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**Towards a tool for the analysis of
developing pastoral livestock industries
in the Pacific Islands**

A thesis
submitted in partial fulfilment
of the requirements for the Degree of
Master of Applied Science

at
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by
Stephen Alastair Hamlin

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Pacific Island countries have been unable to achieve self-sufficiency in meat from pastoral livestock. Livestock industries generally remain in a plateau of production despite many development projects supported by governments and international donors. This research analysed 30 projects that committed time and resources to aiding the growth of Pacific pastoral livestock industries. Most projects focused on technical and biological aspects of on-farm production, as well as training personnel on the same aspects. This was despite strong evidence found in the literature that many other aspects of industry are also vital to industry growth. The framework for analysis of livestock industries produced by this research included nine vital industry components. Seven of the nine industry components were underrepresented in the design of the past Pacific projects.

This research took a practical approach to the problem by creating a tool aiming to make it easier for future project designers to analyse the entire scope of their Pacific livestock industry of interest. The tool was developed after formation of the framework for analysis to ensure all vital industry components were considered. The framework was contextualised by fleshing it out with understanding from within-industry data. This understanding was formed by analysing information elicited from key informants within the Samoan pastoral livestock industry. Literature addressing industry constraints was used to strengthen the analysis and understanding of the context.

The research to develop the tool found that land tenure issues, availability of livestock, credit availability and return on investment all heavily influence the number of livestock the nation will carry. Genetics, expertise, sale prices along with many cultural specifics will influence the level of productivity of any livestock farm. These factors in turn are influenced by other factors which must

also be understood. Government policy, livestock organisations and industry communication tend to influence the performance of the industry at many levels.

The tool takes the form of a three page checklist consisting of questions for the user to probe the industry of interest. It can be used by development generalists. Use of the tool in the Pacific is likely to result in modifications which will increase its usefulness in certain contexts. This thesis stresses the journey 'towards a tool' for industry analysis because it should not be considered a finished product. Its primary attribute is to ensure an even-handed consideration of where resources should be applied. The tool is presented in this thesis along with guidelines, limitations and an illustration of its use.

Keywords: livestock, cattle, sheep, industry, Pacific, agriculture, development, project design

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Table of Contents

Abstract	ii
Acknowledgements	iv
Table of Contents	v
List of Tables	vii
List of Figures	viii
Abbreviations and Acronyms	ix
Chapter 1 Introduction	1
1.1 Introduction	1
1.2 Background	1
1.3 Aims and objectives	3
1.4 Structure of the thesis	5
Chapter 2	7
2.1 Introduction	7
2.2 The concept of 'industry'	7
2.3 Defining livestock industry development	9
2.4 The development of a framework	10
2.5 Selection of literature to inform the framework	10
2.6 Analysis method and resultant framework for analysis	11
2.7 Projects aiming to develop Pacific pastoral livestock industries	14
2.8 A comparison of projects with the framework	16
2.9 Study conclusions	17
2.10 Limitations to the findings	18
2.11 The generic nature of the framework	18
2.11.1 Livestock industry considerations	18
2.11.2 Considerations of pastoral livestock industries in the Pacific	19
2.12 Conclusions	20
Chapter 3	22
3.1 Introduction	22
3.2 Existing methodologies for industry analysis	22
3.2.1 Comprehensive methodology	23
3.2.2 Farmer First methodology	23
3.2.3 Farm First influence in the research	24
3.3 Samoa as a model for livestock analysis in Pacific Island countries	24
3.4 Underlying logic for the creation of the tool	25
3.5 Research approach	26
3.5.1 The interview process	26
3.5.2 Human Ethics	27
3.5.3 Overlapping of data collection and analysis	27
3.6 Results	30
3.6.1 Contextualised components from the framework for analysis	30

3.7	A model of the industry	34
3.8	Aims of the tool	39
3.9	The process of creating the tool.....	40
	Pacific Livestock Industry Constraints Identifier: a Tool.....	42
3.10	Using the tool.....	45
3.11	Reducing bias	46
3.12	Potential tool limitations	47
	3.12.1 Limitations of original data	47
	3.12.2 User to user variation.....	48
	3.12.3 Economic assumptions.....	48
	3.12.4 Heterogeneity in the Pacific.....	49
3.13	Notable absences in data from interviews	49
	3.13.1 Environmental issues	49
	3.13.2 Competition	50
	3.13.3 Marketing.....	50
3.14	Illustration of the tool’s use	50
3.15	Conclusion.....	53
	Chapter 4 Conclusions	55
4.1	Overview	55
4.2	Findings.....	55
4.3	Limitations and evaluation of the research	56
	4.3.1 Data collection and analysis	56
	4.3.2 Use of the tool	57
	4.3.3 Further development of the tool.....	57
	Appendix A Data from past projects versus ‘priority needs’ comparison.....	59
A.1	‘Priority needs’ literature analysis data.....	59
A.2	Past project analysis data.....	61
	Appendix B Data profile for nine Pacific Island countries	65
	Appendix C Interview Guides	66
C.1	Interview guide for Samoan farmers	66
C.2	Interview guide for government advisory staff	66
C.3	Interview guide for university staff involved in teaching agriculture courses	67
C.4	Interview guide for veterinary staff involved in livestock	67
C.5	Interview guide for Samoan retailers of beef products (NB no formal retail of sheep meat currently exists).....	68
C.6	Interview guide for government staff involved in writing &/or evaluating agricultural policy....	68
C.7	Interview guide for Samoan land rights staff	69
	References	70

List of Tables

Table 2.1	The generic framework for analysis of Pacific pastoral livestock industries.....	12
Table 3.1	Biases which could lead to erroneous results if not minimised. Adapted from Chambers (1981).	46
Table 3.2	Identified constraints to the development of the Samoan sheep industry and their inclusion in past projects	53
Table A.1	Graphical summary of components stressed in 17 'priority needs' papers.....	59
Table A.2	Graphical summary of components stressed in 30 past project reports.	61
Table B.1	Complete and near-complete data for nine PICs of interest showing average figures as compared to Samoan data.	65

List of Figures

Figure 1.1.	A typical cycle of activities used in action research	5
Figure 2.1.	Priority needs of Pacific pastoral livestock industries and the percentage of selected papers that stress the importance of those needs.....	13
Figure 2.2	Differences in weighting of policy objectives in nations of different development stages. From The State of Food and Agriculture (FAO, 2009, p. 97)	14
Figure 2.3.	Past projects set against the priority needs of the industries, and the percentage of projects or papers that stress importance of each industry component.....	16
Figure 3.1.	A constraints hierarchy using availability of cars as an example.....	35
Figure 3.2	An example of a potentially misleading constraint relationship.....	36
Figure 3.3	A model of constraint relationships in the context of the Samoan sheep and beef industry	38
Figure 3.4	An example probe within the tool: identification of PPLI-specific credit constraints.	41
Figure 3.5	An illustrative report from use of the tool using the Samoan sheep industry as the subject	52

Abbreviations and Acronyms

ACIAR	Australian Centre for International Agricultural Research
AusAID	Australian Agency for International Development
DFID	Department for International Development (United Kingdom)
ESCAP	Economic and Social Commission for Asia and the Pacific (of the United Nations)
FAO	Food and Agriculture Organization (of the United Nations)
GDP	Gross Domestic Profit
GHG	Greenhouse gases
ICU	Intensive Care Unit
MAF	Ministry of Agriculture and Fisheries (of Samoa)
PIC	Pacific Island Country
PPLI	Pastoral Livestock Industry in the Pacific
R&E	Research and Extension
SPC	Secretariat of the Pacific Community

Chapter 1

Introduction

1.1 Introduction

The rural development industry has interested me for many years. While practicing as a veterinarian with livestock in New Zealand I gained a post-graduate diploma in development studies, then started investigating where international needs aligned with my interests and skills. After seeing rural development projects in Indonesia, Bolivia and Pakistan, a year designing livestock projects in Mongolia and two years in the Samoan Ministry of Agriculture, I have seen some patterns that are in need of attention. In all of these situations there were difficulties in identifying the best focus point for interventions to encourage further development. Finding a need is easy – finding priority needs, and finding *all* priority needs, is much more difficult.

Pacific pastoral livestock industries (PPLIs) are the challenging and intriguing focus of this research. Pastoral livestock are those animals which graze growing plants and this research concentrates on meat production rather than milk or fiber production. This research addresses unfulfilled needs, or ‘constraints to development’ in the Pacific context. It aims to contribute to the solution by creating a practical tool for analysing PPLIs and identifying priority needs.

1.2 Background

Pacific pastoral livestock industries are not thriving. Despite farming pastoral livestock for decades, Pacific Island countries have a high dependency on meat imports. Across these countries, the level of food self-sufficiency is dropping leading to livelihood risks and a continuous haemorrhage of much needed capital (Food and Agriculture Organization of the United Nations [FAO], 2009). In Samoa, 2010 figures estimate that 87% of consumed mutton and beef was imported despite the 6000 cattle or sheep owning households in a population of only 180,000 (Brandenburg, 2010, p. 6). All Pacific Island countries saw a drop in their agriculture¹ sector’s contribution to GDP in the 30 years to 2000; some countries by more than 30 percentage points (Balakrishnan, 2005, Table 11). Many firms and service providers throughout the industries are functioning poorly.

¹ The definition of ‘agriculture’ may include the production of crops and raising of livestock (Merriam-Webster, Incorporated, 2012). Although this research focuses on livestock, the close association between livestock and plants means that data is often aggregated since activities are often intertwined.

When accompanied by development of other sectors in the national economy, economists consider it tolerable, even desirable for small-holder agriculture to be gradually taken over by more productive ventures (FAO, 2009). The drop in agriculture's contribution to GDP is not a problem *per se*, the concern in the Pacific is that it is not being accompanied by necessary nation-wide development. Many livestock farmers appear to be unable to find productive work elsewhere and unable to make the climb out of poverty by increasing their production. Literature focusing on livestock in Pacific nations tends to be in agreement that the industries are under-whelming (MacFarlane, 2009; Aregheore, 2009; Ministry of Agriculture and Fisheries [MAF], 2011).

Failure-to-succeed situations in industry are not simple. There are a large number of debates and disagreements in the literature about how best to *characterise* industries, let alone improve them. The realities of industries simply contain too many variables to harness them into a simple recipe for success. Consider the complex nature of a parasitised ruminant converting poor quality grasses into milk on disputed land; consider the cultural pressures of providing the heifer with the best genetics for the funeral feast; consider customers choosing between poorly processed, potentially unsafe local meat and imported, high quality meat. These examples represent real life for those within livestock industries in the Pacific.

This problem is not trivial – there is a vitally important link between livestock and humankind. Livestock have been domesticated for human use since 8000 – 7000 BC (Zeder, 2008). Since then the human-livestock link has remained strong and its importance in absolute figures is still slowly increasing (FAO, 2001). Pastoral livestock are raised on 26% of the earth's ice-free land mass and support the livelihoods of nearly 1 billion people (FAO, 2009, p. 3). The world's poor have a disproportionate interest in pastoral livestock (Haan, 2001). As well as a source of income, livestock represent food security, savings, a continuing source of protein through meat and dairy products, skins and hides, fibre, mechanical power, collateral for loans, trading for other goods, insurance, transport, and can be a social indicator (*ibid*; FAO, 2001). Many of these potential uses are even more relevant for the poor than they are for larger scale farmers.

Governments of developing nations are starting to prioritise agriculture in their interventions, along with the international development community (e.g. FAO, 2009; MAF, 2011; Department for International Development [DFID], 2005). Developing livestock – the self-feeding, self-reproducing, self-growing asset – is to develop the livelihood of many of the world's poor. Livestock industries in developing nations also have relevance to several dimensions of nation-wide development. Employment, food security, and import substitutions are examples that encourage governments to support livestock industries.

The role of agriculture in poverty alleviation and economic development is controversial (Christiaensen, Demery, & Kuhl, 2011) but strong evidence for the link is prevalent (e.g. Diao, Hazell, & Thurlow, 2010; Fan, Brzeska, & Shields, 2007). Analysing the controversy is beyond the scope of this research; however, the existence of the controversy supports the notion that achieving poverty alleviation and economic development is a difficult and complex matter.

One significant difficulty comes when those designing development interventions need to decide where the intervention focus should be. Livestock industries in developing nations often involve large-scale donor involvement together with national government decision-making and investment. Typically, this relationship relies on expert informants and secondary data to design interventions and aid delivery. For example, an agronomist may be used to identify beneficial grasses, and a policy analyst will use national statistics to discuss needs for tax breaks. But it is difficult for any decision maker to systematically and comprehensively analyse livestock industries to see them in their entirety. Each stakeholder organisation has a skewed set of interests, skills and knowledge. Donors, governments, retailers, consumers and farmers, for example will each have a bias in his or her understanding of the whole system. It is natural for many farmers to be more concerned about farm-gate sale prices than about offal disposal in abattoirs and it is understandable if the urban poor complain about high meat retail prices but are less interested in rural land use rights.

Livestock do not exist in a vacuum. They form part of, and interact with many other dimensions. Given that these dimensions are connected we can expect them to potentially constrain each other. Nearly 30 years ago, rural development author Robert Chambers (1984) recognised that the difficulty in efficiently examining all aspects of a rural industry can result in over-emphasis of some intervention types, and under-emphasis of other interventions. This problem has not gone away. This research aims to help towards the solution.

1.3 Aims and objectives

Information about livestock industries, and tools to investigate them, certainly exist. Chapter 3 assesses the principles behind these tools. However, as evidence shows in this thesis, these tools have not been effective in sending project designers to the right places. To improve the situation, this thesis investigates the breadth of pastoral livestock industries in the Pacific, and creates a framework to facilitate a view of *all* aspects of these industries. From the framework, a specific tool is created as a way to ensure that the weakest links of an industry can be identified. This tool is systematic and comprehensive enough to minimise the risk of missing limiting constraints. It takes into consideration the particular characteristics of Pacific livestock industries without relying on the

unedited and sometimes inappropriate lessons from generic industry. Using the tool in a *specific* pastoral livestock industry in a *specific* Pacific nation should be possible for any generalist policy maker, industry leader or project designer.

The primary research questions of this thesis are:

- 1. What are the components of Pacific pastoral livestock industries that must be investigated in order to find constraints to the development of those industries?**
- 2. How can those components be presented within a tool for use in industry analysis?**

An illustration of the tool's use is presented to answer the following secondary research question:

What are the constraints to the development of the Samoan sheep industry?

The relevance of the tool is clear when we consider the development consequences of information gleaned from using the tool. If the above question can be adequately answered, industry leaders and project designers will then be able to ask highly relevant questions such as:

Can the constraints be overcome to potentially increase production?

How can interventions be designed to do this?

Although the last two example questions are beyond the scope of this research, it should be reiterated that these questions are often asked at present but they may not be asked of the complete range of constraints. If some limiting constraints have not been identified, their analysis is impossible.

The paradigm in which this research is conducted has much in common with epistemological constructivism. This is the notion that reality is a construction by an observer, rather than an objectively verifiable truth (Raskin, 2002). It is not sufficient, for example, to know some objective characteristics of a road, but this research is more interested in whether the observer considers it suitable for the purpose of transporting livestock. It is not 'truth' *per se* that is of interest, it is the construction of an understanding which is useful.

1.4 Structure of the thesis

This research has an iterative nature. It presents the findings in a multi-stage progression. As the iterations have much in common with the concepts of *action research*, it is useful to briefly describe an action research cycle here.

