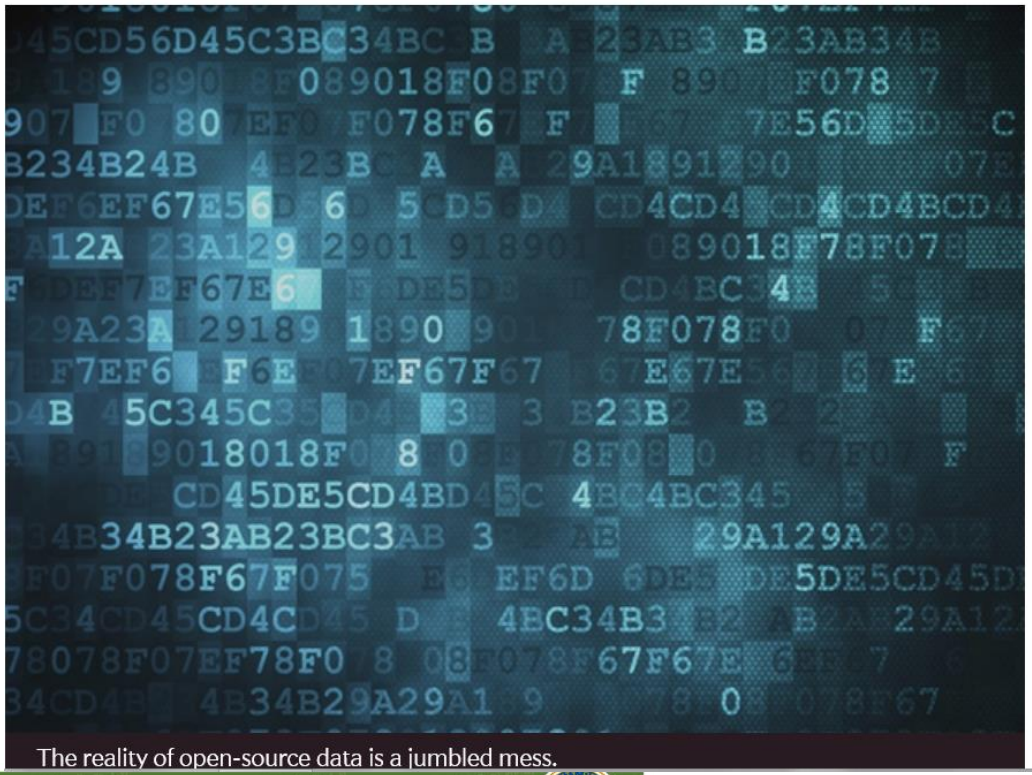
Creation of database for meta-analysis

future tense | THE CITIZEN'S GUIDE TO THE FUTURE | JUNE 24 2015 6:40 PM

Researchers Sharing Data Was Supposed to Change Science Forever. Did It?

By Lily Hay Newman



The reality of open-source data is a jumbled mess.

Databases

- Why do we need big data?
  - "We have tiny little brains. We can't understand the big stuff anymore" – The Defense Advanced Research Projects Agency
- The hard thing is not actually to dump your data into the public domain, It's to dump it in an intelligible way. To make data from a project usable, it takes about 20 percent of a researcher's total work.

Databases

- Creation of the database will be the first step towards analysis
- Once the contracts are signed all participants will be asked to provide their data
- The data will be held under strict confidence and access will be discussed and finalized today

