

Map of potential farm classes and earning before interest
and tax (EBIT) from pastoral activities

Derived dataset, various sources

Data Documentation
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Derived data set

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2. Data keywords:

Agriculture, New Zealand, farm class, profitability

3. Dataset abstract:

The dataset has two GIS layers. The first layer is the potential farm by class and by region map in 2002. It is derived using sheep-beef farm class and region definitions from Meat and Wool Ltd and dairy region definitions from MAF. The second layer presents the average (1990 to 2007) potential profitability (EBIT per ha) for being a farm of a certain class in a certain region.

4. Motu Working Papers using this data set.

Kerr, Suzi and Wei Zhang. 2009. "Allocation of New Zealand Units Within Agriculture in the Emissions Trading System," Motu Working Paper 09-16. Available online at <http://www.motu.org.nz/publications/working-papers>.

5. Background

Jo Hendy, Kelly Lock and Suzi Kerr created the first version of a map of potential farm classes from pastoral activities. In their paper (Lock et al, 2006), they infer sheep-beef classes, defined by Meat and Wool Economic Service (MWES) (see

Table 1), from Quotable Value data (1990 to 2002) at meshblock level and a land productivity map developed by (Baisden, 2006), where no sheep-beef farm locations are revealed. No information for Agribase related data is used.

Table 1 Farm class definitions

Class	ES Farm Class	Characteristics
1	South Island High Country	Extensive run country located at high altitude carrying fine wool sheep, with wool as the main source of revenue. Located mainly in Marlborough, Canterbury and Otago.
2	South Island Hill Country	Mainly mid micron wool sheep mostly carrying between two and seven stock units per hectare. Three quarters of the stock units wintered are sheep and one-quarter beef cattle.
3	North Island Hard Hill Country	Steep hill country or low fertility soils with most farms carrying six to ten stock units per hectare. While some stock are finished a significant proportion are sold in store condition.
4	North Island Hill Country	Easier hill country or higher fertility soils than Class 3. Mostly carrying between eight and thirteen stock units per hectare. A high proportion of sale stock sold is in forward store or prime condition.
5	North Island Intensive Finishing Farms	Easy contour farmland with the potential for high production. Mostly carrying between eight and fourteen stock units per hectare. A high proportion of stock is sent to slaughter and replacements are often bought in.
6	South Island Finishing-Breeding Farms	A more extensive type of finishing farm, also encompassing some irrigation units and frequently with some cash cropping. Carrying capacity ranges from six to eleven stock units per hectare on dryland farms and over twelve stock units per hectare on irrigated units. Mainly in Canterbury and Otago. This is the dominant farm class in the South Island.
7	South Island Intensive Finishing Farms	High producing grassland farms carrying about ten to fourteen stock units per hectare with some cash crop. Located mainly in Southland, South and West Otago.
8	South Island Mixed Finishing Farms	Mainly on the Canterbury plains with a high proportion of the revenue being derived from grain and small seed production as well as stock finishing.

9	Average	Average
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Their map carries only one dimension of available information, which is the sheep-beef farm class that the land would likely be if it were used as a sheep-beef farm.

We had some reservations about the original land class map that was produced. Specifically, some of the land that was classified as hill or high country was actually flat land (for example the Canterbury plains).

An initial modification to this map to address this concern classified all land with slope less than 1 degree as high quality pasture land. This land was intended as dairy land. However, this contradicts the original intension of the map.

This initial modification of the map also enriched the map by identifying department of conservation land and separating pasture lands by regions.

The map was revised a second time. All land with slope less than 1 degree was reclassified to be in the more intensive land use classes. For North Island land the hard hill country and hill country land with slope less than 1 degree was reclassified as intensive. For South Island land the high and hill country land was reclassified as finishing according to a nearest neighbour algorithm (so reclassified pixels took the same value as their nearest neighbour).

List of data used

A list of data used (all GIS data, maps, are raster files with a resolution of 500m by 500m, or equivalently 25 hectares per pixel):

- a. A potential sheep-beef farm class map from pastoral activities created by Jo Hendy, Kelly Lock and Suzi Kerr.
- b. Department of Conservation land map 2003.
- c. MAF monitor dairy farm regional boundary map, derived from Territorial Authority (TA) map 1996 and Regional council map 2001 based on information provided by MAF (Phil Journeaux).
- d. Meat and Wool Economic Service sheep-beef farm boundary map, derived from TA map 1996 based on information given by MWES.
- e. Farm economic/financial information for Dairy farms, from MAF farm monitoring reports (2000 to 2008). All variables are by MAF defined regions.
- f. Farm economic/financial information for sheep-beef farms, from Meat and Wool Economic Service (2000 to 2008). All variables are by sheep-beef farm class AND MWES defined regions.
- g. Slope (GIS) data from Land Environment New Zealand. As the original map is 25m by 25m, we condense the map to 500m by 500m (25ha per pixel) to match the base map.