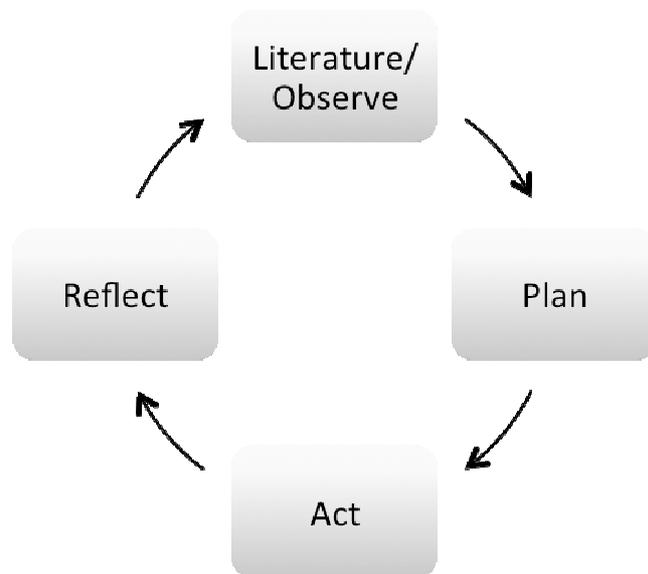


Figure 1.1. A typical cycle of activities used in action research

Action research uses theory and practice to define problems, act on them, and reflect on what can be learnt by the process (Avison, Lau, Myers, & Nielsen, 1999, p. 94). In order to make academic research more useable in real situations, a cyclic process is used to ‘try out’ ideas and theories and see how they fare in real life. While variations on the details of the processes exist in the literature, a diagram of a generic cycle is presented Figure 1.1. These stages align with the progress of this research and therefore how the structure of this thesis is presented.

Chapter 2 describes the first research cycle.

Literature was initially consulted to ensure a full view of industry. This full view gave the research a comprehensive or wide-angled lens through which to see all that industry consists of, and what it industry needs for success and growth.

A **plan** was then presented which aimed to create a framework for analysis of Pacific pastoral livestock industries. The plan included the use of the lens developed from the previous step, and further analysis of literature that focused on industry needs.

The **action** presented in Chapter 2 was the creation of a framework. Literature was selected and analysed to create new categories for industry analysis, with particular relevance to PPLIs.

To aid in the **reflection** process, past projects that aimed to support livestock industries in the Pacific were compared with the new framework components. This comparison helped to illuminate a problematic lack of alignment. A more in-depth understanding of particular characteristics of PPLI particulars was sought.

Chapter 3 starts a second research cycle.

In the **observation** phase, many stakeholders from within the industry were consulted by interview on how they perceived industry constraints. Literature supplemented the data from stakeholders.

Using the rich data from the interviews and literature, a **plan** was formulated as is presented in this thesis which used qualitative research techniques to contextualize the framework to specific livestock industries within the Pacific. The plan aimed to address a real-life problem: a project designer in the Pacific may or may not have the lens which enables analysis of all potential constraints to an industry, so there is a need to flesh out the framework for analysis in order to ensure the designer has a wide angle view of industry.

The plan was put into **action** to produce a tool intended for project designers which is presented in this chapter.

A number of limitations and cautions are discussed in the thesis on **reflection** of the new tool, as well as the anticipated benefits. The research questions were answered by the development of this tool.

In a final half cycle, the new tool was used to illustrate what it could produce in a real situation. The Samoan sheep industry was analysed by the tool and the findings are presented in Chapter 3.

Chapter 4 provides conclusions of the research and tool development. It summarises the research processes, its findings and considers how the research has met its objectives.

Chapter 2

2.1 Introduction

Chapter 2 develops an understanding of what industry is, and what is required for industry growth. Any industry which does not have all that it requires will, in a simple truism, be constrained by that lack. Throughout this chapter and the thesis, the argument excludes discussion on the design of solutions to constraints, despite much of the literature including both constraints and their solutions. It is the location of the solution within an industry rather than the design of the solution that is of interest.

This chapter presents the first cycle of action research. First, the literature was consulted to ensure a complete understanding of what defines an industry. A definition of 'development' was also made – one which defines what the industries are attempting to head towards. This process sensitized the researcher to all relevant aspects of PPLI growth.

Using a wide understanding of 'industry', a framework for analysis of industries was created. The process used literature that informed the researcher about priority needs of industries. The framework used a variety of literature sources and is complete, but non-specific.

Evidence is given that past attempts to improve pastoral livestock industries in the Pacific have been very narrow in scope and may have failed in their over-arching goals. The reflection process of this chapter finishes by addressing the differences between generic industry and Pacific livestock industries.

2.2 The concept of 'industry'

An underlying necessity of this research is to clarify fully what is meant by 'industry'. For an analyst to identify all constraints to an industry, s/he must consider any and all components of industry that have the potential to constrain its growth. Although industry is a commonly used term, definitions in the literature are not unanimous. The following explores influential industry literature and develops a comprehensive understanding of industry that was helpful for the research.

Porter, an influential industrial economist used as a working definition of industry: "[a] group of firms producing products that are close substitutes for each other" (Porter, 1980, p. 5). Porter considered this simple definition adequate for economic analyses of firms in a competitive

environment. Although he admits that industry definitions are often controversial, the controversy he is interested in is firmly within a paradigm of economic analysis.

Despite the fact that Porter claimed a narrow definition of industry, it is clear that he accepted the importance of other components that he considered essential to an industry. In the introduction of his seminal book, Porter used a graphic of industry interactions ensuring that the reader understands that many components² are important to an industry (Porter, 1980, p. xvii). Remaining consistent in his narrow definition of industry, Porter referred to any other function outside the producing firms as a “supporting industry” rather than being part of the industry of interest (Porter, 1990, p. 80).

A more inclusive way of defining the parameters of an industry is the value chain. Value chains are considered to be a useful way to analyse industries, particularly for poor countries new to competition in the global market (Kaplinsky & Morris, 2000). The government of India for example, defined industry grounded in value chain understanding: “any systematic activity... for the production, supply or distribution of goods or services with a view to satisfy human wants or wishes” (The Government of India, 1947, p. 4). This definition of production-distribution-consumption represents a chain of processes where value of a product increases as it moves along the chain. A steer in a paddock will increase in value when it becomes a chilled, dressed carcass, and increase again when it becomes packaged, finally increasing when it sits in the supermarket fridge being advertised for sale to the consumer.

It can be argued however, that value chains are not a complete way of analysing industry. Even the proponents of value chain analysis Kaplinsky and Morris admit that their methods do “not tell the whole story” (ibid, 2000, p. 2). Simple understandings of industry can neglect the “dense network of co-operation and affiliation” within them (Richardson, 1972, p. 883). Likewise, each *firm* must be seen in a full way in order to identify any industry constraints. Instead of simply lying within a flat and simple value chain, firms must be seen as embedded in society in every aspect of their structure and functioning (Scott & Meyer, 1994, p. 4).

Elaborating on the multifaceted industry environment, Van de Ven and Garud (1989) describe what they refer to as the ‘subsystems’ of industry. In order to form a functional industry, they argue,

² Those components are: Research and Development, Purchasing, Labor, Manufacturing, Distribution, Sales, Marketing, Target markets, Product line, and Finance and control.

firms and other industry actors must perform all functions within three subsystems. The first subsystem, the 'instrumental subsystem' correlates to the value chain concept, which has been described above – manufacturing, distribution and marketing are the focus of this subsystem. In addition, Van de Ven and Garud claim that an 'institutional subsystem' and a 'resource procurement subsystem' are vital for the function of an industry, and therefore help to completely define industry. The institutional subsystem acts to give legitimacy to the industry through governance, regulations, standards and support. The authors claim that without these functions, customers will be untrusting and powerful firms will dominate unfairly. Resource procurement must also function satisfactorily for a successful industry. The physical resources of manufacture are typically included in value chain analyses, but Van de Ven and Garud stress other forms of resources, argued as equally vital. Technical knowledge, financing and a pool of competent human resources (ibid, p. 207) constitute this subsystem.

Industry in this thesis will be considered in the widest of these definitions, considering any component for which there is good argument for inclusion. This research actively works towards inclusion of all components that may be constraining the development of PPLIs. This view, or lens through which industry is seen, is not common. Little of the industry development literature attempts to completely analyse the three subsystems of industries for example. Most look at only one speciality area such as competing on resources (e.g. Collis & Montgomery, 2008) or product innovation (e.g Henard & Dacin, 2010). The lens used by these authors allows for a great deal of specialisation and technical expertise, but is at risk of missing components which constrain the industries of their focus.

2.3 Defining livestock industry development

Another important point to clarify in this research is the definition of 'development' as it refers to PPLIs. Although multiple definitions of development exist (Sachs, 1997), this research implicitly asks: 'What are the aims of PPLIs?' and therefore 'what defines development for these industries?'

In Samoa, the government wants agriculture (including livestock) to contribute more to the nation's GDP (MAF, 2011, p. 46), and the World Bank wants to see improved productivity (The World Bank, 2012a). Elsewhere in the Pacific, agriculture (including livestock) is often awarded a priority focus (The World Bank, 2005; FAO, 2009). Regardless of their reasons for farming livestock, farmers, almost by definition want to produce more meat given their resources. Other stakeholders are also likely to benefit from increases in production.

In keeping with the broad objectives of these stakeholders, this thesis assumes the definition of livestock development to be '*an increase in meat produced per nation*'. By avoiding economics in the definition, the common cultural practices of gifting meat, or selling through covert informal markets is not judged as good or bad, unless it applies pressure to increase or decrease meat production. Other potential candidates for inclusion in the definition include poverty relief (FAO, 2011) and self-reliance in food production (MAF, 2011, p. x). On a national level these additional desires are included in the simple definition above. Fibre and dairy products are not included in this definition.

2.4 The development of a framework

In order to systematically assess all parts of industry, a framework for analysis of PPLIs was created. This framework defines which industry components are essential for growth of the industries, as defined by an increase in meat production per country.

The framework was developed using literature. Specifically, the literature was consulted with an inclusive view-point, or lens. Having addressed what is meant by 'industry', and using the widest possible definition, information was extracted based on how it is seen through this lens. Having been sensitized to the multiple dimensions of industry, the literature was seen in a different way than a specialist sees it. While missing technical detail, the advantage of this lens is its ability to provide a comprehensive view.

2.5 Selection of literature to inform the framework

A total of 17 generic and specific (to PPLIs) papers addressing industry needs were identified and analysed. An attempt was made to identify all components which are considered by published experts to be vital for the growth of the industries, as defined by an increase in meat production per country. It is assumed that 'priority needs' and 'constraints to growth' are directly but inversely correlated: any priority need which is absent or performing poorly will have become a constraint. The two terms can be used together with the knowledge that they are different sides of the same coin.

It is assumed that although published articles are often highly informative, many only aim to inform in their area of specialisation. The process of literature selection was purposive and based on an attempt to include a range of view-points. The selection of papers started with generic industry, moving to agri-business papers, livestock industries papers, and PPLI-specific papers. This gradual specialisation of analyses aimed to ensure that important fundamentals of industry were heard, as

well as livestock-specific viewpoints. Papers that took a broad whole-industry view were sought. Selection of papers in each category prioritized this whole-industry view, particularly where the industry(s) of interest were in developing nations. In the case of PPLI-specific papers, selection and analysis continued until data saturation.

Two generic industry analysis papers were selected: Porter (1990) and Van de Ven (1989). Both have been influential (as measured by a high number of citations), and both build a model to help the reader understand what is essential for the growth of an industry.

Three papers were chosen which analysed a large number of agricultural industries in their struggle to develop: Collins & Lim-Camacho (2005), Greer, Greer, & Zwart (2000) and Yadav, Deshmukh, & Sagheer (2009). These papers define the difference in needs between generic industries and agricultural industries.

Three 'birds-eye-view' policy oriented papers were included, all with a strong livestock focus: FAO (2011), Pica-Ciamarra (2010) and Department for International Development (2005).

Finally, nine papers concentrating on Pacific livestock industries were assessed: (Food and Agriculture Organization of the United Nations, 2008), Ramsay (2011), Henson (1998), Ministry of Agriculture and Fisheries (2011), Mgheni et al. (1993), Aregheore (2008), FAO (n.d.), Menz (1988) and FAO Regional Office for Asia and the Pacific (2002).

2.6 Analysis method and resultant framework for analysis

An analysis was performed on the 17 selected papers. The analysis identified the authors' findings or views on all aspects that are required for success in industry. These requirements were gradually reclassified into new categories chosen to facilitate comparisons between studies, and to help in the understanding of the structure of a successful PPLI. These categories are referred to as the "components" of industry in this section. It is only those components that the author(s) believed were *important* (and potentially constraining) for the industry that were marked. Simply mentioning a component was not enough to trigger its inclusion in the graph. During this phase of assessment the components evolved in an organic manner as more papers were included. The components acted as placeholders for organising the content of the papers. A brief description of the nine components follows. Despite the inclusion of PPLI-specific papers, this list acts as a generic but complete framework for the analysis of needs, and therefore of potential constraints to the growth of an industry.

Table 2.1 The generic framework for analysis of Pacific pastoral livestock industries

1	Farm level operations	Primary manufacture including materials, production, land, finance, management
2	Processing	The conversion of primary products into higher value goods
3	Retail/marketing/exports	The processes involved in getting the right goods into the hands of the consumer
4	Supply chain and infrastructure	Physical systems for the movement of materials, products, and anything else physically required for the industry
5	Human Resources	Getting the right skills in the right places within the industry
6	Government	Relates to part of Van de Ven's institutional subsystem which regulates, legitimises, and sometimes funds an industry
7	Food (or product) safety and quality	An additional component of legitimising industry. Often considered to be essential for meat production, but also relevant to any product for sale
8	Environmental Issues	Includes the effect the environment has on the industry (e.g. soil salination), and the effect the industry has on the environment (e.g. nitrogen leaching into waterways)
9	Relationships within industry	Includes <i>inter alia</i> sharing of resources for efficiency, availability of market information and the ability of private firms to influence government policy

The number of papers stressing each component was tallied and graphed (Figure 2.1). The horizontal axis lists each of the industry components; the vertical axis shows the percentage of papers which stressed the importance of that component. The particular components stressed by each paper can be found in Appendix A.1.

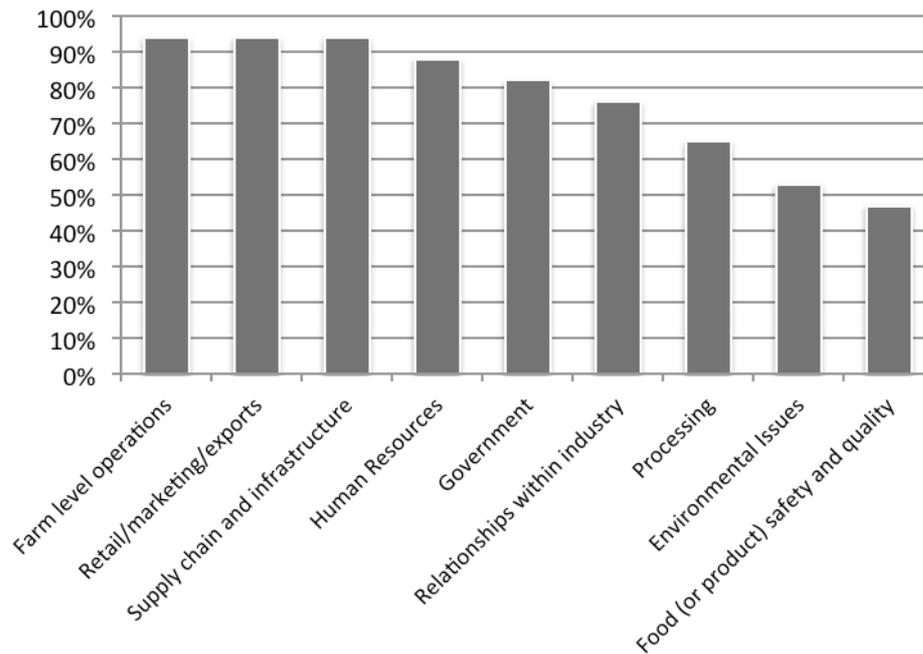


Figure 2.1. Priority needs of Pacific pastoral livestock industries and the percentage of selected papers that stress the importance of those needs

Despite attempting to select papers with a whole-industry view, no component was considered important by every paper. The most visible aspects of industry were most often stressed by the papers (*Farm level operations, Retail/marketing/exports, and Supply chain and infrastructure*).

A potential limitation to the conclusions is the reliability of the published industry literature. It is an assumption that the industry requirements (and therefore potential constraints) given by the literature have a high level of sensitivity and specificity. In other words, the literature may label some things requirements that are in fact, not essential in all situations, and the literature may *miss* requirements that are in fact needed for meaningful development of PPLIs. Published expert opinion is not necessarily correct in *all* situations and, in most cases, it does not claim to be. To minimise this limitation, this analysis has not dwelt on a single paper, but looked at patterns from 17 papers.

