workingpaper

Evaluating the Livestock and Crops Datasets

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Authors Resource Project Team

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Working Paper to support Report 10: *The State of New Zealand's Resources**

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*Work on this report was put on hold and this paper now contributes to a new project, *Project LivestockNZ*.

About the Resource Project Team

The Resource Project Team comprises of Jessica Prendergast, Nicola Bradshaw, Chris Aitken, Lisa Bazalo, Jean-Charles Perquin, and Steph Versteeg. Each team member has placed a significant amount of time and effort into each Working Paper and the corresponding datasets.

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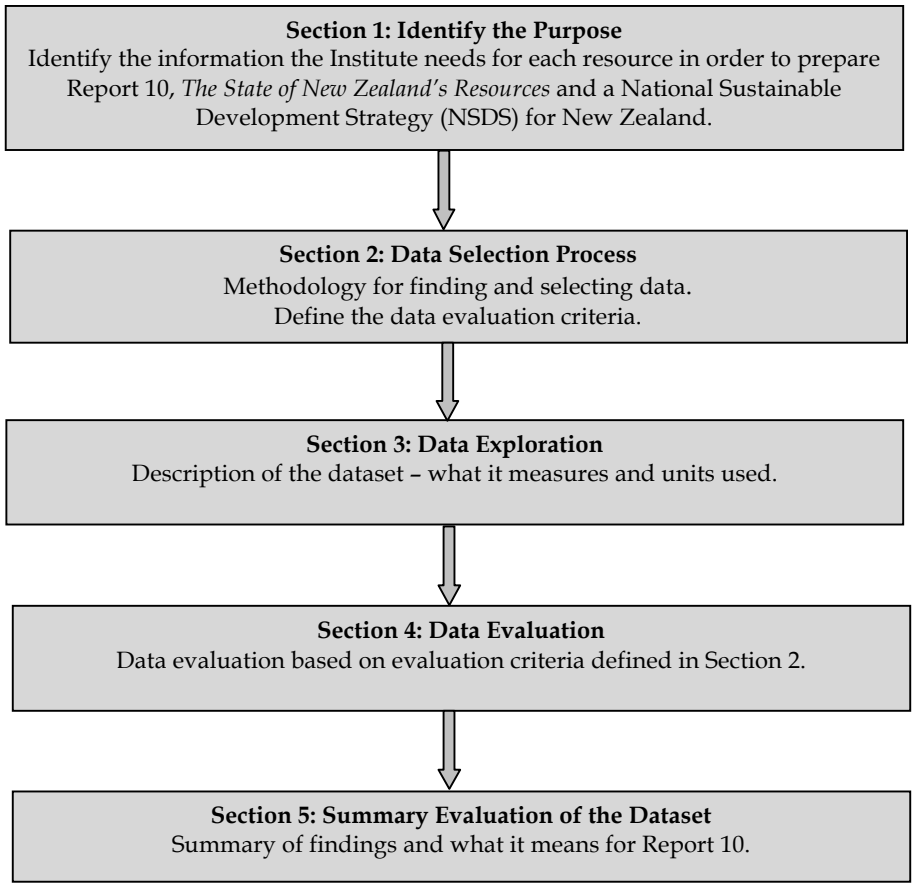
1. Purpose

This Working Paper is one of a series of 11 papers prepared as background to the Sustainable Future Institute's Report 10, *The State of New Zealand's Resources* (SFI, in press). Report 10 aims to provide an overview of available data and information covering a range of resources, and to discuss the use, availability and appropriateness of the data in the preparation of a National Sustainable Development Strategy (NSDS).

The purpose of this Working Paper is to describe the process by which the Institute collected, collated and presented a selection of New Zealand livestock, crop production and export data. The datasets are summarised and evaluated for completeness, accuracy, relevance, appropriateness of sources and public availability. This paper also discusses the purpose for which the data was collected by its custodians, and why the Institute has selected this data for its reporting. The content of the dataset is not interpreted or analysed; rather, our purpose is to evaluate the usefulness of this dataset for the purposes of Report 10.

Following this evaluation any gaps and resulting limitations in using the selected data are assessed, as well as the data's relevance and reliability in relation to the Institute's purpose of using the comprehensive series of datasets to inform the development of an NSDS for New Zealand.

Figure 1 The Five-step Process for Evaluating the Institute's Datasets



1.1 The Sustainable Future Institute

The Institute is an independently funded think tank based in Wellington, New Zealand. Earlier work by the Institute has indicated that New Zealand is well behind other developed countries on its international obligations to develop and implement a National Sustainable Development Strategy (NSDS) (SFI, 2007). It is hoped that *Project 2058* will help inform ministers, policy analysts and members of the public about key events and trends in New Zealand's past, and alternative strategies for the future. With this in mind, this Working Paper is a step towards the Institute's goal of preparing an NSDS for New Zealand in 2011.

