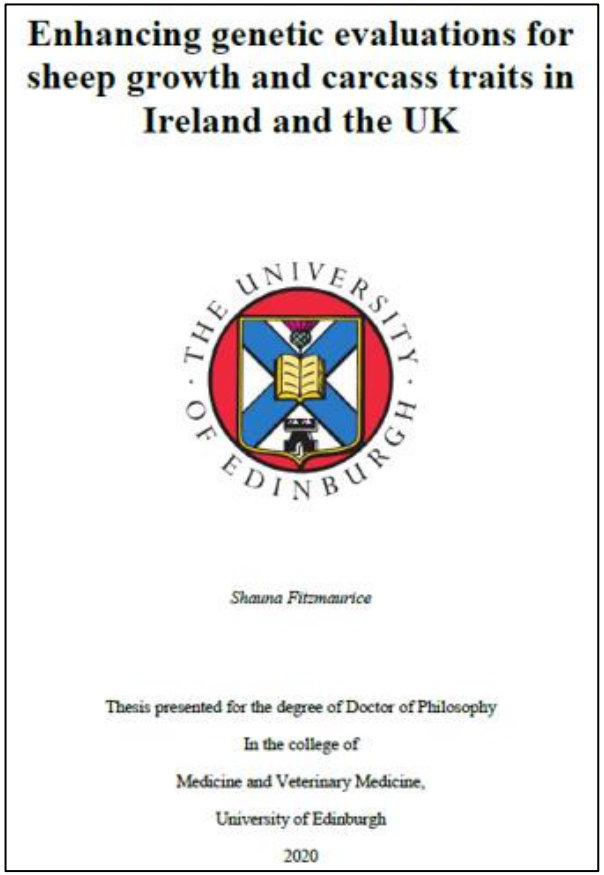
ELSEVIER

Animal

Volume 14, Issue 5, 2020, Pages 899-909

Genetic analyses of live weight and carcass composition traits in purebred Texel, Suffolk and Charollais lambs

S. Fitzmaurice [1 2], J. Conington [1], N. Fetherstone [2], T. Pabiou [3], K. McDermott [3], E. Wall [3], G. Banos [1], N. McHugh [2]



Enhancing genetic evaluations for sheep growth and carcass traits in Ireland and the UK

THE UNIVERSITY OF EDINBURGH

Shauna Fitzmaurice

Thesis presented for the degree of Doctor of Philosophy

In the college of

Medicine and Veterinary Medicine,

University of Edinburgh

2020

Task 6.2: International genetic and genomic evaluations

frontiers in Genetics | Livestock Genomics

Genetic Characterization and Population Connectedness of North American and European Dairy Goats

Marc Teissier[1*], Luiz Brito[2], Flavio Schenkel[3], Guido Bruni[4], Pancrazio Fresi[5], Christèle Robert-Granie[6] and Hélène Larroque[6]

JDS Communications®
2022; 3

https://doi.org/10.3168/jdsc.2021-0195
Short Communication
Genetics

High genetic correlation for milk yield across Manech and Latxa dairy sheep from France and Spain

C. A. Garcia-Baccino,[1,2,3] C. Pineda-Quiroga,[4] J. M. Astruc,[5] E. Ugarte,[4] and A. Legarra[1]*

Submitted to Journal of Dairy Science communications the 24th of January

GENETIC PARAMETERS ACROSS FOUR COUNTRIES IN ALPINE AND SAANEN GOAT BREEDS FOR MILK PRODUCTION AND TYPE TRAITS

Short running title: genetic correlations across dairy goat populations

Marc Teissier[1,*], Luiz F. Brito[2,3], Flavio S. Schenkel[3], Guido Bruni[4], Pancrazio Fresi[5], Beat Bapst[6], Christèle Robert-Granie[1], and Hélène Larroque[1]

Genetic characterization and connectedness of dairy goats in Canada, France, Italy and Switzerland

Teissier, M.; Schenkel, F.; Larroque, H.; Fresi, P.; Brito, L.F.; Robert-Granié, C.; Bruni, G.; Bapst, B.

Genetic parameters across European and North American Alpine goats for two milk production and one udder type traits

Robert-Granié, C.; Schenkel, F.; Larroque, H.; Bruni, G.; Brito, L.F.; Bapst, B.; Teissier, M.; Fresi, P.

Task 6.3: Practicalities of international evaluations

- Visit of Interbull (Uppsala-Sweden).
- Recommended utilisation of tools built in 6.1
- Lessons from T6.2 (technical solutions & issues)
- Comprehensive survey on international evaluation, Questionnaire managed by ICAR (5 languages)
- Willingness to share data - Expectations and concerns – Interested breeds
- Target : breeding organisations and farmers
- Link with WP7 (interviews of breeders) & WP8 (stakeholder platform)

D6.4 – Business/operation model for int'l evaluation in sheep/goat

Focus (J.M. Astruc)