The least frequently appearing components featured in approximately half of the papers analysed. *Environmental issues* were considered important by only nine of the 17 papers. In the analysis this component was given a wide definition referring to local sustainability (e.g. soil fertility, longevity of pasture species), as well as factors contributing to, and resulting from global climate change. The other component stressed least frequently is *Food (or product) safety and quality* (8 of 17 papers). As the component name suggests, some papers were not food-specific so catchment for this component included product safety or quality for products of any type.

The low frequency of appearance of these two components in Figure 2.1 is likely to be a function of the bias in paper selection towards developing nations. The State of Food and Agriculture publication (FAO, 2009, p. 97) makes it clear that industry priorities (reflected by government policy) typically depend on level of development of the nation of interest. The FAO recognises that *Food Safety*³ and *Environment* are typically a low priority in countries of low or slow development with many smallholders (Figure 2.2). This provides an explanation for why these two components are not stressed by many published experts, and is applicable to the situation in Pacific island nations. This common characteristic of less-developed countries is not considered desirable or ideal by the FAO, and is not without risk (Haan, 2001). The underlying principle is that other factors like food security (the predictable availability of affordable food to the entire population) may take a justifiably higher priority in developing nations.

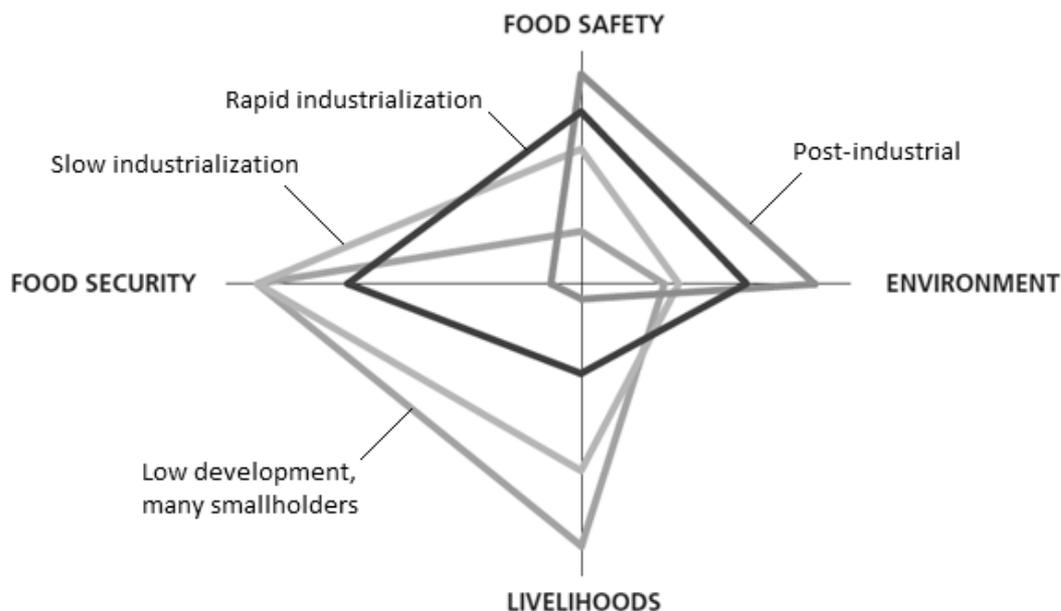


Figure 2.2 Differences in weighting of policy objectives in nations of different development stages. From The State of Food and Agriculture (FAO, 2009, p. 97)

2.7 Projects aiming to develop Pacific pastoral livestock industries

To aid in the reflection process of the research, a comparison was made between the focus of past Pacific livestock projects, and priority industry needs. Have projects used a comprehensive framework for their design? Is there more to learn about the particulars of PPLI context? Past Pacific livestock projects are defined as those interventions which have aimed to improve pastoral

³ The component *Food (or product) safety and quality* is considered to be very similar to the *Food Safety* category given by FAO.

livestock industries in the Pacific ('improve' being consistent with an increase in meat production). A search was made of any literature describing projects, programmes, or other interventions which fitted this description. A variety of search strings were used, typically including "livestock" and "Pacific". Web-based searches included Google, Google Scholar, FAO document repository, AusAID, New Zealand Aid Programme, Australian Centre for International Agricultural Research (ACIAR), Secretariat of the Pacific Community (SPC), The World Bank and the Lincoln University library database. A hard-copy search was made of the archives of the livestock division of the Ministry of Agriculture and Fisheries in Samoa.

Most of the information detailing past projects was in the form of 'grey literature'. Grey literature refers to information not published in professional and academic journals, and includes government reports, technical reports, reports to and from donors, and conference proceedings. All literature meeting the criteria was included – a total of 30 complete documents were found. A complete list of these projects is found in Appendix A.2.

The projects were analysed by identifying the focus of their planned or actual activities. These foci were noted, then categorised using the same components of industry that are presented in the framework for analysis. The number of projects that focused on each component was tallied and graphed (Figure 2.3). The horizontal axis lists each of the industry components, the vertical axis shows the percentage of project which focused on that component.

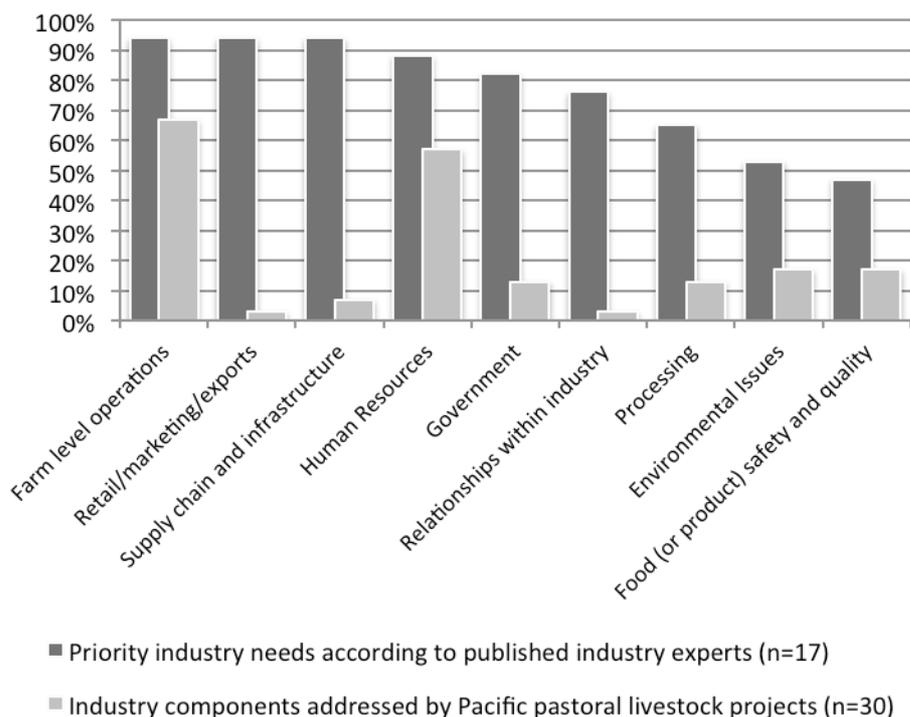


Figure 2.3. Past projects set against the priority needs of the industries, and the percentage of projects or papers that stress importance of each industry component

2.8 A comparison of projects with the framework

One large difference between the two data sets involves the number of industry components that were addressed by each PPLI project. Far fewer components were addressed by each project than those stressed as important by industry papers (an average of 7 components per ‘priority needs’ paper, versus an average of 1.8 components per project). This finding suggests that individual projects were not covering an adequate range of constraints. However, narrowly focused projects are not inherently inferior to widely focused projects. Planning and coordination between projects could ensure an good overall strategy. The narrow focus of *individual* projects is not sufficient to claim that they were poorly designed.

The comparison in Figure 2.3 also reviews that most projects focused on *Farm level operations* and *Human Resources* rather than all nine components of industry. This is despite all nine components being identified as vital parts of industry. *Farm level operations* and *Human Resources* were the subject of focus in 20 and 16 projects respectively, with other components being focused on 3, 0, 2, 4, 4, 5, and 1 times in Pacific livestock projects.

Referring back to the PPLI projects that informed Figure 2.3, further details from the *Farm-level operations* and *Human Resources* interventions can be found. *Farm-level operations* were biased towards the technical and biological themes. Genetic supply and disease management featured heavily; production techniques also featured.

Human Resource improvements were almost all based on training existing staff or farmers on technical matters with a strong biological science bent. It was not uncommon to see projects focusing on both training and changes on farms, all with a technical and biological focus. Very little effort was spent training in other fields. Marketing, extension technique, logistics, leadership and communication for example, are notable by their absence.

2.9 Study conclusions

It is evident that the full range of PPLI needs have not been addressed in a balanced manner by Pacific projects. Even without a formal analysis of PPLIs, it is evident that many industry needs are unfulfilled needs that have become constraints to growth of the industries. Because many of these constraints have not been addressed – as evidenced by the underwhelming performance of the industries – without full and appropriate interventions they are likely to remain constraints.

Information about constraints has not been appropriately used to inform the design of PPLI interventions. It is apparent that interventions have been aimed at only a small handful of targets. There is evidence that project design has often been directed towards the biological sciences at the expense of other fields, and lends some support to the concern that failing to examine all aspects of an industry from all angles can result in incomplete or inappropriate projects. Others have found similar findings in similar situations. Discussing livestock sector interventions in developing nations, Pica-Ciamarra et al. (2010, p. vii) claim that

“livestock sector interventions have been mostly of a technical nature, focusing on the elements of animal husbandry, feeding/nutrition and disease control. While important, these interventions tended to disregard the broader policy and institutional framework within which farmers operate.”

This concern is also stressed by Ramsay (2011, p. 10) in the context of Pacific industry development who claims that

“constraints to development are rarely solely technical in nature, which can often be the focus of donor programs”.

2.10 Limitations to the findings

There are limitations to the conclusions above. In most cases, reasons behind project design foci could not be elicited from the information. Although unlikely, it is possible that each project was designed to minimise a most-limiting constraint, which was identified after a thorough and measured investigation. Without consulting the design team for each project it is only possible to guess the background.

Another limitation of the literature analysis is whether the literature has value in identifying constraints in a *specific* Pacific environment. A stack of 17 papers describing various ways of understanding industry is not particularly user-friendly. The framework for analysis was helpful in the comparison above, but is too non-specific to have value in identifying particular constraints.

Given the poor scope of Pacific projects, there is a need to more precisely identify where the needs lie. This gives support to the need for a tool to better communicate to project designers the range of constraints in a particular PPLI.

2.11 The generic nature of the framework

The framework for analysis formed in this chapter focuses on PPLIs, but remains relatively generic. It was created to be wide in scope to ensure no component of industry would be missed. Generic industry papers were included to ensure this wide scope. However, the understanding gained from generic industry papers has some significant limitations when used to evaluate PPLIs. The characteristics of livestock-specific industries have significant differences from generic industries, and the context of the Pacific needs individual consideration. These differences will be addressed separately, below.

2.11.1 Livestock industry considerations

To draw on understanding from generic industry knowledge, differences between generic industries and livestock industries must be understood. 'Generic industries' here can be defined as the type of industries where the product is invented and manufactured. Examples include cars, televisions, penicillin and cochlear implants. Commodities (e.g. meat) are rarely included in generic industry literature. Livestock industries cannot be assumed to follow the same development steps, or have identical needs as product-based industries. General aims and components of generic industry have relevance to all industries, but livestock industries have some important differences.

By way of explanation, the following list of examples is built from lessons learnt about broad agricultural characteristics by Greer, Greer and Zwart (2000) but adapted for livestock particulars.

Low product differentiation. Compared to many manufactured products, meat and other animal products have a low variation in characteristics, provided basic principles are adhered to⁴. Consumers are unlikely, for example, to distinguish hamburger from Charolais over Angus breeds (although marketers may try to make this distinction). Likewise, technologies in livestock processes are unlikely to create demand-side incentives for change. The result is that innovation focused on special product qualities are a poor way to dominate the industry.

Low barriers to entry. In regions where land is available for use, it is relatively easy to initiate a small livestock firm. This is evidenced by the vast number of the world's poor who own livestock (half of those in absolute poverty, according to Haan (2001)). Low barriers to entry does not mean *no* barriers to entry, however.

Uncertainty. Uncertainty, especially in early stages of any industry, is a predictable feature. Agricultural industries have additional uncertainty due to the biological processes and environmental conditions involved. Climate, nutrition, diseases, and breed suitability are examples.

Delays in product availability. Pastoral livestock has an inherent delay between starting production (buying animals which are, or will become, reproductively active) and having saleable products (animals are conceived, born, and grow until an appropriate slaughter-weight). This delay can act as a barrier to entry in some cases, especially when capital for start-up has terms that require short-term repayment. The ability to respond to market signals can also be inhibited by these delays. Likewise, growth rates of livestock industries can be slowed by reproductive limits and availability of breeding animals.

2.11.2 Considerations of pastoral livestock industries in the Pacific

Pacific island nations have many features in common which are relevant as potential and significant constraints to their development. They are physically isolated from each other and the rest of the world inhibiting or increasing costs of exports and imports (Gibson, 2007), their markets are small which prevents economies of scale, their infrastructure is underdeveloped and expensive, they are vulnerable to natural hazards, and suffer from human capital flight (or 'brain drain') (The World Bank, 2005).

⁴ Principles for producing meat include appropriate slaughter weight and age, low-stress slaughter, carcass aging etc.

It may be less well acknowledged in the literature that there are significant (or at least potential) *advantages* for the livestock sector in the Pacific. These include an unwaveringly warm climate with high rainfall, fertile land availability, ability to coexist with crop-based industries, and low levels of production-limiting disease. There are typically free government services (husbandry advice and animal health) and periodic donor investment into the livestock industry.

Decisions made by individual farmers in the Pacific are often based on a complex array of non-economic factors, evidenced by the non-economic uses of livestock. Analysis of agricultural systems in developed nations is typically assumed to be economically rational and detached from other aspects of culture (e.g. Collis & Montgomery, 2008; Henard & Dacin, 2010; Poole & Van de Ven, 2004; Porter, 2008). This type of analysis can miss the weighty influence of local cultural practices on livestock decisions (FAO, 2001). Particularly in developing nations, cultural practices can alter how productive livestock are managed, sometimes in dramatic ways such as the practice of *fa'alavelave* where Samoan villagers are obliged to present livestock for consumption at feasts of importance. Often the animals of highest reproductive potential are slaughtered to show respect. This example shows how economically rational management systems can be foiled, and production decreased, by cultural systems. Timmer, Falcon, Pearson and Bank (1983) make it clear that a full understanding of the context of farmer decisions is needed for the successful design of interventions.

2.12 Conclusions

Many governments of Pacific Island countries want to increase their meat production. To do this, they must first identify what is constraining this production increase. It is clear that the whole of the industry must be assessed, that livestock-specific factors must be incorporated into the analysis, and that the Pacific countries of interest are sufficiently atypical to require their own assessment rather than relying on findings from elsewhere. Any increase in meat needs to be made in the Pacific, with Pacific land, money, skills, labour, culture and leadership. PPLIs cannot simply follow, or be measured by livestock industries in other regions.

A framework for the analysis of industries has been developed, which proved useful in recognizing the deficiencies of past projects. Projects have been very narrow in scope and have failed in their over-arching goal of industry growth.

Despite the theoretical value of the framework, it is too non-specific to have practical value because it does not include factors of PPLI context or enough detail to inform the design of future industry interventions.

Chapter 3 examines what is needed to inform design of PPLI interventions and ultimately provides a tool to help designers in this process.

Chapter 3

3.1 Introduction

Chapter 2 developed a framework for the complete analysis of industries, but that framework is not specific or detailed enough for practical use. Chapter 3 aims to contextualise constraint identification.

A second action research cycle is presented in Chapter 3. Initially the literature was consulted on what is known about context-specific analyses for the purpose of intervening appropriately. Two methodology families are presented, with a discussion of their advantages and disadvantages.