Databases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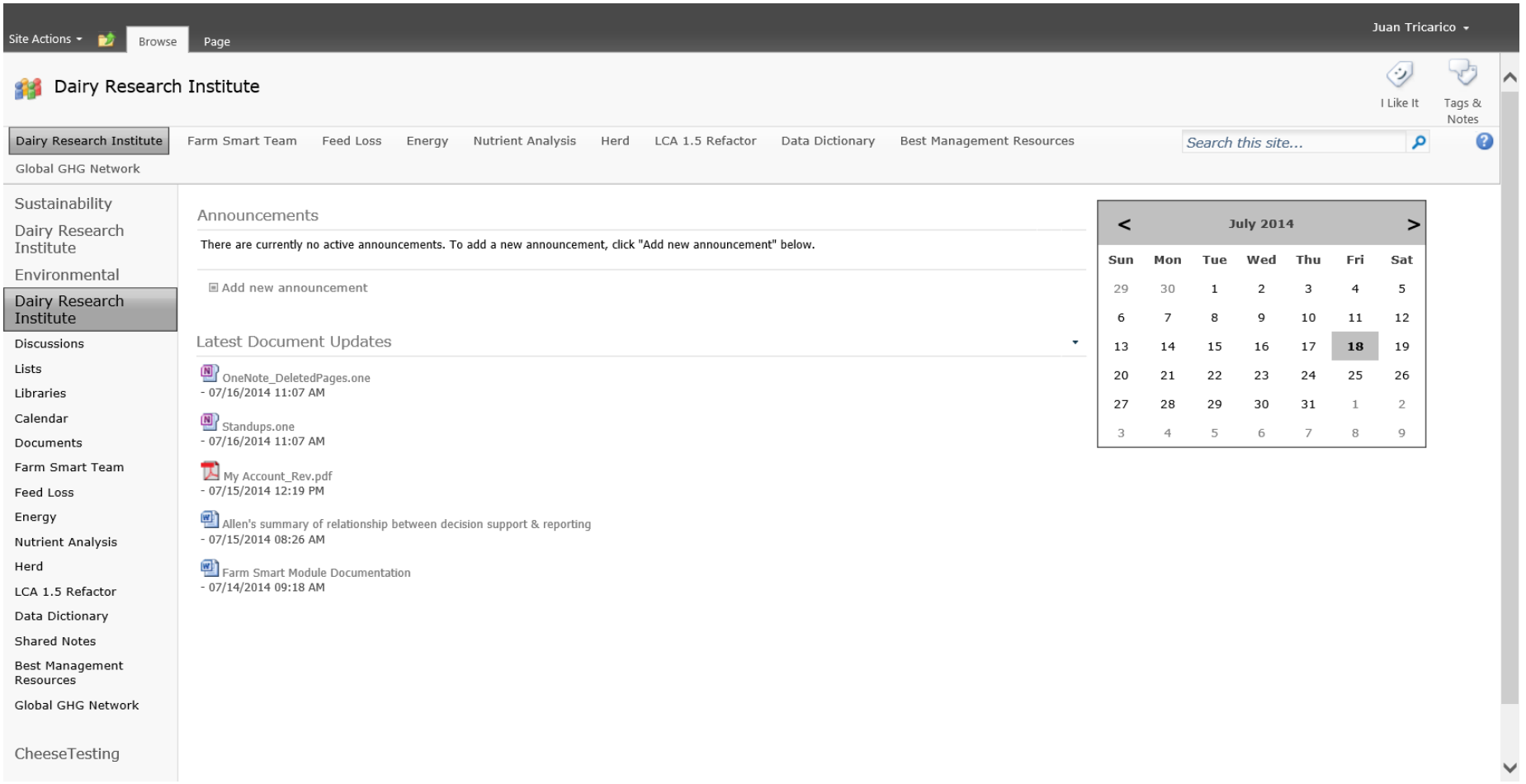
Databases