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Business Improvement Sustainability Frameworks and Indicators: Literature Review

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Abbreviations

anova	analysis of variance
BPP	Business Practices and Performance model
BSC	Balanced Scorecard business model
DM	Dry matter (kiwifruit orchardists receive premiums for achieving high levels of DM)
MAF	Ministry of Agriculture and Forestry
PCA	Principal Components Analysis
RISE	Response-Inducing Sustainability Evaluation
SAFA	Sustainability Assessment of Food and Agriculture Systems
SFB	Sustainable Family Business model
SI	Sustainability Indicator
SME	Small to Medium Enterprise

Financial abbreviations

COS	Cash orchard surplus = income minus operating expenditure
C & NC feed	Cash and non-cash supplements
C & NC Labour	Cash and non-cash labour
EBIT	A measure of how profitable a company's assets are in generating revenue
EBITR	Earning Before Interest, Tax and Rent – Farm profit before interest, tax and rent
EOS	Economic Orchard Surplus (difference between income and expenditure which has an adjustment for soil P and unpaid labour)
EFS	Economic Farm Surplus (EFS) – the return available to the owner operator of a freehold, unencumbered farm after allowance has been made for labour and management input and is calculated as follows: EFS = Farm Profit before Tax + Managerial Salaries + Interest paid + Rent paid – Assessed managerial reward (equivalent ruling wage for an experienced farm worker + 1% of farm capital for management)
FWE	Farm Working Expenses
FWE/GFR	Farm Working Expenses divided by Gross Farm Revenue (a measure of the 'efficiency' of the farm because it measures the proportion of the revenue that is spent on the workings of the farm.
GFR	Gross Farm Revenue – total revenue earned from the year's farming operations. From this. Total Farm Expenditure that was spent to generate the farm revenue is deducted to show the Farm Profit Before Tax (PBT) for the year.
GOR	Gross Orchard Revenue (income)
NCI	Net Cash Income
NFPBT	Net Farm Profit Before Tax
OWE	Orchard Working Expenses
OWE/GOR	Orchard Working Expenses divided by Gross Orchard Revenue (a measure of the 'efficiency' of the orchard because it measures the proportion of the revenue that is spent on the workings of the orchard.
RoR on TFC	Rate of Return on Total Farm Capital = EFS as a percentage of Total Farm Capital.
TFC	Total Farm Capital is defined as Farm Capital (farm assets at market value) plus an allowance for working capital. The working capital allowance is necessary because of timing differences between farm revenue and expenditure resulting in overdrafts to finance expenditure, or high credit balances to pay for upcoming expenditure. The working capital allowance is assumed at 50 per cent of the sum of Working Expenses and Assessed Managerial Reward.

Farm management

Ha	Hectares
Calving %	Number of calves marked as percentage of cows mated in the previous autumn (adjusted for the sale or purchase of in-calf cows).
Lambing %	Number of lambs tailed as percentage of ewes mated in the previous autumn (adjusted for the sale or purchase of in-lamb ewes).
SU	Stock units

Soil variables

AMN	Anaerobic Mineralisable Nitrogen
C	Carbon
K	Potassium
Mg	Magnesium
N	Nitrogen
S	Sulphur

Chapter 1: Introduction

1.1 The New Zealand Sustainability Dashboard

The purpose of this report is to produce a literature /internet search/ review on business improvement sustainability frameworks and indicators – including a review of ARGOS results, in order to contribute to Milestone 1.1.4 'Frameworks, indicators and monitoring frameworks' of the New Zealand Sustainability Dashboard project.

The New Zealand Sustainability Dashboard project proposes to "develop a sustainability assessment and reporting tool in partnership with five primary industry sectors in New Zealand. Internationally recognised frameworks and their key generic sustainability performance indicators (KPIs) will be co-opted to ensure that overseas consumers can benchmark and verify the sustainability credentials of New Zealand exported products. We will also design New Zealand and sector-specific KPIs to guide farmers and local consumers to best practices to best practices of special relevance to New Zealand society, ecology and land care. Monitoring protocols will be described, where possible for the farmers themselves to rapidly score their own performance across economic, social and environmental dimensions of food and fibre production. A multifunctional web application will be created that facilitates uploading of regular monitoring results and instantly summarises and reports back trend to the growers, to industry representatives, and to agriculture regulators and policy makers at regional and national government levels. Tests of the accuracy and statistical reliability of the KPIs will be coupled with ongoing research on how much the farmers use the tool, whether it changes their actions and beliefs for more sustainable agriculture, and whether stakeholders at all levels of global food systems trust and regularly use the tool" (Manhire et al., 2012: iii).

1.2 Background to the measurement of sustainability debate

The measurement of sustainability has been an ongoing project for over twenty years.[1] The World Commission on Environment and Development (WCED) in 1987 adopted the definition commonly referred to as the Brundtland definition:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

This is the definition that continues to be used by many countries, for example, Statistics New Zealand which has expanded on this definition by adding:

Sustainable development means ensuring that well-being is as least maintained over time. The principle of fairness within and between present and future generations should be taken into account in the use of environmental, economic and social resources.

Putting these needs into practice requires living within the limits of the natural environment.
(Stats NZ, 2009: 7).

The catalyst for this was Agenda 21, a set of action points for sustainable development set up by the Rio de Janeiro Summit held in 1992. It is hoped that by measuring sustainability individuals, businesses, regions, industries, countries and the world could discover whether in fact they were progressing in the achievement of sustainability and if not it was hoped that they could find out what to do about it and how.

[1] In 1991, Lele said, "Sustainable development has become the watchword for international aid agencies, the jargon of development planners, the theme of conferences and leaned papers, and the jargon of developmental and environmental activists".

Simply put, the question it was hoped to answer was, "How might I know objectively whether things are getting better or getting worse?" (Lawrence, 1997). It was also hoped that by putting frameworks for indicators and measure of those indicators in place a common language and understanding could be developed globally (SAFA, 2012: 17). As a result there is an ongoing debate on the definition of sustainability, and how and if it can be measured (Bell and Morse, 2008).

The United Nations debate on sustainability has continued with the development of the concept of a 'Green Economy", an economy "that results in improved human well-being and social equity, while significantly reducing environmental risk and ecological scarcities" (UNEP, 2011). It is believed that it is only through good governance that the challenge of meeting the environmental, economic and social dimensions of sustainability can be achieved (SAFA, 2012). Many of the indicators and measurements for sustainability have been developed with this perspective in mind (e.g., SAFA).

1.3 Business sustainability

There is pressure on businesses to be accountable and transparent and indications that stakeholders want to know more about a business than its financial performance. According to Keeble et al. (2003: 149):

- Investors are looking for evidence of good corporate governance, particularly sound business strategy and effective management of risk.
- Customers are asking about the origins of products, who made them and what they contain.
- Employees are looking to work for companies that visibly account for their responsibilities to society and the environment.
- Governments and civil society are increasingly placing pressure on businesses to report on social and environmental performance.

According to Thurm (2013) reporting on sustainability, particularly through an impact-based assessment within the value chain, "should become an enabler of change, not a lagging and compliance-driven instrument …". He sees it as contributing to 'integrated' thinking and comes out of a company developing a clear view on how it "aims to contribute to a thriving world today and, more importantly, tomorrow". It should contribute to providing useful context-based information … that triggers collaboration and fuels innovation".

The Global Reporting Initiative (GRI) is a tool used widely globally by organisations and companies to report on their sustainability performance. GRI is a non-profit organisation promoting economic, environmental and social sustainability. GRI works towards a sustainable global economy which should combine long term profitability with social justice and environmental care. This means that for organisations, sustainability covers the key areas of economic, environmental, social and governance performance. By reporting transparently and with accountability, organisations can increase the trust that stakeholders have in them, and in the global economy.[2]

The GRI reporting guidelines state that "sustainability reporting in the practice of measuring, disclosing, and being accountable to internal and external stakeholders for organizational performance towards the goal of sustainable development" (GRI Guidelines vs3.1, n.d.: 3). Such reports can be used for:

- Benchmarking and assessing sustainability performance with respect to laws, norms, codes, performance standards, and voluntary initiatives;
- Demonstrating how the organization influences and is influences by expectations about sustainable development; and
- Comparing performance within and organization and between different organizations over time. (GRI, 2011: 3)

[2] https://www.globalreporting.org/information/about-gri/Pages/default.aspx

1.4 Sustainability of agribusinesses

Saunders et al. (2006a: 2) suggest that agribusinesses are different from other businesses because businesses in the agricultural sector have a biological basis and hence are dependent on the "natural environment and climate, [and] seasonality of production". Secondly, farms as agribusinesses tend to be based around families and family labour. Thirdly, the agricultural sector is not homogeneous. Farms are at the base of a processing supply chain that upstream can include large firms such as Fonterra and meat processing companies. Many farms are becoming corporate farms, no longer based on a family centred operation. In addition farms are supplied by other firms with commodities such as chemicals and fertilisers which may be subsidiaries of large overseas companies. This produces a split between on-farm and off-farm agribusinesses (Saunders et al., 2006b: 1).

1.5 Conclusion

This chapter has introduced this report by moving through a basic summary of what needs to be covered in a literature review such as this. First the Dashboard project was described, then the issue basic to this project was introduced – that of measuring sustainability. As this is a literature review of business sustainability the definitions of sustainability was narrowed to reflect this arena. This was further refined to reflect on the topic of agribusiness sustainability and what that might mean.

The second chapter investigates the development of the issue of sustainability and its meaning.

Chapter 2: What is sustainability? Definitions and basic frameworks

2.1 Definitions of sustainability

At its core sustainability is about "how people feel about their surroundings and their way of life" (Levett, 1998: 294).

Origins of the contemporary use of the word sustainability are complex but originally it was associated with the maintenance of environmental quality, the major concept being that of the "ecological concept of carrying capacity and the idea of maximum sustainable yield" (Bell and Morse, 2008: 6). The second major concept is that of the understandings around resource and environment that arose from questioning the ability of the earth to sustain a growing human population (FAO, 2012). As can be seen from these two concepts, the ability for agriculture to provide food for the global population while remaining within the sustainable limits of the earth's provisioning capability has arisen as one of the main concerns of discussions on sustainability.

The word 'sustainable' now seems to be closely associated with the word 'development', both words usually appearing together. The most commonly and longest used definition of sustainable development is that of the Bruntland Commission – development that "seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future" (WCED, 1987: 43). Development is not to be equated with growth. Growth implies an increase in something whereas development can include a change in perception for the better (Stats NZ, 2008). Development is defined by the Economic and Social Council of the UN (2008: 7) as "an increase in well-being across the members of a society between two points in time". 'Welfare' is sometimes used as an alternative word to well-being but the two words can have different meanings particularly to economists who see welfare to do with the benefit derived from the consumption of goods and services and so is very much related to 'wealth'. Apart from this there is still on-going debate about the meaning of well-being and how to measure it.

The RISE programme has adopted an extended version of that of the Brundtland Commission: "Sustainable development allows a life in dignity for the present without compromising a life in dignity for future generations or threatening the natural environment and endangering the global ecosystem" (Häni et al., 2003: 79).

2.2 Sustainable development: conceptual and measurement frameworks

2.2.1 Anthropocentric versus physiocentric viewpoints

Stats NZ (2009: 134-136) states that there are two basic viewpoints on sustainable development anthropocentric and physiocentric. From an anthropocentric position, human needs are the starting point and environmental protection is seen as necessary in that it contributes to human well-being - the first principle of the Rio Declaration, states that "human beings are at the centre of concerns for sustainable development" (UNCED, 1992). On the other hand, from a physiocentric view, protecting and conserving the environment for its own sake is the focus, whether or not it is useful to humans.

The Brundtland definition is anthropocentric –humans are the focus of attention. It also incorporates a principle of fairness - the needs of the present generation are to be balanced with the needs of future generations. One is not to be achieved to the detriment of the other. Therefore attempting to meet the needs of the current generation must also not close off options for the future. There is a strong relationship between meeting human needs now and into the future, and living within the limits of the environment. Both are constrained by the natural systems of the Earth.

2.2.2 Weak and strong sustainability

Another way of approaching an understanding of sustainability is through the concepts of weak and strong sustainability (Neumayer, 2003).

- Strong sustainability – where "there is little, if any, consideration of the financial or other costs of attaining sustainability. It equates to what some call ecological sustainability and the focus is primarily on the environment … system quality is taken in terms of the physical measures of things (e.g., population, soil erosion and biodiversity)".
- Weak sustainability – where the "costs of attainment are important and typically based on a cost benefit analysis, which inevitably involves trade-offs between environment, social and economic benefits … [it] equates to a sort of economic sustainability where the emphasis is on allocation of resources and levels of consumption, and financial value is a key element of system quality" (Bell and Morse, 2008: 14).

These two definitions are mutually exclusive, not simply at the opposite ends of the spectrum. Strong sustainability means that it is not acceptable to do trade-off between economic gain and environmental quality, whereas for weak sustainability the environment is valued in monetary terms.[3]

2.2.3 Sustainable carrying capacity

The Royal Society of New Zealand (RSNZ) has recently produced two papers on New Zealand's emerging issues and adopts the language of 'sustainable carrying capacity' which significantly removes the word 'development' , important to business and the so-called 'developing nations', and replaces it with the more static notion of 'carrying capacity'. From an ecological perspective this means "the number of species that can be supported in a particular area indefinitely, given that area's endowment of water, food and other necessities" (RSNZ, 2013: 1). However, New Zealand's situation as a nation dependent on food exports for its survival[4], means that most of the people 'supported' are overseas, which increases the complexity of attempting a definition. A recent one is: "The Human Carrying Capacity (HCC) is the measure of a specified area's ability to sustainably support human activity given aggregate lifestyle and development choices and the means used to achieve these, and is expressed in terms of number of people" (AECOM and Landcare, 2011). It is added that "This statement does need the caveat that the needs of future generations will be different from our current needs so we should preserve the opportunities and choices that future generations may value more highly than us". (RSNZ, 2013a: 1).

This concept is presented in the language of 'capitals' and weak and strong sustainability. RSNZ wants to see more discussion on the 'trade-offs' between "resource use and conservation", "current use and future opportunities", and "narrow optimisation and wider resilience" (RSNZ, 2013a: 1). Such an approach can obviously be applied to agribusinesses.

The Natural Step framework is an example that has carrying capacity at its core. It sets out the following guiding principles for achieving sustainability:

- Material from the earth's crust must not be systematically increased in the Earth's environment.
- Material produced by society must not be systematically increased in the Earth's environment.
- The physical basis for the productivity and diversity of nature must not be systematically diminished.
- There must be a fair and efficient use of resources with respect to meeting human needs. (James and Lahti, 2004)

[3] Bell and Morse, 2008: 14) assert that it is the latter vision that has the upper hand at present.

[4] "New Zealand currently produces enough calories for 20 million people and enough protein for 45 million people (Riddet Institute, 2012: 12).

2.2.4 The three pillars of sustainability and cultural and institutional sustainability and governance

Sustainability is often expressed in terms of the three 'pillars' - social, environmental and economic sustainability. Social sustainability includes concepts such as resilient communities, sustainable livelihoods and access to core services of education and health. Saunders et al. add cultural sustainability, which includes language, values and cultural aspirations, to these three (Saunders et al., 2010: 5).

In 2001 the United Nations introduced another dimension, that of 'institutional' to the usual three- 'pillars' in order to cover the influence of societal and government rules or norms on sustainability or, in the words of Spangenberg,(2002: 104), to incorporate "crucial societal and cultural elements" of Agenda 21. Spangenberg's (2002: 105) graphic depiction of this as a prism (see Fig. 2-1) accentuates the complexity of the reality of sustainability and the fact that the pillars are inter-related and interact.

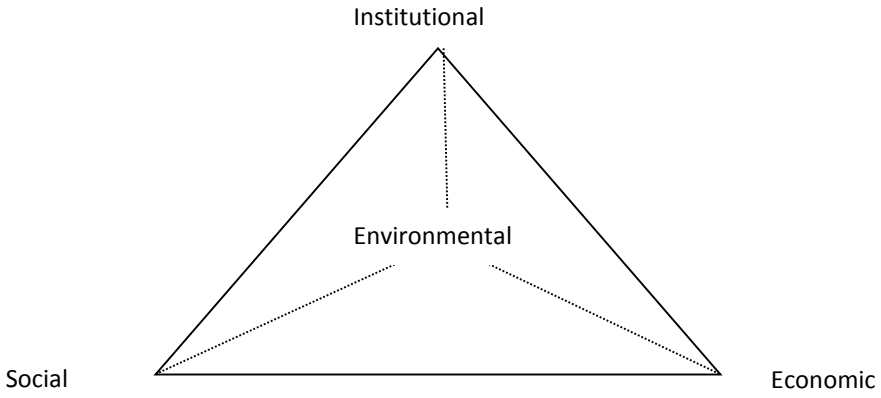

Figure 2-1: The prism of sustainability (Spangenberg 2002)

However, this four-pillar framework has not been maintained by the UN. Many more cross-cutting themes have been introduced to acknowledge the multi-dimensional nature of sustainability and to integrate the 'pillars' (UN, 2007: 10) (see chapter on indicators). [5] SAFA has now instituted an overarching theme titled 'good governance': "The challenge of delivering sustainability lies in an effective integration of the environmental, economic and social dimensions of development. This can only be achieved through good governance" (FAO, 2012: 16). Hence this theme covers many of the aspects covered by the institutional pillar.

2.2.5 Space and time

Space and time need to be considered before we can consider we have a 'good' definition of sustainability.

1. Over what space is sustainability to be achieved?
2. Over what time is sustainability to be achieved?

The first is a problem because space is interlinked. For example, if the boundary under consideration is that of a farm, this farm had multiple interactions beyond its boundaries which affect its sustainability. The time scale presents other difficulties – are we talking about a generation or more, or it is hundreds or thousands of years? Different components of sustainability may require different time frames (Bell and Morse, 2008: 15).

2.3 Visions of sustainable agriculture

There are two main ways in which people have envisaged sustainable agriculture. There are those who see it as possible to have sustainable high input, high yield farming and those who do not. For the first group agriculture must be profitable, whereas for the second there is a long-term emphasis not only on financial

[5] UN indicator themes and measurements are more tailored to measuring the sustainability of nations rather than individual enterprises.

viability but on the maintenance of the associated environmental resources and even for some on social justice (Bell and Morse, 2008: 9).

The Sustainable Agriculture Initiative Platform (Fellus, 2012) has adopted the definition: "Sustainable agriculture is a productive, competitive and efficient way to produce safe agricultural products, while at the same time protecting and improving the natural environment social/economic conditions of local communities.

2.4 Visions of business sustainability

It is very common these days for businesses to report on their sustainability initiatives. The names given to these reports vary and include: sustainability, sustainable development, corporate social responsibility, corporate responsibility, triple bottom line and accountability reports. While such reporting is usually voluntary, many guidelines have been produced, the most commonly used being the Global Reporting Initiative (GRI, 2006). Typically such guidelines state that the report should contain "a description of the organisation, its sustainability vision, its objectives towards sustainability and a series of indicators illustrating the performance of the organisation…" (Roca & Searcy, 2012: 103).

There is no universal agreement on what corporate sustainability means. One common definition is: "… adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining and enhancing the human and natural resources that will be needed in the future" (Deloitte and Touche, 1992). Another is: "demonstrating the inclusion of social and environmental concerns in business operations and in interactions with stakeholders" (Van Marrewijk, 2003: 102). Labuschagne et al. (2005: 373) take a slightly different perspective on sustainability seeing it more as a tool to manage risk. They state, "Optimal decisions can only be made when the economic, social and environmental consequences are taken into consideration".

The fourth dimension of institutional sustainability (Spangenberg et al., 2002) is divided into two themes: institutional framework and institutional capacity. According to the United Nations description, companies can address institutional sustainability strategically by:

a) Mentioning and incorporating sustainability principles within business strategies (i.e., vision, mission, business goals, etc.) in line with those of national and international government.
b) Openly acknowledge support for global agreements.
c) Including external sustainable development objectives in internal research and development.
d) Allocating funds to address sustainability issues beyond the immediate control of the company (Labuschagne et al, 2005: 376).

This can be called the 'corporate responsibility strategy' and "it implies that a prerequisite for all sustainability is a strategy that accepts the company's responsibility and its vital role in every society it operates in and also in the global environment" (Labuschagne et al, 2005: 376). Corporate responsibility should also include making a positive contribution to core business activities, "poverty- focused social investment and philanthropy programs", and "institution building and public policy dialogues" (Labuschagne et al, 2005: 377).

2.5 Sustainable development and local government

The requirement to maintain or increase well-being over time is included in the conceptual definition of sustainable development. The link between well-being and sustainable development is explicit in New Zealand's Local Government Act 2002, which refers to the role of local authorities in "promoting the social, economic, environmental, and cultural well-being of communities, taking a sustainable development approach" (NZ Stats, 2008: 134-136). The indicators used in this report provide a national-level overview of sustainable development. Sustainable development principles are equally applicable at a local level and sustainable development is one of the key philosophical underpinnings of the Local Government Act 2002.

To ensure that local authorities take a sustainable development approach, the Local Government Act 2002 requires them to publish long-term plans that take into account all dimensions of well-being – environmental, economic, social, and cultural, as well as allowing for the reasonably foreseeable needs of future generations(NZ Stats, 2008: 134-136).

The Act also promotes engagement with local communities. The resulting responses are described through community outcomes, and the long-term council community plan. Local authorities are responsible for monitoring the progress towards community outcomes. They must report back to the community on progress made towards achieving sustainable development at the local level. This complements the reporting at the national level(NZ Stats, 2008: 134-136).

Some of the information and indicators used to monitor local-level community outcomes can inform national monitoring and reporting on sustainable development. The reverse is also true; national information can be used to inform local monitoring and reporting (NZ Stats, 2008: 134-136).

2.6 Measuring sustainability: conceptual frameworks

It is regarded as important to measure sustainability to see if we as individuals, as a nation and as the world are moving in the right direction (Saunders et al., 2010). However, while sustainability is intuitively comprehensible, in practice it is difficult to define and operationalize (Briassoulis, 2001), as the definition of sustainability can vary and hence the indicators chosen to measure it can vary by discipline, objective, interest group and so on (Saunders et al, 2006a:15).

Therefore, the next two chapters consider in detail some of the different frameworks commonly in use to direct the development of indicators that measure business sustainability. Chapter 3 describes business models in general and then how these might be adapted to represent agribusinesses. This chapter comes with the understanding that the way a business is structured will then reflect on the appropriateness or suitability of a particular framework for measuring its sustainability. Chapter 4 on the other hand presents the frameworks developed to measure sustainability that are presented independently of a business model. That is they are presented as if they are generic, isolated and not operating in a particular context.

Chapter 3: Underlying approaches used to measure/comprehend/operationalise sustainability

3.1 Introduction

Before moving on to look at different models or frameworks which are used to lead to the measurement of sustainability we need to consider the different assumptions and theories that underlie and inform these models.

According to Statistics NZ (2009) there are three basic approaches to sustainability frameworks. The capital approach "borrows from the concept of capital from economics and broadens it to include other elements that are relevant to human well-being (NZ Stats, 2008: 18) Statistics New Zealand have used this approach many times to measure things such and New Zealand's progress towards sustainable development. The systems approach aims to measure sustainable development by measuring the whole system (environmental, economic, and social) completely. It emphasises that nature, society, and the economy are interdependent parts of a complex system (e.g., Response Inducing Sustainability Evaluation (RISE)). Advocates of this approach argue that many approaches to measuring sustainable development fall short of representing all the variables and relationships inherent in a complex system (Sustainable Aotearoa New Zealand, 2009). The participatory focus taken by Bell and Morse (2008) would endorse this perspective. Finally, a theme-based approach groups indicators into various issues or themes that are typically determined on the basis of policy relevance. The United Nations (2007) sustainable development indicators are formed from a theme-based approach.

3.2 The 'capitals' approach

First of all the 'capitals' approach is described because the ideas contained in this approach have been described and/or used in much of the literature about sustainable development frameworks or business models reviewed (e.g., Saunders et al., UN, 2008, Stats NZ; IIRC, GRI). A generic version of the 'capitals' approach will be presented focused specifically on sustainability. "Individuals and society derive well-being from the total wealth of a country, where total wealth encompasses a range of capital assets" and has been broadened to include four [or five][6] types of capital – financial and produced capital, natural capital, human capital, and social capital". In other words, "capital assets … can be defined as resources that generate a flow of goods and services that enhance well-being over time" (Stats NZ, 2008: 134-136). "Capital assets are therefore integral to meeting people's needs. Maintaining and managing them in a way that preserves options over time, to ensure a non-declining level of well-being, is a necessary condition of sustainable development" (Stats NZ, 2009: 134-136). The UN et al. (2003) has abbreviated this to: "sustainable development can be defined as non-declining per capita wealth over time".

"The term 'capital' was first used in economics to describe assets that enable future economic production, such as buildings and machinery. Capital assets are capable of generating income and have themselves been produced. All goods and services can be viewed as being produced through the use of capital, normally in conjunction with human labour. The capital approach, therefore, analyses assets or capital goods as means of production that will produce a flow of services into the future" (Stats NZ, 2008: 18).

As "benefits flow from capital assets, maintaining or enhancing stocks of capital is a necessary condition for sustainable development. The stock of capital that is currently used to meet the needs of the present generation should be passed on to the next generation intact or enhanced". In other words, "the income of a nation is the amount that it can collectively spend during a period without depleting the capital base upon which it relies to generate this income (United Nations, European Commission, International Monetary Fund, OECD & World Bank, 2003)" (Stats NZ, 2008:18).

[6] For example, UN (2008), separates out financial and produced capital.

This capitals-based approach portrayed in Figure 3.1 is used by the IIRC to illustrate how capitals are transformed by an organisation. They are not just the resources used 'up' by an organisation but are changed and perhaps transmuted into 'different 'capitals. In this way, the responsibility of an organisation to produce positive outcomes from its resources is revealed.

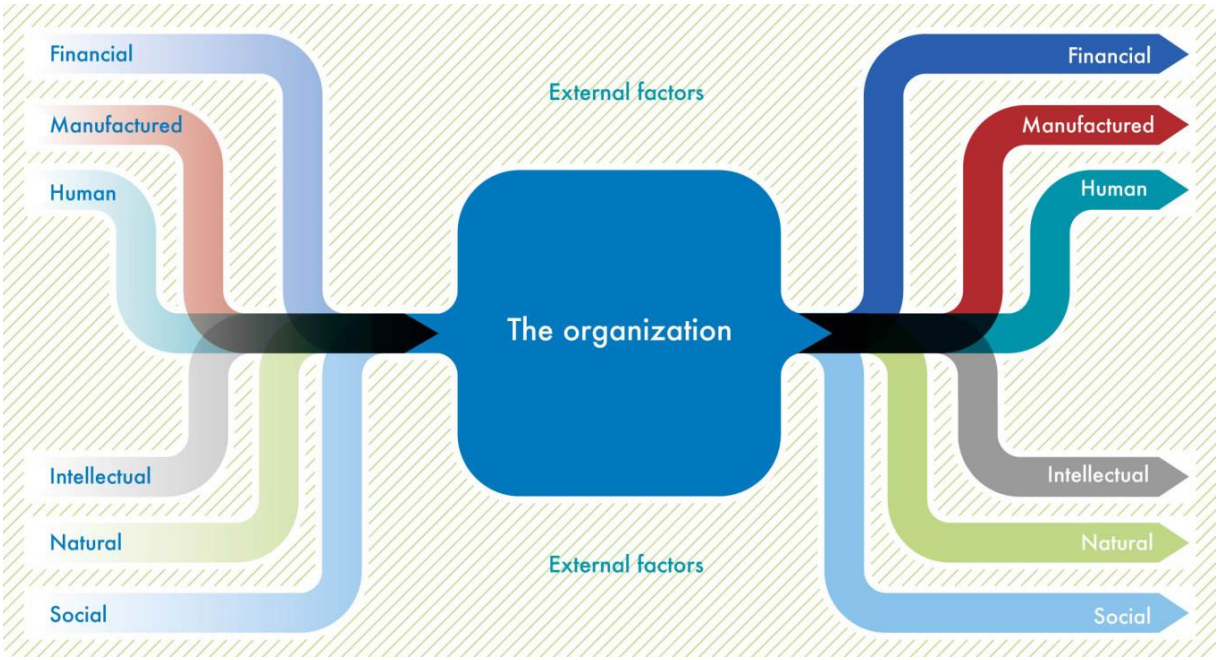

Figure 3-1: How the IIRC depicts the way in which capitals are used and affected by an organisation

Source: IIRC (2012: 8).

3.2.1 Weak and strong sustainability under the capitals approach

The concepts of weak and strong sustainability take on very particular meanings when using the capitals approach.

- Weak sustainability is the situation in which one type of capital stock can be replaced or substituted by another. For example, produced and human capital can be substituted for natural capital, when a technology can be used as a substitute for scarce resources (NZ Stats, 2008: 134-136).

Weak sustainability implies that the sum of all capital assets must be maintained, rather than the individual stocks of capital assets (WGSSD, 2008). However, this also assumes a level of certainty about each capital asset that does not really exist.

- Strong sustainability is the situation in which capitals are not regarded as freely interchangeable and each type of capital stock should be maintained. An assumption is that substitution options among capital stocks are limited, because some forms of capital are considered critical and not exchangeable (WGSSD, 2008).

The debate over weak and strong sustainability relates to the degree to which capital stocks can be exchanged. It is thought that some forms of capital are not exchangeable as they provide an essential stream of benefits for which there is no known substitute. Earth has a finite carrying capacity, and we must live within these limits (Stats NZ, 2008: 134-136, RSNZ, 2013a). A very relevant example of a critical natural asset is related to the threat of climate change. As the climate becomes unstable, the long-term basis of

our civilisation may be endangered in a fundamental way, however materially wealthy we might be (WGSSD, 2008).

In the language of the market, meeting needs and maintaining options can be characterised as managing a portfolio of assets. In managing these assets, we must take into account that there may be limits to the amount of substitutability, which has implications for the options available to future generations (Stats NZ, 2008: 134-136).

3.2.2 Functions provided by the environment

The functions provided by the natural environment can be divided into three groups: resource functions, sink functions, and ecosystem services. Resource functions are the natural resources used by humans. Sink functions are the ability of the natural environment to absorb waste and pollution caused by human activities (United Nations, European Commission, International Monetary Fund, OECD, & World Bank, 2003).

Ecosystem services encompass:

- supporting services, such as soil formation and nutrient cycling
- provisioning services, such as production of food and clean water
- regulating services, such as regulation of climate and disease
- cultural services, such as spiritual and recreational benefits obtained from ecosystems

(Millennium Ecosystem Assessment, 2003).

Biodiversity and ecosystems are closely related concepts. Products of biodiversity include many of the services produced by ecosystems. Changes in biodiversity can influence all the other services they provide (Millennium Ecosystem Assessment, 2003). Ecosystems and the biological diversity contained within them provide a stream of goods and services which are essential to our well-being (Stats NZ, 2009: 134-136).

3.2.3 Types of capital

3.2.3.1 Economic sustainability criteria: Produced and financial capital

Economists often refer to the pillars of sustainability in terms of 'capital'. Economic sustainability ('man-made capital') "includes not only the formal economy, but as well all kinds of informal activity that provide services to individuals and groups and thus increase the standard of living beyond the monetary income" (Spangenberg, 2002:104).

A definition used by Stats NZ (2008: 18) of produced capital, says it "includes fixed assets that are used repeatedly or continuously in production processes for more than one year. Fixed assets can be tangible" (i.e., machinery, buildings, roads, harbours, and airports) or intangible (i.e., computer software, original works of artistic value, intellectual property, and other specialised knowledge used in production).

Financial capital includes assets and liabilities that have a degree of 'liquidity' and tradability as a discrete store of value. They come in many forms and include currency, deposits, debt, company shares, government bonds, and other financial instruments. Financial capital may further be defined as an asset for which a counterpart liability exists (NZ Stats, 2008:18).

3.2.3.2 Environmental sustainability criteria: Natural capital

"The sum of all bio-geological processes and the elements involved in them" ('environmental capital') (Spangenberg, 2002:104). "Natural capital refers to Earth's natural resources, land, and the ecological systems that provide life-support and other services to society and all living things. This broad category covers both non-renewable natural resources (such as land, coal, oil and gas, minerals, and gravel) and conditionally-renewable resources (such as forests, fish, and water flows used for hydro power production. In addition, natural capital covers ecosystems and other natural systems that provide essential services to

humans. For example, nature's capacity for absorbing waste products that would otherwise cause pollution damage, and recreational services provided by the environment (WGSSD, 2008). Ecosystems have the ability to renew and maintain themselves, depending on conditions, both in terms of their components (i.e., species) and functions (such as the interaction between species and the physical environment, e.g., the conversion of sunlight into energy stored in food) (NZ Stats, 2008:19).

In terms of assessing business sustainability, Labuschagne et al. (2005: 378) suggest the assessment of an external focus of the impact of the company on air, water land and mineral and energy resources which fits with Keeble et al. (2003: 155) who add a fifth 'key sustainable development question', that of 'the use of natural resources'.

3.2.3.3 Social sustainability criteria: social, human, institutional and cultural capital

Labuschagne et al. (2005: 378) state that there has been a shift of interest in sustainability from environmental to social components, but less work has been done on the social. Social sustainability is seen by them in terms of a company's impact on "the social systems in which it operates" and the "company's relationships with its various stakeholders" and hence it is regarded in terms of a social impact assessment framework. Labuschagne et al. (2005: 381) have indicators to measure stakeholder participation through consideration of the quantity and quality of information provided to stakeholders and their influence in decision making. Internally, the focus is on the company's social responsibility towards its workforce through the health and wellbeing of employees, disciplinary practices, equity and human rights in the employment sourcing and training and development opportunities for employees. Externally the focus is on the impact of the company locally, nationally and internationally.

For some social sustainability means only 'human capital': "The social dimension ('human capital') consists of the intra-personal qualities of human beings: their skills, dedication and experiences" (Spangenberg, 2002:104). The OECD defines it as apart from social capital. For it the definition is "the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social, and economic wellbeing" (OECD, 2001a). The economic importance of knowledge and skills is widely recognised within labour economics (for individuals' income), growth theory, and business. At the same time, the personal well-being effects and social effects of learning are considered by many to be as important as the economic effects (WGSSD, 2008).

According to Stats NZ, the most commonly adopted definition of social capital is the OECD (2001b) definition: "networks, together with shared norms, values and understandings which facilitate co-operation within or among groups". As with other forms of capital, social capital generates benefits that improve well-being. This includes benefits associated with institutions such as the rule of law and transparency of political processes, as well as cultural benefits such as language, religion, and sports (Stats NZ, 2008: 19).

The assets of social capital are the networks and associated norms, such as shared understandings and informal rules that influence behaviour. Networks link individuals, groups, and institutions, and occur in a variety of different modes and forums, including face-to-face meetings, legislation, and technology-assisted transmission of information (Stats NZ, 2008: 19).

Improved social capital produces positive outcomes, such as identity and a sense of belonging, increased knowledge and understanding, community resilience, and lowering of transaction costs. A lack of social capital results in negative outcomes, such as social exclusion or intolerance of difference, reduced family functioning, and corruption (WGSSD, 2008).

Two other forms of capital that are sometimes used in measures of sustainable development are institutional capital and cultural capital. These have been placed as a subset of social capital for the reasons given below.

- Institutional capital is "the range of formal and informal civic, political and legal arrangements that underpin market activity and civic life" (adapted from OECD, 2001). Institutional capital relates to both formal networks and processes, such as the legal system and democratic participation, as well as informal elements, hence it could be seen to fit into the OECD definition of social capital given above.
- Cultural capital is a community's embodied cultural skills and values, in all their community defined forms, inherited from the community's previous generation, undergoing adaptation and extension by current members of the community, and desired by the community to be passed on to its next generation. Again, this could be seen to part of the OECD definition of social capital. The New Zealand Government's legislation charges local government with a responsibility for environmental, economic, social and cultural capital (Dalziel & Saunders, 2009).