A research method was developed to create in-depth understanding of the context of one PPLI. The Samoan sheep and beef industry is justified as an appropriate model. Study of this industry used some of the advantageous features of 'Farmer First'-type methodologies and qualitative research techniques. Many stakeholders from within the industry were consulted on how they perceive industry constraints. Literature findings supplemented the data from stakeholders.

The data was processed and analysed qualitatively, and the resultant understanding used to 'flesh out' the non-specific framework into a very different format. A tool was created by this process and is presented in this chapter.

A number of limitations of the tool and cautions in its use are discussed, as well as the anticipated benefits. The research questions are answered by the development of this tool.

3.2 Existing methodologies for industry analysis

Design of interventions requires identification of constraints that are contextualised to industry type, time and place. What assistance does the literature provide in this field?

Many examples of context-specific livestock industry analyses exist in the literature (e.g. Nell, 2006; Stür, Gray, Bastin, & Siddiq, 2002), but typically they are reported without meaningful description of the methodology used in their analysis. Of the methodology descriptions that do exist in detail, two main camps exist which will be referred to as the *Comprehensive methodology*, and the *Farmer First methodology*.

3.2.1 Comprehensive methodology

Comprehensive analyses of rural industries are, by definition, comprehensive and full. The Food and Agriculture Organisation (FAO, 2011) provides one such guideline on how to prepare and present a comprehensive livestock sector review. Comprehensive analyses dovetail with other speciality areas and tend to be considered reliable in the accuracy of their data. They typically include extensive information on, *inter alia*, sector structure, economics, resources, geography, logistics, institutions and markets.

Theoretically a gold standard, these comprehensive reviews have some characteristics that are very undesirable. FAO guidelines admit that a comprehensive review may cost US\$350,000 and take two years to complete. Not only does this limit the situations where they can be used, but the results of such an undertaking are often too cumbersome or too late to be used by those attempting to induce change (Crawford, 1997). Robert Chambers, a long-term critic of such methodologies repetitively slates them as highly inefficient (Chambers, 2012).

3.2.2 Farmer First methodology

The last few decades have seen the rise of a group of related approaches within a different paradigm for assessing rural systems. These approaches can be summarised by Robert Chambers' term 'Farmer First' (Robert Chambers, 1988). This collection of methodologies are not homogenous but have in common a recognition that farmers and other stakeholders are too complex and diverse for purely economic or biological analyses and research station protocols (e.g. Morton, 2007). In these methodologies, data collected tends towards 'emic', defined by Harris (1976, p. 330) as "what goes on inside of people's heads". It is the needs, perceptions and situation of the stakeholders (particularly but not solely farmers) that is relevant. Given that projects in the Pacific claim to be *for* the Pacific people, there is a significant benefit in understanding needs and perceptions of stakeholders. This is in contrast to the data collection of Comprehensive methodologies, where experts collect 'etic' data based on measurement and observations of actions and their effects on the surroundings (ibid).

Farmer First methodologies can be difficult to carry out. They require "changes in personal behaviour and attitudes" to ensure the research is "owned and shared by local people" (Chambers, 1994, p.1437). Chambers admits that true participation of local people is very difficult (Chambers, 1988; Chambers, 1997) and others claim it is wrongly pushed on researchers anyway (Cooke & Kothari, 2001).

The two relevant families of analysis methodologies have advantages and disadvantages as have been described. For the identification of constraints in a particular PPLI setting, neither is ideal.

3.2.3 Farm First influence in the research

The research deliverable, a tool used in the efficient identification of PPLI needs, requires an understanding of the structure and function of the whole industry of interest. Ideally, the research should draw on the advantages of the existing methodology types without the disadvantages. The ultimate goal is to provide a tool to widen the tunnel vision of project designers which appears to have caused the narrow focus of past projects.

The research in this chapter used some techniques typically associated with Farmer First methodologies. The perspective of the farmer (or processor, or retailer etc.) was sought, while the opinion of the researcher and quantitative measurement took a position of lesser importance. Semi-structured interviews were used to understand the variation of human viewpoints from within PPLIs. Interviews were conducted attempting to incorporate the characteristics: *iterative*, *interactive* and *informal*, as listed by Moris and Copestake (1993) as typical for Farmer First-type methodologies. Data collection was qualitative and placed value on cultural context (Silva & Souza Filho, 2007).

3.3 Samoa as a model for livestock analysis in Pacific Island countries

Due to resource and time limitations, one Pacific livestock industry was used as a case study from which to base contextual understanding for the tool. Although there is no consensus on which countries to include under the term 'Pacific Island countries' (PIC), the United Nations list 14 member countries (The United Nations ESCAP, 2012). This list includes the atypical nations of Papua New Guinea, New Zealand and Australia which have (relatively) large populations, large land area and high levels of resources, and Nauru and Tuvalu which have extremely small populations and land area. The remaining nine PICs⁵ have many characteristics in common and happen to be the same nine that the World Bank collates data for on their publically available data site (The World Bank, 2012b).

Of the nine PICs, Samoa was chosen as a representative country for this research. Most of Samoa's characteristics are close to the average of figures for PICs as presented by World Bank data. Exceptions are land area which is slightly under half of the PIC average, and foreign investment where Fiji and Solomon Islands are outliers, increasing the average hugely. Both of these deviations

⁵ Those nine Pacific Island countries of interest are Fiji, Federated States of Micronesia, Kiribati, Marshall Islands, Palau, Samoa, Solomon Islands, Tonga, and Vanuatu

from PIC average will disadvantage Samoan PPLI development, so the risk of missing a potential constraint to other PICs due to this is low. The PIC data are attached in Appendix B.

Within Samoa, the sheep industry was chosen as the pastoral livestock industry of study. This industry is new and has been initiated intentionally by the government of Samoa. All sheep farmers are known to the Ministry of Agriculture and Fisheries and the Government is eager to see the industry grow.

3.4 Underlying logic for the creation of the tool

This research used qualitative research techniques to contextualize the framework developed in Chapter 2 to the specific livestock industry which revolves around Samoan sheep. The methodology draws from several sources.

Like many Farmer First methodologies, this research used curiosity and an eagerness to learn about key informants' professional lives to create data through informal semi-structured interviews. Informants were prompted to discuss what matters in the industry, and what the constraints might be – all from their own viewpoint *within* the industry. Those opinions from *outside* the industry (i.e. the literature) were later given a chance to inform the research as well.

Semi-structured interviews are commonly used in many types of qualitative research (DiCicco-Bloom & Crabtree, 2006). As a tool for learning about systems, and for following up reasons behind those systems, semi-structured interviews fitted well with the research aims (FAO, 2012). Literature supplemented the data from stakeholders.

Information collected from the industry and literature was analysed using a methodology influenced by grounded theory. Grounded theory approaches were originally developed by Strauss and Glaser (1967) and have value in analysis of this type of data. Strauss and Glaser developed a logic for coding the large quantities of data that interviews create and continuously comparing the data with the theory which slowly emerges from it. Qualitative analysis techniques published by Kathleen Eisenhardt (1989) were also influential in this research. Details of the analysis process used in this research are described later in this chapter.

The analysis resulted in the ability of the researcher to 'flesh out' the non-specific framework into a very different and more detailed format. A tool was created by this process and is presented in this chapter. Rather than having a particular theory under consideration for this research, it was only the

framework and the goal which were fixed. The goal was to answer the research questions and in doing so, create a practical tool. This phase of research was the journey from framework to goal.

The purpose of the tool also underlies the research methodology. A project designer in the Pacific may or may not have the lens which enables analysis of *all* potential constraints to an industry, so there was a need to ensure a wide angle view of industry. Data collection needed to be wide enough in scope to cover elements that *could* be constraining, not just presently constraining. All nine components in the framework were examined during the research. The tool was constructed under the paradigm of constructivism which, in the case of the tool, prioritises ‘usefulness’ rather than any other measure of precision or theoretical purity.

3.5 Research approach

3.5.1 The interview process

The interview process was conducted during the second half of the author’s two year contract with the Ministry of Agriculture and Fisheries in Samoa; a job which involved much communication with farmers. Key industry stakeholder groups were identified during this work. A purposive selection of members of each stakeholder groups was made based on their likely ability to effectively communicate issues of the industry around them. This selection increased over the course of the data collection process. Most informants spoke English language well; one informant required translation help from a trusted member of MAF staff. All members who were invited to participate agreed without hesitation.

Data collection for stakeholder members took the form of one or more semi-structured interviews performed in Samoa between the 15th November 2011 and the 21st February 2012. Ethics approval was not necessary given the nature and subject of the interviews.

Interviews were pre-prepared in terms of appointment times and the creation of an interview guide. These guides were specific for each stakeholder group and were written with a view to exploring issues deemed to be constraining by the interviewee. These initial interview guides can be found in Appendix C. In the theme of semi-structured interviews, interview guides were not followed precisely. The overarching aim was to encourage participants to talk about topics they considered to be important – if connected in any degree to PPLI constraints.

In order to smoothly get through what DiCicco-Bloom & Crabtree (2006) call the “initial apprehension phase” of an interview, initial questions were open-ended and easy to answer such as “tell me about your job – what does it mean to be a ~?”. Rapport with each interviewee was

evident by their quickly relaxed demeanour and ease with which they talked. Interviews were typically held in the workplaces of the participants, or in the offices of the Ministry of Agriculture and Fisheries, and typically lasted for 45-60 minutes. Two telephone interviews were also performed. Most volunteered much information tangential to the questions, although one farmer was only interested in answering specific questions. During each interview, notes were written to record the ideas, views and details given by the respondent. The process of taking notes did not appear to bother any respondent; in fact some appeared to be honoured that their views were taken seriously.

It became apparent early in the interview process that there is a lack of experience and resources in the sheep industry. It was not possible to collect meaningful data about all nine components of the framework since some do not exist, or are too immature for perceptions to be meaningful. At the time of the initial interviews no Samoan-bred sheep had been sold on the formal market, no meat processing was being performed on sheep meat, no carcasses were being formally examined and many farmers were not clear on even simple management issues.

In keeping with the research objective of fleshing out the framework with context-specific understanding, a change was made to the data collection process. Rather than collect thin, often speculative data on the embryonic sheep industry, the older and more developed beef cattle industry became an additional industry of focus. The process of selecting key informants in the cattle industry was straightforward and it was quickly obvious that informants were better able to make broad and considered comments across a wide range of industry components.

3.5.2 Human Ethics

In line with previous advice to the Principal Supervisor of this thesis from the Chair of the Human Ethics committee, this project was exempted from formal human ethics approval under Clause 6.2.3 (2) of the Lincoln University Human Ethics regulations, given that all interviews were limited to non-personal matters relating to areas of professional competence of industry personnel, including farmers.

3.5.3 Overlapping of data collection and analysis

After each interview a period of reflection was needed, through the use of coding, to develop adequate understanding of the organic situation, and to be able to reflect new understanding in

words. This approach was influenced by the principles of grounded theory but did not attempt to follow the processes precisely⁶. The processes of analysis used are described below.

Shortly after each interview, the notes were reproduced electronically. Instead of a verbatim reproduction, a review of the entire interview enabled notes to be contextualised and made more full. A respondent's opinion which was later self-contradicted, for example, made that opinion weaker. In this way, not only the spoken word, but also the manner of the conversation was taken into consideration. Points that were emphasised confidently were given emphasis in the electronic note form.

Responses were grouped according to topic, and for each topic thematic codes were created. Codes were designed to be self-explanatory when viewed with a *constraint* orientation. Examples include land, commitment, experience, and transport – stressing the underlying issues from the interviews. Corbin and Strauss (1990) call this phase of coding “open coding” eluding to the openness one must have to new ideas.

The following steps take their names from Eisenhardt's (1989) description of building theory from qualitative data:

Analysing Data. As interviews progressed, responses within codes were compared, initially using responses from within similar stakeholder groups. Codes were grouped to focus on specific issues. Where multiple interviews elicited similar responses, these ideas contributed to a first phase of emerging theory. Where responses disagreed, the topics of disagreement were particularly investigated during further interviews. Responses between stakeholder groups were then compared and analysed to find patterns which strengthened or disconfirmed understanding. Comparing responses from different stakeholder groups meant a diversity of lenses which see different aspects of the industry.

Qualitative research protocols stress that agreements and disagreements should be taken seriously rather than continuing with the original linear path of investigation. One method of taking this seriously is ‘theoretical sampling’. Theoretical sampling is the notion of selecting data sources (interviewees in this case) that help to refine or elaborate emerging theory. For example, experts in trade and finance were not part of the initial plan but added to help confirm or disconfirm issues

⁶ There are differences of opinion about precisely how grounded theory should be used, even between the creators of the methodology (Corbin & Strauss, 1990; Glaser, 1992). The commonly used general principles of grounded theory still have value in the analysis of qualitative data.

deemed to be important by other key players. Similarly, original interview guides were adapted during the interview phases to investigate issues of interest more deeply.

Shaping Hypotheses. Within each of the nine industry components developed in the framework, new, fuller, and contextualised understanding was tabulated. New understanding was repeatedly compared with responses to iterate towards a stronger level of confidence in the understanding.

Adjustments to sub-categories were made as the relationships between functions of the industry became clear. The ability to enter farming or expand a farm was found to have several contributing factors for example. Separate sub-categories including 'livestock', 'finance' and 'land' were created to study them individually, and to examine the relationship between them.

Enfolding Literature. Literature searches were made to find relevant theory which added to the understanding of each of the nine components of the framework. Literature addressing "constraints" or "needs" of "agriculture", or ideally "livestock" "industries" was searched. Web-based searches used the same data sources as in section 2.7. Literature was purposively selected for its ability to either strengthen or disconfirm parts of the emerging theory.

In order to create a practical tool there was a need to understand where constraints lie now and where they might lie in the future. The literature helped in the prediction of global trends and how constraints may change as a consequence of an increase of meat production in the Pacific.

Rather than using the literature to define the components of an industry (as was the case in Chapter 2), the literature at this point was given the same rights as the data from interviews. Views that were consistent with interview responses strengthened the emerging theory. But where the literature disagreed with interview data, thought was given as to why the disagreement existed. Literature functioned to fill in gaps in understanding and occasionally corrected erroneous understanding. Interview data was also able to correct erroneous or irrelevant literature. During this process the author's understanding and analysis took a large role. Literature was consulted past the point of data saturation.

The interview phase is typically completed, according to typical qualitative research methodology, when data becomes 'saturated'. This situation occurs when no new codes are created or little new information is gained from interviews. In the Samoan context, some interview investigations stopped when every member of the (small) industry stakeholder group was interviewed.

A total of 29 interviews were carried out consisting of

- 4 advisors
- 9 farmers
- 5 vets and educators
- 1 agricultural policy expert
- 1 finance expert
- 5 processing and retail staff or managers
- 1 land expert
- 1 chamber of commerce representative
- 1 trade expert
- 1 international donor representative

In addition, many opportunistic and informal discussions with other stakeholders took place in the course of the researcher's work in the livestock division of MAF, Samoa.

3.6 Results

3.6.1 Contextualised components from the framework for analysis

This section gives an overview of theory from key informants and literature based around constraints within the nine industry components and their sub-categories. It is intended as an overview rather than a comprehensive report of all constraints and their relationships. Because data collection and analysis revolved around constraints, positive attributes of the industry tend to be missing from this list.

This overview acts as an answer to the first research question of:

What are the components of Pacific pastoral livestock industries that must be investigated in order to find constraints to the development of those industries?

Component One: Farm-level operations

Land access

Village leaders in Samoa administrate land access; that leadership may change or change its mind about who is given access to specific parcels of land. There is a perception that increased productivity on a farm increases the risk of land being disputed. The insecurity of land access along with small average farm sizes is constraining infrastructure investment on farms. Most concerning are lack of fences and water for livestock. Both may significantly limit production. Future demand for bio-energy may alter land availability for livestock production.

Attitude and Culture

Samoaan farmers cannot divorce cultural obligations from business decisions. While there are many

significant benefits to their communitarian attitude, it also leads to diminished entrepreneurial behaviours and commercial ambition. Many farmers raise a small number of livestock with minimal input and low productivity, considering them 'money in the bank' for when a cultural gift is required. The pressure to contribute premium meat to cultural events often leads to economically poor decisions such as killing young fertile female animals.