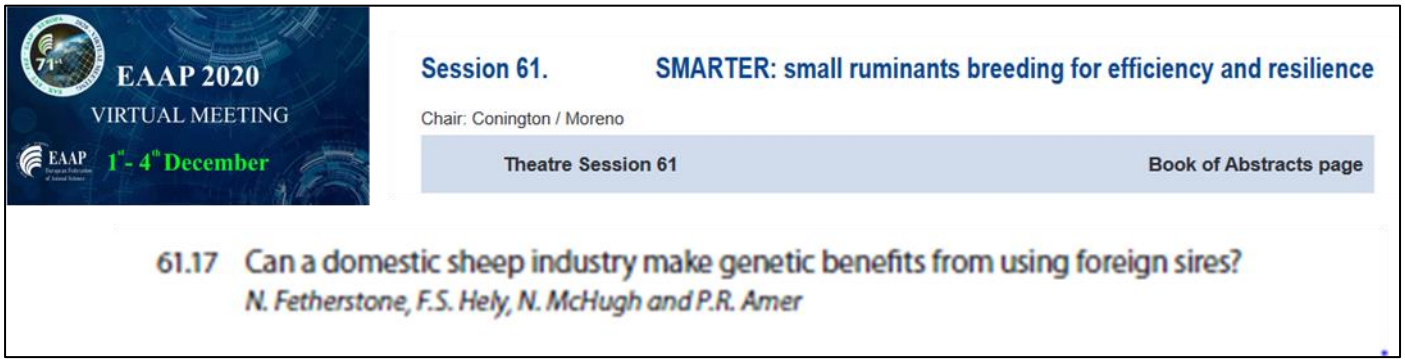
Task 6.4: Cost-benefit of international evaluations

- Framework (model & tool) developed to quantify the benefit of international sharing of germplasm (Teagasc). Case study: Ireland and New Zealand
  - Overview and demonstration on how to run the model and tool.
  - Possible use of template in other SMARTER countries as new case-studies
- Meat sheep case study of across country evaluation: selection across country, using an across country genetic evaluation => the predicted benefits are +3-20% compared to a selection within countries (according to the traits)

M25– Cost-benefit model developed

D6.5 – Report on cost effectiveness of harmonisation & int'l evaluation

Task 6.4: Cost-benefit of international evaluations



EAAP 2020
VIRTUAL MEETING
EAAP 1st - 4th December

Session 61. SMARTER: small ruminants breeding for efficiency and resilience

Chair: Conington / Moreno

Theatre Session 61 Book of Abstracts page

61.17 Can a domestic sheep industry make genetic benefits from using foreign sires?
N. Fetherstone, F.S. Hely, N. McHugh and P.R. Amer

Fetherstone *et al. Genet Sel Evol* (2021) 53:5
https://doi.org/10.1186/s12711-020-00594-y

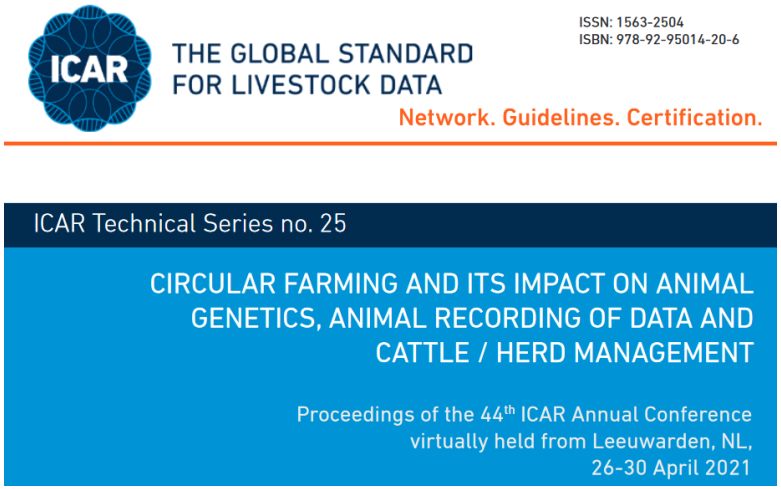
GSE Genetics Selection Evolution

RESEARCH ARTICLE Open Access

Genetic and economic benefits of foreign sire contributions to a domestic sheep industry; including an Ireland-New Zealand case study

Nicola Fetherstone[1,2*], Fiona S. Hely[3], Noirín McHugh[1], Fiona M. McGovern[1] and Peter R. Amer[3]

General presentation of the WP



Selection tools to benefit from international cooperation in small ruminants: a comprehensive work package of the SMARTER project

J.M. Astruc[1], L. Brito[2,3], B. Bapst[4], G. Bruni[5], M. Burke[6], G. Ciappesoni[7], J. Conington[8], C. Garcia-Baccino[9], H. Larroque[9], A. Legarra[9], A. O'Brien[10], J. Posta[11], C. Robert-Granié[9], M. Teissier[9], E. Ugarte[12], C. Moreno-Romieux[9], D. Berry[10]

Main outputs and perspectives

- Harmonisation and cooperation across country are key drivers to make breeding more efficient in small ruminants.
- Data pooled from different countries increase cost effectiveness of selection. Tools are built, connectedness was evidenced (although less strong than in dairy cattle), models run with sufficient genetic correlations across country.
- Genotypes have been included in the genetic analysis. An optimal panel of SNPs has been proposed and is available on the SMARTET website.
- Acceptability if not willingness to share data for a greater efficiency.
- An operation model of international evaluation was proposed, as a strong basis for the future
- Recommendations for recording efficiency, resilience and environment were proposed and are ready to be translated in ICAR guidelines

SMARTER PARTNERS

Thank you for your attention

www.smarterproject.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement n°772787