3.2.4 Institutional/governance criteria

(Spangenberg, 2002:104) disagrees with institutional capital being classified with social capital. "Institutions (confusingly called 'social capital') are the result of inter-personal processes, such as communication and co-operation, resulting in information and systems of rules governing the interaction of members of a society".[7] He (Spangenberg, 2002: 107) defines institutions as "rules by which political decision-making ads implementation is structured". They also are the socially accepted rules or norms that can govern 'good' behaviour in any given society (Abercrombie et al., 1988). Hence indicators in this area can measure the impact of political decisions. As will be seen, this description closely resembles that of governance.

3.2.5 Risk management approach

Another approach that could be added to the list is a risk management approach which attempts to measure the impact a company has on the many different aspects of its operation (Labuschagne et al., 2005). This seems to be easily incorporated as part of the capitals approach (e.g., IIRC). The IIRC, in seeing that opportunities for 'adding value' to a firm are also a risk ventures and that a firm's use of capitals and impact on capitals involves risk, include risk in their measurements of a business's value creation (IIRC, 2012: 34).

3.3 Systems approach

Systems theory is an approach that attempts to understand the 'whole' and not all the parts that make up that whole. "The systemic perspective argues that we are not able to fully comprehend a phenomenon simply by breaking it up into elementary parts and then reforming it; we instead need to apply a global vision to underline its functioning" (Mele et al., 2010: 126). The focus is not on its parts but on how those interact and relate in order to understand a phenomenon's "organisation, functioning and outcomes" (Mele et al., 2010: 127). It also means that a phenomenon is given a boundary so that inputs and outputs can be identified and internal and external elements distinguished. It is obvious from this brief description how and organisation or business can be viewed from a systems perspective to understand its sustainability.

One of the most popular system approaches used frequently in social impact assessment is Checkland's (1981) soft systems methodology. "His approach is dynamic and interactive, reflecting the notion that change in any part of the system will affect other parts of that system. Accordingly, the approach will require backtracking and iterations in order to be effective" (Taylor et al., 1995: 114). This method can involve the use of both quantitative and qualitative data and has proved particularly useful in dealing with complex social problem situations.

[7] This normative description of social capital is rather different from the usual one to do with people's development of networks and contacts that serve them well in getting on society.

3.4 Theme based approach

The United Nations Commission on Sustainable Development (CSD) was founded in 1992 to follow up on the implementation of Agenda 21 and the Rio Declaration on Environment and Development after the United Nations conference on known as the Earth Summit. Its special task was to develop indicators for measuring sustainable development. The first set was published in 1996 consisting of 134 indicators assigned to the three pillars of sustainability. After years of evaluation the first set was regarded as too large and it was reduced to 58 and published in 2001. In this revision the pillar system approach was changed to a theme-based approach as it was thought that sustainability indicators can be better managed politically in this system as individual indicators are related directly to political processes and goals. It was thought that the first system could not cope with the complexity and multidimensionality of the world. The third revision, which was published in 2007, has 50 core indicators with a full set of 96 and has taken account of the Millennium Development goals. Hence, this set has 14 themes related to: poverty; governance; health; education; demographics; natural hazards; atmosphere; land; oceans, seas and coasts; freshwater; biodiversity; economic development; global economic partnership; consumption and production patterns (UNDSD, 2001; Schlör et al., 2009; UN 2007).

3.5 Conclusion

In describing the different approaches it was hoped to make clear that underlying the development of indicators to measure sustainable business development there are some differing understandings of the way the world works. The capitals-based approach has been critiqued by the systems and theme based approaches as needing to address complexity and inter-relationships better. The systems based approach does this by attempting to see sustainability more holistically. The theme based approach does it by introducing policy-based themes that relate better to government goals and aspirations and may use indicators from any of the three/four pillars of sustainability.

The next chapter presents different business models that then are adapted to fit agribusinesses. In order to understand what to measure for business development sustainability, those in a business need to have a grasp of how stakeholders envision it operating.

Chapter 4: Business Models

4.1 Introduction

In business, survival alone is not regarded as a sufficient goal but it is accepted that "A business must at all times maintain its own economic health and viability … the first step for a business is to stay in business" (Labuschagne et al, 2005: 377). A non-viable business cannot make a contribution to the local, national or global economy. Labuschagne et al. (2005: 378) use four criteria to evaluate a business's short- and long-term financial stability and survival related capabilities - financial health (profitability, liquidity, solvency), economic performance (share profitability, contribution to GDP, market share performance), potential financial benefits – other than profits (e.g., subsidies or rewards for certain business initiatives), trading opportunities (vulnerability and risk within the network the company trades in).

The measurement of business sustainability is very dependent on the understanding a firm has of its own business model – how and why it operates. In general these models can be broken into three types – economic, operational and strategic. In drawing up a business model, the executives and boards of a firm are able to analyse where the firm fits in a sector, plan and monitor performance. This chapter briefly introduces some business models with an emphasis on how they might inform agribusiness models in particular and hence, indicators of agribusiness improvement sustainability (Saunders et al., 2007c). A major part of this chapter draws on work funded by MAF and carried out by the AERU in 2006 and 2007 (Saunders et al., 2006a, 2006b, 2007a, 2007b and 2007c).

Due to the lack of a shared understanding of what exactly is a business model, Morris et al. (2005) reviewed many definitions and found that they involved three functions which could also be positioned as 'layers' (Osterwalder, 2004) (see Figure 3-1).

Level	Layer	Activities
Planning	strategic	vision, goals & objectives
Architectural	business model	money earning logic
Implementation	process	organisation & workflow

Figure 4-1: Business Layers

Source: Osterwalder (2004) as interpreted by Saunders et al. (2007a: 2).

Models of business development have recently expanded to cover not only quality control, financial returns and product development but also the interaction of these factors with technology, export potential and workforce capabilities (Saunders et al., 2006a: 3). As demonstrated in the chapter on indicators in this report, New Zealand's primary industries have concentrated on collecting "production efficiency and financial performance" data but as Saunders et al. (2006b: 9) have commented, these are "not the only goals of individual farmers, agricultural industries or policy-makers. The vision of what it means to be a good famer or a healthy sector is much broader". This chapter presents some traditional business models and then shows these can be applied to three different models in the agricultural sector.

4.2 Business Management models

4.2.1 The Business Practices and Performance model

The Business Practices and Performance (BPP) model[8] places importance on 'good practice' and coordinated cooperative approaches, bringing together the concepts and theories associated with core competencies and distinctive capabilities, competitive strategies, organisational culture and learning organisations, couched within a capitals-based conceptual framework. Key elements are:

- structural issues – size, ownership structure;
- industry type and length of time in business;
- strategy – focus on products, marketing and positioning;
- conduct – leadership and planning, customer focus, human resources policy and employee relations, quality and supplier focus, adoption and use of innovation and technology, information on benchmarking to identify risks and opportunities and assess performance;
- outcomes;
- business results – financial performance measured by productivity, profitability and sales etc.;
- competitive environment – context – market, government policies, economic conditions, industry structure, power of buyers and sellers (Saunders et al. 2006a: 7).

An example of the use of this model is from Knuckey et al. (2002) who developed two indices from questionnaire data gathered from New Zealand firms, to measure sustainable business performance:

1. The Strategizing/Practice Index – an assessment of a firm's efforts on the way to business progress, and
2. The Operational-Outcome Index – the extent to which practices have been transformed into operational outcomes.

Important factors in success were considered to be:

- Leadership and planning,
- Employee practice,
- Quality and supplier focus,
- Information and benchmarking,
- Use of IT operational outcomes,
- Competitive environment,
- Overseas ownership, and
- Business result (financial) (Saunders et al. 2006a: 7).

Barriers were different from industry to industry, with agriculture, forestry and fishing hampered by the fluctuating exchange rate and access to international markets (Saunders et al. 2006a: 7).

4.2.2 The value creating model: Integrated Reporting (IIRC) framework

4.2.2.1 Rationale for Integrated Reporting

This section describes the approach taken by the International Integrated Reporting Initiative (IIRC) which hopes to encourage organisations to produce integrated reports – that is reports which communicate how an organisation's "strategy, governance, performance and prospects lead to creation of value over the short, medium and long term", summarised in Figure 4-2. It is hoped that this will:

- "catalyze a more cohesive and efficient approach to corporate reporting that draws together other reporting strands and communicates the full range of factors that materially affect the ability of an organization to create value over time

[8] This model was developed further and used by Knuckey et al. (2002) in their Firm Foundations report to assist the New Zealand Government's then Ministry of Economic Development to develop policies and indicators to measure the success of New Zealand businesses.

- Inform resource allocation by providers of financial capital that supports long term, as well as short and medium term, value creation
- Enhance accountability, stewardship with respect to the broad base of capitals (financial, manufactured, human, intellectual, natural, and social and relationship) and promote understanding of the interdependencies between them
- Promote integrated thinking, decision-making and actions that focus on the creation of value in the long term, as well as short and medium term" (IIRC, 2012: 3).

It follows the BPP model because it is also underlain by capitals-based theory, and is included in this chapter because it proposes a particular business model, rather than a framework, on which to hang indicators.

Figure 4-2: The components of an organisation as depicted by the IIRC.
Source: IIRC (2012: 9).

The IIRC released a draft working document in late 2012 after gaining responses to its 2011 discussion paper, 'Towards integrated reporting – communicating value in the 21st century'. The guiding principles of integrated reporting are described as:

- Strategic focus and future orientation
- Connectivity of information
- Stakeholder responsiveness
- Materiality[9] and conciseness
- Reliability
- Comparability and consistency.

[9] Financial statements are prepared to help the users with their decisions. Hence, all such information which has the ability to affect the decisions of the users of financial statements is material and this property of information is called materiality. In deciding whether a piece of information is material or not requires considerable judgment. Information is material either due to the amount involved or due to the importance of the event. (Source: http://accountingexplained.com/financial/principles/materiality).

This framework does not provide KPIs. The IIRC thinks that this is the work of senior management and those charged with governance. In this way it hopes that the procedure will be flexible enough to meet the needs of organisations of different sizes and kinds. While the IIRC (2012: 13) acknowledges the importance of metrics it does not require or expect quantification of all movement of capitals: "Many uses of and effects on the capitals are best (and in some cases can only be) reported on in the form of narrative rather than through metrics".

The IIRC framework does require the reporting of material 'trade-offs:
(a) "Between capitals or between components of a capital (e.g., creating employment, which increases social and relationship capital, through an activity that negatively affects the environment, which decreases natural capital)
(b) Over time (e.g., choosing a course of action when it is likely that a different course would result in a greater capital increment but not until a later period)
(c) Between capitals owned by the organization and those owned by others or not owned at all" (IIRC, 2012: 13).

4.2.2.2 IIRC business model

The IIRC defines a business model as "a system of inputs, value adding activities and outputs that aim to create value over the short, medium and long term" (IIRC, 2012: 14). It is portrayed in Figure 4.3 in the form for reporting. It is a capitals-based model, hence inputs are regarded as the key capitals on which the organisation depends and differentiates itself from others. They are the capitals that are essential to the organisation for its robustness and resilience. The value adding activities are those that "transform inputs into valuable outputs" (IIRC, 2012: 15). These activities appear to be seen more in descriptive terms than quantitative. The outputs are the products and services produced. The outputs are not outcomes, which are also reported but in the 'performance and outcomes' part of the 'content elements' section of the report. This section includes:

- Organisational overview and operating context – what does the organisation do and what are the circumstances under which it operates?
- Governance – what is the organisation's governance structure, and how does it support the organisation's ability to create value in the short, medium and long term?
- Opportunities and risks – what are the key opportunities and risks the organisation faces?
- Strategy and resource allocation – where does the organisation want to go and how does it intend getting there?
- Business model – what are the organisation's key inputs, value adding activities and outputs by which it aims to create value over the short, medium and long term?
- Performance and outcomes – how has the organisation performed against its strategy and what are the key outcomes resulting from its activities?
- Future outlook – what opportunities, risks, challenges and uncertainties is the organisation likely to encounter in pursuing its strategy, and what are the potential implications for its business model and its future performance and outcomes? (IIRC, 2012: 32-38).

It is expected that an integrated report would also contain a full explanation of how an organisation creates value over time and is not only associated with changes in financial revenue and financial capital. That means it should include "a description of the way in which the organization has used and intends to use the different capitals to operate the business model and the effects on and trade-offs between those capitals over different time periods; and the organization's value drivers and the opportunities and risks that affect them" (IIRC, 2012: 17).

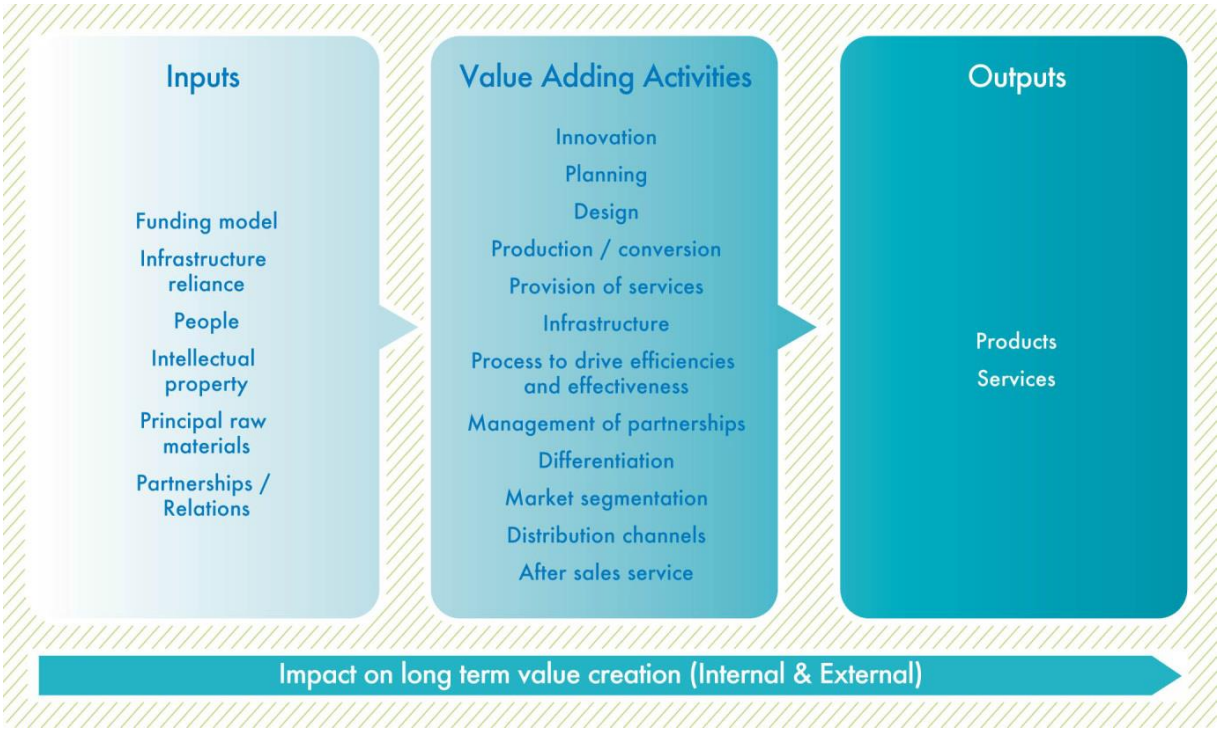

Figure 4-3: The value creating model of the IIRC

Source: IIRC (2012:14)

4.2.3 The 'balanced scorecard' model

The 'balanced scorecard' model (BSC) was proposed by Kaplan and Norton (1992) as way of making a connection between a firm's monitoring and business strategies. It takes account of process, innovation and customer objectives as well as financial position[10] and was found to bring together disparate measures (Saunders et al. 2006a: 9). The word 'balanced' refers to the ability of this tool to reflect the balance between short and long-term objectives, financial and non-financial measures, lag and lead indicators, and external and internal performance perspectives. "… it forces the perspectives of human resources (innovation, continuous improvement and learning), internal processes (turning inputs into outputs), the market (customer relationships, product and service criteria) and shareholders (profitability, return on assets, wealth, non-financial and ethical goals) to be explored and the linkages between them to be determined" (Saunders et al., 2006a: 9-10).

The BSC is based on a developing a common vision for the business incorporating four different perspectives:

1. Financial interests
2. Customer interests
3. Internal processes and learning
4. Growth

Organisations have changed the priority placed on different perspectives or added others of their own. In family businesses there may be conflict between business and family visions and purpose (Saunders et al. 2006a: 10).

Key Performance Indicators (KPIs) are specified for each goal and include both the outcomes (lag indicators) and the drivers (lead indicators). The next step is identifies the links or cause and effect relationships

[10] See Saunders et al. (2006a: 11) for a diagram of the Balanced Scorecard Strategy map taken from Kaplan and Norton (2000).

between the indicators and views these as on "a continuum from learning and growth to internal processes to the customer and to the financial results" (Saunders et al. 2006a: 10).

4.2.4 Organisational development model: The five stage SME model

A model that examines organisational development is the stage model, based on the idea that businesses pass through life cycle stages characterised by periods of stability and crisis, in which crises may create opportunities for adaptation, learning and growth. When this concept was related to 'small to medium enterprises' (SMEs) (Churchill and Lewis, 1983), it was proposed that firms go through five stages with different foci:

1. Existence: obtaining customers and finding ways of delivering the product or service
2. Survival: emphasis on profit (revenue vs. expenses) and cash flow generation for re-investment.
3. Growth and/or separation: choice between growth or stability, continuation of ownership by original owner/founder or go beyond this control.
4. Take-off: how to finance rapid growth
5. Resource maturity: how to consolidate and control gains and retain advantages.

Essentially this is a model that implies that firms are constantly undergoing change within each stage and through the transition from one stage to the next. Four key resources for the development and transition of an enterprise were identified by Churchill and Lewis (1983) as financial, personnel, systems and business. Similarly, they recognised that owners need to have goal(s), and three key attributes - operational abilities, managerial abilities and strategic abilities.

Firms may not pass through the stages sequentially or at all. Some writers have described firms by their attitudes to growth and others have found that businesses that do not grow are common (Saunders at al., 2006a: 9).

4.2.5 The Sustainable Family Business model

Olson et al., (2003) developed the Sustainable Family Business (SFB) model (Figure 4.4) originally designed by Stafford et al. (1999), to provide a model of the interaction and overlap between a family and their family business. The usual focus in the past has been on one or the other. This model suggests that the sustainability of a family business is dependent on both business success and family functioning. In a review of the literature on family businesses Olson et al., (2003: 643) found that in earlier models the family is often set against the business as limiting its functioning; families are seen as operating in an emotional context whereas businesses are described as operating in a rational context; women are viewed as a real problem area; and a family must be managed. In contrast, a few writers have suggested that women can contribute and even lead a family and/or a business and to not acknowledge this can limit the operation of the business. For example, the interpersonal dynamics in a family will reflect on the movement of the business from one generation to the next. In difficult economic times it may be the family business that survives, not necessarily because it is a good business but because of the sacrifices the family are prepared to make to keep it going.

This model used both objective and subjective indicators. While the former are most common and measured in financial terms, the latter can be measured by indicators of motivation, rewards, goals and perceptions of success. These subjective measures help to understand issues such as "how owners choose to invest their resources of time and money, whether they choose to stay in business, how they work with customers and employees, and how they utilize their ability to recognize and solve problems" (Olson et al., 2003: 644).

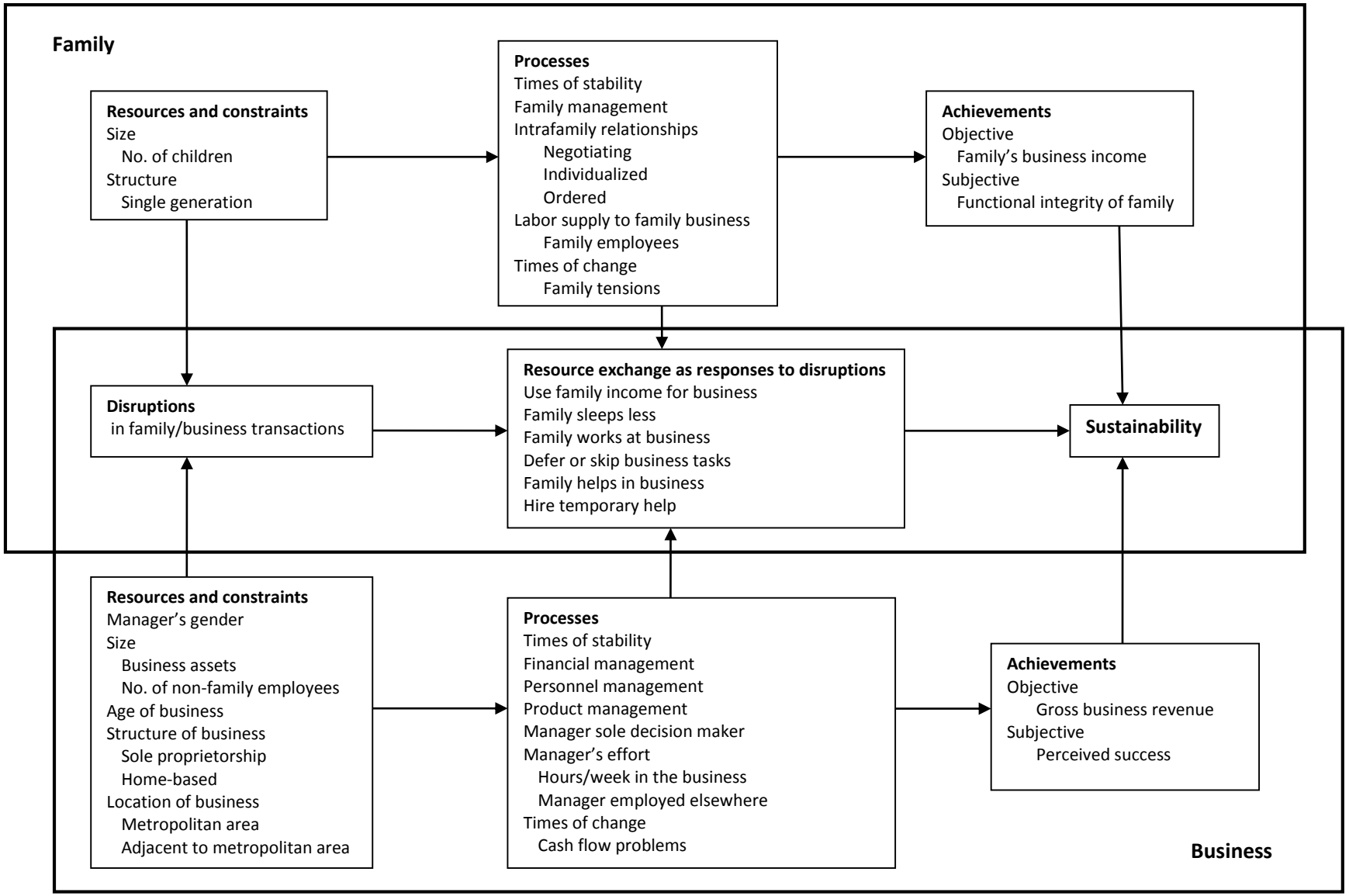

Figure 4-4: Operational model of family business sustainability

(Source: Olson et al., 2003: 643)

Also they acknowledge that "different processes occur … during times of stability and times of change" (Olson et al., 2003: 644). In fact "the long-term health and sustainability of any family business depends on its ability to anticipate and respond to change" (Olson et al., 2003: 644).

Another strength of the SFB model is the recognition that the business and the family will often exchange resources. This is presented graphically in Figure3-3 in which part of the model is shared between both the family and the business. Essentially this model is the same as the 'value creating model' in that it is concerned about the transformation of resources into 'achievements', but this is presented as a system of interactions between and family and their business (which could be considered to be 'trade-offs') rather than a capital's based process.

4.2.6 Other models

Firm size has been found to be an important determinant in business success, as smaller firms have more problems than larger firms in many ways (Schiffer and Weder, 2001). Watts et a. (1998) using the four quadrants of Ansoff's Matrix (Ansoff, 1965) – market penetration, market development, product development and diversification – found that SMEs and larger firms showed differences in the growth process.

Other models have been developed to do with the impact of organisational culture. D'Audney (2000) found NZ business culture placed emphasised short term gain and so were lacking in long term planning. Owner intentions and attitudes (Lewis, 2006 and others) have also been found to impact on business success. Lewis (2006) found that most NZ SMEs are unlikely to grow in size or use the growth strategies suggested in stage growth models (Saunders et al., 2006a: 12). Owners and managers may be interested in economic return, lifestyle, and/or security (Baines and Wheelock 1998), however, lifestyle, is deemed to be one of the most important factors in determining the growth of a small business (SME) in New Zealand (Massey, 2003, Lewis, 2006). Massey (2003) describes a lifestyle business model which includes "the owners' desire to have micro-firms, willingness to operate a business to achieve personal objectives, satisfaction with a target level of income" and the attitude to growing their own business (Saunders et al, 2007c: 12).

4.3 Applications to agricultural businesses: Agricultural success models

Saunders et al. (2006a, 2006b, 2007a, 2007b, 2007c) explored the applicability of different business models to agribusinesses. The first model they suggest for agribusiness is based on the concept of capital and takes as its basis that a sustainable business is a successful enterprise. Capital stock is regarded broadly as all the capitals – human, social, cultural, human-made and natural. Indicators can be used to measure capital levels and their changes over time (Saunders et al., 2007a: 5).

The second model is based on the Balanced Scorecard model already described. It has been adapted to reflect an agricultural context. For example, Dunn et al. (2006) developed a model with six perspectives: learning and growth, natural resources, agricultural commodities/production, customers, financial and ranch lifestyle.

A third model was the use of 'best practice' programmes in agriculture (Shadbolt and Martin, 2005). "With best practice, farmers update their basic knowledge as time goes by, hone their skills and attributes, cultivate a learning culture, and have self-knowledge and self-belief" (Saunders et al., 2007a: 5).

4.3.1 Model 1: Sustainability perspective: The capitals approach

Agricultural sustainability has been based on Solow's (1974) fundamental concept that economic "sustainability is non-declining per-capita human wellbeing (utility) over time". This evolved into the commonly used definition known as the Hartwick-Solow condition for sustainability which states that there should be a non-declining capital stock over time (Repetto, 1986; Solow, 1986). Capital is used here in its broadest manner to include human, social, cultural, human-made and natural capital.

The capitals approach has already been described in Chapter 3. In this section that approach is summarised from the perspective of an agricultural business. In economics, natural or environmental capital is divided into three types – extractive resources or resource functions (soils, minerals, forests, fish and water), which are used for economic production and are "converted into goods and services for the benefit of humankind" (United Nations et al, 2003: 5); service functions which are subdivided into two categories – survival functions (aspects of the habitat that are crucial for the survival of biological beings such as oxygen and water) and amenity values (direct and indirect such as landscapes, native bush, recreational fishing); and assimilative capacity or sink functions ("the ability of the environment to 'process' waste pollution" – usually to one of three 'sinks' – the atmosphere, water and/or land). Some things identified as natural capital are different from other types of capital because of their irreversibility. As a result some 'wellbeing' rules for renewable resources have been developed, such as the harvest rate is less than the renewal rate, or waste is kept within the limits of the natural environment to assimilate it. Rules have also been developed for the kind of resources that can be 'used up' which involve ensuring reductions in stock are compensated for in some way or other[11] (Saunders et al., 2010: 5-7).

Another factor in assessing capital is the multi-functionality or interactional nature of capital. To be sustainable and resilient the impact on the ecosystem also needs to be considered to avoid threatening the stability of the environmental system. Also, multi-functionality means that there can be a degree of redundancy and diversity in the system, so that sustainability is not just about one pathway but multiple possible pathways to realising sustainability. Capital also is related to time. The 'stock' of capital exists at a particular time but it also 'flows' as it is produced, consumed and exchanged (Fisher, 1986: 514; Saunders et al. 2010: 6).

There is a push for biological diversity to be regarded as an element of natural capital (Zheliazkov and Zaimova, 2012). Under this approach ecosystem services can become valued and formed into a market (Bishop et al., 2009; Zheliazkov and Zaimova, 2012), just as in the Emissions Trading Scheme (ETS) (Climate Change Response Act 2002) in New Zealand.

4.3.2 Model 2: The balanced scorecard model (BSC) adapted for agricultural businesses

Dunn et al. (2006) have adapted the BSC approach for use in ranch businesses in the U.S. They consider that ranchers see their businesses from six perspectives and suggest appropriate measures or metrics for these.

- Learning and growth: assessment of the intellectual capital status and development of those working in the business. Indicators – participation in short courses, use of internet for information gathering, enrolment in business or similar courses.
- Natural resources: a farm should aim to maintain to improve its on-farm natural resources as these are the basis of its business. Indicators – assessment of stocking rates, wild life counts, monitoring of range and water conditions.
- Agricultural commodities/production: the amount and quality of production can be measured in a number of ways and some measures may be misleading. This perspective does not consider just total output but efficiency and value creation. Indicators: lambing percentages, kilograms weaned per animal, number of days hay was fed out, death losses, vet costs.
- Customers: satisfying customers' needs and keeping customers coming back are important. It is important to know who the customers are and what needs they have.
- Financial: financial success is perhaps the most obvious and monitored of all the indicators of success, but there are many different measures of this and each a different aspect. Indicators: liquidity, cash flow, return on assets, return on equity, net operating profit after taxes.

[11] Though this carries with it the assumption that an equivalent substitution is possible (Solow, 1974), and this is under debate (for example, see Daly, 1996: 76-80).

- Lifestyle: Many farmers say that they are not very well off but they like the lifestyle. How do the five factors described above contribute to the wellbeing of the people involved in the business? Indicators: personal health, happiness, security, stress levels, employee turnover, succession plans (Saunders et al., 2006b: 13.)

The BSC model has been adapted by others for agribusinesses. Case studies have suggested that the customer focus is a problem. Shadbolt et al. (2003) suggest that it may be better for farmers to view their farms as part of a supply chain with links to up-stream suppliers and down-stream customers, distributors or cooperatives. They also suggest that a family aspect could be incorporated in the financial perspective.

4.3.3 Model 3: Best practice models

There are many competitions and study programmes that award and identify farmers (and farms) for their good practices, such as the Ballance Environmental Awards and the BNZ Dairy Business of the Year Competition, in New Zealand. Australian research (Knuckey et al, 2002; Australian Quality Council, 2000) has identified twelve common principles which are regarded as the basic principles on which most awards and business improvement models have been developed. They are:

1. Clear direction that allows organisational alignment.
2. Mutually agreed plans translate direction into action.
3. Understanding how customer requirements and expectations influence organisational direction, strategy and action.
4. Improving outcomes relies on improving the system and its processes.
5. A firm's potential is realised through its people, their enthusiasm and participation.
6. Continual improvement and innovation depend on continual learning.
7. Outcomes are maximised when people work on a system, not just in it.
8. Effective use of facts, data and knowledge leads to improved decision making.
9. Variability is inevitable: it impacts on both predictability and performance.
10. Firms provide value to their community.
11. Sustainability is determined by a firm's ability to create and deliver value to all stakeholders.
12. Senior leadership has a constant role in modelling each of these principles and assisting the firms and its people to reach their potential.

Some of the principles may be emphasised more because of the sponsors of the award. For example, people seeking a Fonterra/Westpac scholarship were asked about their knowledge of Fonterra and its global marketing operations. One of the sponsors of the Federated Farmers Taranaki Meat and Fibre Farmer of the Year is the Taranaki Regional Council and as a result there is an emphasis on environmental management. Many of the competitions analyse three years of financial accounts and often the shortlist of farmers is chosen according to their return on capital or operating profit per hectare. Terms like profitability, productivity, environmental sustainability and risk management appear in the judging criteria but competitors are expected to be able to communicate well and share information. Encouraging best practice in this way is seen to be more effective in educating other farmers because it is acknowledged that farmers often learn more through their peers rather than 'outsiders' (Saunders et al. 2006b: 15).

Table 4.1: Elements of best practice

Basic knowledge	Skills and attributes	Learning culture
Command of basic facts	Analytical problem solving skills	Creativity
Relevant professional understanding	Social skills and abilities	Mental agility
Continuing sensitivity to events	Emotional resilience Proactive inclination	Balanced learning habits and skills Self knowledge

(Summarised from Martin and Shadbolt, 2005 by Saunders et al. 2006b: 16).

One of the examples of such a competition is the BNZ Dairy Business of the Year Competition. The main criteria for winning appears to be based on what are seen as the 'main profit drivers': milk production, pasture production, labour efficiency, supplementary feed costs and core costs (Red Sky, 2008: 4-5). Mainly financial data based around profitability, efficiency, risk and solvency (seeTable 5….) is collected. It is compared with the district average and the top ten per cent of the district.

4.4 Agribusiness model as proposed by Saunders et al. (2007b)

4.4.1 Identified gaps between business and agricultural models and their indicators

Firstly, there is a gap between standard business and agribusiness models and indicators. How big is this gap? What indicators will be different for agribusinesses? Is there also a gap between on-farm and off-farm businesses? Secondly there is a gap between the information already collected and that needed to assess the success or health of agribusinesses. "Financial indicators are widely collected and monitored, but all other types of indicators are largely absent …". They do not necessarily provide a complete picture (Saunders et al., 2006b: 17).

Agriculture is a biological industry. It is dependent on the natural environment, subject to climatic and weather influences, and has seasonal production patterns, biological risks, and natural physical characteristics related to location. Size may not be applicable as many agricultural enterprises are based around families. The sector is not homogeneous. Agribusinesses at the farm level may be based around families but the businesses they supply and rely on for the marketing and sale of their products may be very large – such as meat processing companies, Fonterra or ZESPRI (Saunders et al., 2006a).

Saunders et al. (2006b: 17) come to the conclusion that standard business models provide a good basis for thinking about agribusiness but some of the indicators are not very useful for on-farm businesses. They propose using a model based around these themes (Saunders et al., 2006a: 26-27):

- Structure of the firm
- Business strategy
- Customer focus
- Quality
- Employee relations
- Innovation
- Social/environmental factors
- Business performance

4.4.2 The agribusiness model (Saunders et al., 2007b)

The structure of an agribusiness depends on where it fits in the agricultural value chain. This can be described as suppliers who service the farmers/growers, who send their products to processors who then send the refined product to wholesalers/retailers who distribute it to consumers (Saunders et al., 2006b: 5). The distance the firm is from the market will affect the value of feedback from the market place. Further, the position in the chain will affect the number and type of businesses firms sell or receive products from. Compared to most other businesses, agribusinesses tend to operate over longer time lines because of their seasonal nature, the dependence on environmental conditions and the 'lumpy' nature of their income streams. This can mean that they form long-term relationships and commitment to one another.

Saunders et al. (2007b) developed an agribusiness business model (Figure 4.5) based on the Firm Foundation model, a model of New Zealand businesses developed by the Ministry of Economic Development in 2002 (Knuckey et al, 2002) . The indicators that come out of this model are shown in Table6.10 (see later). They then researched with farmers and others in agribusiness enterprises which of

two models fitted their business. In doing so they discovered that farmers found it difficult to focus on the business models and were more concerned about macroeconomic issues and compliance costs (Saunders et al, 2007c: 24).

4.5 Conclusion

This chapter has described several basic business models and shown how these may be adapted to fit agribusinesses. It concluded with a specific model developed by Saunders et al. (2007c). While some indicators arising from these models have been described in this chapter (SFB and BSC), more will be disclosed in Chapter 6, while the next chapter, Chapter 5, will present more generic frameworks of sustainability.

The most common base to build on is a capitals approach. In the Business Practice and Performance model this takes the form of emphases on the context, strategy, operational framework and the outcomes which Knuckey et al. (2002) have reduced to two components – strategising/practice outcomes, and operational/outcomes. The context indicators are aspects like the business structure – size and ownership structure – and type, and the length of time in business. These are measure of the internal and external environment in which the business takes place and can be quite individualised. They are factors that need to be accounted for before sustainability can be measured. How many of these factors to account for will be a big question in the dashboard design. In a model of an agricultural business weight is placed on natural or environmental capital and how the business converts this capital into other forms of capital.

Best practices emphasised in agricultural competitions in New Zealand tend to measure fairly static outcomes to do with production and financial success while evaluating farmers themselves through interviews and quizzes. It is hoped that tis emphasis on best practice will be passed on from farmer to farmer through the publicity given to these competitions.