Creation procedures for the map of potential farm classes in different regions:

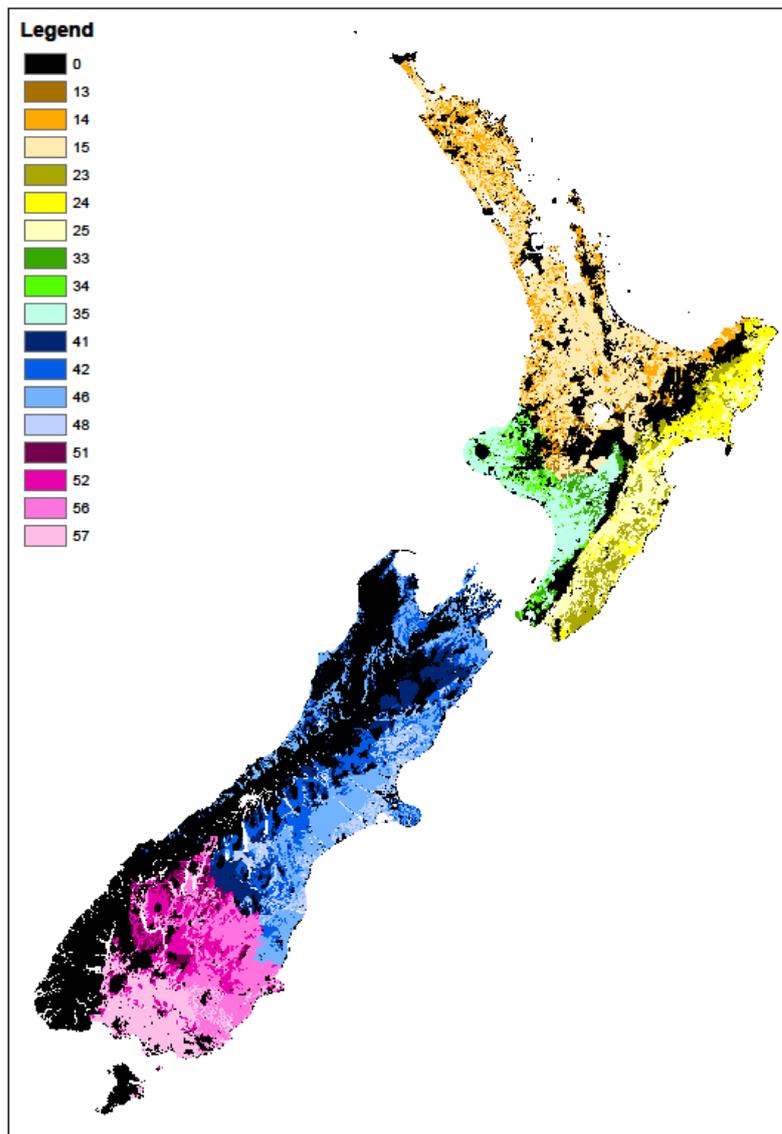
The map carries information on potential dairy farm areas and potential sheep-beef farm areas from pastoral activities. The potential dairy farm areas are by regions defined by MAF, and the potential sheep-beef farm areas are by region and class defined by MWES.

To create the map, we follow the steps listed below:

- a. Add the MWES sheep-beef farm boundary map to the base map (created by Hendy et al), so that the potential sheep-beef farm areas are now by region and by class.
- b. Use slope map to identify where the potential dairy farm areas are. The slope threshold used is 1 degree, which means that if the mean slope of a pixel is less than or equal to 1 degree that pixel is regarded as potential dairy farm area. This threshold is based on the paper (Todd and Kerr, 2009), where it shows that more than 85% of dairy farm parcels have an average slope of under 1 degree (page 13 and 14 and Figure 9).
- c. Reclassify land by region
- d. Identify Department of Conservation land and exclude them from the map created from step 3.

Note: the final map (see Figure 1) does not show actual locations of dairy and sheep-beef farms that are recorded in any dataset for any period, i.e., Agribase related database.

Figure 1 the map of potential farm classes in different regions from pastoral activities