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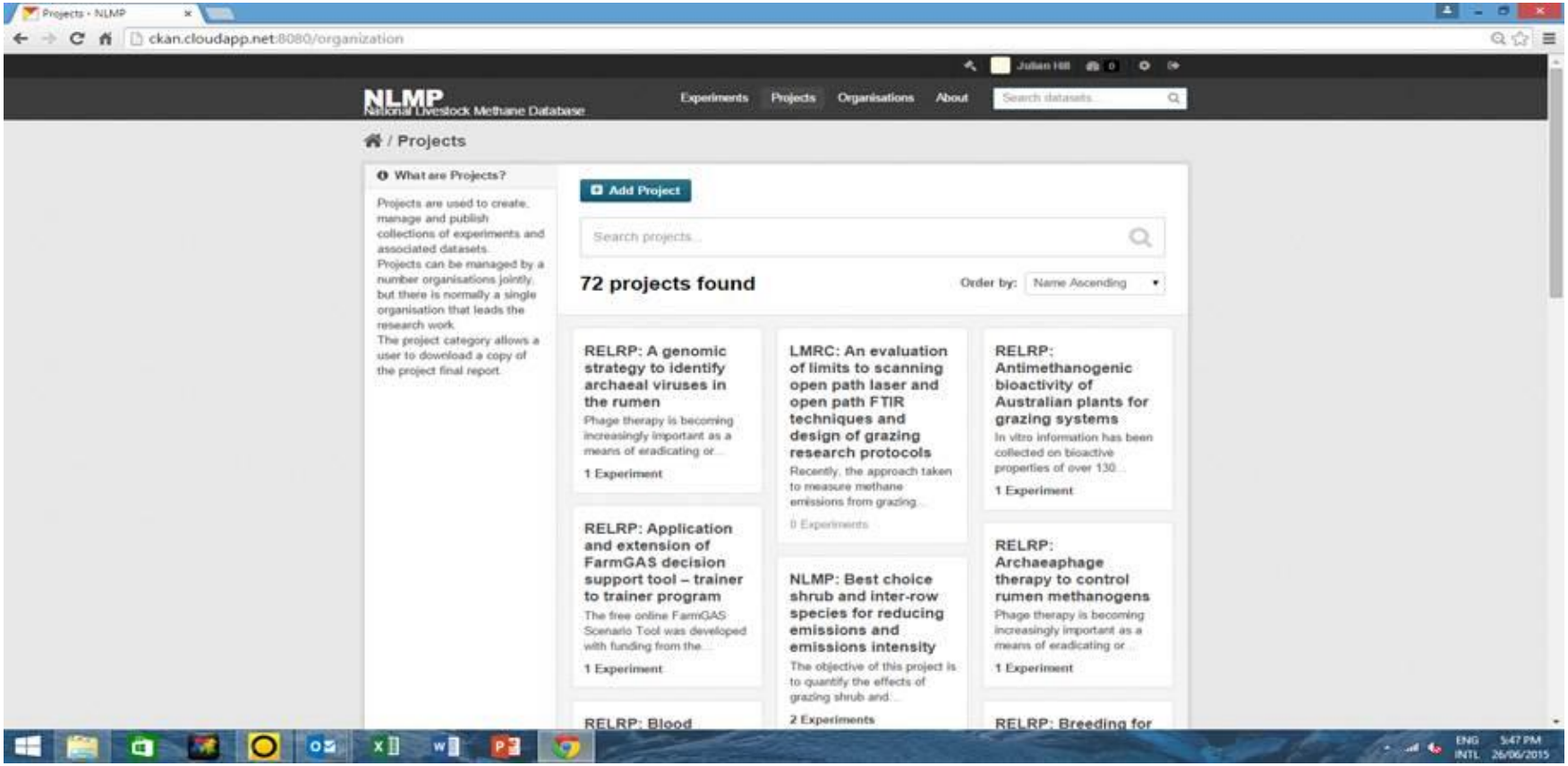
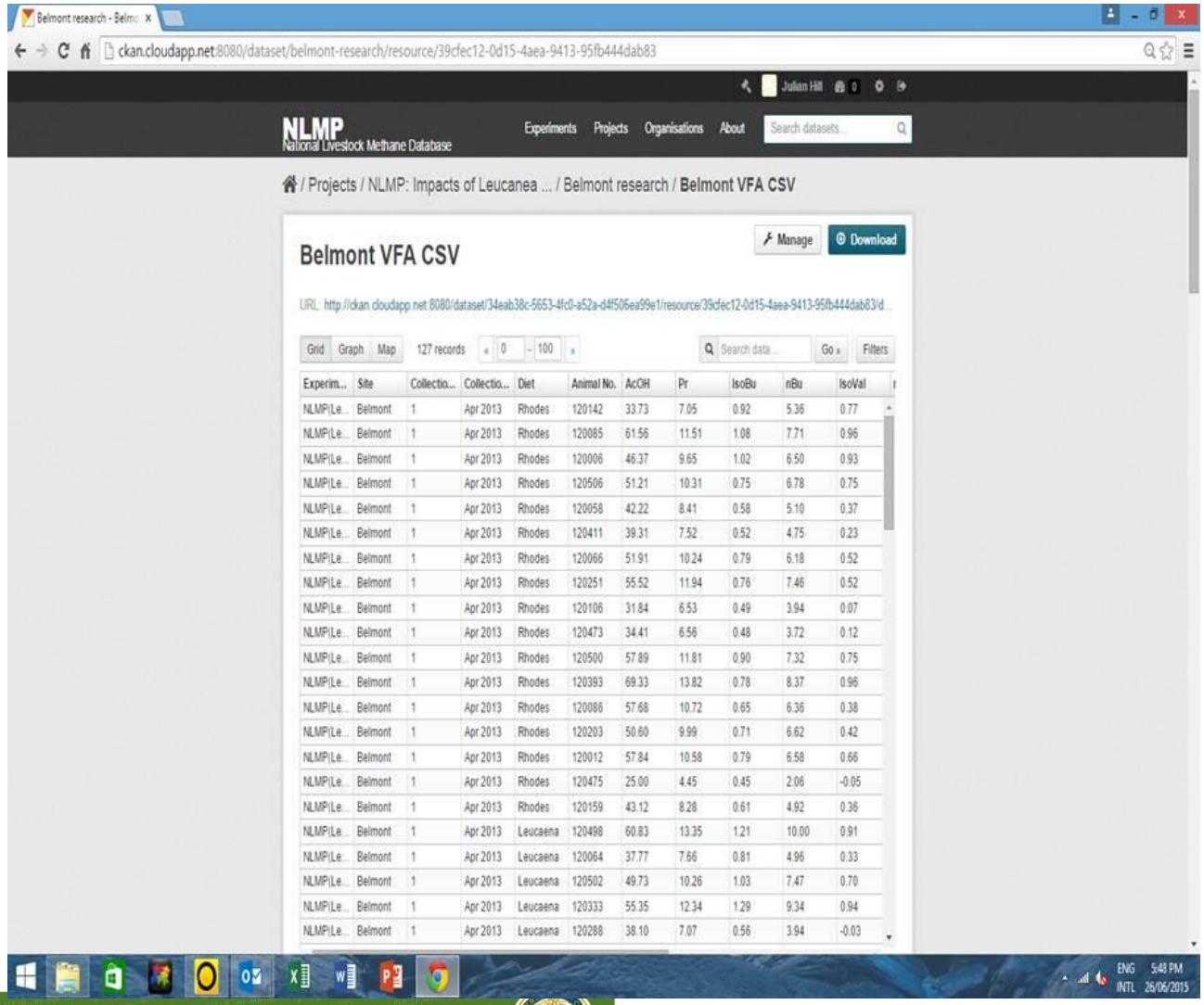
Databases - Australia