Livestock

There is a perception that high quality genetics are difficult to source. Information about performance and genetics of livestock is extremely lacking – very few farms keep any records which allow for calculation of performance. This lack of records has consequences for disease surveillance, inbreeding and research on management techniques. Heat stress and nutritional deficiencies may also be constraining production but lack of data precludes analysis.

Farm Management

Few farmers treat livestock raising as their full time job, so there is a large variation of time and effort spent on-farm. Many farm owners rely on untrained stockmen or relatives to manage their livestock. This leads to poor pasture management and unrecognised livestock problems.

Typically a low level of innovation in livestock systems exists and management excellence is difficult to find. Cost minimisation tends to be performed well, but this is not balanced by good productivity.

An increase in meat production would increase competition – possibly leading to an increase in management quality through innovation and collaboration.

Finance

Private land ownership is unusual; customary land cannot be used as collateral for loans. Interest rates tend to be high⁷, probably due to recognition by banks that farming ventures are risky and poorly profitable. The small average size of farms⁸ limits profitability. Many farmers do not have a business plan when borrowing money for their livestock investments. The ability to repay loans can be unpredictable due to cultural pressures to gift livestock with little notice.

Market Demand (ability of farmers to sell meat)

A large informal market exists which results in a high number of potential buyers, but lack of systems means that no trading strategies are possible. Farmers tend to have preconceptions about the ideal

⁷ 14% per annum is typical for agricultural start up in Samoa through the Development Bank (mid 2012).

⁸ 5.8 acres average agricultural (crop and livestock) holding per household in Samoa 2009 (Samoa Bureau of Statistics, 2012)

market type without market research. Formal market buyers consider meat quality very variable, so domestically produced meat is kept cheap. More standardised imported meat products are awarded premium prices.

Component two: Processing

Key informants had little awareness of issues and potential constraints regarding processing. The level of expertise of slaughtermen⁹ and processors is not regarded as a priority to most people interviewed. Cattle are almost always killed and prepared on the ground by poorly trained stockmen, even for the formal market. The few better-trained commercial slaughtermen and processors are not regarded as significantly better than stockmen. The consequences for meat quality and safety are therefore poorly understood.

Globally, increases in per capita income tend to result in demand for high value processed foods. Whatever the trend in the Pacific, industry growth requires the monitoring and supply of consumer demands.

Component three: Retailer/marketing/exports

Poor livestock disease and meat safety surveillance in Samoa excludes the possibility of exporting meat to most countries. The isolation of Pacific islands also disadvantages exports.

No attempts appear to have been made to increase desirability of local meat products. Few people recognise the needs of consumers as a factor in the industry. Needs of consumers are changing, particularly in terms of taste and convenience, and need to be monitored and communicated to producers.

Global demand for meat is expected to rise which may increase imported meat costs. In the event of an increase in domestic meat production, prices may hold or even rise.

Component four: Supply chain and infrastructure

No attempts have been made to design a coordinated supply chain system. Supermarkets seem to be attempting a 'just-in-time' supply of meat, but infrastructure problems (*inter alia* poor stockyards and poor rural roads) often cause delays. The large proportion of small holders keeps economies of scale low with no dedicated commercial livestock transport, almost no commercial traders and a

⁹ Slaughtering animals is not typically considered appropriate for women in Samoa

poorly executed system of preferred suppliers. An increase in meat production may only increase economies of scale if good distribution systems are in place.

Component five: Human Resources

Access to knowledge (internet access) is generally sufficient, but most informants appear to lack the skills to find, analyse and utilise that knowledge. Government livestock divisions typically have many staff vacancies due to insufficient professional and technical skills in-country. Leadership is not visionary or motivational.

It is likely that all areas of industry have some degree of difficulty in accessing sufficiently trained personnel.

Component six: Government

Government stud farms, Research and Extension

Limited funds for physical resources to manage government stud farms and advisory services may be constraining the level of farm management. Less well recognised by industry informants is the relatively low level of expertise and enthusiasm for livestock production. Samoan government farms are promoted as model farms with top genetics but a lack of management skills and records lead to doubt that this is really the case. Although a government research section exists, it appears to conduct almost no research, probably due to staff skill levels.

Policy

Policy is attempting to provide the livestock industry with an environment in which to grow commercially and compete in the world market. Commercial stakeholders tend to believe there should be more public consultation of policy, while policy makers believe there is sufficient consultation. Certainly accurate data (e.g. total beef produced) is not available to policy makers. Whether Samoa has a comparative advantage (according to economic theory) in sheep and beef production appears to be unknown to policy makers.

There is a pattern globally to move to a small number of large, efficient livestock producers which replace smallholders.

Government must balance national production with food security throughout the population.

Component seven: Food safety and quality

Meat safety

Meat safety is below international standards as defined by typical carcass bacteria counts at the time of sale to supermarkets. Consequences to human health are not sufficiently monitored in Samoa. Carcass rejections and payment penalties are rare. It is likely that meat safety in the informal market is even further below standard. No abattoir system currently exists in Samoa and risk management principles are used only rarely in meat processing. This is likely to become a more significant constraint over time as expectations of consumers increase.

Meat quality

Payment for carcasses is not based on grading for expected quality of meat (defined as the enjoyment of eating the meat). In Samoa, informal markets may reward large, impressive carcasses with higher payment; formal markets tend to pay less for uncastrated bulls. Few informants appear aware of other contributing factors to meat quality like aging and pre-slaughter stress. Further study in this field is recommended and must consider cultural preferences.

Component eight: Environmental issues

There is a notable lack of opinion, understanding and ideas relating to the effect of livestock on the environment and vice versa. Given the low livestock density and very low use of fertilizers the effects on the local and global environment are likely to be less than more productive areas of the world. Poor data and insufficient expertise prevent certainty about this.

There may be future environmental constraints to production particularly in water and waste management.

Component nine: Relationships within industry

Leadership and communication between different parts of industry is poor. Few informants have faith in livestock associations to coordinate industry relationships. There appears to be little awareness of consumer needs and no concept of 'farm to fork' coordination. Government is claiming that the commercial sector needs to be supported but this state-private relationship is immature at best.

3.7 A model of the industry

A model of the form and function of the Samoan sheep and beef industry was formed. Despite an intellectual transformation of the data into a rich and contextualised framework (in the last section), the further step of understanding the industry as a whole was needed. Given that a significant

criticism of past project design is its piecemeal or reductionist viewpoint, the importance of seeing the entire industry had to be brought to the fore. To bring together all major aspects of industry in a graphical form, or model, allows the viewer to see how the industry functions as a whole.

Simply seeing the entire industry is not enough. The point of the model was as a stepping stone towards the definitive aim of the thesis which is the creation of a tool to identify constraints to the industry. A vital characteristic of the tool is that it is efficiently organised and able to be used without months of detailed industry examination. This efficiency requires that time is not wasted on symptoms, rather it concentrates on the most relevant cause. Each part of the tool needed to be efficient, so each element of the model also had to be efficiently presented. The following explains this process with some examples from interview data.

Constraints tend to be hierarchical in the Samoan sheep and beef industry. Each constraint as perceived by an industry member fitted as a sub-constraint into a more broad category of constraint. Some broader constraints fitted into yet another even broader category of constraints. For example, several staff members of the government extension services complained about the availability of cars, which limited their ability to do their job. Staff and farmers were queried about why this might, or might not be important. An understanding of the aims of the extension services, and the skill of livestock farmers, led to the constraint hierarchy seen in Figure 3.1:

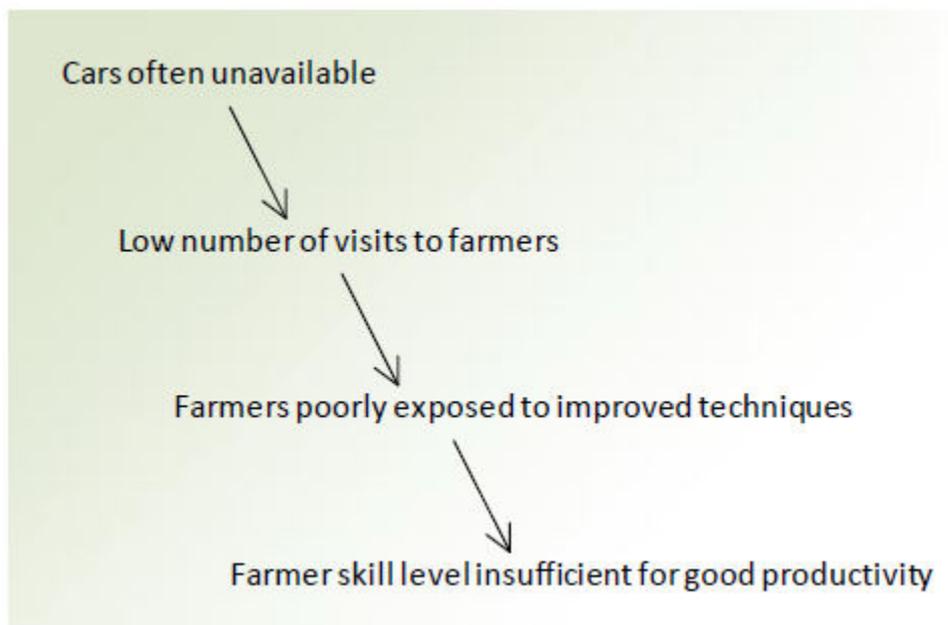


Figure 3.1. A constraints hierarchy using availability of cars as an example

The poor availability of cars is only a constraint because it constrains the number of visits to farmers. The number of visits to farmers is only a constraint because it constrains the exposure of farmers to

improved techniques, and so on. All constraints feed the ultimate constraint of interest – the development of the pastoral livestock industries of the Pacific.

Once these hierarchies of constraints (and there are many) are understood, there is a huge potential efficiency advantage. A practical tool does not need to cover each detail mentioned during interviews or in the literature. Counting the number of cars available is not required when assessing the industry, for example. The tool can be designed to focus on an arbitrary level above car availability which will encompass car availability. In a hypothetical example, if we know that farmers have excellent skills for productivity, everything else feeding this finding must be satisfactory. It may still be true that cars are sometimes unavailable for farm visits, but this is not a constraint to the development of the industry in this hypothetical situation.

The example of excellent farmer skills is likely to be a false example throughout the Pacific. Even without a tool, farm consultants find it easy to see that typical farm practices are not excellent. Understanding hierarchies of constraint, one can simply slide one step back on the hierarchy and try again. Are the farmers exposed to improved techniques? If the answer is also 'no', move to the next step back. This simple process continues until the root causes are found.

Some hierarchical connections are not necessarily obvious to the onlooker. In a situation where livestock farming is profitable, there is a logical flow seen in Figure 3.2.

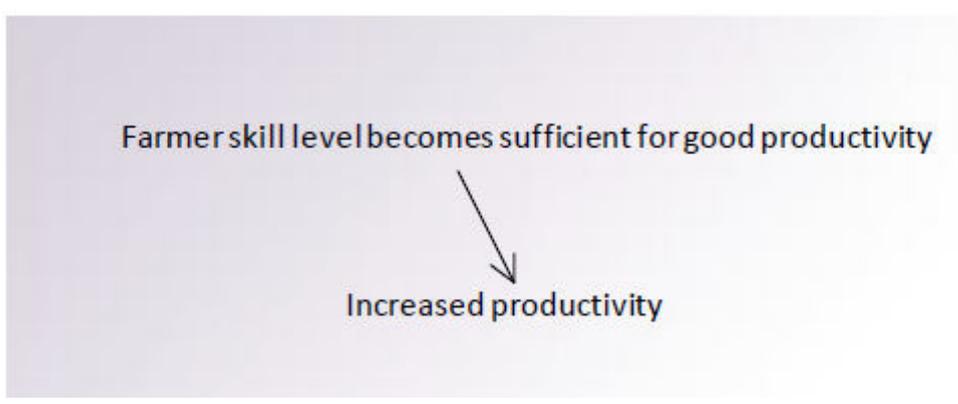


Figure 3.2 An example of a potentially misleading constraint relationship.

It is seemingly obvious that knowing how to do something profitable will result in many electing to perform the practice, which becomes profitable for them. Information gleaned from the Samoan sheep and beef industry has shown a more complex situation. Most farmers have other employment, so lack of time may constrain farm work. The emigration flow from many Pacific countries is high enough that insufficient labour may be constraining. Profits may be shared with an extended family, diluting the personal return on investment, reducing motivation to act on skills.

Cultural norms may prioritise practices other than increasing production. Insufficient land or capital may limit necessary resources for practicing highly productive farming. Livestock may be of poor or inappropriate genetics. These intertwined and potentially contributing factors force a whole-industry view if one is to identify all constraints. The isolated view of biological scientists is not able to appreciate many of these dependencies of constraint hierarchies.

Each 'element' of the model was constructed from the processes seen above. Groupings of components and codes were processed through constraint hierarchies to distil the most efficient elements to include in the model. The size of the model could not be too large and detailed, nor too simple which would become unhelpful. The model does not attempt to cover every detail of the industry. It does cover all major elements, from which individual constraints (like insufficient cars) potentially feed into. The degree of division of hierarchies displayed in the model is the minimum which fully explains the entire industry covering all stakeholder groups and their relationships.

The model presents key constraint hierarchies by connecting elements with arrows. Arrows represent dependency. Each element depends on the function of those elements upstream. The model can be viewed from the ultimate goal of 'Industry Development' where, as discussed in Chapter 2, industry development is defined as an increase in meat production per nation. Two broad factors drive this development: number of sheep and beef cattle, and productivity¹⁰ of the farms. An increase in either, or both, may result in industry development, while constraints in either, or both, will constrain development in the industry. Some arrows of dependency affect nearly everything on the rest of the model and are displayed in the top left taking aim at the entire system.

The model consists of both tangible and intangible elements. *Desirability/Perception* of meat products for example is intangible and therefore difficult to measure. Instead, what can be measured more easily are the consequences of high or low *Desirability/Perception*. *Value of Livestock Sales* and *Ease of Sales* are both direct consequences which can and should be addressed by the tool. Those elements which are to be assessed by the tool are signalled by bold type in the industry model seen in Figure 3.3.

¹⁰ 'Productivity' refers to the efficiency of production, ie. the amount of meat produced per unit of input. It differs from 'production' which refers to the quantity produced.