Another capitals-based model is the value creating model where the emphasis is on trade-offs between capital, over time and between organisationally owned capital, those owned by others, and those not owned at all. This model looks at inputs, value adding activities and outputs and can be quite descriptive.

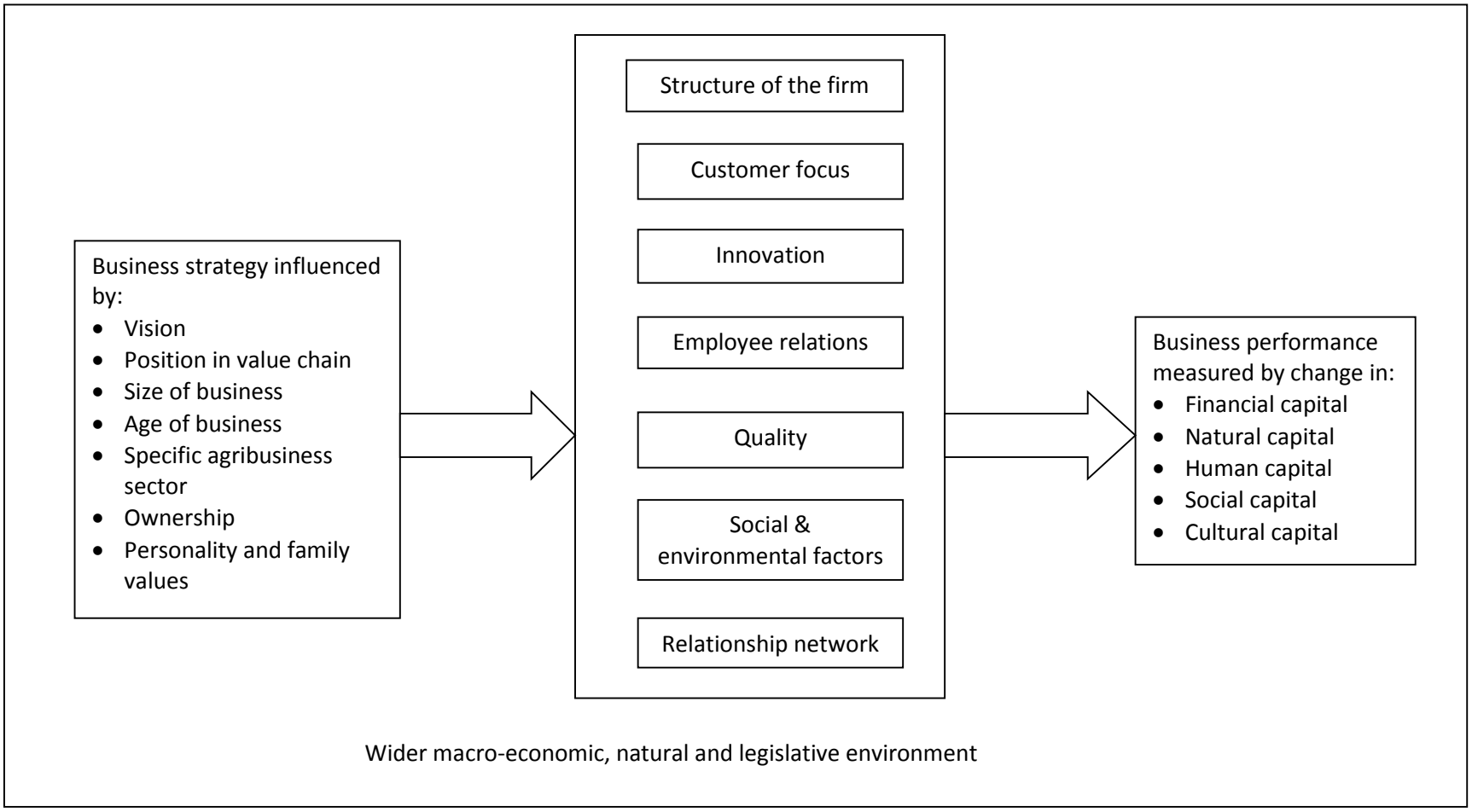

Figure 4-5: Model for a New Zealand agribusinesses as proposed by Saunders et al. (2007b: 7; 2007c: 26)

The Balanced Scorecard model stresses finding a balance between the competing demands of financial interests, customer interests and internal processes of learning and growth and the links between them. This model uses KPIs and sees them in terms of outcomes (lag indicators) and drivers (lead indicators). This model has been adapted for use in agribusinesses and uses indicators to do with learning and growth, natural resources, agricultural commodities/production, customers, financial success and lifestyle. It has been suggested that a focus on customers is irrelevant for some agribusinesses and it might be better to take account of their placement in a supply chain.

The organisational development model presents businesses as going through stages. At each transition a enterprise needs financial, personnel, systems and business resources. An owner needs operational, managerial and strategic capabilities.

In the Sustainable Family Business model account is taken of how the family and the business interact and it measures the business sustainability by using objective and subjective indicators.

The next chapter, Chapter 5, will investigate more generic indicator frameworks that have not been derived from particular business models. One of the questions arising from this chapter will therefore be, what model is implicit in a specific framework? In other words, what is the belief system underlying a framework? What assumptions are being made about the users of a framework and their goals and purposes? What taken-for-granted assumptions have the developers of a framework revealed about themselves?

Chapter 5: Frameworks or models of sustainability

5.1 Frameworks: Structuring indicators of business sustainability

This chapter describes various frameworks which in turn structure the ways in which sustainable development can be measured. The first frameworks described are the dominant global ones used by business organisations such as: the Global Reporting Initiative (GRI) – a non-profit organisation that works towards a sustainable global economy by providing sustainability reporting guidance; Sustainability Assessment of Food and Agriculture systems (SAFA) from the Natural Resources and Environment Department of the FAO; and International Integrated Reporting Council (IIRC), a global coalition of regulators, investors, companies, standard setters, the accounting profession and NGOs[12].
Most indicators of business sustainability are constructed in some way around a framework based on the 'triple bottom line' of economic, environmental and social performance. For example, the GRI G3 framework includes 79 indicators organised in this way with the social dimension subdivided into labour practices, human rights, society and product responsibility (GRI, 2006). As discussed earlier, the UN under RIO – Agenda 21 is updating its indicator structure every few years and like others has added to or diverged from the original 'three pillars' of sustainability. Keeble et al. (2003: 155), using a system developed by the company, Arthur D. Little Limited, based a project assessment on four key sustainable development questions:

- Economic – will the project generate prosperity and enhance the affected economies?
- Social – will the project be implemented in a socially responsible manner and benefit the affected communities in a fair and equitable way?
- Environmental quality – will the project cause long-term damage to the environment?
- Use of natural resources – will the project protect and enhance natural capital?

These four 'impacts' were broken into 15 criteria , 37 sub-criteria and 69 indicators. Common across each impact were the criteria of 'governance' and 'risk'.

Some organisations that measure sustainability do so by going straight to a many-themed framework where each theme has an indicator or indicators (non-hierarchical). This chapter just describes the more complex, usually hierarchical, frameworks of two or more levels whereas the next chapter emphasises the indicators. It must be said that there seems to be some differences over what is meant by indicator, and some confusion between the indicator and the variable/s that measure/s it. Some frameworks have one variable to be measured per indicator while others may have several ways of measuring one indicator and sometimes these are made into a single measurement to form a composite indicator (such as in the RISE framework).

5.2 UN Framework

The UN indicators were framed in terms of:

1. social aspects of sustainable development;
2. economic aspects of sustainable development;
3. environmental aspects of sustainable development – further subdivided into water, land, atmosphere and waste;
4. institutional aspects of sustainable development (Bell and Morse, 2008: 29).

[12] This is actually described in the 'Business Models' chapter because it is based upon a particular business model, unlike the frameworks described in this chapter which may have an underlying implicit model but it is not made explicit.

5.3 The GRI model (Version G3.1)

The Global Reporting Initiative (GRI) model suggests that indicators fit into two groups – core and additional, the core indicators being those which are of interest to most stakeholders and the additional indicators are those that may be emerging or of interest to a minority. The framework is based on the three pillars of sustainability but the social pillar has been broken into three – labour practices and decent work, human rights and society, and another 'product responsibility' has been added which could come under economic or social (Table 5.1). Other models would place some of these as belonging to the 'institutional' pillar or to governance (e.g., SAFA).

Table 5.1: The categories and sub-categories in the GRI (G3.1) indicator framework

Category	Aspect	Indicators
Economic	Economic performance	EC1 Direct economic value generated and distributed
		EC2 Financial implications and other risks and opportunities … due to CC
		EC3 … benefit and plan obligations
		EC4 Financial assistance received from government
	Market presence	EC5 Gender equity
		EC6 Use of locally-based supply
		EC7 Use of local labour
	Indirect economic impacts	EC8 Development and impact of infrastructure investments and services for public benefit
		EC9 Indirect economic impacts
Environment	Materials	EN1 Materials used
		EN2 Recycled materials used
	Energy	EN3 Energy consumption
		EN4 Indirect energy consumption
		EN5 Energy saved due to conservation and efficiency
		EN7 Reduction in indirect energy consumption
	Water	EN8 Total water withdrawal
		EN9 Water sources affected
		EN10 Volume recycled and reused
	Biodiversity	EN11 Land used in or next to protected or high biodiversity value areas
		EN12 Impacts on above areas
		EN13 Habitats protected or restored
		EN14 Strategies, actions plans for managing impact on biodiversity
		EN15 No, of IUCN Red List spp. and national conservation list spp. with habitats in areas affected by operations …
	Emissions, effluents and waste	EN16 Total GHG emissions
		EN17 Other indirect GHG emissions
		EN18 Reduction in GHG
		EN19 Emissions ozone-depleting substances
		EN20 Pollution - NO_x, SO_x and other significant air emissions
		EN21 Water discharge
		EN22 Total waste
		EN23 Spills

Category	Aspect	Indicators
		EN24 Waste imported, exported or treated deemed hazardous
		EN25 Water bodies affected by waste discharges and runoff
	Products and services	EN26 Mitigation of environmental impacts
		EN27 Reclaimed products and packaging
	Compliance	EN28 Fines and sanctions for non-compliance
	Transport	EN29 Environmental impact of transport
	Overall	EN30 Total environmental protection costs
Labour practices and decent work	Employment	LA1 Total workforce by employment type, employment contract, and region, broken down by gender
		LA2 Total number and rate of new employee hires and employee turnover by age group, gender, and region.
		LA3 Benefits provided to full-time employees not provided to temporary or part-time employees.
		LA15 Return to work and retention rates after parental leave, by gender.
	Labor/management relations	LA4 Employees covered by collective bargaining agreements.
		LA5 Minimum notice period(s) regarding operational changes.
	Occupational health and safety	LA6 Percentage of total workforce represented in management–worker health and safety committees.
		LA7 Rates of injury, occupational diseases, lost days, and absenteeism, and number of work related fatalities.
		LA8 Education, training, counselling, prevention, and risk-control programs to assist workforce members, their families, or community members regarding serious diseases.
		LA9 Health and safety topics covered in formal agreements with trade unions.
	Training and education	LA10 Average hours of training per year per employee.
		LA11 Programs for skills management and lifelong learning that support the continued employability of employees and assist them in managing career endings.
		LA12 Employees receiving regular performance and career development reviews.
	Diversity and equal opportunity	LA13 Diversity of composition of governance bodies.
	Equal remuneration for women and men	LA14 Gender analysis of remuneration.
Human Rights	Investment and procurement practices	HR1 Investment agreements and contracts that include clauses incorporating human rights concerns.
		HR2 Suppliers, contractors and other business partners that have undergone human rights screening, and actions taken.

Category	Aspect	Indicators
		HR3 Total hours of employee training on policies and procedures concerning aspects of human rights relevant to operations.
	Non-discrimination	HR4 Total number of incidents of discrimination and corrective actions taken.
	Freedom of association and collective bargaining	HR5 Operations and suppliers identified in which the right to exercise freedom of association and collective bargaining may be violated or at risk, and actions taken.
	Child labor	HR6 Operations and suppliers identified as having risk for incidents of child labor, and measures taken to contribute to effective abolition.
	Forced and compulsory labor	HR7 Operations and suppliers identified as having risk for incidents of forced or compulsory labor, and measures to contribute to the elimination of all forms of forced or compulsory labor.
	Security practices	HR8 Security personnel trained in the organization's policies or procedures concerning aspects of human rights.
	Indigenous rights	HR9 Total number of incidents of violations involving rights of indigenous people and actions taken.
	Assessment	HR10 Total number of operations that have been subject to human rights reviews and/or impact assessments.
	Remediation	HR11 Number of grievances related to human rights filed, addressed and resolved through formal grievance mechanisms
Society	Local community	SO1 Operations with implemented local community engagement, impact assessments, and development programs.
		SO9 Operations with significant potential or actual negative impacts on local communities.
		SO10 Prevention and mitigation measures implemented in operations with significant potential or actual negative impacts on local communities.
	Corruption	SO2 Number of business units analyzed for risks related to corruption.
		SO3 Employees trained in organization's anti-corruption policies and procedures.
		SO4 Actions taken in response to incidents of corruption.
	Public policy	SO5 Public policy positions and participation in public policy development and lobbying.
		SO6 Value of financial and in-kind contributions to political parties, politicians, and related institutions.
	Anti-competitive behavior	SO7 Number of legal actions for anticompetitive behavior, anti-trust, and monopoly practices and outcomes.
	Compliance	SO8 Monetary value of fines and number of non-monetary sanctions for noncompliance with laws and regulations

Category	Aspect	Indicators
Product Responsibility	Customer health and safety	PR1 Life cycle stages in which health and safety impacts of products and services are assessed for improvement, and products and services categories subject to such procedures.
		PR2 Number of incidents of non-compliance with regulations and voluntary codes concerning health and safety impacts of products and services during their life cycle.
	Product and service labelling	PR3 Type of product and service information required by procedures, and percentage of significant products and services subject to such information requirements.
		PR4 Number of incidents of non-compliance with regulations and voluntary codes concerning product and service information and labelling.
		PR5 Practices related to customer satisfaction, including results of surveys.
	Marketing communications	PR6 Programs for adherence to laws, standards, and voluntary codes related to marketing communications.
		PR7 Number of incidents of non-compliance with regulations and voluntary codes concerning marketing communications, including advertising, promotion, and sponsorship by type of outcomes.
	Customer privacy	PR8 Number of substantiated complaints regarding breaches of customer privacy and losses of customer data.
	Compliance	PR9 Monetary value of fines for noncompliance with laws and regulations concerning the provision and use of products and services

Guidance for using Indicators

In reporting on the Performance Indicators, the following guidance on data compilation applies:

- **Reporting on Trends** Information should be presented for the current reporting period (e.g., one year) and at least two previous periods, as well as future targets, where they have been established, for the short- and medium-term.
- **Use of Protocols** Organizations should use the Protocols that accompany the Indicators when reporting on the Indicators. These give basic guidance on interpreting and compiling information.
- **Presentation of Data** In some cases, ratios or normalized data are useful and appropriate formats for data presentation. If ratios or normalized data are used, absolute data should also be provided.
- **Data aggregation** Reporting organizations should determine the appropriate level of aggregation of information. See additional guidance in the General Reporting Notes section of the Guidelines.

(Table with abbreviated indicators constructed from GRI Indicators Protocol Sets (GRI vs3.1, 2011).)

In May of this year (2013), Version G4 of the GRI guidelines is to be published. Organisations will probably have a two year grace period to move to the new version. It is different in many technical ways but the change of most significance is that each organisation reporting is to provide new information about its supply chain including a complete description (GRI, 2012).

5.4 The SAFA model

5.4.1 Frameworks: Structuring indicators of business sustainability

SAFA is structured on the four sustainability 'dimensions': good governance (G), environmental integrity (E), economic resilience (C), and social well-being (S). Each of these dimensions is broken into four or more

'themes' (See Table 5.2), then each of these into sub-themes have indicators attached to them. SAFA does not see themes as discrete entities and provides a diagram showing how the themes are linked (Figure 5.1).

Table 5.2: Dimensions, themes and subthemes in the SAFA structure

Dimension	Theme	Sub-theme
Good governance	G1 Governance structure	G1.2 Corporate ethics
		G1.2 Due diligence
	G2 Accountability	G2.1 Holistic audits
		G2.2 Responsibility
	G3 Participation	G3.3 Stake-holder dialogue
		G3.2 Grievance procedures
		G3.3 Conflict resolution
	G4 Rule of law	G4.1 Commitment to fairness and legitimacy
		G4.2 Remedy, restoration and prevention
		G4.3 Co-responsibility
		G4.4 Resource appropriation
	G5 Holistic management	G5.1 Sustainability in quality management
		G5.2 Certified production and sourcing
		G5.3 Full-cost accounting
Environmental integrity	E1 Atmosphere	E1.1 Greenhouse gases
		E1.2 Air pollution
	E2 Freshwater	E2.1 Water quantity
		E2.2 Water quality
	E3 Land	E3.1 Organic matter
		E3.2 Physical structure
		E3.3 Chemical quality
		E3.4 Land degradation and desertification
	E4 Biodiversity	E4.1 Habitat diversity and connectivity
		E4.2 Ecosystem integrity
		E4.3 Wild biodiversity
		E4.4 Agricultural biodiversity
		E4.5 Threatened species
	E5 Materials and energy	E5.1 Non-renewable resources
		E5.2 Energy supply
		E5.3 Eco-efficiency
		E5.4 Waste disposal
	E6 Animal welfare	E6.1 Freedom from stress
		E6.2 Species appropriate conditions
Economic resilience (C)	C1 Investment	C1.1 Internal investment
		C1.2 Community investment
		C1.3 Long-ranging investment
	C2 Vulnerability	C2.1 Stability of supply
		C2.2 Stability of marketing
		C2.3 Liquidity and insurance
		C2.4 Employment
		C2.5 Stability of production
	C3 Product safety and quality	C3.1 Product information
		C3.2 Traceability
		C3.3 Food safety
		C3.4 Food quality
	C4 Local economy	C4.1 Value creation
		C4.2 Local procurement

Dimension	Theme	Sub-theme
Social well-being	S1 Decent livelihood	S1.1 Wage level
		S1.2 Capacity building
	S2 Labour rights	S2.1 Employment relations
		S2.2 Forced labour
		S2.3 Child labour
		S2.4 Freedom of association and bargaining
		S2.5 Working hours
	S3 Equity	S3.1 Non-discrimination
		S3.2 Gender equality
		S3.3 Support to vulnerable people
	S4 Human health and safety	S4.1 Physical and psycho-social health
		S4.2 Health resources
		S4.3 Food security
	S5 Cultural diversity	S5.1 Indigenous knowledge
		S5.2 Food sovereignty

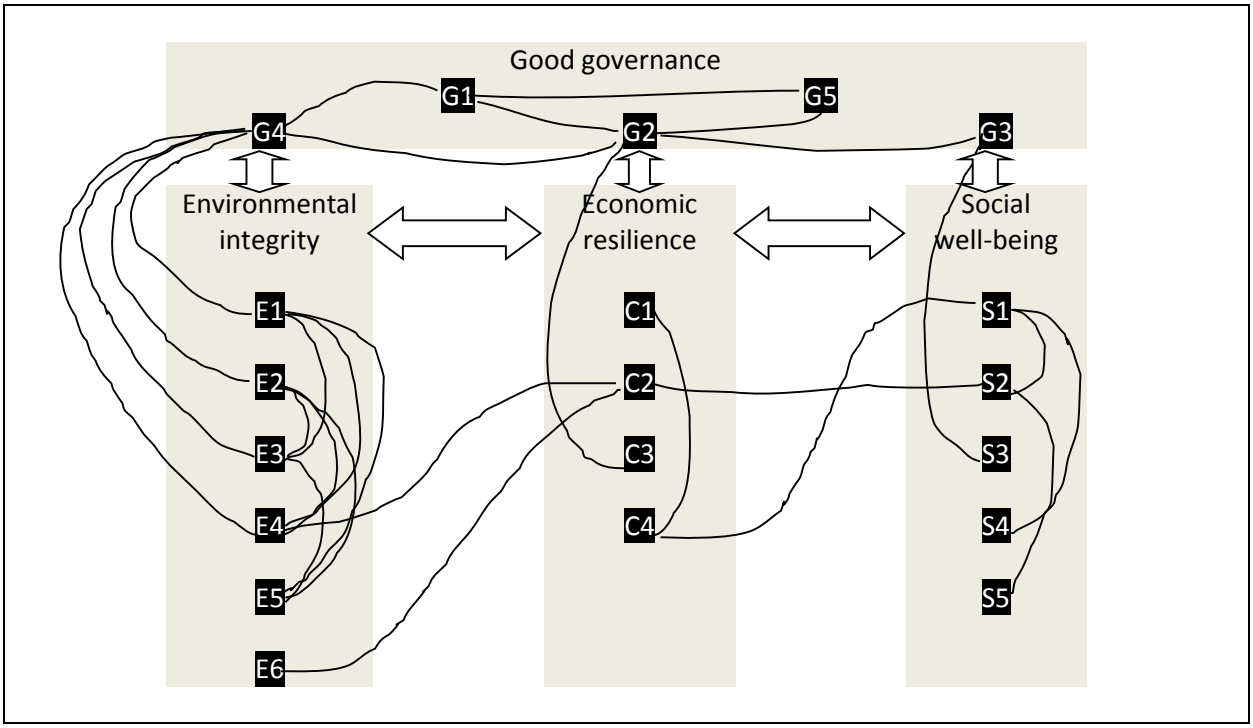

Figure 5-1: Interrelations between SAFA sustainability dimensions and themes.
Lines indicate strong, direct interrelations between one or more sub-themes. Theme numbers as in Table 5.2. (Source: SAFA, 2012: 39)

5.5 The RISE framework

The Response-Inducing Sustainability Evaluation (RISE) tool is a farm-level, system-oriented approach developed in Switzerland, that covers ecological, economic and social aspects of sustainability by defining 10 indicators for energy and climate, water use, nutrient flows, soil use, animal husbandry, plant protection and biodiversity, farm management, economic viability, working conditions, quality of life. These are calculated from 54 parameters collected in an interview. Indicator measures are normalised to give a measure of the degree of sustainability, resulting in a number between 0 and 100, where 100 represents a completely sustainable way of producing and 0 represents a completely intolerable situation. (This

'normalisation' is carried out through the use of software which takes account of farm and reference data and uses valuation functions.) The results are represented in a farm sustainability 'polygon' diagram which is another name for the 'spider's web or radar type (RISE, 2011; Häni et al., 2003: 78). See Figure … for an example.

RISE's users represent many large global companies such as Nestlé, Fonterra and Syngenta and it has support from organisations such as the FAO (RISE, n.d.).

5.6 Framework used by Stats NZ in 2008 for 'Measuring New Zealand's Progress using a Sustainable Development Approach'.

The capital approach to measuring sustainable development underpins the Statistics NZ measurement framework (Statistics NZ, 2008). Its framework is based on different 'principles' (see Table 5.3). The measurement framework provides the basis for selecting and interpreting the results of the indicators. Stock and flow indicators are derived from the capital approach. However, the measurement framework goes beyond the capital approach to include other types of indicators (Statistics NZ, 2009: 134-136) because Stats NZ think that "a purely capital approach does not adequately consider the concept of development and how assets are currently used to meet needs, how assets are distributed, or how efficiently resources are used" (Statistics NZ 2008: 4). Hence they base their framework on that of MONET (Swiss Federal Statistical Office, 2004) which combines two methods for setting up indicator systems – the thematic approach (which answers the question 'what to measure'), and "the procedural approach which focuses on processes and causal connections and represents these in a model"[13] (Stats NZ, 2008: 4).

Table 5.3: Stats NZ Sustainable Development Framework

Target dimensions	Defining principles	Principles
Environmental responsibility	Ecosystems and biodiversity	1a Preservation and protection of biodiversity 1b Maintenance and restoration of the ecological integrity of ecosystems
	Consumption of resources	2a Limits for renewable resources 2b Limits for non-renewable resources
	Materials and wastes	3a Limits for degradable waste and toxins 3b Avoidance of non-degradable toxins
	Risks	4a Management of biosecurity risks 4b Apply the precautionary approach 4c Avoiding irreversibility
	Rate of change	5a Taking into consideration the time needed for natural processes
	Access to and value of the environment	6a Access to the environment for recreation and tourism 6b Protection of Māori values and use of the environment
Economic efficiency	Economic system	7a Economic system meets the needs of society 7b Maintenance of infrastructure 7c Financial position
	Efficiency and innovation	8a Investment in innovation 8b Economic efficiency 8c Development of knowledge and skills to meet the needs of economic development
	Rate of change	9a Socially compatible rate of change 9b Promoting resilience in the economic system

[13] Probably referring to a 'systems' approach.

Target dimensions	Defining principles	Principles
	International connections	10a World economic activity from which all parties can benefit
Social cohesion	Objective living conditions	11a Meeting needs 11b Promoting health
	Subjective living conditions	12a Satisfaction and happiness
	Equality of opportunity, access to resources	13a Equal opportunities and access to resources 13b Limits to individual freedom
	Knowledge and skills	14a Development of individual knowledge and skills
	Governance	15a Civil and political rights 15b Civic and political participation 15c Government effectiveness 15d Partnership between Mäori and government
	International assistance	16a Development cooperation
	Culture and identity	17a Historic heritage Protecting and promoting New Zealand's historic heritage. 17b Cultural diversity Ensuring cultural diversity is freely expressed, respected, and valued. 17c Cultural identity New Zealanders have a strong sense of identity based on their distinct heritage and cultures. 17d Mäori cultural identity
	Social connectedness	18a Social participation Social participation is promoted. 18b Integration of disadvantaged groups

Source: Stats NZ 2008: 2, 7-9.

5.7 Discussion and conclusion

This chapter and the previous one have described some different frameworks and models that have been used to structure the way in which indicators are grouped. Some are strongly based on a capitals approach – the agribusiness model of Saunders et al. (2007c), and the business reporting frameworks IIRC and GRI. Some are strongly based on a systems approach such as the BSC, the organisational development model, SFB and possibly the best practice model. Some are based on a thematic approach such as the later UN frameworks and RISE. Some have developed from a mix of these approaches, for example, Stats NZ, UN, BPP and SAFA. Stats NZ for example, has a framework based on the three capitals but then uses a themed approach for the indicators (see next chapter).

As can be observed from this chapter most indicator frameworks are based on the longstanding RIO three pillars of sustainability - environmental, economic and social - with an addition of something to do with governance or institutionalisation. However, from there many frameworks branch out into a theme or systems based approach to make sure all aspects of sustainability are covered in terms of the interests of the organisation. As we will see in the next chapter, some entities have not developed a framework at all relying just on themes of financial success and production, indicating sometimes that they have not thought beyond reporting for statistical collection purposes for a government ministry or NGO.

The next chapter delves into business indicators. How are they defined? What do they do? How are they best constructed? It then provides some of the many available examples.

Chapter 6: Indicators

6.1 Definition of an indicator

As the Compendium of Sustainable Development Indicator Initiatives includes more than 500 efforts at measuring sustainability (Parris and Kates, 2003) this chapter will not be able to comprehensively survey all of these!

Stats NZ (2013: 8) define an indicator as "a summary measure related to a key issue or phenomenon that can be used to show positive or negative change. The evaluative nature of an indicator distinguishes it from the descriptive nature of statistics. Indicators are measurable aspects of a project/environment/society that can be used to monitor its progress and direction. A key function of an indicator is to reduce the volume of information to which decision makers must attend.

Indicators are presented in a hierarchical way by Stats NZ (2013: 8) with global indicators at the top (presumably because they are summarising a lot of information), then indicators of sustainable development, then sectorial indicators such as environmental indicators, then descriptive statistics, and lowest in the hierarchy, primary raw data (as the building blocks on which the rest are built).

6.2 Purpose

Indicators can serve many different purposes. They can:

- Characterise current performance
- Identify a better course of action
- Reduce complexity
- Simplify communication by being easily comprehensible and limited in number
- Identify where problems persist, where improvements have been made or where change is desirable
- Identify whether things are getting better or worse
- Set and monitor progress to performance goals
- Measure performance versus benchmarks
- Contrast progress against competitors
- Evaluate underlying factors which affect outcomes
- Guide political decision-making by helping policy makers in setting, evaluating and modifying economic policies
- Monitor a particular group of the population or a particular issue

(Bos et al. 2007; Saunders et al., 2006a: 3; Stats NZ, 2013: 1; Spangenberg, 2002:105-6).

In the context of poverty alleviation and environmental protection Bos et al. (2007: 5) developed the Rural Sustainability Index to:

- Provide better access for farmers to the international market.
- Make sure that farmers receive a fair share of the world market price for their product.
- Make sure that farmers are being paid in due time.

The purpose of indicators is an important consideration in the selection process. Indicators for use informing policy can need to be changed whenever there is a change in policy. However, at the same time, while indicators may change it is better if at their core there is reasonable consistency over time (UN, 2008: 9). Also, the needs for certain indicators will change depending on what scale (local, regional, national, global) they are measuring and what type of business or sector of the economy.

6.3 Construction and properties of good indicators

Many have recorded what they think what makes a good indicator (Bos, 2007: 3; Harger and Meyer, 1996; IIRC, 2008: 37; Keeble et al., 2003: 152-4; Paterson, 2002; RISE, 2011: 3; Saunders et al., 2006a: 14; Spangenberg, 2002: 105-6; Stats NZ, 2013: 2-3). Their thoughts can be organised as follows:

- Generality/relevance
  - not dependent on a specific culture or society
  - relevant and useful to an organisation
  - relevant to key internal/external concerns
  - appropriate for a given audience
  - linked to policy or emerging issues

There is debate about whether indicators should be independent of culture and society or relevant to a particular organisation or group.[14] Obviously this relates to the purpose for which they are collected. Global comparisons, compared with national business comparisons, compared with internal organisational comparisons are all situations possibly requiring different indicators or different ways of measuring similar indicators.

- Indicative
  - Representative of phenomenon
  - Specific to underlying phenomenon
- Communicate
  - Have transparency/clarity
  - Intelligible and easily interpreted
  - Appropriateness of data transformations
  - Able to be disaggregated
  - Reported whether trends favourable or not
  - Presented with qualitative information to provide context and meaningfulness
  - Message has immediacy – compels, interests and excites
- Sensitive
  - React to change over time
- Allow for comparisons
  - International
  - Trends (i.e., comparisons over a number of time periods)
  - Able to compare what is better and what is worse
- Consistency
  - Robust – consistent over time
  - Consistent with other indicators used in organisation (especially those used for governance)
  - Consistent with industry/regional/global benchmarks
  - Potentially able to be benchmarked
- Scientific and theoretical validity – science-based
  - Grounded in research
  - Statistically sound
  - Methodologically sound
  - Reproducible
  - Verifiable
- Manageable
  - Data availability
  - Measurable
  - Cost effective –reasonable cost-benefit ratio (of doing a sustainability analysis)

[14] This looks suspiciously as if there is an underlying, taken-for-granted belief that globally collected statistics can be independent of culture and society, rather than probably dominated by a western world view of what is important.

- Scope
  - Cover the diversity of social, economic and environmental issues and overlap as little as possible
- Relationship to other data
  - Connected to other data where appropriate, e.g., with financial information
- Free from bias
  - Ethically, theoretically and philosophically neutral
- Action oriented
  - Within a farmer or firm's scope of action
  - Critically activity related.

6.4 Process of development

6.4.1 A process

Keeble et al. (2003: 152) assist organisations to develop indicators which measure their sustainable development performance by getting staff and boards of directors to answer four questions:

- What is critical and relevant to the organisation?
- What commitments does the organisation need to support?
- How will they benchmark performance?
- What do stakeholders expect of them?

Then Keeble et al. (2003) instituted a ranking process as often there are several indicators at this stage that may nearly measure the same thing. They wanted the indicators to be ranked according to these criteria:

- To be leading rather than lagging
- To be motivational
- To be within the control of those accountable
- To be practical to measure
- To be likely to provide new, useful information, validated by engagement
- To help differentiate a business from its competitors
- To be outcome-based rather than input/output based.

6.4.2 What is to be measured?

When indicators are being developed it is important to decide what is being measured. Is it:

- Short and long-term objectives?
- Financial and non-financial measures?
- Lag and lead indicators? Is the indicator predictive or a measurement of something in the past? Is it reflecting something that happened or indicating something that is likely to happen?
- External and internal performance perspectives, i.e., whose perspective are the measurements to be taken from – the farmer, the businessman, an external auditor? Is there to be some external reference point for some of them? (Saunders et al., 2006a: 9-10).

Note that these are not one or the other but both, and they need to be identified because they can open up for examination, and (per)form links between past and present, human resources, internal processes, the markets and shareholders (Saunders et al., 2006a: 9-10).

Another way of interpreting the kinds of things an indicator is measuring was first developed by a simple division into two groups:

1. State sustainability indicators (SIs) – describe the state of a variable, e.g., soil's physical and chemical properties.

2. Pressure SIs (or control, process of driving force SIs) – these are SIs that gauge a process that, in turn, will influence a state SI, e.g., the amount of pesticide used in an area (Bell and Morse, 2008: 28).

Obviously indicators in these two groupings are often related. For example, the amount of fertiliser used will affect soil's physical and chemical properties.

This division was promoted by the United Nations (UN) after the 1992 Rio Earth Summit, but the UN included a third type called 'response' indicators, which were used to gauge the progress of governments' responses. This became known as the DSR (Driving force, State, Response) framework (Bell and Morse, 2008: 28-30. The UN also preferred the expression 'driving force' rather than 'control' or 'pressure'. It later evolved into the DSIR (driving force, state, impact, response) framework (Bell and Morse, 2008: 31)).

Statistics NZ considers indicators to be of particular types dependent on what they are measuring (Table 6.1). Their use of stock and flows are ways of describing whether a measurement indicates the amount of something as compared with a flow which indicates the change over time of a variable. Some indicators are 'levels' which are variables that are compared with another in some way, for example, the proportion of a capital that is 'used up'. Indicators can also be classified as 'structural' meaning are capitals being used efficiently and responsibly, such as making efficient use of public or company resources. Some examples of each type are provided by Stats NZ in Table 6.1.

John Reid (of the Dashboard research team) reported on his experience of the SAFA meeting in Rome in March, 2013. He came back with a clarity about the need for a distinction to be made between performance-based indicators and practice-based indicators. There is a need to understand the role of planning indicators which measure long-term improvement at various scales, and how these relate to performance indicators, practice indicators, and contextual indicators. He produced some definitions of different types of indicators.

1. ***Context indicators*** reflect the state of the economic, social or environmental situation of the territory in which a farming/fishing/forestry (etc.,) enterprise is situated.
2. ***Context indicators*** underpin ***Standards*** that establish 'limits' for an enterprise operating within a territory. For example, each territory will have different limits for water use based upon the rainfall, water storage capacity, soils, etc., specific to the territory. However, each territory may also establish standards common to other territories nationally, or internationally. For example, standards for greenhouse gas emissions, or labour conditions.
3. ***Practice Indicators*** measure the adoption and utilization of ideas and technologies within a farming/fishing/forestry (etc.,) enterprise that have proven impacts in improving social, environmental, and economic outcome, e.g., direct drilling, precision irrigation, long-line instead of bottom trawling. The importance of practice indicators is that they focus on ***conscientisation,*** or the raising of awareness, of new practices that assist an enterprise in reaching sustainable outcomes. The focus of practice indicators is on utilising the 'best practices' available.
4. ***Key Performance Indicators*** measure the actual environmental, social, and economic, performance of a farming/fishing/forestry (etc.,) enterprise resulting from its practices. For example water quality, profit etc.
5. ***Connection between Practice Indicators and Key Performance Indicators*** – Improvements in practices, measured by ***Practice Indicators***, should lead to an improvement across ***Key Performance Indicators***.