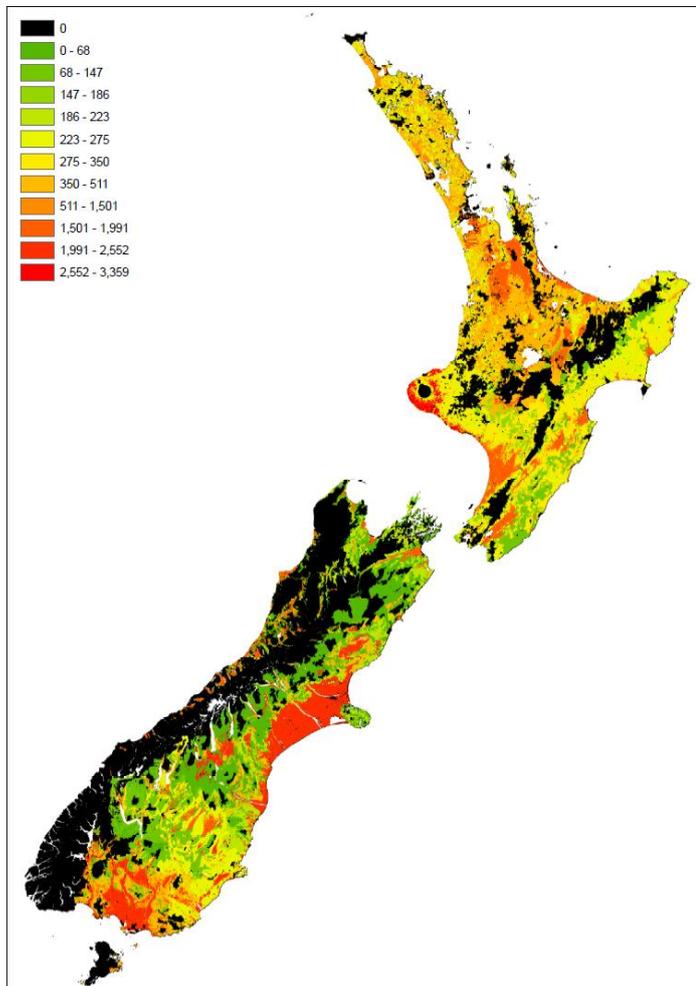
Creation procedures for the map of potential EBIT from pastoral activities

The map of potential EBIT from pastoral activities is created based on the map of potential farm classes from different regions. (EBIT is Earnings before Interest and Tax [and Rent]. Interest is a cost of capital used, so is Rent. Effectively this standardisation process adds back Interest [and Rent] to Farm Profit before Tax so farm businesses can be more directly compared.) The procedures are:

- Use data collected from MAF farm monitoring reports (2000 to 2008) to calculate average EBIT per hectare from 2000 to 2008 (in 2008 price) for dairy farms from different regions.
- Use data from MWES to calculate average EBIT per hectare from 2000 to 2008 (in 2008 price) for sheep-beef farms by class by region.
- Assign dairy average EBIT per ha to the map (shown in Figure 1) by regions. The assignment takes place in pixels that are labeled with suffix “high production pastoral land”.

- d. Assign sheep-beef average EBIT per ha to the map by regions and by classes. The assignment takes place in pixels that are labeled with the format of “Region: farm class”.

Figure 2 the map of potential farm EBIT per hectare from pastoral activities



6. Output

The outputs are two maps – “PastoralLandByClassRegion.asc” and “PastoralLandByClassRegion_EBITPerHa.asc” They are in ASCII format and can be read directly into ArcGIS 9.3 or above, or can be read into ArcGIS 9.2 or below after rasterizing. The resolution of both maps is 500m by 500m, or equivalently 25 hectares per pixel.

Each pixel in the first map has a value and the meaning of the value is shown in the table below:

Table 2 Map keys for the map of potential farm classes in different regions

Potential Sheep-beef farms			
North Island			
VValue	1st digit meaning	2nd digit meaning	Description of Class
13	Northland-Waikato-BoP	Class 3	NI hard hill country
14	Northland-Waikato-BoP	Class 4	NI hill country

15	Northland-Waikato-BoP	Class 5	NI intensive finishing
23	East Coast	Class 3	NI hard hill country
24	East Coast	Class 4	NI hill country
25	East Coast	Class 5	NI intensive finishing
33	Taranaki-Manawatu	Class 3	NI hard hill country
34	Taranaki-Manawatu	Class 4	NI hill country
35	Taranaki-Manawatu	Class 5	NI intensive finishing
South Island			
VValue	1st digit meaning	2nd digit meaning	Description of Class
41	Malborough-Canterbury	Class 1	SI high country
42	Malborough-Canterbury	Class 2	SI hill country
46	Malborough-Canterbury	Class 6	SI finishing-breeding
48	Malborough-Canterbury	Class 8	SI mixed finishing
51	Otago-Southland	Class 1	SI high country
52	Otago-Southland	Class 2	SI hill country
56	Otago-Southland	Class 6	SI finishing-breeding
57	Otago-Southland	Class 7	SI intensive finishing

For the second map, each pixel represents a potential EBIT per hectare measured by 2008 dollars.

References

- Baisden, W. T. 2006. "Agricultural and Forest Productivity for Modelling Policy Scenarios: Evaluating Approaches for New Zealand Greenhouse Gas Mitigation", *Journal of the Royal Society of New Zealand*, 36:1, pp. 1-15. Available online at <http://www.royalsociety.org.nz/includes/download.aspx?ID=85496>.
- Lock, Kelly; Jo Hendy and Suzi Kerr. 2006. "Sheep and Beef Production Costs Across New Zealand: Introducing the Spatial Dimension," in *New Zealand Agricultural and Resource Economics Society*, Nelson.
- Todd, Maribeth and Suzi Kerr. 2009. "Changing Land Cover and Use in New Zealand: How Does It Related to Land-Use Capability and Slope?," *Forthcoming Motu Working Paper*, Wellington, New Zealand.