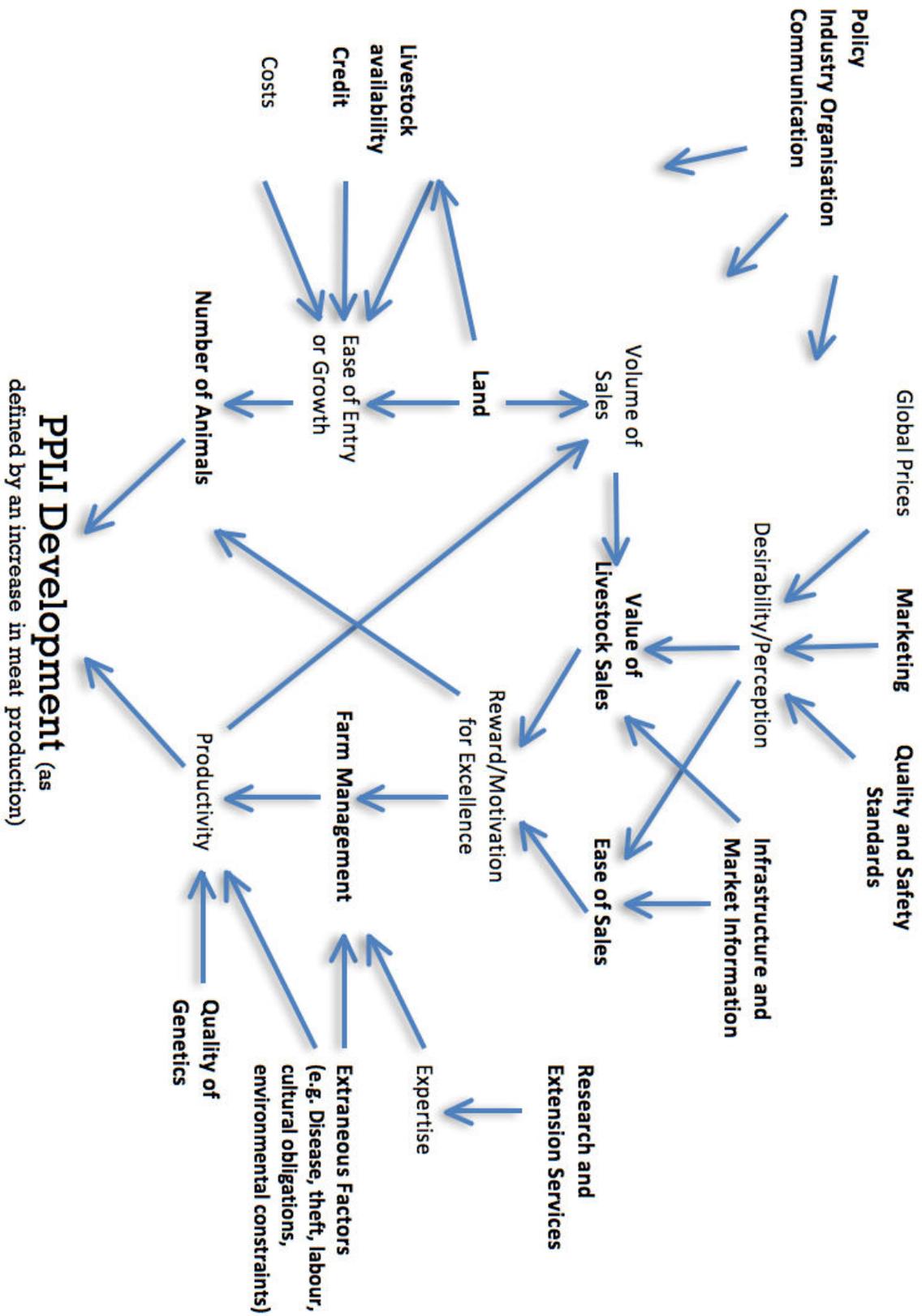


Figure 3.3 A model of constraint relationships in the context of the Samoan sheep and beef Industry

3.8 Aims of the tool

The creation of the tool aims to answer the second primary research question of

How can those components be presented within a tool for use in industry analysis?

The tool was constructed using the contextualised framework (Section 3.6.1) and the model (Figure 3.3), together with literature and understanding about all nine Pacific Island nations. The understanding from these sources was crafted into a format deemed to be useful in the design of development projects.

The model communicates, for example, that desirability of Samoan meat products can potentially be a constraint and may itself be constrained by several other elements. There is some benefit in knowing this, but in any given context, the user needs to examine the real situation. Is there a problem? What is likely to be causing the problem? The model gives theoretical and generic answers; the tool aims to give practical and specific answers with detail derived from the contextualised framework.

The tool was not designed to suggest solutions to any given constraint. Its purpose is to identify any constraint which exists in the industry. Where a constraint is identified, it requires a thorough and specialised investigation to those areas flagged by the tool. Industry elements found *not* to be constraining are unlikely to require additional investigation.

The tool takes the form of a list of probes or questions which can be answered by an experienced generalist in a timely manner. The probes are not technically demanding to execute; they are specific, based on available data and result in useful information. The level of detail of that useful information must contain a compromise. While a tool could be created to result in highly detailed information, it would be cumbersome, time-consuming and subject to the same criticisms as Comprehensive reviews seen in Section 3.2.1. Conversely, the tool could be so concise as to provide very general and weak information to the user. This research aimed to find the middle ground where, after a few weeks of following the tool, a highly focused list of constraints can be reported for further expert investigation. The users of the tool should be confident that the list is complete, yet specific enough to direct experts to defined areas. The process of developing the model was very useful in maximising efficiency in the tool.

3.9 The process of creating the tool

Key points in the model were selected from which to start converting constraint hierarchies into questions. These starting points formed base questions and then sub-questions. The key points were: *Ease of Entry or Growth*, *Productivity*, *Reward/Motivation for Excellence*, and relationships within the industry (*Industry Organisation* and *Communication*). Although the first two elements (*Ease of Entry or Growth* and *Productivity*) were positioned to cover the entire industry, the additional three were key points which allowed investigative entry into the higher levels of the industry. From these key points, details from the contextualised framework were aligned under each associated element, and from the details were sketched 'candidate' or draft questions which examined potential constraints. For each group of questions, an overarching question – one which encompassed all other questions – was created or selected for the first draft.

Questions were checked to ensure no redundancy ('wasted' questions) and no missing focus of enquiry according to data. Questions were shaped and prioritised to create a flow of understanding for tool users. Each question is positioned in its hierarchy to ensure the user knows the purpose of the question, greatly aiding the process of investigation. The actual order in which questions are answered can be decided by the user and his/her resources, but the flow of questions as presented helps in mentally walking through the entire industry.

An example from the tool is presented here to illustrate the process of the creation of tool probes. It illustrates the inclusion of the subjectivity within PPLIs which has been drawn from those within the industry. The example focuses on the topic of *credit*, where thirteen candidate questions or comments were drawn from the contextualised framework. These were conceptually grouped under questions:

- Is credit needed?
- Is it shown to be wise to borrow money?
- Can credit be accessed?
- Is credit affordable?
- Is it realistically repayable?

It was concluded from Pacific literature that *many* potential businesses in PPLIs require credit to start or expand their livestock business. Lack of credit availability therefore represents a potential constraint to entry into the industry. The probe must enquire whether credit is a constraint to the PPLI of interest, or whether credit systems function satisfactorily.

The wisdom to decide about borrowing money is given a subsidiary position as entrepreneurs and hobbyists should be able to decide on the level of risk for themselves. Requiring borrowers to understand what they are doing (via a repayment plan) was considered more important.

Although land tenure featured with a high profile in credit availability discussions, other causes can have the same result. *Availability* then, is the appropriate word to query potential borrowers. Typically it is farmers who find it most difficult to access credit in the Pacific so the question should be directed at them.

Affordability of loans is ideally calculated by including the bottom line of business ledgers. Because these ledgers exist only rarely, and because profit is often not seen as the main purpose of farming livestock, *perception* of loans is more important. The hierarchy level above *credit* is entry barriers. Perception of unaffordable loans is thus more important and more helpful in assessing entry barriers than calculating return on investment. Likewise, the repayment of loans may be a barrier to entry. An option of delaying repayment until livestock reach slaughter-weight might indicate that lenders understand characteristics of agriculture and eliminate the constraint.

The tool line for this example draws on an understanding from those in the industry and from the literature, and is reduced to the distilled question in Figure 3.4. Each question is accompanied by guidelines (in italics) to give the user context and direction. The tool is presented below.

Is credit available and affordable for those needing capital?

Ask farmers. Note that perception here is more important than the actual figures. In addition, ask credit institutions whether repayment can be delayed several years, and whether potential borrowers must present calculated repayments based on realistic figures.

Figure 3.4 An example probe within the tool: identification of PPLI-specific credit constraints.

Pacific Livestock Industry Constraints Identifier: a Tool.

Instructions

Choose which species you are interested in investigating – one at a time.

Questions do not need to be addressed in order, but sub-questions should wait until the lead question is answered. Only address sub-questions if the answer to the lead question is 'no'.

Biases must be avoided. Particularly when consulting with farmers, ensure a varied sample.

Look past normal variation between people. Assessments should be made bearing in mind the development of the industry as a whole. At all times be aware of trends and potential changes in the future regarding constraints.

Can people enter livestock production or expand livestock numbers without significant barriers?

1. Are reproductive livestock available for purchase? *Ask farmers whether they could easily find both male and female animals to buy.*
2. Are livestock herds/flocks increasing in size or number over time? *Consult government statistics. If 'no':*
 - a. Are interventions in place to lift public perception of livestock as a good investment? Are they working? *Consult with policy makers and livestock association members. Examples include promotional campaigns, insurance to reduce risk, irrigation schemes to minimise effects of dry spells.*
3. Is credit available and affordable for those needing capital? *Ask farmers. Note that perception here is more important than the actual figures. In addition, ask credit institutions whether repayment can be delayed several years, and whether potential borrowers must present repayment budget based on realistic figures.*
4. Is suitable land is available with secure tenure? *Ask farmers if they are certain their farmed land will stay in their hands for >15 years¹¹. Exclude very small plots (<2 acres) and land with fertility problems and accessibility problems (for labour and for access to the supply chain).*

Is productivity high, given current resources?

1. Are reproductive stock of appropriate and high quality genetics? *Consult government vet for evidence that stud animal breeds are situation-appropriate, genetics are superior to national average, animals are not inbred, and buyers enjoy satisfactory wait times. Corroborate wait times with farmers.*

¹¹ Based on typical Samoan sheep budget. Adjust as appropriate.

2. Is the stock-handler able to manage with excellence? *Wide-spread evidence of high quality pastures, plus well conditioned livestock satisfies this question. If unanswerable or 'no':*
 - a. Are Research and Extension (government or association) services adequate to promote growth? *To address the three sub-questions below: Initially consult with the organisation's leader to assess his/her clarity, vigour and direction. Gain a clear understanding of what the leader is claiming to be achieving and how. Talk to several staff at various levels of hierarchy to assess each question. Note that staff need both technical and educational skills, with excellent two-way communication with farmers.*
 - i. Do R&E services have clear leadership and functional systems?
 - ii. Do staff and producers prioritise learning?
 - iii. Do staff have sufficient skills?
 - b. Do farmers have sufficient time and labour? *Ask farmers what they would achieve with more time and more labour. Elaborate answers indicate a 'no' to this question.*
 - c. Do farmers prioritise productivity maximisation? *Ask farmers what they have changed (i.e. innovated) that aims to increase production or lower costs.*
 - d. Do farmers have the freedom to do what they consider best? *Ask farmers what they would do differently if they had no legal constraints. Then if there were no financial constraints. Then if there were no social/cultural/church constraints. Elaborate answers indicate a 'no' to this question.*
 - e. Can they diagnose and manage limiting micro-nutrient deficiencies? *Consult vets, laboratories and secondary data as to whether reliable information exists on micro-nutrient deficiencies. If a consensus exists on recommended supplementation, ask agricultural stores how much of that supplement they sell.*
3. Are significant production-limiting diseases dealt with efficiently? *Ask vets for their assessment. Exclude diseases of management origin here. Requires information to exist for the specific conditions, and requires available, affordable and valued treatment and advice for diseases. Ask how many farm clients they have visited over the last year. Calculate this as a percentage of all farms to assess saturation of services.*
4. Are environmental issues dealt with efficiently? *Consult the Meteorology department about weather extremes (particularly humidity/temperature and dry spells). Calculate heat stress¹². Consult with Natural Resources department about other issues that are affecting livestock (e.g. soil salination, landslides). Follow up significant issues to assess whether they dealt with efficiently.*
5. Are extraneous factors (e.g. dog bites, theft) being overcome satisfactorily? *Consult government vet for figures on dog bites, theft, and other constraints on the livestock themselves. If government figures unavailable, ask farmers.*

Are local livestock producers being adequately rewarded?

1. Can producers sell at preferred times? *Ask farmers. Can be any type of market. Effective and efficient systems for distribution are desirable.*
2. Are the value of sales sufficient to encourage flock/herd growth by the producers? *Farmers should be consistently happy with farm-gate sales prices (any type of market), if not:*

¹² Temperature-Humidity Index = $db\ ^\circ C - \{(0.31 - 0.31 RH)(db\ ^\circ C - 14.4)\}$ where $db\ ^\circ C$ is the dry bulb temperature ($^\circ C$) and RH is the relative humidity (RH%)/100. The values obtained indicate the following: <22.2 = absence of heat stress; 22.2 to <23.3 = moderate heat stress; 23.3 to <25.6 = severe heat stress and 25.6 and more = extreme severe heat stress (Marai et al., 2001).

- a. Are the meat products consistently desirable to the consumer? *Initially, compare prices of imported meat with the equivalent in locally sourced meat. Similar prices indicate desirability of local meat. Look at global meat prices and trends to estimate future prices. If not clear, interview members of the public for Q i, ii and iii. Consult government or slaughterhouse figures for Q iv. If figures do not exist, assume 'no'.*
 - i. Are local meat products being adequately marketed?
 - ii. Are types of local meat products appropriate for consumer demands?
 - iii. Is the quality of local meat products adequate?
 - iv. Is the safety of the meat products adequate?
- b. Can producers use market information to make sell decisions? *Ask farmers for typical prices of, say, a 3 year old steer paid by several different buyers. Confidence in answering indicates 'yes'.*
- c. Is the infrastructure functional and efficient? *Consult national statistics on the below categories. If not available, vets and slaughtermen may be able to semi-quantitatively assess. Infrastructure should share with other industries where possible.*
 - i. On-farm *includes stockyards and fences*
 - ii. Transport *includes roads, trucks, ferries*
 - iii. Processing *includes killing yards and chilling facilities*
- d. Is the supply chain logistically and economically efficient? *Follow goods and values from livestock to retail. Are sales values transmitted adequately to processors and producers? Note particularly transport costs, resources which need to be imported, and the efficiency of small volumes of through-put. Requires skilled supply chain management.*

Does the industry work as a whole?

1. Is there effective industry leadership and communication?
 - a. Is there functional industry leadership with commercial skills and focus? *Look for industry leadership which performs and responds to commercial monitoring.*
 - b. Is each group of stakeholders able to effectively communicate to each other, and to government? *Consider this during all investigations. Innovation and functional systems as a result of collaboration is good evidence e.g. government research based on consumer desires, traceability systems, policy change due to farmer demands etc.*
2. Does policy work towards solutions, and do no harm?
 - a. Is government working to identify and minimise constraints? *Consult with agricultural policy writers. Their priority constraints should line up with preliminary findings from this tool, and solutions should be pragmatic.*
 - b. Does policy encourage commercial participation, but also support the desirability of rural areas? *Consult the opinion of the Chamber of Commerce.*
 - c. Is livestock industry policy guided by an effective national agriculture sector plan? *Consult government policy repository for evidence.*
 - d. Are enough resources provided for effective execution of policies? *Consult with government livestock managers as to whether past targets have been met. If not, consider what is preventing this.*
3. Are decisions based on adequate and accurate data? *Consult with government statistics division on how data is collected. Often livestock data is hidden within 'agriculture' data.*

3.10 Using the tool

The tool can be used by those with general skills and experience in development. Given that the tool is a set instructional pathway, a single user can operate the tool and identify industry constraints.

Collegial discussion is likely to help the process where needed. The assessment of pastures and livestock condition may require additional assistance from someone with experience in Pacific farms.

The tool is designed with multiple levels to reflect the constraint hierarchies - potentially increasing efficiency of use. Some questions act as a switch, that switch triggering a different action depending on the answer. In any given industry, the user may need to answer all, or just some of the questions on the tool. The following instructions clarify this technique. All questions are posed in a format requiring a yes/no answer.

YES: When a question is posed, a 'yes' response indicates that the issue in hand is NOT a constraint. The user then moves to the next lead question *in the same level*. Any sub-questions on associated lower levels can be ignored since the sub-issues will also be non-constraining. Intervention in non-constraining issues is unlikely to aid development of the industry.

NO: Where a 'no' is the response to a question, there is a development constraint associated with this issue.

Where no sub-levels exist in the tool for this question, **flag this question** as identifying a constraint.

Where sub-levels do exist in the tool, they must then be investigated by posing them to the industry.

Each lower level question may result in a:

'yes' answer (this 'sub-issue' is not constraining, see YES section above), or a

'no' answer (this 'sub-issue' is constraining). Where no 'sub-sub-levels' exist in the tool for this question, **flag this question** as identifying a constraint. Where sub-sub-levels do exist in the tool, they must be investigated by posing them to the industry.

Once all probes are complete, those flagged questions are recorded as industry constraints. In most Pacific contexts, the government should be the party to coordinate further research with a view to intervene appropriately. Specialists should be brought in to concentrate on those areas identified as constraints to understand the details and functionality of the constraints, and to prioritise them for intervention. The details of this are beyond the scope of this research.