1.2 Project 2058

The strategic aim of *Project 2058* is to promote integrated long-term thinking, leadership and capacity building so that Aotearoa/New Zealand can effectively seek and create opportunities, and explore and manage risks, over the next 50 years. In order to achieve this aim, the *Project 2058* team is working to:

1. Develop a detailed understanding of the current national planning landscape, and in particular the government's ability to deliver long-term strategic sustainability thinking;
2. Develop a good working relationship with all parties that are working for and thinking about the 'long-term view';
3. Recognise the goals of iwi and hap□, and acknowledge te Tiriti o Waitangi;
4. Assess key aspects of New Zealand's society, asset base and economy in order to understand how they may shape the country's long-term future, such as government-funded science, natural and human-generated resources, the state sector and infrastructure;
5. Develop a set of four scenarios to explore and map possible futures for New Zealand;
6. Identify and analyse both New Zealand's future strengths and weaknesses, and potential international opportunities and threats;
7. Develop and describe a desirable sustainable future in detail, and
8. Prepare a *Project 2058* National Sustainable Development Strategy. (SFI, 2009: 3)

The culmination of *Project 2058*, the development of a National Sustainable Development Strategy, depends on having an accurate assessment of key aspects of New Zealand society. Earlier reports have dealt in particular with points 1, 3, 5 and 6 above,[1] and this Working Paper is designed to help progress the fourth point: 'Assess key aspects of New Zealand's society, asset base and economy in order to understand how they may shape the country's long-term future …'

1.3 Livestock and Crops Resources within an NSDS

Below we ask six strategic questions that drive this research. These are then expanded upon to discuss the use, availability and appropriateness of the data in the preparation of an NSDS. Without accurate, comprehensive, relevant and accessible data to answer the following questions, it will be difficult to develop and execute an informed NSDS for New Zealand.

[1] For a detailed list of published and upcoming reports, see *Project 2058 Methodology: Version 3* (SFI, 2009: 7).

- **What** are the issues facing livestock and crops in New Zealand? Are New Zealanders clear on exactly what these issues are? Does New Zealand have quality data and information to enable us to understand these issues as fully as possible? Are New Zealanders able to establish an informed understanding of the priorities?

- **Why** does New Zealand need to confront issues affecting our livestock and crops? Are there improvements that can be achieved; or practices that need to change? Are current indicators relevant and meaningful to benchmark changes over time? What is the purpose and the benefit in taking action?

- **When** should New Zealand start to address issues which impact on New Zealand's livestock and crops? Is now the right time? Are current economic, social and environmental conditions conducive? Would it be beneficial to wait and monitor events as they evolve? Are current measures and indicators appropriate to monitor developments? Is there a risk of rushing into short-term action when a long-term approach is needed?

- **Where** do New Zealanders most need to concentrate their efforts to address New Zealand's livestock and crops issues? Which aspects of the issue should be focused on first? Where should New Zealanders begin to ensure the most beneficial and sustainable outcome? Does New Zealand have sufficient knowledge, based on accurate and appropriate data, to assess outcomes?

- **Who** must be engaged to effectively address issues facing livestock and crops in New Zealand? Who needs to be involved if New Zealand is going to successfully tackle these issues? Is data on livestock and crops in New Zealand accessible and transparent to allow those interested to be accurately informed? Are data ownership issues affecting public involvement?

- **How** should New Zealand ensure we have effective management of our livestock and crops? What is the best approach? What skills or techniques are needed? Does New Zealand have comprehensive and accurate information to enable effective management? How can New Zealand learn from international experience to assist in maximising effective and sustainable livestock and crops?

This working paper does not attempt to answer the above overarching questions. These overarching questions do however inform our purpose for Report 10 and in progressing an NSDS. Data collected for inclusion within this dataset has enabled us to understand the level of accuracy, relevance, comprehensiveness and issues of ownership that exist surrounding publicly available data in New Zealand. The above questions function as a bridge between the dataset, this Working Paper and Report 10; specific questions pertaining to how the Institute's selected dataset will inform the development of an NSDS are outlined in Table 1.

2. Data Selection Process

2.1 Methodology

Report 10a, *Designing a Framework to Monitor New Zealand's Resources* (SFI, 2010a) outlined the process through which the Institute developed the framework for collecting and presenting data. With this framework in place, the steps towards the completion of Report 10 are: (i) building the datasets for the 11 resource types studied; (ii) evaluating the selected datasets; and (iii) reporting on the findings in relation to the Institute's aim of defining an NSDS for New Zealand. The datasets developed in Step (i) are available on our website.[2] This Working Paper is one of 11 that form Step (ii), the data evaluation. Step (iii) will be published in Report 10.

The source data for the Institute's Livestock and Crops Datasets was selected from a variety of static tables, originally collated by Statistics New Zealand, which the Institute extracted from the Ministry of Agriculture and Forestry and DairyNZ websites. The tables used are listed on the Institute's website under Project 2058 Publications and State of New Zealand's Resources. The Institute has taken the original data and reformatted it in Excel spreadsheets to facilitate use and analysis. The original data values have been preserved.