Table 6.1 Indicator types as used by Stats NZ

Type of indicator	Question answered by the indicator	Description of the indicator	Value measured
Stock	How much resource (capital) is available to satisfy a particular need?	To be able to meet the needs described by the level indicators, appropriate provision of natural, economic, and social resources (capital) is required. In this context, capital is broadly defined, and includes produced, natural, human, and social capital. Capital stocks refer to the measurable quantity of a resource that is both accessible and available for use at a particular moment in time.	Capital stocks are measured using physical quantities or monetary measures. These may be represented as absolute values (e.g., drinking water supply, newspaper circulation figures) or relative values (e.g., proportion of threatened species, hospital beds per person).
Flow	To what extent does the capital appreciate/increase or depreciate/diminish?	Meeting the needs (described by level indicators) generally requires consumption of capital and often produces emissions (negative flows). Conversely, measures are taken to maintain or improve total capital (e.g., in the form of net investments in the economy or environmental protection measures). Flows have positive or negative effects on capital.	Flow indicators measure the activities (flows) that cause changes in stocks (additions or reductions) from one period to the next. They are described in terms of input and output flows. They may be represented as absolute values (e.g., greenhouse gas emissions in tonnes) or relative values (e.g., proportion of GDP spent on education, phosphorus input per hectare).
Level	To what extent is a particular human need met?	Level indicators provide a starting point or benchmark to assess the extent to which human needs are met.	Level variables are measured on a per person basis.
Structural	To what extent is capital being used in a socially responsible and efficient manner?	Structural criteria are: • economic, environmental, and social efficiencies (e.g., fuel consumption per 100km is an indicator of environmental efficiency) • disparities which relate to the distribution of met needs and capital between various population groups (e.g., age, ethnicity, sex) or between different regions.	Efficiency is always expressed as a relative variable (e.g., nitrogen oxide emissions per km) or defined as a proportion (e.g., proportion of journeys made using public transport). The description of disparities can be broken down by population group (e.g., proportion of women completing tertiary education) or region (e.g., regional economic output).

According to Jon Reid the process to follow is to:

1. ***Identify Context Indicators*** and associated ***Standards*** relevant at different scales (e.g. territory, nation, international) to enterprises based on a scientific evidence base. For example limits to water use at a territory scale, greenhouse gas emissions at national scale. Identify where there are gaps and how they might be filled by science.
2. ***Identify Practice Indicators*** that measure the adoption and utilization of **best practice** ideas and technologies in farming/fishing/forestry (etc.,) enterprises that will lead to ***Standards*** being met.
3. ***Identify Key-Performance Indicators*** that measure the impacts of enterprise practices to continually identify and determine 'best practice.'

6.4.3 Focus beyond financial performance

Historically the financial performance of a business was all that was measured – usually in the form of ratios [probably because these would be free of units and so comparable across different industries, businesses, sectors etc.]. However, it has been found that these ratios differ by industry grouping, size of firm, and location. Also, it is advised not to use aggregate level data, signifying that several areas of an enterprise need to be assessed rather than calculating one overall, composite measurement. More recently there has been an increasing focus on intangibles such as branding and staff training, rather than things such as plant and machinery. ([Ironically, it is suggested that in evaluating intangibles they must be operationalized, benchmarked, assessed and improved on.)[15] (Saunders et al. 2006a:16-17).

Strategic development has also been regarded as important and this has involved the development of measures of business performance using indicators of financial and operational performance. Market orientation has been found to be "positively related to the six indicators of firm performance – financial, customer values, market, internal business process, employee and new growth performance" (Saunders et al. 2006a:17).

Things to do with communication – "absence of information, absence of a proper system to diffuse vital information, lack of communication across functional area, and lack of understanding of a firm's functional boundaries appear to negatively affect firm performance through uncertainty in decision making" (Saunders et al. 2006a: 17). From a customer perspective "commitment to a 'quality product' and a market focus were important" (Saunders et al. 2006a: 17).

6.5 Types of indicators

6.5.1 Levels of measurement

Spangenberg (2002: 106) describes the different hierarchies of measurement – nominal, ordinal and what he calls 'cardinal' (which encompasses what is usually called interval and rational (Babbie, 2010: 470-472)) to provide a background to the different ways indicators can be measured. An understanding of this is important when developing measure for indicators because it limits what can be done statistically with data. He calls indicators with a cardinal scale to be performance indicators and as such, they are the most preferable.

6.5.2 Qualitative or quantitative?

Many reports of the sustainability of business organisations place an emphasis on qualitative information but commentators say that quantitative "indicators represent the concrete data on the corporation's performance" and are "at least as important" (Roca and Searcy, 2012: 103). Whereas Saunders et al. (2006a: 26) state that many factors leading to business success are qualitative and do not translate easily into indices. To repeat a quote from the IIRC (2012: 13), which, while acknowledging the importance of metrics, does not require or expect quantification of all movement of capitals: "Many uses of and effects on

[15] I say 'ironically' because I presumed that an intangible is something that is difficult to measure effectively.

the capitals are best (and in some cases can only be) reported on in the form of narrative rather than through metrics".

SAFA has developed a hierarchy of indicator types (Table 6.2). The qualitative types indicated below deal with the situation of whether or not particular criteria are met or not – in other words tick the box or yes/no nominal criteria.

Table 6.2: Hierarchy of SAFA indicator types

Type of indicator					Indicator example
	Type of information on which rating is based	**Quantitative or qualitative data**	**Rating based on absolute scale or on benchmark comparison?**	**State or trend data?**	
1	Performance-based	Quantitative	Absolute	State	Total freshwater use (m^3) in 2012
2	Performance-based	Quantitative	Benchmark[16]	State	Total freshwater use (m^3) per kg of milk solids, in % of regional average in 2012
3	Performance-based	Qualitative	Absolute	State	Does the enterprise meet criteria for water use efficiency stated, e.g., by local government or a standard?
4	Performance-based	Qualitative	Benchmark	State	Does the enterprise meet stricter criteria for water use efficiency (see above) than other enterprises in the same sector and region?
5	Measure-based[17]	Qualitative	Absolute	State	Rating of irrigation and other water use technology, based on standard data on the efficiency of these technologies
6	Measure-based	Qualitative	Benchmark	State	Rating of irrigation and other water use technology, in comparison with the regional average

Source: SAFA (2012: 29).

6.5.3 Composite indicators - indices

Most national attempts to measure sustainable development rely on a set of indicators. Single indices are often calculated from a collection of indicators to make a composite indicator or an index. This allows changes across several dimensions of sustainable development to be presented as one value, which provides a more concise, more easily understood summary, at the cost of course, of losing a lot of detail. It can also become difficult to make simple statements on the direction of the changes when the various indicators move in different directions. One way to get around this is to use indicators that combine a range of individual measures for environmental, economic, and social aspects.

When a composite indicator is constructed, it requires some statistical interventions of each of the measures that make up the indicator. Usually this is in the form of 'normalisation', a process which puts all the variables into the same units so that they can be combined. It often is done with reference to some standard or historical comparison. However, this gives equal emphasis to all variables and so often there is a next step of weighting, so that variables that are regarded as more important are given greater emphasis. Life Cycle Assessment (LCA) has a systematic and established process worked out for this. Many of the

[16] Comparison with a reference value, e.g., regional average, sector average or a defined situation. Note that combinations of absolute and benchmark comparisons are a further appropriate option.

[17] Qualitative rating of technologies or measure based, for example, on resource efficiency.

decisions related to these processes is subjective and related to choices made in discussion with others (AECOM and Landcare, 2011).

Such indicators are referred to as composite indicators and include:

- Ecological footprint
- 'Green' GDP
- Genuine Progress Indicators (GPI).
- The Environmental Sustainability Index

6.5.3.1 Ecological footprint

The measurement called the 'ecological footprint' is the total amount of land required to directly or indirectly sustain human activity. This includes not only the land used in supplying goods and services, but also the land required to absorb CO_2 emissions and other wastes. An ecological footprint identifies the maximum population a given land area can support, so making visible the hidden ecological cost of an activity or population (Bell and Morse; 2008). Another way of looking at it is: "An indicator that attempts to measure the resource use of a person (for food, goods, mobility, services and shelter) in terms of how much biologically productive land (globally averaged) is needed to meet that use" (RSNZ, 2013a: 3). It is expressed as a ratio of required resources to available resources. Ratios greater than one are regarded as unsustainable (Böhringer and Jochem, 2007: 2).

6.5.3.2 'Green' GDP

Green GDP uses conventional gross domestic product (GDP) as its basis, and typically takes account of two extra factors: resource depletion and degradation (source function), and pollution and waste (sink function). This is done by subtracting from GDP both the value of resources lost through depletion or degradation, and the cost of mitigating and managing waste and pollution. Green GDP combines measurement of the source and sink functions into one indicator. China decided to use this indicator but discarded it when it was discovered just how much environmental degradation was occurring thought its emphasis on growth (Zheng and Chen, 2007).

6.5.3.3 Genuine progress indicators

Genuine progress indicators (GPIs) describe a range of measurement tools that share a general principle of measuring the progress of society in a way that accounts for economic externalities, and changes across environmental, economic, and social domains. Some GPIs are aggregated to a single value and can be compared with changes in GDP. The proposition is that GPIs tell us more than our current reliance on GDP, which has a focus on economic growth. GPIs distinguish between 'goods' and 'bads' and acknowledge that society's views on these can change over time, leading to appropriate changes in the indicators used (Talberth, Cobb and Slattery, 2006).

6.6 Interpreting indicators: what do they mean?

6.6.1 Interpreting indicators

Bossel (2001) attempts to provide a holistic vision of sustainability that recognises that any system does not exist in isolation and that boundaries are permeable. He has produced what he calls 'six fundamental environmental properties' that need to be recognised when interpreting indicators. Though these properties are related to environmental sustainability, the word 'environment' can be interpreted to cover the environment in which a business operates and this understanding also makes some important points.

1. A normal environmental state – an actual environmental state can vary within a certain range and still remain normal
2. Resource scarcity – resources required for survival may not be available when and where they are needed.

3. Variety – the system environment is seldom uniform; many qualitatively different processes and patterns of environmental variables occur and appear in the environment both constantly and intermittently.
4. Variability – the state of the environment fluctuates within the normal environmental range in random ways and these fluctuations occasionally take the environment outside this range.
5. Change – over time the normal environmental state may gradually or abruptly change to a permanently different normal environmental state.
6. Other systems – the environmental system contains other systems or agents whose behaviour may have system specific significance for the given system (Cited from Bell and Morse, 2008: 32-33).

Many of these points provide a justification for having different ranges within a threshold meaning that the transition from one range to another indicates the degree of sustainability of a system and how much concern should be surrounding it. This shows that the indicators are on a continuous spectrum and a single value on that spectrum is not as important as staying within a particular range.

6.6.2 Thresholds for measurements of achievement or warnings of lack of sustainability

SAFA uses a four level rating scale which can be visualised using an extended traffic light colour code (See Table 6.3). Thresholds have to be adapted to the "conditions of the sector and the region under consideration" (SAFA, 2012: 30).

Table 6.3: Descriptions of thresholds developed by SAFA

Rating	Performance
Best sustainability performance	Performance: All operations of the assessed entity fully comply with the sustainability goal, as proven through performance data. Compliance: All operations fully comply with applicable law and agreements. Measures (only for some categories): All applicable measures have been taken, best practice [has been achieved].
Good sustainability performance	Performance: The sustainability goal is reached in more than 80% of operations[18]. Compliance: All operations fully comply with applicable law and agreements. Measures (only for some categories): In more than 80% of operations, substantial[19] measures to improve sustainability performance have been taken.
Moderate sustainability performance	Performance: The sustainability goal is reached in less than 80% of operations. Compliance: All operations fully comply with applicable law and agreements. Measures (only for some categories): In less than 80% of operations, substantial measures to improve sustainability performance have been taken.
Insufficient sustainability performance	Performance: Operations damage environment and society. Compliance: Operations violate applicable law and relevant agreements. Measures : No effective improvement measures have been taken,

Source: SAFA (2012: 30).

RISE (see Figure 7.2 in the next chapter), presents information in a radar diagram, which it calls a 'the RISE sustainability polygon', with zones of colour, like a target. The green zone represents indicators that are 'positive' indicating a 'good performance', yellow indicating 'critical, further scrutiny required' and red indicating that the indicators are 'problematic" and there is a 'need for action'.

[18] In terms of the number of employees, the amount of produce, the area, the number of animals etc. directly affected by improvement measures.

[19] In terms of investment made, the impact of operations (interruptions, restructuring, require training of employees etc.) and the effects on sustainability performance.

6.7 Examples of indicators arising from a capital based business model

The most common underlying assumption of many indicators is that they are based on a conceptual model based on capitals. The following tables and sections give examples of these.

6.7.1 Indicators proposed by model of Saunders et al.

In terms of capital indicators, Saunders et al. (2006b: 11-12) propose that agribusiness sustainability be measured as relating to themes through the use of these indicators:

Human capital

- Employment (full-time, part-time and unemployed)
- Qualifications of employees
- Skill level and experience of employees
- Attributes of employees

Human-made capital

- Buildings by type and age
- Water (water races and potable supplies)
- Power distribution network (network capacity and current delivery)
- Telecommunications (access to phone (cell phone coverage), internet and fax; and data capacity)

Natural Capital

- Land use (by type)
- Water quality
- Greenhouse gas emissions
- Energy use
- Water (stock water, groundwater, riparian water usage)
- Soil fertility
- Climate

Social Capital

- Turnout at elections
- Membership of local groups
- Donations to local groups
- Use of local facilities (e.g., doctor)

Cultural Capital

- Participation and sense of belonging to ethnic group
- Usage rates of public halls, recreation centres, libraries
- Length of time in locality

(adapted from Saunders et al. 2006b: 11-12).

Some examples are given below (Table 6.4) of how these indicators can be translated into stocks and flows. Table 6.5 provides a full description of the Saunders et al. (2007c) model.

Table 6.4: Potential indicators of business sustainability

Type of capital	Short term (flows)	Long term (Stocks)
Financial	Investment expenditure	Shareholder value
Natural	Pollution measurements Proportion of materials used that are recycled Energy consumes Water use and source GHG emissions	
Human	Training provision	Per cent of employees with (tertiary) qualifications
Social	Injury rates	Proportion of employees from the locality Proportion of suppliers locally based Participation in local/public policy making Contributions to local groups Retention rates Donations to local community groups
Cultural		Recreational facilities

Source: Saunders et al. 2006a: 15.

6.7.2 Indicators used by IIRC

IIRC (2012) does not wish to impose particular indicators on organisational reporters but at the same time suggests some quantitative indicators that should be used in the 'content elements' of a report.
They are:

- Key quantitative information – number of employees, turnover, number of countries in which organisation operates and changes in these.
- Governance –remuneration and incentives, KPIs to do with pay.
- Strategy and resource allocation – measurement of achievements and target outcomes
- Performance and outcomes – KPIs and KRIs[20] to do with performance and outcomes, effects on capitals, indicators that are able to be compared against goals and targets (IIRC, 2012: 32-38).

6.8 Examples of indicators arising from a systems-based business model

A systems-based model has an understanding that everything is linked together and forms a working whole. The examples that follow are based on this conceptual framework.

6.8.1 Indicators and parameters used by RISE

The RISE takes parameter values and using readily available software calculates standardised values of different indices which measure the indicators given in Table 6.6.

[20] Key Risk Indicators

Table 6.5: Agribusiness indicators to fit business model proposed by Saunders et al. (2007c: 37)

Inputs						
Vision	Position in value chain	Size of business	Age of business	Specific agribusiness sector	Ownership	Personality and family values
• Vision statement • Business plan	• Proximity to consumer	• Hectares • Turnover (GFR) • Employees (FTEs)	• Years trading	• Sector	• Publicly listed company • Private company • Owner operated	• Personal objectives • Lifestyle ambitions • Target income • Attitudes to growth
Processes						
Structure of the firm	Customer focus	Innovation	Employee relations	Quality	Social/environmental factors	Relationship network
• Size • Ownership structure • Industry • Industry structure (e.g., concentration ratio) • Age of business	• Per cent sales from new products • Share of key account purchases* • Delivery times • Customer profitability • identification of and contact with customers • Processes for receiving feedback from customers	• Number of new products trialled or sold • Number of new processes or techniques attempted or adopted • Use of ICT • Investment capital/change in capital	• Employee turnover* • Absentee rates / sick leave • Injury rates* • Productivity • Performance based pay • Skills and qualifications • Training provision	• Quality grades of products • Membership of certification schemes • Productivity • Waste • Returns as a proportion of total sales	• Pollution measurements • Proportion of materials recycled • Energy used • Water use & source • GHG emissions • Environmental certification • Local employees* & local suppliers* • Participation in local/public policy • Participation in local groups	• Informal networks • Formal networks
Outputs						
Financial	Natural	Human	Social	Cultural		
• Shareholder value • Diversity of revenue sources* • Per cent of market share for 5 years* • Economic value added • Return on invested capital • Gross margin • Profit after tax • Economic value added • Debit/equity ratio	• Land use • Water quality • GHG emissions • Energy use • Water usage • Soil fertility • Climate	• Employment • Employee qualifications • Skill level & experience • Attributes of employees • Training provided	• Election participation • Donations to local groups • Local group memberships • Usage of local facilities (e.g., doctor)	• Ethnic group • Usage rate of public facilities (e.g., library) • Length of time in locality		
These indicators may have limited usefulness or their applicability varies by industry						

Table 6.6: Indicators and parameters of the RISE 2.0 indicator set

Indicators	Parameters
Energy & climate	• Energy management • Energy intensity of agricultural production • Share of sustainable energy carriers • Greenhouse gas balance
Water use	• Water management • Water supply • Water use intensity • Risks to water quality
Soil use	• Soil management • Crop productivity • Soil organic matter supply • Soil reaction • Soil pollution • Soil erosion • Soil compaction
Plant protection & Biodiversity	• Management of plant protection + biodiversity • Ecological priority areas • Intensity of agricultural production • Landscape quality • Diversity of agricultural production
Nutrient cycles	• Nitrogen balance • Phosphorus balance • N and P self-sufficiency • Ammonia emissions • Waste management
Animal husbandry	• Herd management • Livestock productivity • Possibility for species-appropriate behaviour • Quality of housing • Animal health
Economic viability	• Liquidity reserve • Degree of indebtedness • Economic vulnerability • Livelihood security • Cashflow turnover ratio • Usage of debt service limit
Farm management	• Farm strategy & planning • Supply and yield security • Planning instruments+ documentation • Quality management • Farm cooperation
Working conditions	• Personnel management • Working times • Safety at work • Salaries and income level

Indicators	Parameters
Quality of life	• Occupation + education • Financial situation • Social relations • Personal freedom & values • Health • Further aspects of life

(Taken from RISE, 2011: 4).

6.8.2 The SFB model indicators

In this model it must be noted that sustainability was equated to business success and that this was measured objectively by gross business revenue and family's business income, whereas the subjective indicators were perceived success and the functional integrity of the family (Olson et al., 2003: 649). In this method objective and subjective values are compared (Table 6.7).

Table 6.7: Indicators that can be used in the Sustainable Family Business (SFB) model

Indicators of		Measured by
Sustainability/business success (dependent variables)	Objective Subjective	• Gross business revenue • Family's business income • Perceived success of business • Functional integrity of family
Business system (explanatory variables)	Description of business	• Manager's gender • No. of non-family employees • Age of business • Based – at home/not at home • Proprietorship – sole, partnership etc. • Place of business – metropolitan/non-metropolitan • Manager sole decision maker • Hours/per week worked by manager • Manager employed elsewhere • Cash flow problems in last year
	Business size	No. of non-family employees Total business assets
	Business management scale	Utilisation of: • advertisement and promotion budgets/strategies • costs and expenses analysis • cash flow statements • balance sheets or inventory control methods • determining numerical objectives such as sales, earnings • written strategic plan and mission statement
	Personnel management scale	Manager's practices of:

		• estimating or setting personnel needs • labour costs • evaluating employee performance • evaluating worker motivation
	Product management scale	Manager's practices of: • continually analysing customer satisfaction • evaluating quality of services/products
Family system	Description	• No. of children living with family • Only single generation family living together
	Family functioning	• Family management • Intra-family relationship style — negotiating — individualised — ordered • Family employees • Family tensions scale/index • Family management scale
	Disruptions – transfers between family and business	• Use of family income for business • Transfer of time or change in where work was performed — family sleeps less — family works at business — defer or skip business tasks • Labour — family helps in business — hire temporary help for business or home

Constructed from the description given by Olson et al. (2003: 649-651).

6.8.3 The Rural Sustainability Index

The Rural Sustainability Index quantifies the performance of cropping agriculture with the aim of "improving the socio-economic position of farmers while protecting the environment" (Bos et al. 2007: 1). It is based first on three conditions that need to be fulfilled before this index can be evaluated.

1. People – no hazardous work or child labour should be used within the crop production chain.
2. Planet – crops should not be grown on land allocated to nature by national law of regulations.
3. Profit – when a genetically modified crop is present, or is introduced in a region, it should not harm development opportunities for other (non-GM-crop) growers (Bos et al., 2007: 2)).

Within the people, plant and profit perspectives, five themes are considered – the social position of the rural community, availability of water, soil fertility, crop protection and the rural economy. Five indicators were chosen to represent these (Table 6.8) with each indicator measuring several things at once.

Table 6.8: Selected key indicators for sustainable agricultural production

Perspective	Indicator	Major aspects being assessed by the indicator
People	% children completing primary school	Ability of farmer t read documentation, manuals, etc. Level of child labour
Planet	Water use and consumption	Water availability Crop yield (productivity) Drainage of water from field to downstream environment
	Fertilizer use	Potential pollution of groundwater and the downstream environment Depletion of soil fertility Crop yield
	Pesticide use	Environmental risk downstream of agricultural area Potential pollution of groundwater in relation to drinking water safety Crop Yield
Profit	Gross margin of crop production	Potential income of farmer Position of farmer with respect to market

(Source: Bos et al.,2007: 4)

6.8.4 A cross-tabulation systems approach

Izac and Swift (1994) proposed a cross-tabulation-type structure for indicators for measuring the sustainability of sub-Saharan African agro-ecosystems (see Table 6.9). This framework focuses on research and was developed to guide agricultural research policy and so the intended users are a specialised group.

Table 6.9: Some sustainability indicators proposed by Izac and Swift (1994) for sub-Saharan African agro-ecosystems

	Cropping system	**Scales** **Farm**	**Village**
Products	Ratio of annual yield for all products to potential and/or farmer's target yield	Profit of farm production Ratio of profit to farmer's target income	Economic efficiency Social welfare
By-products	Soil pH, acidity and exchangeable aluminium content. Soil loss and compaction. Ration of soil microbial biomass to total soil organic matter. Abundance of key pest and weed species.	Ratio of aggrading to degrading land area Nutritional status of household	 Nutritional status of community Stream turbidity, nutrient concentration and acidity Human diseases and disease vectors Biodiversity and complexity
Amenities		Drinking water quality	Drinking water availability

	Cropping system	Scales Farm	Village
		Sources and availability of fuel.	

(Source: Bell and Morse, 2008: 34).

6.9 Indicators arising from a 'best practice' business model

A best practice business model works on the assumption that there is such a thing as best practice and therefore indicators measure how far along a business is in achieving best practice, usually in financial and production terms.

6.9.1 The BNZ Dairy Business of the Year competition

The BNZ Dairy Business of the Year competition initially evaluates entrants by using a system based on KPIs, entirely based on financial and production measures (Table 6.10). While there probably is some value of a KPI which is regarded as epitomising good practice, this is not incorporated within the KPI so that it is measured as a proportion of achievement of best practice.

Table 6.10: KPIs used in the BNZ Dairy Business of the Year competition (2008)

Measures	KPI	Indicators
Profitability	Return on assets	
	Operating profit/ha	
	Return on equity	
	Pasture DM harvested (tDM/ha)	
Efficiency	Milk production (kgMS/ha)	Milk production per cow
		Stocking rate
	Average cost of consumed feed ($/tDM)	Cost of pasture
		Forage cost ($/tDM)
		Concentrate cost
	Labour efficiency	Cows per full-time staff equivalent
		Management and staff costs per cow
	Core Costs	Core per cow cost ((animal health + breeding + dairy shed expenses + electricity + grazing + freight + other expenses + 50% repairs and maintenance + 30% standing charges + 70% vehicle expenses + 50% depreciation) divided by Peak Milking Cow numbers)
		Core per hectare cost ((administration + cropping (green feed) + Phosphate and all other fertiliser + pasture maintenance and renovation + 50% repairs and maintenance + 70% standing charges + 30% vehicle expenses + weeds and pest + 50% depreciation) divided by Effective Milking Area)
Risk	Operating profit margin	
	Cost of production per kg milk solids	
	Pasture as % of feed consumed	

Measures	KPI	Indicators
Solvency	Equity %	

Source: Red Sky (2008: 1-4).

6.9.2 Sustainable Business from BusinessNZ

The Sustainable Business Council draws together companies that want to lead the New Zealand business community in creating a sustainable future for business, society and the environment. Part of this vision has been the development of Key Performance Indicators (KPIs) for the Sustainable Business Forum, Performance Benchmarking Project.[21] Its chosen framework is shown in Table …

Annual reports for companies belonging to the Sustainable Business Council can be found on its website[22] and they show that the KPIs can be presented as individual graphs for each KPI which means that t it is expected that these measures are taken over time and so will show a trend..

Table 6.11: KPIs for Sustainable Business NZ

Theme	KPI	Unit	
		Absolute	**Normalised**
People	Absenteeism rate	Rate of absence per annum	
	Employee turnover	% of total no. of employees	
	Lost time injury frequency	Rate of frequency per million hours worked	
	Skills enhancement	$ total	$ total/FTE
	Workplace safety management practices	Primary, secondary or tertiary level	
	ACC experience rating	% loading/discount rate of company's standard industry levy	
	Employee engagement	Proportion of engaged staff from total no.	
	Gender diversity	% women from total no. of employees and senior management	
Economy	Direct contribution to New Zealand's economy	$ million	$ /$ wages, salaries/benefits $ / $ taxes $ / $ NZ-based supplier contracts
	Full-time equivalent employment	Total no.	
	Revenue	$ million	
	Customer satisfaction	% of satisfied customers from total customers	
	EBIT margin	% of EBIT from total revenue	
	Dividends	$ million	
	Return on assets	% EBIT from total average assets	
	Return on equity	% net profit after tax from total shareholder equity	
Environment	Energy consumption	kWh	kWh/$ million revenue kWh/FTE
	GHG emissions	tonnes of CO_2-e – expressed as a total as well as divided by Scope 1, 2 and 3 emissions.	tonnes of CO_2-e/$ million revenue tonnes of CO_2-e/FTE

[21] See http://www.sbc.org.nz/resources-and-tools/tools/bsb-key-performance-indicators.

[22] http://www.sbc.org.nz/resources-and-tools/reports/nz-sustainability-reports

Theme	KPI	Unit	
		Absolute	**Normalised**
	Water consumption	cubic metres	cubic metres/$ million revenue cubic metres/ FTE
	Waste to landfill	tonnes	tonnes/$ million revenue tonnes/ FTE
	Recycled waste	tonnes	tonnes/$ million revenue tonnes/ FTE
	Hazardous waste	tonnes	tonnes/$ million revenue tonnes/ FTE
Compliance	Environmental compliance	No. of non-compliance instances $ monetary value of penalties and fines paid	No. of non-compliance instances/$ million revenue
Community	Community contribution	$ monetary value of all contributions made, reported as a combined value as well as a breakdown by areas of contribution	% of revenue

6.10 Indicators arising from a combined theme and systems approach

SAFA 's themes are based on the four pillars and they are represented in the following Table 6.7 by the themes as identified by G for Good Governance, E for Environmental Integrity, C for Economic Resilience, and S for Social Wellbeing. These are broken into themes which are represented in the first column of this table and the second column is subthemes from which the indicators emerge. This table has been reproduced in full to show how some indicators are related to compliance with a yes/no measure of compliance or non-compliance.

Table 6.12: SAFA sub- themes and indicators

Theme	Sub-theme	Indicators: What is being measured
G1 Governance structure	G1.1 Corporate ethics	Existence of a publicly accessible mission statement including social, economic and environmental objectives of the enterprise **AND** existence of a Code of Conduct providing guidance concerning rules, information flow, sanctions and other important sustainability issues of the sector(s), supply chain(s) and region(s)
		Existence of procedures and instruments (e.g. risk management, environmental impact assessment) to identify and address sustainability challenges within sector and supply chain, in compliance with agreed international standards
		Number and substantiality (share of turnover or gain invested, number of people affected) of activities and initiatives to improve sustainability, such as a rolling-plan for improving sustainability, capacity-building and partner-ships, etc.
	G1.2 Due diligence	in relation with which due diligence, risk assessment, or ex-ante and ex-post impact assessment on economic, environmental, social and governance issues were done, and the results shared with affected stakeholders
		Existence of regular, timely, correct and adequate communication with all stakeholders affected by operations
G2 Accountability	G2.1 Holistic audits	Existence of publicly available information about economic, social and environmental performance (e.g. CSR, CSV, triple bottom line reporting)
		Existence and accessibility to auditors of complete, correct data and records required for holistic auditing and reporting
	G2.2 Responsibility	Existence of transparent definitions of mandates, responsibilities and accountability concerning sustainable development at all levels of management
		Existence of procedures and instruments to evaluate the Code of Conduct and improve its implementation, including acting upon deviations
		Number of incidents where responsibility for incidents was not assumed.
G3 Participation	G3.1 Stake-holder dialogue	Existence of a thorough stakeholder analysis based on legitimacy of claims, including explicit justification **AND**[23] [explanation] (*)[24]
		Percentage of identified stakeholders with whom the enterprise is in dialogue or contact and whose claims are duly considered in decision-making (*)
		Rating of the quality of stakeholder participation in dialogues

[23] A bold AND indicates that more than one indicator is needed to cover the sub-theme, therefore something has been omitted here (See SAFA :46) and I suggest it is 'explanation' (in square brackets].

[24] Not sure what the * indicates.

Theme	Sub-theme	Indicators: What is being measured
		Percentage of identified stakeholders with access to information that is sufficient to empower them to effectively participate in stake-holder dialogue[25] (*)
		Percentage of identified stakeholders who are actively informed (*)
		Percentage of decisions on disputed subjects, which are thoroughly justified and explained to affected stakeholders
	G3.2 Grievance procedures	Mutually recognised grievance procedures **AND** Existence and utilisation of procedures or instruments ensuring integrity of complaining persons or groups
	G3.3 Conflict resolution	Percentage of disputed subjects that are addressed in a dialogue-based solution-finding process lead by an independent, commonly agreed party
		Existence and utilisation of procedures or instruments (e.g. mediators) ensuring that conflict solution is dialogue-based (not power-based)
G4 Rule of law	G4.1 Commitment to fairness and legitimacy	Existence of a written commitment to legality and compliance (see left), and to not committing or being complicit in human rights violation is explicitly stated in the company's internal business practice and codes.
		Existence of internal guidelines against bribery and corruption **AND** below indicator (*)
		Number of trainings for employees who work in areas vulnerable to corruption **AND** below indicator (*)
		Number of cases of bribery and corruption involving the enterprise (*)
	G4.2 Remedy, restoration and prevention	Existence of mechanisms for adequate remedy, restoration and commitment to non-repetition in case of infringements
		Existence of simple and accessible recourse mechanism to address complaints of infringements by internal or external stakeholders
		Number of infringements after liability was assumed and adequate remedy was provided
	G4.3 Co-responsibility	Existence of a statement in the Code of Conduct that requires compliance with the stricter environmental and social laws, where there are differences between old and new location
		Number of incidents where local or national authorities were pressurised to offer conditions convenient to the enterprise, but detrimental to society or environment.
		Activities and initiatives taken to improve the regulatory framework on sustainability
		Number of attempts to influence the legal framework in the direction of sustainable development
	G4.4 Resource appropriation	Existence of a written protocol that excludes ownership of any operation involving the use of natural resources under legal or legitimate dispute
		Number of incidents were due diligence for recognition and respect for formal and informal claims, user or access arrangements over natural resources was not carried out

[25] Processes involving free, prior, informed consent are a good example for an appropriate procedure.

Theme	Sub-theme	Indicators: What is being measured
G5 Holistic management	G5.1 Sustainability in quality management	Quality and completeness of planning instruments and documentation, and of implementation, in the social, governance, environment and economic dimensions
	G5.2 Certified production and sourcing	Share of inputs sourced from suppliers that have passed independent evaluations of social, ethical, human rights or environmental compliance or of sustainability performance
		Share of production taking place, or share of turnover generated, at sites that are certified according to accepted systems for environmental and social management
	G5.3 Full-cost accounting	Rating of the comprehensiveness of internalisation of external effects into accounts
E1 Atmosphere	E1.1 Greenhouse gases	Net GHG emissions of the enterprise (kg of CO2-eq)
		GHG intensity of operations (net emissions in kg of CO2-eq per unit product or revenue or area etc.)
		List and efficacy rating of GHG mitigation measures, including carbon sequestration by soils and vegetation, and carbon off-set schemes (e.g. Gold Standard37, Clean Development Mechanism38)
		Reduction of GHG emissions through mitigation measures (e.g.,kKg CO_2 –eq)
	E1.2 Air pollution	Total emissions of ammonia, CO, NOx, SOx, photochemical oxidants, particulate matter (PM2.5, PM10, suspended particulate matter etc.), pesticides, microorganisms
		Total consumption of ozone-depleting substances (all substances treated in the annexes to the Montreal Protocol[26])
		Ambient concentrations of gaseous pollutants (as above) in the surroundings of production sites
		List and efficacy rating of measures implemented for reducing emissions of ammonia, CO, NOx, SOx, photochemical oxidants, particulate matter, pesticides, microorganisms
		List and efficacy rating of measures implemented for reducing emissions of ozone-depleting substances
E2 Freshwater	E2.1 Water quantity	Total freshwater use from all sources (tap water, rivers, wells, communal grid etc.; in m^3)
		Ratio of water withdrawal to recharge
		Number of water-related disputes (law-suits, social unrest, substantial and lasting dissonance)
		Number, intensity and duration of disturbances and disruptions of production due to lack of water
		Rating of irrigation technologies and their application (timing, installation etc.)
		Hygienically safe water re-use (including water from rainwater harvesting) and recycling (in m^3 or in % of total water or treated wastewater volume)
		Water productivity, expressed in unit of product, or value of output (including services) per unit of water supply (cubic metre)
	E2.2 Water quality	Water quality in groundwater and open water on and close to production sites (downstream): NO_3, PO_4, salts, faecal coliforms, plant protection products; BOD, COD (in ppm, dS/m, l of O_2 per l of water etc.)