3.11 Reducing bias

The method used for the creation of the tool aimed to minimise skill-set bias for the user. By using inductive reasoning from a wide range of stakeholders, many biases have been either avoided or minimised by the voices from many viewpoints. The risk of introducing bias in the use of the tool still exists however.

Although now 30 years old, a paper by Robert Chambers gives a still relevant warning about bias in investigations into rural areas (Chambers, 1981). Chambers warns that poor rural people may be “underperceived or misperceived” by this bias (ibid, p. 1). Selection of key informants need not be randomised in a qualitative study, but some bias cautions must be mentioned here. Nine probes in the tool require the user to consult with farmers. The information collected from rural areas is of particular concern because a large number of heterogeneous farmers exist; selecting with a bias can give a misleading understanding. Conversely, selection of government veterinarians is likely to be simple and less susceptible to bias. Table 3.1 shows the biases that need to be mitigated.

Table 3.1 Biases which could lead to erroneous results if not minimised. Adapted from Chambers (1981).

Bias type	The problem	The solution
Spatial	Due to time constraints and access to remote areas, the poorest farmers who tend to live remotely can be missed	Ensure that farmers from remote areas are consulted
Project	Users of the tool may be guided towards the areas already improved by projects	Ensure that farmers from non-project areas are consulted
Person	Elites, males, the healthy and users of facilities tend to be more visible, and more likely to be consulted	Attempt to consult with a genuine range of farmers
Dry-season	Problems in wet-season may be overlooked if consultations occur mostly in dry seasons	Ensure that farmers consider all seasons when commenting
Politeness	Rural differences in culture, or poverty may inhibit some questions	Awareness. Diplomatically reduce bias
Professional	It is easy to be disproportionately aware of issues in one’s own area of expertise	Awareness. Stay receptive to all issues

Of the above biases, it is the *professional* bias that is of greatest interest. The literature analysis in Chapter 2 found past PPLI projects have mostly been isolated to the quantitative, biological sciences. It is professional bias that can cause some experts, trained and experienced in biological quantitative sciences, to be disproportionately aware of biological constraints. Biological constraints must not be over-reported at the expense of non-biological constraints. Simply being aware of this risk, in conjunction with the use of the entire tool, is likely to minimise the bias.

Although Chambers (ibid) was most concerned about how the biases relate to rural dwellers, the project, politeness and professional biases are not confined to rural situations. The user must be aware of these, and attempt to mitigate them when consulting all key informants. It is easy to imagine that a government policy writer for example would be most interested in discussing matters relating to successful projects and reluctant to discuss awkward issues that indicate failure or seem impolite.

Two lines of the tool involve observation of farms. Spatial, project and dry-season biases may lead to misunderstanding the situation. These biases can be minimised in the same way as listed in the table above.

3.12 Potential tool limitations

Basing findings on data collected from people has limitations. Consistent with the constructivist paradigm in which this research takes place, industry findings are reliant on perceptions rather than absolute truths. Unlike the quantitative research of biological science, this whole-industry view requires a subjective dimension where questions cannot be answered with discrete precision. The advantages of this methodology are many and have been discussed, but limitations must also be considered.

3.12.1 Limitations of original data

The tool has been developed to identify constraints to the development of PPLIs. It was assumed that where a constraint may exist, some of those interviewed or published have recognised and communicated that to the researcher. It also assumes that no one has strongly disconfirmed that constraint's existence. Steps were designed into the process to minimise these risks. A wide range of interviewees and literature were consulted, with data saturation (where possible) ensuring that data have been sensitive enough to (probably) detect all relevant potential constraints. It is however quite possible that neither the interviewed stakeholders, nor the literature have detected every element constraining the development of PPLIs. Two areas in particular may be under-reported. Where the constraint involves the skill or knowledge base of the informant themselves, that informant may be unable to adequately explain, or even unaware that that constraint exists. Additionally, where a feature of industry does not exist, or at least the informant does not know that the feature exists, it may be difficult for the informant to make helpful comments about that feature. The absence of information-sharing livestock associations, for example, may constrain the spreading of farm-based innovations, but if these associations have not been conceived of by informants, no comment will be made about them.

Another difficulty when identifying constraints are those issues that are personally sensitive. Asking if someone has the right to use land, or the skills to farm well, for example, may be met with a natural motivation to protect oneself from embarrassment. The research on which the tool is based attempted to minimise this risk by diplomatic question design and the tool itself avoids blatantly personal questions. The risk of incomplete constraint identification through this self-protection remains a low risk however.

3.12.2 User to user variation

Because tool probes are typically qualitative, there is a degree of judgement needed when using the tool. When reporting an answer to any particular tool question, there may be some user to user variation. Whether a user has erred on the harsh side, or been optimistic, that user is likely to be able to give an idea of how certain the 'no' answers were. In situations where many 'no' answers are reported, in other words, where many constraint areas are identified, the user should also emphasise the smaller number of 'no' answers where the confidence in the 'no' is very high. Where resources are limited, those high confidence 'no's should be prioritised. This is likely to reduce user to user variability, although testing with multiple users and comparing resultant reports is needed to assess how significant this issue is.

3.12.3 Economic assumptions

Cahn (2008) discusses the complex interaction between Samoan culture and small businesses (all livestock-related businesses except supermarkets could be classed as small in Samoa). She found some significant positives for businesses who remained tightly within cultural norms; conversely adopting business systems that are too 'Western' can have detrimental consequences on sustainability and success. There is a continuum of producer attitudes ranging from very 'cultural' (e.g. *I am blessed to have 3 cows because one day I will be able to give, and bring respect to my family*), to a more economic approach (e.g. *I can expand my herd and make more money*). It should be noted from interview data that probably no livestock producer in Samoa is of the purely Western mindset, and, according to research by Cahn (ibid), nor should they be. That culture can strongly compete with economic development is a typical Pacific-wide characteristic (e.g. Hooper, 2005; Olutimayin, 2002).

It can be difficult to assess constraints to a nation's meat production while taking these cultural aspects into consideration. To take a purely economic view would be to promote a Western mindset as ideal (itself a controversial minefield) as well as evaluating unsustainable practices as positive. Instead of examining each motive for livestock raising, a partial solution was to design the tool to focus on money, but in an inclusive way. Regardless of the reasons that Pacific farmers raise

livestock, the *economic value* of those livestock is assumed to correlate with their *cultural value* and the motivation to raise them well. Even for the producers who see livestock as a 'gift-storage' operation rather than profit-maximising, it was assumed that value of the livestock is still positively correlated with incentive. As long as the buyers or recipients of livestock products are happy, and the producers are seen as generous or get a price they are happy with, the situation is optimal for all subgroups of producers. If buyers or sellers are not happy as evidenced by monetary terms in the tool, there will be a lower incentive for everyone to produce meat, and a constraint to development as defined by meat production.

3.12.4 Heterogeneity in the Pacific

Despite the geographic, economic and cultural similarities between all nine Pacific Island countries, differences do exist. Low lying atolls differ from mountainous volcanic islands, Indian influences in Fiji differ from New Zealand influences in Samoa and from Japanese influences in Palau. Introduced plant species vary, as do introduced farming techniques and customer preferences. These differences, although mitigated in the design of the tool, have not been tested as to their significance when identifying constraints to each country's PPLIs.

3.13 Notable absences in data from interviews

3.13.1 Environmental issues

Although environmental issues are gaining a high profile worldwide, they did not feature commonly in interviews with Samoan livestock industry stakeholders. Livestock grazing systems are extensive (as opposed to intensively barn-raised), and not industrialised. Chemical use is extremely low, effluent run-off is minor, and land erosion uncommon. Stakeholders did not report any environmental concerns, bar a vague unease about future effects of global warming. FAO (2009) discusses livestock and the environment in more depth. Concerns revolve around biodiversity loss, water use, land degradation and greenhouse gas emissions. Pacific Island countries tend to have a high level of biodiversity and high rainfall. Land degradation is not considered a concern by FAO Pacific pasture experts (e.g. MacFarlane, 2009; Aregheore, 2009). Greenhouse gas emissions are proportional to the consumption of meat by the nations' people, but modified by the efficiency of feed conversion. It can be argued that by developing livestock industries in the Pacific feed conversion is likely to improve, thus mitigating the increase in greenhouse gases emitted by decreasing the GHG emitted per kg of meat product. Unfortunately the low level of reliable

information about PPLIs and the environment can lead to sweeping factoids¹³. This field is constantly changing and needs to be considered by policy makers as the industry changes.

3.13.2 Competition

The stakeholders interviewed had very little to say about competition within the industry, or between industries. One might argue that a lack of acknowledgement or understanding about competition is a constraint in its own right. Porter, the influential industry economist, argues strongly that competition is important and desirable and should be understood to ensure an advantage in competition (Porter, 1990). Whether acknowledged or not, the Pacific does compete in meat products; PICs have a high level of meat product imports (International Trade Centre, 2010).

To remedy the lack of interview data, the creation of the tool included concepts from authors such as Porter (1990) and Ambastha & Momaya (2004). As influenced by grounded theory, concepts from the literature were not taken at face value, rather they were compared to what the stakeholders did see as important. Interestingly, while not recognising issues of competitiveness as such, stakeholders had much in common with the literature. Issues such as labour, character of home demand, supporting industries, and prestige have been mentioned by both stakeholders and the literature, and in turn influenced the creation of the tool.

3.13.3 Marketing

Although marketing was often mentioned by stakeholders, their understanding tended to be shallow. There is a greater depth to the concept which may need further investigation. Samoa buys cheap cuts of sheep meat ('mutton flaps') from New Zealand for example. As a result of the cheap price and the local desirability of these cheap cuts, sheep meat consumption is high in Samoa (24% of all meat consumed in country according to one estimate (Brandenburg, 2010, p. 6)). There is scope for consumer market research to investigate whether there is actually a market for other types of sheep meat. Prime lamb receive a high price at present, but it is unknown whether the market for prime lamb is near saturation or could grow considerably. The Ministry of Health is likely to support meats with a lower fat content than mutton flaps and the small number of sheep producers want all cuts of sheep meat to be desirable, but it is not clear what consumers will actually demand.

3.14 Illustration of the tool's use

In a final phase of the research an example of what is produced by the tool is presented. This is not a process of validation, but an illustration of the tool's use to further describe its capabilities.

¹³ Reti's paper (2007, p. 14) on the impact of climate change on agriculture in Vanuatu is a case in point. He blames climate change for an increase in "incidence of disease" and claims that "stream dry[ing] up, as they are doing more and more nowadays" is also due to climate change. No details or evidence is provided.

It was planned that the Samoan sheep industry would be the industry of study in the development of the tool. It was not possible to collect a full range of data from such an immature industry so the beef industry was purposively added. This allowed for a richer data set from which the context of a PPLI could be understood. The tool is likely to be more useful because of the addition of the beef industry context.

The Samoan sheep industry should not be forgotten. It exists as a deliberate attempt by the Government of Samoa to help increase domestic meat production. The industry is growing more slowly than many anticipated, but with little investigation into why that might be. It is therefore an appropriate industry on which to utilize the new tool.

Each probe of the tool was able to be examined without further enquiry. All relevant details were obtained during the interview phase. The results of this use of the tool cannot claim to be a validation of the precision or correctness of the tool. It is aimed however, that the usefulness of the tool might be illustrated.

Figure 3.5 presents a report created by the use of the tool with respect to the Samoan sheep industry.

The sheep industry in Samoa is new, small and immature. From 44 sheep imported in 2004, currently more than 500 sheep exist on 41 small farms.

Can people enter livestock production or expand livestock numbers without significant barriers?

1. Very low numbers of reproductive sheep are available for purchase
2. Credit is available but interest rates are high
3. Land with secure tenure exists presently but problems will occur with further growth of sheep numbers

Is productivity high, given current resources?

1. Stud sheep are cheap but most are inbred and have no production records. Long delays accompany purchase of stud sheep. Fertility rates appear satisfactory.
2. Management of farms is poor leading to nutritional disease and poor production.
 - a. Research and Extension services do not have clear leadership and functional systems. Staff and producers do not prioritise learning. Staff lack adequate skills.
 - b. Farmers cannot diagnose and manage limiting micro-nutrient deficiencies
3. Sheep in Samoa are likely to suffer from production-limiting heat stress during periods of the day, depending on where they are grazed
4. Theft and dog attacks are sporadic but can be debilitating to individual flocks.

Are local livestock producers being adequately rewarded?

1. Sale prices for sheep meat are adequate, but industry growth may be constrained by
 - a. Poorly executed standards in safety and quality,
 - b. Poor industry responsiveness, particularly with respect to market research
 - c. Poorly available market information to producers
 - d. An inefficient supply chain

Does the industry work as a whole?

1. Leadership is not responsive to commercial realities and communication does not flow up or down stream well
2. Policy, as written, is satisfactory, but lack of resources including human resources prevents good execution
3. Policy attempts to consider views of village elders but lack of accurate data hinders decision making

Figure 3.5 An illustrative report from use of the tool using the Samoan sheep industry as the subject

The report is specific enough for initial prioritising by government and associated donors and other organisations. Specialists can use their resources investigating the focused constraints and know they have relevance to the entire industry. Government can ensure that the entire list is understood and ensure that each feature is being addressed.

Results for this specific PPLI can be fed back to the past livestock projects that have been addressed in Chapter 2. Revisiting the literature analysis, the identified constraints for the Samoan sheep industry can be compared to planned or actual activities of projects, programmes, or other interventions. The results of this comparison are seen in Table 3.2.

Table 3.2 Identified constraints to the development of the Samoan sheep industry and their inclusion in past projects

	Constraint (Samoan sheep industry)	Addressed by past projects?
1	Low numbers of reproductive stock	Yes
2	Expensive credit for livestock investment	No
3	Land tenure insecurity	No
4	Genetic records and production	Yes
5	R&E leadership and systems	Yes
6	Attitude and skills of R&E staff and producers	No
7	Micro-nutrient knowledge	No
8	Heat stress mitigation	No
9	Theft and dog attacks	No
10	Consumer research and marketing	No
11	Quality and safety of meat products	Yes
12	Industry cohesiveness and responsiveness	No
13	Poor market information availability	No
14	Inefficient supply chain	No

Chapter 2 concluded that PPLI projects have focused on only a small handful of targets. Those targets tend to be in the biological sciences at the expense of other fields. Table 3.2 above, shows evidence from one particular PPLI that many other constraints exist that have not been addressed in the past. Ten of 14 identified constraints appear to be untouched by deliberate external interventions. Even if projects become successful in their aims, the entire industry is likely to remain in its juvenile stage of development if the remaining ten constraints are not considered.

3.15 Conclusion

The poor alignment between priority needs of PPLIs and projects attempting to develop them has led to a second phase of research, presented in Chapter 3. This phase of research is the start of the journey towards a solution to the poor alignment. Although it is helpful to know that the focus of projects tend to be too limited in scope, finding specific constraints in specific PPLIs is more difficult.

The proposed solution is a way to analyse the industry efficiently to identify constraints to an industry's growth. Only then can projects be designed taking into account all limiting factors. The solution needs contextualisation of the generic information and generic methodologies to the specific characteristics of PPLIs. Contextualisation in this research used a process of data collection from within a PPLI (the Samoan sheep and beef industry) and analysis of that data. The resultant understanding was used to contextualise the framework developed in Chapter 2.

In order to ensure efficiency, particular attention was paid to 'constraint hierarchies' which allows design of a tool using probes focusing on the level of constraint most useful for identification of all industry constraints, with some degree of detail. The tool is not the whole solution – it needs specialist investigation of all of the identified constraints, and needs projects to be designed around the constraints.

Although there are limitations and cautions with the tool's use, it is a step towards the ultimate goal of development – an increase in meat production with all the consequential benefits to the nation, the community and the people.

Chapter 4

Conclusions

4.1 Overview

Pacific Island countries have been unable to achieve self-sufficiency in meat from pastoral livestock. Livestock industries generally remain in a plateau of production despite many development projects supported by governments and international donors. This research analysed 30 projects that committed time and resources to aiding the growth of Pacific pastoral livestock industries. Many projects focused on technical and biological aspects of on-farm production, as well as training personnel on the same aspects. This was despite strong trends found in the literature that many other aspects of industry are also vital to industry growth. The framework for analysis of PPLIs produced by this research included nine vital industry components. Seven of the nine industry components are underrepresented in the Pacific projects.