2.2 Sources of Data

The Institute supports the free availability of data relating to environmental statistics. With this in mind, we deliberately used only openly accessible data so that we were able to report on its availability and identify potential gaps. This enables us to report on the implications of using only freely available data, and to evaluate the information that can be extracted from these data sources.

We acknowledge that many sources of information exist for New Zealand's livestock and crops that may or may not be publicly available or easily discoverable. Crown Research Institutes (CRIs), universities, national and local government, and other private and public organisations also collect and hold data on livestock and crops.

For various reasons including privacy, commercial sensitivity, cost of dissemination or commercial sale price of the data, there are many datasets on New Zealand's resources that are inaccessible to the public. Without extensive research, funding or expertise to assist in the interpretation of the data, many others remain unavailable. The Institute has focused on open data; therefore no efforts have been made to retrieve the other datasets. This is a limitation of this project as gaps identified by the Institute could potentially be filled by these other data sources.

Organisations that hold such data may include those with access to economic measures of production, such as the Inland Revenue Department which collects GST data, or agencies that deal directly with imports and exports, such as the New Zealand Customs Service.

[2] www.sustainablefuture.info

The Institute searched for and compiled its datasets in 2009. What we have selected and discussed within this Working Paper reflects data fitting our purpose within the environmental data landscape at the time of research.

As data availability increases rapidly on an ongoing basis, it would not be practical to include within this Working Paper all datasets relevant to livestock and crops in New Zealand. Report 10 investigates the past, present and future of the environmental data landscape in New Zealand. It also provides a list of alternative sources of information pertaining to New Zealand resources. When appropriate, we have mentioned complimentary data sources in this Working Paper.

Data on New Zealand resources is often produced and targeted to industry experts. This makes a thorough analysis and evaluation of datasets a complex task for the uninitiated. We have referred to the original source documents to support our evaluation of the datasets.

2.3 Livestock and Crops Datasets Evaluation Criteria

The Institute has developed a series of criteria to support the effective evaluation of its datasets and to consider the data in the context of our wider work programme. Each criterion is supplemented with questions to direct attention to relevant areas for consideration. The aim is to structure the analysis of each dataset in a way that is consistent and replicable across the 11 datasets. In this Working Paper, these criteria are applied to the Livestock and Crops Datasets as a whole and to the different indicators and sources that comprise the datasets.

The criteria and guiding questions are outlined in Table 1.

Table 1 Criteria for Evaluating the Institute's Datasets

Criteria for evaluation	Guiding questions
Comprehensive time series	For how long has the data been collected? Are there gaps in the records? Are data/indicators consistent and comparable over time?
Quality data	What is the scope and range of indicators; are there any gaps? Is data comprehensive and detailed? How is data classified/categorised? Is the data local/regional/national? Is the data internationally comparable and valid? Is the data accurate – is there any sampling bias? Are error bars calculated? Is the data relevant and able to be interpreted with meaning?
Appropriate sources	How many sources are drawn on, and what are they? Who owns the data? Why, how and where is data collected/measured?

	Is the data original, self-reported/obtained by survey? Is the data collection and analysis informed by sound assumptions? Is data reliable, independent, verifiable and/or of international standard? Is the data subject to (external) review?
Publicly available	Is the data easy to access? Is the data located online, in publicly available reports or databases, or within institutions? Is the data freely available?

2.4 Selected Sources

In order to find possible sources of data to establish a baseline portrait of livestock and crops in New Zealand, the websites of agencies and organisations with relevant links to the livestock and crops sector were reviewed for all publications that provided data and information on livestock and crops in New Zealand. A search was undertaken to find online datasets and statistics, specific publications on livestock and crops production including exports, documentation on the data collection and its uses, as well as general publications such as annual reports.

The New Zealand organisations whose websites were searched included Statistics New Zealand, Fonterra, the Ministry of Agriculture and Forestry (MAF) and DairyNZ. International organisations which correlate data on New Zealand livestock and crops, including the Food and Agriculture Organisation of the United Nations (FAO) and the Organisation for Economic Cooperation and Development, (OECD) websites were also searched.

The Institute collected information for the Livestock and Crops Datasets primarily from the MAF website, where a range of data is publicly available. The tables and spread sheets provided on the website are updated on an annual basis. Most data presented on the MAF website is compiled by Statistics New Zealand, the official source of the data, via the annual *Agricultural Production Survey* (*APS*). While MAF does conduct some of its own surveys, the Ministry also draws upon a variety of different sources of information from across government and other industry organisations. On this basis, some of the information may not be as up to date as the original source. Where the data has been sourced from other organisations, MAF notes the source.

Although the official source of the *APS* data (the primary source for the Institute's Livestock and Crops Datasets) is Statistics New Zealand, the Institute judged that the publicly available data presented on the MAF website best aligned with the purpose of the project.

