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GLOBAL RESEARCH ALLIANCE
ON AGRICULTURAL GREENHOUSE GASES

Enteric Fermentation Flagship Project: Rumen microbiomes to predict methane

Animal Selection Genetics & Genomics Network

Suzanne Rowe

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High Throughput Predictor

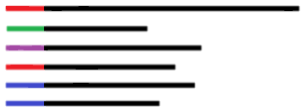
DNA extracted

Global Rumen Census freeze-dried DNA extraction method

DNA digested by restriction enzyme(s)

ApeKI or PstI

Ligation with ‘barcode’



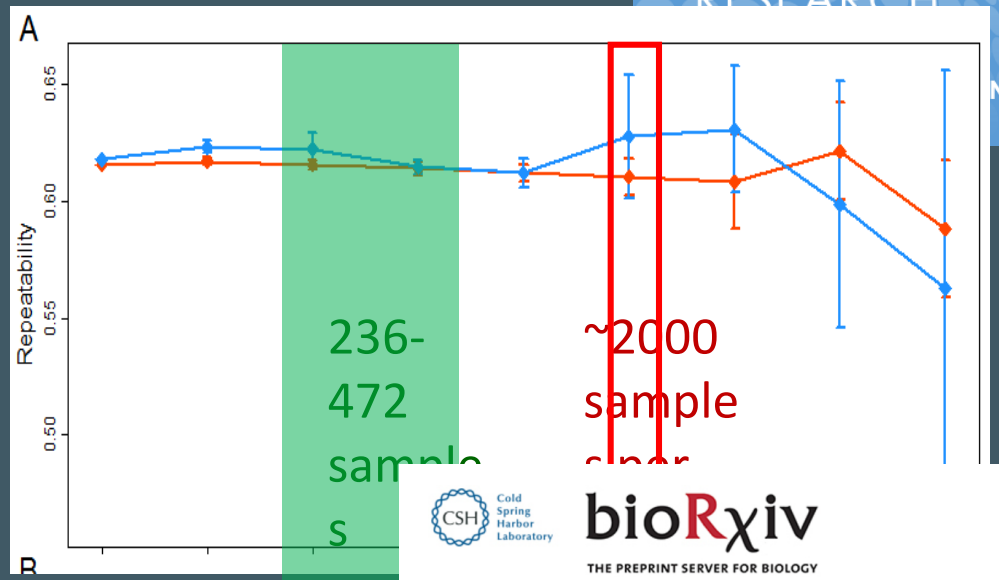
To link sequences with samples

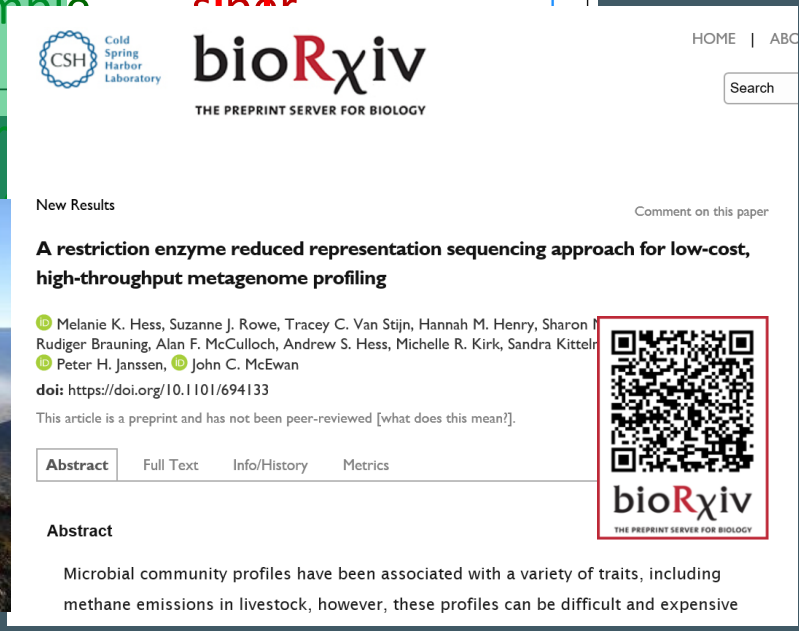
Fragment size-selection

193-318bp

Fragments sequenced

Illumina HiSeq2500
236 samples across 2 lanes





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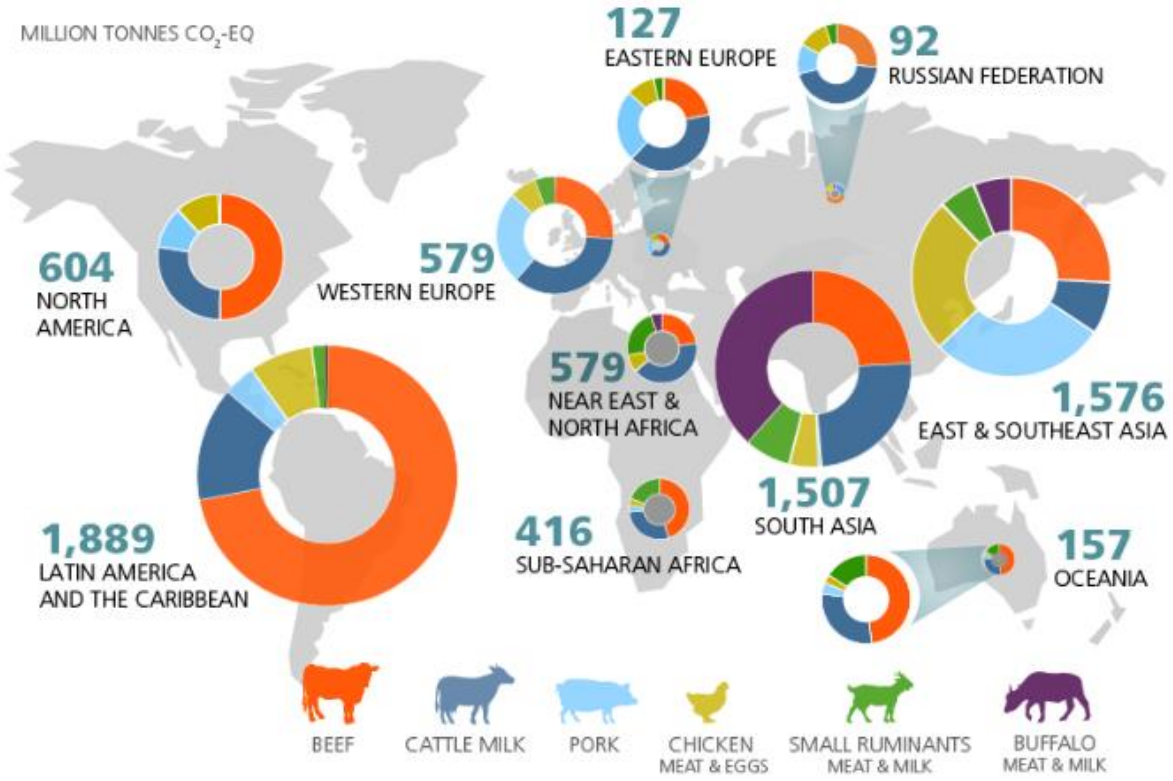
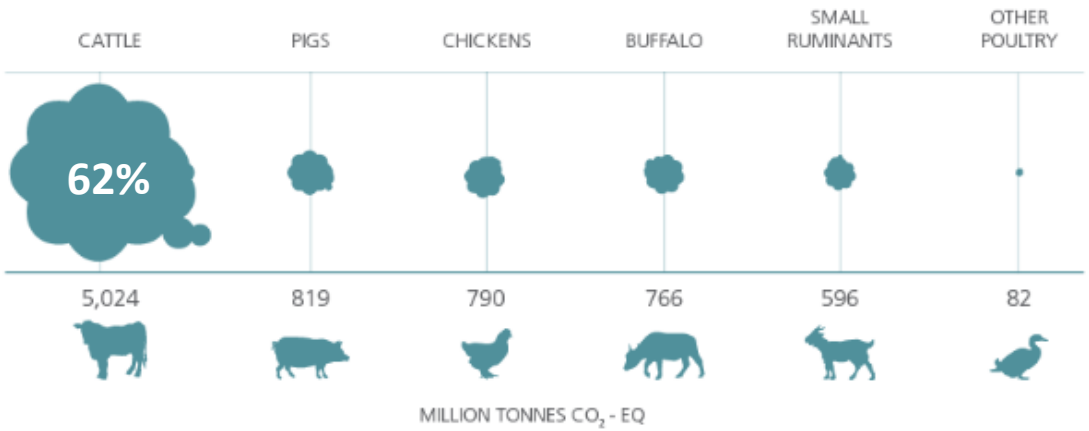
Enteric Fermentation Flagship Project



Regional emissions. *Regional total emissions and their profile by commodity are shown. Results do not include emissions allocated to non-edible products and other services.*



Global estimates of emissions by species. *It includes emissions attributed to edible products and to other goods and services, such as draught power and wool. Beef cattle produce meat and non-edible outputs. Dairy cattle produce milk and meat as well as non-edible outputs.*

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Expand to Cattle…..GRA Flagship

- LEARN Post-Doc – Quantitative Genetics
- Starting with method validation in cattle
- Expand to additional systems and partners
- Make new sequencing methods available to all partners
- Protocols and agreement to share samples and phenotypes
- 1,000 samples fully funded

Global Outcomes

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- Trained LEARN Post-doctoral fellow
- Low cost microbial predictor to compare and evaluate systems, feeds, individuals
- Pan species - characterisation of rumen microbial communities
- Greater understanding of the rumen microbiome and biological differences between high and low emitters
- Potential for low cost accessible global breeding solutions