This research took a practical approach to this problem by creating a tool aiming to make it easier for future project designers to analyse the entire scope of their Pacific livestock industry of interest. The tool was formed after collecting and analysing qualitative data from industry stakeholders, and adding industry-needs theory to strengthen the analysis. The tool used a framework which ensured all vital industry components were considered, and contextualised the framework by fleshing it out with understanding from within-industry data.

4.2 Findings

Livestock do not live isolated from the world. Increasing meat production in the Pacific requires more than deciding which grasses to feed and which drugs to use for worm control. The analysis of interview data with literature was used to identify potential constraints which must be addressed when understanding a PPLI in its entirety. Land tenure issues, availability of livestock, credit availability and return on investment all heavily influence the number of livestock the nation will carry. Genetics, expertise, sale prices along with many cultural specifics will influence the level of productivity of any livestock farm. These factors in turn are influenced by other factors which must also be understood. Government policy, livestock organisations and industry communication tend to influence the performance of the industry at many levels.

The tool for analysis of a specific PPLI uses specific probes designed from the above potential constraints. The probes are used to elicit enough understanding of each part of the industry to identify which parts are constraining the industry's growth. Any identified constraint must then be

examined in more detail using specialist techniques. Elements that are not constraining growth require lower priority attention.

4.3 Limitations and evaluation of the research

4.3.1 Data collection and analysis

Data collection for the research included a wide range of industry participants and literature to minimise risk of bias. It is not possible to completely eliminate the risk of this bias, in data collection or in use of the resultant tool. It is particularly the isolated, the poorest, and the disabled who are at greatest risk of being excluded from analysis unless deliberately included.

The industry informants interviewed for this research were assumed to have, collectively, a complete understanding of the industry and where its constraints might lie. In reality, there may be ideas and concepts which are missing from all informants' understanding which will therefore have been missing from the data used for the creation of the tool. Using many informants and literature as a data source should have minimised, but not eliminated this risk.

Nearly all information sources were based in one Pacific country (Samoa). Samoa has been shown to be an appropriate choice for the Pacific because many of its national characteristics are average for the nine Pacific Island Countries for which the World Bank collects data for. The 'averageness' of Samoa does not rule out the risk of significant differences in other Pacific countries in the realm of pastoral livestock industries. Further testing is needed to validate the tool's appropriateness throughout the Pacific.

Over time, PPLIs will change. It is hoped that growth and other improvements result in dramatic changes which place each PPLI into a more advanced stage of industry development. Global trade and consumer demands are changing, and industry must monitor and respond to these demands. As industries grow and mature, many of the perceptions and realities feeding the research will have changed, risking that the model and tool become less valid. Given the slow progress in most PPLIs over recent years, this is not an imminent risk. Environmental perceptions and competition factors may need to be included more overtly in coming years.

The data collection and analysis was performed by one researcher. At all times, as influenced by grounded theory and other qualitative methods, the researcher kept an open mind, actively curious about potential constraints outside his expertise. The researcher has acknowledged his speciality areas but it is also recognised that data cannot be analysed in the complete absence of "preconceived bias, dogma and mental baggage" (Allan, 2003).

4.3.2 Use of the tool

Due to its design the use of the tool results in incomplete information. Further specialist research is needed after each use of the tool. No specific information about solutions can be gleaned from results and there is also likely to be some degree of user to user variability.

The worth of the tool should not be undervalued however. The tool was developed to address a poor alignment between ailment and cure – without a proper diagnosis of the problems ailing PPLIs curative projects cannot hope to lift production. Although information and techniques that give guidance in identifying industry constraints exist in the literature, they are either incomplete or in an inappropriate format for ease of use. The prevalent information about generic industries ignore the vital uniqueness of livestock industries, and typically, assessment techniques focus on only one blinkered viewpoint, or are so cumbersome as to be impractical. The tool presented in this thesis is designed to ensure a complete diagnosis and can be used cheaply and rapidly using context-specific probes. Although the tool requires validation in other Pacific livestock environments, it represents a genuine contribution to development practice.

The tool has characteristics in common with a checklist. The use of checklists may seem amateur to some – the domain of technicians rather than professionals – but aircraft pilots realised long ago that checklists are a vital tool to ensure the safety of complex pieces of machinery. Others are starting to realise the same thing. Surgeon Atul Gawande (2010) believes that the use of checklists should go far beyond pilots. Gawande created and implemented a surgical checklist that reduced two thirds of ICU infections as soon as the checklist started to be used. The argument of his research might be summarised that no matter how expert you might be, a well-designed checklist can improve outcomes for a system where people are responsible for *all* components that must be addressed (ibid).

The checklist presented in this thesis does not replace expertise. Countries involved in livestock need people at all levels of industry who are experts in their field. The checklist can help to ensure that those experts are focused on the right issues. It is only once they are focused on the right issues that the weighty problems of unemployment, food insecurity and import reliance can be solved.

4.3.3 Further development of the tool

This thesis has presented a journey towards the tool for the analysis of PPLIs. It is not possible to state that the tool is complete and in a final form. There are two reasons for this.

First, the tool has not been validated with use in a different Pacific context. To have a different operator use the tool in, for example, the goat industry in Fiji, may highlight characteristics of the

tool which need modification or clarification. Using data from a different context is a requirement for validation. Even in its present form the tool is likely to be useful, regardless of any future modifications.

Second, the tool should be kept as a 'living tool' – one which is modified according to the needs of the user and context. The concept of considering all relevant factors is important around the world, and the tool presented in this thesis may have relevance further afield than the Pacific with modifications. The title of this thesis reflects the importance of the journey 'towards a tool' rather than the development of a finished product.

Appendix A

Data from past projects versus 'priority needs' comparison

A.1 'Priority needs' literature analysis data

Table A.1 Graphical summary of components stressed in 17 'priority needs' papers.

	Paper number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total for row	
Farm level operations		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	16
Processor		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	11
Retailer/marketing/exports		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	16
Supply chain and infrastructure		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	16
Human Resources		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	15
Government		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	15
Food (or product) safety and quality		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	8
Environmental Issues		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	9
Relationships within industry		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	13

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A.2 Past project analysis data

Table A.2 Graphical summary of components stressed in 30 past project reports.

Paper number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total for row
Farm level operations	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	20
Processor	■	■																■			■										3
Retailer/marketing/exports																															0
Supply chain and infrastructure																							■			■					2
Human Resources	■	■			■		■	■				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	16
Government											■	■										■				■					4
Food (or product) safety and quality	■	■																■			■	■									4
Environmental Issues											■						■					■		■		■					5
Relationships within industry																						■									1

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Appendix B

Data profile for nine Pacific Island countries

Table B.1 Complete and near-complete data for nine PICs of interest showing average figures as compared to Samoan data.

Data Profile 2010										
	Kiribati	Marshall	Micronesia	Palau	Fiji	Solomons	Tonga	Vanuatu	Samoa	Average
World view										
Population, total (millions)	0.10	0.05	0.11	0.02	0.86	0.54	0.10	0.24	0.18	0.24
Population growth (annual %)	1.5	1.2	0.3	0.6	1.0	2.6	0.5	2.5	0.4	1.2
Surface area (sq. km) (thousands)	0.8	0.2	0.7	0.5	18.3	28.9	0.8	12.2	2.8	7.24
GNI, Atlas method (current US\$) (billions)	0.20	0.20	0.30	0.13	3.12	0.55	0.34	0.63	0.55	0.67
GNI per capita, Atlas method (current US\$)	2,010	3,640	2,730	6,560	3,630	1,030	3,280	2,640	3,000	3,169
GNI, PPP (current international \$) (billions)	0.35	..	0.39	0.23	3.88	1.19	0.48	1.04	0.78	1.04
GNI per capita, PPP (current international \$)	3,530	..	3,490	11,000	4,510	2,210	4,580	4,320	4,270	4,739
People										
Mortality rate, under-5 (per 1,000)	49	26	42	19	17	27	16	14	20	25.56
Immunization, measles (% of children)	89	97	80	75	94	68	99	52	61	79.44
Environment										
Forest area (sq. km) (thousands)	0.1	0.1	0.6	0.4	10.1	22.1	0.1	4.4	1.7	4.40
Economy										
GDP (current US\$) (billions)	0.15	0.16	0.30	0.16	3.19	0.68	0.35	0.70	0.57	0.70
GDP growth (annual %)	1.8	5.2	3.1	-2.1	0.3	7.0	-0.5	3.0	1.7	2.17
Inflation, GDP deflator (annual %)	-1.4	2.2	3.1	1.1	8.1	5.6	3.9	2.8	2.3	3.08
States and markets										
Time required to start a business (days)	31	17	16	28	46	57	25	47	9	30.67
Mobile cellular subscriptions (per 100 people)	10	7	25	65	116	6	52	119	91	54.56
Internet users (per 100 people)	9.0	..	20.0	..	14.8	5.0	12.0	8.0	7.0	10.83
Global links										
Merchandise trade (% of GDP)	73.4	90.2	61.2	82.6	70.2	93.1	51.4	47.8	64.4	70.48
Net barter terms of trade index (2000 = 100)	101	104	115	109	106	93	72	105	81	98.44
Foreign direct investment, net inflows (current US\$, millions)	4	9	10	2	129	238	16	39	1	49.78

Appendix C

Interview Guides

Generic Introduction for each interview

"I am conducting research for a Masters degree through Lincoln University, New Zealand, researching Samoan agriculture and all of its important components.

I am interested in your opinions about the Samoan livestock industry. Your personal details will be kept private and not shared with anyone except my supervisors (and the translator [if used]). No one else will be able to connect you with the findings from this research."

C.1 Interview guide for Samoan farmers

1. When did you start sheep farming? (or beef where appropriate)
2. Why did you make the decision to farm sheep?
3. Where did you learn how to farm sheep?
4. Where did you get your sheep? Was that an easy process? Have livestock associations helped?
5. How much did you pay? Have you made more money than you have spent? [break down into sale price x number sold if needed]
6. How has the selling and gifting process gone?
7. Not just thinking about sheep, what does a typical day look like for you? [explore whether there is enough time for labour and farm duties]
8. If I picked a ewe, could you tell me about how old she is, how many lambs she has had, has she been sick?
9. What are the priorities of your sheep business?
10. Do you think you will be still farming sheep in 5 years? Why/why not?
11. Have you ever made a change in the way you farm or sell sheep? Could you tell me about that change?
12. There is a lot of talk about increasing income from sheep farming. Do you think that will happen from your sheep?
13. If everything was perfect, what could you achieve with sheep farming?
 - a. Is there anything stopping you from achieving that?
14. What are the problems with sheep farming? - IF UNANSWERED ALREADY.
15. Is there something else you think I should know to understand sheep farming?

C.2 Interview guide for government advisory staff

1. Tell me about your job – what does it mean to be a [insert job title]?
2. What are the great things about your job?

3. How do you achieve these things? What, or who, do they depend on?
4. What type of farmers are the easiest to teach? What type of people make the best livestock farmers?
5. What are the challenges associated with this work? Can you give me some examples?
6. Would it be possible to make a living doing advisory work privately?
7. When you are advising farmers, do you stress the practical aspects, or the financial aspects? Why?
8. Apart from MAF advisors like you, in what other ways do farmers learn new things about farming?
9. Do you think that sheep farmers could produce more meat than they are now? Do you think that would be a good idea? If yes, how? If no, why not? What about beef farmers?
10. What are the problems associated with that?
11. What are the first things you think of when I ask “what would the Samoan livestock industry think are top priorities?”
12. Have you ever made a change in the way you train or advise farmers? Could you tell me about that change?
13. Is there something else you think I should know to understand advisory implications in the livestock industry?

C.3 Interview guide for university staff involved in teaching agriculture courses

1. Tell me about your job – what does it mean to be a [*insert job title*]?
2. Can you outline the courses that your university offers which cover livestock farming?
3. What proportion of the graduates end up working in the livestock industry?
4. How do you make decisions about **what** to teach? [are you involved in this decision? IF NEEDED]
5. When you are teaching students, do you stress the practical aspects, or the financial aspects? Why?
6. What are the challenges associated with your work?
7. Do agriculture-based teaching staff like you have links with non-university groups when designing or running specific courses?
8. What are the first things you think of when I ask “what would the Samoan livestock industry think are top priorities?”
9. Can you think of any difficulties the Samoan livestock industry might have that involve education?
10. Can you think of any other non-educational difficulties?
11. Is there something else you think I should know to understand education implications in agriculture?

C.4 Interview guide for veterinary staff involved in livestock

1. Tell me about your job – what does it mean to be a [*insert job title*]?
2. How do you achieve these things? What, or who, do they depend on?
3. What type of sheep and beef cattle diseases do you see most often in Samoa? What are the challenges associated with treating livestock? Can you give me some examples?
4. Would it be possible to make a living treating livestock commercially?

5. Do you think that livestock farmers could produce more meat than they are now? Do you think that would be a good idea? If yes, how? If no, why not? What about beef farmers?
6. What are the first things you think of when I ask “what would the Samoan livestock industry think are top priorities?”
7. Can you think of any difficulties the Samoan livestock industry might have that involve health issues (sheep health or human health)?
8. Can you think of any other non-health issue difficulties?
9. Is there something else you think I should know to understand health implications in the livestock industry?

C.5 Interview guide for Samoan retailers of beef products (NB no formal retail of sheep meat currently exists)

1. How long have you been selling beef?
2. Where do you get your carcasses? Is that an easy process?
3. Take me through your interactions with the beef farmers over a typical week.
4. Where did you learn about meat processing and marketing?
5. Are there any legal issues?
6. Is it a profitable part of the business? Are profits fairly stable?
7. Do meat issues take up much of your day normally?
8. Do you think that beef farmers could produce more meat than they are now? Do you think that would be a good idea? If yes, how? If no, why not? What about sheep farmers?
9. Do you have any interactions with your customers over a typical week? What do they think about local vs. imported beef?
10. Was it always the plan for the business to include local meat? Why? What were your expectations?
11. Have you ever made a big change in the way you buy and sell beef or to the services you provide? Could you tell me about that change?
12. Would you like to sell sheep meat in the future? Would it be profitable, marketable, have special advantages or disadvantages?
13. Are there any other problems with buying, processing and selling beef you can think of?

C.6 Interview guide for government staff involved in writing &/or evaluating agricultural policy

1. Tell me about your job – what does it mean to be a [*insert job title*]?
2. What is involved in making the decisions?
3. Speaking particularly about policy that involves livestock/meat now, what groups do you hear from/consult with?
 - a. Or, if there hasn’t been recent discussion about livestock/meat policy, how *would* you decide which groups to hear from/consult with?
4. What are the challenges associated with this type of work? Can you give me some examples?
5. What are the first things you think of when I ask “what would the Samoan livestock industry think are top priorities?”
6. Do you think that sheep farmers could produce more meat than they are now? Do you think that would be a good idea? If yes, how? If no, why not? What about beef farmers?

7. Do you think there is any difference between NZ meat imported into Samoa, and local meat that can be produced in Samoa? In other words, can we compare apples with apples when wanting to outcompete NZ livestock with Samoan livestock?
8. Can you think of any difficulties the Samoan livestock industry might have that involve policy?
9. Is there something else you think I should know to understand policy implications in agriculture?

C.7 Interview guide for Samoan land rights staff

1. Tell me about your job – what does it mean to be a *[insert job title]*?
2. Could you think of the most recent time when you saw a case that involved a livestock farmer. Could you tell me how and why that decision was made?
3. Speaking particularly about land rights that involve farming, what *groups* are involved? How are they involved?
4. What are the challenges associated with this work? Can you give me some examples?
5. What are the first things you think of when I ask “what would the Samoan livestock industry think are top priorities?”
6. Can you think of any difficulties the Samoan livestock *industry* might have that involve land issues?
7. Each family has a right to a small parcel of land within the village right? How big is that land? How is it calculated?
8. Who can access government land/church land to lease? Is it generally more expensive than land leased from a village? Is it hard to find? Is there an advantage in knowing someone (e.g. a minister)?
9. Is there something else you think I should know to understand land rights implications in agriculture?

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