Statistics New Zealand is responsible for the design, collection, analysis and dissemination of the *APS* and its outputs; whereas MAF is one of the most important stakeholders and users of these agricultural production statistics. MAF sponsor and provide input into the design of *APS* as a key client, but do not collect data. Statistics New Zealand also consults with other

APS clients including the Ministry for the Environment (MfE), Deer Industry New Zealand, the Poultry Industry Association of New Zealand (PIANZ), DairyNZ, Horticulture New Zealand and Beef and Lamb New Zealand. Therefore, as the official source of the data, Statistics New Zealand supplies the more comprehensive information.[3]

The *APS*'s purpose is to produce up-to-date, reliable statistics on agricultural, horticultural and forestry activity. In a full census year the return of the completed *APS* questionnaire by all businesses involved in agricultural, horticultural or forestry production (approximately 80,000) (Statistics New Zealand, n.d.[a]) is a compulsory requirement under the Statistics Act 1975.

The *APS* collects full census data every five years and in a sample year approximately 30,000 businesses are surveyed. Data on horticulture variables are collected every second year as well as on census years. Questionnaires are posted out in July of each year, the provisional release of APS data occurs in December, and the final release of the data is in May of the following year.

Statistics New Zealand is also the official source of Agricultural and Forestry import and export information, New Zealand Customs collects this data but Statistics New Zealand releases it to the public. Statistics New Zealand supplies MAF with import and export tables which MAF publishes on its website. MAF does not store a rolling database on Agriculture and Forestry import and export information, it simply replaces the tables on its website when new and updated information has been received from Statistics New Zealand.[4]

2.5 Purpose for which the Data was Initially Collected

The *APS* is undertaken for the purpose of identifying changes in the agricultural sector for planning and forecasting (Statistics New Zealand, n.d.[a]) and is led by Statistics New Zealand, with input from MAF (as outlined above) (Statistics New Zealand, 2009a: 63–64).

Data on milk production was sourced from the *New Zealand Dairy Statistics 2008-2009* report (DairyNZ, 2009). DairyNZ's report provides statistical information relating to the dairy industry in New Zealand. DairyNZ is a dairy farming industry association funded by a levy on milk solids and government investment (DairyNZ, n.d.). To collect data DairyNZ drew upon multiple sources including the Livestock Improvement Corporation National Database, dairy companies, the Animal Evaluation database, the Animal Health Board's annual report, Quotable Value New Zealand Rural Property Sales Statistics, and Statistics New Zealand (DairyNZ, 2009: 4). Historical data is presented when and where available, up to the 2008-2009 season.

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3 This can be found on the Statistics New Zealand website under InfoShare (http://www.stats.govt.nz/infoshare/) and TableBuilder (http://www.stats.govt.nz/tools_and_services/tools/TableBuilder.aspx).

4 This situation is similar between Statistics New Zealand and other government agencies and businesses. Some of the datasets that are released on other government agencies' websites are likely to be sourced from Statistics New Zealand.

2.6 Additional sources

The Institute's 11 working papers, prepared as background papers to Report 10, *The State of New Zealand's Resources,* are selective in their use of specific information and data from within a broader pool of information. The boundaries set for these working papers were tightly focused on openly accessible online data available as at February 2009, the original time of data collection for the Institute's accompanying datasets. For further reading and comparisons which fall outside of our collection strategies we suggest contacting Statistics New Zealand.

Statistics New Zealand has a long history of collecting agricultural production statistics. However, not all the statistics are published on its website. Users can contact Statistics New Zealand's information centre should they need assistance to retrieve information required. There are also various hard copies of previous releases available to supplement the online data series, these include supporting information concerning sample design, development history, and limitations of the data and are freely available by telephoning Statistics New Zealand's toll-free number 0508 525 525.

3. Data Exploration

The cultivation of crops and the production of livestock comprise a large proportion of New Zealand's economy; over 55% of all exports by value in 2009 came from these sectors (MAF, 2009). The significance of these sectors in New Zealand's economy necessitates a detailed understanding of the livestock and crop industries to be supported by accurate data. To help achieve this understanding, the Institute has provided data on New Zealand's livestock and crops under seven sub-categories: (i) Livestock Numbers; (ii) Meat Production; (iii) Milk Production; (iv) Pastoral Exports; (v) Crop and Fruit Production; (vi) Fertiliser Use; and (vii) Crop and Fruit Exports.

Table 2 Livestock and Crops Dataset Summary Table

Dataset Category	Data Custodian	Data Presented	Dates	Measures	Data Reporting
Livestock Numbers	Ministry of Agriculture and Forestry (official source: Statistics New Zealand)	Beef calves	1971–2007	Heads	Annual
		Beef cattle			
		Dairy calves			
		Dairy cattle			
		Sheep			
		Lambs			
		Chickens			
		Deer			
		Pigs			
		Goats			

Meat Production	Ministry of Agriculture and Forestry	Sheep Lambs Bulls Calves Cows Heifers Goats Pigs Steers Deer Poultry	1987–2009	Tonnes (t)	Annual
Milk Production	DairyNZ & Livestock Improvement Corporation	Milk processed Milk fat processed Protein processed Milk solids processed Average litres per cow Average milk fat per cow Average kg protein per cow Average kg milk solids per cow	1974–2008	Million L, million kg, L, kg	Annual
Pastoral Exports	Ministry of Agriculture and Forestry (official source: Statistics New Zealand)	Live animals Meat products Dairy products Wool Miscellaneous agricultural and food products	2002–2008	NZ$000	Annual
Crops and Fruit Production	Ministry of Agriculture and Forestry (official source: Statistics New Zealand)	Production of cereals Production of vegetables (outdoor) Production of vegetables (indoor) Production of fruit	1990–2007	Tonnes (t), hectares (h)	Annual