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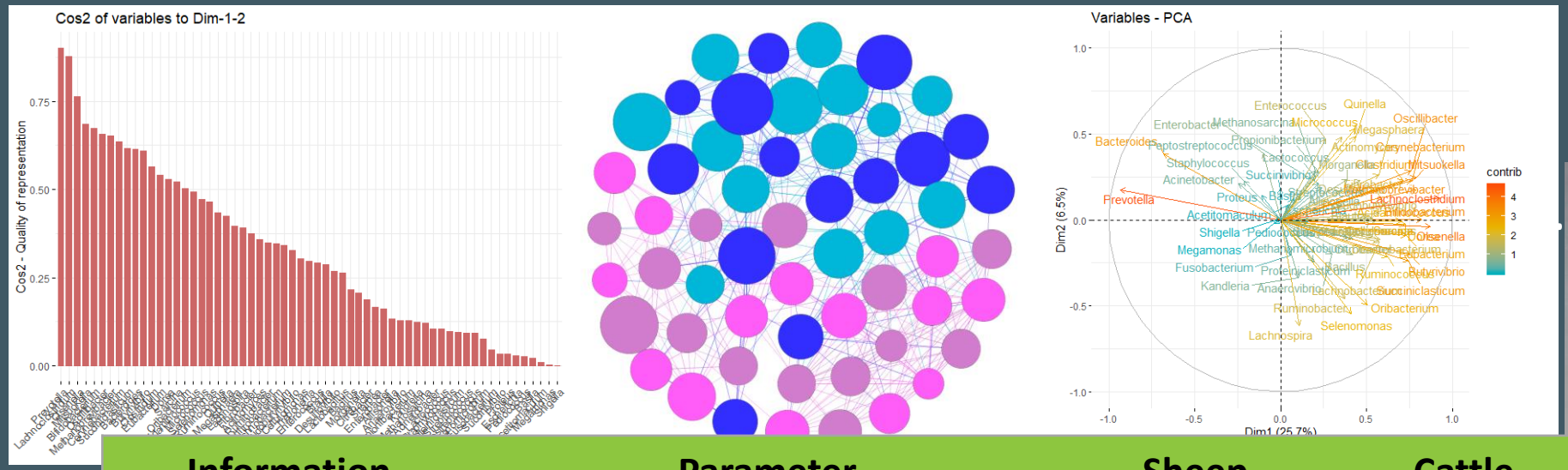
Rumen Microbes to Predict Methane from Cattle



Information	Parameter	Sheep	Cattle
Sequencing	Number of Samples	236	186
	Samples per Lane	118	188
	Number of Reads/Sample	2.7M ± 680k	759k ± 147k
Reference-Based	Percent Assigned	6.8 ± 1.8	9.3 ± 1.6
Reference-Free	Number of Tags*	503k	423k
	Percent Assigned	38.1 ± 16.2	64.3 ± 6.8

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Collaboration

Collaborators

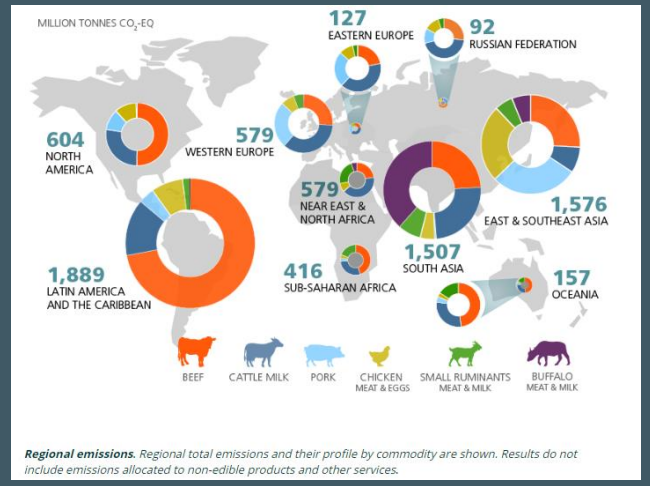
- Argentina
- Australia
- Belgium
- Finland
- Ireland
- Mexico
- Peru
- Philippines
- South Korea
- USA
- Uruguay

- *Bos taurus*
- *Bos indicus*
- *Bubalus bubalis*

- Beef
- Dairy
- Dual purpose

Next steps

- Collaborator meetings at GGAA and EAAP
- ASGGN meeting at EAAP
- Oral presentation at the EAAP
- Social media (Twitter, GRA websites, …)



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Challenges

- Protocols
- Sharing Agreements
- Importing sample types
- New sampling regimes

Rumen samples

1	2	3	4
 (Kittelmann et al, 2014)	1ml rumen sample + 1ml of 2X concentration solution A	1ml rumen sample + 1ml of 2X concentration solution B	1ml rumen sample + 2mls of 100% alcohol solution C