[26] http://ozone.unep.org/new_site/en/Treaties/treaty_text.php?treatID=2

Theme	Sub-theme	Indicators: What is being measured
		Rating of pollution risk from excreta and silage: safety of storage facilities, proximity to nearest water body (precision and efficiency of application technology, timing and conditions during application)
		Amount of pesticides used that can have detrimental effects on aquatic ecosystems (also consider metabolites). If possible, rate the quality of pesticide application.
		Rating of pollution: number of spills, volumes discharged, pollutant load of discharged water
		Rating of wastewater treatment procedures by standard effluent quality
E3 Land	E3.1 Organic matter	Percentage of land where soil organic matter in the topsoil exceeds 1%.
	E3.2 Physical structure	Percentage of land where infiltration rate is between 10 and 20 mm of water per hour
	E3.3 Chemical quality	Plant-available N, P and K content in the root zone
		Ratio of nutrient (N, P. K) supply to demand, at farm or parcel level
		Percentage of crop and livestock nutrient (N, P, K) demand covered from farm sources
		Percentage of land where pH in the root zone is between 5.5 and 7.0
	E3.4 Land degradation and desertification	Percentage of land where soil erosion is below 10 tons per hectare and year **AND** indicator [in E3 section] marked with "*"
		Net loss or gain of productive land surface (area where productivity was restored minus area lost due to degradation or sealing (*).
		Percentage of area used for growing any ingredient for a product, where natural habitat was destroyed during the last ten years **AND** indicator [in E3 section] marked with "*".
		Percentage of utilised areas where effective soil conservation or rehabilitation measures are in place **AND** indicator [in E3 section] marked with "*"
E4 Biodiversity	E4.1 Habitat diversity and connectivity	Number of habitat types51 within sphere of influence and presence of biodiversity corridors between the natural habitats
	E4.2 Ecosystem integrity	Percentage of total area where natural or near-natural ecosystems and habitats are protected from human interventions
		Net deforestation (in ha) due to the activities and share of primary forest damaged
	E4.3 Wild biodiversity	Amount of toxic substances used for plant protection, livestock treatments, cleaning etc., total or per hectare
		Number of incidences of introduction of potentially invasive species
		Trends in catch per unit effort
		Percentage of utilised area and stocks with certified organic or integrated production
	E4.4 Agricultural biodiversity	Percentage of utilised area where a single plant species is grown, without rotation or percentage of the livestock by breed
		Existence of a written policy promoting the purchase of wood products from known, uncontroversial sources audited on their sustainable forestry plan

Theme	Sub-theme	Indicators: What is being measured
		Percentage of wood-based materials (paper, cork, wood) contained in products, packages and facilities that come from certified sources (e.g. FSC, PEFC) or were recycled
	E4.5 Threatened species	Substantiality of measures taken to improve state of threatened wild species and trend of their population
		Number of wild species and domesticated plant varieties and animal breeds recognised as deserving protection (e.g. under national programs) and their population trend with the sphere of influence
		Existence of a written policy promoting the purchase of marine products from known, uncontroversial sources
		Percentage of marine-based products that come from labelled sources (e.g. MSC)
E5 Materials and energy	E5.1 Non-renewable resources	Percentage of total material use (raw materials, associated process materials, semi-manufactured goods) made up of materials that are rare (static range of few decades) and cannot be substituted
		Total non-renewable material use per unit produced (by weight, volume, value etc.)
	E5.2 Energy supply	Energy efficiency: amount of final energy (in MJ) used per unit of produce / revenue / area / workforce. Calculate from quantities of energy carriers and energy densities, correct by energy exports and imports (e.g. contractual work in agriculture).
		Percentage of renewable energy sources in total energy use
	E5.3 Eco-efficiency	Percentage of total material use that is made up of recycled materials **AND** indicator [in E5 section] marked with "*"
		Total amount of annual waste (units volume or weight) by category: hazardous / non-hazardous and trend of waste avoidance (*).
		Total amount of waste and of hazardous waste generated per unit produced and trend of waste avoidance
		Percentage of lost or wasted food in relation to total amount of food produced and marketed
	E5.4 Waste disposal	Percentage of total waste segregated
		Share of disposal methods in disposed waste (reuse/ recycling/composting/ recovery/ burn/ deep well injection/landfill/export)
		Yearly amount of treated waste classified as "hazardous" by the Basel Convention, Annexes I through IV
		Amount of hazardous waste stored and average age of waste and compliance with international standards53.
E6 Animal welfare	E6.1 Freedom from stress	Assessment of housing conditions, body condition and behaviour of animals (e.g. based on Welfare Quality55 protocols)
		Assessment of lighting, aeration, noise, space, hygiene and water supply; signs of stress
		Assessment of conditions and distances of transportation to slaughterhouses and methods of killing
		Incidence of animals affected by illnesses or injuries, and animals lost prematurely due to diseases, injuries and accidents (including during transport to slaughterhouse)
		Annual cost of veterinary treatments or amounts of veterinary medicines, including those used prophylactically, curatively and to boost performance.
		Percentage of animals subject to tail docking, beak clipping etc. without use of analgesics or anaesthetics

Theme	Sub-theme	Indicators: What is being measured
	E6.2 Species appropriate conditions	Assessment of possibilities for animals to express normal behaviour (space, bedding, contact with conspecifics, etc.)
C1 Investment	C1.1 Internal investment	Percentage of revenue that is invested into research, capacity-building and infrastructure that improve sustainability performance[27]
	C1.2 Community investment	Percentage of total revenue that is invested into the maintenance or rehabilitation of common goods (soils, water, forests etc.) and into capacity-building at community level
	C1.3 Long-ranging investment	Rating of the decision criteria for investing and holding resp. selling shares, facilities etc.
		Ratio between actual and necessary investment into maintenance of production facilities (taking into account capital availability)
		Ratio between periods that shares are held and facilities are used, compared with average holding periods on the market and with potential useful life of such facilities.
C2 Vulnerability	C2.1 Stability of supply	Number of actual and alternative suppliers
		% dependence on the biggest provider of inputs
		Stability of supplier relations (e.g. past problems)
		Rating of contractual arrangements by duration, conditions, volume
	C2.2 Stability of marketing	Number of actual and alternative buyers
		% dependence on the biggest source of income
		Stability of buyer relations (e.g. past problems)
		Rating of contractual arrangements by duration, conditions, volume
		Rating of access to and utilisation of information systems (related to markets and policies)
	C2.3 Liquidity and insurance	Indebtedness (share of debt in total assets)
		Debt service coverage ratio (% of short-term debt service limit that is utilised)
		Stability of lender relations (e.g. past problems)
		Existence of a formal and informal safety net that is sufficient to withstand liquidity crises
	C2.4 Employment	Average duration from announcement to filling of positions
		Fluctuation rate of personnel (annual percentage of total personnel leaving the enterprise)
		Matching of job applicant qualifications with requirements
		Percentage of personnel with legally recognised, work contract of unlimited duration

[27] Examples: research into agroecology, green inputs, renewable energies; afforestation, eco-efficient buildings, heat and rainwater recovery, native tree nurseries, ecological sanitation; awareness of personnel etc.

Theme	Sub-theme	Indicators: What is being measured
	C2.5 Stability of production	Geographical distribution of production sites in relation with major production risks[28]
		Stability of production (e.g. past interruptions)
		% dependence on a single species or variety of crop, fish, tree, livestock
		Existence of stocks of inputs, food etc. that are sufficient to withstand crop shortfalls and supply bottlenecks
C3 Product safety and quality	C3.1 Product information	Percentage of comprehensively66 and correctly labelled products in total produced volume (or in turnover or profit)
	C3.2 Traceability	Percentage of stages of production, processing and distribution for which traceability is guaranteed and related sanctions defined
	C3.3 Food safety	Number of production facilities certified by an independent party concerning food safety management (e.g. HACCP, Good Manufacturing Practice)
		Number of incidents of chemical and biological food contamination (heavy metals, pesticides and their metabolites, mycotoxins, GMO)
	C3.4 Food quality	Percentage of food products that meet the highest nutritional standards, e.g. low contents of saturated and trans fat, added sugars and added sodium, no food additives
		Percentage of food products that achieve a high rating in a nutritional rating system, such as the overall nutritional quality index67
		Expenditures on advertisement for children under age 12 (except healthy products) and in primary schools
C4 Local economy	C4.1 Value creation	Ratio of lowest paid wage to average regional wage
		Percentage of regionally hired workforce and of new jobs created in the region
		Ratio of value added through operations (or tax payments) to total revenue (or profit)
		Percentage of total revenue (or profit) invested into the regional economy
		Percentage of turnover (or profit) coming from short resp. local value chains
	C4.2 Local procurement	Percentage of inputs procured from the region (not for inputs that are not regionally available)
S1 Decent livelihood	S1.1 Wage level	Remuneration (lowest wages paid, corrected to account for in-kind payments; including informally employed personnel) compared with local living wage.
	S1.2 Capacity building	Percentage of work-force undergoing training and further education during their employment / during one year disaggregated by sex and ethnicity (if available).
		Percentage of suppliers provided training on sustainability-related topics (e.g. integrated or organic crop production, health, nutrition, human rights etc.)
		Average quantity of training and further education of workers

[28] Meaning environmental, political and socio-economic events that disrupt a large share of production at the affected sites, and hat are likely to occur within the lifecycle of the production facility, or the risk of whose occurrence has substantially increase[d] over the last years.

Theme	Sub-theme	Indicators: What is being measured
S2 Labour rights	S2.1 Employment relations	Percentage of personnel with a legally binding work contract and no precarious employment **AND** who benefit from a contribution of the employer to formal and safe pension and other social security schemes, and who can take paid sick, personal and annual leave
		Percentage of personnel whose wages and benefits are rendered in full compliance with all applicable laws and wage setting procedures involving social partners
		Number of human rights abuses
		Percentage of personnel who are paid a living wage and who always receive their full wage in time
	S2.2 Forced labour	Number of incidents of forced, bonded or prisoner labour among workers and subcontractors
		Percentage of suppliers pro-actively and positively influenced on the issue of forced labour
	S2.3 Child labour	Number of incidents of unacceptable forms of child labour among workers and subcontractors
		Percentage of workers under the age of 18 engaged in hazardous work, overtime or night shifts
		Percentage of suppliers pro-actively and positively influenced on the issue of child labour
	S2.4 Freedom of association and bargaining	Percentage of work-force who are free to organise, associate and collectively bargain
		Percentage of work-force adhering to an association defending workers' rights
	S2.5 Working hours	Percentage of work-force whose working time arrangements are fully compliant with ILO standards
S3 Equity	S3.1 Non-discrimination	Equity and non-discrimination commitments are explicitly mentioned in the Code of Conduct AND means for the implementation of an equity policy (e.g. equal pay audits) exist
		Number of incidences of discrimination in hiring, remuneration, access to training, promotion, termination, or retirement
		Number of incidences of harassment
		Wage gap: wage differential (in % of the higher wage) between permanent and temporary staff, local and migrant workers etc. doing similar work
		Assessment of recruitment procedure (e.g. job adverts, short-list, interview, selection criteria list) ensuring that anti-discrimination procedures are implemented
	S3.2 Gender equality	Similar indicators as for S3.1, but with a focus on gender (e.g. gender wage gap)
	S3.3 Support to vulnerable people	Average number of training days differentiated by group (e.g. age, sex, race)
		Percentage of personnel with access to trainings and career development programs and other measures to promote women, handicapped, youth etc.
		Assessment of policies and programmes that favour vulnerable groups
		Share of workplaces appropriately equipped for disabled persons
		Ratio of jobs that could be done by disabled persons to the actual number of disabled persons employed

Theme	Sub-theme	Indicators: What is being measured
S4 Human health and safety	S4.1 Physical and psycho-social health	Number of work-related accidents and injuries
		Recordable incident rate: number of personnel involved in recordable injury or illness per 100 persons
		Severity rate (number of lost days per incident)
		Percentage of personnel with access to clean drinking water and to improved sanitary installations
		Percentage of personnel adequately trained on occupational health and safety
		Percentage of personnel doing dangerous work who is adequately trained
		Percentage of personnel with access to adequate protective gear and medical assistance
		Rating of the storage and application of dangerous substances
		Rating of fire safety
		Rating of personnel exposure to hazardous substances and situations
		Rating of security and health concepts
		Number of activities, effectiveness of activities addressing the psycho-social work environment
		Extent and effectiveness of activities addressing community health issues (e.g. promoting healthy lifestyle)
	S4.2 Health resources	Percentage of personnel (both men and women) with access to decent housing (if applicable), clean sanitary facilities, clean drinking water and effective medical aid
		Percentage of workers with access to medical assistance or minimum levels of healthcare
		Extent (e.g. money spent) and efficacy of activities, effectiveness of activities addressing personal health resources
	S4.3 Food security	Share of production sites where operations contribute to the improvement of the economic and physical access of the local population to sufficient, safe and nutritious food
		Percentage of personnel whose food security is directly improved through activities of the enterprise
S5 Cultural diversity	S5.1 Indigenous knowledge	Monetary value of benefits related with traditional, cultural and ecosystem knowledge that is shared in a fair and equitable way based on mutually agreed terms
	S5.2 Food sovereignty	Percentage of stake-holders who confirm they can freely pursue their own food production and consumption choices

Source: SAFA (2012: 42-94)

6.10.1 Indicators based on a capital and a theme-based approach

Statistics NZ says that its framework was initially based on a capitals approach but that it needed to adapt into them to cover all the things they wished to incorporate into their measurements (Stats NZ, 2008). The following Table 6.8 only shows the themes and indicators of the Stats NZ framework. Table 5.3, in the previous chapter shows how Stats NZ has adapted the three pillars as a capital based overarching framework.

Table 6.13: 'Topics' and indicators used by Stats NZ (2009): a framework for measurement of human impact on sustainable development

Topic	Indicators
Population	1.1 Population size and growth 1.2 Fertility rate 1.3 Dependency ratio 1.4 Ethnic diversity 1.5 Regional population change
Biodiversity	2.1 No. of threatened spp. 2.2 Distribution of selected native spp. 2.3 Area of native land cover 2.4 Proportion of assessed fish stocks below target levels 2.5 Distribution of selected pest animal and weed spp.
Air and atmosphere	3.1 Net GHG emissions 3.2 GHG emissions by sector 3.3 Annual surface temperature 3.4 GHG intensity of the economy 3.5 Stratospheric ozone levels 3.6 Air pollution
Water	4.1 Population with drinking water meeting standards 4.2 Nitrogen in rivers and streams 4.3 Biological health of rivers and streams 4.4 Lake water quality 4.5 Groundwater quality 4.6 Bacterial pollution at coastal swimming spots, rivers and lakes 4.7 Water allocation compared to total water resource
Land use	5.1 Area of land used for farming 5.2 Soil health 5.3 Nitrogen and phosphorous content in soil 5.4 Contaminated soil sites 5.5 Versatile sol extinction 5.6 Hill country erosion
Energy	6.1 Total primary energy supply per person 6.2 Energy intensity of the economy 6.3 % of electricity generation from renewable resources 6.4 Household energy used in the home, by income group 6.5 Energy dependency 6.6 Energy-related GHG emissions
Transport	7.1 Vehicle-kilometres travelled by road, by vehicle type 7.2 Road freight transport intensity of the economy 7.3 Total public transport boardings per person 7.4 No. of international flights per week 7.5 Proportion of population in employment walking or cycling to work

Topic	Indicators
Waste	8.1 Solid waste disposed to landfill 8.2 Proportion of population with access to kerbside recycling 8.3 Proportion of packaging waste recycled 8.4 Real household consumption expenditure
Innovation	9.1 Research and development expenditure as a proportion of GDP 9.2 Research and development expenditure by purpose 9.3 Personnel involved in research and development 9.4 Rate of innovation by type
Work, knowledge and skills	10.1 Labour force participation rate 10.2 Unemployment rate 10.3 Pay equality by ethnicity 10.4 Labour productivity 10.5 Educational attainment of the adult population 10.6 Participation in tertiary education 10.7 Literacy skills 10.8 Access to early childhood education, by ethnicity
Economic resilience	11.1 Real net stock of total assets per person 11.2 Real net stock of infrastructure per person 11.3 Real investment in fixed capital per person 11.4 Ratio of debt services to export earnings 11.5 Diversity of exports 11.6 Government debt
Living conditions	12.1 Real gross national disposable income per person 12.2 Real household consumption expenditure per person 12.3 Income inequality 12.4 Population with low incomes 12.5 Housing affordability 12.6 Household satisfaction with material standard of living
Health	13.1 Health expectancy at birth 13.2 Prevalence of healthy lifestyles 13.3 Childhood immunisation coverage 13.4 Prevalence of psychological distress 13.5 Suicide rate 13.6 Avoidable hospital admissions 13.7 Cancer-survival probabilities
Social connection and governance	14.1 Formal unpaid work outside the home 14.2 Rate of death from assault 14.3 Impact of fear of crime on quality of life 14.4 Voter turnout at general and local elections 14.5 Representation of women in Parliament and local government 14.6 Trust in government institutions
Culture and identity	15.1 Speakers of te reo Mäori 15.2 Children attending Mäori language immersion schools 15.3 Number of historic places 15.4 Local content on New Zealand television

6.11 Indicators currently collected in New Zealand

Agricultural production is very important to the New Zealand economy hence the Government collects a lot of data on farm performance and these are reported through what is now called the Ministry of Primary Production (MPI) formerly the Ministry of Agriculture and Forestry (MAF), and through Statistics New Zealand. Beef+Lamb New Zealand (formerly Meat and Wool New Zealand) collect data on the productivity of sheep/beef farms and Fonterra through use of the DairyBase programme run by DairyNZ. For Stats NZ, most of these indicators are to do with production and export earnings, and are used for the calculation of nation-wide statistics. MPI, Beef + Lamb and DairyBase are more concerned about the performance of individual farms.

6.11.1 Beef + Lamb

While Beef+Lamb[29] collects a lot of data and it is reported in sections, the sections are not labelled, so they are not structured by indicator but more by indicator measure. In the following Table 6.14 I have suggested the indicator these measures might relate to.

Beef+Lamb rank the farms by their EBIT/ha value to place them in five groups of 'quintiles' – those that make up the lowest 20%, those between 21-40%, those between 41-60%, those between 61-80%, and the top 20% of those of the sample. They then calculate the average for each measure for each group and this can be used as a reference point or benchmark. The measures are calculated for the regions of New Zealand and the farms in each region are also divided up by a defined farm class to cover the many different types of farm locations.

Table 6.14: Indicators collected by Beef+Lamb New Zealand in 2010-11

Indicator (suggested)	Measure	Unit
Size of business	Effective area	ha
	Cash crop area	ha
	New grass area	ha
	Total labour units	No.
	Working Owners	No.
Size of business - livestock	Open sheep	SU
	Open cattle	SU
	Open deer	SU
	Open total	SU
Intensity/intensification	Stocking rate	SU/ha
Sheep or beef farm	Sheep: Cattle SU ratio	%
Intensification	Pasture fertiliser	tonnes
	Crop fertiliser	tonnes
	Total fertiliser	tonnes
	Total fertiliser	kg/ha
	Other fertiliser	$
Intensification	Pasture N	kg/ha
	Pasture P	kg/ha
	Pasture K	kg/ha
	Pasture S	kg/ha
Intensification	Lime	tonnes
	Lime	kg/ha
	Lime	kg/SU

[29] For an example go to:
http://www.beeflambnz.com/Documents/Information/Sheep%20and%20beef%20farm%20survey%20Western%20North%20Island.pdf

Production	Ewes mated	No.
	Lambs from ewes	No.
	Lambs from hoggets	No.
	All lambs tailed	No.
Intensification	Lambing	%
Intensification?/expertise of farmer?	Hogget lambs as a % of all lambs	%
Production	Cows + heifers mated	No.
Production	Calves marked	No.
	Calving	%
	Hinds mated	No.
	Fawns marked	No.
	Fawning	%
Production	Lamb loss	%
	Sheep loss	%
	Calf loss	%
	Cattle loss	%
	Fawn loss	%
	Deer loss	%
Production/intensification	Lamb production	kg/ha
	Mutton production	kg/ha
	Beef production	kg/ha
	Deer production	kg/ha
	Total (including goat)	kg/ha
Production	Wool sold	kg
	Wool shorn	kg
	Wool shorn	kg/head
	Wool shorn	Kg/SSU
	Wool shorn	kg/ha
	Wool production (calculated)	kg
	Wool production (calculated)	kg/ha
	Wool net before freight	c/kg
	Shearing expenditure	c/kg
	Shearing expenditure	cSSU
Production	Sales prime lambs	No.
	Sales prime lambs	$/head
	Sales store lambs	No.
	Sales store lambs	$/head
	Sales all lambs	No.
	Sales all lambs	$/head
Revenue	Sheep gross margin	$/SSU
	Cattle gross margin	$/CSU
	Deer gross margin	$/DSU
Revenue	Gross Farm Revenue (GFR)	$
	Gross Farm Revenue	$/ha
	Gross Farm Revenue	$/SU
Revenue	Wool revenue	S/SSU
	Sheep revenue	S/SSU
	Sheep+Wool revenue	S/SSU
	Cattle revenue	$/CSU
	Dairy grazing revenue	$/DzSU

	Deer+velvet revenue	$/DSU
Expenditure/costs	Total expenditure	$
	Total expenditure	$/ha
	Total expenditure	$/SU
	Total expenditure	% of GFR
Working expenses	Wages	$/ha
	Animal health	$/ha
	Weed and Pest	$/ha
	Shearing	$/ha
	Fertiliser	$/ha
	Lime	$/ha
	Seeds	$/ha
	Vehicles and fuel	$/ha
	Electricity	$/ha
	Feed and grazing	$/ha
	Cultivation/sowing	$/ha
	Cash crop	$/ha
	Repairs and Maintenance (R&M)	$/ha
	Cartage	$/ha
	Administration	$/ha
	Insurance & ACC	$/ha
	Rates	$/ha
	Interest	$/ha
	Rent	$/ha
	Managerial salaries	$/ha
	Depreciation	$/ha
Working expenses	Wages	$/SU
	Animal health	$/SU
	Weed and Pest	$/SU
	Shearing	$/SU
	Fertiliser	$/SU
	Lime	$/SU
	Seeds	$/SU
	Vehicles and fuel	$/SU
	Electricity	$/SU
	Feed and grazing	$/SU
	Cultivation/sowing	$/SU
	Cash crop	$/SU
	Repairs and Maintenance (R&M)	$/SU
	Cartage	$/SU
	Administration	$/SU
	Insurance & ACC	$/SU
	Rates	$/SU
	Interest	$/SU
	Rent	$/SU
	Managerial salaries	$/SU
	Depreciation	$/SU
Profit	Farm Profit Before Tax	$
	Farm Profit Before Tax	$/ha
	Farm Profit Before Tax	$/SU
Profit	EBITR	$

	EBITR	$/ha
	EBITR	$/SU
Profit	Economic Farm Surplus (EFS)	$
	Economic Farm Surplus (EFS)	$/ha
	Economic Farm Surplus (EFS)	$/SU
Capital	Capital value at open	$
	Capital value at open	$/ha
	Capital value at open	$/SU
	Total assets at close	$
Capital	Current liabilities at close	$
	Term liabilities at close	$
	Reserves at close	$
	Net worth at close	$
	Equity at close	%
	RoR on TFC at open	%

Acronyms
SSU – sheep stock unit
CSU – cattle stock unit
CDU – deer stock unit
CDzU – dairy cow grazing stock unit

6.12 Indicators collected by DairyBase

The DairyBase system is run by Dairy NZ and collects information from the majority of dairy farms in New Zealand. If used by dairy farmers it can provide financial and physical analyses of how their farm is operating in comparison with others which can then be discussed with a farm consultant and/or the farm accountant.

Table 6.15 has been built up for the description given in the DairyBase handbook. Full descriptions of each measure are available in the Handbook. These are only the measures collected by DairyBase that relate to the business side of the farm. There is also a wide collection of other data related more to farm management such as days in milk per cow, farm area in crop, cows treated for lameness, soils measure, fertiliser applied, irrigation details etc.

Benchmarking is selected by: business type, production system, Island, region or district, irrigation, management system (Organic or non-organic). Then farms in the benchmark criteria are ranked by EFS/ha, and/or Return on dairy assets, and the farms are then divided into benchmark groups by top 10%, top 20% or top 50%. There must be at least 20 farms in each benchmark group.

Table 6.15: Indicators collected by DairyBase

Theme	Indicator	Description/Measurement	Units
Physical Data (used to provide benchmark grouping)	Dairy Co, supplied		
	Production system		
	Business Type		
	Balance Month		
	Calving Season		
	Milking Interval		
	Winter Milk		
	Organic		
	Location	Region District	
	Water availability	NIWA 10 year average rainfall Season's rainfall % milking area irrigated	mm mm
	Farm Dairy Type		
	Predominant Soil Type		
	Stock	Predominant dairy breed	
	Stock/size of farm	Peak cows milked Stocking rate- Replacement calves reared Non-replacement calves reared	Cows/ha
	Labour/size of farm	Full time paid labour equivalents Full time unpaid labour equivalents FTE unpaid management Total FTEs	
	Work load	Milking cups per FTE	
	Land area (ha)/size of farm	Total dairying area	
		less Ungrazeable area	
		Effective dairying area	

Theme	Indicator	Description/Measurement	Units
		less Defined Young Stock area	
		Milking area	
		Dairy Run-off effective area	
		Non-dairy effective area	
	Production	Milk Litres	Total, per ha, per cow
		Fat kg	Total, per ha, per cow, composition (%)
		Protein kg	Total, per ha, per cow, composition (%)
		Financial year – milksolids kg	Total Fat + Protein, per ha, per cow
		Production year – milksolids kg	Total Fat + Protein, per ha, per cow
		Non-replacement Calf Milk	l
		Non-replacement Calf Milksolids	kg
Key Performance Indicators (Financial)	Farm Physical KPIs	SR	Cows/ha
	Production	Kg Milksolids/ha, /cow	
	Production in relation to Labour	Cows/FTE Kg MS/FTE	
	Profitability	Gross Farm Revenue Operating Expenses Operating Profit (EFS) FWE Operating Profit Margin % Asset Turnover % Operating Return on Dairy Assets %	$/ha, $/kg MS $/ha, $/kg MS $/ha, $/kg MS $/kg MS % % %
	Total business	Interest & rent Interest & rent Total Return on Assets % Return on Equity % (excluding change in capital value) Total Return on Equity %	$/Total Revenue $/kg MS % % %

Theme	Indicator	Description/Measurement	Units
	Liquidity	Net Cash Income	$
		Farm Working Expenses (FEW)	$
		Cash Operating Surplus (COS)	$
		Discretionary Cash	$
		Cash Surplus/Deficit	$
	Total Wealth	Closing Dairy Assets $	$
		Closing Total Assets $	$
		Closing Total Liabilities $	$
		Closing Total Equity $	$
		Growth in Equity $	$
		Growth from Profit	$
		Growth from Capital	$
		Growth in Equity %	%
		Debt to Assets %	%
		Opening Liabilities	$/kg MS
		Closing Liabilities	$/kg MS
Financial detail	GFR	Net Milk Sales	
		Net Dairy Livestock Sales	
		Value of Change in Dairy Livestock	
		Other Dairy revenue	
		Dairy Gross Farm Revenue – total of above	
		Non-Dairy Cash Income	
		Value of Change in Non-dairy Livestock	
		Total GFR	
	Operating expenses	Labour Expenses	
		Wages	
		Labour Adjustment (Unpaid)	
		Labour Adjustment (Management)	
		Total Labour Expenses (total of last thee))	
		Stock Expenses	
		Animal Health	Total $, $/kg MS, $/ha, $/cow
		Breeding & Herd Improvement	Total $, $/kg MS, $/ha, $/cow

Theme	Indicator	Description/Measurement	Units
		Farm Dairy	Total $, $/kg MS, $/ha, $/cow
		Electricity (Farm Dairy, Water Supply)	Total $, $/kg MS, $/ha, $/cow
		Total Stock Expenses	Total $, $/kg MS, $/ha, $/cow
		Feed Expenses	
		Supplement Expenses	
		Net made, Purchased, Cropped	Total $, $/kg MS, $/ha, $/cow
		Less Feed inventory Adjustment	Total $, $/kg MS, $/ha, $/cow
		Calf Feed	Total $, $/kg MS, $/ha, $/cow
		Total Supplement Expenses	Total $, $/kg MS, $/ha, $/cow
		Grazing & Run-off Expenses	
		Young & Dry Stock Grazing	Total $, $/kg MS, $/ha, $/cow
		Winter Cow grazing	Total $, $/kg MS, $/ha, $/cow
		Run-off Lease	Total $, $/kg MS, $/ha, $/cow
		Owned Run-off Adjustment	Total $, $/kg MS, $/ha, $/cow
		Total grazing and Run-off Expenses	Total $, $/kg MS, $/ha, $/cow
		Other Working Expenses	
		Fertiliser	Total $, $/kg MS, $/ha, $/cow
		Nitrogen	Total $, $/kg MS, $/ha, $/cow
		Irrigation	Total $, $/kg MS, $/ha, $/cow
		Regrassing	Total $, $/kg MS, $/ha, $/cow
		Weed 7 Pest	Total $, $/kg MS, $/ha, $/cow
		Vehicles	Total $, $/kg MS, $/ha, $/cow
		Fuel	Total $, $/kg MS, $/ha, $/cow
		R & M – land & buildings	Total $, $/kg MS, $/ha, $/cow
		R & M – plant and equipment	Total $, $/kg MS, $/ha, $/cow
		Freight & general	Total $, $/kg MS, $/ha, $/cow
		Total Other Working Expenses	Total $, $/kg MS, $/ha, $/cow
		Overheads	
		Administration	Total $, $/kg MS, $/ha, $/cow
		Insurance	Total $, $/kg MS, $/ha, $/cow
		ACC	Total $, $/kg MS, $/ha, $/cow
		Rates	Total $, $/kg MS, $/ha, $/cow

Theme	Indicator	Description/Measurement	Units
		Depreciation	T Total $, $/kg MS, $/ha, $/cow
		Total Overheads	Total $, $/kg MS, $/ha, $/cow
			Total $, $/kg MS, $/ha, $/cow
		Total Dairy Operating Expenses	Total $, $/kg MS, $/ha, $/cow
		Non-Dairy Operating expenses	Total $, $/kg MS, $/ha, $/cow
		Total Operating Expenses	Total $, $/kg MS, $/ha, $/cow
	Operating Profit	Dairy Operating Profit	Total $, $/kg MS, $/ha, $/cow
		Non-Dairy Operating Profit	Total $, $/kg MS, $/ha, $/cow
		Total Operating Profit	Total $, $/kg MS, $/ha, $/cow

Built up from DairyBase: Report Description Handbook, February 2010.

6.13 Indicators collected by MPI (formerly MAF)

An example of the statistics collected by MAF (now MPI) is provided below for kiwifruit.[30] MAF had two kiwifruit model orchards – one ZESRI®GREEN and the other ZESPRI®GOLD, both 5 ha in size, for which it produced the following statistics:

- Production (export trays/ha)
- Total production (export trays)
- Total revenue (OGR $/tray)
- Revenue before 31 March ($/tray)
- Revenue after 31 March ($/tray)
- Total crop revenue (OGR $/ha)
- Net cash income ($)
- Orchard working expenses ($)
- Orchard profit before tax ($)
- Orchard surplus for reinvestment ($)

Then a model budget was also produced which showed the past financial years results and then a prediction for the coming year. What was measured is contained in Table 6.16.

Table 6.16: Kiwifruit Orchard Model Indicators

Indicator	Measure	Unit
Revenue	OGR progress payment Previous crop final payment Other orchard income Net cash income	Whole orchard, per ha, per class 1 tray
	Orchard working expenses	Whole orchard, per ha, per class 1 tray
	Cash operating surplus	Whole orchard, per ha, per class 1 tray
	Interest Rent and/or leases Depreciation Net non-fruit cash income Orchard profit before tax	Whole orchard, per ha, per class 1 tray
	Tax Orchard profit after tax	Whole orchard, per ha, per class 1 tray
Allocation of funds	Add back depreciation Drawings/living expenses Orchard surplus for reinvestment	Whole orchard, per ha, per class 1 tray
Reinvestment	Net capital purchases Development Principal repayments Orchard cash surplus/deficit	Whole orchard, per ha, per class 1 tray
Other cash sources	Off-orchard cash income ZESPRI® dividends (net of tax) New borrowings Introduced funds Net cash position	Whole orchard, per ha, per class 1 tray

[30] These results and the table are constructed from material taken from a MAF Horticulture and Arable Monitoring 2011 report titled 'Bay of Plenty Kiwifruit: Key results from MAF's 2011 kiwifruit monitoring programme'. Downloaded on 18/12/2012 from http://www.mpi.govt.nz/news-resources/publications.aspx?title=Farm%20Monitoring%20Report&keywords=horticulture

Indicator	Measure	Unit
Assets and liabilities	Land and building (opening) Plant and machinery (opening) Orchard related investments (opening) Total orchard assets (opening) Total liabilities (opening) Total equity	Whole orchard, per ha, per class 1 tray
Orchard working expenses	Pruning wages Thinning wages Picking wages Other wages ACC – employees Total labour expenses Weed and pest control Psa management Pollination Fertiliser and lime Electricity Vehicle (including fuel) Repairs and maintenance General Frost protection Freight to packhouse Contract machine work Total other working expenses Rates Insurance ACC – owners Communication Accountancy Legal and consultancy Levies and subscriptions Other administration Total overhead expenses Total orchard working expenses	Whole orchard, per ha, per class 1 tray
Profit	Economic orchard surplus (EOS) EOS/total orchard assets EOS less interest and lease/equity EOS/NCI Wages of management	Whole orchard, per ha, per class 1 tray % % % Whole orchard, per ha, per class 1 tray
Efficiency	Orchard working expenses/Net cash income (NCI) Interest+rent+lease/NCI	% %

6.14 Discussion and conclusion

6.14.1 The 'beforehand' questions

When setting up business indicators many decisions need to be made:

- What is their purpose?
- Are they to be specific or general
- What is critical to the organisation?

- What commitments does the organisation need to support (e.g., regulations, compliance, international agreements)
- How is benchmarking to be carried out?
- What are the stakeholders' expectations?
- What thresholds will be used to indicate acceptable or unacceptable levels of sustainability?

What is to be measured? There are many names and descriptions given to the functions of the measurements made on indicators. Are they to be:

- Short and/or long-term objectives?
- Financial and/or non-financial measures?
- Lag and/or lead indicators?
- External and/or internal performance perspectives?
- Driving force, state, impact and/or response indicators (DSIR, UN)?
- Stocks, flows, levels and/or structural indicators (Stats NZ)?
- Context, practice and Key Performance Indicators, where practice indicators lead to change in the KPIs (SAFA, via John Reid).

There is also the scale of the measurements. Is the Dashboard measuring the sustainability of an individual, a farm/business, an industry/sector, a region or New Zealand? Some indicators are relevant to one level but not others.

What sort of measurement are the indicators to be?

- Qualitative or quantitative?
- Single or aggregated/composite?

Are the indicators going to be subjective or objective or a mixture of both? The Sustainable family business model used both. It could be possible to pop into the Dashboard short questionnaires that measure a person's risk profile, their likelihood of being innovative/adaptive, their leadership or learning style or how they fit a particular typology.

Good indicators are seen as those that are:

- Generalisable/relevant
- Indicative
- Communicate
- Sensitive
- Allow comparisons
- Consistent
- Scientifically and theoretically validated
- Manageable
- Related to other data
- Free from bias
- Action oriented.

6.14.2 Which indicators?

After all these questions are considered it is obvious from the examples given in this chapter that there are many indicators already in use to choose from! In addition the Dashboard team may feel that they wish to construct some themselves.

One of the issues apparent straight away from the indicator lists given here is that some of them relate to classes, categories or context variables that affect the responses to 'what is sustainable?' and how the

response fits the level of sustainability (e.g., red, amber or green). Examples of these sorts of variables are sector, location, size (of farm/orchard, number of employees, turnover etc.), political climate (e.g., government policies and legislation), compliance with an audit system, and exchange rate. These are variables that cannot be benchmarked and many are of the yes/no or 'tick the box' variety. Many of them set the conditions before any exploration can start of a level of sustainability.

If the three pillar (plus one) framework of environmental, economic, social and governance/institutional categories is to be used then there are some obvious indicators that will be chosen, If the environment is thought of as a source of natural capital or resources then there will be measurements to do with land, climate, water, soil, atmosphere and biodiversity. However, all of these resources can be impacted on or transformed through agricultural use and management practices by the use of fertilisers, pesticides, energy, and may produce not only agricultural products but waste or by-products (Izac and Swift, 1994). Therefore it is likely that these too will need to be measured and/or the related change in the original resources. This balance between resource use and the associated risks is very much part of the capital based model. The SAFA framework includes plant and animal health in the environmental category, so while these can be seen as a necessary resource for agricultural production, they are also the result of management practices and other factors.

The economic pillar will consist of standard indicators to do with 'money' such as an enterprise's revenue, profit, efficiency (the expenses to total revenue ratio), equity, return on assets etc. However, it can also be thought of as the resource provided by human-made capital such as contribution to a country's wealth (exports, pay rates, work provision etc.). As with the other categories there is also an element of risk which seeks a balance between the cost of innovation compared with business as usual.

The 'social' and governance/institutional pillars have a considerable overlap. While both can be associated with working conditions, for example, the social is more to do with the benefit or wellbeing of the individual whereas the institutional is to do with the wellbeing of the society and community through having the provision of good working conditions. The attributes an individual has in terms of knowledge and skills are regarded as social whereas at the governance level the concern is to do with the provision of places of learning and skill development. The governance pillar is to do with the resources society has through the existence of social norms, the way a government enables through policy and legislation, the encouragement and support of equity, gender equality and cultural diversity, while the social pillar can also cover social capital – the resources an individual has developed that enable them to be of benefit to society through the work (paid and unpaid) they can do.