Fertiliser Use	Ministry of Agriculture and Forestry (official source: Statistics New Zealand)	Urea	1981–2007	Tonnes (t), hectares (ha)	Annual
		Diammonium phosphate (DAP)			
		Ammonium sulphate			
		Super-phosphate			
		Lime			
		All other nitrogen-containing fertilisers			
		All other phosphatic fertilisers			
		All potassic fertilisers			
		Effluent sprayed on fields			
Crops and Fruit Exports	Ministry of Agriculture and Forestry (official source: Statistics New Zealand)	Kiwifruit	2002–2008	NZ$000	Annual
		Pipfruit			
		Wine			
		Other fresh and processed fruit			
		Vegetables, grains and seeds			

Livestock numbers

Information on livestock numbers is provided in the Livestock Dataset in 10 categories based on species; data on cattle is further divided according to maturity and the purpose for which the animals are kept (dairy or beef). The range of dates for which the earliest data is available is between 1971 and 2002. An excerpt from the livestock numbers dataset is provided in Figure 2. Note that entries from 1973 to 2005 have been omitted for representation purposes.

Figure 2 Excerpt from the Livestock Numbers Dataset
Source: SFI, 2010b

Dataset	Indicator	Attribute	1971	1972	2006	2007	Data source table #
8a. Livestock	8a.1 Livestock numbers	beef calves head	..	..	1,004,513	1,015,139	8a.a
		beef cattle head	4,796,000	5,344,000	4,439,136	4,393,617	8a.b & 8a.j (1997, 1998, 2000, 2001)

Meat production

Figures on meat production within the Livestock Dataset are divided into 11 categories based on species, with data on cattle and sheep further divided into sub-categories. The range of dates for which the earliest data is available is between 1987 and 2003. The units of measurement are tonnes (t). An excerpt from the meat production dataset is provided in Figure 3. Note that entries from 1989 to 2007 have been omitted for representation purposes.

Figure 3 Excerpt from the Meat Production Dataset
Source: SFI, 2010b

Dataset	Indicator	Attribute		1987	1988	2008	2009	Data source table #
8a. Livestock	8a.2 Meat production (total weight at slaugther)	sheep	tonnes	162,194	148,689	151,741	101,920	8a.k & 8a.v from 2003
		lamb	tonnes	417,999	429,140	446,354	397,528	8a.k & 8a.w from 2003
		Total sheep	**tonnes**	**580,193**	**577,829**	**598,094**	**499,449**	

Milk production

Figures on milk production are provided in the Livestock Dataset within eight categories. The range of dates for which the earliest data is available is between 1974 and 2003. The units of measurement are litres (L) and kilograms (kg). An excerpt from the milk production dataset is provided in Figure 4. Note that entries from 1976 to 2006 have been omitted for representation purposes.

Figure 4 Excerpt from the Milk Production Dataset
Source: SFI, 2010b

Dataset	Indicator	Attribute		1974	1975	2007	2008	Data source
8a. Livestock	8a.3 Milk production	milk processed	million L	..	..	14,745	16,044	8a.r
		milk fat processed	million kg	..	..	722	791	
		protein processed		..	..	548	602	
		milk solids processed		..	..	1,270	1,393	
		average litre per cow	L	..	..	3,567	3,710	8a.s
		average milk fat per cow	kg	128	137	175	184	
		average kg protein per cow		..	..	132	139	
		average kg milk solids per cow		..	..	307	323	

Pastoral exports

Data on pastoral exports (livestock, dairy and meat products) is divided into four categories in the Livestock Dataset. At the time the Institute's research was conducted data was available for all categories for the years 2002 to 2008. Exports across all categories are measured in thousands of New Zealand dollars (NZ$000). An excerpt from the pastoral exports dataset is provided in Figure 5. Note that entries from 2004 to 2006 have been omitted for representation purposes.

Figure 5 Excerpt from the Pastoral Exports Dataset
Source: SFI, 2010b

Dataset	Indicator	Attribute		2002	2003	2007	2008	Data source table #
8a. Livestock	8a.4 Exports livestock, dairy & meat products at 31 March	**Live animals**		**157,005.00**	**140,565.00**	**156,819.03**	**176,813.00**	8a.q
		beef and veal	$000	1,800,096.00	1,675,908.00	1,815,624.00	1,562,107.00	
		lamb and mutton		2,237,344.00	2,260,926.00	2,522,114.00	2,404,211.00	
		venison		229,615.00	169,407.00	260,101.00	255,645.00	
		other meat		258,817.00	234,883.00	355,413.00	343,462.00	

Crop and fruit production

Figures on crop and fruit production comprise a significant part of the Crops Dataset. The data is presented in four categories, which are further sub-divided into species. The earliest data available for any category in the Crops Dataset was for 1981. Data is available in most categories up to 2007. The units of measurement are tonnes (t) and hectares (ha). An excerpt from the crop and fruit production dataset is provided in Figure 6. Note that entries from 2004 and 2005 have been omitted for representation purposes.