Databases - Australia



Databases – Treatment Means

- At the minimum we need information on:
  - Number of observations
  - Some measure of variability. SD is preferred but SEM or SED will also be usable by converting it to SD
  - Measurement methodology (e.g., VHC, GreenFeed etc for methane)
- Need to conduct 'quality control' to make sure numbers are within the expected range

Analysis

- A meta-analytical approach will be used.
- All analysis will be conducted using R statistical software or WinBugs
- A correlation matrix will be developed in order to avoid multi-collinearity issues
- Variable selection will be conducted using reversible jump Markov Chain Monte Carlo method

Bayesian Hierarchical Model

- Model for the data given model parameters
  - *Let* y_{ijk} denotes the k^{th} (i = 1, …, n_{ij}) record on the i^{th} (i = 1, …, I) animal in the j^{th} (j = 1, …, J) study

$$y_{ijk} \mid \boldsymbol{\beta}, \alpha_i, \delta_j, \tau, \nu \sim t(\mathbf{X}'_{ijk}\,\boldsymbol{\beta} + \alpha_i + \delta_j, \tau, \nu)$$

  - Data modeled through a student's-*t* density
  - Expected value modeled through covariates selected by RJMCMC plus animal and study random effects

Selected Models

- MCMC Posterior means

Model	Posterior Prob.	Prediction Equation
GE	-	CH_4 = 3.25 (0.429) + 0.043 (0.001) x GEI
Dietary	0.74	CH_4 = 0.225 (0.7133) + 0.042 (0.001) x GEI + 0.125 (0.015) x NDF - 0.329 (0.094) x EE
Animal	0.86	CH_4 = -9.31 (1.06) + 0.042 (0.001) x GEI + 0.094 (0.014) x NDF - 0.381 (0.092) x EE + 0.0078 (0.001) x BW + 1.62 (0.119) x MF

Moraes et al. 2014, Global Change Biology