A cross-cutting theme that does not seem to fit in any particular one of the pillars is that of farm management. It could be seen as having 'process' indicators and it is also a resource in terms of the skills and attributes of a farmer.

A final point to be considered from this chapter is that all indicators need some form of comparison– to a former value in time so that progression to a particular desirable state can be measured or movement towards an aspirational benchmark .

It is important to decide on a framework for indicators. A framework links all the indicators together. It provides the action/movement/process component that moves between what you start with (resource) and what is produced at the end (outputs/outcomes). It is the part that explains how the starting resources are transformed into something else (Figure 4-3). It means that the sustainability indicators are not static. (In fact the capitals approach is also a systems approach in the sense it provides a model of how a system works.) It is notable the indicators collected by Beef+ Lamb, or the farm monitoring programme are not structured in a useful framework. Many of the best practice models such as those used in agriculturally based competitions are similar thought there is a somewhat camouflaged benchmark of how far an entrant

is away from 'best practice'. The DairyBase model, while collecting mainly financial and physical resource and product –based KPIs does have all the previous years' data to compare these figures against. Putting indicators into a three pillars (plus four) framework runs the risk of becoming static. It would be easy to lose sight of any movement towards or away from sustainability. We need to remember that the aim is to become 'more' sustainable. So ultimately there is a need for a time component within the Dashboard so that farmers, growers and orchardists can see for themselves what they have achieved and what they need to do to move towards more sustainable practices.

The next chapter briefly looks at the different forms a dashboard might take.

Chapter 7: The presentation of sustainability indicators

7.1 Introduction

This chapter briefly identifies the different ways in which sustainability indicators can be presented. This subject will be covered in greater depth by others in the Dashboard project. The presentation of indicator values has come under much scrutiny with particular emphasis being placed on the audience who are expected to use the results in some way. So often the claim is made that 'so-and-so' " 'require a clear and simple presentation' rather than scientific models 'which nobody can understand' " (Ten Brink et al. (1991), as quoted in Bell and Morse, 2008: 64).

A single value to represent a level of sustainability is attractive. Simplifying a system's complexity into allows us to make easier comparisons. However, single values require some sort of baseline to be able to be interpreted. What is the target or reference value? (Often this is not known.) Others, not happy with a single index have used the 'radar' or 'spider web' presentation (e.g. AMOEBA, Gilbert ,1996) to present the results for three or more indicators or indices. What perspective is to be taken on sustainability? What is an acceptable level of sustinability? Can it be binary – either a system is sustainable or it is not, or, are there gradations of sustainability? What does a trend mean? An absolute value may not matter but a change might (Bell and Morse, 2008: 40.)

7.2 Single indicators or single indices

In order to understand and deal with complex issues such as sustainability we can develop and use indicators, which may themselves be mathematically constructed from any data to form indices. Many high-level decision makers such as government ministers, chief executives of corporations etc., often want a reasonably small number of indices that are easy to understand and use. The lure of a single index is strong. They would like to see an index like the gross domestic product (GDP) and are frustrated by the claim that a single number is not adequate to deal with the complexity associated with sustainability. Bell and Morse (2008) called their book 'Sustainability indicators: Measuring the immeasurable?' demonstrating their concern that the search for any indicators may be like searching for the Holy Grail.

But as the International Institute for Sustainable Development suggests, "the attempt to create an SDI, a sustainable development index at the national level, may prove useful even if it fails because it might force a disciplined effort at presenting the complexity of sustainable development in a simplified form" (iisd, 2007). The iisd thinks that going through the process of attempting to aggregate sustainable development indicators will show if it can be done; it would indicate "the relative sustainability of a state or trend"; it could introduce policy and decision-makers to the goal of sustainable development, encourage a user to "further explore the complex details of sustainability" and help them see how individual actions can link to the whole of society; and that it should encourage a sustainability indicator framework to be adaptable as people's understanding of each indicator grows (iisd, 2007).

At the same time, there are certain issues and difficulties associated with aggregation. If individual indicators are to be aggregated this requires the combining of measures with different scales, and associated with quite different topics. While aggregation reduces the amount of information presented, it may make interpretation of the aggregated indicator more difficult. As indicators may be of greater or lesser importance the various indicator components are usually weighted in the aggregation process. This is a very subjective process. As would be expected, aggregation also makes the identification of threshold values more difficult. (Woodhouse et al., 2000)

7.3 Presentation in tables

The most common way for sustainability to be reported is in tables which can present a lot of detailed information in a reasonably confined space; however, this density does not necessarily make tables a good

option for a lay audience. Figure 7.1 shows how pictorial images can also be presented in a table and used to identify the level of change or improvement in certain indices.

Sustainability 2017 Aspiration

- At least double earnings per share
- Achieve zero waste to landfill
- Achieve carbon neutrality
- Halve key resources per unit of output

KPI	Baseline 2006/07	2008/09[3]	2017 Target
Underlying earnings per share (pence)	82.2[1]	89.6	≥164.4
Total global warming potential (tonnes CO_2 equivalent)	386,074[2]	370,787	0
Amount of waste to landfill (tonnes)	16,555[2]	5,535	0
Electricity consumption (GJ '000)	1,469[2]	1,351	735
Natural gas consumption (GJ '000)	2,146[2]	2,260	1,073
Water consumption (m^3 '000)	1,909[2]	1,951	955

Data presented is for the period:
[1] 1st April 2006 to 31st March 2007.
[2] 1st January 2006 to 31st December 2006.
[3] 1st April 2008 to 31st March 2009.

Figure 7-1: An 'aspirational' table of sustainability indicators

Source: Johnson Matthey (2009).

7.4 The spider's web, cobwebs, star fish, radar and AMOEBA approaches

For Ten Brink et al. (1991: 64-5) the solution of how to present indicator values was to use what has become known in some circles as an AMOEBA diagram. A circle is drawn around a central point to represent a reference level or baseline year which, in their case, acted as the state/abundance of the indicator species of fish, plants and invertebrates in the fishing zone of the Netherlands which are being compared. Then the abundance level of the indicator species are plotted as joined points distant from the central point and so it can be seen at a glance which species are more-or-less abundant than at the time of the reference period. This method of presentation is also known by many other names – such as starfish, spider's web, sustainability polygon, etc.

One of its strengths is that it can show, not only the present state, as described above for the AMOEBA diagram as used by Ten Brink et al., but it can also show the level of sustainability of different aspects as shown in the 'sustainability polygon' as used by RISE (see Figure 7.2) and whether these aspects are at a sustainable level or not. The RISE diagram is in the form of a target with the red centre being the danger zone.

The star fish or spider's web approach illustrated in Figure 7.3, shows how this method can be used to present several results so they can be compared. Figure 7.4 shows a kite shape which has very little detail leaving interpretation to the intuition of the audience members. It is just based on four major indicators or axes. Figure 7.5 is in the same form as the RISE polygon but it only highlights the level of achievement of sustainability for each indicator and hence is not in the form of a target.

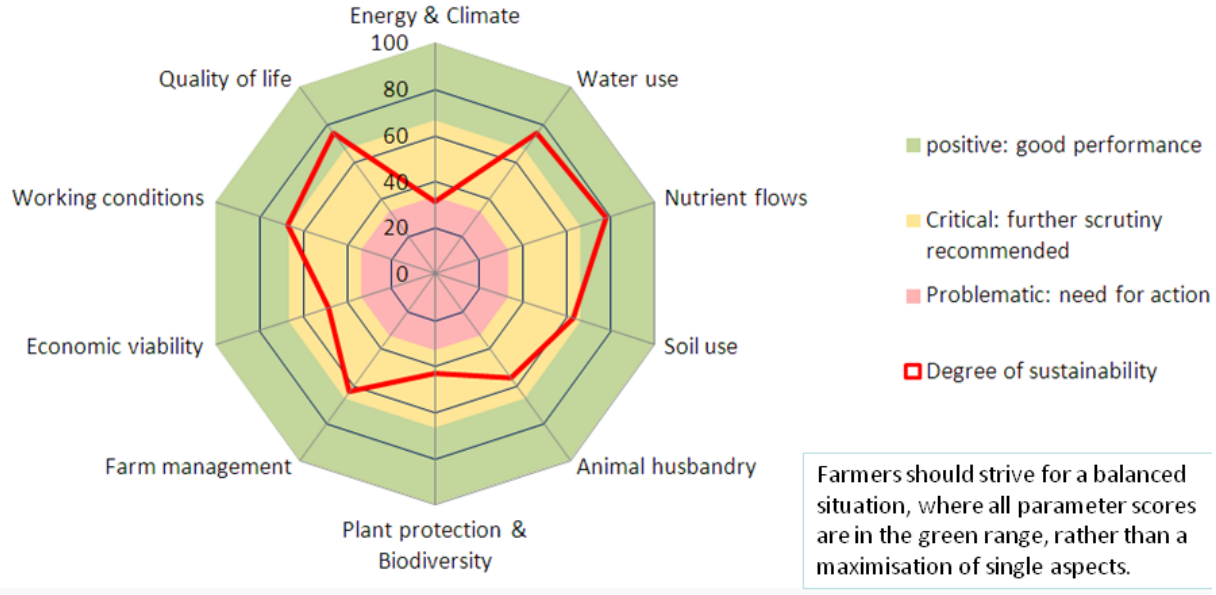

Figure 7-2: The RISE sustainability polygon

Source: RISE (2011: 3)

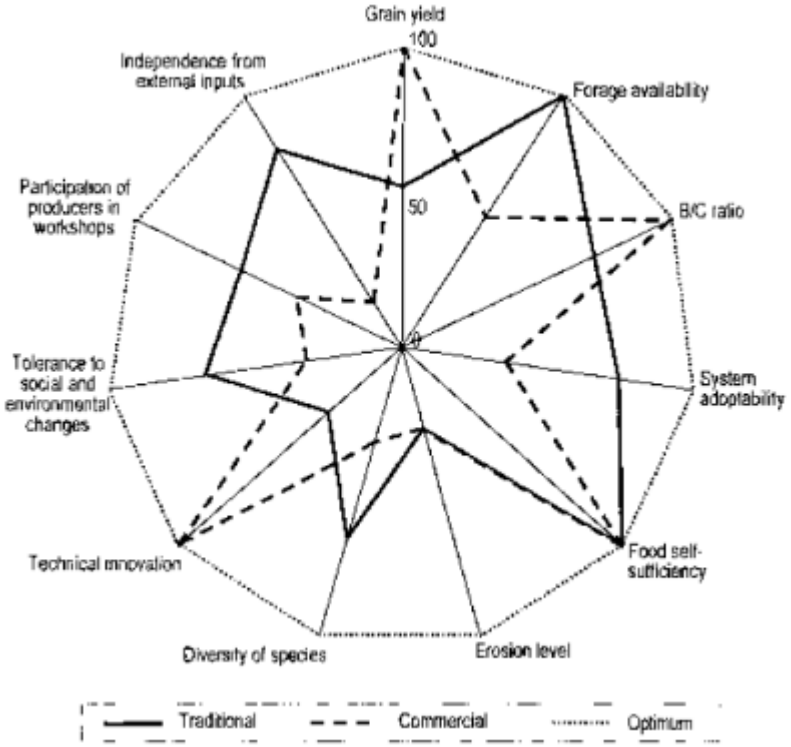

Figure 7-3: The starfish, showing two achievements of indicators against the optimum

Source: Lopez-Ridaura et al. (2000: 3).

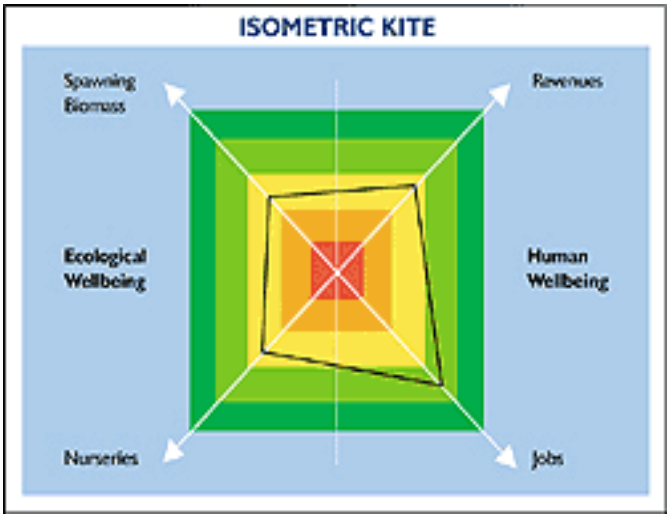

Figure 7-4: The isometric kite

Source: FAO, 1999.

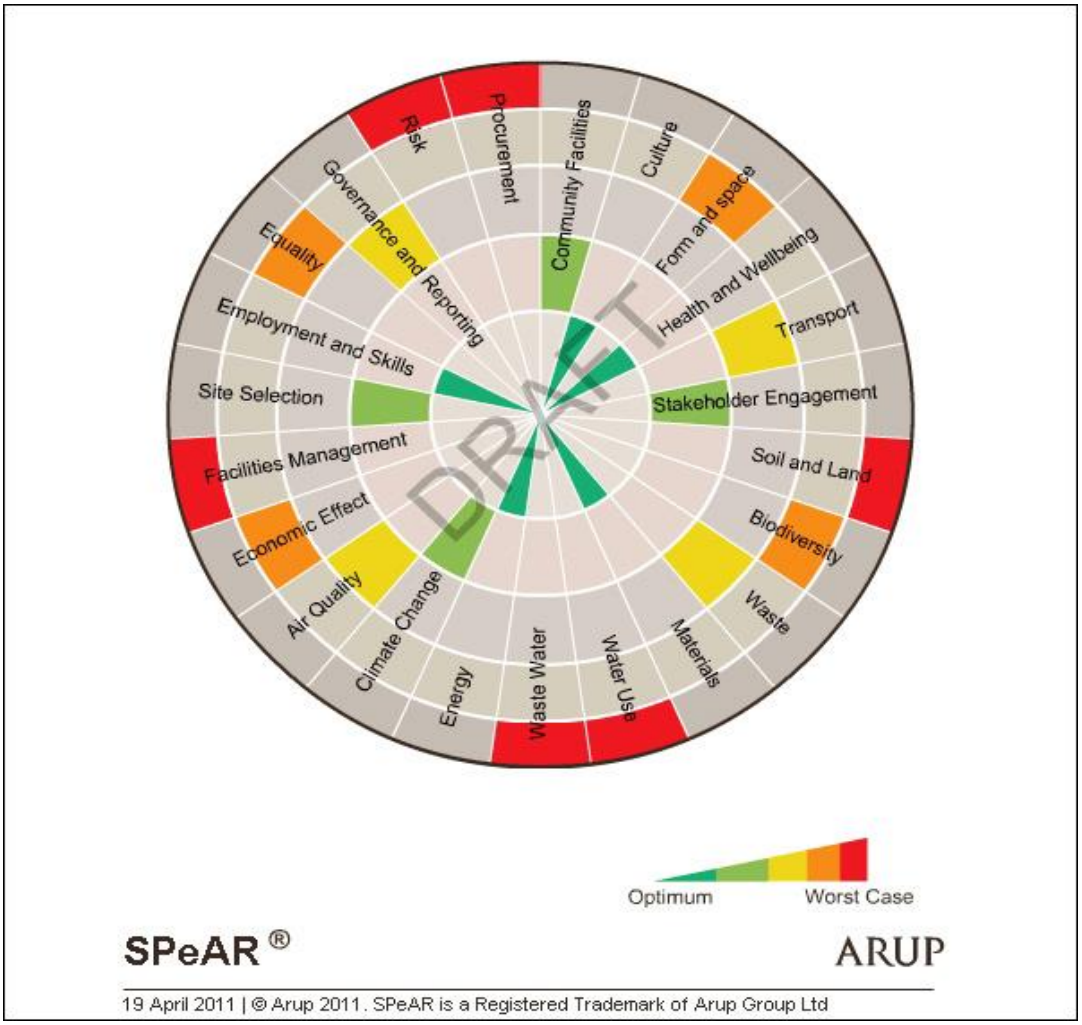

Figure 7-5: The SPeAR® (Sustainable Project Appraisal Routine) decision making tool

Source: http://nelsonelson.com/wiki/index.php?title=Sustainable_Development_Theories

7.4.1 Criticisms

The AMOEBA is a set of state sustainability Indicators rather than pressure indicators, so it gives no clues to why the situation may have changed. Another criticism is that all indicators are given equal weight in this diagram. It can be argued that different stakeholders may give different weights to different species so this way of presentation leaves this open. The other obvious criticism is that the choice of reference level is crucial to the comparison (Bell and Morse, 2008: 66). It also focuses on a measure of abundance when other factors may also be of importance (such as lifecycle stage).

The question, would using this method pick up a trend? The problem is that it looks at a fairly closed system and influences from outside are not able to be factored in. For example, no-one could have predicted the impact of El Nino on the anchovy fishery of Peru (Bell and Morse, 2008: 69).

Dashboard presentation

Other groups have used the dashboard approach to indicator presentation. In this approach a dashboard of a car or aircraft is replicated to reproduce Key Performance Indicators (KPIs) in order to show how well a group, institution or country is meeting its goals. Figure 7.6 illustrates this method with the results for an educational institution.

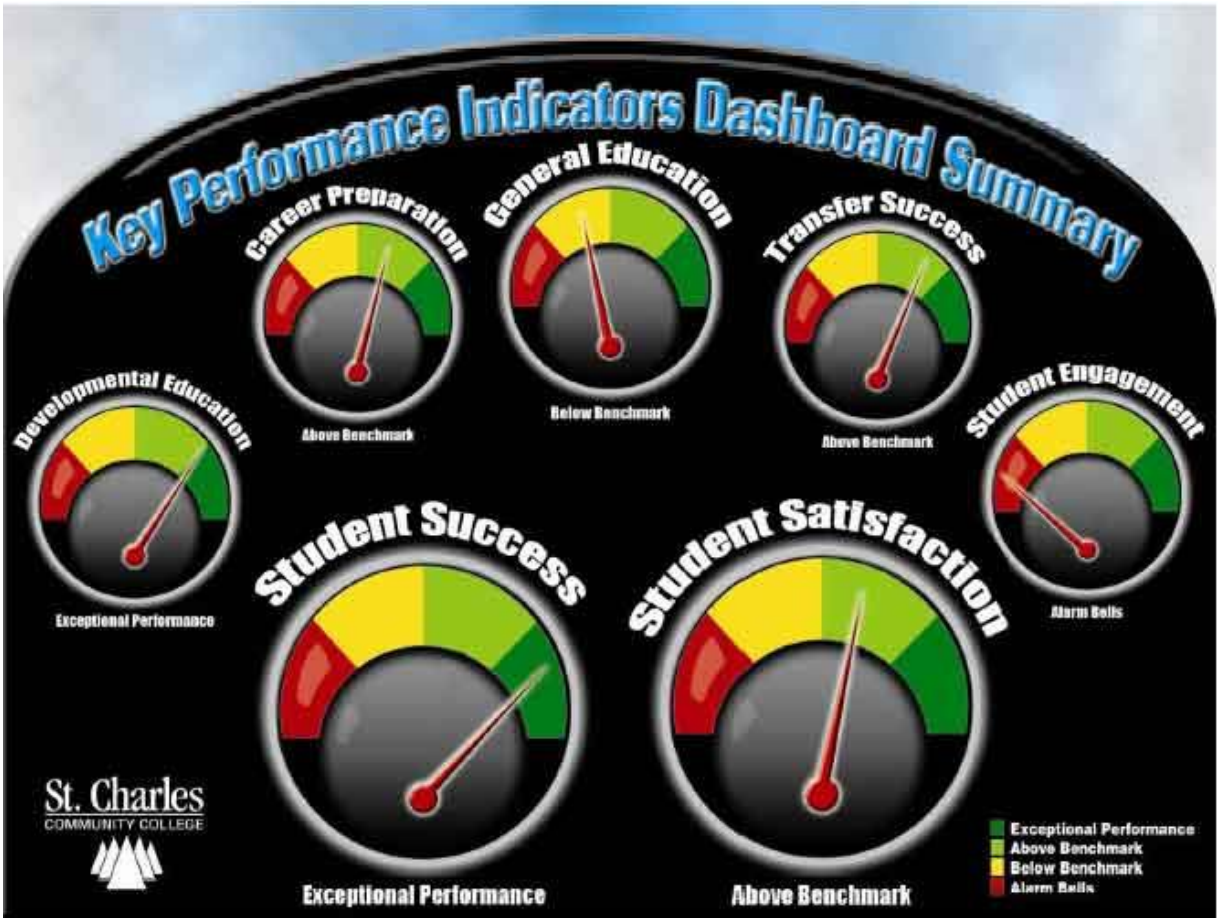

Figure 7-6: An aircraft-type dashboard

Source: http://dashboardspy.wordpress.com/2006/03/11/college-executive-dashboard-management-system/

Figure 7.7 displays a rather busier dashboard, attempting to not only show where some indicators are at but where along in its transportation improvement programme the organisation has reached.

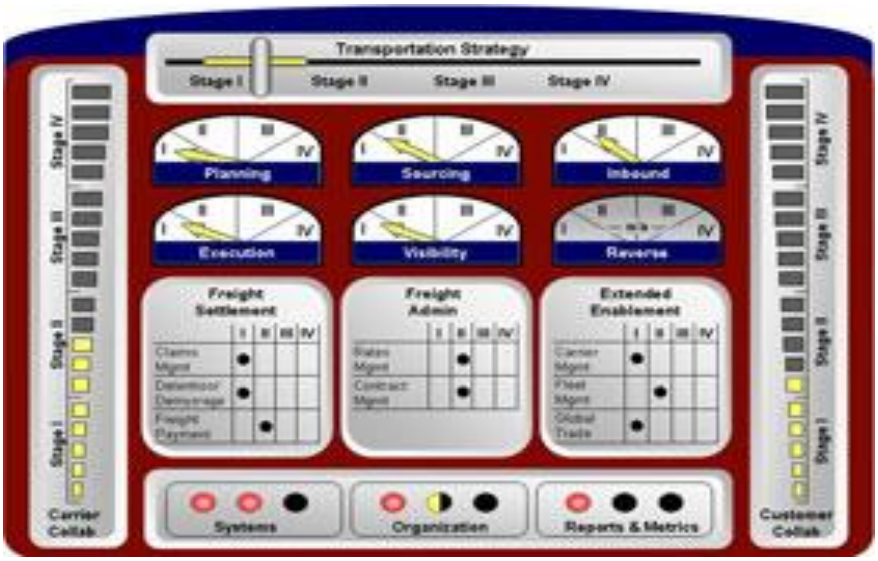

Figure 7-7: A dashboard displaying information in other forms

Source: **http://www.cssi-consulting.com/transportation_improvement.html**

There seems to have been few comments critiquing the dashboard way of presenting data. The criticisms of the cobweb/radar etc. diagrams would also apply to the dashboard as rather than an axis in a circle, the dashboard presents the same individual indicator result in its own space. This does mean that there is not the same easy identification and comparison with how other indicators are doing and the relationships there might be between them as in the cobweb/radar diagrams. It also means that fewer indicators can be presented in the same area of a page, so it is not such a compact presentation.

This chapter has presented a few ways of presenting indicator results of the many examples available. A fuller range of examples can be found in any Google search using key words such as 'indicator images'! It is clear that any presentation of data has its limitations and in the process of presentation development it loses some of its detail in the drive for accessibility to a particular audience. However, it is hoped that with the presentation of sustainability indicators there will also be delivered a desire to understand more, pursue further and implement ways of becoming more sustainable.

The next chapter examines how indicators have worked in practice and what might be learned from that.

Chapter 8: Indicators in practice: Hurdles and enablers to uptake

Bell and Morse (2008: xvii) believe that trying to measure sustainability is a 'futile exercise of measuring the immeasurable". They think that the approach of quantifying sustainability has not worked and has ended up "measuring things that can be measured and not things that should be measured" and eventually sustainability has become "defined by the parameters that can be measured rather than the other way around".

8.1 What indicators are being used?

Roca and Searcy (2012) conducted extensive research to see what indicators were being used in corporate sustainability reporting in Canada. They identified 585 different indicators reported by 95 corporations, and organised these into 15 key themes (Roca and Searcy, 2012: 109):

- Interaction with community
- Employees
- Health and safety
- Management
- Operations
- Purchasing
- Research and development
- Financial
- Satisfaction – clients, stakeholders
- Service
- Reclamation (land)
- Emissions and effluents
- Energy
- Waste
- Water

8.2 Target values: Choosing the division between sustainable and non-sustainable

Bos et al. (2007: 3) found that it was virtually impossible to give a sharp division between what was sustainable and what was non-sustainable for a given indicator so they suggested a transition range (ibid: 5) bounded by a target value and a critical value. This was translated into a 'spider'/target type diagram with a green outer ring – sustainable, a yellow ring – nearly sustainable, and a red inner circle – not sustainable. The indicators were reduced to measures out of ten (Bos et al: 2007: 5). This is the method also adopted by Response Inducing Sustainability Evaluation (RISE) but their indicators are adjusted to be measures out of 100. ISE indicators are used widely throughout the world, often to assess the sustainability of farms connected to corporates such as Nestle and Fonterra, and institutions of government, particularly in Switzerland.

8.3 Linking indicators: Making an efficient choice of indicators

One of the things that has to be determined when choosing indicators is to make an efficient selection so that some indicators can stand in or represent others. In other words, it is not necessary to measure everything because some indicators will be so closely aligned/correlated with others that there is no need to collect everything. Some literature uses indicators to study the relationships between them by doing regression analyses, for example.

8.4 Critiques of indicators and points to ponder

8.4.1 Top down versus bottom up

Most indicator and framework examples reported here are top-down and technocratic. Mitchell et al. (1995) state as the first principle in the development of sustainability indicators:
"Stakeholders [should] reach a consensus on the principles and definitions of sustainable development that are used and the objectives of the sustainability indicators programme." (cited in Bell and Morse, 2008: 37).

This has rarely been put into practice and "the methodology for developing SIs [Sustainability Indicators] have been set by outsiders, with perhaps a nod in the direction of those whom the SIs are ultimately meant to serve. Indeed is sustainability really an important consideration for all stakeholders, and if it isn't, should an outsider impose it? The following comment by Tisdell (1996) related to agricultural sustainability is very sobering: 'In fact, sustainability is unlikely to be an overriding consideration of a farmer from an economic viewpoint'." (Bell and Morse, 2008: 38). Thus an argument has been developed on the need for more involvement of those at 'the bottom', those being acted on by the use of indicators.

8.4.2 The need for dialogue

Bossel (2001), identifies the need for people to be involved in indicator development rather than it being top-down and expert driven. In the experience of Keeble et al. (2003: 150-152), sustainable business development indicators need to be relevant to management needs, and therefore need to have the involvement of those who will be accountable for their delivery. The process should also include dialogue with key stakeholders, and should end up being balanced across the diverse demands of internal and external stakeholders. They believe that only then will there be an understanding and a commitment to sustainable development.

Nylund and Kröger (2012) investigated the different understandings of the word sustainability between corporates and the local populations where corporates have their operations. They found that the corporate understanding of sustainability was more to do with environmental and social responsibility and had an emphasis on business- related indicators which was supported through the use of the GRI standard. This move away from the broader Rio and Brundtland definition meant that the companies studied had omitted to account for the fact that long-term sustainability involves the livelihood of local people.

(Bell and Morse, 2008) advocate a participatory approach to the use of sustainability indicators called 'Systemic Sustainability Analysis' (SSA) which accommodates multiple views of sustainability from all stakeholders in a project. It draws on learning from systemic approaches such as Soft Systems, learning organisation theory and Participatory Rural Appraisal. It involves five cyclical steps:

1. Understand the context;
2. Agreeing on SIs and the band of equilibrium[31];
3. Develop the AMOEBA[32] scenario-making;
4. Review and meta-scenario-making;
5. Publicity, publicising and marketing the message.

8.4.3 Making people/staff/employees accountable

Who should be responsible for putting into effect what the indicators tell an organisation? Keeble et al. (2003: 152) believe it is crucial for senior executives and line managers to be responsible for implementing indicators. They need to understand how they can influence sustainability performance and use it in their decision making.

[31] The 'band of equilibrium' is the reference conditions for a SI – the limits within which it is seen to be operating.
[32] A variant of the radar diagram as a way of presenting data.

8.4.4 Encapsulating complexity and diversity in simple measures

"The world is a complex place, and people have had to make sense of it for a long time!" (Bell and Morse, 2008: 41.). The usual approach is to deal with the complexity of the world in a reductionist way – in manageable bits. If it is broken down into a lot of variables all of those variables also interact causing an incredibly complex situation. However, scientists, particularly biologists have been working with this for a long time.

8.4.5 Quantification

The development of a sustainability paradigm automatically leads to quantification. "Can we really use simple SIs to gauge such a complex issue as sustainability?" According to Bell and Morse (2008: 42) this strikes at the very heart of the sustainability debate. Inevitability we will try to measure sustainability but we have to decide how much of a trade-off we can accept between simplification and having SIs that are meaningful. However, this is not a problem unique to sustainability, and all science is tested against the reality. Ecology and farming systems research have both successfully used quantification. However, Bell and Morse (2008: 43) disagree that the development of SIs parallels that of science as the concept of sustainability and the development of SIs involves circular thinking. Sustainability is a human vision that is full of human political and ethical values and the development of SIs is not carried out to further our understanding of sustainability. They are not developed to test whether they measure sustainability. "… the starting point is a description of sustainability, with all its human subjectivities, followed by an identification of SIs to gauge attainment of that description".

8.4.6 Subjectivity in choice of structure and indicators within that structure

Many indicators are subjective and dependent on how they are measured, when and by whom (Bell and Morse, 2008: 33.)

8.4.7 Set in stone or open to change?

According to Keeble et al. (2003:151) those developing indicators should not feel constrained to use internationally recognised standards but such indicators do form part of the learning and understanding of the use and development of indicators. They also say that there is no such thing as an 'ideal' set of indicators and the attempt to get such a set can prolong development. They proceed on the understanding that they should be open to an on-going debate and could be changed to better fit changing circumstances and expectations of stakeholders. The iisd (2007) would agree with this perspective. They state that indicators and their frameworks should be adaptable as we learn more and more about what sustainability is. However, this perspective is in disagreement with Bell and Morse (2008: 43), who think that it is not a good idea to develop a system where the SIs are constantly changing in order to get closer to the object 'sustainability'.

8.5 How to take account of context? Drivers and their relationship to indicators?

According to (Saunders et al 2006a, 10), outcomes are lag indicators and drivers are lead indicators. Therefore some lead indicators/drivers could be:

- Exchange rate: If a driver is to manage the fluctuations in the exchange rate then this may relate to the type of contracts available and hence the choice a farmer makes, market access, price, export/local supplier.
- Tax regulations: If a farmer is 'managing' what tax is paid so his kids can benefit from a student allowance then he will perform in a particular way.
- Government and local body policy and regulations: - tenure review, ETS, RMA, family trusts, water, roadside maintenance
- Family situation: management of succession – will affect asset accumulation – land for sons (and possibly daughters), money for non-farming daughters/sons.
- Personal attitudes: risk
- Location: water, distance from processing plants, weather, altitude

Does this mean that there should be a particular model for each situation? Many agribusinesses, particularly pastoral farms are family owned and operated. Therefore the work of Olson (2003) is particularly applicable to the business indicators for Dashboard.

8.5.1 A farm as a small family business (SFB)

Olson et al. (2003: 645-8) made an extensive review of literature that could be related to family businesses[33]. They found:

- Businesses with a less formal business structure have a lower business income.
- Home-based businesses were associated with less income than those not home-based.
- Rural home-based businesses generate less income than their urban counterparts.
- Women make less income than their male counterparts.
- When business owners have another job, it is detrimental to business success.
- On average small business owner/manager households hold over three times more debt than other borrowers (Haynes and Avery, 1996: 71).
- Having family income other than the householder's income contributed to lifting self-employed householders above the poverty threshold.
- Family characteristics affect family success.
- Family and business systems within family businesses compete for time, energy and financial resources of individual family members and of the family collectively.
- Destructive conflict between family and business goals can affect the sustainability of family businesses.
- Whether workers were related to the family and whether they lived with the family or not affected income. For example, paid unrelated workers contributed in positive ways, but unpaid, non-residential, related workers decreased income and contracting such workers increased the working hours of the business owner.
- Home-based businesses frequently utilized or traded family resources (used friend and family volunteers of spent less time doing family chores) in order to spend more time on their business.
- A new business often benefits from the exchange of resources between the family and the business.
- A business at a later stage often had family members who drained its resources.
- Family labour was more productive than non-family labour but that did not translate into profitability.

8.5.2 Results using the SFB

The results of the research of Olson et al. (2003) using the SFB model, are important because though statements are not made about the level of sustainability of a particular family business, the inter-relationships between particular indicators, which help or hinder a family business, are identified. This may be useful when choosing indicators for the Dashboard project. In general they found that a family can both help and hinder business success. The net impact is dependent on how the family manage the overlap between the family and the business and how they manage disruptions. The most important seemed to be employing family members was more likely to be related to business success and this practice is not bad (Olson et al., 2003: 661-662). Particular relationships are found below (Olson et al., 2003: 659-662):

- Effect of family on a family business venture is significant.
- Wellbeing of family and wellbeing of business are closely linked.
- Reducing family tension, employing a relative who lives in the home, and hiring temporary help at busy times would increase revenue.

[33] Most of this literature is from the U.S., hence I mainly report on examples from it that relate to what I have heard when interviewing many farmers and orchardists in New Zealand over the past 9 years.

- Single generation family are associated with less business revenue that two or three generation families.
- No. of children under 18 in the household had no impact on revenue but reduced the owner's perceived success of the business.
- As family tension is not helpful in achieving success for either the family of the business.
- As family members function more autonomously rather than attempting to function as a group, owner managers perceive their business to be less successful even though revenue does not decline.
- The less income the business generated, and the higher the family's functional integrity score the more likely the family was to use its income to meet business cash flow problems.
- Acquiring additional labour was a key action for dealing with additional demands on the business and staying within time constraints. Businesses that generated less revenue obtained this as unpaid labour from family and friends while those with more revenue hired temporary labour.
- The less functional the family the more likely it is to have cash flow problems.

8.6 Corporate sustainability

8.6.1 Firm structure and governance: Lessons from the kiwifruit sector?

Saunders et al. (2007a) surveyed face-to-face sheep/beef farmers and kiwifruit orchardists and interviewed agribusiness personnel to determine the importance and validity of indicators collected in prior research of the literature. Most interviewees considered the firm structure and governance issues to be unimportant because many were family-run. But Saunders et al. point out that the kiwifruit sector provides evidence of the importance of industry structure for the success of individual businesses. Before 199?, the industry used "a multiple seller market which was a good structure during the development years because it enabled market development and good returns. When returns collapsed, as supply finally exceeded demand, buyers were able to play-off one exporter against the other, purely on price. The oversupply was caused by the focus on commodity production orientations, rather than trade and payment incentives focused on quality. The industry later united under a single structure [ZESPRI] to enable the following:

a. Production volumes and therefore market plans could be put in place and offered to customers;
b. Sufficient quantities of fruit could be assured to warrant big customers carrying the product;
c. Buyers could only negotiate with one marketer out of New Zealand;
d. High quality could be assured by standards set and enforced within NZ; and
e. Economies of scale in shipping to the other side of the world meant affordability" (Saunders et al. 2007a: 10).

"Key industry initiatives such as Taste Zespri and KiwiGreen have been driven from market demands. However, the key to success of the industry has been the ability of the industry to work as an integrated cohesive unit to make the changes itself to deal with those demands … grower control, ownership and strong supplier entities have ensured that Zespri has not fallen into the monopoly trap of inefficiency and waste" (Saunders et al., 2007a: 11).

8.6.2 Size, revenue and profit

In the surveys and interviews conducted by Saunders et al. (2007a) the farms of the sheep/beef farmers surveyed did not show any relationship between gross farm revenue (per ha) and number of paid employees or size of farm, whereas the kiwifruit orchards showed a relationship between the number of paid employees and gross orchard revenue (per ha) and cash surplus (per ha). Owner operated orchards had a higher cash surplus than managed orchards but not a higher gross revenue. The age of the business did not appear to be an indicator of financial success for kiwifruit.