Figure 6 Excerpt from the Crop and Fruit Production Dataset
Source: SFI, 2010c

Resources	Indicators	Attributes		2002	2003	2006	2007	Data source table #
8b. Crops	8b.1 Production of cereals	barley	ha	78,097	64,700	47,078	51,481	8b.a & 8b.b
			t	440,883	371,837	277,020	335,627	8b.c
		wheat	ha	42,215	42,600	38,000	40,538	8b.a & 8b.b
			t	301,498	318,900	261,798	344,434	8b.c

Fertiliser use

Fertiliser use data is presented in nine categories within the Crops Dataset. The earliest data available was for 1981. Data is available in most categories up to 2007. The units of measurement are tonnes (t), and in one category hectares (ha). An excerpt from the fertiliser use dataset is provided in Figure 7. Note that entries from 2004 and 2005 have been omitted for representation purposes.

Figure 7 Excerpt from the Fertiliser Use Dataset
Source: SFI, 2010c

Resources	Indicators	Attributes		1981	2007	Data source table #
8b. Crops	8b.5 Fertiliser use	urea	t	17,319	433,331	8b.g
		diammonium phosphate (DAP)		..	182,714	8b.g
		ammonium sulphate		19,132	40,589	8b.g

Crop and fruit exports

The crop and fruit exports section combines production of cereals, vegetables (indoor), vegetables (outdoor), and fruit. Information on the monetary value of crop and fruit exports is presented in five categories, with data available from 2002. Exports in all categories are measured in thousands of New Zealand dollars (NZ$000). An excerpt from the fertiliser use dataset is provided below in Figure 8. Note that entries from 2004 and 2005 have been omitted for representation purposes.

Figure 8 Excerpt from the Crop and Fruit Exports Dataset
Source: SFI, 2010c

Resources	Indicators	Attributes		2002	2003	2007	2008	Data source table #
8b. Crops	8b.6 Exports	kiwifruit	($000)	169,360	160,489	758,704	779,464	8b.h
		pipfruit		578,216	563,885	318,004	359,519	8b.h
		wine		363,373	380,084	659,435	763,922	8b.h

4. Data Evaluation

In this section we evaluate the data presented in the Livestock and Crops Datasets based on the evaluation criteria set in Table 1.

4.1 Comprehensive Time Series

Inconsistent data collection year to year by the *APS*

The *APS* was not undertaken in the years 1997, 1998 and 2001. In 1999 the survey covered only livestock and arable farming, and in 2000 only horticulture was surveyed (Statistics New Zealand, 2006: 5). In order to acquire data to cover these gaps, the Institute used information from MAF's *Situation and Outlook for New Zealand Agriculture and Forestry (SONZAF)*. Data for this annual report is typically drawn from the *APS*; in the absence of this data, estimates from MAF and Meat and Wool New Zealand Limited were used (MAF, 2008).

Further, since 1994 agricultural production collections have gathered information on livestock and arable farming, horticulture, and forestry with the following exceptions (Statistics New Zealand, 2009c: 11):

- In 1999, the survey collected information on livestock and arable farming only.
- In 2000, the survey collected horticulture production information only.
- In 2004, 2006, and 2008 the surveys collected information on livestock and arable farming, and forestry (horticulture production information was not collected).

Inconsistent timeframes for *APS* data collection

The length of time for which data is reported on is highly variable from one category to the next. The earliest available data for some categories, such as livestock numbers for beef and dairy cattle, is since 1971, while data on others such as chicken is only available since 2002.

In the Livestock Dataset, it appears that comprehensive data collection undertaken by Statistics New Zealand only started around 2002. Exceptions are for meat, where collection began in 1987, and for milk production data which has been collected since 1998 by DairyNZ.

Similar observations can be made of the Crops Dataset. Data is available for cereal, vegetable and fruit production since 1990, fertiliser use since 1981, and exports since 2002.

In all cases, this limits comprehensive time series analysis over the datasets. Further research is necessary to gain a full overview of the industry, prior to when the data collection for particular variables began.

Gaps in the *APS* data

In many instances there are data reporting gaps within the dataset; the reasons for most of these gaps are not specified in online references.

For example, data on fruit and vegetable production is missing for the years 1998, 1999, 2001, 2004 and 2006. No horticultural data was collected in these years, and the reason for this omission is not provided. Numerous other minor gaps permeate the crop and fruit production dataset as illustrated in Figure 9 below.

