How can statisticians contribute towards agricultural science in New Zealand?
Examples from an AgResearch statistician

Chikako van Koten
AgResearch Lincoln Research Centre

2013 Canterbury Statistics Open Day (20 Nov.)
New Zealand pastoral sector statistics (2012~)

6.4 M dairy cattle in 1.6 M ha
3.9 M beef cattle in 8.2 M ha
31.9 M sheep
1.1 M deer

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19.1 B litres of milk (1.69 M tonnes of milk solids)
> 1 M tonnes of red meat
109,540 tonnes of wool

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Export
$12.3 B of dairy products
(95% of milk)
$7.9 B of meat, textile & by-products
(80% of beef & veal, 90% of sheep meat, 90% of wool)
AgResearch core purpose

To enhance the value, productivity and profitability of New Zealand’s Pastoral, agri-food and agri-technology sector value chains to contribute to economic growth and beneficial environmental and social outcomes for New Zealand.

AgResearch core value proposition

Partner with the pastoral, agri-food and agri-technology sectors to identify the innovation that is needed and deliver our collective expertise to create value for New Zealand.
AgResearch

Largest CRI with over 800 staff (over 600 science)
located in 4 campuses

Ruakura (Hamilton)  Grasslands (Palm Nth)  Invermay (Dunedin)

University

CHC

Lincoln

2016/7  ?
AgResearch

Sector portfolios
Dairy in-farm
Dairy off-farm
Meat & fibre on-farm
Meat & fibre off-farm
Pan-sector &
Maori agribusiness

Science groups
Animal Nutrition & Health
Animal Productivity
Food & Bio-based Products
Forage Improvement
Innovative Farm Systems
Land & Environment
AgResearch Statistics team

14 statisticians (5: Ruakura, 5: Grasslands, 1: Lincoln, 3: Invermay)

Main roles:
• Statistical consulting in collaboration with other scientists in research, to provide statistical solutions to scientific problems
  - Design experiments/trials
  - Analyse data
  - Report analysis results
  - Co-author publications
• Design & deliver customised statistical training to other scientists

Team members regularly attend NZSA, IBS and many other statistical conferences.
Example 1: Bird-deterring grass

1st trial at the CHC airport (2007~8)
Comparing bird counts between treated vs. control plots

Generalised Estimating Equations (GEE) analysis, presented in 2009 NZSA conference

More trials & analysis

Avanex™ grass is sold worldwide for airports, golf courses, etc.
Example 2: Which woollen carpet prevents dust flying?

Comparing time series of dust particle concentration at 0.5m from floor after disturbance, between two types of carpets

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Time series analysis, presented in 2010 NZSA conference

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Healthier carpets are in the market.
Example 3: Composite flax (Harakeke)-polymer fibre

To improve stress-strain characteristic of the fibre, we needed to know if treatment is effective.

Nonlinear mixed model analysis presented in 2011 NZSA conference

Treatment is implemented in the industry.
Example 4: Enhanced biosecurity
- time to death after Methyl Bromide (MB) fumigation

MB has been used for over 70 years for quarantine purposes, to kill unwanted pest organisms within imported commodities. But some pest organisms do not die instantly. So, how long should commodities be held after fumigation?

Fumigated fly eggs were stored & mortality had been monitored over a 1-month period

Survival (Time-to-event) analysis to estimate 95 percentile time-to-death at each fumigation level + storage temperature research paper submitted to a scientific journal

Enhanced biosecurity
Example 5: Clover Root Weevils (CRW)

CRWs damage clovers, nutrient food for livestock. To control CRW, we need to estimate the population size.

CRW larvae have been sampled from paddocks. Which collection method can catch most larvae?

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Generalised linear model analysis (Zero-inflated negative binomial model) published in NZ Plant Protection journal

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More accurate population size estimated

On-time CRW control

Loss of production avoided
Example 6: Wool traceability

Tracing elements within wool fibre are unique to its country of origin, due to the country’s geographical environment (altitude, rainfall, etc.) & farming practice (use of chemicals).

Multivariate analysis (Discriminant Function Analysis) to formulate a model that can estimate which country wool fibre is from presented in 2013 International Wool Textile Organisation Congress

promising tool to protect authenticity of New Zealand wool from cheap, low-quality wool produced in other countries.
In AgResearch statisticians can:

- use multiple statistical software (SAS, R, GenStat, Minitab) to conduct various statistical analyses
- solve a wide range of scientific problems in New Zealand
- closely collaborate with other scientists
- work in a high-performance environment
- update statistical knowledge and skills by attending workshops, courses, seminars
- interact with other statisticians in conferences, networking events
- contribute towards our better future
- and always have fun 😊
Final thoughts

Wool is cool.            Meat is neat.            Grass is always green!