8.6.3 Business strategy

In the surveys and interviews conducted by Saunders et al. (2007a) only the larger firms tended to have a plans or visions set in place and the reason for this seemed to be that people felt there were so many

factors outside their control that they could not plan for, such as seasonal variation and their lack of control of overseas markets. This lack of a long-term perspective is more likely in agribusiness than elsewhere. Mentoring has been found helpful (Saunders et al., 2007a: 12). However, the kiwifruit industry itself "has pursued a pro-active visionary strategy, based on the long-term interested of the industry and underpinned by strong leaders and an action-oriented, cooperative culture. As NZ is not the lowest cost producer, given market access and location issues, the NZ industry has followed a differentiation strategy particularly in the most profitable markets. This has been based on taste, health benefits and low pesticide usage and has led to a successful price premium to support the promotional and branding efforts … they have been able to claim the best kiwifruit in the world … The Zespri brand has been one of the most critical initiatives in the industry" (Saunders et al., 2007a: 12).

Sheep/beef farms with a business plan did appear to have a higher gross revenue than those who did not but this did not translate into a higher profit.

8.6.4 Customer focus

In the surveys and interviews conducted by Saunders et al. (2007a), importance of having a customer focus varied according to the type of business. Producers of niche products and those that served the agricultural community were very active, the latter emphasising the building of long-term relationships. "… the kiwifruit sector focused on market demands driving innovations and the incentive structure to producers. Market demand factors must be communicated constantly throughout the entire values chain ... Growers respond to financial incentives, but financial indicators are lagging indicators [i.e., promotion and profits increase in the short-term but lead to long term brand depreciation and the erosion of competitive advantage" (Saunders et al., 2007a: 13).

"Customer focus is important but not easily defined" (Saunders et al., 2007a: 14).

Consumer preferences are different in different markets.

8.6.5 Quality

"One way to signal quality to potential customers is to participate in a certification scheme" but this was regarded as costly and there was the feeling that those doing the certification often had little understanding of the industry they were certifying (Saunders et al., 2007a: 14).
Saunders et al. (2007b) felt that tick box approaches to quality did not capture a sector's view of quality.

8.6.6 Employee relations

In the surveys and interviews conducted by Saunders et al. (2007a), most firms had difficulties in finding people with the appropriate skills and flexibility. They generally had in-house training but felt that attitudes were more important than qualifications.

Labour law could be more 'business friendly' such as having a three month trial period for new employees [now in place] and making it easier to dismiss staff. For a small business, taking on new employees was very risky.

Labour requirements differ across agribusiness sectors. Contractors are often used as this reduces the risks of employing staff and agribusinesses differ from conventional businesses in this way. Hence the usual indicators such as rates of absenteeism and performance pay are not so applicable, but training could be (Saunders et al., 2007a: 16).

8.6.7 Innovation

In the surveys and interviews conducted by Saunders et al. (2007a) it was found that innovation is an important part of the culture of the kiwifruit sector. Early on government supplied funding for R & D as this

could not be funded by individual growers. This is seen as key for emerging export industries. The three group structure of growers, packhouses and Zespri have helped in the dissemination of information driven by the need of this industry to overcome the barriers imposed by distance from the markets. Growers tended to want a short-term problem solving research focus whereas researchers had a more long-term focus, necessary for maintaining the competiveness of the industry. The type of innovation that was important varied across sectors (Saunders et al., 2007a: 16-18).

8.6.8 Social factors

Saunders et al. (2007a: 18-19) found little variation in social factors and so were not able to establish effectiveness of the proposed indicators associated with the support and participation in community activities. There was only one indicator of environmental wellbeing, that of earthworm counts, but it was not associated with financial success.

8.6.9 Business performance

The main indicators used in the work of Saunders et al. (2007a: 20) were gross revenue and cash surplus measured in units per ha and per farm/orchard. Share price or share dividends were not appropriate for what were mainly family-owned businesses. Debt levels could be useful but this information was not available. However, as the example of Zespri illustrates, such an industry body must provide "the financial returns to growers to justify the costs of the organisation" (Saunders et al., 2007a: 20).

8.6.10 Additional factors related to the NZ context

One issue for the Dashboard is going to be how to take account of the context in which businesses operate over which they have very little, if any, control. The context may vary depending on when regulations come in or laws change, how the global situation fluctuates and with it the money available for spending in New Zealand's overseas markets, and the physical environment and its relationship to such aspects as the growing conditions in a particular year.

New Zealand's agricultural sector is almost entirely based on exports and as such is severely impacted on by the exchange rate, which has remained remarkably high for many years. If firms do not export the exchange rate still affects their businesses. Another factor in the past has been interest rate and tax issues. Interest has to be paid constantly throughout a year whereas a farm or orchard income is not uniform. Similarly, predicting income as required by Inland Revenue is difficult. The cost of compliance with certification schemes and the cost of going through the RMA process are also regarded as impeding business success (Saunders et al., 2007a: 20-21).

Agribusinesses are usually part of a supply chain and produce an end product that is exported, meaning that an individual may have little control over the end result of their product. The flow of information about the market, the signals from that market and how they are incorporated into incentives for producers are important as illustrated by the kiwifruit sector. Some producers do market their own products themselves both in New Zealand or overseas Saunders et al. (2007a: 24).

Agribusinesses tend to focus to long-term returns rather than annual returns and this related to the emphasis on the formation of long-term relationships Saunders et al. (2007a: 24). For example, in High Country farming it is often the case that farms only have a 'good' year every ten years or more (Hunt, 2012).

8.6.11 Risk and leadership

John Reid (pers. comm.) thinks that there is a relationship between leadership and risk taking.
That in New Zealand businesses there are largely bureaucratic folk that want to avoid risk at all costs rather than embrace risk and manage it. Basically they see environmentalism and social responsibility as a threat to bottom lines. They cannot intuit the global changes and long-term trends - which is linked to the short

time horizons on which they operate" It became clear to him after speaking with different industry leaders in the biological industries that they lack visioning capability for 'brand NZ.' They do not understand the power of wrapping everything in sustainability and establishing NZ as the world's 'Noah's Ark'. There are some leaders that do get this - but they are few are far between."

He thinks that "this aversion to risk at a micro-level (i.e. business level), and short-time horizons, creates a much more serious risk at a macro level. With individual businesses collectively failing to adopt sustainability standards this becomes a serious threat to our environmental reputation generally. However, I also think it is to do with the NZ corporate leadership style which is more about role-modelling (i.e. copying what happened before you) rather that leading through breaking convention … To get around this … we need to partner with new and agile businesses that actually do 'get it.' They will likely be family orientated and think inter-generationally. If we get such businesses on-board then they become the role-models the large corporates will mimic (if it makes them more money)."

8.7 Arguments for and against sustainability reporting

Sustainability reporting in corporate institutions has been widely criticised. The use of the GRI set of voluntary guidelines in reports has been found to be confusing over their scope, "lack the requirement for independent verification of the report, and … different levels of application permit selective reporting on the performance indicators" (Roca and Searcy, 2012: 105).

The Agenda 21 indicators published as the CSD (Commission on Sustainable Development) indicators resulted in a focus on historically experienced problems of political relevance, hence collecting data which monitored an issue. However, such a focus means that such data is not able to give guidance on how to proactively react to potential future threats.

The Global Reporting Initiative (GRI) is producing new guidelines in May, 2013 and the International Integrated Reporting Council (IIRC) framework has a consultation draft due out in April, 2013. In an article in the Guardian, Thurm (2013) writes that this has ignited discussions about the pros and cons of sustainability reporting. He breaks the arguments down into reasons for and against. He sees them "largely dominated by the defenders of the status quo, rather than by those who have a vision of what the scope and purpose of reporting has to be in relation to the global challenges in front of us".

The 'defenders of the status quo' make the point that "reporting becomes too burdensome". There is a concern that even more indicators will be added. There is a suggestion that an organisation will be positioned within a value chain and its impact on the value chain will have to be assessed thus adding further to the complexity - particularly for multinationals, and to the burden for smaller organisations. Thurm points out that the GRI has always been flexible, indicators are just recommended and reporting is about learning how to report. "Value chain assessments are too complex" is another point of contention. Even if this is so, Thurm makes the argument that it is still an obvious thing to report on – the positive and negative impacts of an organisation upstream and downstream. Nowadays, it makes particular sense when the economy is thought of as circular.

The second argument is that "we don't have the data". While this may have been an acceptable response in the past now, in the days of 'big data', there are techniques for making sense of the large amount of available data. If supply chains strategies are based on collaboration rather than price pressure and mandatory codes of contact then there is a greater inclination to disclose and share data.

The fourth point that some make is that "sustainability reporting is too costly". Thurm says some organisations spend a large amount on their annual report that is read by very few people compared with a sustainability report.

The fifth argument that there are "too many indicators", is seen as ridiculous by Thurm. He thinks the problem is more to do with whether the indicators are the right ones, in order to develop 'impact-based' reporting in which an organisation can tell whether it is part of the problem, part of the solution or part of both.

8.8 Discussion

This chapter has delved into a little bit of the literature on how others have used indicators and what they have learned from the issues that have arisen. The topic will be investigated more fully as the Dashboard project progresses.

Saunders et al. (2007a: 25) suggest that there are some indicators that are potentially significant in predicting agribusiness sustainability, performance and success. They are the use of business plans, the presence of recent management changes, a focus on product quality (e.g., improving dry matter in kiwifruit), farmer and employee training and adopting innovations from increasing computer use for records or communication, to adopting new crops or management practices. Further, Saunders et al. (2007a: 25) wonder if the agricultural sector is so heterogeneous it is difficult to find indicators that will apply universally and that people in agribusinesses seem to have found many ways to be successful". Hence, "simple indicators may not be robust enough to capture their range of experiences".

The next chapter summarises the learning gained from the ARGOS project and how it might help in designing the Dashboard.

Chapter 9: Learnings and hints from ARGOS

9.1 Introduction to ARGOS

The first part of this chapter is taken from the Complementary Pathways to Sustainability Report (Hunt, 2011) to summarise ARGOS to date and to position it in a way which demonstrates how the results from this report are pertinent to discussions of frameworks and indicators of sustainability. The ARGOS programme is a study of New Zealand sheep/beef and dairy farms and kiwifruit orchards that examines the sustainability and resilience of New Zealand's farming - economically, socially and environmentally.

9.2 ARGOS 1

Up until 2009 the ARGOS study (ARGOS 1) was concerned with comparing the difference between management practices associated with audit systems in the kiwifruit, sheep/beef and dairy sectors of New Zealand's agriculture. The kiwifruit study was of 36 orchards at 12 locations - Kerikeri (1), Bay of Plenty (10) and Motueka (1). At each location there were three ARGOS orchards under management systems associated with growing green, gold and organic green kiwifruit. For the sheep/beef study there were 36 farms based at 12 different locations throughout the South Island. At each location there were three farms using conventional, integrated and organic management systems. In the dairy sector 12 locations were studied and at each location there was a farm converting to organic management and one under conventional management.

In completing ARGOS 1, additional and more intractable sustainability concerns (e.g. climate change and carbon emissions, RMA, animal welfare) were identified by both the preliminary research and through discussion with industry partners, as key emerging pressures on management practices. In such cases, the pathways to enhanced performance are not exclusively organised around market assurance schemes, but are often structured around regulatory responses, eliciting a separate and substantial set of economic, social and environmental impacts in the primary production sector to that studied in ARGOS 1. In addition, cross-cultural comparisons among ARGOS participants demonstrated the often-essential role of differing philosophical approaches to agricultural practice, which affect the mix of concerns (environmental, social and economic) that influence management actions. To account for the broader spectrum of pathways that influence management, ARGOS 2 examined the characteristics and outcomes of various pathways to sustainability.

9.3 ARGOS 2

9.3.1 Summarising the results from the retrospective interviews: complementary pathways to sustainability

The first part of ARGOS 2 was based on retrospective interviews of ARGOS famers and orchardists which were conducted to find out how they dealt with shocks over their time in farming (Sanne et al., 2011a) and orcharding (Sanne et al., 20011b). It was found that sheep/beef farmers were resilient and flexible. The sheep/beef retrospective interviews revealed that ARGOS farmers' responses to shocks - including the impact of Government policy and the lower returns they have been receiving for their animal-based products – resulted in many farmers making changes which gave them greater flexibility to respond to future shocks and diversified their product range. This flexibility is such that ARGOS sheep/beef farms reveal no common patterns of meat production – variability being the norm.

The single desk marketing organisation ZESPRI has managed a robust kiwifruit industry which has enabled different kinds of people to participate with a sense of satisfaction. However the sustainability of the industry is challenged by the coming together of several challenges – the psa incursion, the declining market value of Hayward green kiwifruit and the value of land.

9.3.2 Implementation pathways: changing practices to manage risk and enhance chances of survival

Elements of sheep/beef farmers' pathways to sustainability on-farm included:

- Increasing lambing percentages by breeding genetics.
- Scanning pregnant ewes to better manage nutritional requirements.
- Stocking rate flexibility - destocking at certain times of the year to manage anticipated drought periods, by earlier lambing, faster lamb growth through better feed etc., trading in stock to manage feed availability.
- Keeping greater stocks of silage, baleage and growing feed crops, to have on hand sufficient feed for winter or drought periods.
- Increasing farm size by purchase or lease of land to provide a run-off for summer.
- Adding irrigation, or increasing the area already irrigated.
- Diversification – changing the balance of sheep and cattle, providing dairy support, growing for meat rather than wool, growing contract crops only, animal trading.
- Reducing fuel consumption by employing low till techniques.
- Belt tightening – reducing fertiliser input, reducing costs.
- Focusing on efficiency - seeing farm as a business.

Off-farm elements included:

- Off-farm work. (Female partners often work in their own right and though this may not be to complement the farm's finances, it does this none-the-less.)
- Restructuring of finances. Many wanted to earn sufficient income to help them prepare for succession by investing off-farm.

High country farming is also changing: The retrospective interviews of the High Country farmers illustrated the many different forms of farm ownership available. Farmers can now own or lease land under different arrangements. As the fine wool market has been through a long period of poor market returns, High Country farmers were taking a particular pathway to sustainability through:

- Diversification - producing both meat (merino lambs and beef) and fine wools, developing a niche market for merino meat.
- Intensification - finishing stock themselves on irrigated and cultivated land, growing their own supplementary feed crops.
- Long term contracts of 3- 5 years for fine wool with companies like Icebreaker, with whom farmers develop personal relationships.

In the Kiwifruit industry ZESPRI leads from the front and orchardists follow: The kiwifruit retrospective interviews were carried out before the discovery of PSA on orchards. Pathways to sustainability have been imposed by ZESPRI as it has responded to what they have viewed as market demands. In return orchardists have responded to these demands with their own pathways. These have included:

- Off-orchard work – which is more readily available in the areas where kiwifruit is grown.
- Response to labour shortage by changing pruning techniques.
- Response to Taste ZESPRI by the development of controversial vine girdling techniques. Some orchardists are not practicing them or now reducing this practice because of concern about the impact on vine health long-term.
- Continued support for the single desk structure of ZESPRI.
- Response to GlobalG.A.P.is now incorporated into practice after initial fears of some orchardists about being restricted to book work. For younger orchardists such audit practices are just part of being a contemporary business.
- Response to KiwiStart is mixed. This was expressed as concern about the quality of early season fruit.

9.3.3 The relative effectiveness of various pathways and tools for promoting change

The complementary pathways to sustainability report examined quantitatively the pathways (apart from audit) that the ARGOS kiwifruit orchardists and sheep/beef farmers took to ensure they survived through the time of the ARGOS study (2003 to 2011). Hard data gathered on aspects of farm management, environmental, economic and social aspects of farming practice gathered over the period of ARGOS (2003 to 2010) were analysed.

Farmers/orchardists may already be following best practice, and so be seeking to maintain practices rather than improve on them, so it was realised that the analysis needed to study absolute values over time (variable means) as well as change. The analysis of the sheep/beef farming system was found to be complex and the meat production data showed high variability over the past few years. That is, farmers were constantly adjusting their systems in terms of how many stock they finished/sold/bought etc. This introduced another way of looking at the data – how variable was it? Were farmers and orchardists constantly adjusting their practices or were they doing the same thing year after year? The obvious analysis was to find whether there were different patterns of practice followed by groups of farmers/orchardists which were resulting in differing outcomes over the time of the ARGOS study so far.

Pathways to sustainability indicate resilience over time. Core variables were chosen to develop groupings of farmers and orchardists that would align sufficiently to form separate indices of resilience associated with intensification, capital value, efficiency and sustainability. Cluster analyses on a reduced number of variables composed from principal components analysis produced different groupings of farmers and orchardists associated with averages, change and variability of the core variables. Further characteristics of these groups were then found by analysis using relevant variables from the ARGOS research. Hence the core variables were used for analyses in three forms – means over time, annual change/trend, and variability of a variable over time (s.d.).

9.3.4 Kiwifruit pathways

What strategies have orchardists practiced and are they sustainable and/or resilient?

Group 1 – on way up by moving on to a 'better' orchard, one in a location more suited to kiwifruit growing

Group 2 – small, were lifestyle orchards expected to make a profit or gain capital value but now not profitable, now possibly managed, selling/want to sell, dependent on unpaid labour

Group 3 - inefficient and inconsistent - trying to do the right thing by building up the soil, trying to manage costs but not consistently

Group 4 – high investment for high return, constantly innovative, resilient but not sustainable

Group 5 – consistent, reliable and profitable - low input (most organic), low expenses, continue to do what they have always done, sustainable but not resilient

9.3.5 Sheep-beef pathways

Sheep/beef farming is practiced in very diverse ways. Most of the results showed considerable variation over the years indicating that managing all the things that impact on a farming enterprise requires continual adjustment and adaptation, there are so many variables and uncertainties. The strategies used by famers over the period of ARGOS could be summarised in the following ways:

- Low input organic farmers - only sustainable financially because of unpaid labour, low expenses, and adding value to their products through on-farm processing.
- Innovative high risk, highly profitable farmers who vary what they do season by season by following the market in cropping and finishing of stock. They are possibly very resilient but their dependence

on irrigation and high fertiliser and pesticide use (for the non-organic farmers) probably compromises this. The inclusion of an organic farmer in this group indicates that there are other ways of achieving very profitable farming.

- Consistent, profitable and efficient farmers with high equity, who are cautious in preparation for extreme weather events with high supplies.
- Stable/consistent, efficient, reliable farmers who make a modest profit and look after their soil resource. They could be sustainable, but not resilient because of their consistency which means they are less adaptable and innovative, surviving through bad times by the common farmer tactic of 'belt tightening' (rather than risk taking).
- Investing and changing farmers who have been adding to their land area and investing in farm development.
- Low performing, high cost farmers.
- Extensive pastoral farmers with a lower rate of production, but a good soil resource who are making a meagre living.

9.4 Findings of relevance to indicators for sustainability: Reflections on the Complementary Pathways analysis.

9.4.1 The variables: indicators used

As shown in Table 9.1, 14 core variables were chosen by the ARGOS team to separate the kiwifruit orchards and orchardists, and 15 were used to separate out the sheep/beef farms and farmers, to find the different pathways they had followed over the past eight years. The variables were chosen according to availability – those that had been measured over the past eight years - and relevance. (Unfortunately there were no environmental variables apart from physical soil measurements.) Each of these variables was studied as an average, annual trend and s.d. (as a measure of its variability). Averages, annual trends and variability were analysed separately. In the sheep/beef analyses it was found that three farms with a high proportion of income from cropping dominated the data, so a separate analysis was also carried out on the sheep/beef data which did not include these farms.

Table 9.1: Core variables used to find complementary pathways to sustainability

	Kiwifruit	Sheep/beef
Category	**Core variable**	**Core variable**
Intensification	E0S/ha	EFS/ha ($)
	COS/ha	NFPBT/ha ($)
	Trays/ha	Carc wgt/ha
	% Green	Crop %
Capital	Canopy area (ha)	Effective area (ha)
		Equity %
	pH	pH
	Olsen P	Olsen P
	N %	N %
	K	
	S	
Efficiency	COE/GOR	FWE/GFR
	EOS/tray	EFS/su ($)
		NFPBT/su ($)
		Lambing %
Sustainability		EFS/farm ($)
		NFPBT/farm ($)
Others	DM	
	Size	

9.4.2 The framework

As stated earlier, the variables were classified into four categories – to do with intensification, capital resources, efficiency or financial sustainability. (Some of the variables could have fitted into two or more categories. All covered sustainability in one way or another.) It was hoped that separate indices could be formed for each of these categories so comparisons could be made on these indices. Hence, it was expected that the variables in each of the categories would be correlated with each other and so could easily be added or given a composite score through PCA analysis, to form indices. However, this did not happen (e.g., see Hunt, 2011: 80).

Learning 1: the variables did not correlate with each other as expected or group together in the PCAs.

Implication: One variable will not necessarily stand in (act as a surrogate) for several other supposedly linked variables as a measure of intensification, for example.

In the sections that follow descriptions are given of the four categories of the framework used in the ARGOS analysis and then a 'learning box' summarises what was found in this category that is relevant to the Dashboard. The results from which these were formulated are to be found in the Complementary Pathways Report (Hunt, 2011).

9.4.3 Intensification

Intensification was chosen as one category because there is a current argument about whether intensification is a good or bad thing. If productive land is intensified and land not suited to productivity is used or left for some other purpose it is thought this practice may make a farm more sustainable. Measures of intensification were taken to be the amount of profit made per effective ha, the production per effective ha, and the percentage of the orchard that grew green kiwifruit (less intensive than gold kiwifruit) or the percentage of a farm's income from cropping (the higher the more intensive). These latter variables were not included in the trend or variation analyses because they did not change or vary much over the ARGOS years.[34]

Profit was measured in two ways – one of which included cost of unpaid labour and feed reserves (sheep/beef).

Learning 2: For kiwifruit, changes in intensification are reflected in changes in efficiency and DM.

Implication: It may be that only one variable will be needed to represent changes or trends, or that several could be added together or used in a PCA to obtain a score/index representing all variables.

Learning 3: The kind of labour and the amount of it is important in comparisons between farms.

Learning 4: Whether income is earned from cropping is important.

Implication 1: Farms/orchards may need to be 'typed' in some way before it can be said that they are sustainable or not (or can be assigned a 'sustainability score).

Implication 2: this demonstrates the increasing complexity of assigning 'sustainability' values to indicators.

[34] An obvious thing missing here is the amount or proportion of the farm that is not used for productive purposes, i.e., the 'ineffective' ha!

9.4.4 Capital resources

Capital resources were measures of the attributes of the farm or orchard on which its production was based. Hence, farm or orchard 'effective' size, and the physical soil resources are measures of the potential productivity, and the percentage equity is a measure of the level of ownership of the farmer in the capital resources of the farm/orchard. It is only measured here for the sheep/beef farmers because the situation is different in the kiwifruit sector where the ARGOS orchard under study was sometimes just part of a larger orchard and the ownership structures varied such that equity was not an easily available variable.

Learning 5: Not all indicators may be available or appropriate measures for a sector.

Learning 6: For kiwifruit, capital as measured by the physical properties of the soil, except for pH, may be represented sufficiently by one variable.
Implication: They may be averaged or calculated in a PCA analysis to produce a single score measuring soil capital.

Learning 7: Changes in cropping and lambing percentages need to be balanced by fertiliser inputs. (This is known but it has implications for indicators.)

Implication: Nutrient budgeting – are resources being replaced? Can this be used predictively and militated rather than mitigated after the event? Does it make no difference as long as it is done?

Learning 8: Will all capital resources be independent of each other?

Implication: How many will we need indicators for? Which ones are important?

9.4.5 Efficiency

Efficiency was measured by the ratio of expenses to gross revenue, a standard measure for a primary-based production business. It was also measured by the profit made per unit of production, a higher value indicating how efficient the business is at turning production into profit (converting the flow of product into money-based capital).

Learning 9: Size of farm/orchard may be an important indicator

Learning 10: Could use one measure of profit as an indicator as long as labour (and feed stored?) was taken account of somewhere else? NFPBT is an easier indicator to produce than EFS.

Learning 11: The profitability of the farming enterprise has more to do with efficiency than production.

Implication: What weight do we place on production in terms of sustainability? This is an interesting question because at some point a farmer has to produce something no matter how efficient s/he is! There must be some minimum production for maximum profit/sustainability point for particular levels of efficiency.

9.4.6 Sustainability

While all the variables used related to sustainability it seemed that one things that was missing was whether the orchard or farm was making enough for it to provide a reasonable standard of living for the owner/s and their family. This could only be measured by the profit the farm was making as a whole, independent of size. It was not an appropriate measure for an ARGOS orchard for the reasons already discussed above. This exemplifies the fact that a business needs to be defined as being of a particular kind for certain indicators to be applicable. (What are the classifications needed? Owner operated, family, corporate, managed, leased etc.)

9.4.7 Kiwifruit: DM and fruit size

These two variables were added to the analysis because they seemed to be important. DM is the main quality on which KF are marketed, and growers receive payments for their DM level – Taste ZESPRI. Size is related to production because it is measured in trays/ha because the size of a kiwifruit is related to how many can fit in a tray.

Learning 12: the relationships between some variables will be already well known in the industry.

Implication: Only one variable may need to be collected from an orchardist to fix the position of several others.

9.4.8 What other framework of variables might make sense rather than the intensification, capital, efficiency and financial sustainability framework?

The next sections indicate how variables in the pathways analyses were grouped and the implications this might have for the Dashboard indicator frameworks.

9.4.8.1 Kiwifruit

For averages:
Profit/ha (EOS, COS), effective area (orchard size) and efficiency (COE/GOR, EOS/tray – profit per tray) could form a composite indicator as an average or a factor score from a PCA.

Soil measurements could form another composite indicator that is a measure of the soil capital/resource (Olsen P, % N, K, S). pH and K were aligned in a separate factor.

Production – quantity and quality – could be measured by trays/ha, DM and fruit size, as long as there were separate categories for green and gold fruit before the analysis started. If an orchard grew both fruit perhaps some measure of the percentage that was green would need to be used, or perhaps this could remove the need for categorisation. This also raises the question of what to do when there are now different varieties of kiwifruit grown?

Annual change:
Change in profit, production efficiency and DM were all aligned and therefore might form a composite indicator or be represented by a single value.

Change in Olsen P was associated with change in fruit size.

Variability:
Variability in efficiency was only associated with variability in the COS/ha measure of profit.
Variability of production was associated with pH soil K, and fruit size.
Variability in Olsen P was associated with DM variability.

The other measure of profit, EOS/ha was associated with soil % N.

9.4.8.2 Sheep/beef

For averages:
Use EFS or NFPBT or both? For assessment of change and variation probably only need one. If use NFPBT would need to build in something to do with labour and with feed supply/storage.

All forms of EFS could be grouped – therefore only need one or would a PCA or average of them be better in explaining sustainability?

EFS is also related to crop % and soil %N. Should crop % be included as an indicator or a way of sorting/categorising a farm before deciding on its sustainability? Should soil %N be included as an indicator? (It could be part of data required to use a Decision Support Tool.)

All forms of NFPBT could be grouped – therefore only need one or would a PCA or average of them be better in explaining sustainability? NFPBT also grouped with equity and farm effective area. Do we need indicators for all of these? (A farmer would probably have this data readily available.)

Production – meat production and lambing percentage are closely aligned (though this may change over time if a farmer decided to take greater risks – see above). (This brings up the idea of what social variables do we need? A risk profile?)

For trends.
Financial variables all linked – change in one implies a change in any of the others.
Soil variables – linked to cropping % except for Olsen P.

For yearly variation.
EFS (per ha, su and farm) linked to financial efficiency and also NFPBT/farm.
NFPBT (per ha, su) linked with equity and EFS/su.
Soil variables (except for Olsen P) linked to lambing %.
Meat production linked with Olsen P.

In the PCA analysis of trends, a changing lambing percentage was related to a dropping meat production which may mean that lambing percentage will stand in as a proxy indicator for production statistics which are very hard to come by and difficult to calculate. This is an obvious link between lambing rates and production, but one that raises other questions. How could more meat be produced that is not related to lambing rates? Could a farmer confound this link by producing heavier lambs, buying in lambs to finish etc. Could this also be related to risk management?

Learning or point for pondering: Once an indicator has been selected as a proxy for another indicator or indicators, how could this link be broken? Implication: Continuing research may have to be done on the discarded indicators to check that they are still linked to their proxy indicator and that some practice of farmers has not changed the manifestation of this link.

It could be expected that a trend in one variable would be reflected by the trend in another to which it related in some way, whether or not these variables show a link when measured as averages. Similarly variation in one variable would be reflected in another to which it was linked in some way. Each value of a variation variable consists of the s.d. of a set of values over time and therefore is not fixed at any point in that time period. (So though each of these s.d.s could be considered to be made up of a trend plus the

variation of the differences of each value from that trend, it could mean that there is some relationship between the analysis of trends and variations. Hence variables aligned in the PCA of variation may also be aligned in the trend PCA because a large variation may indicate a trend and be linked to other variables that also have large variations.)

Thinking points: An indicator based on an average, is an indicator of the level of a variable. It is not an indicator of a trend. Variability can sometimes be partly explained by a trend.

Variability is also an important part of the power of statistics. Are the results we are saying are the same just a result of the variability and number of the measurements made. Do they actually have the power to pick up differences?

9.4.9 What form could data be in when collected over time – means, trends/change and/or variability?

What form could be used for variables that have been collected over several years? Should they be analysed as means, annual changes, or a measure of variation?

9.4.9.1 Means

What could averages of variables tell us about sustainability and resilience (Tables 6.2 and 11.4)? They obviously indicate the quantity of something – that is they measure stocks of capital. If they are compared to some maximum or ideal, then they could also measure a level of capital.

9.4.9.2 Trends

A trend describes whether this variable is changing and whether this change is regarded as indicating whether the level of sustainability is getting better or worse. Hence the trend data measures the flows of capital.

9.4.9.3 Variation

What has variability got to do with sustainability? A resilient farmer is one who can adapt to changing circumstances and work with his/her farm through change. The variability of an indicator can tell us something of this. However, to be sustainable a farmer also needs some consistency and stability. So which variables can serve of indicators of adaptability and which ones need to be stable? For example, profit probably needs to be reasonably stable to provide a consistent and reliable living for a farming family and to leave some room for costs to cover change or development, but the components that influence profit need to be able to be adapted and changed.

Variability may be covering up a trend, therefore would it be necessary for all variables to be examined to see if they need to have the trend removed so that the variability left over can be examined? (One example here is a financial adjustment so all financial data is adjusted to the value of the dollar value in a particular year.)

9.4.10 Typing the ARGOS indicators

Stats NZ describe indicators as either, stocks, flows, levels or structural capital (see Table 6.2). How do these relate to different forms of a variable over time? To briefly summarise Table 6.2 – stocks are the resources/capitals from which the profit is made, flows are the changes in those resource levels, measure the extent to which a need is met and are usually compared against something else, and 'structural' capital is the extent that a capital is being used in a socially and environmentally responsible manner.

An attempt has been made to classify the variables used by ARGOS into these kinds (see Table 9.2). The problem is that the more they are examined the more they seem to measure more than one 'kind' of capital. For example, profit can be thought of as a stock because it provides money/capital for spending in

the next year say, but it can also be regarded as a flow because it is what has come from what is done on a farm. If it is considered per farm, then it could also be regarded as a structural variable because it could be put against some baseline of what income is required in a household to live adequately – like a 'living wage'. Similarly equity is a stock because it shows how much capital you have (and which you could use and go into debt for development, for example) but it is also a 'level' because it is a measurement of whether or not you fully own your farm, which would presumably be regarded as optimum.

Table 9.2: What types of variables were used in ARGOS 2 to differentiate pathways to sustainability?

	Kiwifruit	Sheep/beef		Type of variable			
Category	**Core variable**	**Core variable**	**Variable form**	**Stock**	**Flow**	**Level**	**Structural**
Intensification	E0S/ha	EFS/ha ($)	mean	√			
			trend		√		
			s.d.	√			
	COS/ha	NFPBT/ha ($)	mean	√			
			trend		√		
			s.d.	√			
	Trays/ha	Carc wgt/ha	mean		√	√[35]	√[36]
			trend		√		
			s.d.	√			
	% Green	Crop %	mean	√			
Capital	Canopy area (ha)	Effective area (ha)	mean	√			
			trend		√		
			s.d.	√			
		Equity %	mean	√		√	
			trend		√		
			s.d.				
	pH	pH	mean	√		√	
			trend		√		
			s.d.	√			
	Olsen P	Olsen P	mean	√		√	
			trend		√		
			s.d.	√			
	N %	N %	mean	√		√	√
			trend		√		√
			s.d.	√		√	
	K		mean	√		√	
	S		mean	√		√	
Efficiency	COE/GOR	FWE/GFR	mean			√	√
			trend		√		√
			s.d.				
	EOS/tray	EFS/su ($)	mean	√			
			trend		√		
			s.d.	√			

[35] Could be compared against some optimum – what is considered to be 'best practice'?

[36] There could be some value which is regarded as efficient and good use of the land resource – where any more could be considered to be pushing it too hard?

		NFPBT/su ($)	mean	**√**			
			trend		**√**		
			s.d.	**√**			
		Lambing %	mean			**√**	**√**
			trend		**√**		
			s.d.		**√**		
Sustainability		EFS/farm ($)	mean				**√**
			trend				**√**
			s.d.				**√**
		NFPBT/farm ($)	mean				
			trend				
			s.d.				
Others	DM		mean				
			trend				
			s.d.				
	Size		mean				
			trend				
			s.d.				

9.4.11 Which variables seemed to count?

If an indicator is to be of any value it must be able to differentiate the sustainability status of one farmer from another. A variable in which all farms or farmers obtain the same value will not serve the purpose of an indicator, except of course, in terms of compliance. Which variables in the ARGOS analyses (of means, trends and variation) were able to differentiate between farmers and orchardists? Cluster analyses were carried out on the PCA scores which had reduced the core variables to four or five factors. When the core variables were analysed across the groups/clusters formed from the cluster analyses the core variables had been able to differentiate the farms/orchards. This could demonstrate that all the core variables could be used as indicators.

Another part of the analysis used all the variables collected across the time of ARGOS that had full enough data sets across the groups found in the cluster analysis. This analysis could be used to suggest other possible indicators that also separate out farmers or orchardists.

Tables 9.3 and 9.4 show which variables were able to differentiate between the groups of orchardists and farmers found using a cluster analysis of the PCA scores of core variables. In these tables, there are three columns for the analyses performed on the means of the data, the annual trends and the variability as measured by the s.d. The groups formed in these analyses were then tested over the means, trends and s.d.s of each available variable. So, for example, in the kiwifruit table (Table 11.3), the EOS/ha showed significant differences across the groups found in the means and variability analyses for the means and s.d.s of the EOS/ha data, while for the trends analysis only the trend of the EOS/ha was able to differentiate. When a variable is able to differentiate across each kind of analysis it is circled. If it is able to differentiate within one kind of analysis for manes, trends and variability it is also circled.