Figure 9 Excerpt from the Crop and Fruit Production Dataset highlighting Inconsistencies
Source: SFI, 2010c

Attributes		1999	2000	2001	2002	2003	2004	2005	2006	2007
barley	ha[2]	55,792	..	..	78,097	64,700	48,503	49,825	47,078	51,481
	t[3]	..	..	..	440,883	371,837	226,082	302,023	277,020	335,627
wheat	ha	52,797	..	..	42,215	42,600	39,100	39,400	38,000	40,538
	t	..	..	..	301,498	318,900	255,860	318,946	261,798	344,434
peas field	ha	..	..	..	10,925	..	12,238	9,658	7,710	6,273
	t	..	..	..	29,457	..	31,912	29,068	22,506	22,053
oat grain	ha				7,353	5,900	7,500	7,900	6,300	5,773
	t	..	..	..	34,987	29,900	30,844	..	28,478	27,531
maize grain	ha				14,178	19,500	20,300	19,200	20,500	17,030
	t	..	..	..	148,847	211,700	234,248	210,253	215,649	185,627
other cereals	ha	..	..	..	..	2,400	..	..	..	2,267
	t	..	..	..	..	12,100	..	..	..	13,709

The fertiliser use dataset also suffers from a significant number of gaps. This is particularly prevalent between 1991 and 2001, when only 11 data points are available, compared with the years 1981 to 1990 when 47 data points are reported on.

These gaps may hinder any analysis of trends, spikes and drops in production that have occurred over the past 30 years.

MAF agricultural products exports data only available from 2002/2003 onwards
MAF does not store a rolling database on Agriculture and Forestry import and export information, it simply replaces the tables on its website when new and updated information has been received from Statistics New Zealand; i.e. as new statistics became available for the latest year, the statistics for the earliest year are removed from the publicly available dataset.

4.2 Quality Data

Annual *APS* and comprehensive sampling every 5 years since 2002
The survey is mailed to a sample of approximately 30,000 known farmers most years, but during five-yearly agricultural census years all 80,000 known farmers are contacted.[5] The list of known farmers is drawn from Statistics New Zealand's database, the *Business Frame*, which 'is a comprehensive list of businesses and other undertakings in New Zealand engaged in the production of goods and services' (Statistics New Zealand, n.d. [b]).

Farmers are defined within the business frame as any enterprise registered for GST and engaged in agriculture (Statistics New Zealand, 2009b). Since businesses are not required to register for GST if their annual turnover is less than $60,000, the use of the business frame to identify the population therefore results in a gap in coverage among small farms.

[5] This number also includes foresters (Statistics New Zealand, 2009a: 64), a category outside the Institute's Livestock and Crops Datasets.

On-going Adaptation of the *APS*

The survey includes or expends questions to take into account the needs of recording new and different information. Changes made to the *APS* methodology and questionnaires are made to fit the uses of the statistics and enhance the data quality. These changes are either documented in the *Technical Notes* of the *Hot off the Press* publications, or in the survey information on Statistics New Zealand's website.

4.3 Appropriate Sources

Different data sources

The data presented in the Institute's Livestock and Crops Datasets are from a number of different sources, namely Statistics New Zealand's *APS,* MAF and DairyNZ. Gaps in the annual APS were filled by data provided by other sources. They are noted in the methodologies provided by the data custodians.

The use of a number of different sources prevents direct comparisons between data and obliges the user to understand survey methodologies before drawing conclusions from the data provided. This is particularly true for the *APS* where methodologies changed in 2003 and for which data may not be consistent from year to year. Also the *New Zealand Dairy Statistics 2008/09* report shows historical information up to and including the 2008/09 season. Data for previous years were released under various other reports (DairyNZ, 2009).

Changing methods of data collection for *APS* from 1981 to 2002

Although the Business Frame has been used by Statistics New Zealand as the sampling population since 2003, population sampling parameters have changed several times since 1981. The changes that have taken place are described by Statistics New Zealand below:

> From 1981 to 1991, the population was sourced from an agricultural directory. Statistics NZ maintained this directory by tracing transfers of farming, horticulture, and forestry land. In 1992, this agriculture directory was merged with Statistics NZ's Business Frame. For the 1992 and 1993 surveys, population units were drawn from the Business Frame by industrial classification. In the 1994 Agricultural Production Census, for the first time the population was extracted using both the industrial classification and GST registration information.
>
> Between 1994 and 1996, the population was all businesses, sourced from the Business Frame, that were registered for GST and classified to agriculture. The 1999 Agricultural Production Survey population was sourced solely from AgriBase (a geospatial database owned and managed by AgriQuality New Zealand Ltd). The population for the 2000 Horticulture Production Survey was sourced from the Business Frame, supplemented by AgriBase and growers' lists. For the 2002 census, the population was sourced from the Business Frame and the Inland Revenue Client Register. These sources were checked against industry lists and AgriBase to ensure all large units were included in the population. The Business Frame was used for the 2003, 2004, 2005, and 2006 surveys, the 2007 census and the 2008 and 2009 surveys.
>
> (Statistics New Zealand, 2009c: 11)

It would be useful to have further information on how the changes to the method by which the survey population is identified have actually affected the number of farms surveyed. Any differences in the population surveyed raise uncertainties when drawing year to year

comparisons; as these changes remain unknown, the size of these uncertainties cannot be quantified.