Table 9.3: Kiwifruit: Variables that may be indicators

Area	Variable	Form	Means	Trends	Variability
Financial: Income	EOS/ha	mean	√	√	√
		trend		√	
		s.d.	√		√

Area	Variable	Form	Means	Trends	Variability
	COS/ha	mean	√		√
		trend		√	
		s.d.	√		√
	COE/GOR	mean	√		√
		trend		√	
		s.d.	√		√
	EOS/tray	mean	√	√	√
		trend		√	
		s.d.		√	√
	GOR/ha	mean	√		√
		trend		√	
		s.d.			√
Financial Expenses	Electricity	mean	√		
		trend	√		
		s.d.	√		
	Spray and chemicals	mean	√		
		s.d.	√		
	Repairs and maintenance	mean			√
	Pollination	mean	√		
		trend		√	√
		s.d.	√		
	Fertiliser	mean	√		
		s.d.	√		
	COE/ha	mean	√		√
		trend	√		
		s.d.	√		√
Capital	Effective land area	mean	√	√	√
	Equity%	mean			√
		trend			√
		s.d.			√
Soil resource	pH	mean	√		
		trend			√
		s.d.	√	√	
	Olsen P	mean	√	√	√
		trend		√	
		s.d.		√	√
	N%	mean	√		
		trend		√	√
		s.d.	√	√	√
	K	mean	√		
		trend			
		s.d.	√		√
	S	mean	√		
	C%	mean	√		
		trend	√	√	√
		s.d.	√		√
	C/N	mean	√		
		trend		√	
		s.d.		√	√

Area	Variable	Form	Means	Trends	Variability
	AMN/N	mean	√		
		trend			√
		s.d.	√		
Production	trays/ha	mean	√	√	√
		trend			√
		s.d.	√	√	√
	DM	mean	√	√	√
		trend	√	√	√
		s.d.		√	√
	fruit size	mean	√		√
		trend		√	
		s.d.	√	√	√
	% green	mean	√	√	√
		mean			
		trend			
Fertiliser applied	Sulphur kg/ha	s.d.	√	√	√
	Phosphate kg/ha	mean	√		
	Nitrogen kg/ha	mean	√		
Bird density	Introduced: all	mean	√	√	√
	Introduced: insectivores	mean	√	√	
	Introduced: granivorous	mean		√	√
Attitude variables					
Importance of financial indicators	B1a: Gross income				√
	B1b: Working expenses				√
	B1c: Change in bank balance				√
	B1e: Cash surplus/deficit				√
	B1f: Net profit/loss				√
	B1h: Ration working expenses to gross income				√
	B1k: Don't monitor		√		
Importance of production indicators	B2a:Health of stock and/or plants				√
	B2b: Yields/ha cf similar orchards			√	√
	B2d: Minimum weeds		√		
	B2g: Good mixture of productive uses		√		
Importance of environmental indicators	B3b: Soil biological activity		√	√	√
	B3c: Soil health		√	√	√
	B3d: Health of livestock and/or plants				√
	B3e: Biodiversity		√		
	B3f: Native bird spp.		√	√	√
	B3g: Bird spp.			√	√
	B3h: Native plant spp.		√		√
	B3i: Plants or trees		√	√	√
	B3l: Water budgeting		√		
	B3n: Pesticide use				√
	B3o: Energy use		√		

Area	Variable	Form	Means	Trends	Variability
	B3p: Carbon stored		√		
Importance of social indicators	B4a: Children involved in orchard			√	
	B4b: Time for community activities		√		
	B4c: Time for family and friends				√
	B4d: Time for recreation ...				√
	B4e: Connection to place		√		
	B4g: Orcharding contributes to local customs/traditions			√	
	B4h: Orchard contributing to community		√		
	B4m: Orchard workers are treated well		√		
	B4n: Scope for farm succession		√		
Consideration/implementation of approaches to management	C1e: Focus on limited no. income sources		√		√
	C1g: Seldom deviate from farm plans		√		
	C2: Orchard different in 10 years?		√		
Agreement with connections of management to -	D1a: wellbeing of self and family				√
	D1b: wellbeing of local community		√		
	D1c: wellbeing of nation and world		√		
Agreement with management affects -	D2a: productive areas		√	√	√
Importance of farming factors	F1a: Customer requirements		√		√
	F1c: Family needs				√
	F1e: environmental health				√
	F1f: future generations/succession		√		
Agreement with statements about emissions trading	G1a: NZ farmers contribute to climate change ...		√		
	G1d: Technological solutions needed				√
Agreement with statements about native bird diversity and farm management	H1A: would not like more birds on farm		√		
	H1Ac: Birds provide important services ...		√		√
	H1Ad: Not responsibility as land owner to encourage birds ...		√		
Agreement with statements about introduced bird	H1Ba: would not like more birds on farm		√		

Area	Variable	Form	Means	Trends	Variability
diversity and farm management	H1Bc: Birds provide important services ...		√		
	H1Bd: Not responsibility as land owner to encourage birds ...				√
Importance of exotic trees and shrubs	I1Bd: Enhancing stream health by planting ...				√
Background information	J6: Level of debt (high to low)				√
	J7: Satisfaction with level of economic viability				√
	J10: No. of years in future expect to be orcharding			√	

From the above table it can be seen that possible variables that could act as indicators because they look as if they provide a sufficient range of values to separate out kiwifruit orchardists[37] are:

- Production/level of intensification – trays/ha, DM, fruit size, % of orchard that grows green kiwifruit
- Profit – EOS/ha
- Capital resources – effective orchard area (canopy area), soil Olsen P, soil % of Carbon
- Efficiency – profit (EOS)/tray
- Expenses – COE/ha, electricity
- Applied fertiliser – Sulphur – kg/ha
- Bird intensity – all introduced birds
- Social attitudes – importance of soil biological activity and health, level of agreement with how much management affects the productive areas of an orchard, importance of having a number of native bird spp., and a number of plant or tree spp. on orchard.

Table 9.4: Sheep/beef: Variables that may be indicators

Area	Variable		Means analysis	Means (w/o crop)	Trends analysis	Variation analysis
Financial: Income	EFS/ha	mean	√	√		
		trend	√	√	√	
		s.d.	√	√	√	√
	NFPBT/ha	mean	√	√	√	√
		trend	√		√	
		s.d.	√	√	√	√
	FWE/GFR	mean	√	√		
		trend	√	√		
		s.d.	√	√		√
	EFS/su	mean	√	√		
		trend	√		√	√
		s.d.	√	√	√	√

[37] This does not necessarily mean that they would make good indicators for other reasons. The potential indicators need to be evaluated for a number of qualities.

Area	Variable		Means analysis	Means (w/o crop)	Trends analysis	Variation analysis
	NFPBT/su	mean	√	√	√	√
		trend	√		√	
		s.d.	√	√	√	√
	EFS/farm	mean	√	√		
		trend	√	√		
		s.d.	√	√		√
	NFPBT/farm	mean	√	√	√	
		trend	√	√		
		s.d.	√	√		√
	GFR/ha	mean	√		√	√
		trend	√	√	√	
		s.d.	√	√		√
	GFR/farm	mean	√	√		
		trend	√	√		
		s.d.	√	√		√
Financial Expenses	Stock expenses/ha	mean	√	√		
		trend	√	√		
		s.d.	√	√		
	Cash cropping/ha	mean	√	√		
		trend	√	√	√	
		s.d.	√	√	√	√
	Pasture/ha	mean	√	√		
		trend	√	√		
		s.d.	√			
	Vehicles and fuel/ha	mean	√		√	√
	Repairs and maintenance/ha	mean	√			√
		trend	√	√		
		s.d.		√		√
	Other/ha	mean	√			
		s.d.	√			
	Overheads/ha	mean	√			√
	Cash & NC labour/ha	mean	√			√
		s.d.	√	√		√
	Cash & NC feed/ha	trend	√	√		
		s.d.		√	√	√
	Fertiliser	mean	√	√	√	
		trend	√	√	√	√
		s.d.	√	√		
	Weeds and pests	mean	√		√	
		trend			√	√
		s.d.	√	√	√	
	FWE/ha	mean	√			√
		trend		√		√
		s.d.	√	√		√
	FWE/farm	mean	√	√		√
		trend	√		√	

Area	Variable		Means analysis	Means (w/o crop)	Trends analysis	Variation analysis
		s.d.	√			√
Capital	Effective land area	mean	√	√		
	Equity%	mean	√	√		
		trend		√	√	√
		s.d.		√		
Soil resource	pH	mean		√		
		trend			√	√
		s.d.			√	√
	Olsen P	mean	√	√		
		s.d.	√			
	N%	mean	√	√		√
		trend	√	√	√	√
		s.d.	√	√		√
	C%	mean	√	√		√
		trend	√		√	√
	C/N	trend	√			
	AMN/N	mean				√
		trend		√		
		s.d.				√
Production	Carcase weight/ha	mean	√	√		
		trend			√	
	Crop %	mean	√		√	√
		trend			√	√
		s.d.	√		√	
	Lambing %	mean	√	√	√	
		trend			√	√
		s.d.		√		√
Management	Stock units/ha	mean		√		
		trend	√			
		s.d.	√	√	√	
	% Sheep	mean				√
		trend	√			√
	Scanning %	mean	√	√	√	
	Total DM used t/farm	mean		√		
	Total wet matter used t/farm	mean		√		
	Total supplements not used t/farm	mean		√		
Fertiliser applied	Calcium kg/ha	mean	√	√		
		s.d.	√	√		
	Calcium kg/su	trend				√
		s.d.				√
	Calcium t/farm	mean	√	√		
		trend		√		
		s.d.	√	√		
	Potassium kg/ha	mean	√		√	
		trend	√			√

Area	Variable		Means analysis	Means (w/o crop)	Trends analysis	Variation analysis
	Potassium kg/su	mean	√		√	
		trend	√			√
		s.d.			√	
	Potassium t/farm	mean		√		
		trend	√			√
	Magnesium kg/ha	mean	√			
		s.d.	√			
	Magnesium t/farm	mean	√			
		trend	√			
		s.d.	√			
	Nitrogen kg/ha	mean	√	√	√	
		trend	√	√	√	√
		s.d.	√	√	√	
	Nitrogen kg/su	mean	√	√	√	
		trend		√	√	√
		s.d.		√	√	
	Nitrogen t/farm	mean	√	√	√	
		trend	√	√		√
		s.d.	√	√	√	
	Phosphate kg/ha	mean	√	√		
	Phosphate kg/su	mean	√	√		
		s.d.		√		
	Phosphate t/farm	mean	√			
		s.d.	√	√		√
	Sulphur kg/ha	mean	√	√	√	
		trend			√	
		s.d.	√			
	Sulphur kg/su	mean	√	√	√	
		trend				√
		s.d.	√			√
	Sulphur t/farm	mean	√	√		
		trend	√	√		
		s.d.	√	√		
Bird density	Introduced spp.	mean	√			
		trend				
		s.d.	√		√	
	Native spp.	mean	√			
		s.d.	√			
	Introduced: insectivores	mean	√	√		
		trend	√		√	√
		s.d.	√			√
	Native: insectivores	mean	√	√		
		trend		√		
		s.d.	√	√		
	Introduced: granivorous	mean	√			
		s.d.	√			
Attitude variables						

Area	Variable		Means analysis	Means (w/o crop)	Trends analysis	Variation analysis
Importance of financial indicators	B1a: Gross income		√			
	B1c: Change in bank balance		√	√		√
	B1d: Actual vs budget income		√	√		
	B1e: Cash surplus/deficit			√		
	B1f: Net profit/loss				√	√
	B1g: Changes in equity		√		√	
	B1h: Ratio of working expenses to gross income			√		√
	B1i: Return on capital				√	
Importance of production indicators	B2a:Health of stock and/or plants			√		√
	B2b: Yields/ha cf similar farms		√			
	B2d: Minimum weeds			√		
	B2e: Volume of production at a maximum					√
	B2g: Good mixture of productive uses			√		√
	B2i: Reducing carbon emissions			√		√
Importance of environmental indicators	B3b: Soil biological activity			√		
	B3c: Soil health		√			
	B3d: Health of livestock and/or plants		√			
	B3g: Bird spp.		√			
	B3h: Native plant spp.		√	√		
	B3i: Plants or trees		√	√		
	B3j: Water quality in streams ...			√		
	B3k: Presence of prod. & non-prod. spp.		√			
	B3m: Nutrient budgeting		√			
	B3n: Pesticide use			√		
	B3o: Energy use				√	
	B3p: Carbon stored		√			
Importance of social indicators	B4g: Farming contributes to local customs/traditions		√			
	B4h: Farm contributing to community		√			

Area	Variable		Means analysis	Means (w/o crop)	Trends analysis	Variation analysis
	B4i: Neighbours approve …				√	
	B4k: Neighbours consider me a good farmer				√	
	B4m: Farm workers are treated well		√			
	B4n: Scope for farm succession		√	√		
Consideration/ implementation of approaches to management	C1a: Adopt proven practices …			√		√
	C1b: Pay close attention to changes …					√
	C1c: Pay close attention to ... good financial returns ...			√		
	C1g: Seldom deviate from farm plans		√			
	C2: How different farm in 10 years?					√
Agreement with connections of management to -	D1b: wellbeing of local community		√			
	D1c: wellbeing of nation and world		√			
Agreement with management affects -	D2c: environment on a global scale					√
Importance of farming factors	F1a: Customer requirements			√		
	F1e: environmental health					
	F1f: future generations/succession		√			
	F1g: Off-farm product quality			√	√	
Agreement with statements about emissions trading	G1a: NZ farmers contribute to climate change ...				√	√
	G1b: NZ farmers should take responsibility only …		√			
	G1c*: Farmers being asked to assume more than their fair share ...			√		
	G1d: Technological solutions needed		√		√	
	G1e: Higher market returns will balance costs		√			√

Area	Variable		Means analysis	Means (w/o crop)	Trends analysis	Variation analysis
Agreement with statements about native bird diversity and farm management	H1Aa: would not like more birds on farm		√			
	H1Ab: Native birds help farm cope ...			√		
	H1Ad: Not responsibility as land owner to encourage birds ...		√	√		
	H1Ae: Interested in participating in native bird tick accreditation			√		√
Agreement with statements about introduced bird diversity and farm management	H1Ba: would not like more birds on farm		√		√	√
	H1Bb: Introduced birds help farms cope ...			√		
	H1Bc: Birds provide important services ...					
	H1Bd: Not responsibility as land owner to encourage birds ...		√	√		√
	H1Be: Interested in participating in bird tick accreditation			√		√
	H1Bf: Some birds cause damage ...					√
Importance of planting native trees/shrubs	I1Aa: To generate carbon credits					√
	I1Ab: To increase native bird diversity & abundance		√	√	√	
	I1Ac: To increase insect diversity & abundance		√	√	√	
	I1Ad: Enhancing stream health by planting …				√	
	I1Ae: To enhance shelter for stock					√
	I1Af: To manage erosion		√			
	I1Ag: To make farm look attractive				√	√
	I1Ah*: To provide fodder for stock		√			
	I1Ai: To provide logs & timber		√			
Importance of planting exotic trees/shrubs	I1Ba: Generate carbon credits			√		
	I1Bb: To increase native bird diversity & abundance		√	√		

Area	Variable		Means analysis	Means (w/o crop)	Trends analysis	Variation analysis
	I1Bc: To increase insect diversity & abundance		√			
	I1Be: To enhance shelter for stock					√
	I1Bf: To manage erosion		√			
	I1Bg*: To make farm look attractive		√		√	
	I1Bh*: To provide fodder for stock		√			
	I1Bi: To provide logs/timber					√
Background information	J8: How many years ... associated with current farm?		√	√		
	J9: How many years farming?		√	√		
	J10: No. of years in future expect to be farming		√			√

From Table 9.4, it can be seen that there are considerably more variables that could act as indicators because they produce enough of a range of values over means, trends and variability to separate out sheep/beef farmers according to their level of sustainability. They are:

- Profitability/intensification – EFS/ha, NFPBT/ha, % of income from cropping
- Financial sustainability - EFS/farm, NFPBT/farm
- Efficiency - FWE/GFR, profit per stock unit – EFS/su, NFPBT/su
- Income – GFR/ha, GFR/farm
- Expenses – FEW/ha and FWE/farm, stock expenses/ha, cash cropping expenses/ha, pasture costs/ha, fertiliser costs/ha, weeds and pests expenses/ha
- Capital - % equity, soil % N
- Applied fertiliser – Calcium, Magnesium and Sulphur (tonnes/farm), Nitrogen (kg/ha, kg/su, tonnes/farm)
- Bird density – introduced insectivores
- Social attitudes – level of agreement with 'would not like more birds on farm'

9.5 Insights from other ARGOS research

9.5.1 Differences between management systems

In ARGOS 1 in depth interviews were undertaken of all farm and orchardist participants (Hunt et al. 2005, 2006). From these interviews we devised an 'ovoid ideal type' (e.g., Hunt et al, 2006: 124) to illustrate how we found that farmers and orchardists had a lot in common but their particular management practice (organic/organic green, integrated/integrated green or integrated gold, or conventional) pushed out 'bumps' that symbolised practices that were more likely to be found in those practicing a particular management system. As indicators need to differentiate between practitioners these characteristics will be summarised below in order to provide more clues as to what indicators may be appropriate for use in the Dashboard.

The typical green orchardist:

- Relies on established production methods.
- Likes a tidy orchard – sees it as an indicator of good management, environmental health, and responsible behaviour.
- Likes to be in control.
- Sees him/herself as providing community wellbeing through employment.
- Often owns a kiwifruit orchard as a way of managing an active retirement.

The typical organic orchardist:

- Considers that looking after the environment involves a belief in broader ideals and stewardship of the land.
- Is creating an environmental haven.
- Experiments with practices.
- Is concerned about the practices of neighbours and the impacts of these on their orchard.
- Uses fewer sprays and in particular does not use the bud break spray, hydrogen cyanamide.

The typical gold orchardist:

- Emphasises financial aspects of orchard management and has a sophisticated understanding of financial management.
- Is prepared to spend on capital investment in orchard.
- Places an importance on lifestyle.
- Likes new challenges.
- Is entrepreneurial.

The typical organic sheep/beef farming couple:

- Are happy to be 'different'.
- Pursue change in order to be more resilient economically and environmentally.
- Pursue more lucrative markets.
- Work with nature.
- Think of soil in terms of its biological rather than chemical nature.
- Rely on breeding and natural resistance for animal health.
- Are more interested in health of pasture and crops than in productivity.
- Belong to communities that tend to be distant rather than local.
- Enjoy the challenge of growing organically.

The typical integrated sheep/beef couple:

- Have a vision of increased productivity.
- Are able to work to produce stock that meet requirements (quality and quantity) of market via a meat processing company contract.
- Actively pursue practices that increase their farm's resilience to the ups and downs of the sector (climate, market and exchange rates).
- Are more organised and structured and so able to take time off.

The typical conventional sheep/beef farming couple:

- Are most susceptible to the stress of farming life.
- Emphasise perseverance.
- Value and participate in the traditional rural community.
- Have a vision that involves the maintenance of the present farming system.

9.5.2 Life cycle stages

It was also found that a certain degree of what happened on a farm could be explained by the life cycle stage of the farming family (Hunt et al., 2006: 127-8). This was not necessarily dependent on the age of the farmers or of their children but a combination of both with rather fuzzy boundaries. In an unpublished report we suggested that farmers managed to make a larger profit when their children were at primary and secondary school and that this profit diminished if they went on to higher education when funding availability was related to parental income (Hunt, 2009). The life cycle stages for sheep/beef farming couples were identified as follows. There may be more but these fitted the ARGOS farming couples.

Stage 1: The farming couple are young and may have young children. Finances are likely to be tight and they may be having trouble distinguishing themselves from their parents.

Stage 2: The children likely to be at school and the needs of the family are being considered in terms of the farm house. It can be a stressful time balancing the needs of the family with those of the farm, for example, in terms of taking holidays.

Stage 3: The farming couple are middle ages and their children are leaving or have left home. They have become more relaxed but the physical toll of farming on aging bodies is likely to be having an impact.

Stage 4: The farming couple are planning how they are going to manage succession. They are less likely to be trying something new.

9.6 Conclusion

This chapter has examined the research carried out in the ARGOS programme over the past nine years to identify what indicators might form KPIs for the Dashboard project, what has been learned, and what other questions are raised by this research. It has been useful in finding indicators that not only identify an outcome and/or a process but also were useful in identifying trends and variation over time. It is going to be important to choose indicators that allow measurement of progress towards sustainability, rather than just a state of sustainability. Variables that were common to both kiwifruit orchardists and orchards and sheep/beef farmers and farms were:

- Production/level of intensification
- Profitability – level of intensification in terms of crop/product value
- Financial sustainability - a 'liveable' income
- Capital resources –effective farm/orchard area, soil attributes, % equity
- Financial efficiency – ratio of working expenses to gross revenue, expenses per unit of product
- Expenses
- Income
- Applied fertiliser
- Bird intensity
- Some social attitudes

The next chapter moves on to a discussion of points raised in this report.

Chapter 10: Discussion and conclusion

10.1 Sustainability and measurement

Bell and Morse (2008) remind us that sustainability is an ever changing concept in which measurements need to be viewed as part of the journey, not the end result:

"… sustainability is the mindset of those who are intimately entwined with its achievement, and not an entity that lies 'outside' of our heads. In other words, sustainability cannot be studied as we can study an ecosystem. Like the term environment, but far more so, sustainability is what we want it to be and can change as we change. It is an organic and evolving construct of our minds and not an inorganic and static entity that can be physically probed. Indeed the very action of trying to implement what we think is sustainability may change one's vision of what it is. The best we can achieve is to acknowledge the centrality of people and to put participation and the narrative or story of sustainability at the very heart of implementation. The issue now becomes one of compromise between expectations and what is achievable without causing harm … This may be vague; but it is the nature of the beast. Indicators can play a very useful role here but only in terms of empowerment and not as precise measures".

In a sense the search for sustainability indicators masks what is a very qualitative, inductive exercise. Bell and Morse (2008) try to understand it like this: "Why have many tried to show that sustainability = 42? In part, the answer lies in a very human desire to understand and make sense of complexity, and this appears to arise with every new human vision of where we want to be. We want to achieve X, so let us first understand it, and to do this we need to measure it. An alternative and equally human approach would be: we want to achieve X, so let us first understand it by means of knowing how the story of it relates to the story for me or us; by knowing this story we relate and correlate the notion of X to our own self-notion. In this process the knower and the known are one – this is knowing beyond measurement" (Bell and Morse, 2008: 200-201). John Reid (pers. comm.) has made a comment about two roles the Sustainability Dashboard can play. It can be "a 'consciousness raising' learning tool versus a rating and evaluation tool for an enterprise." He asks, "How do these two elements talk to each other?"

In 1996 an international group of measurement practitioners and researchers met in Bellagio, Italy to review the progress made since the meeting of the Brundtland Commission in 1987 and to develop new ways to measure and assess progress towards sustainable development. The result was the development and publication of the ten Bellagio principles which attempt to cover both the flexible, growing in understanding component of sustainability, while also presenting principles of measurement. These are:

1. What is meant by sustainable development should be clearly defined.
2. Sustainability should be viewed in a holistic sense, including economic, social and ecological components.
3. Notions of equity should be included in any perspective of sustainable development. This includes access to resources as well as human rights and other 'non-market' activities that contribute to human and social well-being.
4. Time horizon should span 'both human and ecosystem time scales', and the spatial scale should include 'not only local but also long-distance impacts on people and ecosystems'.
5. Progress towards sustainable development should be based on a measurement of 'a limited number' of indicators based on 'standardized measurement'.
6. Methods and data employed for assessment of progress should be open and accessible to all.
7. Progress should be effectively communicated to all.
8. Broad participation is required.
9. Allowance should be made for repeated measurement in order to determine trends and to incorporate the results of experience.

10. Institutional capacity in order to monitor progress towards sustainable development needs to be assured.

(See Box 1.5, Bell and Morse, 2008: 22, adapted from Hodge and Hardi (1997)).

10.2 Business sustainability frameworks

In order to understand what to measure for business development sustainability, those in a business need to have a grasp of how stakeholders envision it operating. It is important to decide on a framework for indicators. A framework links all the indicators together. It provides the action/movement/process component that moves between what you start with (resource) and what is produced at the end (outputs/outcomes). It is the part that explains how the starting resources are transformed into something else (Figure 4.3). It means that the sustainability indicators are not static.

In this report the different approaches to the development of frameworks for sustainability business indicators have been described. It was hoped to make clear that underlying the development of such indicators there are some differing understandings of the way the world works. While most indicator frameworks are based on the longstanding RIO three pillars of sustainability - environmental, economic and social - with an addition of something to do with governance or institutionalisation, many frameworks then branch out into a theme or systems based approach to make sure all aspects of sustainability are covered in terms of the interests of the organisation. The most common base to build on is a capitals approach. For example, in a model of an agricultural business weight is placed on natural or environmental capital and how the business converts this capital into other forms of capital. In the Business Practice and Performance model this takes the form of emphases on the context, strategy, operational framework and the outcomes which Knuckey et al. (2002) have reduced to two components – strategising/practice outcomes, and operational/outcomes. The capitals-based approach has been critiqued by the systems and theme based approaches as needing to address complexity and inter-relationships better. The systems based approach does this by attempting to see sustainability more holistically. (In fact the capitals approach is also a systems approach in the sense it provides a model of how a system works.) The theme based approach does it by introducing policy-based themes that relate better to government goals and aspirations and may use indicators from any of the three/four pillars of sustainability.

Some entities have not developed a framework at all relying just on themes of financial success and production, indicating sometimes that they have not thought beyond reporting for statistical collection purposes for a government ministry or NGO. It is notable the indicators collected by Beef+ Lamb, or the farm monitoring programme are not structured in a useful framework. Many of the best practice models such as those used in agriculturally based competitions are similar though there is a somewhat camouflaged benchmark of how far an entrant is away from 'best practice'. The DairyBase model, while collecting mainly financial and physical resource and product –based KPIs does have all the previous years' data to compare these figures against.

The capitals approach makes the trade-offs more transparent. What resource is being used and what is it converted to? What is left in its place? It seems the crucial part of measuring sustainability is whether or not you believe that something (a resource) can be substituted for something else (another resource). The capital's approach is that unless a resource is regarded as 'critical' it can be substituted by something of an equivalent value and presumably something that will serve the same purpose.

Putting indicators into a three pillars (plus four) framework runs the risk of becoming static. It would be easy to lose sight of any movement towards or away from sustainability. We need to remember that the aim is to become 'more' sustainable. So ultimately there is a need for a time component within the Dashboard so that farmers, growers and orchardists can see for themselves what they have achieved and what they need to do to move towards more sustainable practices. Sept

10.3 The indicators

10.3.1 The problem of context indicators

It is obvious from the examples given in this report that there are many indicators already in use to choose from! In addition the Dashboard team may feel that they wish to construct some themselves. One of the issues apparent straight away from the indicator lists is that some of them relate to classes, categories or context variables that affect the responses to 'what is sustainable?' and how the response fits the level of sustainability (e.g., red, amber or green). These are variables that cannot be benchmarked and many are of the yes/no or 'tick the box' variety. Many of them set the conditions before any exploration can start of a level of sustainability. Examples of these sorts of context variables/indicators are sector in which the business takes palce, location, size (of farm/orchard, number of employees, turnover etc.), political climate (e.g., government policies and legislation), compliance with an audit system, exchange rate, business structure – size and ownership structure – and type, and the length of time in business. These are measure of the internal and external environment in which the business takes place and can be quite individualised. They are factors that need to be accounted for before sustainability can be measured. How many of these factors to account for will be a big question in the dashboard design.

10.3.2 Indicators based on the three pillars plus one framework

If the three pillar (plus one) framework of environmental, economic, social and governance/institutional categories is to be used then there are some obvious indicators that will be chosen, If the environment is thought of as a source of natural capital or resources then there will be measurements to do with land, climate, water, soil, atmosphere and biodiversity. However, all of these resources can be impacted on or transformed through agricultural use and management practices by the use of fertilisers, pesticides, energy, and may produce not only agricultural products but waste or by-products (Izac and Swift, 1994). Therefore it is likely that these too will need to be measured and/or the related change in the original resources. This balance between resource use and the associated risks is very much part of the capital based model. The SAFA framework includes plant and animal health in the environmental category, so while these can be seen as a necessary resource for agricultural production, they are also the result of management practices and other factors.

The economic pillar will consist of standard indicators to do with 'money' such as an enterprise's revenue, profit, efficiency (the expenses to total revenue ratio), equity, return on assets etc. However, it can also be thought of as the resource provided by human-made capital such as contribution to a country's wealth (exports, pay rates, work provision etc.). As with the other categories there is also an element of risk which seeks a balance between the cost of innovation compared with business as usual.

The 'social' and governance/institutional pillars have a considerable overlap. While both can be associated with working conditions, for example, the social is more to do with the benefit or wellbeing of the individual whereas the institutional is to do with the wellbeing of the society and community through having the provision of good working conditions. The attributes an individual has in terms of knowledge and skills are regarded as social whereas at the governance level the concern is to do with the provision of places of learning and skill development. The governance pillar is to do with the resources society has through the existence of social norms, the way a government enables through policy and legislation, the encouragement and support of equity, gender equality and cultural diversity, while the social pillar can also cover social capital – the resources an individual has developed that enable them to be of benefit to society through the work (paid and unpaid) they can do.

A cross-cutting theme that does not seem to fit in any particular one of the pillars is that of farm management. It could be seen as having 'process' indicators and it is also a resource in terms of the skills and attributes of a farmer.

As stated in one of the Bellagio Principles, all indicators need some form of comparison– to a former value in time so that progression to a particular desirable state can be measured or movement towards an aspirational benchmark .

Saunders et al. (2007a: 25) suggest that there are some indicators that are potentially significant in predicting agribusiness sustainability, performance and success. They are the use of business plans, the presence of recent management changes, a focus on product quality (e.g., improving dry matter in kiwifruit), farmer and employee training and adopting innovations from increasing computer use for records or communication, to adopting new crops or management practices. Further, Saunders et al. (2007a: 25) wonder if the agricultural sector is so heterogeneous it is difficult to find indicators that will apply universally and that people in agribusinesses seem to have found many ways to be successful". Hence, "simple indicators may not be robust enough to capture their range of experiences".

As far as John Reid (pers. comm.) is concerned "it is not necessary for most enterprises to put in place Key-Performance Indicators. However, it is important that they have Practice Indicators in place. This is because if sustainable Practice Indicators are being met then Key-Performance Indicators and associated Standards will automatically be met. What is important, however, is that there are key enterprises, within territories, that are measuring across Key Performance Indicators and testing new practices to improve sustainability performance. This will continually give rise to new practices (and new Practice Indicators) that are correlated to strong social, economic and environmental performance."

It is clear that any presentation of data has its limitations and in the process of presentation development it loses some of its detail in the drive for accessibility to a particular audience. However, it is hoped that with the presentation of sustainability indicators there will also be delivered a desire to understand more, pursue further and implement ways of becoming more sustainable.

10.4 Helpful attitudinal approaches to sustainability

10.4.1 Compliance

According to John Reid (pers.comm.), "the challenge with approaches like the SAFA is that it is compliance heavy – this is because it is performance focused – and attempting to measure across so many variables. I consider that it [the Dashboard] should be focused primarily on practice rather than the outcomes of practice (performance).

Through focusing on improving practices that lead to improved environmental, economic and social outcomes, then you are far more likely to get buy-in from enterprises. This is because it is about learning and conscientization rather than identifying deficits in performance - a 'carrot and stick' approach which businesses dislike.

This does not mean however that you don't use 'key performance indicators' in some circumstances. However, you only need to use them on the more innovative enterprises where you are trying to find correlations between practice and sustainability performance within a particular territorial context. You use these fishing/farming/forestry enterprises to establish your Practice Indicators following testing on these enterprises.

My conclusion from this is that we should focus the dashboard on Practice Indicators that are background informed and tested on various enterprises in different territorial contexts.

For example a farm the dashboard would concentrate on farm practices in the following way:

- % of streams fenced – aiming for 100%
- N and P applications below Xkg per ha per year
- % wetlands fenced (if relevant) – aiming for …%
- % of woody ground cover on landmass – aiming for ….%
- Stocking rate per hectare per year under x number
- Management of debt to equity %

- Time invested into voluntary community activities
- $ spent in local businesses and infrastructure
- Etc.,"

John suggests that the majority of Practice Indicators could be easily monitored (e.g. satellite imagery could be used to determine streams fenced, wetlands fenced, stocking rates, woody ground cover etc., while bank IRD records could be used for financials, etc.. In making these suggestions he introduces other issues. Who is going to 'use' the Dashboard? The general understanding has been that it needs to be farmer friendly and interactive. If a farmer does not need to enter his/her own data then will they use it? How often is it expected that someone will use the Dashboard? For farmers to incorporate it as part of their practice it needs to be used frequently enough for a person to get used to using it. However, the indicator selection would have to be on this basis and how many indicators in farming make any sense on a weekly or monthly time line unless time of year/season is somehow taken account of? For a system like DairyBase, for example, it is expected that the accountant of the farm business would enter the data, and/or a consultant would work with the farmer. This raises the question of whether it will need to be used via an 'expert' who would also interpret what the results mean.

10.4.2 Attitudes

Bell and Morse (2008) in a chapter title 'Where next? Humility and honesty', advocate a need for all of us to change our culture "to one that is more inclusive and tolerant of other beliefs". The result would be:

- "An appreciation that 'different' does not mean 'wrong';
- A recognition that variety is the basis for sustainability;
- An understanding that time spend in understanding other people's viewpoints is time saved later when the project starts" (Bell and Morse, 2008: 201).

10.4.3 Reflection and reflexivity

Bell and Morse (2008: 203) think that an essential and omitted element for all work to do with sustainability indicators is 'reflective practice'. While there is an ever increasing amount written about sustainability indicators there is very little written about how it worked, or producing an underlying theoretical base. Such acknowledgement of our vulnerability would produce:

1. A recognition (in humility) that we are all learning: the only human being who ceases to learn is a dead human being.
2. New contexts can be experienced and from this can follow understanding.
3. The object of our study is part of us; if we study and learn about it, we are engaged with it and have become part of it (no matter however slightly)" (Bell and Morse, 2008: 204).

10.5 Conclusion

It is regarded as important to measure sustainability to see if we as individuals, as a nation and as the world are moving in the right direction (Saunders et al., 2010). However, while sustainability is intuitively comprehensible, in practice it is difficult to define and operationalize (Briassoulis, 2001), as the definition of sustainability can vary and hence the indicators chosen to measure it can vary by discipline, objective, interest group and so on (Saunders et al, 2006a:15).

This report has detailed some of the different frameworks commonly in use to direct the development of indicators that measure business sustainability. The manner in which a business is structured will reflect on the appropriateness or suitability of a particular framework for measuring its sustainability. Therefore a chapter was devoted to business models in general and then how these might be adapted to represent agribusinesses. Another chapter presented sustainability frameworks that are independent of a particular business model. The most common base to build on is a capitals approach. In a model of an agricultural business weight is placed on natural or environmental capital and how the business converts this capital into other forms of capital. One capitals-based model is the value creating model where the emphasis is on

trade-offs between capital, over time and between organisationally owned capital, those owned by others, and those not owned at all. Different approaches illustrate differing understandings of how the world works. The capitals-based approach has been critiqued by the systems and theme based approaches as needing to address complexity and inter-relationships better. The systems based approach does this by attempting to see sustainability more holistically. The theme based approach does it by introducing policy-based themes that relate better to government goals and aspirations and may use indicators from any of the three/four pillars of sustainability.

The agribusiness model of Saunders et al. (2007c), and the business reporting frameworks IIRC and GRI are strongly based on a capitals approach. Some models are based on a systems approach such as the BSC, the organisational development model, SFB and possibly the best practice model. Others are based on a thematic approach such as the later UN frameworks and RISE while others have developed from a mix of these approaches, for example, Stats NZ, UN, BPP and SAFA. Stats NZ, for example, has a framework based on the three capitals but then uses a themed approach for the indicators.

Most indicator frameworks are based on the longstanding RIO three pillars of sustainability - environmental, economic and social - with an addition of something to do with governance or institutionalisation. However, from there many frameworks branch out into a theme or systems based approach to make sure all aspects of sustainability are covered in terms of the interests of the organisation. Some entities have not developed a framework at all relying just on themes of financial success and production, indicating sometimes that they have not thought beyond reporting for statistical collection purposes for a government ministry or NGO.

One chapter in this report delves into business indicators. How are they defined? What do they do? How are they best constructed? It then provides some of the many available examples. It has set out what decisions need to be made when setting up business sustainability indicators, about what is to be measured, about what sort of measure is it to be (quantitative, qualitative, objective or subjective), and about what qualities a good indicator should have. Another chapter summarises what has been learnt from the ARGOS programme and how it might be useful to the Dashboard project.

It is appropriate to end with a hopeful quote from Bell and Morse who, though having major issues with measuring sustainability, still believe it is a worthwhile, if not essential, ongoing project for humankind.

“Nevertheless we believe we will never achieve a universal and unchanging set of sustainability indicators that provide a handle on sustainability, and the challenge is one of keeping pace with people’s conceptions, ideas and dreams and trying to make them real. With sustainability, we (the whole of humankind) really are the creators” (Bell and Morse, 2008: 201).

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