4.4 Public Availability

All data publicly available and well documented

It is the aim of this project to assess publicly available data, i.e. data that is able to be accessed by parties independent of those who collect or present it. Both MAF's and DairyNZ's reports fit this criterion; the reports are freely available to the public via each agency's website. Statistics New Zealand is the official source of much of the data included in the Institute's Livestock and Crops Datasets, however much of its data does not fit this working papers definition of being publicly available as not all the statistics are published online. Such statistics can be attained by contacting Statistics New Zealand's information centre to retrieve required information.

5. Summary Evaluation of the Dataset

The Institute chose data from Statistics New Zealand's APS, MAF and DairyNZ to inform its upcoming Report 10 and an NSDS as it was deemed to be comprehensive and reliable. Whilst the datasets have many limitations, it provided the Institute with the information necessary to establish a baseline of livestock and crop production in New Zealand. Table 3 below summarises the Institute's evaluation of the dataset.

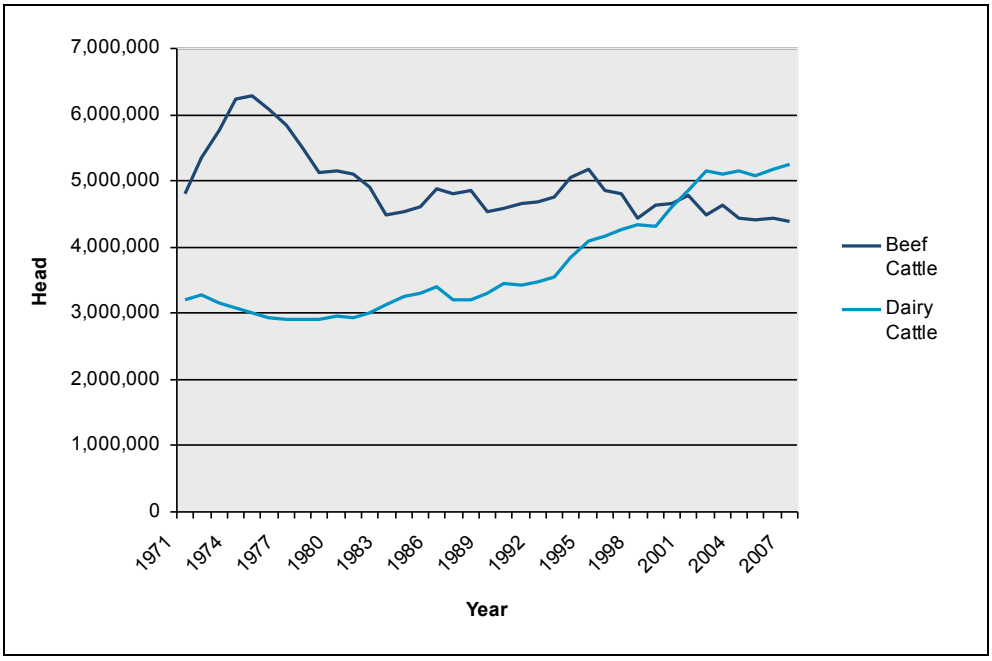
Table 3 Summary of Livestock and Crops Datasets Evaluation

	Strengths	Weaknesses
Comprehensive time series		▪ No historical data provided prior to 1971 ▪ Inconsistent data collection for the *APS* across years. Gaps are filled with alternative data sources ▪ The length of time for which data is available in the *APS* is highly variable from one category to the next. This limits comprehensive time series analysis for some variables ▪ Gaps in the *APS* data. This also limits comprehensive time series analysis for some variables ▪ No rolling database for MAF agricultural products export data
Quality Data	▪ Annual *APS* and comprehensive sampling every 5 years since 2003 ▪ Standard survey methodology used in *APS* since 2003 ▪ On-going adaptation of *APS* through time	
Appropriate Sources	▪ Data on Livestock and Crops from MAF's website is the most complete	▪ Different data sources and cross over between data presented by Statistics New Zealand and MAF made data gathering

		and analysis difficult and prevents direct comparisons between certain variables ▪ Changing methods of data collection for *APS* from 1981 to 2002
Publicly available	▪ All data included within the datasets is publically available	▪ Only a selection of *APS* is published online by Statistics New Zealand in their Hot off the Press publications

The Institute acknowledges that other sources will need to be consulted in order to gain a complete and comprehensive overview of livestock and crops in New Zealand. The Institute's datasets do not answer the questions outlined in Section 1.3, but can provide background statistics to support reporting, analysis, and argumentation, provided caution is exercised when data prior to 2003 is used in the analysis. This is due to the variability in the source data owing to changes in methodologies and gaps in the dataset. An example of how the data may be used is presented in Figure 10 below.

Figure 10 New Zealand Livestock Numbers: Cattle Heads 1971 - 2007
Adapted from: SFI, 2010b
Original Source: Statistics New Zealand *APS*



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